Functionality and adaptability of low cost apartment space design : a case of Surabaya Indonesia

FUNCTIONALITY AND ADAPTABILITY OF LOW COST APARTMENT SPACE DESIGN

A CASE OF SURABAYA INDONESIA

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door

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Summary

This research concerns the floor plan designs of affordable housing units. In particular, the study considers the spatial arrangements and suitability of space based on household activities both in and around the homes of houses offered in the public housing schemes in developing countries (DC's). Although there are various publications of research regarding spatial arrangements and floor plan designs, there is still a lack of research concerning households' spatial demands. While adding to the existing literature that deals with the spatial arrangements and floor plans, this study also address the issue of spatial demands.

As a consequense of trends towards urbanization and population growth in general, the increased demand for housing, especially of the urban poor, has resulted in an increase in urban slums, marginal housing and shanty towns. Resettlement of low income households to low cost rental apartments is necessitated by a scarcity of urban land in big cities such as Surabaya, Indonesia. Land costs have been risen while urban green and open spaces have decreased over the last decade. To accommodate these rising numbers of housing backlog, it is necessary that the housing for the urban poor be developed in multi-storied complexes as single-family detached or ground bound individual housing can no longer be accommodated given scarce land resources in urban environments.

Apartments for low income households in order to solve urban problems have been developed in a fast pace particularly in Asian developing countries such as in Singapore, Malaysia, Philippines, Korea, including Indonesia (Laquian, 1979). Millions of tower housing complexes have been developed in recent decades. However, problems regarding this type of housing for the urban poor have become evident: given the low-income households result in small space housing. In spite of the increase in the unit size of the public apartments (from 18m^2 initially to upwrads of 32m^2 more recently in Surabaya), the recent unit size is still considered below acceptable standards especially when such units should house more than four household members. Moreover, the space design (dimensions) should also accommodate the users' changing needs over the course of the time.

In view of sustainability, functionality and adaptability of space design is a premise. Improving the functionality means sustaining the building function to cater to a households' demand for space. Following Tipple (2000), it is nearly impossible to determine the actual space shortage of housing in the developing worlds, as not only insufficient data is available, but there is also little agreement amongst the countries relating to the units of measurement used or what constitutes adequacy (i.e. functionality). This research has attempted to fill the identified gap in knowledge by using the activity based approach. This approach is based on the reasoning that household demands for space become apparent in their activities and the way they use space within the apartment unit. A household's demand for space is achieved when adequate space has been provided for their activities.

Improving the adaptability of housing units means sustaining the functionality of the apartment through the capability of the design to change (a) the use or function of the functional areas and /or (b) changing the dimensions of the space either vertically or horizontally, as well as through the capability of the households to adapt to the available space to cover their changing space demands.

Through intensive field survey using questionnaires and in-depth interviews, this research investigated which, where and when each household activity is carried out by users, and identifies how much space is required for these activities to be performed. It aims to gain knowledge and understanding of the particular users' demands for functionality and adaptability of space designs of low cost apartments relative to how and to what extent the current and adjusted space designs will continue to meet the demands.

Of all fourteen low cost rental apartment complexes in Surabaya, 300 families contributed as respondents to this study, as the total amount of units in Surabaya was 3459, therefore 21-27 units at each of the fourteen locations were used as samples. Questionnaires were formulated according to a list of household activities applicable for low income families in Surabaya based on the findings of a literature search and on interviews with local academic and cultural experts. The supporting checklist containing blocked plan of each unit was prepared to record the users' response indicating where and which areas

were needed for conducting each activity. Functionality of current space design is assessed by standards that primarily relied on the national rather than international standards, therefore SNI, the Indonesian national standards, are prioritized. The adapting capability of users was evaluated by the use of space. The adaptability of the space was assessed vertically with the possibility for mezzanine construction. Horizontally the adaptability was evaluated with the possibility for corridor occupation, as well as for changing the balcony to a bedroom.

The results suggest that there are seven activities that are missing from the national standards. These include: drying, storing of food, praying, studying, child-caring, relaxing, and playing. The sizes of spaces required for these activities were determined by referring to international standards and anthropometric studies and were also based on the scale of furnishing typical to the unit type. With the average size of the provided whole unit space of 23.14m^2, the national standard, whose original size is 29.76m^2, is adapted to 44.94m^2, and ultimately adjusted further upwards to 48.41m^2. Based on the proposed national standard, only the balcony meets the standard (100%), while the median size of space measure 52%.

On average, the provision of spaces in the subject units falls significantly behind the national standards except for the balcony: whole unit (51%), multi-functional space (50%), kitchen (55%), and bathroom / toilet (75%). The median size of spaces measure 55% of the national standard in terms of space provided. According to the findings of this study, the actual space used by the households is 41.91m^2 on average. To meet their needs for functional space, many households had undertaken some adaptations to their apartment unit. The most widely found adaptation was horizontal partitioning. 214 families divided their multi-functional space, followed by corridor occupations that were done by 97 households. Changes of balcony in function were performed by 29 households. Balcony extensions were carried out by 22 families, while 16 families added mezzanines. The primary motivations for adaptation were privacy, changes in activities, changes in family structure, and the presence of income generation. Of all adaptation types, only the installation of a full mezzanine is capable of meeting the space demands. This upward adaptation can make all the LCRA meet the households' requirements except Tanah-Merah that only meets 81% of the household's need for space.

Accordingly, this research **recommends** standard revisions for:

a. Multi-functional space of low cost rental apartments that accommodates four functional areas: (1) living room, (2) bedroom, (3) dining room, and (4) ironing room. The standardized space is originally only 29.76m^2, then it is adapted to 34.89m^2 by adding the activities that were not included; and is finally revised to 37.38m^2
b. Kitchen whose original standard is between 3.08m^2 and 4.4m^2 is revised to 4.52m^2.
c. Bathroom / toilet that originally standardized at 1.92m^2 is combined with washing whose standard is 1.5m^2. The combined standard 3.42 m^2 is finally revised to 3.78m^2.
d. Balcony size is suggested to maintain the average provided area 2.73m^2, in order to cover the needs of larger space or changing spatial needs in the future.

Regarding **contribution to the theory**, this research found that consciousness as an internal activity of a subject is not only inseparable from the external activity, but also determines the implementation of (external) activity. Meanwhile, with regard to the media or tool in the Activity Theory, it is found that space as a medium or tool in the daily activities of the household in this study is less significant or not appreciably influential. Households keep conducting their daily activities without caring whether the space is adequate or not. However, in order to realize the need for privacy and adaptation, the space as a tool as well as an outcome is highly needed as no privacy and adaptation can be realized without space. Furthermore, LCRA as products for the public has to be analyzed by involving society. The developer must implement an activity based plan and should consider the requirements not only from the supply side but also from the demand side, so that the resulting space design can meet the needs of all parties. The problem regarding the daily functional adaptation that occurs in the public sub-space in this research cannot be solved by using Activity Theory. There is no part of the theory that takes into account when two or more conflicting activities should occur simultaneously in the same space. In fact, the operation of actions of each activity could potentially disturb each other. In addition, the influence of individual households in this research played a more significant role in determining the final outcome patterns of space design than did the larger public or society in general.

Samenvatting

Dutch Version Summary

Dit onderzoek richt zich op het ontwerp van de ruimtelijke plattegrond van wooneenheden. De studie houdt in het bijzonder rekening met de ruimtelijke ordening en is uitgevoerd op basis van huishoudelijke activiteiten in en rond de bewoonde woningen in typische locaties van ontwikkelingslanden. Hoewel er meerdere publicaties zijn verschenen met betrekking tot de plattegrondontwerpen is er nog steeds gebrek aan goed onderbouwd onderzoek naar de feitelijke ruimtelijke eisen. Deze studie dient als toevoeging aan de bestaande literatuur op het gebied van de ruimtelijke ordening en plattegrondontwerpen en pakt ook het probleem van de ruimtelijke eisen aan.

Ten gevolge van de enorme bevolkingsgroei, heeft de toenemende vraag naar huisvesting vooral in de stedelijke gebieden geleid tot een steeds groter aantal sloppenwijken. Verplaatsingen van deze huishoudens met lage inkomens naar sociale huurwoningen zijn dringend noodzekelijk met name in grote steden zoals Surabaya, Indonesië.. Om het toenemende huisvestingstekort aan te pakken is het noodzakelijk dat de huisvesting voor de sociaal zwakkeren ontwikkeld wordt in stapelbouw complexen met meerdere verdiepingen. Immers de schaarste aan grond in stedelijke omgevingen maakt het niet langer mogelijk om in eengezinswoningen of grondgebonden woningen te voorzien.

Appartementen voor huishoudens met lage inkomens zijn in een snel tempo ontwikkeld. In het bijzonder in de Aziatische landen, zoals in Singapore, Maleisië, de Filippijnen, Korea, maar ook Indonesië (Laquian, 1979). De bouw van miljoenen hoogbouwhuisvestingen zijn daar in de afgelopen decennia gerealiseerd. De betaalbaarheid van deze woningen is een onoverkomelijk probleem,. dit ging ten koste van de grootte van de wooneenheid. Ondanks de toename in de laatste jaren van de grootte van de appartementen in de sociale woningbouwsector van oorspronkelijk 18m^2 naar recentelijk 32m^2 in Surabaya blijken deze afmetingen nog steeds onder de norm te zijn, in het bijzonder bij gebruik van meer dan 4 leden van het huishouden. Bovendien moeten het appartement in de loop der tijd tegemoet kunnen komen aan de veranderende behoeften van de gebruikers. Met het oog op duurzaamheid zijn zowel de functionaliteit als het aanpassingsvermogen van het ruimtelijke ontwerp uitgangspunt in dit onderzoek. Het verbeteren van de functionaliteit betekent het behoud van de functies van het gebouw.

Volgens Tipple (2000) is het bijna onmogelijk om het daadwerkelijke tekort aan woningen in de ontwikkelingslanden te bepalen. Dit komt doordat er niet alleen onvoldoende gegevens beschikbaar zijn maar ook omdat onder die landen er weining overeenkomst is met betrekking tot de maatvoering van de ruimte of de mogelijkheid om huishoudens een functionele woonomgeving te bieden die bij de vraag past. Dit onderzoek vult het gat in deze kennis door de activity based-benadering toe te passen. Deze aanpak is gebaseerd op de redenering dat de huishoudelijke vraag naar ruimte zichtbaar wordt in hun activiteiten en de manier waarop ze gebruik maken van het appartement. Het gaat uiteindelijk om het bieden van voldoende ruimte teneinde de activiteiten van het huishouden te voldoen.

De flexibiliteit en uitbreidbaarheid van de woning betekent het behoud van de functionaliteit van het appartement. Door het mogelijk te maken in het bestaande ontwerp om (a) het gebruik of de functie van de ruimte te wijzigen en / of (b) de ruimtelijke dimensie horizontaal of verticaal te wijzigen, wordt het mogelijk voor de huishoudens om de gebruiksbehoefte aan te passen aan de beschikbare ruimte.

Tijdens het intensieve veldonderzoek met behulp van vragenlijsten en diepgaande interviews is in dit onderzoek onderzocht waar en wanneer welke activiteiten door de huishoudens in de apartementen worden uitgevoerd, en hoeveel ruimte daarvoor nodig is. Het doel is om kennis en inzicht van de eisen van de gebruikers te krijgen ten behoeve van zowel de functionaliteit als het aanpassingsvermogen van het ruimtelijke ontwerp van de appartementen.

Van alle 14 goedkope huurwoningen in Surabaya zijn 300 families als respondenten genomen. Het totale aantal eenheden in Surabaya is 3459, waardoor 21-27 huishoudens van elke locatie als steekproef werden gebruikt. Vragenlijsten zijn opgemaakt op basis van een inventarisatie van huishoudelijke activiteiten die met name van toepassing zijn op gezinnen met lage inkomens in Surabaya. Deze lijst is gebaseerd op literatuuronderzoek en interviews met plaatselijke academische- en cultuurdeskundigen. Een ondersteunende checklist met daarin de plattegrond van elke eenheid werd gebruikt om de reacties van de gebruikers vast te leggen waar en welke ruimte nodig was voor het uitvoeren van elke activiteit. De functionaliteiten van het huidige ruimtelijke ontwerp werden hoofdzakelijk beoordeeld op basis van de nationale, namelijk de SNI (Indonesische nationale standaard) in plaats van de Internationale normen. Het aanpassingsvermogen van de

gebruikers werd geëvalueerd op basis van het gebruik van de ruimte, terwijl het aanpassingsvermogen van de ruimte in verticale zin werd beoordeeld door middel van de mogelijkheid voor de bouw van een mezzanine in het apartement. In horizontale zin is dit onderzocht door middel van een inventarisatie van de corridor besetting en de mogelijkheid voor het veranderen van het balkon in een slaapkamer.

De resultaten geven aan dat er zeven activiteiten zijn die niet zijn opgenomen in de nationale normen, te weten: afdrogen, opslaan van voedsel, bidden, studeren, kinderen verzorgen, ontspannen, en spelen. De functionele afmetingen voor deze activiteiten werden bepaald door de verwijzing naar Internationale normen en antropometrische studies en zijn gebaseerd op de grootte van de meubel(s) die typisch bestemd zijn voor deze typologie. De gemiddelde omvang van de aanwezige ruimte was 23.14m^2, terwijl de nationale norm van 29.76m^2 al was aangepast op op 48.41 m^2. Op basis van de grootte van deze nationale norm kan alleen de grootte van het balkon voor 100% aan de standaard voldoen, terwijl de andere ruimten slechts 52% van de eis bereiken.

De gemiddelde beschikbare ruimte in de onderzochte eenheden is aanzienlijk minder dan de nationale normen, behalve het balkon: het gehele eenheid (51%), multi-functionele ruimte (50%), keuken (55%) en badkamer / toilet (75%). De mediane omvang van de totale beschikbare ruimte is 55% van de nationale normen. Op grond van de resultaten van deze studie is de werkelijke ruimte die benut werd door de huishoudens gemiddeld 41.91m^2. Om aan hun behoefte aan functionele ruimte te voldoen hebben de huishoudens een een aantal aanpassingen gedaan binnen hun appartementseenheid. De meest gevonden aanpassing was een horizontale partitionering. Tweehonderdveertien gezinnen hebben hun multi-functionele ruimte ingedeeld terwijl 97 huishoudens kozen voor het bezetten van de toegangscorridor. Verandering van de functie van het balkon werd uitgevoerd door 29 huishoudens, balkonuitbreiding door 22 gezinnen en de bouw van een mezzanine door 16 gezinnen. De belangrijkste drijfveren voor de aanpassingen waren de privacy, de veranderingen in de activiteiten, veranderingen in de gezinssamenstelling en de aanwezigheid van activiteiten ten behoeve van het genereren van inkomsten. Van al de verschillende aanpassingen kon alleen de installatie van een volledige mezzanine voldoen aan de ruimtebehoefte. Dergelijke verticale aanpassingen kunnen ertoe leiden dat alle onderzochte goedkope huurwoningen aan de eisen van de huishoudens voldoen. Alleen de apartementen in het Tanah Merah-complex bereiken dan slechts 81% van de ruimtebehoefte.

Dit onderzoek beveelt derhalve standaard herzieningen aan voor de:

a. Multi-functionele ruimte van de goedkope huurwoningen, die 4 functionele gebieden herbergen: (1) woonkamer (2) slaapkamer, (3) eetkamer, en (4) strijkkamer. De gestandaardiseerde ruimte was oorspronkelijk slechts 29.76m^2 en is aangepast tot 34.89m^2 door het toevoegen van de activiteiten die niet waren opgenomen; en uiteindelijk verbeterd tot 37.38m^2.
b. De keuken met de oorspronkelijke standaard tussen 3.08m^2 en 4.4m^2 is wordt verbeterd tot 4.52m^2.
c. Badkamer / toilet zijn oorspronkelijk gestandaardiseerd op 1.92m^2 en worden gecombineerd met het wassen waarvan de standaard 1.5m^2 is. De gecombineerde standaard 3.42m^2 werd uiteindelijk herzien in 3.78m^2.
d. Wat betreft de grootte van het balkon wordt hierbij voorgesteld de gemiddelde oppervlakte van 2.73m^2 te handhaven, teneinde de behoefte aan grotere ruimte of veranderende ruimtebehoefte in de toekomst te kunnen dekken.

Voor wat betreft de bijdrage aan de theorie bleek uit dit onderzoek dat de interne activiteit onlosmakelijk verbonden is met de externe activiteit en dat deze tevens bepalend is voor de uitvoering van deze (externe) activiteit. Verder werd met betrekking tot de Activity Theory ontdekt dat de beschikbare ruimte voor het uitvoeren van de dagelijkse activiteiten van de huishoudens minder significant of van minder invloed is. De huishoudens blijven hun dagelijkse activiteiten uitvoeren zonder er rekening mee te houden of de ruimte die ze hebben deze wel of niet toelaat. Desalniettemin kwam ook naar voren, dat ten behoeve van de verwezenlijking van de behoefte aan privacy en divers (zakelijk) gebruik, ruimte zeer noodzakelijk. is In de toekomst zal de woningontwikkelaar een activity-based plan moeten ontwikken en rekening moeten houden met de eisen van zowel de aanbodzijde als de vraagzijde, zodat het ruimtelijk ontwerp zal voldoen aan de behoeften van alle partijen. Het probleem betreffende de dagelijks functionele aanpassingen die in dit onderzoek zijn geinventariseerd kan niet met de Activity Theory opgelost worden. Er is geen enkel deel van de theorie die rekening houdt met de mogelijkheid dat twee of meerdere tegenstrijdige activiteiten tegelijkertijd in dezelfde ruimte plaatsvinden. Het uitvoeren van acties van elke activiteit zou elkaar kunnen verstoren. Immers de invloed van de individuele sociaal zwakkere huishoudens speelde in dit onderzoek een belangrijkere rol in de totstandkoming van het ruimtelijk ontwerp dan de gemiddelde eisen van de samenleving in het algemeen.

Ringkasan

Indonesian Version Summary

Penelitian ini berfokus pada disain penataan lantai ruang perumahan murah di kawasan negara sedang berkembang yang didasarkan pada kebutuhan ruang keluarga miskin menurut aktivitas kesehariannya. Meskipun sudah ada beberapa penelitian tentang rancangan penataan ruang, namun studi yang berkenaan dengan kebutuhan keluarga akan ruang masih jarang.

Dikarenakan urbanisasi, kepadatan penduduk terutama penduduk miskin kota meningkat. Hal ini mengakibatkan makin banyaknya permukiman liar serta kawasan kumuh. Permukiman kembali keluarga miskin ke rumah susun sederhana sewa (rusunawa) menjadi krusial (sudah sangat mendesak) dan tidak bisa dihindari karena lahan perkotaan seperti di Surabaya Indonesia sudah semakin langka. Harga lahan semakin melangit dan lahan terbuka hijau kota semakin mengecil pada dekade terakhir ini. Jadi, sangat penting untuk mengembangkan permukiman bagi warga miskin berupa bangunan bertingkat / apartemen secara vertikal karena pengembangan perumahan individual secara horisontal sudah tidak mungkin lagi.

Apartemen bagi keluarga miskin untuk mengatasi masalah perkotaan sudah berkembang pesat di negara-negara sedang berkembang di kawasan Asia seperti Singapore, Malaysia, Filipina, Korea, termasuk di Indonesia (Laquian 1979). Pengembangan ribuan menara permukiman terjadi akhir-akhir ini. Namun permasalahan terkait permukiman murah menyeruak. Keterjangkauan / daya beli kelompok keluarga miskin, keterbatasan dana yang tersedia serta ukuran unit, masih tergolong dibawah standar. Meski terjadi perkembangan luas unit rumah murah di Surabaya Indonesia, dari awalnya 18m^2 sampai 32m^2 akhir-akhir ini, unit hunian masih kurang memenuhi kebutuhan penggunanya terutama bila dihuni lebih dari 4 anggota keluarga. Lebih lagi, dimensi ruang mestinya harus dibuat mampu mengakomodasi perubahan atau pertambahan kebutuhan ruang seiring pertambahan waktu.

Dalam hal sustainabilitas, fungsionalitas dan adaptabilitas ruang adalah premis. Perbaikan fungsionalitas berarti perpanjangan fungsi bangunan dalam memenuhi kebutuhan keluarga akan ruang. Menurut Tipple (2000), hampir tidak mungkin untuk bisa menentukan kekurangan ruang di negara sedang berkembang, karena disamping tidak cukupnya data yang tersedia, sangat kecil / belum pernah ada kesepakatan antar negara-negara mengenai apa yang dimaksud dengan “kecukupan” (adequacy). Penelitian ini bermaksud mengisi gap pengetahuan tentang ini melalui pendekatan berdasarkan aktivitas (activity based). Pendekatan ini didasarkan pada pemikiran bahwa kebutuhan keluarga akan ruang akan menjadi jelas bila dilacak dari kegiatan-kegiatan serta cara penggunaan ruang sehari-hari. Kebutuhan ruang yang sesungguhnya dapat ditemukan melalui penyediaan ruang untuk aktivitas mereka. Memperbaiki adaptabilitas berarti memperpanjang fungsionalitas apartemen melalui kapabilitas ruang untuk merubah (a) fungsi ruang yang ada, dan (b) dimensi ruang baik secara vertikal maupun horisontal, serta kemampuan keluarga dalam mengadaptasikan kebutuhan mereka terhadap ruang yang tersedia.

Melalui survey yang intensif, menggunakan kuesioner serta wawancara mendalam, riset ini meneliti: apa/mana saja, dimana saja, dan kapan saja keluarga melakukan kegiatan nya, serta menandai ruang yang terlibat/digunakan. Tujuannya adalah mencari tahu kebutuhan ruang yang sesungguhnya: tentang fungsionalitas dan adaptabilitas rancang ruang apartemen murah terkait seberapa besar perbedaan antara ruang yang ada terhadap kebutuhan ruang sesungguhnya.

Dari 14 rusunawa yang ada di Surabaya, 300 keluarga diambil sebagai responden, karena jumlah keseluruhan unit yang ada di Surabaya adalah 3459, oleh karenanya 21-27 unit per lokasi dijadikan sampel. Kuesioner di formulasikan berdasarkan daftar kegiatan keluarga yang sesuai untuk keluarga miskin di Surabaya, yang ditentukan melalui studi literatur serta wawancara intensif kepada para ahli lokal, baik dari kalangan akademisi maupun kalangan budayawan. Checklist yang digunakan untuk menunjang survey berisi blok plan masing-masing unit yang disiapkan untuk merekam respon pengguna tentang dimana serta ruang mana yang digunakan untuk melakukan tiap aktivitas. Fungsionalitas ruang yang ada dinilai menggunakan standar yang utamanya mengandalkan standar nasional daripada standar internasional, oleh karenanya SNI, Standar Nasional Indonesia diprioritaskan. Adaptabilitas dievaluasi berdasarkan pemenuhan penggunaan ruang. Secara vertikal, adaptabilitas dinilai melalui kemungkinan

kapasitas yang terjadi bila dipasang mezzanine. Secara horizontal, dinilai kemungkinan kapasitasnya bila dilakukan okupasi koridor serta bila fungsi balkon dirubah menjadi ruang tidur.

Hasil penelitian ini menunjukkan perlunya ditambahkan standar untuk 7 aktivitas yang tidak atau belum tercantum dalam standar nasional Indonesia meliputi: menjemur, menyimpan makanan, melakukan ibadah sembahyang, belajar, momong anak, bersantai, serta bermain untuk anak. Ukuran yang diusulkan ditentukan dengan mengacu standar internasional, berdasarkan studi anthropometric, serta berdasarkan ukuran perabot atau sarana yang dipakai dalam aktivitas. Dengan luas rata-rata keseluruhan unit 23.14m^2, standar nasional yang awalnya 29.76m^2 disesuaikan menjadi 44.94m^2, dan pada penyesuaian akhir diperbaiki menjadi 48.41m^2. Berdasarkan ukuran pada standar yang diusulkan, hanya luas balkon yang memenuhi standar 100%, sedangkan median ukuran ruang-ruang adalah 52% dari standar.

Rata-rata penyediaan ruang dibawah standar nasional kecuali balkon: unit keseluruhan (51%), ruang multi-funsional (50%), dapur (55%), dan kamarmandi-WC (75%). Median ruang-ruang tersedia adalah 55% dari standar nasional. Menurut temuan luas ruang yang sesungguhnya dipakai oleh keluarga adalah 41.91m^2. Untuk memenuhi kebutuhan ruang yang sesungguhnya ini keluarga melakukan adaptasi. Adaptasi terbanyak dilakukan adalah pemisahan ruang multi-fungsional. Sebanyak 214 keluarga membagi ruang multi-fungsionalnya. Adaptasi terbanyak berikutnya adalah okupasi koridor yang dilakukan oleh 97 keluarga, diikuti oleh perubahan fungsi balkon yang dilakukan oleh 29 keluarga. Berikutnya adalah perluasan balkon yang dilakukan oleh 22 keluarga, serta pemasangan mezzanine yang dilakukan oleh 16 keluarga. Pemicu utama perlunya adaptasi adalah privasi, diikuti oleh terjadiya perubahan aktivitas, serta perubahan struktur keluarga, dan yang terakhir adalah terdapatnya kegiatan ekonomi dalam unit. Diantara sekian jenis adaptasi yang dilakukan, hanya pemasangan mezzanine sepenuhnya menutup lantai ruang multi-fungsional yang bisa memenuhi kebutuhan ruang. Melalui adaptasi keatas sepenuhnya menutup lantai ini semua rusunawa dalam penelitian ini mampu memenuhi kebutuhan ruang kecuali Tanah Merah yang hanya bisa memenuhi 81% kebutuhan ruangnya.

Dengan hasil seperti diatas, maka penelitian ini menyarankan perbaikan standar sbb:
Ruang multi-fungsional rusunawa yang menampung 4 ruang fungsi: ruang keluarga, ruang tidur, ruang makan, dan ruang seterika. Total luas ruang yang pada awalnya di standarkan 29.76m^2, mengalami penyesuaian menjadi 34.89m^2 karena harus menambahkan aktivitas yang belum terlibat, dan akhirnya diperbaiki menjadi 37.38m^2.
Dapur yang awalnya di standarkan antara 3.08m^2 dan 4.4m^2 diperbaiki menjadi 4.52m^2.
Kamar mandi dan WC yang awalnya distandarkan 1.92m^2 dikombinasikan dengan ruang cuci yang standar luasnya 1.5m^2. Standar kombinasi yang pada awalnya 3.42m^2 akhirnya diperbaiki menjadi 3.78m^2.
Balkon sengaja disarankan untuk dipertahankan luas rata-rata awalnya yakni 2.73m^2 dalam rangka mengantisipasi kebutuhan ruang yang lebih besar di masa datang.

Mengenai kontribusi terhadap teori, penelitian ini menemukan bahwa kesadaran sebagai aktivitas internal dari subyek tidak hanya tak terpisahkan dari aktivitas eksternal, namun bahkan menentukan pelaksanaan dari aktivitas eksternal. Dalam hal media atau alat / sarana dalam sistim aktivitas pada Teori Aktivitas, ditemukan bahwa dalam penelitian ini ruang sebagai media atau sarana dalam kegiatan rumah tangga sehari-hari tidaklah penting atau sama sekali tidak berpengaruh. Keluarga tetap melakukan aktivitas kesehariannya tanpa perduli apakah ruang yang diperlukan cukup atau tidak. Bagaimanapun juga, dalam rangka merealisasikan privasi serta ruang hasil dari adaptasi, ruang sebagai alat (tool) serta hasil akhir (outcome) sudah pasti sangat perlu, karena privasi serta adaptasi tidak bisa direalisasi tanpa adanya ruang. Kemudian, permasalahan yang berkait dengan adaptasi fungsional sehari-hari yang berlangsung di ruang sub-publik pada penelitian ini tidak dapat dipecahkan dengan memakai Teori Aktivitas karena teori ini tidak pernah membahas bila aktivitas yang terjadi lebih dari satu serta berlangsung dalam ruang yang sama. Padahal aktivitas-aktivitas tersebut berpotensi saling mengganggu. Sedangkan mengenai pengaruh terhadap hasil akhir, penelitian ini menemukan bahwa pengaruh keluarga secara individu berperan lebih besar dalam menentukan pola hasil akhir rancang ruang dibandingkan dengan peran dari masyarakat atau publik.

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Rika Kisnarini

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CHAPTER 1
General Introduction

PART ONE
Research Design

CHAPTER 1
General Introduction

1.1. RESEARCH THEME

This research project deals with the potential contribution of space designs of low cost apartment buildings in developing countries to meet the users' requirements for their living environment in terms of functionality and adaptability with a main focus on spatial arrangements of floor plans.

1.2. BACKGROUND

Housing and urban problems in developing countries

The unfavorable economic situation of developing countries is often accompanied by bad housing conditions of low income households. Urbanization and fast growing populations especially in the cities in developing countries often results in overcrowding. This may happen as the cities offer good job opportunities to villagers that compels them to migrate to the cities, thereby increasing the urban density and resulting in land scarcity (Komarudin, 1997). In view of a sustainable and healthy living environment, cities need more green open spaces. These problems result in homelessness of the urban poor citizens that may cause them to live in slum areas, shanty towns and marginal settlements.

Currently the demand for adequate housing and the housing backlog is relatively high especially in many developing countries such as in South Asia due to fast economic growth coupled with rapid urbanisation. Over fourteen percent of South Asians are estimated to have no home. The figure excludes forty-five percent of the region's people living in overcrowded conditions (World Bank 2010). This means that billions of urban poor still live in inadequate settlements within the city with most deplorable living and environmental conditions. These areas are characterized by an inadequate water supply, squalid conditions of environmental sanitation, an overcrowded and dilapidated habitation, a hazardous location, an insecure tenure, and vulnerably serious health risks (UNHABITAT, 2003).

Sustainability

There is increasing pressure in many regions in the world to provide a sustainable environment for present and future generations. This pressure involves the simultaneous pursuit of social equity, environmental quality and economic prosperity (people, planet and profit) (UN Millennium Development Goals, 2000; UN 2005). Together with solving the housing problem for the urban low-income households in a sustainable manner, sustainability has become one of the most urgent imperatives in developing countries.

Housing programs

UNHABITAT (2003) noted that the rapid growth of cities, the resulting social problems and serious burdens for humans and the environment, together with the increasing international pressure to provide a sustainable environment for present and future generations, motivated governments to start relocation and housing programs. The study also indicated that from the 1930s to the 1970s policies focused on re-housing the poor from existing 'slum areas' through the construction of public housing in the form of high rise blocks. According to the study, even after re-housing, residents remained poor (UNCHS 2003).

People uprooted from urban problems or environmental reasons will have to look for alternative livelihoods elsewhere while at the same time remaining oriented towards both their areas of origin. Low income houses (LIH), with different layouts and space design, have been built for the lower-income households through various housing programs intended to alleviate the housing problem in developing countries, particularly in densely populated urban areas where land is scarce.

The Indonesian government was recently urged to implement renewals in dense urban areas as a means of improved urban planning, as a way to conserve urban land, as a way to solve housing problems, and as a means to improve the standard of living in urban areas. This resulted in resettlements of the urban low-income households to low-cost rental apartments (LCRA), for example in Jakarta and Surabaya, whilst they are generally used to living in individual ground-bound housing units. Despite the difficulties in relocating the urban poor to apartments, it can be expected that the Indonesian government will keep developing low-cost rental towers as a means of addressing land scarcity concerns. This is imperative as the government also needs to enhance the green open space areas within the cities (Kementrian PU, 2012).

Functionality and adaptability of low cost houses

Not all houses offered to the relocated households in the social housing programs have shown to be adequate or widely accepted in the situation of the urban areas (ADB 2003). In a developing country such as Indonesia, housing for low-income households is provided by the government and the real estate markets. The space provided is based on standards from SNI, the Indonesian National Standard.

Evidence suggests that the basic design of many of these apartment blocks were more or less copied from examples in Europe. The blocks themselves often had the opposite effect of what was intended. No considerations were taken into account for the socio-cultural environment and thus with the daily life and activities of the local users. The result is housing that is hostile to traditional social patterns and fail to make use of community and open space for lifestyle and income opportunities. The system-built dwellings are difficult for the occupants to repair or to expand as changing family circumstances dictate. Moreover, this type of housing requires expensive commercial interventions for repairs or expansions (UNHABITAT 2003).

It can be concluded that the space design of the housing models provided do not accommodate adaptation and expansion that responds to present and future social needs and demands of low-income households. More than seventy-five percent of low income housing is changed or renovated by the occupants when their economic situation improves and when there are additional needs of the family (Silas, 2003). There is an increasing number of houses in Indonesia that are adapted in the course of time to comply with the changing needs of its users to support both domestic and business activities. People demolish their house partly thereby causing an increase of waste generation, wasting both resources and capital. The terms of reference used for houses in the social housing programs had no specific consideration for a community's habits and activities in Indonesia (Silas, 2003; Tipple et.al, 2002).

The conventional way of constructing apartment buildings in Southeast Asian regions makes them static throughout the whole building's lifespan. The building does not easily allow for adaptations that respond to the different and fast-changing user activities and demands in the dynamic societies of the 21st century (UNHABITAT, 2003). Adaptations to housing units that meets changing user requirements involve demolition and generates waste. This is detrimental to sustainable development that envisages a balanced ecological, economic and social development (Friedman 2007). A major problem is that a proper forecast of the future users' requirements cannot be made, because the motivating factors that lead to such change are often not recognized until the need arises. There are (many unknown) factors that can have an impact on these (Tipple, 2000).

This implies that the design of the houses should allow change of use throughout the structure's lifespan. In other words the houses should be functional and adaptable to respond to the present and future social needs and demands of the households. Functional and adaptable buildings are inherently sustainable because they reduce material and energy consumption as well as pollution (Johnstone 1995, Binder 2003, Bullen 2007).

Research on housing for low income households

There is a considerable volume of literature that addresses the issue of housing for low-income households that has been published since the 1960s. Recent publications stress the problematic housing situation for the urban poor (UNHABITAT 2003, UN/Millennium Development Goals 2008). Housing policies and programs have been investigated and described in many publications (e.g. Grebler 1955; Abrams 1964; Currie 1966, Turner 1968, UNHABITAT 1996 -2008; World Bank 1976-2003). Much attention has been given to the studies on housing policies, financing and affordability issues particularly for the low-income households in developing countries. Robert M. Buckley and Jerry Kalarickal (2005) examined housing policies in the course of time and their effects on housing and the housing situation of the low-income households**.** They reported that many attempts have been made not only to improve the housing situation of the low income households but also their socio-economic situation.

Many policies and housing programs have pursued integrated solutions for housing. What was noticed is that a market-based housing provision, that had been rejected for a period of time, has been attracted attention due to the dual benefits of improved housing and socio-economic they provide**.** During the 1970's Turner (1976) emphasized that elementary sources of housing

could be properly and economically achieved by the people themselves. In reality nearly eighty-five percent of low-income housing in developing countries were built by the owner or by the community themselves (BTN Housing Report, 2007).

UNHABITAT (2003) reported that considerable progress has been achieved in developing countries in the past two decades in policy formulation. This facilitates a shift of the public sector's role to increasing the capacity of informal sectors in order to improve the housing and living environments of people living in urban slums. Despite this, there is a widening gap between policy formulation and the implementation process. The status of low-income housing delivery is far beyond satisfactory. The 'formal' approaches for example official housing programs, often fail because of their lack of adaption to the economic and social requirements of the residents (UNHABITAT 2003).

Quite a number of studies have focused on technological issues, such as the building systems and design of low income houses in developing countries. By acknowledging the need to improve sustainable development and recognizing the complexity of housing problems, the focus of research needs to change from the pure technological perspective on housing towards an integrated socio-technological concern. As such there is a need for research that integrates the human perspective. Such research is directed to meeting the households' requirements related to the technological perspective, focused on design solutions that meet these needs (ECTP 2007, UNEP 2008-2009, UNU 2009).

Yet, fundamental knowledge about the requirements posed to the low-income housing in developing countries (DCs) is inadequate. Important aspects that need to be investigated are the actual stakeholders' requirements with particular attention paid to functionality and adaptability of space design of the houses (Szokolay, 1980; Kisnarini, 2007). There is some research concerned with housing problems worldwide but little has investigated the sustainability of the building and household requirements related to the changing of needs of households overtime (Kobayashi, 2004 ; Marfa'i et al, 2003).

Under the circumstances of these knowledge gaps, housing strategies such as interventions and the design of low income housing are compromised. The sustainability of buildings and, implicitly, the functionality and adaptability of the space designs will lag behind the need for better service to all people (Hamelin and Hauke 2005; ECTP 2007; USGBC 2008). Research and development efforts are needed to increase the knowledge and understanding of the low income users' requirements for housing, particularly in the developing countries related to the standards that are generally applied in housing programs. Such research will factually reveal inconsistencies and gaps between the actual requirements and those taken as standards in housing programs. The results will support to bring about meaningful space designs that contribute to sustainable building (ECTP 2007). This research project intends to contribute to fill these knowledge gaps.

Conclusion

To relieve the housing problems in developing countries, including Indonesia, it is critical to understand the users' functional requirements for their accommodation and to translate these

requirements for functionality into floor plans or spatial arrangement solutions that are adaptable to individual needs and changing demands over time.

1.3. RESEARCH PROBLEMS

Despite the diverse housing strategies, many of design concepts and building technologies that have been developed internationally have shown to be inadequate or not widely accepted for implementation in the developing countries. Prevailing standards, codes, and regulations can result in harm to the sustainable social performance of buildings. Most standards are derived from western codes and most seemingly do not fit to the local conditions and household needs and requirements. No consideration appears to be given to the particular contextual environment (people, culture, economy and society) in which housing is to be implemented (ADB, 2003).

Despite the wealth of studies on housing, including in developing countries, literature studies tend to echo. Priemus (2001) stated: “Too many theories and a lack of empirical evidence, an uneasy perspective for housing research”. New insights and knowledge about how floor plans in housing schemes for low income households can be adapted to accommodate changing demanded spatial arrangements for daily activities and interactions, is needed. Social housing projects around the world showed a large uniformity in interior spatial arrangement. Such plans cannot easily be adapted to the requirements of individual households.

Further, no consideration appears to be given to the fact that “The household lifecycle and labor market career, condition and the development or maintenance of certain patterns of values, norms, and attitudes that, in turn, affect the formation of an aspiration picture of the household’s residential situation” (Priemus 1986). Spatial arrangements should be adaptable to cater for the diverse and changing needs of the households. Unfortunately, in contrast, households are generally assumed to stick to long-established uses and habit patterns, with only minor changes possible during the lifespan of the household. Literature on sustainability, functionality and adaptability of low cost housing, in the context of developing countries (DCs), is sparse. Therefore, this research is undertaken to explore the patterns of activities of household members and other households and their implications for fulfilling the varying needs and requirements of households for spatial arrangements in and around the home.

1.4. RESEARCH GOAL, AIM, AND QUESTIONS

The Goal / Objective

The objective of this research is to support designers and housing corporations in making informed decisions in the development and application of space designs of low cost apartments (LCA) that meet the users’ demands for functionality and adaptability.

Aim of Research

The aim of this research is to gain knowledge and understanding of the particular users’ demands for functionality and adaptability of the space designs of low cost apartments.

Main Research Question

To what extent do the currently applied space designs of low cost apartments in Surabaya, Indonesia meet and allow changes to meet the users' demands?

Sub Research Questions

1. What are the characteristics of the currently-applied space designs of low cost apartments in Surabaya, Indonesia? (chapter-4)
2. What are the activities of low income households in Surabaya, Indonesia, and what are the standard requirements for space designs of low cost apartments in Indonesia? (chapter-5)
3. How is the use of space of low income households of low cost apartments in Surabaya, Indonesia? (chapter-6)
4. How is the functionality of low cost apartment space designs in Surabaya, Indonesia? To what extent do the currently applied space designs meet the users' demands? (chapter-7)
5. How is the adaptability of low cost apartment space designs in Surabaya Indonesia? To what extent do the current space designs allow changes to meet the users' demands? (chapter-8)
6. What are the recommendations for the space designs of low cost apartments in Indonesia that comply with the users' demands? (chapter-9)

1.5. RESEARCH SETTING

This research project will be carried out under the responsibility of the BCC chair by a PhD candidate in a "sandwich" set-up (collaborative arrangements). This means that the major part of the research is carried out at TU/e whilst the field studies will be performed in Indonesia co-supervised by faculty members from the Indonesian Technological University in Surabaya (ITS) who also support with the necessary field measurement equipment that is available at the Institute of Technology Sepuluh Nopember (ITS), Surabaya Indonesia.

1.6. RESEARCH PLAN

The research will encompass the following sub-studies:

1. Literature studies to find the proper methodology, preceded by basic theoretical framework which include conceptual definitions of Developing Countries (DCs) as the contextual base; Low Income Households (LIH); Housing in apartments; Space Design (SD) of houses; Sustainable housing; Functionality of space; and Adaptability of space.
2. Identify the indicators for assessing the functionality and adaptability.
3. Identify the available standards, rules, regulations and guidelines for space designs.
4. Investigate the current space designs that were developed in the course of time through building drawings, codes & regulations, and field survey including measurements, checklist, and interviews.
5. Investigate the users' daily activities and use of space through questionnaires and checklist.
6. Determine the users' demands for space design by analyzing the data collected from daily activity observation and sketches of existing layout arrangements from the checklist.
7. Examine the functionality and adaptability of the current space designs.
8. Validate, conclude, and recommend the space designs that comply with users demands.

1.7. OUTLINE OF THE THESIS

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PART ONE
Research Design

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PART ONE
Research Design

CHAPTER 2
Methodology

2.1. INTRODUCTION

This chapter discusses the findings of literature studies relevant to this research on the extent of the functionality and adaptability of space designs of apartments for low income households in developing countries. The purpose is to find a useful methodology for conducting this research. The intension of learning from the past studies is to investigate the major concepts of this research, and learn how these are dealt with by the other researchers.

Scientifically, this research project envisages contribution to knowledge regarding concepts of functionality and adaptability related to space designs of low cost apartments in developing countries. The focus of this research is on the theoretical basis behind design standards and principles. A theoretical basis should result in an intellectually tough, analytic, partly formalizable, partly empirical, and teachable doctrine about the design process (Simons 1969). Practically, this research project intends to contribute to systematic design principles, methods and guidelines in order to provide housing designs that meet the users' requirements or spatial demands by means of the research results.

This chapter begins with definitions of the core concepts that are used in this research i.e. developing countries, low income households, housing in apartment, space design of houses, sustainable housing, and functionality and adaptability of space. These definitions are meant to lend transparency and to define scope and boundaries to the requirements of data that are collected during the field research. A summary of major empirical findings from an extensive literature review are subsequently provided followed by discussions that concern the major theoretical approaches used by other scholars in their research. Based on these investigations, the theoretical framework to be used in this research is derived.

2.2. LITERATURE REVIEWS

This section presents conceptual definitions based on extensive literature reviews and a general overview of previous researches that were revealed by previous scholars in their past studies.

2.2.1. Conceptual Definitions

In the following sections seven major concepts important for this research, will be defined based on an extensive literature review on topics concerning this research: developing countries; low income households; space design of houses; housing in apartments; sustainable housing; functionality of space; and adaptability of space.

2.2.1.1. Developing Countries

Developing countries are countries with a lower economic condition compared to developed countries. In other words, according to Kofi Annan, former Secretary General of the United Nations: “A developing country is a nation with a low level of material well-being, while a developed country is one that allows all its citizens to enjoy a free and healthy life in a safe environment” (un.org). World Bank (2008) classifies countries into four income groups based on the Gross National Income (GNI) per capita:

- Low income countries had GNI per capita of US$995 or less.
- Lower middle income countries had GNI per capita between US$996 and US$3,945.
- Upper middle income countries had GNI per capita between US$3,946 and US$11,905.
- High income countries had GNI above US$11,906.

Indonesia belongs to the second group i.e. lower middle income countries. This constraints the investment capacity in the country to cater for a healthy life and safe environment for all people (World Bank, 2008)

There is a correlation between developing countries and population growth (World Bank, 2008). The world population keeps growing. This growth particularly takes place in developing countries. Asia is the most densely populated continent and the majority of the asian nations are classified as developing countries. Population growth will mainly take place in the cities of developing countries where populations will double to nearly four billion by 2030: about the size of the developing world’s total population in 1990. Rapid urban growth in developing countries reflects substantial migration to cities from rural areas and is due also to natural population increase among city residents. On average, natural increase plays the greatest role (www.un.org).

Urban transition offers significant opportunities to improve the quality of life for all individuals, but whether this potential is realized depends critically on how cities are managed and on the national and local policies affecting their development. Across all countries, urbanization accompanies sustained economic improvement over time and, when well-managed, it can be an important contributor to broad-based social welfare gains. The development of urban areas is also closely linked to the rural economy through the exchange of labor, goods, services, information and technology, capital, and social transactions that benefit residents in both locations. However in many urbanized regions, a large percentage of the poor already live in urban areas. By 2025, one-third to one-half of the poor in East and South Asia will reside in cities or towns (www.un.org). The nature of urban poverty is more than an income or employment issue, it is also characterized by squalid living conditions; risks to life and health

from poor sanitation, air pollution, crime and violence, traffic accidents, and natural disasters; and the breakdown of traditional familial and communal safety nets. Urban populations are also particularly hard hit by macro-financial shocks, such as the recent financial crises. Urban environmental degradation has immediate effects on poor urban residents. It also has serious national and global impacts. Urbanization and population keeps growing, but when this is well managed by the government, increase of prosperity may turn citizens to economic improvement (World Bank, 2008).

Conclusion: developing countries are countries that have limited investment capacity to provide decent housing for all its inhabitants, whilst a large part of citizens are not yet able to enjoy a free and healthy life in a safe environment. Indonesia belongs to the lower middle income developing countries, with a rapid urbanization and a lack of decent housing for all its inhabitants, especially for the lower income households.

2.2.1.2. Low income households

Many different concepts have been used in the literature to define and measure 'low income' or 'poverty' across and within member countries (Forster 1994, Olsen 2003). In the absence of a universally accepted method of calculating poverty, household expenditure can be used to provide an indication of inequality of wealth and serve as an indicator of poverty. Household expenditure comprises expenditure of private households on goods and services, irrespective of their durability. The portion of household budgets allocated to different types of goods and services provides an indication of the material standard of living of a population.

According to the UN declaration that resulted from the World Summit on Social Development in Copenhagen in 1995, absolute poverty is "a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information (www.**un**-documents.net/poa-wssd.htm).

So, absolute poverty is a level of poverty as defined in terms of the minimal requirements necessary to afford minimal standards of food, clothing, health care and shelter. For the measure to be absolute the line must be the same in different countries, cultures, and technological levels. An absolute measure generally looks only at individual's power to consume and it is independent of any changes in income distribution. The idea behind an absolute measure is that mere survival takes essentially the same amount of resources across the world and that everybody should be subject to the same standards if meaningful comparisons of policies and progress are to be made. It should be noticed that if everyone's real income in an economy increases, and the income distribution does not change, absolute poverty will decline.

Relative poverty defines "poverty" as being below some relative poverty threshold. For example, the statement that "those individuals who are employed and whose household equalized disposable income is below 60% of national median equalized income are poor" uses a relative measure to define poverty. Using this definition, if everyone's real income in an economy increases, but the income distribution stays the same, then the rate of relative poverty will also stay the same. This means, by its very nature, there will always be a family living in (relative) poverty, even if they have a very high living standard, unless everyone has almost exactly the

same income. Relative poverty measurements can sometimes produce odd results, especially in small populations. For example, if the median household in a wealthy neighborhood earns US$1 million each year, then a family that earns US$100,000 would be considered poor on the relative poverty scale, even though such a family could meet all of its basic needs and much more. At the other end of the scale, if the median household in a very poor neighborhood earned only 50% of what it needs to buy food, then a person who earned the median income would not be considered poor on a relative poverty scale, even though the person is clearly poor on an absolute poverty scale.

However, poverty is not only dependent on income, but also on access to services. "David Gordon's paper, "Indicators of Poverty & Hunger", for the United Nations, further defines absolute poverty as the absence of any two of the following eight basic needs (Gordon, UN):

- Food: Body Mass Index must be above 16.
- Safe drinking water: Water must not come solely from rivers and ponds, and must be available nearby (less than 15 minutes' walk each way).
- Sanitation facilities: Toilets or latrines must be accessible in or near the home.
- Health: Treatment must be received for serious illnesses and pregnancy.
- Shelter: Homes must have fewer than four people living in each room. Floors must not be made of dirt, mud, or clay.
- Education: Everyone must attend school or otherwise learn to read.
- Information: Everyone must have access to newspapers, radios, televisions, computers, or telephones at home.
- Access to services: This item is undefined by Gordon, but normally is used to indicate the complete panoply of education, health, legal, social, and financial (credit) services.

For example, a person who lives in a home with a mud floor is considered severely deprived of shelter. A person who never attended school and cannot read is considered severely deprived of education. A person who has no newspaper, radio, television, or telephone is considered severely deprived of information. All people who meet any two of these conditions e.g. they live in homes with mud floors and cannot read, are considered to be living in absolute poverty.

Over 600 million people in the cities of developing countries cannot meet their basic needs for shelter, water, food, health, and education. Recent migrants to cities are particularly vulnerable, often clustered in slums with little access to jobs or services (World Commission on Environment and Development, 1987).

For low income communities, the low income level, purchasing power and relatively high un-employment rate combined with a low level of skills, is in many developing countries make the affordability for formally provided adequate housing facilities rather limited (UNHABITAT 2003). The community's income level is related to the overall income level in the country (Gaillard 1996). Rubinger M et al (2008) refer to the very few credit providing institutions in developing countries and to the lending practices for low income communities that undermine the affordability for a formally built adequate house not only for individual families but also for entire neighborhoods. Economic activities of the low-income households are limited to traditional low wage work, mostly due to the relatively low level of knowledge and skills that do not support productivity and diversification of their activities (UN 2002).

In this research low income household is a household with an income below the current minimum wage in the respective country. In typical developing countries almost seventy to seventy-five percent of the population belongs to lower income groups, but some countries have less percentage e.g. Malaysia, Thailand, etc. The following four income categories in developing countries are distinguished by the UNCHS as a rule of thumb: lowest-income household zero to twenty percent, lower income household twenty-one to seventy-five percent; middle income household seventy-five to ninety-five percent, and high income household ninety-five to one hundred percent of the population (van Egmond, 2008). The focus group on this research is the lower income household.

People, who are engaged in building design, engineering and construction, should consider the discussed socio-economic aspects of the low income households carefully. Unfortunately, this is not always the case in practice. The consequences are detrimental to the users of the building. Evidence indicated that consideration for the existing social systems in developing countries formed the most important aspect for successful project execution by architects and engineers. The habits, behavior, ideas and mindsets of the architects and engineers involved in the projects should comply with those of the users of the building such as the low income households (Egmond, 2003).

Conclusion: low income households are families, who are often clustered in slums and cannot meet their basic needs for shelter, water, food, health, and education, as well as have limited access to jobs and limited affordability for adequate housing, Their economic activities are limited to traditional low wage work, whilst their income level is thirty to fifty percent of the median of the country income (World Commission on Environment & Development 1987, UNHABITAT 2003, Gailard 1966, UN 2002).

2.2.1.3. Housing in apartments

Housing and human needs

Housing, as described by Maslow (1970), is a basic need of human beings. A house is an object or technology where individuals or household members can conduct human actions (household activities) in order to fulfill their needs in life. These actions take place in a social system such as a community and the natural environment.

Figure 2- 1: Maslow hierarchy of human needs

The human needs according to (Maslow 1970) include five basic needs that are hierarchically listed in figure 2-1: physiological needs, safety and security, love and belonging, esteem, and self-actualization. Human beings carry-out activities to fulfill their needs. Thus, a house is a physical structure that functions primarily to meet the second basic need such as protection from weather and intrusion to carryout activities in order to fulfill all their needs.

Yet a house should be more than a physical structure to people, it should be a home, although the way home is defined varies considerably throughout the literature and between individuals (Rapoport, 1995). According to Gibbs (2000) a home is a social environment that is dependent on time or the impression of time and is represented by a personalized physical environment, such as a house, that nurtures the attachment of meaning. A home will enable its inhabitants to fulfill the lower level needs as well as the higher-level needs (Maslow, 1970). Higher level needs include the fulfillment of one's ideals and values and the creation of positive memories. Thus, the house is a physical structure that is supposed to function as a home, a social environment in which the inhabitants are enabled to carry out activities to fulfill their needs in life. Based on this, a house or apartment unit in this research, is expected to function in such sense that inhabitants will be enabled to carry out their daily living activities properly to fulfill the human needs.

Apartment housing for low income households

Housing for low income households is a widely discussed topic among politicians, public and private housing organizations and researchers. World Bank (2009) indicated that these households do not have enough income to provide adequate housing themselves. UNHABITAT (2003) reported that from the 1930s to the 1970s, the policy focus was on re-housing the poor from existing 'slum areas' through the construction of public housing that often is in high rise apartment blocks. An apartment is a self contained housing unit type of residential buildings that occupies part of the total building for instance, an apartment building or apartment block. Many apartment blocks consist of apartments for rent (Miriam Webster.com).

Conclusion: housing in apartments is a housing type that consists of individual housing units in an apartment block that usually occupied by renting.

2.2.1.4. Space design of houses

The word "design" as well as "space design" can have many different ambiguous meanings, as they are applied differently in varying contexts. A literature review of meanings of space design relevant for this thesis provides the following understanding (sources: American Heritage Dictionary; Cambridge Dictionary of American English, at Dictionary.com; Ralph P and Wand Y 2009; Holm J, 2006).

In engineering, design (as a verb) is a component of the engineering process. Other authors see a design (as a noun) as the outcome of a process, a fashion in the mind of the designer resulting in an "invention", a "plan". In engineering, design is seen as the result of the application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, products, processes, and systems" (American Heritage Dictionary). Both meanings refer to a certain problem solution.

Space design (as a noun) is the outcome of the design process that determines the use and allocation of space for a proposed user. In a building a space is an area enclosed and defined by inner and outer walls. Space design (as a verb) refers to the process of analysis and design of spatial and occupancy requirements, including, but not limited to, space layouts and final planning. Getlein (2008) suggests that the principles of design are "almost instinctive", "built-in", "natural", and part of "our sense of 'rightness', but the intended application and context of the resulting works will vary greatly.

Pile (1988) stated that the term design, either in architecture, industrial, or interior design, describes all of the decisions that determine how a particular object, space or building will be. It can also be described as determination of form, with form understood to mean every aspect of every quality including size, shape, material, structure, texture, and color that differs one particular physical reality from any other. These aspects of quality, as meant by (Manning 1987 and Voordt, 1997), are mentioned by (Canter, 1997) as physical attributes that are the third aspect of space. So, attributes characterize the space designs that are determined by activities. For space design, the attributes can be the dimensions of space or the length, width and the height of the space.

Designing the space according to Pile (1988) usually is initiated by preliminary sketches that can be visualized such as through a floor plan that includes circulation and the layout of furniture, and through a section. A floor plan is defined as a scale drawing of a horizontal section through a building at a given level, contrasts with section. So, ground plan is a floor plan for the ground level of a building. A floor plan can also be defined as a scale diagram of a room or building drawn as if seen from above (The American Heritage Dictionary of the English Language, 2009). A section (Pile, 1988) shows an object, a space, or a building as if it had been sliced through to reveal internal spaces and construction. The section discloses also the hidden structure and materials within the thickness of the subject being sectioned. Thus, a section provides the design cut-off vertically in scale, visualizing the space height as the third dimension. Circulation (Pile, 1988) is the movement patterns of a space's occupants. The study of circulation patterns is particularly important in planning complex interiors made up of many rooms, corridors, or other areas. Furniture layout or configuration of a floor plan is a form of detailed planning, usually follows more general space planning (Pile, 1988).

In the first step of layout study the designer must return to the program to learn what activities are to take place in the space, then list what furnishings are required. Decisions must be made on what furniture clusters will serve those activities, what are the needs for storage, or will new built-in units be best for dealing with some furniture needs, such as the placement of books, kitchen utensils, or other things to be stored? How many people will use a particular space, how many will need to be seated, both in normal situations and special occasions? All such questions need to be explored in an effort to arrive at layout planning decisions that will serve users needs as the best possible levels of satisfaction (Pile, 1988).

However there are countless approaches, philosophies and theoretical views that guide design and provide design principles that dictate how a designer approaches the design problem. Design values and the accompanying aspects within design vary between different schools of

thought as well as among practicing designers. Holm (2006) Design philosophies are generally used to determine design goals and requirements to guide the design process. The goals range from solving the least significant individual problem to most holistic utopian goals.

Examples of design philosophies are

- sustainable design, which is based on reflections of environmental and social concerns.
- use-centered design, which focuses on the goals and tasks associated with the use of the artifact, rather than focusing on the end user.
- user-centered design, which focuses on the needs, wants, and limitations of the end user of the designed artifact.

Scholars like Broadbent (1973) and Szokolay (1980) adhere to the last mentioned philosophy. They indicated that the task of architects is not the design of buildings only, but also the creation of controlled environments for humans and their various activities, even if a particular task is the design of only one small building. The argument used for this is that “physical considerations alone do not satisfy the human desires, position and movement of the muscles and joints are vital to our perception of space, and help us define our relationships with the spaces we occupy” (Broadbent, 1973).

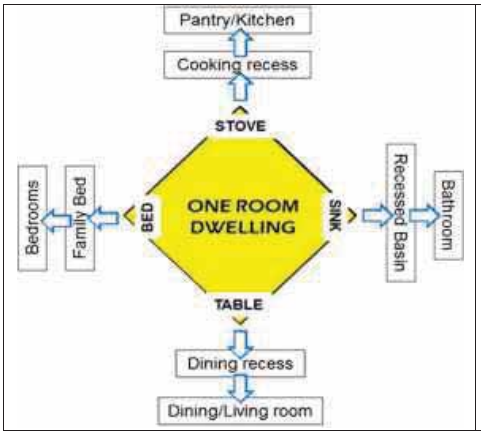
According to King (2004), dwelling is a principle of activity, that policy can feed into if we let it. Housing policy forms only minor elements of our lived experience. It cannot make a dwelling, it can merely help along the way. In addition, he stated that much of a tenant’s dwelling activity is outside the scope of policy. It may be established in the most general of senses, and it may be periodically assisted by policy, but most of the time, there is a blissful ignorance of performance indicators, efficiency indices, rent plans, and so on. These phrases indicate that there are two versions of space design. Housing that is designed based on housing policies and regulations, and housing that is designed based on users’ activities. This research investigates the gap between the two.

Design of houses

Mahdi (1986) revealed that initially human beings only construct roofs to protect them from rain and sun heat. Afterwards, they put external walls to secure them against wind, storm, and other climatic attacks, by which they fulfilled their shelter requirements (their basic needs). Thereafter the building is divided into spaces or rooms suitable to different functions required for their various activities. The arrangement of spaces reflects the character of inhabitants. Yet, spaces can conversely affect the inhabitants’ behavior and even can cause dis-harmony in the family. Additionally Mahdi indicated that house is not just a set of spaces for doing activities such as sitting, sleeping, bathing, eating, cooking etc, but it is also a place where a family can provide love, peace, and prospect for all household members.

Supporting Mahdi, Neufert (1980) stated that the subdivision of houses either a one room dwelling or a palace, should at least provide its dwellers space for a number of basic activities, that are related to human needs, for example: space for food preparation; washing, bathing and toileting; working; eating; and resting. Accordingly, Pile (1988) mentioned that functional areas

in the space design of houses might include a living area, dining area, family room, bedroom, cooking area, and non-residential spaces.



The minimum facilities that should be present at a dwelling unit according to (Neufert, 1980):

- a stove for cooking
- a sink for washing
- a table for doing works
- a bed for resting/sleeping

From the above sentence, it can be concluded that a house / apartment design should at least involve those functions:

- pantry
- bathroom
- living room & dining room
- bedroom

Figure 2- 2: Minimum requirements of functions in dwelling (Neufert, 1980)

Furthermore, Neufert (1980) mentions that for house designs, users' requirements should be taken into consideration. Where houses are not designed for known clients, user requirements can most briefly be summarized in a statement of a number of rooms in the house (not counting kitchen bathroom etc) and the number of people intended to accommodate the structure. In any such analyses, not all plans can meet the requirements of every user satisfactorily. The designer should judge which priorities should be achieved. Pile (1988) stated that designers must consider all issues that involve space locations, sizes, functions and positioning of walls and openings, circulation, and furniture layout in the process of designing houses.

Pile (1988), Mahdi (1988), and Neufert (1980) amongst others declared that the activities of households also determine the specific functions that should be given to separate spaces in a house. Pile (1988), for example, indicated that for deciding the layout of spaces, it is important to consider the primary function and supporting items that are required to carry out activities. Also it is needed to investigate by whom and by how many people will the space be used on a regular basis? By these measures, the size of other means such as electricity, water taps and furniture pieces can be determined. The location of these are related to the size and shape of spaces within the house. Consequently, the locations of required openings (doors and windows) then can be determined.

Monteiro (1997) identified the bedroom, living (or sitting) room, bathroom, kitchen, laundry, terrace, yard, and garden as common places in the home. This was supported by (Julie Stillman & Jane Gitlin, 2003) in their "Family Home of Idea Book". Here, Stillman and Gitlin involved the areas of grouping more clearly by stating that a home is made up of both public and private areas. The open floor plan that is so popular presents many opportunities for family to mingle, but separate territory where family can spend time alone is also needed. The gathering places in the home, the primary areas where family can congregate are: living rooms, kitchens, dining

areas, and play spaces for kids of all ages. The getaway places include the smaller, more private spaces, such as libraries and hobby rooms, or private sanctuaries of bedrooms and bathrooms. The useful and appealing space is the outdoor room of the house that can make great family havens for open-air relaxation such as porches, decks, patios, and outdoor play spaces.

In Asian countries, (semi) external spaces such as porches, verandas, balconies, and corridors play quite important role for conducting home activities. While there is some evident that there are similarities across cultures regarding the activities associated with different spaces in the home, for example between the USA and Europe, there are also likely to be differences when compared with non- western cultures, as described in the next example.

Different from the American and European house, the Japanese house according to (Koji Yagi, 1989) in “A Japanese Touch for your Home” consists of intermediate space and interior space. In the traditional Japanese house, the distinction between interior space and exterior space is not clearly defined. Nature is drawn into the house rather than excluded from it, by a variety of means such as bamboo screen and the entranceway or veranda. The intermediate zone derives from the formal entranceway, the veranda, and the screening devices. The interior space, however, is different from western house. In the western house, the functions of rooms such as the dining room, the living room, and bedrooms are clearly defined. In the traditional Japanese house, one room can have several functions. The function and size of a room is determined by use. Since needs change through the course of the day, one Japanese style room can act as several of its western counterparts. Japanese homes give the impression of simplicity and sometimes emptiness. Where is the furniture then? The custom of sitting on the floor and the use of “tatami” as a kind of chair, table, and bed lead to an economy of furniture. Next, what little furniture there is stored away into a fitted wall closet found in every room with articles for use being removed as needed. For example, at the end of the day, futon mattresses, pillows, and blankets are brought out and laid on the tatami floor. Then in the morning, these are returned to the closet and the room is arranged for use by the family. When it comes to meal time, a low table and cushions are produced. After the meal is over, the table is cleared, and the family may spend the rest of evening in the same room watching television.

Similarly in principle, yet Asquith (2003) emphasized more to the multi-functionality of space in which, she indicated that the type and combination of activities affects spatial patterns resulting from practical considerations as to where specific activities can take place. Labels assigned to rooms may presume a function specificity that does not actually exist. A kitchen may be used for many purposes, not only cooking or eating but also working, doing homework or hobbies, playing, entertaining, and talking. A bedroom is most commonly associated with the activity of sleeping but can also be used for homework, playing, dressing, listening to music, reading, and playing musical instruments. Bathrooms may be used not only for personal hygiene but also as places to retreat, read, listen to music and relax. The label a room has, and its assigned function, is not always indicative of the purpose for which the room is intended, most of the time.

From the break down table below, it can be assumed that functional apartments should at least include bedroom, living-room, bathroom, kitchen, and terrace or balcony.

Table 2. 1: The breaking down of spaces in a house

Authors	Bedroom	Living	Dinning	Bathroom	Kitchen	Laundry	Terrace	Private	Outdoor
Monteiro	x	x		x	x	x	x		
Stillman	x	x	x	x	x		x	x	x
Koji Yagi	x						x		
Asquith	x			x	x				
Total	3	3		3	3		3		

A Living-room (informal: lounge) in Western architecture, is a room in a house for relaxing and socializing. Such a room is sometimes called a front room when it is near the main entrance at the front of the house. The term sitting room is sometimes used synonymously with *living room*, although a sitting room may also occur in a hotel or other public building. In homes that lack a parlor / drawing room, the living room may also function as a reception room. A typical Western living room may contain such a sofa, chairs, occasional tables, and bookshelves, electric lamps, rugs, or other furniture. Traditionally, a sitting room in the United Kingdom and New Zealand has a fireplace. In a Japanese sitting room, called a *washitsu*, the floor is covered with tatami, sectioned mats on which people can sit comfortably. In larger homes in the United States and Canada, the living room may be reserved for more formal and quiet entertaining, while a separate room such as a den, family room, or recreation room is used for leisure and informal entertainment.

A bedroom is a private room where people usually sleep for the night or relax during the day. About one third of our lives are spent sleeping and most of the time we are asleep, we are sleeping in a bedroom. To be considered a bedroom the room needs to have a bed. Bedrooms can range from really simple to fairly complex. Other standard furnishings, a typical bedroom usually has are, a closet, nightstand, desk, and dresser. Today in richer countries that have houses with multiple bedrooms, a bathroom may be connected to the bedroom. This did not start happening until the mid to late twentieth century.

A kitchenette is a small cooking area. In motel and hotel rooms, small apartments, college dormitories, or office buildings a kitchenette usually consists of a small refrigerator, a microwave oven or hotplate, and, less frequently, a sink. New York City building code defines a kitchenette as a kitchen of less than 7.4 m^2 (80 ft^2) of floor space. Modern kitchenettes often have microwave ovens. In British English, the term kitchenette also refers to a small secondary kitchen in a house. Often it is found on the same floor as the children's bedrooms, and used by a nanny or au pair to prepare meals for children.

A toilet is a sanitation fixture used primarily for the disposal of human excrement and urine, often found in a small room referred to as a toilet, bathroom, or lavatory.

A balcony is an important provision in an apartment (LCRA) since it is the only possible outdoor space in a non-individual dwelling. The balcony is a desirable extension of the living room especially for flats and apartments. The purpose is to enhance exterior space and modulate open space. There are five kinds of balconies (Neufert, 1980):

1. corner balconies that cannot be overlooked and are protected from wind, more comfortable than freely projecting balconies which have to be shielded on wind and weather side.
2. grouped balconies should be suitably divided or partitioned for privacy.
3. separated balconies
4. loggias are less economic as they create more exterior wall surface.
5. staggered: balconies staggered vertically more difficult to protect from wind and from being overlooked, while those staggered in plan are well protected and more private.

Important considerations in designing a balcony (Fairweather and Sliwa, 1972) include:
1. orientation to sun, view,
2. position of neighboring flats and buildings, and
3. the relationship of living room, studio, kitchen, and sometimes bedroom.

Other factors important to be solved are: size, privacy, protection from street noise, shielding from excessive sun, wind and rain.

Table 2. 2: design consideration of functional rooms of houses (Neufert Architect Data, 1980)

House space	Design Considerations
living room	Varies widely from the formal to the all- purpose space of a studio apartment. Primary uses call for furniture groupings suitable to conversation and various types of entertaining; television frequently becomes the vocal point. A combined living-dining room demands furniture for dining functions.
Bedroom	Planned around the bed or beds Furniture for sitting, reading, dressing, and storage may offer facilities for other quiet semiprivate purposes e.g. office work & hobby activities. Children's bedrooms should be planned to adjust to children's changing needs as they grow. So, the most important furniture to be provided is the bed or beds that allow all family members to rest, normally at least once in the night time. That is why designing adequate sleeping space for all household members, is crucial
Kitchen	cooking area activities arranged as: (1) prepare, (2) mix, (3) cook, (4) serve, and (5) wash-up
Bathroom	Personal hygiene requirements

Studio Apartment and its spaces

It is essential that the definition of studio apartment be understood within the context of this research, as well as defining the basic spaces that are included in the definition.

Figure 2- 3: American Studio Apartment (Parker Morris, 2010)

A studio apartment, also known as a studio flat (UK), efficiency apartment or bachelor apartment, is a small apartment that combines living room, bedroom, and kitchenette into a single room. These kinds of apartments typically consist of one large room that serves as the living, dining, and bedroom. Kitchen facilities may either be located in the central room, or in a small separate room, and the bathroom is usually in its own smaller room (Parker Morris, 2010).

The main room of a studio apartment in Minneapolis USA includes the sofabed (that is to the right), and a small alcove (that is partially seen to the left); Not shown are the small kitchen and bathroom. A sofa-bed, (in the US often sofa-bed, hide-a-bed, couch bed or sleeper-sofa), is typically a sofa or couch that, underneath its seating cushions, has a metal frame and thin mattress that can be unfolded or opened up to make a bed. A futon differs from a sofa-bed, although sofa beds using futon mattresses are common.

A studio apartment according to Akmal (2007) is an apartment unit that has only one room that is multi-functional. The room acts as the living-room, bedroom, and kitchen, each being open to one-another without partition. The only separated room usually is the bathroom. A studio is a relatively small apartment. This type is suitable to be occupied by a single person, or a childless couple.

Conclusion: Space design of houses is analyzing process results concerning spatial and occupancy requirements of the users. The produced design should enable its inhabitants to carry-out their daily activities properly in order to fulfill human needs. The spaces should be suitable for different functions required for various household activities. Generally the spaces include: living, dining, and sleeping areas; kitchen; toilet; and outside space such as balcony and non-residential spaces (Mahdi 1986, Neufert 1980 and Pile 1988).

2.2.1.5. Sustainable houses

Sustainability

According to UN/WCED (1987), and UN (2005), Sustainability refers to more than only environmental issues. It involves a balanced state of social equity, environmental quality and economic prosperity (people, planet and profit) for present and future generations.

Figure 2- 4: Balanced state of sustainability

Sustainable housing relates to sustainable development. The principle of sustainable development of a society according to Friedman (2007) implies sustaining the fulfillment of the needs of the present population, while considering the needs of future generations. Based on this principle, the concept of sustainable housing formulated by (WCED, 1987) is defined as:

housing that encompasses the provision of residential buildings in a simultaneous pursuit of a balanced social equity, environmental quality and economic prosperity for the benefit of human well-being (people, planet and profit).

Accordingly, in sustainable housing there are three dimensions that should be well balanced: the economic dimension, ecological or environmental dimension, and social or human dimension. The purpose of sustainable housing according to Kibert, (2007), parallel to Friedman, is to create and operate a healthy built environment in such manner that it meets the needs of present generations without limiting the capability of future generations to respond to their demands for a sustainable built environment. There are two fundamental messages that are important to consider. First are the human needs that may include food, clothing, shelter, and particularly the enhancement of living income to above the standard of the absolute minimum. Secondly, is the limitation in fulfilling the present needs so that there are remaining sources for future generations.

Parallel to the line of thought of Friedman (2007): in the provision of housing, one has to deal with the human needs which primarily involve the use of natural resources such as land, water, energy, materials, etc. as well as human resources, such as laborers, experts with skills and knowledge. There are two limitations on resources in housing provision: limitation of natural resources, and limitation of human resources especially for sustainable housing. A lack of these resources will affect housing provision both in terms of quality of the space design as well as in quantity of provided houses. Therefore, a sustainable provision of housing involves inherently an environmental as well as a social dimension. Graphically it is explained in the following figure.

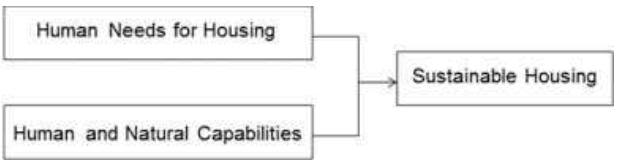


Figure 2- 5: A macro variables

The figure above indicates that sustainable housing is achieved when the human and natural resources for realizing the housing units can fulfill the human needs for housing. In other words it can be said that sustainable housing involves a condition that users' housing needs should match with the quality of the space design of the provided houses.

Recent research underpins that a better match between buildings and users' real needs will influence the users' satisfaction. The inhabitants thus might be longer satisfied with the building, that leads to a higher level of durability of the building. Ye et al (2009) stated: "It comes down to the fact that there should be a capability amongst the stakeholders in the construction industry to meet the inhabitants' requirements". This capability refers to the ability to understand the language in which the requirements expressed by the users are translated into that of the suppliers in the construction industry, in order to make the houses more functional to the users (Szigeti F and Hammond D, 2005).

Following Neufert, (1980) sustainable design at least should have considerations for a standard horizontal dimensions i.e. a minimum surface (width times length), and vertical dimensions i.e. minimum (ceiling) heights which must be such as not to create an unpleasant sensation and not to restrict physically movement of occupants and furnishings. In fact Neufert here means that sustainable spaces should at least meet the basic Physiological and Psychological human needs. Besides, housing should remain meeting the minimum standard requirements and regulations.

To be sustainable,
- a house should not act as only dwelling but more as a home.
- the designs and building systems should allow users to adapt to their changing needs.
- users' requirements should be met, in other words "activity based" analysis is suggested
- the space designs should meet the minimum standards for housing.

Conclusion: Sustainable houses in this research are houses that balance essential considerations including ecological, economic, social and technological aspects in compliance with the building codes and regulations. In this research the focus is on the social aspects particularly for the fulfillment of the users' needs regarding the provision of dwelling spaces.

2.2.1.6. Functionality

"Function" according to Pile (1988) is a term to describe the practical purposes that any design is intended to serve. Functionality of a designed product means that the product works efficiently and effectively for its intended purpose. In other words, it is capable to perform the intended task (Miriam Webster, 2002). Brodt and Smith (2009) stated that one most basic principle of design is to ensure functionality of the building and its operations. Furthermore, it is suggested that a building is considered to be functional when it safisfies a functional program such as spatial needs and requirements, system performance, etc.

Greer (2010) agreed with WBDG by declaring that architecture that is strictly form-based, often fails to function as usable space. For example, Frank Gehry Walt Disney Concert Hall design in Los Angeles, also indicated as an object. The structure is absolutely stunning as a sculptural piece, but it fails to meet many functional requirements of a successful concert space. In other words, although its form is essential, to be usable, the function of space is of primary importance. This is supported by Pile (1988) who stated that in order to be successful, any design must support its function. A well designed space will provide an outstanding superior setting for its intended function. Superior functional performance is the first test of design quality. Beverly N West (2004) put forward that the most critical issue in housing is spatial functionality. A house that was too small could never be made into a comfortable home. Spatial standards need to be reviewed regularly due to the increased rate of social change. Failure to provide adequate room dimensions or functional spatial design, taking into account door swings, window openings, electrical outlets, results in uncomfortable or unusable designs. Broadbent (1973) suggested that the first and obvious purpose of buildings was to provide rooms or other spaces in which the user's activities could be pursued (in most cases) conveniently and in comfort.

Conclusion: functionality in this research refers to space design and room dimensions that allow occupants to carry out their daily activities. Consequently, the dimension of the spaces are important determinants.

2.2.1.7. Adaptability

There is a multitude of definitions for adaptability. Many of them coincide with concepts such as flexibility. Important determinants of adaptability derived from literature are generally changes of functions without changing characteristics. Elasticity is the ability to increase or change the function by attaching or detaching parts from other building parts. Flexibility is change of function by changing the technical structure at minimal costs and changes in operation (Blakstad 2001, Douglas 2006, Bullen 2007). Central in these definitions is the functionality of the building or building component. West and Emmit (2004) described that adaptability is the affordance of dwelling space to fit the changing requirements placed upon it at different times and stages of development family. Similarly, Jia (1993) agreed that adaptability is a way to fulfill a large variety of needs and change of needs of housing users within the same building by using the potential means which the building techniques and management system offer. Geraedts (2001) suggested that adaptability concerns the way in which buildings and building components or facilities can be changed according to the changing users demands, resulting, for example, in changes in use, changes in number and size of rooms. West and Emmit, Jia and Geraedts defined adaptability as a way to satisfy users' changing demands in general. Moffat and Russel (2001) described the changing demands more specifically by defining adaptability as the capacity of buildings to accommodate substantial functional change. A building that is more adaptable will be utilized more efficiently, and stay in service longer, because it can respond to changes at a lower cost. A longer and more efficient service life for the building may, in turn, translate into improved environmental performance over the life cycle. In this case, adaptability is related to efficiency lifetime and environmental sustainability.

Construction is a wasteful sector. The use of extensive resources and wastes of demolition can be prevented when dwellings are designed by taking into account the functional lifespan (Friedman 2007). Buildings with relatively short functional lifespan lead to obsolescence, demolition and material waste generation. Waste generation can be prevented when buildings are designed to be adaptable to changing needs of the residents (Brand 1994, Kibert 2007, and Friedman 2007). Path concept home (2005) illustrated how inadaptable homes are designed and built with little consideration of the future. Houses that were built as static objects are not easy to customize or modify beyond surface finishes. This impedes the future repairs, renovations, and expansions that all households experience, especially those faced with the inability to move due to affordability constraints. Currently, significant changes to a home's floor plan are complicated by structural implications, the need to locate and re-route mechanical systems, and impacts on interior finishes. These constraints are barriers to reconfiguring a home's floor plan as occupant requirements change over time or when new owners acquire an existing home. These constraints can impede a builder's ability to readily change the layout of a given design during the initial construction process to meet different buyer preferences. The concept of adaptability according to (Moffat and Russel, 2001) can be broken down into a number of simple strategies that are familiar to most designers:

- flexibility or enabling minor shifts in space planning;
- convertibility or allowing for changes in use within the building; and
- expandability, (alternatively shrink-ability) or facilitating additions to the quantity of space in a building.

In practice these strategies can be achieved through particular design, and through the use of alternative materials and technologies. To increase the adaptability, Friedman (2007) stated that the space needs to be free of support walls and permit locations of selected functions such as kitchen, bathrooms, and storage compartments, in whichever place the occupants want.

Then, adaptability is closely related to, but different from, two other design strategies that attempt to enhance long-term environmental performance: durability, that is concerned with selecting materials therefore related to lifetime of materials and technology in a building; and design for disassembly, that considers the reuse and recycling of materials and building components. Adaptability in principle can be seen as a tool to satisfy the changing demands. Also, adaptability is a capability to accommodate household changes and requirements for space caused by household growth, changing needs, substantial functional changes, and therefore related to efficiency, advances of technology, as well as the future. Adaptability can be realized through providing flexible, convertible and expandable spaces. Adaptability is a solution for meeting changing demands for space, which can be met through self-built improvement by residents that include changes of space dimension either horizontally or vertically and functional changes. This research, therefore, agrees with Geraedts (2001) and Moffat & Russel (2001) who consider adaptability as the capacity of space design and room dimensions of buildings to accommodate substantial functional changes required by and without burdening its occupants.

Conclusion: Adaptability of space refers to the capacity of space design that enables the users to adapt their spatial needs to the available space and change the space design in volume and size and in function.

2.2.2. Conclusion from the conceptual definitions

From the above description of definitions, the final conclusions can be drawn. The features in the conclusions are expected to provide criteria, possibility of scope, and boundaries of space design of housing for the low income households in developing countries.

1. Developing countries include: limited economic condition, demographic situation with high population growth, urbanization, affordability. This context provides criteria, possibilities and boundaries for housing of the low income households.
2. Low income households have to face a number of problems that are: limited economic capacity, limited access to job and housing. In this research the focus is at the housing problem of the low income households.
3. Housing in apartments: A house is for all human beings a basic need. Apartments are a particular type of housing. A house contains spaces that should provide rooms with functions that meet the users' needs. Thus, a house should function in such a way that the inhabitants can carry-out the daily activities properly in order to meet their needs.

4. Space design of a house represents a three dimensional layout of a house that defines the dimensions and functions allocated to the different spaces of the building. The design should have considered the users' requirements for the spaces in a way that enables them to use these spaces to carry-out their daily activities properly in order to meet their needs.
5. Sustainable housing refers to the conditions by which the houses are provided. This implies that they are provided based on a balance consideration of social, economic, and ecological aspects. In this research we only focus on the social aspect of housing that means that the research will consider the users' needs on the spaces.
6. Functionality of space refers to the extent to which the space design responds to the users' requirements for the spaces regarding the dimensions and functions allocated to the different spaces in the house.
7. Adaptability of space refers to the capacity of the space design that enables the users to adapt their spatial needs to the available space and change the space design in volume and size and in function.

Informed by the above it can be concluded that there is a relationship between the living spaces and the users that live in these spaces. In the following section, theoretical views about this relationship will be elaborated.

2.3. THEORETICAL APPROACH

2.3.1. Approaches Relevant to this Research

The nature of the relationship between people, their environment and the spaces they occupy has been debated extensively. (Binford 1990, Bordieu 1973 and 1977, Banning and Byrd 1987, Giddens 1995, Hall 1966 and 2002, Kent 1993, and Rapoport 1969) signaled that most theories about the relationship of human beings to their constructed environment indicate that there remains something to be learnt about individuals or groups and the way people construct, organize and furnish their physical living spaces. Therefore this topic attracts contributions of researchers of various disciplines for example, sociologists, anthropologists, architects, environmental scientists and archaeologists.

The discussions dealt with by the researchers involved in research on the relationship between people, their environment and the spaces they occupy ranged from environmental determinism to social evolution in order either to describe or to explain how and why people live as they do today or lived as they did in the past. In principle, all research intended to contribute to the well being of people. Progress from the studies has provided knowledge about this relationship, about methodological approaches, theoretical foundations and research methods, also about the definition of interdisciplinary fields of sciences of the built environment. Some theoretical views as proclaimed and used by the scholars are discussed below.

According to Szokolay (1980) the interactions between humans and their environment can be seen as man-environment system. Further, Olgyay V (1973) indicates that the interactions concerning a physical environment consists of many elements in a complex relationship. The environmental constituents include: light, sound, climate, and space. They all act directly upon

the human body, that can either absorb them or try to counteract their effects. The resulting reactions can be either physiological or psychological. This research only focused on space as an element of the physical environment.

Figure 2- 6: Man interact with the space as the environment surrounding

Supporting Olgyay, Nantana (2001) stated that the responses of man to the environment are different from those of other creatures. For example, whilst animals manage to adapt themselves to the environment, humans need to modify to suit to the environment. Module V (2002), on the other hand, indicated that the environments, in which human live and work, affect their thoughts, feelings, and behavior. Environmentalists Kahana (1982), Lawton and Nahemow (1973), Proshansky (1995), and Rapoport (2000) articulated theories that are relevant to housing design. They posited from their research that persons with particular needs search for environments that meet their needs. The better the environment meets the person's needs, the greater the person's satisfaction in life. Similarly Proshansky (1995) suggests that problems in the environment are determined by the requirements for the design of the built environment. Sociologists such as Kahana (1982) and Law et al (1996), and social constructivists (Pinch Trevor J, and Bijker Wiebe E 1987, Stewart et al 1994, Langdon et al 2006, Ogburn 1990, and Thomas 2002) note that the social structure and culture in a society determine the requirements for any technology. They proclaimed that the functional performance of a design can be predicted or explained by socio-environmental characteristics (culture, socio-economic and political situation). These characteristics are believed to have an impact on the needs and collective actions of individuals in the society.

The above viewpoints indicate that at macro / country or regional level socio-environmental characteristics have an impact on the needs and actions of individuals and that the needs and actions of individuals determine the environment that matches best with their needs.

In contrast, the "technological deterministic" views posed by scholars like Stanton et al. (2005) and Wickens et al (1997), indicate that society is affected by attributes of the physical environment (technologies, buildings) that change the social structure and culture (such as knowledge, rules, standards, expectations, needs). The physical elements in the environment in these views are independent and autonomous factors in society. Basic sciences, research and development result in the development and changes to the physical environment. This, resultantly, is the cause of societal changes (Ogburn and Nimkoff 1964, Lynn White 1978). These authors claim that both social structures and socio-cultural elements (values, norms, expectations) are forced to change through changes in the technological or built environment. Reference was made, for example, to the introduction of the micro chip. Yet quite some critical notes were given on these views that indicate that:

1. society itself can make decisions on whether to adopt the technology or not. Societal characteristics are determining for the adoption of new technologies (Morrison, 1981).
2. Same technologies have different impacts in different societies, depending on the location –societal characteristics- and time of introduction of the technology (See Mackenzie D and Wajcman J. 1999). Various authors mentioned factors that then should be taken into account while studying the impacts of technology on society (Freeman, Clark, and Soete 1982; Cooper and Clark 1982).

Other groups of scholars e.g. Heller (1997), Cherns (1976), Mumford (2000), Mate & Silva (2005) adhere to the reciprocal version of how a physical environment interacts with humans and visa-versa. Based on their research on technology and society, they proclaim a gradual development and change in a joint optimization of both subsystems. This means that society, humans and the physical environment (including buildings) and technologies follow each progress respectively. Moreover, Kroes (2001) found that technological artifacts have a dual ontological nature: being a social construction as well as a technological construction. Accordingly Rosenman and Gero (1998) state that the realization involves the transformation of human needs into material objects, for axample, the translation from socio-cultural intents into techno-physical objects. This makes artifacts such as buildings socio-technical systems. The artifacts represent the outcome of choices and decisions made by an individual in creating new objects in response to human needs. Additionally, (Stanton, Salmon, Walker, Baber and Jenkins 2005, Wickens et al. 1997) wrote that human capabilities, for axample, human specific physical, cognitive and social properties (such as knowledge, skills and needs), in a certain social system, determine the requirements and solutions for artifacts, technologies and buildings.

2.3.2. Activity Theory

Vygotsky (1993) developed a science of psychology influenced by the phenomenological ontology of (Husserl 1931). The authors pointed on the psychological aspects of the human interaction including the use of tools (i.e. technology and built environment). According to Vygotsky (1993), the tools are thought and language, and according to (MIT Press and Husserl, 1993) the tools are ideas i.e. general introduction to pure phenomenology of George Allen and Unwin, London.

The “Activity Theory” is applied in more recent development as a framework for understanding human actions by using computers as tools and their interaction with these tools. Heidegger (2002) wrote that humans act as social beings and their use of a technology is influenced by the cultural, social and psychological framework of the interaction. It can be seen that the basic notion is formed by the rational goal-setting behavior of the humans. Such behavior elements only exist in activities. Moreover, the use of tools on an operational basis is also only involved in activities. Frequently, actions in this activity theory are described in a socio-technical system, hence, the reason why an “activity based” approach is applicable to this research. That is why approaching the goal of space design through activities is proposed as a possibility.

The latter studies discussed above result in a scheme of activity formulized by Engestrom (1987) that consists of three interacting entities: the individual, object or technology, and the

social system (a community with its own structure, cultural habits, norms, and standards). This scheme differs from the former by Leont'ev (1978), that consists only of two components: human and space or environment. Human activities, as indicated by researchers using activity theory, can be reduced by breaking down a series of tasks into stepwise measures taken with rational means. Various areas such as urban planning (according to Fjeld, 2002) have used activity theory as the theoretical framework. The scheme shows that the individual needs technology or an object to be able to conduct his or her actions that occur in the social system.

Conclusion:

The physical environment (including buildings and technologies) can be seen as essential element in social changes. At the same time it should be recognized that when this is the case (for example with innovations in the built environment), then social changes will occur, Yet, in the end, social changes will result in adapted user requirements for their built environment. The above described views were translated into different approaches.

a. The environmentalist approach proposed by Proshansky (1995) and Rapoport (1982), suggests that problems in the environment determine the requirements for the design of the built environment.In this way, the approach is solution oriented that focuses on the effects of an environment on all members of society, based on which particular requirements for the design can be developed.
b. The social constructivists or structuralists (e.g. Pinch, Trevor & Bijker 1984, 1987; Stewart 1986; Langdon 1993; Ogburn & Thomas 1990), opposing ideas: social structure and social culture in the actor network determine the requirements for any technology.
c. The technological deterministic approach (Ogburn & Nimkoff 1964; Lynn White 1978, Large 1980, Mckenzie & Wajcman 1990) technologies (buildings, equipment) are determining for societal development. Technological attributes will affect society. The societal structure and culture (knowledge, rules, standards, expectations, and needs) will change.
d. Socio-technical approach (e.g. Heller 1997, Cherns 1976, Mumford 2000, Mate & Silva 2005) technology and society are gradually developed in a joint optimization of both subsystems: Kroes (2001) Technological artifacts have a dual ontological nature being a social construction as well as a technological construction. Technical artifacts represent the outcome of choices and decisions made in creating new objects in response to human needs. Their realization involves the transformation of human needs into material objects: the translation of socio-cultural intents into techno-physical objects (Rosenman and Gero, 1998). This makes artifacts socio-technical systems.
e. Human factors engineering approach (Stanton, Salmon, Walker, Baber & Jenkins 2005; Wickens c.s. 1997) human capabilities (human specific physical, cognitive and social properties e.g. knowledge, skills, needs) in a certain actor network determine the requirements and solutions for technologies
f. Activity based approach stems from an attempt, primarily initiated by Lev Vygotsky (Vygotsky, 1993, 1996), to create a science of psychology, influenced by the phenomenological ontology of Husserl (Husserl, 1931). The authors point to the psychological aspects of the human (inter)action involving the use of tools i.e. technology, built environment (Vygotsky, L.: 1993, Thought and language, MIT Press.; Husserl, E.: 1931, Ideas: General Introduction to Pure Phenomenology, George Allen and Unwin,

London). More recent development uses the Activity Theory as a framework for understanding human actions with the use of (computer) tools and their interaction with these tools. (e.g. Heidegger, M.: 2002): humans act as social beings and their use of a technology is influenced by the cultural, social and psychological framework of the interaction. The rational goal-setting behavior of humans forms the basic notion for this. The activities contain elements of goal oriented rational behavior and involve using tools on an operational (transparent) basis. In further use of the Activity theory it is most often applied to describe actions in a socio-technical system.

Activity Theory as a theoretical framework has been applied in various areas such as urban planning (Fjeld, 2002). In other words: a human (the individual) needs means (the object, technology, a house) to carry out actions, that take place in a social system. Researchers using the activity theory indicate that human activity could be reduced by breaking down a series of tasks into stepwise measures taken with rational means.

In this line of thinking, Canter (1977) in Edgu and Unlu (2003) posed that spaces are formed according to the relations between activities, concepts and the physical attributes. This suggests that to design a space, aspects of activities, concepts, and physical attributes should be taken into account. Also, Manning (1987) and Voordt (1997) indicated that the demand for space design is derived from the users' activities that influenced by the users characteristics. The attributes in this design process are identified from the space design. So, it is assumed that attributes can clarify the design concept.

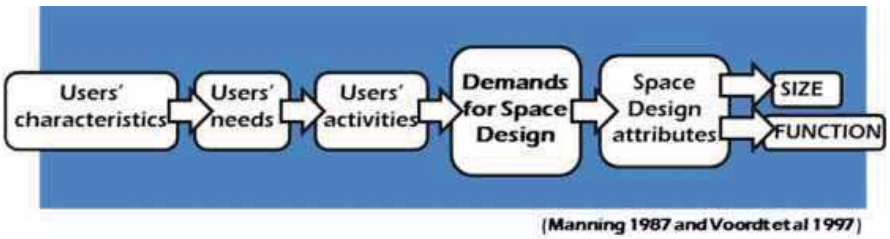


Figure 2- 7: Attributes clarify the demands for space design that determined by the users' activities

2.4. THEORETICAL FRAMEWORK

The theoretical framework in this research is based on "Activity Theory" that is thus is applied as the basic theoretical or philosophical theory.

A basic presupposition of this research is that sustainable housing is achieved when the design requirements for the house fulfills the needs of its users. To be sustainable, the human needs for housing that are notified as the requirements and solutions for the artifacts, technologies and buildings, should meet the human capabilities (i.e. the specific physical, cognitive, and social properties e.g. knowledge, skills, and needs).

Thus, based on the above discussed theoretical approaches it is suggested that the design requirements for the space in houses are determined by the needs of users living in the space. The users' needs are influenced by their characteristics namely the human capabilities i.e. their specific physical and social properties. These needs determine the demanded space, which are notified as the requirements and solutions for the artifacts, technologies, and buildings. The design requirements for the space cannot be directly determined from the users' needs, but it will be determined through the users' actions or activities, that are carried out by the users to fulfill their needs. The activity theory indicates that activity is the proper medium, a construct to specify the design requirements of the space required by its users.

The functionality and the adaptability of the current space design are considered within the national socio-economic and geophysical environment of Indonesia as the context in this research. This context influences the characteristics of users/households, that in turn have an impact on their needs. The requirements of space demanded by the low income households are subsequently determined by the users' needs which become apparent through the households' activities (figure 2-8).

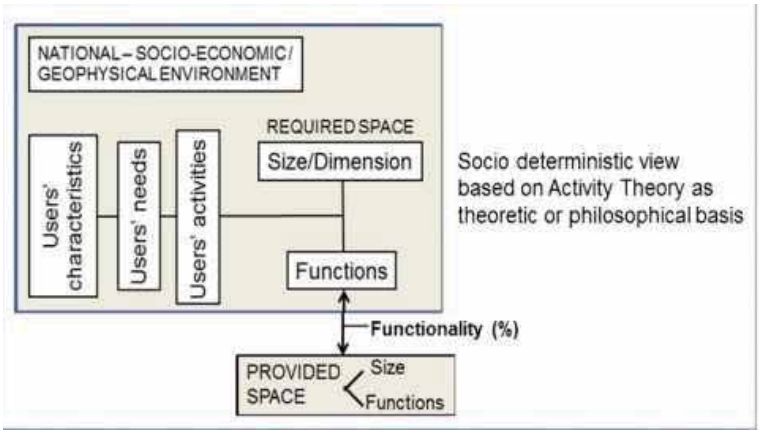


Figure 2- 8: Theoretical framework

Functionality of space in this research is defined as space design and room dimensions that allow occupants to carry out their daily activities. Functionality relies on the adequacy of the space size or dimensions for conducting the household activities. This study will show the difference between the space provided and the space required by comparison of the existing space to the space use as well as to the standard.

Adaptability of space in this research is defined as the capacity of space design and room dimensions of buildings to accommodate substantial functional changes. In short, it is the capacity for physical change (spatially) and for functional change.

2.5. CONCLUSION

Literature studies on the conceptual definitions and theoretic approaches led to the theoretical framework that is proposed in this research. This framework provides guidelines for this research as it indicates linkages between the involved variables: the context, the characteristics, the needs, the activities, and the space demands (including the attributes).

The framework is generic. It can be applied to assess the functionality and adaptability of any house, at any location, since it includes the variables (context and user characteristics) that have an impact on the users' activities and the resulting demands for the attributes of the space in which they live.

Thus, the context in this research, (the Indonesian situation) affects the characteristics of a particular community. Specifically, the characteristics can be more local, both geographically and culturally. In this research the characteristics of respondents are socio culturally specific as the low-income households, and geographically specific as Surabaya citizens. These characteristics determine the needs of this community. To realize their needs, this community has to act or do their activities. This activity determines the demands for the attributes of the space design that can be derived from the space required for doing the activity. The demands for the space attributes are determined by considering the furniture and means, the movements, as well as the circulations needed for carrying out the activity. The indicators for the space attributes are size and functions. The latter refers to the location of any functional area and its nature that can be public, semi public, or private.

Further, the framework indicates there are two versions of space attributes: the required space that is considered from the users' side, and the provided space that is considered from the side of the building such as provided to users.

The latter is the designer's version that should be based on standards. However, in reality the provided space can be different from that standardized. Moreover, the standard itself can be inadequately established. Therefore, based on this theoretical framework, this research exposes the gaps between the use of space by households on the one side, and the provided space, as well as the standardized space on the other side by assessing the functionality and adaptability of space designs.

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PART ONE
Research Design

CHAPTER 3
Empirical Issues

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Research Design

CHAPTER 3
Empirical Issues

3.1. INTRODUCTION

In this chapter the empirical aspects concerning the analysis of functionality and adaptability of apartment designs for low income households are further elaborated and adapted for the field application in the case studies. The developed theoretical framework for the analysis is considered to be generally applicable in any case study on housing. However, the research instruments that are to be applied need to be adapted to the particularities of the cases and locations that are investigated. The location and type of housing within the specific contextual setting varies. Therefore the particularities of the context need to be determined first. This chapter explains “How the basic research methodology is elaborated in such a way that it fits to the particularities of the case studies under investigation”.

Thus, in this chapter, the set-up of the research design particularly the research methods applied in the analysis are introduced. The chapter describes the research design, research approach, research instruments, sources of data, techniques for data collection, study population and sampling, methods of data analysis, and is finalized by the research plan.

3.2. RESEARCH DESIGN

The theoretical framework that was described in chapter 2 is meant for investigating the functionality and adaptability of low cost apartment space designs in developing countries, including Indonesia, with particular emphasis on the users’ requirements for functionality and adaptability. The main focus is at the spatial attributes of floor plan.

This study is designed as an explorative, descriptive, ex-poste, cross-sectional and synchronic evaluation study. It is explorative as initially this research tries to find more familiarity and new insights concerning the subject of study: specifically the users’ activities. It is then expected that these studies can indicate what, how, when, and why they happen. The research is also mentioned as descriptive since it describes the characteristics of the households, their activities, their house, and their use of the spaces in it. The conclusion of this research will be drawn by deductive reasoning based on the found frequencies, dominants, averages etc.

This research examines the functionality and adaptability of low cost apartment units by means of the post occupancy evaluation (POE) method. According to (Preiser et al 1988, 2002), POE is an evaluation that involves a broad range of activities and processes of systematical evaluation of building performance after they have been built and occupied for some time.

This research evaluates the case studies only at one period of time and involves all of the entire population that exists in the location, or a representative sample at one specific point of time. It is synchronic in its approach as the study investigates the households' activities and the space characteristics of the apartment units only at one moment in time. As indicated by Brown and Steadman (1991) the future can be assumed by knowledge of the present. This research tries to present recommendations for future low cost apartment space design by referring to the users' demands at present.

3.3. RESEARCH APPROACH

This research applies a mixed method approach that combines the collection, analysis and the interpretation of quantitative and qualitative data, as the space design attributes are quantitative, while the households' requirements are qualitative. In the end, triangulation of methods is required in order to safeguard the reliability and validity of the research findings (Saunders, 2006). In collecting the data of the apartment units and the households, this research applied a field survey, and in collecting the design standards this research applies literature studies.

3.4. RESEARCH INSTRUMENTS

The main research instruments used in this research are a questionnaire and checklist. These instruments contain questions and issues regarding the major variables that were to be investigated such as indicated in the following.

3.4.1. The Variables

Functionality and adaptability are the dependent variables that are influenced by the household space requirements for household activities in relation to the space attributes of the space design of the provided apartment units. The later are the independent variables. Besides, the households' characteristics may also affect the activities, and thus have an impact on the space requirements.

The research instruments that were developed are those for the investigation of both the household activities and their space requirements and the space design attributes. Household activities and the space requirements are primarily expressed in qualitative terms whereas the space design attributes are in majority quantifiable such as in dimensions (Voordt and Wegen, 2005).

3.4.2. The Households' Activities

This research uses households' activities as a construct to determine the space demands of the house design. Activity is stated as a construct as the design of space cannot be determined directly from the activity, but through the location and size of space needed. The list of activities is further elaborated in chapter 5.

3.4.3. The Space Design Attributes

This research applies net floor area (NFA) in square meters as the basic measurement method. The sizes in this research are calculated based on either the average or the median. The decision selects the larger size.

3.4.4. The Design Requirements

Design requirements are used for evaluating the functionality and adaptability of space design. There are two requirements to determine whether a space can be considered functional: the (national) standard and the actual space use. Functionality is examined both from the supply / building and demand / user sides. First, functionality of all activities on the list of household activities is evaluated by comparing the space use to the standard. When actual space use exceeds standard size it is unacceptable and requires re-examination. Evaluation is then continued by comparing the standard to the provided space to see the sufficiency of the space provided by the government. Comparison is also made between the spaces use to the provided space and to standard to see the effectiveness of space made by the households.

National standards that have been developed for houses or apartments are prioritized. In case of unavailability or inapplicability of national standards, the space requirements need to be included (added) by relying on the international standard or anthropometric study. As stated by Szokolay: To ensure the desirable surrounding physically, suitability of space is crucial (Broadbent 1973, Szokolay 1980, Pile 1988, Neufert 1978, and Nantana 2001). Finally, the provided space is compared to the improved standard to see the extent to which the current space design meets the users' demands.

3.5. SOURCES OF DATA

3.5.1. Secondary Data

Secondary data are data collected from existing information, such as publications, experts or leaders, photographs, pictures and tables or graphs that are available and able to be collected to complete the data set required.

3.5.2. Primary Data

Drawings are the primary data here. The drawings are copied from the original documents of the buildings borrowed from the authorities (i.e. developers and designers) and either from the central or local government. Preciseness of information is undoubtedly considerable. Information that obtained for example concerns the dimension, structure, shape or form of buildings or units, number and type of functional areas, layout, etc.

3.6. METHODS OF DATA COLLECTION

3.6.1. Field Observation

Observation method is applied in the field survey in order to investigate the location and size of the spaces where the households' activities take place in reality in the apartments. In these observations the researcher and the assisting surveyors first observed the site and units in general and made decisions about the questionnaire's distribution in the blocks to know how to approach the respondents.

3.6.2. Interview

Interviews are applied as the data should be collected directly from the person in charge. Interviews are mostly applied to record information from departmental or municipal officers as low cost rental apartment (LCRA or rusunawa) developer, provider or constructor in Surabaya. Other expert sources are academic or public persons who are involved in the LCRA development. Data collected from these interviews include codes, regulations, standards, structures and materials, building plans and sections, as well as the government program concerning LCRA in Surabaya in particular and in Indonesia in general.

3.6.3. Data Collected by Questionnaires

The questionnaires were distributed by surveyors to the respondents in order to collect factual information of households' activities. The questions were derived based on the research questions. The main group of questions in the questionnaires consists of four aspects namely:

1. General information that concerns all required information about the respondents or households' characteristics and apartment unit characteristics including the facilities. These questions were proposed in order to answer Research Question 1: What are the characteristics of the currently applied space design of low cost apartments in Surabaya?

2. Households' activities, including income generation that concern all information about the activities including where each activity is carried-out, how many people do it, why it is done there, when it occurs and how long it takes. These questions were proposed in order to answer a part of Research Question 2: What are the activities of low income households in Surabaya?

3. In addition, a checklist is used to indicate the existing space in both plan and section, as well as to show where the activities take place, from which the size of space used for doing the activities can be determined. The checklist is also used to record any adaptation that had ever been made to the space.

3.6.4. Data Collected by Checklist

The checklist is meant to collect direct reference data leading to the use of space and the existing physical characteristics of the space. The checklist that includes a drawing of the unit floor-plans and section is used by the surveyors to indicate the location and approximate space where the user's activities take place. It is indicated by putting the appropriate letter on the floor-plan that corresponds to the users' information. The recorded data include: the precise location of each activity, layout and approximate size of furniture and means, as well as any adaptation made. These questions were proposed in order to answer Research Question (RQ) 3: How is the use of space? This answer is then used to answer RQ.4: How is the functionality of the currently applied space design? and RQ.5: How is the adaptability of the currently applied space design? To which extent do the currently applied space designs allow changes to meet the users' demands?

3.7. STUDY POPULATION AND SAMPLING

3.7.1. The Case Studies

The population in this research involves both the building and the households. The former is concerned with the whole apartment building blocks, each of which consisting of four to five floors. Most of the apartment units consist of multi-functional space, kitchen, bathroom/toilet, and balcony while the households (users) are concerned with the families living in the apartment units.

3.7.1.1. Low cost rental apartment building blocks

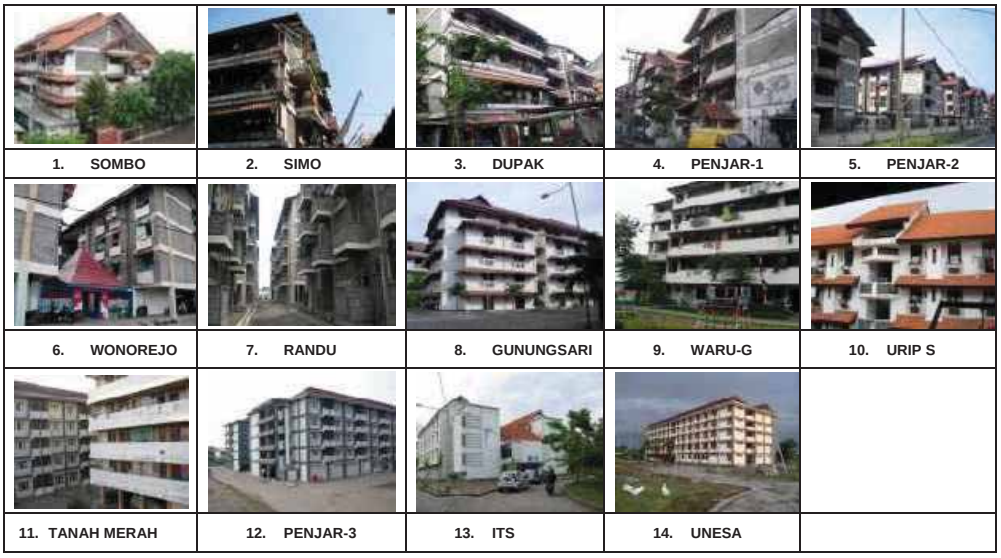

Figure 3- 1: Performances of the building population, in which the units and low income households are taken as samples

The building population in this research includes all fourteen locations of low cost rental apartments offered in the public schemes in Surabaya Indonesia built in 1985-2011 as shown in figure 3-1. The locations include: Sombo, Simo, Dupak, Penjar-1, Penjar-2, Wonorejo, Randu, Gunungsari, Waru-Gunung, Urip-S, Tanah-Merah, Penjar-3, ITS, and Unesa. Surabaya is chosen as the location of the case study as it is the second largest city in Indonesia, a country that faces perhaps the most complicated problems in urban renewal efforts for the urban poor. In spite of having the largest industrial estate and the highest commercial income in Indonesia, Surabaya, as a municipality, has the highest level of poverty in the country.

In Indonesia, there are many low cost apartment locations that can be investigated in terms of their functionality, but the priority must be directed towards poverty alleviation. This research stratifies the locations by the existence or absence of complicated problems in urban renewal projects for housing the urban poor in big municipal cities. Among big cities in Indonesia, Surabaya, with its superiority in commerce and industries, has the most problems in decreasing the poverty level as illustrated below, so this city has been selected as the location of this research.

Table 3. 1: Income growth of Surabaya locally, East Java provincially, and Indonesia nationally 2006-2011

	2006 (%)	2007 (%)	2008 (%)	2009 (%)	2010 (%)
Surabaya Municipality	6.35	6.31	6.23	5.53	7.09
East Java Province	5.8	6.11	5.9	5.01	6.68
Indonesia (nationally)	5.48	6.28	6.10	4.63	6.20

Source: PDRB ADHK 2000, BPS Surabaya in (RPJMD Surabaya 2010-2015)

Table 3. 2: Poverty level in big cities in Indonesia

	Big city	Capital of	Level of largeness	Poverty (%)	Area (km2)	Population 2010
1	Surabaya	East java	Second largest	13.85%	326.27	2.765.487
2	Medan	North Sumatra	Third largest	10.83%	265.10	2.097.610
3	Bandung	West Java	Fourth largest	10.57%	167.67	2.394.873

Source: BPS (Central Statistics Board of Indonesia, Sep 2011)

Table 3. 3: Commodities having strong influence on Increase of Poverty Line

Non-food Commodity	City	Rural
Housing	7.36	5.72
Electricity	2.75	1.58
Education	2.49	1.21
Clothing	2.10	1.72
Transportation	2.10	0.89

Source: National Social-Economic Survey (SUSENAS, September 2011)

Table 3.1 shows that in 2010, Indonesia's income grew by an average of six point two percent. At the same time, incomes rose by six point six-eight percent in East Java (the highest in the country) and by seven point zero-nine in the capital city of Surabaya alone. Moreover, table 3.2 indicates that among the largest cities in Indonesia, Surabaya also had the highest poverty line. In addition, table 3.3 illustrates that housing is the single-greatest non-food commodity having the strongest affects on poverty levels. Therefore Surabaya was chosen as the location of this research.

3.7.1.2. Low cost apartment units

Besides the space designs of the building blocks, this research is also concerned with the space designs of the units. The plans of the units, in which the analyses take place, are the main research unit. The use of space, the most essential ingredients in this research, is found based on signs pointed out by respondents on these unit plans. The surveyors recorded the use of space by indicating the location where the respondents do their activities. These existing unit plans are vital tools not only as the provided space, but also as the space to find the actual space used by households to carry out their activities.

3.7.1.3. Low income households

In the investigation of low cost rental apartments, the focus of this research is on the low income households as the inhabitants of the apartment units, whose need and daily activities determine the space demands. As a result, these low income households are taken as the respondents in the field research. The relevant information of these families is useful for identifying their characteristics. The most important data that contributes to the space design requirements is the respondents' daily activities. This daily living should obviously be able to be accommodated by the apartment units as the living environment of these low income households. Accordingly, the currently applied space designs offered by the government in the existing low cost apartments, needs to be examined as to whether or not they can meet the residents' spatial requirements. Thus, the unit space designs, for which sustainability is examined, are crucial determinants. The assessment of sustainability is emphasized on the functionality that deals with the adequacy of space dimensions and functions, as well as the adaptability that is concerned with capacity of space in changing in function and in size. Therefore, data of low income households living in 300 units of fourteen low cost apartment locations in Surabaya were investigated.

3.7.2. Research Sample

This research implemented stratified random sampling as the method in obtaining the research sample. For this, the population is divided into fourteen strata of low cost rental apartment unit types and locations available in Surabaya. The size of sample was determined by using formula of Krejcie RV and Morgan DW (1970). With a reliability of ninety-five percent and a deviation permit of zero point three five, the total of samples found is 303 which was rounded to 300.

3.7.3. Sampling Strategy

The sample is the group of people who were selected to be included in this study. The strategy in distributing the samples on the field survey was made equal by averaging the 300 samples across fourteen building locations. Accordingly 300:14=21 households of each location were investigated randomly as respondents, except Wonorejo which involved twenty-seven households to round up the total sample to 300.

The distribution of sample can be seen in the following table.

Table 3. 4: Distribution of samples

	LCRA	Number of Households in location	Total Households surveyed	(%) of households surveyed	Total member surveyed
1	SOMBO	618	21	6.8 %	90
2	SIMO		21		80
3	DUPAK	150	21	14 %	69
4	PENJAR-1	250	21	8.4 %	76
5	PENJAR-2	288	21	7.29 %	64
6	WNOREJO	288	27	9.38 %	106
7	RANDU	288	21	7.29 %	74
8	GN SARI	268	21	7.84 %	69
9	WARU-G	480	21	4.38 %	78
10	URIP-S	120	21	17.50 %	79
11	T-MERAH	192	21	10.94 %	85
12	PENJAR-3	96	21	21.88 %	76
13	ITS	448	21	3.59 %	40
14	UNESA	120	21	17.5 %	76
	TOTAL	3606	300		1062

3.8. METHODS OF DATA ANALYSIS

3.8.1. Tools Applied during Data Collection and Analyses

For the analyses of the data collected from the field survey, the raw data were processed using techniques such as those supported by computer programs like Computer Aided Design (CAD), Microsoft Excel, and or Minitab.

3.8.1.1. Computer Aided Design

All drawings in this research that were collected from the government, literature, or other reliable sources were re-drawn by using CAD to produce soft copies thus enable modification, or application of the graph to provide clearer and more precise presentations.

3.8.1.2. Microsoft Excel and Minitab

This program assisted the processing of raw data that were collected through questionnaires during the field research. Calculations were carried out to find such as dominances, sums, averages, medians etc.

3.8.2. Methods in Analyzing the Functionality and Adaptability

Methods of analysis

There are fourteen cases involved in this research, therefore the type of approach is multiple cases. The main intention of analysis is to generalize the results and to improve the reliability (multiple cases). Within each case study functionality and adaptability will be investigated. Frequencies, magnitudes, structures, processes and consequences will be found. For this, each case is first treated as a single case. Case-oriented analysis to understand a particular case is carried out by looking closely at the details of each case (the right table of each checklist in appendix 3).

To analyze, the raw data are examined in order to find linkages between the research object and the outcomes with reference to the original research questions. Each case's conclusion can subsequently be used as information contributing to the whole study, but each remains a single case. A variable oriented, cross case analyses then follows. The variables included in the assessment of functionality and adaptability in this research are those mentioned as attributes of the required space (in the theoretical framework) i.e. the space size or dimensions, and the functions that are represented by the number and availability of functional areas.

The steps involve examining the pairs of cases, categorizing the similarities and differences in each pair. Then, similar pairs for differences, and dissimilar pairs for similarities are followed. Here, patterns emerge. Certain evidence may be revealed and could conflict with the larger patterns observed. If this is the case, follow up focused cross-checking may be necessary. For this, triangulation (interview, expert opinion, documents, and literature reviews) may be needed to confirm the initial data in order to tighten the evidence of the findings and to state relationships in answering the research questions.

Analysis of the functionality of the apartment unit space design took place as follows:

1. Investigate the location where each activity is conducted. The location may take place in multi-functional space, kitchen, bathroom/toilet, balcony, or corridor.
2. Determine the use of space by analyzing how much space is needed for conducting each activity, by measuring the space including the space required for doing the activity, the furniture involved, as well as the movement of the users.
3. Find and determine the design requirements by referring to the applicable national or international standards. The reference includes the size, and number and availability of functional areas.
4. Asses the functionality by comparing the existing space to the design requirements that are inspired by standards and the actual space used for doing the activities
5. Compare the use of space to the currently applied space design, as well as to the standard in order to see the space provision by the government
6. Find the extent to which the current space design meets the demands by comparing the current space to the finally improved standard.

Analysis of the adaptability includes:

1. Find the changing capacity of space:
   (A) Through changing the space in size: horizontally by partitioning; by corridor occupation, and vertically by mezzanine construction.
   (B) Through changing the space in function
2. Measure the extent to which the changes can make the space meet the use of space.
3. Adaptations were also made through functional adaptation by implementation of time-based activity scheduling. This kind of adaptation results in effectiveness of the space.

3.9. RESEARCH PLAN

This research has been conducted using the government-provided low cost apartment housing in Surabaya developed between 1985 and 2011. The functionality will be found by comparing the actual space used for doing the activities to the national standard as well as to the available existing space that was provided by the government. The stages of this research will be executed based on the following sequences of sub-studies.

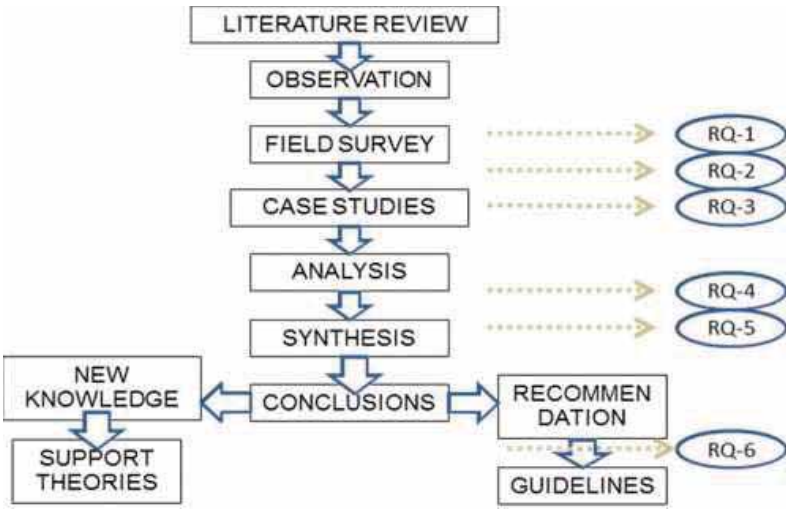

Figure 3- 2: Research stages

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PART TWO
Results & Data Analyses

CHAPTER 4
Current Housing Situation

PART TWO
Results and Data Analyses

CHAPTER 4
Current Housing Situation

4.1. INTRODUCTION

This chapter provides all information concerned with the current situation of the object of this research: low cost apartment housing in Surabaya. The results of the following sub-studies are described: the context, the space design, and the households' characteristics. It begins with the context explaining Indonesia as an Asian developing country which is the location of the case study. It is then continued by housing situation in Indonesia, and in particular regarding low cost rental apartments in Surabaya. The latter is chosen as the representative city. The next sections elaborate the collected data by characterizing and classifying the current space design of low cost apartments in Surabaya starting from the urban up to the unit level. Then, the chapter presents the characteristics of households living in the apartments, and is finalized by conclusions which answer Research Question 1: "What are the characteristics of the currently applied space designs of low cost apartments in Surabaya, Indonesia?"

4.2. THE CONTEXT

4.2.1. Indonesia, a South East Asian Country

Geographically the Indonesian archipelago lies in Asia Pacific between the two continents i.e. Asia on the north and Australia on the south. More specifically, Indonesia is a South East Asian country. The total population of Indonesia in 2010 was 237.641.000 people, while the total land area in 2006 was 1,910,931.32 square kilometers (BPS[1] catalog, February 2012).

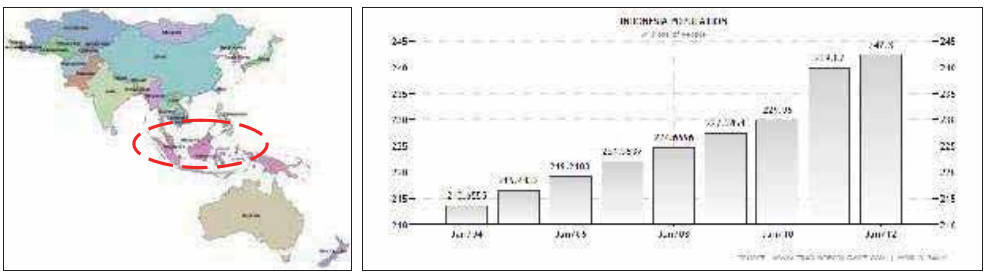


Figure 4- 1: Map of Asia-Pacific where Indonesia lies (aedsicad.com) and table of population (TRADINGECONOMICS.COM)

[1] Badan Pusat Statistik, the Central Board of Statistics

4.2.2. Social - Economic Situation in Indonesia

Within sixty years Indonesia had gone through various progresses in economic development. Starting with basic economic activities in traditional agriculture, nowadays Indonesia had turned to a country with larger proportion of manufacturing industries. The progress brought prosperity increase which was reflected not only in the income per capita, but also in other social economic indicators such as IPM[2]. In 1980-2010 this index increased from point three-eight to point six (Bappenas[3] 2011). Moreover, the economic development in Indonesia in 2011 was indicated strongly defensive within the increase of uncertainty of global economic situation. The economic growth reached six point five percent, the highest figure within the past ten years. This was accompanied by the lowest level of inflation i.e. three point seven-nine percent (BI[4], 2012).

Additionally, an OECD[5] delegation to Bappenas (September 8th, 2011) indicated that the economics of Indonesia would reach the highest growth among South East Asian countries, thereby becoming the momentum maintainer of the economic growth within this region.

In spite of good progress in economic development, poverty alleviation in Indonesia remained disappointing. Data of BPS, the Statistic Central Board, noted that the amount of poor people in Indonesia in Sept 2011 was still 29.89 million or 12.36% of the total population. This absolute poverty percentage was calculated under a poverty line of IDR 230.000 or approximately USD 25 per month which was considered very low. In October 2010, the minimum wage of Surabaya was IDR 1.050.000 or USD 110 which was four times as much. It could be imagined what the poverty score was when the minimum earning was multiplied four times. It could be said that prosperity was still far behind. Although the country had good economic growth, there was no improvement on community prosperity. The handling of poverty alleviation was very slow, even failed. The most recent poverty reported in March 2012 was still 29,132,400 people or 11.96% of total population (BPS, 2012).

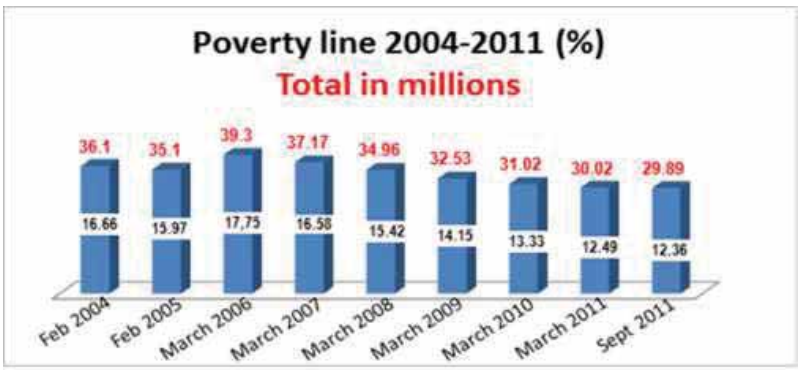


Figure 4- 2: Poverty line of Indonesia 2004-2011. (Source: BPS, 2012)

[2] Indeks Pembangunan Manusia, the Human Development Index.
[3] Badan Perencanaan Pembangunan Nasional, the National Development Planning Board.
[4] Bank Indonesia, the Indonesian Central Bank
[5] Organization for Economic Cooperation and Development

4.2.3. Housing in Indonesia

In Indonesia's first Five-Year Plan (1969-1974), urban housing was originally not considered a high priority. Because of the country's large rural population, the plan was focused at the improvement of agricultural sector. It was expected that further development in agriculture would increase per capita income and establish a better base for a successful housing policy. Nevertheless, a number of activities were planned such as the preparation for a more comprehensive housing policy. These activities included the design and demonstration of prototype housing projects, analysis of different financing schemes, study of land use patterns, research and standardization of building materials, and the upgrading of local governments (Yeh et al, 1979).

In 1969, KIP, the Kampong Improvement Program started in Jakarta to mobilize residents to improve the infrastructure and the existing housing stock. The program was continued in Surabaya in the second five-year plan. In the fifth Five-Year Plan, KIP was executed in 470 cities to serve more or less fifteen million citizens covering 37,000 hectares (Bappenas, 1993). The government also planned to increase the construction of low cost housing units in Jakarta metropolitan area; the aim was to form essentially self-sufficient residential communities that in the future serves as a model for other cities. In 1974, Perumnas[6] was established and responsible for the formulation of the broader policies. National Urban Development Corporation was set up to serve the corporation and a housing mortgage bank was planned to finance the projects. A number of regional executive and financing institutions were planned to implement programs at sub-national level (Yeh et al, 1979).

In the Second Five-Year Plan (1974-1979), the government proposed substantial efforts toward the provision of housing and municipal services as part of an overall strategy to achieve more equitable income distribution. Housing development in the urban areas had been mainly directed to meet the housing demands due to population increase, but phased efforts had also been devoted to decreasing the total shortage and replacing substandard units. The government needed assistance, guidance, and incentives from individuals and private developers. More specifically, government efforts included the improvement of existing settlements, relocation of settlers, and development of new settlements. Meaning, a projected target of 315 000 low-cost housing units for low-and moderate-income groups and the provision of incentives and other facilities stimulated the private sector to build middle-income housing. Simultaneously, kampong improvement programs were increased and accelerated. In the rural areas, the government program emphasized basic services; one target was to establish demonstration plots in 1400 villages. The rural housing programs were limited to special projects for migrants, resettlement activities, relocation of populations from disaster areas, etc.(Bappenas, 2008).

Starting from 1985, when urban land began to be scarce, and more urban development problems appeared, low cost rental walk-up apartments were developed particularly in order to solve the urban density due to the high poverty level (Yeh et al, 1979). Moreover, urban

[6] Perusahaan Perumahan Nasional, the National Housing (Urban Development) Corporation

population had become denser as a result of economic activities offered by cities. The increase of dwellings did not balance the rapid growth of population. The housing programs grew without appropriate plans. They did not meet the requirements of health, safety, as well as comfort. Due to efforts for arranging better city performance and providing settlements for the urban poor, very large land area was required including for infrastructure. This caused the increase of housing prices, while the buying power of the urban poor was still limited/low. Low cost rental apartments were then the answer, although not all community accepted it (Putra, 2004).

The most important sentences in the constitution about housing and settlement in Indonesia said: The fulfillment of the housing need is realized through the development of entirely integrated and planned settlement area in a large scale and in stages. A settlement that is executed by enterprises of housing is only developed in the KASIBA[7], the ready built land area, or LISIBA[8], part of the ready built land area which manage to stand by itself. Every citizen has the same right and opportunity to participate in the housing and settlement development, either individually or corporately. The central government can delegate part of housing and settlement business / responsibility to the local government (Constitution no.4/1992). To complete this, constitution no.1/2011 about the housing of settlement area was formalized. Constitution no.16/1985 about storey house was replaced by constitution no.20/2011 about similar case, in order to strengthen the handling program conception of housing and slums settlements, as well as the conduction of Rusunawa that had been executed by Cipta Karya, the Directorate General of Public Works, since 1993 (Kementrian PU[9], 2012).

4.2.4. Low Cost Apartments in Indonesia

In Indonesia, in order to handle the slums area, 250 twin blocks of Rusunawa[10] were planned to be built within 2010-2014 by Dirjen Cipta Karya, through its Renstra[11]. By this, 24.750 apartment units would be available for the low income community. 110 twin blocks were developed during 2010-2012, the other 140 were planned to be erected in 2013-2014. The city/local governments were given the responsibility to implement the developments. The intention was not only to give prime services to the entire citizens / community, but also to beautify the urban esthetics, and to contribute in fulfilling the nation committment in the world forum i.e. freeing Indonesia from slum areas in 2020 (Kementrian PU, 2012).

Local governments were urged by the central government to be more creative and willing to take risks in rearranging the marginal, slums, and squatter settlements. The urgent request also addressed the issue on saving the urban green open space. The Urban Planning Constitution no. 26/2007 stated that green open space areas in big cities should reach 30%, where in fact, Jakarta had only 10%. The most recent news said that green open space of urban area would be enhanced by the Directorate General of Public Works (Kementrian PU, 2012). For this, Jakarta was requested to change its housing development strategy from horizontal to vertical housing to save the land, by which the land ratio does not necessarily to be 62% like it was.

[7] Kawasan Siap Bangun, the ready built region. It consists of a number of LISIBA
[8] Lingkungan Siap Bangun, the ready built environment. It is the sub-system of KASIBA but stands by itself
[9] Pekerjaan Umum, the Public Works Ministry
[10] Rumah Susun Sederhana Sewa, a Simply Rental Apartment, which is addressed to low income households
[11] Rencana Strategis, the Strategic Plan of Public Works Ministry.

Accordingly, apartments were seen as the answer for the fast growing population and the high demand for housing land. If Jakarta still kept depending on horizontal housing, there would be no more available land, and the environment will be disturbed or unhealthy. The horizontal housing areas that are already dense should be revitalized to become vertical housing areas by constructing apartment close to dense area and relocating the dwellers to apartment in stages (Public Works ministry, 2012).

The unsuitability of location arrangement influenced the success of Low Cost Rental Apartment program that were still constrained by the availability of land. Most locations were not synchronized with their infrastructures. This resulted in a low occupation rate. In fact, the apartments were meant to accommodate middle-low income households which were in huge number. The low cost rental apartment program was tightly related to local government initiative in providing the mature land for the apartment development. The policy for developing low cost apartments was initiated by the central government which was then delegated to the local governments with the aim to reduce marginal, slums and squatter settlements in big cities (PSPI, 2005; Lee et al, 2001). However, relocating the urban poor wais not easy. For example: the unsuccessfulness of victim relocation from East Canal Flood slums (in Jakarta) to the apartments, although the location was considered strategic.

Figure 4- 3: Relocation of the poor from slum areas to decent low cost apartment

The government decided to keep developing low cost rental apartments in the entire Indonesia particularly in big cities as it was no longer possible to build housing horizontally while the population growth had been too fast. The Indonesian president (April 27, 2009), in an opening of an infrastructure project in East Java, clarified that the establishment of infrastructure included several low cost rental apartments in twin block plans. It is the obligation of the government to enhance the community prosperity including plans for providing housing for the poorest residents. In accordance with this, the government intended to increase the floor level of low cost rental apartments in Jakarta Indonesia from 12 to 26 floors in twin blocks. During 2004-2009 the Ministry of Housing only achieved 60% of the target of 60,000 twin blocks. Within five years in the future, 650 more twin blocks were targeted to be built by the ministry.

In order to increase the low cost rental apartment occupation, the housing minister changed the concept from un-furnished to semi-furnished, by which occupant candidates would need only to bring their suitcases without major household equipments. This resulted in the importance of classifying the developed low cost rental apartments as not all of them were ready to accept tenants. This problem influenced the regulation of the apartments' height in Jakarta that resulted in the reduction of the building floors as the government should take into account the population density of the tower.

Changes in the design of low cost rental apartments that occurred during 1985-2011 include:

- the dimension of unit space area — from 18 m^2 to larger than 30 m^2
- the floor plan design — from double loaded corridor to twin blocks
- the stories of building blocks — from three floors to higher than five floors
- the height of unit floor to floor — from 2.65 m to higher than 3.00 m

Despite the difficulties in relocating the urban poor to the apartments, it was concluded that the government of Indonesia would keep developing low cost rental apartment towers in solving the urban problems. The action particularly included the housing of the urban poor and the saving of scarce land to enhance the green open space areas within the cities. Yet, after some evaluations based on reality, due to the change of the regulation, the height of the apartments was decreased from what had been initially planned to be even higher than 8, back to 5-6 floors.

4.2.5. Low Cost Rental Apartments in Surabaya

Low cost apartments, especially low cost rental apartments (LCRA), had already been developed and spread in Indonesia including Surabaya, which was started by the development of Dupak, Sombo, and Simolawang, since 1985. Through cooperation between Surabaya Municipality and the housing laboratory of ITS, research for solving the problem of stuck housing developments, as well as the idea of low cost rental flat development was revealed, therefore Surabaya was ready when the offer for developing low cost rental flats was forwarded (Silas, 1990). Dupak had been prepared for the project location four years prior, in which the preparation was not only for ordinary rental flats like in Bandung, but it was basically meant more to improve the environment of the housing settlement as well. Dupak was chosen as its location was close to industrial area and Perak harbor, where plenty of informal sectors existed. Moreover, in spite of more than 20 year occupancy, the housing condition was mostly below the minimum standard.

In principle, the intended designs were as follows:

1. The basic rules were given by the central government.
2. The design pattern was made in a way the community is accustomed to. It contains a private part, and also parts such as place for gathering, cooking, bathing, and washing to be used by the whole community.
3. The current or prevailing standard was met, even enhanced. For example one toilet which was previously meant for 4-6 families was changed into a toilet for only 2. Further, a shared praying facility and playing area were provided on each floor.

4. The design concept and Architecture form was made to provide shade, cross ventilation, and enough natural light. Additionally, every household has its own roof and mini yard or outdoor open space when needed.
5. A community group of 25 units/block was considered appropriate for the local community.
6. Construction and materials were made durable and low maintenance (Silas 1990).

Before resettlement, the housing situation of Dupak and Sombo was extremely dense and below the standard with density of more than 1000 people/hectare, semi-permanent, unhealthy, with destroyed walls, with no chance of decent social life and no signal of improvement. But then Dupak and Sombo developments were considered to be improving, in which, the slums were fixed without displacing residents. Despite being a real estate prepared for the poor, this low cost apartment development was based on human approach concept. This super development made Surabaya successful in combating poverty (the squalor). Since then, Dupak frequently became example of housing resettlement and had been visited by many visitors who were interested in low cost rental apartments.

The apartment units which average area was $18m^2$ plus balcony of $4.5m^2$ were meant as temporary settlement for the poorest people, with not only low income, but also irregular income. It was expected that by living within some period of time in low cost rental apartment, the occupants would be capable for earning better that they manage to buy own housing or apartment units in the future (Mahmudah Siti, 2010).

In 2010 it was indicated that Surabaya municipality would develop low cost rental apartments in 6 locations in the city, two blocks of 80 units each in every location. In this project the local government cooperated with the central government. The local government provided the land including the infrastructure, while the capital fund was from the national budget of PERUMNAS as the national housing corporation in Indonesia (RPJMD Surabaya, 2010-2015). The representative of Surabaya municipality said that as land price was too high (expensive), it was no longer possible to develop ground bound houses for the poorest citizens. Low cost rental apartments were the best alternative in solving the urban problem.

Standard Procedures, Rules, Regulations, and Guidelines for Space Designs

The procedure

The following description is a script gained by interviewing Mr. Dwija, the vice chief of public works department of Surabaya Municipality explaining the development of rusunawa, the low cost rental apartments in Surabaya. According to him, rusunawa in Surabaya was developed in order to support the local government's program in providing decent housing for poor citizens. The development was conducted under cooperation between the local and the provincial or central government. The procedure started from a proposal of the local government stating that the municipality required to develop low cost apartments (rusunawa). The proposal was usually presented when a conference on development planning either at a provincial or national level was held. When the proposal was approved, then the local government might provide the land that should be ready for construction, including land acquisition and land filling if necessary. The

capital of physical development or construction was then sourced from the national expenditure budget of the central government public works department of housing ministry. When the construction was finished then the rusunawa buildings were handed over by the provincial or central government to the local government to be managed and monitored for operational (Dwija-KMS, Oct. 2010).

The design was always made and prepared by a design team whose composition was determined by the central government through a tender system. The design concept should be consulted to the Surabaya Municipality before it was used as the construction development document. The construction was carried out by a contractor that has been appointed by the central government through a tender system, which was funded by the central government as well. The development monitoring was handled by a team that consisted of central government and the public works department of Surabaya Municipality. After being delivered, the institution in charge for managing the rusunawa in Surabaya was the department of building and land management (source: Dinas Pengelolaan Bangunan dan Tanah).

It could be seen that up to this moment, the most essential institution in the availability of rusunawa in Surabaya was the department of public works (Dinas Cipta Karya dan Tata Ruang) in particular, together with the local government. The target groups mostly were the low income citizens of Surabaya and informal sector people that usually had no dwelling place. The initiative and the developer recruitment for rusunawa development had always been executed by the central government. However, the local government kept striving to force and attract private sectors to participate in the development of rusunawa (Dwija-KMS).

(Dwija, KMS) Problems often faced in the development of rusunawa in Surabaya:

- Land price in Surabaya that was very high. In the availability of land, the local government often intensified the municipal asset lands, most of which are ex or located in villages. Therefore, the intensification of the lands should first be socialized to the surrounding community since conflict frequently arise between local government and the villagers, as their desires were always different from what the local government wished / wanted.
- Land provision that was also concerned with location problem, as according to the occupant candidates, it was important that the rusunawa location be easily accessible by public transportation and close to working and education places or schools for children.
- The limitation or less-adequacy of infrastructure and utilities such as access or roads, electricity, and clean or drinking water.

The building codes and regulations

Dwija-KMS (October. 2010), regarding building codes or guidelines, all building constructions in Surabaya should refer to or based on SNI, the Indonesian National Standards, for buildings: Minister Regulation number: PU 5/2007 about Technical Reference for high rise simple apartment development, and the Regional Regulation number 7, 2009 about buildings. This regulation referred to constitution no.28 / 2002 about buildings and the government regulation number 36 / 2005.

Some determinants that became guidelines in developing rusunawa are:
- KDB (Koefisien Dasar Bangunan) i.e. the ground floor - total land area ratio (in %)
- KLB (Koefisien Lantai Bangunan) i.e. the total floor - total land area ratio (in %)
- building height which includes total, floor-to-floor, and each unit height
- green open space i.e. open space - total land area ratio (in %)
- circulation requirements which includes the slopes, and turning degree grade
- parking place
- public / social facilities.

Regarding the **design concept** according to (Dwija-KMS), recently rusunawa in Surabaya had been developed in twin blocks with open plan concepts, with no permanent partition inside the units, except for pantry and bath & WC, so, it enabled occupants to arrange or adapt the interior to what they wanted or required. The **structure system** applied in rusunawa in Surabaya which generally of reinforced concrete with precast concrete had so far been the primary choice.

However, the local government had started developing light steel construction for the roofs, doors and windows frames, as they were considered more economical, practical, durable, as well as resistant to mold attacks. **building materials** generally used were: concrete and natural or river stones for foundations, precast concrete for beams and columns, bricks or batako or light bricks for walls, and aluminum for doors and windows frames, while the upper part of roof used wood or light steel with simple roof or corrugated tiles as the roof cover.

It was mentioned that the use of light steel such as hebel / citicon was starting to be applied for the roof. The **basic shape** of rusunawa generally developed in Surabaya was block systems or double loaded. However since end of 2009 the local government started to develop twin blocks system that was applied in the new areas such as in Penjaringan Sari-3 and Tanah Merah-2.

Complaints by users

According to (Dwija-KMS) users were mostly concerned with utilities such as the provision of electricity and clean or drinking water that in reality was limited; unavailability of cheap and affordable gas for cooking; lack of public social facilities such as parking place, religious place, health care, and open space or play ground for children. One action that had been done by Surabaya local government is providing reading parks at rusunawa. Regarding comfort, constitution number 28/2002 about buildings, and government regulation number 7/2009, said that the construction development including rusunawa in Surabaya should consider technical premises on the building reliabilities that involve aspects of easiness, safety, comfort, and health. Aspects of comfort such as air movement and indoor air also became one of the considerations in the development of rusunawa in Surabaya.

4.3. THE CURRENT SPACE DESIGNS

The data required in this research were obtained by questionnaires and in depth interviews. 300 user respondents of fourteen building population, thus twenty-one households in each apartment block, were taken as samples. The data collected in the field survey included the location where each of the household activity took place, and which space was required for

doing such activity. Data on the characteristics of the user population were also collected. All data of plans were (re-)drawn and processed by using CAD. All data of activities, use of space, furniture and users' characteristics were processed by using Microsoft Excel. Besides that, data of the current space design of all fourteen apartment buildings were recorded by checklist, measurement observation, and by interviewing local authorities, as well as from drawings. The current space designs of low cost rental apartments (LCRA) in this research are described and presented starting from the urban level up to the unit part or functional area level.

4.3.1. Space Design on Urban Level

It could be concluded that on urban level, fourteen types of low cost rental apartments in this research were planned scattered in twelve complex locations of living areas. They were plotted from the most North, to the most South part of Surabaya.

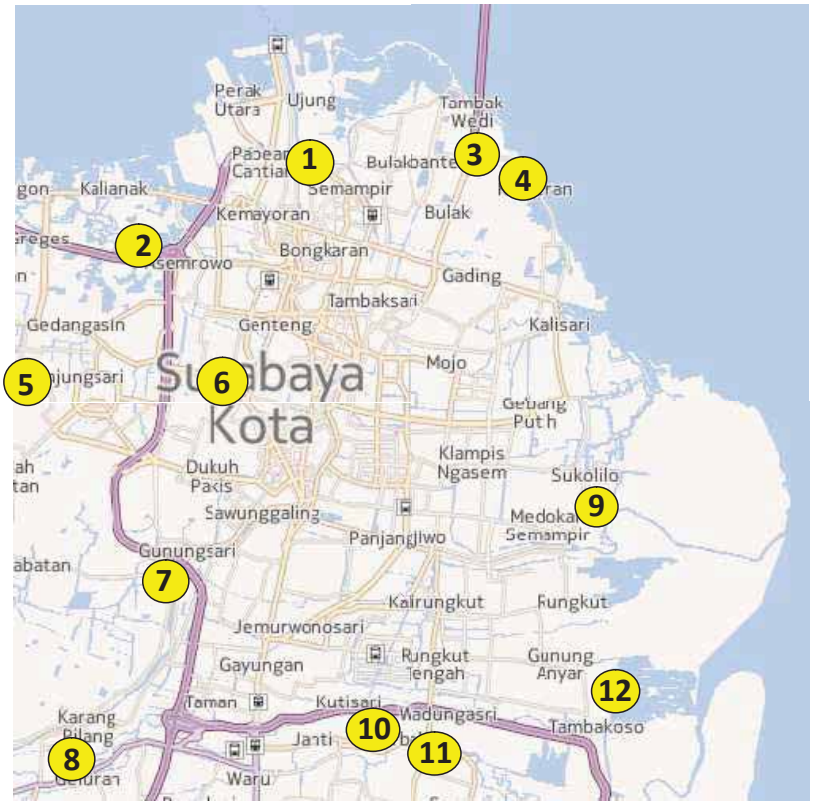


Figure 4- 4: Map of Surabaya showing the plots of all low cost rental apartment complex locations

The complex locations of these LCRAs (figure 4-4) comprise: (1) Sombo and Simolawang in the most North; (2) Dupak in the North West; (3) Randu and (4) Tanah Merah in the North East; (5) UNESA in the West; (6) Urip Sumoharjo and (7) Gunungsari in the centre; (8) Waru Gunung in the South-West; (9) ITS in the East; (10) Penjar 1, 2 and (11) Penjar-3 in the South; and (12) Wonorejo in the South East of Surabaya.

4.3.2. Space Design on Site Level

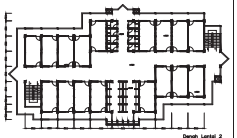
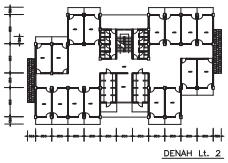
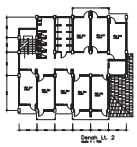
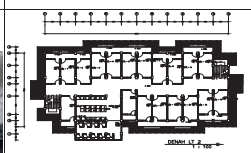
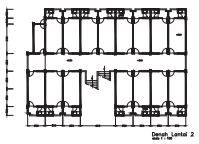
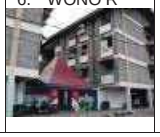
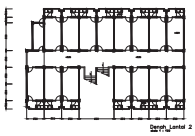
On site level, it could be said that seven of the fourteen low cost apartment locations in Surabaya Indonesia: Sombo, Simo, Penjar-1, Penjar-2, Wonorejo, Randu, and Waru-Gunung were designed as building blocks in rows that were arranged efficiently. While the other seven locations: Dupak, Gunung-Sari, Urip-S, Tanah-Merah, Penjar-3, ITS, and UNESA were designed as blocks arranged centrally oriented to the internal outdoor space. This internal space was usually applied as parking and orientation space on the ground, as the space was situated in the middle or front part of the site. The outdoor space functioned not only as parking place, but also as orientation space from where one could find which building to enter. Around this space, mostly stood a multi-purpose building like that in Gunung-Sari. Residents could use this building incidentally or periodically either charged or not when they needed to celebrate or discuss things among residents. At this ground floor, often available also common facilities such as shops, representative office, guards, and garbage pools.

Figure 4- 5: Site-plan of each low cost apartment's complex

4.3.3. Space Design on Building Block Level

4.3.3.1. Characterization of the building blocks

The characterization of current situations of low cost rental apartments in Surabaya is structured in a table presenting the picture of site plan, performance, and building plan; completed with data of location or region address, development year, total of blocks and types, total floors per block, total units per floor, total units per block, and the facilities: pantry or kitchen, toilet, balcony, and common space. The building population of this research was fourteen, eight of which were designed in double loaded, three in single loaded, and the remaining three were planned in twin blocks.

Site Plan	Performance	Building Plan	Location-year-blocks	Floor/block Unit / floor Units /block	Toilet / Pantry, Balcony	Common Space
Sombo + Simolawang 	1. SOMBO 		Kelurahan Simolawang Kecamatan Simokerto (25.000 m²) 1990 10 double loaded blocks Total rented units 618	4 floors/block 17 units/floor 68 units/ block	Collective service With continuous outdoor balcony	18m²/unit 6x12 m² centered hall
	2. SIMO L 	 DENAH Lt. 2		4 floors/block 16 units/floor 64 units/ block	Collective service With continuous outdoor balcony	18m²/unit 2(9x6)m² separated end halls
Dupak 	3. DUPAK 		Kel Dupak Kecamatan Krembangan (3000 m²) 1989 6 double loaded blocks	3 floors/block 8 units/floor 25 units/ block Total rented units 150	Collective service with private outdoor balcony	18 m²/unit 5x6 m² centered hall
Penjaringan-1 + 2 	4. PENJAR-1 		Kel Penjar Kec Rungkut (9000 m²) 1991 3 double loaded blocks	4 floors/block 19 units/floor 76 units/ block Total rented units 250	Collective service With continuous outdoor balcony	18m²/unit 5x12 m² centered hall
	5. PENJAR-2 		Kel Penjar Kec Rungkut (9000 m²) 1996 6 double loaded blocks	4 floors/block 15 units/floor 60 units/ block Total rented units 288	Individual service With private semi outdoor balcony	21m2/unit 5x6 m² centered hall
Wonorejo 	6. WONO R 		Kel Wonorejo Kec Rungkut (2500 m²) 2004 6 double loaded blocks	4 floors/block 15 units/floor 60 units/ block Total rented units 288	Individual service With private semi outdoor balcony	21m²/unit 5x6 m² centered hall

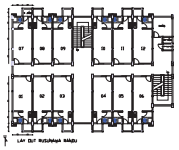
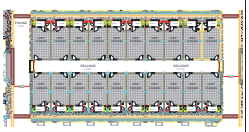
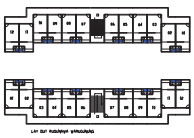
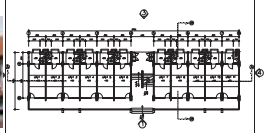
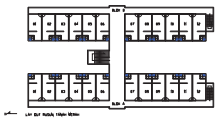
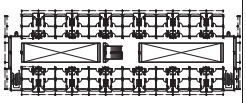
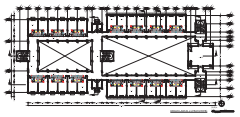
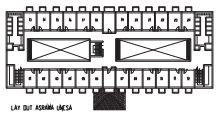
Randu 	7. RANDU 		Kel Sidotopo Kec Kenjeran (6800 m²) 2009 6 Double loaded blocks	5 floors/block 12 unit/floor 48 units/ block Total rented units 288	Individual service With private outdoor balcony	21m²/unit 8x4 m² centered hall
Gunung Sari 	8. GN-SARI 		Kel Gn sari Kec Wonocolo (6799 m²) 2010 3 double loaded blocks	5 floors/block 20 units/floor 80 units/block Total rented units 268 Ground floor for public	Individual service With private indoor balcony	Along the corridor, not specific
Waru Gunung 	9. WARU GN 		Kel.Waru Gn Kec.Kr Pilang (29.845 m²) 1996 10 single loaded blocks	5 floors/block 12 units/floor 60 units/block Total rented units 480 Ground floor for public	Individual service With private indoor balcony	21m²/unit No hall
Urip Sumoharjo 	10. URIP S 		Kel Tegalsari Kec Tegalsarii (3500 m²) 2001 4 single loaded blocks	4 floor/block 11 units/floor 33 units/block Total rented units 120 Second floor for public	Individual service With private semi indoor balcony	21m²/unit 5x6 m² centered hall
Tanah Merah-1 	11. T. MERAH 		Kel Kedinding Kec Kenjeran (6000 m²) 2009 2x2 single loaded blocks	5 floors/block 12 units/floor 60 units/block Total rented units 192 Ground floor for public	Individual service With private indoor balcony	21m²/unit 12x4 m² gallery
Penjar-3 	12. PENJAR-3 		Kel Penjar Kec Rungkut (6000 m²) 2010 1twin blocks	5 floors/block 24 units/floor Total rented units 96 Ground floor for public	Individual service With private outdoor balcony	24m²/fixed plan unit 3(8x4) m² separated halls
ITS 	13. ITS 		Kel Keputih Kec Sukolilo (……m²) 2007 4 twin blocks	4 floors/block 28 units/floor 112 units/block Total rented units 384	Individual toilet Small un-accessible outdoor private balcony	21m2/unit 3(8x3) m² separated halls
UNESA 	14. UNESA 		Kel Lidah W Kec Wiyung (……m²) 2008 1 twin blocks	5 floors/unit 24 units/floor 120 unit/block Total rented units 120	Collective service Small un-accessible outdoor private balcony	3(4x6) m² separated halls

Figure 4- 6: The characteristics of 14 low cost rental apartment blocks (source: RPJMD Surabaya 2010-2015)

4.3.3.2. Classification of the building blocks

The low cost rental apartment blocks of Surabaya that were investigated in this research could be classified into three basic groups, from the earliest namely (1) double loaded, in which one corridor in the middle of the block serves units on both sides; (2) single loaded, whiere building corridors were only charged by units of one side row building; and (3) twin blocks that consists of twin single loaded blocks adjacent to each other with a central open patio.

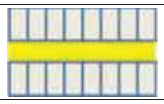
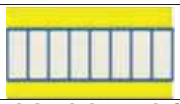
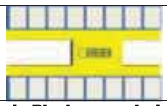
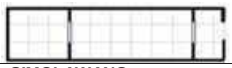
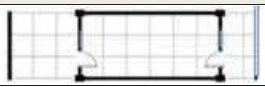
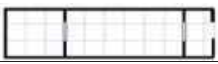
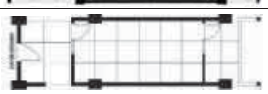
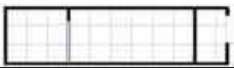
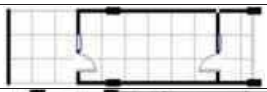
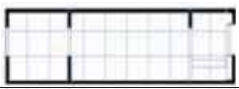
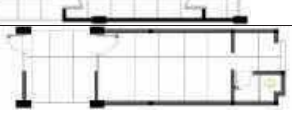
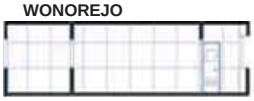
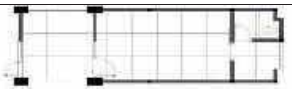
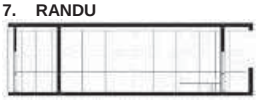
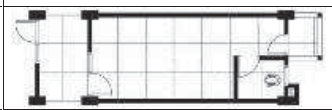
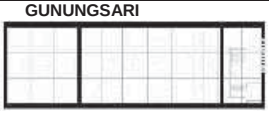
		
8 Double Loaded space designs: 1. Sombo; 2. Dupak; 3. Simo; 4. Penjar-1 5. Penjar-2; 6. Wonorejo; 7. Randu 8. Gunungsari	**3 Single Loaded space designs:** 1. Waru Gunung 2. Urip S 3. Tanah Merah	**3 Twin Block space designs:** 1. Penjar-3 2. ITS 3. UNESA

Figure 4- 7: Classification of the investigated building blocks

4.3.4. Space Design on Unit Level

4.3.4.1. Characterization of the unit plans

Similar to that of the building blocks, the unit characterization also revealed in the following table particularly involving data of unit part dimensions in floor plans and sections as figured below.

	UNIT SECTION	Corridor/ Total unit	UNIT PLAN	UNIT PART DIMENSION
DOUBLE LOADED CORRIDOR	1. SOMBO 	Double loaded 68 units /block		Multi-F= 3x6= 18 Balcony= 3x1.5=4.5 Ceiling height= 3.00 Corridor width= 3.00
	2. SIMOLAWANG 	Double loaded 28 units /block		Multi-F= 3x6= 18 Balcony= 3x1.5=4.5 Ceiling height= 3.00 Corridor width= 3.00
	3. DUPAK 	Double loaded 58 units /block		Multi-F= 3x6=18 Balcony= 3x1.5=4.5 Ceiling height= 3.05 Corridor width= 2.00
	4. PENJ-SARI-1 	Double loaded 76 units /block		Multi-F= 3x6= 18 Balcony= 3x1.5=4.5 Ceiling height= 2.80 Corridor width: 3.00
	5. PENJARINGAN-2 	Double loaded Units /block		Unit area= 3x7.5= 22.5 Multi-F= 3x5.5= 16.5 Balcony= 2x1.6= 3.2 Toilet= 2x1.4= 2.8 Ceiling height= 2.80 Corridor width= 3.00
	6. WONOREJO 	Double loaded 48 units /block		Unit area= 3x7.5= 22.5 Multi-F= 3x5.5= 16.5 Balcony= 2x1.6= 3.2 Toilet= 2x1.4= 2.8 Ceiling height= 2.80 Corridor width= 3.00
	7. RANDU 	Double loaded 72 units /block		Unit area=(3x7)+1.8= 22.8 Multi-F= 3x5.2=15.6 Balcony= 1.5x1.2=1.8 Toilet= 1.5x1.8= 2.7 Ceiling height= 3.40 Corridor width= 2.00
	8. GUNUNGSARI 	Double loaded units /block		Unit area= (4x8)-0.6=31.4 Multi-F=(4x6)-0.6=23.4 Indoor balcony=1.4x2=2.8 Toilet= 1.2x2=2.4 Ceiling height= 3.40 Corridor width= 3.00

SINGLE LOADED CORRIDOR	9. WARU GUNUNG	Single loaded 36 units /block		Unit area= 3.8x5.5= 20.9 Multi-F=3.8x4=15.2 Indoor balcony=2x1.5=3 Toilet=1.8x1.5=2.7 Ceiling height= 2.75 Corridor width= 1.50
	10. URIPSUMO H	Single loaded 40 units /block		Unit area= 3x8= 24 Multi-F= 3x6=18 Balcony= 2x2=4 Toilet= 1x2=2 Ceiling height= 3.15 Corridor width= 2.00
	11. TANAH MERAH	Single loaded 60 units /block		Unit area= 3x7.5= 22.5 Multi-F=3x4.5= 13.5 Indoor balcony= 3x1.5=4.5 Toilet= 1.5x1.5= 2.25 Ceiling height= 2.85 Corridor width= 1.50
TWIN BLOCKS	12. PENJARINGAN-3	Twin blocks Units /block		Unit area= 4.5x5.5= 26.9 Living room=3x5.8=17.4 Pantry=4.05; Toilet=2.7 Balcony= 1.5x1.8=2.7 Ceiling height= 2.65 Corridor width= 1.50
	13. ITS	Twin blocks 56 units /block		Unit area= (3.6x6)-0.5=21.7 Multi-F=(3.6x4)+3.2=17.6 Balcony=0.5x1.2=0.6 Toilet=2+1.5=3.5 Ceiling height= 2.65 Corridor width= 1.50
	14. UNESA	Twin blocks 54 units /block		Unit area=(4x4.5)+0.7= 18.7 Multi-F=4x4.5=18 Balcony=1.2x0.6=0.72 Ceiling height= 2.80 Corridor width= 1.50

Figure 4- 8: Characteristics of 14 unit plans in which the low income household requirements are investigated

4.3.4.2. Classification of the unit plans

The floor plans of the fourteen apartment building types in Surabaya could be grouped into open and fixed floor plans. Amongst fourteen apartment buildings, there was only one apartment building with fixed partitioning in its floor plan. As a matter of fact, most of the existing unit plans of low cost apartments in Surabaya thirteen out of fourteen were designed in open plan. This meant that in selecting the standard reference, they could be considered as studio apartments. Figure 4-9 illustrates the types and grouping of floor-plans in the different apartment buildings.

Open plan			Fixed plan
Collective Service	Private Service		
	Service outside	Service inside	
1. Sombo	1. Penjar-2	1. Waru Gunung	1. Penjar-3
2. Simo	2. Wonorejo	2. Tanah Merah	
3. Dupak	3. Randu	3. Asrama ITS	
4. Penjar-1	4. Urip Sumoharjo	4. Gunung Sari	
5. Unesa			

Figure 4- 9: Grouping of the apartment unit plans

More specifically, the types of the units in the buildings could be classified into four patterns namely: (1) Fixed plan units with one fixed bedroom and an individual toilet and pantry, as well as a balcony; (2) Open plan units with toilets and pantries provided collectively; (3) Open plan units with a private toilet and a pantry located outside or on the balcony, and (4) Open plan units with a private toilet and a pantry located inside as the balcony were indoor, except ITS which balconies were outdoor and had no pantry. The figure below shows the classification.

FIXED PLAN UNITS (1 BLD)	OPEN PLAN UNITS (13 BUILDINGS)		
With One Fixed Room	Collective Service (5 Blds)	Units with Private Service (8 Buildings)	
 **1 bld with 1 fixed bedroom** 1. Penjaringan-3	 **5 blds with service at common space collectively** 1. Sombo 2. Simolawang 3. Dupak 4. Penjaringan-1 5. Unesa	 **4 blds with private service outside, at the balcony** 1. Wonorejo 2. Penjaringan-2 3. Randu 4. Urip Sumoharjo	 **4 blds with private service inside and indoor balcony** 1. Gunungsari 2. Waru Gunung 3. Tanah-Merah 4. ITS (outdoor balcony)

Figure 4- 10: Classification of the apartment units

Basically, the currently applied space designs of unit floor-plans were sub-divided into unit parts: multi-functional space, kitchen, bathroom/toilet, balcony, and corridor. Each unit part would facilitate several activities. The location of activity was determined based on where (which unit part) the activity according to respondents dominantly took place. This is important as standard requirements are usually applied for functional areas that facilitate several or aggregate instead of an individual activity. For instance, the standards found were those for living-room, dining-room, bedroom etc, rather than for drying, child-caring, praying etc. The dominance of location of activities was intended to determine which activities were conducted in each unit part in order to facilitate the comparison to the available standards.

OPEN PLANS			FIXED PLAN
SERVICE PROVIDED COLLECTIVELY	SERVICE PROVIDED INDIVIDUALLY		With private services and outdoor balcony
No service, but with outdoor balcony	service outside + outdoor balcony	service inside + indoor balcony	
			

Figure 4- 11: Zoning of classified units into unit parts

4.3.5. Space Design on Unit Part Level

4.3.5.1. Space design of multi-functional space

The multi-functional space in the units was mostly designed in an open plan. Only one out of fourteen was designed in a fixed plan. The space design was simply an open plan with two doors. One of them was placed in front as an entrance gate from the corridor, and the other was at the back side as an exit to the balcony. None of them had side windows, but all had front windows and some had back windows. The findings of this research indicated that 70% families divided their multi-function space into a public sub space at the outer side, and a private sub space at the inner side. The average size of the existing multi-functional space was 17.41 m^2.

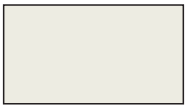
Multi-functional space type I	Multi-functional space type II	Multi-functional space type III	Multi-functional space type IV
			
Rectangle with 3m wide	Almost square with>3.6m wide	Bigger rectangle i.e. 4x6m^2	Fixed smaller square (3x2.75)m^2

Figure 4- 12: Types of multi-functional space designs

Considering the floor plan shape, the current space design of multi-functional space could be classified into four types. Type I includes the multi-functional space of nine low cost apartments: Sombo, Simo, Dupak, Penjar-1, Penjar-2, Wonorejo, Randu, Urip-S, and Tanah-Merah, that was a rectangle with width dimension of 3m, and varying length between 4.5m and 6m. Type II includes the multi-functional space of Waru-Gunung, ITS, and UNESA, that was almost a square with width dimension of 3.6m to 3.9m, and length of 4m to 4.8m. Type III includes only one low cost apartment namely Gunungsari, that was a rectangle of a bigger size i.e. (4x6)m^2. Type IV were the fixed plan units, including only one low cost apartment i.e. Penjar-3, that was shaped as a smaller square (3x2.75)m^2.

4.3.5.2. Space design of kitchen

Not all apartment blocks were provided with a private pantry or kitchen. Out of the 14 low cost apartment locations, only 8 had a kitchen in the unit. The space design could be classified into 4 types: (1) single file in front of the toilet that were found in Penjar-2, Wonorejo, Randu, Waru-Gunung, and Urip-S; (2) L-shape next to the toilet as in Tanah-Merah; (3) single file on half end back wall that was found in Gunungsari; and (4) Long file kitchen that could be found in Penjar-3. The kitchen utility consisted of only a simple ceramic or stainless steel table with a small sink, sometimes completed with a low top cabinet. The average size of the kitchen was 2.56 m^2.

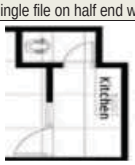
Type 1 of kitchen Single file in front of toilet	Type 2 of kitchen L-shape next to toilet	Type 3 of kitchen Single file on half end wall	Type 4 of kitchen Long full single file shape
			
			
Penjar-2, Wonorejo, Randu, Waru-Gn, Urip	Tanah-Merah	Gunungsari	Penjar-3

Figure 4- 13: Types of kitchen space designs

4.3.5.3. Space design of (bathroom &) toilet

Similarly, not all units were served with private toilets. Out of fourteen, only nine had individual toilets, as the toilets of the other five buildings were provided collectively in the common space. Toilet spaces were designed simply in a rectangle shape with one door facing and located in front or next to the kitchen, equipped with only a water tap and a squatting closet. A fixed

concrete water tank was sometimes provided but often added by the dweller. The space design could be classified into: (1) toilets with WC positioned at the side of the door. These were found in all units with private toilet except Penjar-3 and ITS; (2) toilets with WC positioned in front of the door, that were found at Penjar-3; and (3) toilets with WC separated from the shower space such as those at ITS. The average toilet size was 2.36 m^2.

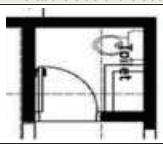
Type 1 of toilet WC at the side of the door	Type 2 of toilet WC in front of the door	Type 3 of toilet WC separated from the shower space
		
		 
Penjar-2, Wono-R, Randu, Gn-sari, Waru-Gn, Urip, T-Merah	Penjar-3	ITS

Figure 4- 14: Types of bathroom & toilet space designs

4.3.5.4. Space design of balcony

Balcony also did not exist in every unit. The balcony of three apartments were not designed outdoor but inside the unit. The balcony of the other eleven apartments was designed exactly in cantilever system which opens to backside outdoor. The space design could be classified into four types: (1) continuous outdoor balcony that were found in Sombo, Simo, Dupak, and Penjar-1; (2) Semi outdoor balcony as in Penjar-2, Wonorejo, and Urip-S; (3) Outdoor balcony such as those in Randu, Penjar-3, ITS and Unesa; and (4) Indoor balcony as were seen in Gunung-sari, Waru Gunung, and Tanah-Merah. The average size of existing balcony was 2.73 m^2.

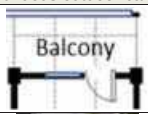
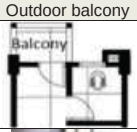
Type 1 of balcony Continuous outdoor balcony	Type 2 of balcony Semi outdoor balcony	Type 3 of balcony Outdoor balcony	Type 4 of balcony Indoor balcony
			
			
Sombo, Dupak, Simo, Penjar-1	Penjar-2, WonoR, Urip-S	Randu, Penjar-3, ITS, Unesa	Gn-sari, Waru-Gn, T-Merah

Figure 4- 15: Types of balcony space designs

4.3.5.5. Space design of corridor

Different from all individual facilities discussed above, corridor is a communal facility although in reality partly is often occupied by households to conduct individual activities. The corridor's main function is horizontal circulation. However it was frequently also used to perform both communal and individual activities that are public so that they could be done outside of the units such as children playing, entertaining, and most of time for relaxing and child-caring. Corridor types at

LCRA in this research are divided according to the type of the buildings: double-loaded, single-loaded, and the twin blocks. Corridors that serve access to units on one side i.e. corridors of single-loaded and twin block buildings had a width narrower than that of double-loaded buildings which serve access to units on two sides. Corridors of double-loaded buildings which were developed earlier had a widening in the middle so it could function better in order to meet the needs of the residents to socialize. The average size of the existing corridor was 7.38 m^2. While the width ranged from 1.5 to 3 meters.

Type 1 of corridor Corridor of Double loaded buildings (without and with enlargement)		Type 2 of corridor Corridor of Single loaded buildings	Type 3 of corridor Corridor of Twin blocks
			
Penjar-2, Randu, Gn-sari, WonoR	Sombo, Simo, Dupak, and Penjar-1,	Waru-Gunung, Tanah-Merah, Urip-S	Penjar-3, Unesa, ITS

Figure 4- 16: Types of corridor space designs

4.4. CHARACTERISTICS OF THE HOUSEHOLDS

Household inhabitants in this research were mostly originated from the village or dwelling place with strong familiar character of kinship between neighbours, they helped each other when one had trouble. This community used to gather and mingle together when they finish the day's work preparing meals, washing etc. For this, a good place where they can congregate daily is needed. In fact, not all LCRA had a communal place where they could gather.

4.4.1. Household Size

Units that house four household members were dominant in this research (33% or 97 of 300 respondents). Then, families with three members followed in the second place (24% or 71 respondents). Households with two members in the third place were (16% or 49 respondents). The fourth rank was families with five members (15% or 45 respondents). Only 7% or 20 units were occupied by a single member. From the remaining 5% or 17 units: ten units were occupied by six people and seven units were inhabited by seven members. Just one unit accommodated more than seven members. This means that the units in this research would be considered to house four household members. As a result, indicators applied in the assessment should be the standard or requirement valid for houses with four people. The mean household size was 3.54.

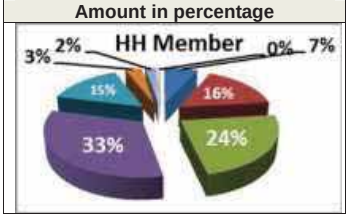
Amount in percentage	Dominant factor
	Dominant Household size is 4 1. 1 people 7% 20 2. 2 people 16% 49 3. 3 people 24% 71 4. 4 people 33% 97 5. 5 people 15% 45 6. 6 people 3% 10 7. 7 people 2% 7 8. >7people 0% 1

Figure 4- 17: Household members (size)

4.4.2. Household Composition

The presence of children was found to be relatively high amongst the households i.e. 39% or 409 among the total of respondents were children. 23% or 242 residents were household heads, and 22% or 231 residents were housewives. There were 116 inhabitants or 10% residents that present as friends in the apartments. The presence of grand-children were only 3% or 29, while the presence of others in the households were just 1% each: nine mothers in law, five fathers in law, and thirteen relatives.

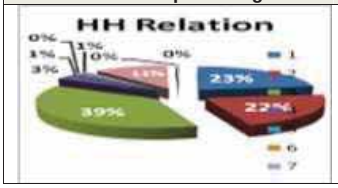
Amount in percentage	Dominant factor
	Dominant composition is children 1. Household Head 23% 2. Housewife 22% 3. Children 39% 4. Grand-children 3% 5. Mother of parent 1% 6. Father of parent 1% 7. Relatives 1% 8. Friend 10%

Figure 4- 18: Household composition

4.4.3. Male and Female

The total of female was bigger than the total of male. The comparison between women and men was 56% by 44%.

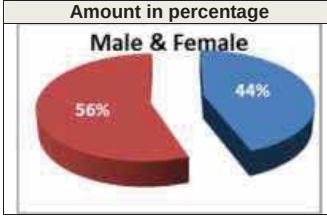
Amount in percentage	Dominant factor
	Female are greater than male 1. Male residents 44% 2. Female residents 56%

Figure 4- 19: Ratio of male and female

4.4.4. Age Groups

Of all respondents, adult residents whose ages were between fifteen and seventy years were dominant in this research (68% or 720 residents). The second top (17% or 176 residents) were adolescence whose ages were between five and fifteen years. The third rank was the group of babies (14% or 149 residents), whose ages were zero to five years. Only 1% or 14 residents were aged older than seventy years.

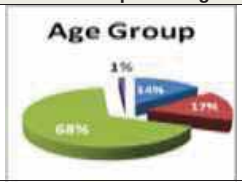
Amount in percentage	Dominant factor
	Dominant age group is adult people (15-70 years) 1. 00-05 years (babies) 14% 2. 05-15 years (adolescence) 17% 3. 15-70 years (adults) 68% 4. > 70 years (elderly) 1%

Figure 4- 20: Ratio of age group

4.4.5. Religions

Regarding religion, it was recorded that ninety-five percent or 1004 respondents were Moslem, while the rest five percent or 49 respondents were Christian. Although not represented in this research there might be LCRA dwellers who had other religion that were not included as respondents.

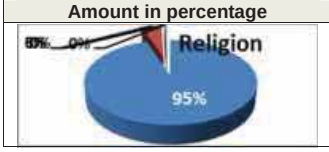
Amount in percentage	Dominant factor
	Dominant religion is Moslem 1. Moslem 95% 2. Christian 5% 3. Hindu 0% 4. Buddha 0% 5. Other 0%

Figure 4- 21: Ratio of residents' religion

4.4.6. Business Activity

In these low cost apartments, among 300 respondents, 21% or 63 households had business activities in their units. The remaining 79% or 237 households did not do income generation activities, they were just ordinary dwellers who might work or earned income outside the units.

Amount in percentage	Amount in number
	Units with no business is dominant 1. Units with business 63 2. Units with no business 237

Figure 4- 22: Ratio of units with and without business

4.4.7. The Length of Stay

The duration of households living in the apartments varies. Households of Simo had been living there for nineteen years therefore they had stayed the longest. Households living in Gunungsari were those who had stayed the shortest as they had just moved to the apartment two years before. Averagely the length of stay was 6.3 years. Figure 4-23 indicates the length of stay.

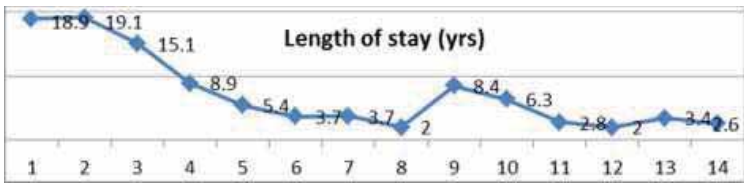
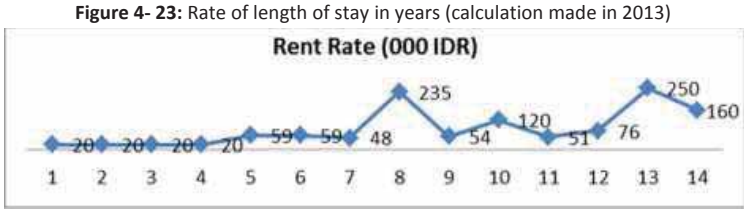


Figure 4- 23: Rate of length of stay in years (calculation made in 2013)



1. SOMBO
2. SIMO
3. DUPAK
4. PENJAR-1
5. PENJAR-2
6. WONOREJO
7. RANDU
8. GUNUNGSARI
9. WARU-GUNUNG
10. URIP-S
11. TANAH-MERAH
12. PENJAR-3
13. ITS
14. UNESA

Figure 4- 24: Rent rates of LCRA in Surabaya (RJPMD Surabaya 2010-2015)

4.4.8. The Rent Rate

The rent rate of unit differed from one another. ITS rent was the most expensive by monthly rate of IDR 250,000. While Sombo, Simo, Dupak and Penjaringan-1 as the oldest low cost rental apartments in Surabaya had the cheapest rent i.e. IDR 20,000 per month. Averagely the rent rate per month was IDR 85,140. Figure 4-24 indicates the rent rates of LCRA in Surabaya.

4.4.9. Furniture and Means Mostly Required

In the field survey of existing unit plans, the set of furniture or equipments and means were recorded in the checklist as essential part of space design (table 4.1). This is useful, not only for determining the use of space, but also for notifying which furniture was the most required.

Table 4. 1: Rough result of furniture, equipments and means used in each activity

ACTIVITY		FURNITURE & EQUIPMENTS																					MEANS			
		Table	Sink	Bucket	Hanger	Chair	Iron	Rack	Drawer	Cupboard	Cabinet	Broom	Mop	Garbage	Stove	Freezer	Rice Cooker	Bed	Mattress	Fan	Tank	TV	Toys	Gas	Water	Sewer	Electricity
A	Washing			1																					1	1	
B	Drying			1	1																						
C	Ironing						1												1								1
D	Storing-1			1				1		1																	
E	Cleaning											1	1	1											1	1	
F	Cooking														1		1							1	1	1	1
G	Eating																	1	1	1		1					1
H	Dish-W		1	1																					1	1	
I	Storing-2	1						1		1						1											1
J	Bathing			1																	1				1	1	
K	Sleeping																	1	1	1							1
L	Praying																		1	1					1		
M	Studying	1				1												1	1								1
N	Childcare																	1	1	1							
O	Storing-3								1	1								1									
P	TV watch							1			1								1	1		1					1
Q	Relaxing																	1	1	1		1					
R	Playing																	1	1				1				
S	Entertain					1													1	1		1					1
T	Storing-4	1						1	1	1																	
U	Celebrate																		1								1
V	Organize																		1								1
W	Religion																		1								1
		3	1	**5**	1	2	1	**4**	2	**4**	1	1	1	1	1	1	1	**7**	**13**	**7**	1	**4**	1	1	**6**	**5**	**11**

Table 4. 2: Dominant furniture, equipments and means applied in each activity

Activities	Dominant furniture	Activities using such furniture
3	Table	for: storing-2, studying, and storing-4
5	Bucket	for: washing, drying, storing-1, dish-washing, and bathing
4	Rack	for: storing-1, storing-2, TV-watching, and storing-4
4	Cupboard	for: storing-1, 2, 3 and 4
7	**Bed**	for: eating, sleeping, studying, child-caring, storing-3, relaxing, and playing
13	**Mattress**	for: storing-1, eating, sleeping, praying, studying, child-caring, TV-watching, relaxing, playing, entertaining, celebrating, organization participating and religion gathering
7	**Fan**	for: eating, sleeping, praying, child-caring, TV watching, relaxing, and entertaining
4	TV set	for: eating, TV watching, relaxing, and entertaining
6	Water	for: washing, cleaning, cooking, dish-washing, bathing, and praying
5	Sewer	for: washing, cleaning, cooking, dish-washing, and bathing
11	**Electricity**	for ironing, cooking, eating, storing-2, sleeping, studying, TV-watching, entertaining, celebrating, organization participating, and religion gathering

Furniture and equipments that were used for carrying out in less than three activities including: basket, machine, drum, shove, rice-box, box, partition and sofa. The dominant furniture and means (table 4.2) are those used in three activities or more, therefore they are indicated as the most required furniture and means that should be available in low cost apartment units.

4.5. PROCESSED DATA

Data collected in this research consisted of plans, space areas, activities, and furniture and means. All data of plans were re-drawn and processed using CAD, while the rest was using Microsoft Excel. Data of activity and furniture and means were processed to find the dominant factor therefore they were calculated through SUM function. As data of space area had to represent all areas of samples, they were processed using AVERAGE or MEDIAN. Data of space area processed and discussed in this chapter were only those regarding the existing space. Data of space areas related to standards and requirements will be discussed in chapter 5, while data of the use of space are processed and discussed in chapter 6. Data of space areas characterizing each low cost apartment as presented in table 4-3 below are the size of the existing or current space design in the evaluation of functionality and adaptability.

Table 4. 3: Average area of existing space (the space supplied)

	Low Cost	Whole Unit		Multi-Functional		Kitchen		Toilet		Balcony		Corridor	
	Apartment	dimension	area	dimension	area	dimension	area	dimension	area	dimension	area	dimension	area
1	SOMBO	3x7.5	22.5	3x6	18					3x1.5	4.5	3x3	9
2	SIMO	3x7.5	22.5	3x6	18					3x1.5	4.5	3x3	9
3	DUPAK	3x7.5	22.5	3x6	18					3x1.5	4.5	3x2	6
4	PENJAR-1	3x7.5	22.5	3x6	18					3x1.5	4.5	3x3	9
5	PENJAR-2	3x7.5	22.5	3x5.5	16.5	0.9x2	1.8	1.2x2	2.4	0.9x2	1.8	3x3	9
6	WONO-R	3x7.5	22.5	3x5.5	16.5	0.9x2	1.8	1.2x2	2.4	0.9x2	1.8	3x3	9
7	RANDU	(3x7)+1.8	22.8	3x5.2	15.6	1.5x1.8	2.7	1.5x1.8	2.7	1.5x1.2	1.8	3x2	6
8	GN-SARI	(4x8)-0.6	31.4	(4x6)-0.6	23.4	**1.4x2**	**2.8**	1.2x2	2.4	1.4x2	2.8	3x4	12
9	WARU-GN	3.8x5.5	20.9	3.8x4	15.2	1x1.5	1.5	1.8x1.5	2.7	1x1.5	1.5	3.8x1.5	5.7
10	URIP-S	3x8	24	3x6	18	1x2	2	1x2	2	1x2	2	3x2	6
11	TANAH-M	3x7.5	22.5	(3x4.5)	13.5	1.5x1.5	2.25	1.5x1.5	2.25	3x1.5	4.5	3x1.5	4.5
12	PENJAR-3	(4.5x5.5)	26.9	3x5.8	17.4	1.5x2.7	4.05	1.5x1.8	2.7	1.5x1.8	2.7	4.5x1.5	6.75
13	ITS	(3.6x6)-0.5	21.7	(3.6x4)+3.2	17.6			1(2+1.5)	3.5	0.5x1.2	0.6	3.6x1.5	5.4
14	UNESA	4x4.5	18.7	4x4.5	18					0.6x1.2	0.72	4x1.5	6
Total average			**23.14**		**17.41**		**2.36**		**2.56**		**2.73**		**7.38**

Table 4. 4: Data of household characteristics

	MEASURES	1	2	3	4	5	6	7	8	9	10	11	12	13	`14	TOTAL
		Sombo	Simo	Dupak	Penj-1	Penj-2	Wono	Randu	G-sari	W.Gn	Urip	T.Mrah	Penj-3	ITS	Unesa	
Size	Total households in location	618		150	250	288	288	288	268	480	120	192	96	448	120	3606
	Total households surveyed	42		21	21	21	27	21	21	21	21	21	21	21	21	300
	% household surveyed	6.8%		14%	8.4%	7.29%	9.38%	7.29%	7.84%	4.38%	17.50%	10.94%	21.88%	4.69%	17.5%	8.32%
	Total member surveyed	90	80	69	76	64	106	74	69	78	79	85	76	40	76	1062
Characteristics	Mean of household size	4.29	3.81	3.29	3.62	3.05	3.93	3.52	3.29	3.71	3.76	4.05	3.62	1.9	3.62	3.54
	% of female residents	52%	52.5%	47.8%	48.7%	40.6%	50.9%	41.9%	50.7%	52.6%	49.4%	52.9%	57.9%	100%	100.0%	
	% of child residents	47%	36%	42%	46.1%	37.5%	45.3%	39.2%	40.6%	47.4%	41.8%	51.8%	44.7%	0.0%	0.0%	
	% of adult residents	73.3%	61.3%	66.7%	65.8%	75.0%	58.5%	52.7%	62.3%	57.7%	77.2%	56.5%	65.8%	100%	100.0%	
	% of Moslem residents	100%	100%	100%	78.9%	100%	94.3%	97.3%	100%	84.6%	86.1%	98.8%	96.1%	85.0%	98.7%	
	Households with business	38% 8	19% 4	33.3% 7	19% 4	28.5% 6	29.6% 8	9.5% 2	47.6% 10	19% 4	23.8% 5	9.5% 2	9.5% 2	4.8% 1	0.0% 0	21% 63
	Rent Rate (000)	20	20	20	20	59	59	48	235	54	120	51	76	250	160	
	Cheapest rent rate (000)	5	5	5	5	38	38	22	156	30	104	23	34	167	100	
	Density (sqm/person)	6.5	7.8	8.5	6.73	8.73	6.51	7.65	13.66	5.97	7.62	7	9.17	11.88	5.27	8.07
	Length of stay (years)	18.9	19.05	15.05	8.86	5.45	3.67	3.71	2	8.43	6.33	2.76	2	3.43	2.57	7.29

4.6. CONCLUSION

The description in this chapter is expected to answer research question 1: What are the characteristics of the currently applied low cost apartments in Surabaya Indonesia?. The context as well as the characteristics of the households living in the apartments should also complete.

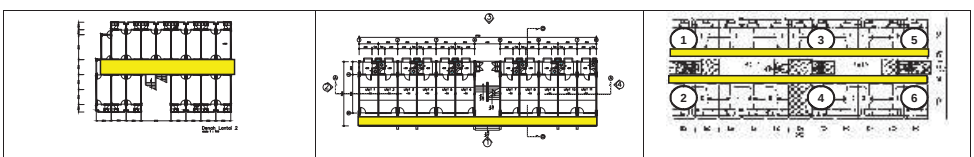
4.6.1. The Context

Contextually this research is conducted in Surabaya, the second largest city of Indonesia that lies in South East Asia. Although its economic growth recently had reached the highest among South East Asian countries, there had been no improvement on community prosperity. The handling of poverty alleviation in Indonesia had been very slow, even failed. Therefore its development in low cost housing was still considered as that of a developing country.

4.6.2. The Current Space Design

The sites of seven low cost apartment locations in Surabaya were designed in building block rows that were arranged efficiently. The other seven locations were designed in blocks arranged oriented centrally to the internal outdoor space on the ground. This space was situated in the middle front of the site, and functioned not only as a parking place, but also as an orientation space from where one could find which building he/she wanted to enter. In this space often stood a multi-purpose building where residents could use or rent to hold a celebration or discussion among residents themselves. On this ground floor always existed other communal facilities such as shops, representative office, guards and garbage pools.

The building blocks that averagely consisted of three to five stories were usually completed by one or two stairs. Most of them had centered entrance hall leading to the corridor. Halls in the blocks that did not provide services in units privately, were enlarged in some places to serve communal space on every floor. The common spaces might include collective pantries, toilets, and praying place. The width of corridor ranged from 1.5 meters the narrowest to 3 meters the widest. There were three types of building blocks regarding the corridor: Building blocks at eight locations were designed in double loaded, three in single loaded, and the rest three locations were in twin blocks. Floor-to-floor height varied from 2.65 meters the lowest to 3.40 meters the highest. Each building floor could include ten to twenty units totally. The main structures were usually of reinforced concrete columns and beams, with brick walls separating between units.



Double loaded Represented by Wonorejo	Single loaded Represented by Urip Sumoharjo	Twin blocks Represented by Penjaringansari-3

Figure 4- 25: The basic space classification of low cost apartment buildings in Surabaya Indonesia

All units of low cost rental apartments in Surabaya were designed in open floor plan except Penjaringan-3 which unit space was designed fixedly. The units which average area was 23.14 m^2 ranged from 18.7m^2 the smallest to 31.4m^2 the largest. Most units consisted of a multi-functional space, pantry or kitchen, bathroom/toilet, and balcony. Although the corridor was a common space, it was often occupied by residents who needed more space area. The units were dominated by multi-functional space as most activities in LCRA took place in this space. One of the findings in this research indicated that 71% households separated their multi-functional space into private and public sub-spaces. In reality this space facilitated the most (12) activities: entertaining, playing, TV-watching, eating, storing-4, praying, studying and ironing in the public sub-zone; and relaxing, sleeping, child-caring, and storing-3, in the private sub-zone. The area of multi-functional space was averagely 17.41m^2, ranging from 15.2m^2 to 23.4m^2.

Kitchen in this research facilitated cooking, dishwashing, and storing-2. The average space area of kitchen in this research was 2.56m^2 which minimum area was 1.5m^2 and maximum 4.05m^2. The bathroom/toilet had average area of 2.36m^2, which minimum area was 2m^2 and maximum 3.5m^2. They were used not only for bathing, but also washing traditionally, and frequently also for storing-1. The balcony which smallest area was 0.6m^2 and the largest 4.5m^2 had an average area of 2.73 m^2. In daily life the balcony was not only used for drying, but also for cooking, dishwashing, and often also for storing-1 and storing-2, even storing-4. Not all units were supported by outdoor balconies therefore some of those whose balconies were indoor, dried their laundries at the corridor. The corridor that was mostly occupied by residents had the maximum area of 12m^2. Its minimum area was 4.5m^2 and averagely was 7.38m^2. It was usually functioned for entertaining, playing, and child-caring in daily activities. Accidentally, it was used for celebrations and religious gathering. In principle, the design of the units was classified into 4 categories as figured below.

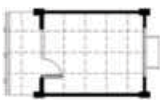
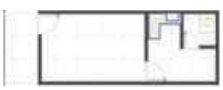
UNIT OF CATEGORY I	UNIT OF CATEGORY II	UNIT OF CATEGORY III	UNIT OF CATEGORY IV
			
Open-plan with separate collective service represented by UNESA	Open-plan with service at balcony represented by Urip-S	Open-plan with service inside, represented by Tanah-Merah	Fixed plan unit represented by Penjar-3

Figure 4- 26: Categories of unit space design

The first category units were designed as an open-plan with collective services provided separately outside the units. In reality, most units of this category added individual toilets and kitchens by self in the balconies in order to be able to cook and bath privately. Users on the ground floor even built these extensions exceeding their balcony border. A bad impact of this was primarily concerned with uncontrolled piping and plumbing both horizontally and vertically. The second category was designed as an open plan with individual kitchens and toilets at the balconies. The third category units were those similar to the second category but the balconies were indoor therefore the kitchens and toilets were inside the units. The fourth category was the only type of units which designed in fixed plan with one fixed room and individual service and balcony. The fixed plan was the most newly developed.

4.6.3. The Households' Characteristics

The respondents who were resided in the low cost rental apartments investigated in this research were low income families which average household size was three point five-four. In composition, the households were dominated by children that reached 39%, while household head were 23% and housewife were 22%. 95% respondents were Moslem therefore a common place for collective praying is important. Female was dominant with ratio between women and men being 56:44. Respondents of fifteen to seventy years of age were dominant by 68%, followed by adolescence 17% with age of five to fifteen years, and babies of zero to five years in the third which was 14% respondents. Units with business were only sixty-three or 21% of respondents. The length of stay ranged from two years the shortest to nineteen years the longest. The rent varied from IDR 20 thousands per month the cheapest to IDR 250 thousands the most expensive.

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PART TWO
Results & Data Analyses

CHAPTER 5
Households' Activities & Standard Requirements for Space Design

PART TWO
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Households' Activities & Standard Requirements for Space Design

5.1. INTRODUCTION

This chapter describes sub-study 4 (the households' activities) and sub-study 5 (the design requirements). The chapter begins with a section of literature study on household activities, followed by the formulation of the list of households' activities applicable for low income households in Surabaya. Then, it continues with presenting the standards and regulations for residential design. This chapter is finalized by a conclusion that answers Research Question 2: "What are the activities of low income households in Surabaya and how are the standard requirements for space designs of low cost apartments in Indonesia?"

5.2. HOUSEHOLDS' ACTIVITIES

This research uses household activities as a construct to determine the space demands for the apartment designs. Activities are taken as a construct as the design of space cannot be determined directly from the households' needs for space, but through their activities and the location and size of space they need to carry-out the activities. This section describes the quest towards a reference list of household activities applicable in this research.

5.2.1. Literature Reviews on Household Activities

The daily activities by which the household space demands are determined are those carried out by particular target users: the low income community in Surabaya. Characteristically, the daily activities of low income households are different from those of higher income families. Moreover, the daily life and habits of Indonesians as Asians, are much distinct from other countries such as the more western countries. There are also more regional characteristics such as the customs or daily life of citizens of Surabaya which are different from that of Madura, or Bali that should be taken into consideration whilst compiling the list of household activities.

The purpose of this research is to determine the space design requirements that match the domestic activities of low income households in Indonesia. Home activities of low income households in Indonesia involve not only domestic, but also income generating activities, which mostly take place in individual low cost housing units. Yet, in low cost apartments, home based enterprises are less common as it is not allowed by the housing corporation i.e. the municipality. Nevertheless, such kind of business practices remained found in low cost apartment units. Most of the times the work place even occupied larger than the unit space and stretched out to the corridor. The Government housing corporation so far never took action as these businesses were considered important to the households' life or income. Families would not be able to live without these businesses.

Supporting this reality, Kellet and Tipple (2000) stated that many studies emphasize a key role of the home as a provider of income security. In this context, they can interpret the economic home based activity as the income source. Such work provides the fundamental sustenance without which the household would perish. The home thereby becomes not merely a container of human life but an essential shelter for those life-sustaining activities. In rural areas, home and workplace are frequently combined and intimately interrelated. In other contexts, the workplace itself, even if separated spatially from the dwelling, may be regarded as having some of the characteristics of home. Rapoport (1995) suggested: "for work oriented people, the workplace may become home". In the following sections, through literature reviews, the quest for an applicable activity list for the purpose of this research is described. Further, it is elaborated and specified for the Indonesian context, Surabaya in particular. First, the generic domestic activities as carried out by any household are described. Then, these activities will be adapted to the low income households in Surabaya Indonesia to make up the final list that is used in this research.

5.2.1.1. Domestic Activities

The lists of home activities in literature vary and largely depend on for whom the home activities are defined, and for which kind of user needs. The categorization of human activities is generally based on the focus of the research. For example activity lists that are prepared for medical research by Parkka et al (2006); Srinivasan et al (2008); and the Alzheimer's & Association (2010).

The domestic activities or Activities of Daily Living (ADL) according to an investment dictionary of a financial company (Investopedis Financial Dictionary) focuses also on health issues. They define domestic activities as routine activities that people tend to do daily without needing assistance. They distinguished six basic ADLs: eating, bathing, dressing, toileting, transferring (walking) and staying. In this case the reference of activities is meant to enable the determination of medication or insurance type that needs to be provided.

For similar reason, the Alzheimer's & Association (2010) developed a classification of activities based on the particular daily routines of persons with dementia:

Chores : Dusting, sweeping, doing laundry
Mealtime : Preparing food, cooking, eating
Personal care : Bathing, shaving, getting dressed
Creative : Painting, playing the piano

Intellectual : Reading a book, doing crossword puzzles
Physical : Taking a walk, playing catch
Social : Having coffee, talking, playing cards
Spiritual : Praying, singing a hymn
Spontaneous : Going out to dinner, visiting friends
Work-related : Making notes, typing, fixing something
In this case the purpose of the categorization is aimed at determining the strategies to activate people with dementia in a more responsive manner.

The amount of space in the home may be restricted by certain activities and conversely certain activities will be restricted by the amount of space. The kinds of potential activities in the home vary, and the number can be large. According to Oseland and Donald (1993) there are fifteen home activities, which they grouped based on the space needs as: (1) household chores, (2) activities that require peace and quietness, and (3) relaxing activities.

1. Household chores include washing clothes, washing hygiene, washing the dishes, cleaning and eating
2. Peace and quiet activities include: sleeping, studying, and reading
3. Relaxing activities include playing games, watching TV, chatting, entertaining and listening to music

Similarly, Monteiro (1997) classified the domestic home activities also based on the needs, yet he split each group into more detailed categories. The extended household chores are added, and the relaxing activities are divided into passive and interactive leisure activities:

1. Household chores (e.g. ironing, cooking, washing clothes);
2. Extended chores (e.g. playing with children, doing special task);
3. Passive leisure (e.g. watching TV, reading, studying, dating);
4. Interactive leisure (chatting, meeting friends)
5. Private or personal needs (e.g. taking a bath, sleeping); and
6. Communal needs (e.g. dining, having lunch).

One also can find a detailed description of household chores in a list from enterprise which offer cleaning services for factories, offices, commercial buildings and houses (www.yellowpages.com.my) such a list may comprise up to 20 activities: (1) clean off the table; (2) clean up the room; (3) dust the furniture; (4) fix up the apartment; (5) hang up the suit; (6) make the bed; (7) mop the floor; (8) pick up the clothes; (9) polish the furniture; (10) put away the books; (11) set the table; (12) sweep up the mess; (13) take out the trash; (14) throw out the garbage; (15) tidy up the closet; (16) turn off the light; (17) vacuum the floor; (18) wash the clothes; (19) wash down the walls; and (20) wash the kids.

Ahrentzen (1989) classified the home activities into five instead of six as Monteiro did:

1. Domestic work: preparation and cooking of food, indoor cleaning, laundry, ironing, repair and upkeep of clothes, gardening, animal care, upkeep of heat and water supplies, etc;
2. Child-care activities: feeding and bathing of children, reading of stories, indoor games, medical care, being affectionate with child, putting to bed, etc;
3. Private needs: personal hygiene, medical care, sleep, etc;

4. Active leisure: hobbies, needlework, artistic creations, playing musical instrument, etc; and
5. Passive leisure: listening to music, or radio, watching TV, reading, conversing, relaxing, etc.

By substituting the extended chores to child care activities, it is assumable that Ahrentzen emphasized the need more to households that have infants.

Different from Oseland and Monteiro, the space within a Japanese house according to Omata (1992) consists of: family, entertaining and private spaces. Family and entertaining space can overlap in many cases, while private spaces are independent. In detail, the Omata activities include:

1. Bathing
2. Cooking: breakfast, lunch, supper, snack
3. Sleeping (father, mother, child, grandparents, other inmates)
4. Family communication: talk and discussion on domestic matters
5. Celebration: dinner parties, religious activities
6. Entertaining (neighbors, housewife's friends, special guests, and visitors): Playing with mates (children), taking a snack with neighbors, having a meal with relatives, entertaining guests with meal, preparing bedroom for relatives and friends.
7. Works (father, mother, grandparents). Study (children)
8. Leisure time
9. Storing matters.

Different from the former lists, the Omata list includes and emphasizes in the detail of entertaining and celebration activities.

Lindsay Asquith (2003) grouped the home activities based on the room function which is spatially more specific as follows: (1) Eating; (2) Sleeping; (3) Playing; (4) Working; (5) Communicating; (6) Entertaining; and (7) Interacting. She proclaims that space is used and claimed through cultural practice and individual choices of the families. Activities, that people do, not only affect the room function, but also the spatial and social relations within the home.

In setting the activities, Duchin (2003) intended to distinguish the way on which households construct their lifestyles. She includes the way on which a household provides its members with: (1) Food; (2) Care for young and old; (3) Health care; (4) Personal care; (5) Education; (6) Clothing; (7) Recreation and entertainment; (8) Vacations; and (9) Household furnishings and maintenance.

Despite that the study was carried out earlier, Tsutomu Terazawa (1992), in his book "Interior Best Selection 5", also grouped activities based on the lifestyle. He stated that residents in today's metropolitan areas have moved from the deep rooted idea of owning their own homes to one of living in rental complexes. By systematizing the life-style or daily activities of urban residents from the concretely focused point of view "Life scenes", he concluded that the trends are based on activities concerning: (1) Food; (2) Bathing and grooming; (3) Fashion; (4) Their relationship to their works; and (5) Their relationship to leisure.

Similar lifestyle based activities were revealed by Asian researchers. In Singapore, Nang, Ngunjiri, Wu, Salim, Tai, Lee and van Dam (2011) classified home activities into (1) Housework; (2) Yard work; and (3) Caretaking for elderly persons or children.

Srinivasan, Stankovic, and Whitehouse (2008) considered that activities in the home are typically very personal and private. The private activities that are listed as the home daily living activities include: (1) Cooking; (2) Showering; (3) Toileting; and (4) Sleeping

The overview of literature shows that there are quite some overlaps in the household activity lists. Differences can be found in the emphasis given to certain activities based on the purpose of the research.

By analyzing and comparing the lists, it can be concluded that the dominant domestic home activities which are mostly included are sleeping, bathing, playing, and relaxing; thereafter, come activities like: cooking, eating and entertaining. At last appear: washing, studying, reading, and TV-watching.

Many authors have attempted to group the activities, which also are based on the purpose of the research. Classifications of household activities related to space functions in the house e.g. by Omata (1992), Monteiro (1997), seem to be most appropriate for this research i.e. grouping the activities into private, semi-private, and public activities.

Table 5. 1: Break down of Activity lists

Oseland and Donald 1993	Monteiro 1997	Ahrentzen 1989	Omata 1992	Asquith, 2003	Duchin 2003	Terazawa 1980	Srinivasan et al 2008
1. Washing	Washing	Washing			Clothing	Fashion	
2.	Ironing	Ironing			Clothing	Fashion	
3.	Cooking	Cooking	Cooking		Cooking	Food	Cooking
4.		Child caring			Child caring		
5. Dishwashing							
6. Washing hygiene	Bathing	Personal hygiene	Washing face		Personal care	Bathing	Showering
7.							Toileting
8. Cleaning		Cleaning			Household maintaining		
9. Eating	Eating		Eating	Eating	Eating	Food	
10. Sleeping	Sleeping	Sleeping	Sleeping	Sleeping	Personal care		Sleeping
11.			Working	Working		Work	
12. Studying	Studying		Studying		Education	Work	
13. Reading	Reading	Reading			Education	Work	
14. Playing	Playing	Playing music	Playing	Playing	Vacation	Leisure	
15. Entertaining	Meeting friends		Entertaining	Entertaining	Entertaining	Leisure	
16. TV watching	TV watching	TV watching			Vacation	Leisure	
17. Relaxing	Chatting	Relaxing	Discussing	Communicating	Vacation	Leisure	

The final list of activities applicable in this research, as well as the categorization of the activities is derived from these studies. Then, adaptation to the local context i.e. the social economic situation was necessary. The list of activities should represent characteristically the activities of the low income households in Surabaya. The adaptation took place through observation during the first field studies. The adapted list of activities was subsequently tested by interviewing local experts, as well as a number of low income households.

5.2.1.2. Business Activities

Many studies of housing concentrate on the dwelling as a place of shelter for the household, as a unit of accommodation, and as a key setting for social reproduction. However, in many parts of the world the dwelling is also a place of production. Some or all of the household members may be involved in income-generating activities, ranging from small-scale, part-time tasks with few specific spatial demands, to manufacturing activities which may dominate the dwelling environment (Kellet and Tipple, 2000). A high percentage of poor people work and generate income within homes. Throughout the cities of Africa, Asia and Latin America, the struggle to increase household income is intimately linked to the process of gaining and improving shelter.
Since the business activities take place at home, and are intended to generate income, it is called “home based enterprise (HBE)”. It is believed that there is a symbiotic relationship between housing and home-based enterprises, as dwellers are able to consolidate their dwellings through the income earned. Many households would not have a dwelling without their home-based enterprise and many enterprises would not exist without the use of a dwelling.

Thus, housing plays an important part in the existence and operation of the informal economy in many countries. Kellet and Tipple (2000) illustrated how the shop owner is probably earning less than he/she could in a formal shop or supermarket, but he/she would be reluctant to give up the shop because it offers income and employment opportunities for the children and others in the family. Many women and children are not available for full-time employment but can divide their time between household chores, education and home-based enterprises.

Alike the domestic activities, the types of HBE also vary. They are classified by authors in different ways, such as that by Pandey (2004), who differentiated the activities based on the nature of the production processes i.e.

1. Production of agricultural products and their subsequent storage (e.g. uncultivated crops, forestry, wood cutting and collection of firewood, hunting & fishing).
2. Production of other primary products (mining salt, cutting peat, the supply of water, etc)
3. The processing of agricultural products (the production of grain by threshing, the production of flour by milling, the cutting of skin and leather product, the preservation of meat and fish product, the preservation of fruit by drying bottle, etc. the production of beer wine or spirits, and the production of baskets or mats, etc.)
4. Other kind of processing (weaving clothes, dress making, and tailoring, the production of footwear, the production of pottery, utensils, and the making of furniture or furnishing, etc.)

Different from Pandey, Tipple (2001) and Tipple & Kellett (2003) classified HBE by considering the nature of each activity as follows: (1) Manufacturing and prefabrication; (2) Retail work; and (3) Services.

By referring to the object of business activity, Mahmud S (2003) distinguished the types of HBE into: (1) Garment shops (embroidery, sewing, etc); (2) Different workshops (tailoring, carpentering, hairdressing, laundry, etc); (3) Household goods (making sweet boxes, weaving baskets, packaging goods, etc); (4) Food (bakery, restaurant, food delivery, etc); (5) Grocery, clothing, fruits and vegetables shops; (6) Sorting old goods and (7) Poultry firm (producing egg, chicken).

In conclusion:

The most basic classification of HBE activities comprises: (1) producing i.e. manufacturing and prefabricating, (2) retailing, and (3) servicing, which were derived from the classification by Tipple (2001) and Kellett (2003). This classification is then adapted to the low income household lifestyle in Asian developing countries by considering the local context, as well as by adding and omitting what is necessary and unnecessary, to be applicable to this research. The final list of activities in the table below combines the home activities and HBE activities applicable to this research. The correctness of the list had been consulted to the experts both from the academic and social sides in Indonesia. This list characteristically reflects the daily life of low income families of Surabaya. The list is then used as the key reference in the formulation of the questionnaires that are most essential for collecting the data during field survey.

5.2.2. The List of Low Income Households' Activities in Surabaya

Table 5. 2: Activity list of low income households in Surabaya

CATEGORY	ACTIVITY		DEFINITION
Household chores	A	Washing	Washing dirty or after use clothes, sheets; washing machine is possibly used
	B	Drying	Drying wet laundry after being washed naturally; drying machine also possible
	C	Ironing	Ironing the dried and clean laundry
	D	**Storing-1**	Storing of washing, drying, ironing and house cleaning equipments, liquids, etc.
	E	Cleaning	Cleaning the house: sweeping, wiping the floor and furniture
	F	Cooking	Preparing and making food for all meal time: breakfast, lunch, and dinner
	G	Dining	Eating at meal times: breakfast, lunch, dinner, normally done together
	H	Dishwashing	Washing dirty dishes after being used for eating, kitchen wares and equipments
	I	**Storing-2**	Storing of cooked food, kitchen wares, utensils, and raw food materials
Private and peace	J	Bathing	Washing hygiene the body
	K	Sleeping	Taking rest by lying on the bed or mattress for health and refit the bodies
	L	Praying	Doing religious obligation each member personally
	M	Studying	Studying, doing office works, reading, computer working; concentration is needed
	N	Child caring	Breast feeding, feeding, baby-bathing, story reading, safeness is highly required
	O	**Storing-3**	Storing of clothes, sheets, towels, blankets etc, money, documents etc.
Communal / leisure	P	TV Watching	Watching television for refreshing or gaining information
	Q	Relaxing	Chatting, relaxing, refreshing , messaging
	R	Playing	Children playing, computer play station is possible
	S	Entertaining	Entertaining guests, serving drinks, cookies,
	T	**Storing-4**	Storing of books, school equipments, toys, electronics, and all other items
	U	Celebrating	Celebrating success, child birth, circumcision, marriage, cure from disease, etc
	V	Organization participating	Attending social or local organization activities: Women meeting
	W	Religious gathering	Attending religious activities: Routine Qur'an reading,
Income generating	X1	Storing raw materials	Storing the raw materials / ingredients required for producing
	X2	Storing products	Storing the products (goods / things produced) or keeping retail merchandise
	Y	Storing equipments	Storing after use equipment of income generating activity
	Z	Business working	Producing products, retailing merchandise and keeping small shop, or servicing

During the field studies it appeared that some activities quite seldom took place. The most rarely occurred activity was child caring. Only 107 of 300 families had children below five years of age which explains the low score for child caring. The population of residents below five years of age was only 14%. Similarly, playing took place rather seldom. 109 respondents indicated no family members who played in and around the apartment. The other activities that were not carried out daily by the households but only incidentally were organization participating, religious gathering, and celebrating.

Although the occurrence was insignificant, these activities which generally took place along the corridor or in the common space should be well considered and listed in the activity list.

Figure 5- 1: activities that rarely occurred

The list of household activities is basically classified into four categories:

1) Household chores which include activities taking place in the service area and which are considered as semi private activities: washing, drying, ironing, storing-1 (storing of cleaning and washing liquids and equipments), cleaning, cooking, eating, dish-washing, and storing-2 (storing of raw materials and cooked food as well as kitchen utensils);
2) Private and peace activities which are considered as the most private activities: bathing, sleeping, praying, studying, and child-caring.
3) Communal and leisure activities which can be considered more public and not necessarily in peace: storing-3 (storing clothes, sheets, blankets, towels etc); TV watching, relaxing, playing, entertaining and storing-4 (storing school/working stuff and other than the previous mentioned).
4) Income-generating activities which are business activities within the unit: storing materials, storing products, storing equipments, and the work itself.

5.3. STANDARDS AND REGULATIONS FOR RESIDENTIAL SPACE DESIGN

5.3.1. Design Standards for Residential Spaces

Information about basic spatial requirements and standards needed for detailed design and planning of any building project are provided worldwide in various publications. Two of them are applicable to (this research) and used in this research.

A.J. Metric Handbook (Fairweather and Sliwa, 1973)

The standard (by Fairwheather Leslie and Sliwa Jan A, 1973) was renewed as Metric Handbook Planning and Design Data by Adler David (1999) the second edition, Architectural Press. This literature has data in metric in a more detailed and clear sizes. The standard data is particularly useful for determining the size of the furniture that is needed by particular activities.

Neufert Architects' Data (Neufert Ernst, 1980).
Published by Granada Publishing Limited – John Wiley & Son, this architects' data provides basic data references regarding spatial requirements as well as space types and detail design including details for furniture and equipments such as for housing.

5.3.2. Standards and Regulations for Spaces in Residential Buildings

Standard space sizes for social housing have been developed in some countries. In the following, several standard and regulations which are used by some countries in Australia, America, and Asia will be presented.

5.3.2.1. ACT Planning & Land Authority Australia (2005)

The standards from the ACT Planning & Land Authority (2005) pointed out that the minimum area for a studio apartment unit is 40 m^2. This could be a good reference as the units in this research have the same arrangement with the space of studio apartments as described in chapter 2 (2.2.1.4). The units in this research are only equipped with an (open plan) multi-functional space, kitchen, bathroom, and balcony.

Table 5.3: ACT international standard concerning floor areas of apartments including studio apartments

Unless otherwise specified in a Neighborhood Plan, Master Plan or other approved area strategy, all apartments have floor areas greater than the following minimum standards:
• Studio apartments 40 sqm
• 1 bedroom apartments 50 sqm
• 2 bedroom apartments 70 sqm
• 3+ bedroom apartments 95 sqm

5.3.2.2. Recommendation for Dwelling Spaces Australia (2010)

Following is standard for minimum storage of residential buildings suggested by Parker Morris.

Table 5.4: Parker Morris (2010), standard for minimum rates of storage

Storage facilities for residential buildings shall be provided at the following minimum rates:
Studio &1 bedroom apartments 4 m^2 at a minimum 2 m high
2 bedroom & 3+bedroom apartments 5 m^2 at a minimum 2 m high
(http://apps.actpla.act.gov.au/tplan/planning_register/register_docs/apartments.pdf)

5.3.2.3. UFC Model Building by laws USA (2011)

Having all area required, it is important then to consider the dimension that may vary according to the similar area. To secure the determination of the dimensions, the list of minimum size and width of different residential components in the table below can be useful to this research.

Table 5. 5: Minimum size and width of different components of residential premises

	Residential component	Minimum requirement for plots <50 m^2			Minimum requirement plots >50 m^2		
		Area	Width	Height	Area	Width	Height
1	Habitable room	7.50 m^2	2.10 m	2.75 m	9.50 m^2	2.40 m	2.75 m
2	Kitchen	3.30	1.50	2.75	4.50	1.50	2.75
3	Pantry	Not appl.	Not appl.	Not appl.	3.00	1.40	2.75
4	Bathroom	1.20	1.00	2.20	1.80	1.20	2.20
5	WC	1.00	0.90	2.20	1.10	0.90	2.20
6	Bath & WC	1.80	1.00	2.20	2.80	1.20	2.20
7	Store	No restrict	No restrict	2.20	No restrict	No restrict	2.20

Source: Model Building by Laws: General Building Requirements (UFC, 2011)

5.3.2.4. Alberta Heath and Wellness Canada (1999)

The owner of housing premises shall not permit it to become or remain over-crowded. Housing premises shall be deemed to be overcrowded if:

(a) A bedroom in it has less than $3m^2$ of total floor area for each adult sleeping in the bedroom.
(b) A habitable room in it that is not a bedroom but is used for sleeping purposes in combination with any other use has less than $9.5m^2$ of floor space for each adult sleeping in the habitable room.

In addition to the standards and regulations that have been described above, several studies on the standard space sizes carried out by some researchers from various countries will be delivered in the following.

5.3.2.5. Building Centre of Japan (2011)

In comparison, the Building Centre of Japan defined the following standards.

Table 5. 6: Standards of Floor Area (m^2) and Living Density (m^2 per person) of housing units

Size of households (persons)	Floor area of housing unit (m^2)	Implied density of housing unit (m^2 per person)
1	18	18
1 elderly	25	25
2	29	14.5
3	39	13
4	50	12.5
5	56	11.2
6	66	11

Source: The Building Center of Japan, a Quick Look at Housing in Japan (2001)

5.3.2.6. Housing Typologies in Mumbai India by CRIT (2008)

Table 5. 7: Sizes of low cost housing types in Mumbai (Shefty P et al, 2008)

	LCA	Units with private service				Units with no private service				Unit Height
		Size	Density	Tenement	BC	Size	Density	Tenement	BC	
1	Koli Wadi	29	760/2808	152	1815/2808					3.20
2	Lokhandwala bld					15	50/62	10	62/62	2.80
3	H.kasam Chawl					13	2500/3931	500	2121/3931	3.50
4	Pradhan bld	45	75/426	15	357/426					
5	BDD Chawls					15	300/	60	480/	2.80
6	Sahakar Nagar	50	60/533	12	223/533					
7	Ashtavinayak	40	160/	32	385/					
8	Sahyadri (2)	40	160/	32	460/					
9	Nav Monica Apt	63	160/	32	440/					
10	BPT housing	49	80/	16	238/					
11	RBI housing 1	56	80/	16	261/	18	60/	12	138/	3.60
12	Taptsya Gorai	24	350/2688	70	1422/2688					
13	Anik 1 R&R	24	320/	64	230/					3.50
14	Shravasti A&B	52	350/	70	608/					
15	Shuba Galaxi					14	200/316	40	274/316	2.40
Average size		**42.9**				**15**				**3.11**

Having learned the housing typologies that are sourced by CRIT, it is seen that units with sizes smaller than $20m^2$ were designed with no private service as the services are provided outside the units collectively. The sizes of units with private service ranged from $24m^2$ to $63m^2$. Most units are sized larger than $40m^2$. Averagely the unit size is $42.9m^2$. The unit heights ranged from 2.40m to 3.60m. Most units are higher than 3m. Averagely their height is 3.11 m.

5.3.2.7. PPR Low Cost Flats developed by JPN Malaysia (2006)

This study was formulized by (Goh Ai Tee and Ahmad Yahya, 2006). It examined the design quality of PPR low cost high rise flats developed by JPN in Kuala Lumpur since the 1998. PPR is one of the Malaysian government projects to provide adequate, affordable and quality housing for the lower income families to alleviate poverty. Having learned the study by Goh and Ahmad (2006), from the table below, it is assumed that the unit area of low cost flats for the lower income households in Malaysia more recently is 650 square feet or 650x0.09=58.5 square meters. Yet, this unit area is provided for families with five members. To be comparable to units that house four people, the area is multiplied by four fifth i.e. 46.8m^2**.**

Table 5. 8: Comparison of area for 3 bedroom type flats in Kuala Lumpur Malaysia (1977 and 2000)

Function of Room	Jalan Shaw 17-storey, 1977 Floor Space (square feet)	PPR 18-storey, 2000 Floor Space (square feet)
Living Room Area	147	260
Bedroom Area	351	258
Kitchen & Bath Area	74	100
Yard	0	31
Total Area of Flat	572	650
Average Number of Persons Designated for	12	5
Area per person (sq.ft)	47.7	130

(Source: Leong, 1979: 95; JPN, 2000)

5.3.2.8. Housing Resettlement in Srilanka (2010)

Space requirements that were referred from "Design and Delivery of Post-Disaster Housing Resettlement Programs" by Judith Shaw and Iftekhar Ahmed (Monash University RMIT) are listed below. The case studies were House and Settlement design from Srilanka and India.

Table 5. 9: Mandatory elements of Urban Development Authority (UDA) housing guidelines

House size	**46.5** m^2 (min)
Plot size	506 m^2 in areas without piped water supply and sewerage 152 m2 in areas with piped water supply and sewerage
Min room requirement	Two bedroom, living room, internal kitchen, internal bathroom with latrine
Min room size	Bedroom 8m^2; Kitchen 5m^2; Store 2.5m^2; Lavatory 1.36m^2 (for pedestal WC); 1.04m^2 for latrine 1.62m^2
Min room heights	Living, bedroom and kitchen 2.8m; bathroom, lavatory, porch, balcony, terrace and garage 2.2m

FINDINGS: From the residential design standards discussed above can be concluded that the area for the whole units with four household members will be ranged from forty to fifty square meters (table 5.10).

Table 5. 10: Comparison among the standards and requirements to indicate the range of whole unit area

		ACT	JAPAN	UFC	INDIA	MALAYSIA	SRILANKA	Parker Morris
1	Whole unit	40m^2	50m^2		42.9m^2	46.8m^2	46.5m^2	
2	Kitchen			4.5m^2			5m^2	
3	Bathroom			2.8m^2			1.62m^2	
4	Storage							4-5m^2

5.4. INDONESIAN SPACE DESIGN STANDARD FOR ACTIVITIES

In Indonesia, standards for determining the size of space required to carry out activities in and around the house properly are limited. The most recommended requirements are the Standard Decree of Public Works Ministry released in 1989 (Kepmen PU No. 306/KPTS/1989). The minimum spaces for home living that specified by the Indonesian design standard are based on the size of the human body and human activities for households with four to five persons.

Standards for nine functional spaces are applicable to be referred. They are standards for: (1) washing room; (2) ironing room; (3) storage; (4) kitchen; (5) dining-room; (6) bathroom; (7) bedroom; (8) living room; and (9) sitting room. Activities which cannot refer to this standard have to refer to other sources such as Metric Handbook.

Before moving to the standard per activity, there are some standards that need to be addressed first. From the existing national standards, standards for storage, kitchen and bedroom have the possibility to be used for more than one activity.

- Standard for storage has 2 cubicles on its both ends plus an off space at its centre. This area allows the standard storage to accommodate two storing activities in this research, both of which are storing equipments namely storing-1 and storing-4. The former keeps materials and equipment for washing and cleaning such as broom, mop, duster, liquids, soap etc. While the latter deals with the storage of work and school supplies, electronics, and stuffs that are not yet accommodated in storing 1, 2, and 3. Since storing-1 only requires small space, one cubicle is considered enough for it, while the other one cubicle and the center space is reserved for storing-4. Therefore standard for storage is reserved for storing-1 and storing-4.

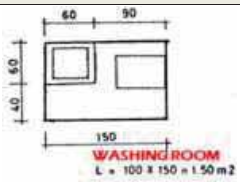
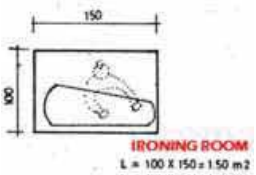
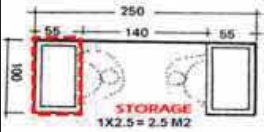
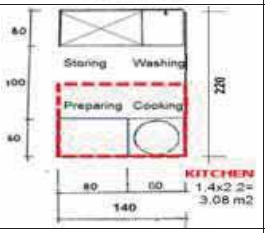
- The standard for kitchen is written to be divided into four sections namely space for: preparing, cooking, washing, and storing. The two initial divisions are suitable for cooking activity, while the latter two are appropriate for washing dishes. Therefore the standard for kitchen is half part reserved for cooking and the other half part is for dish-washing activity.

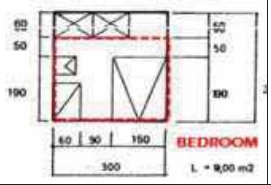
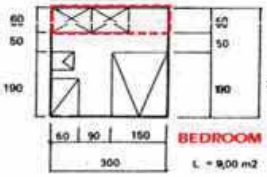
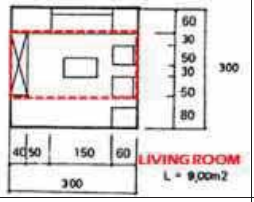
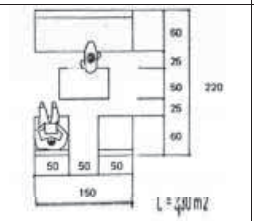
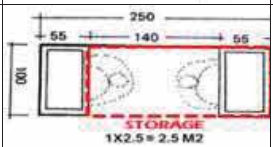
- In the standard for bedroom, there is a section which is dedicated for closet space that will be suitable to be used as a space for storing clothes or storing-3 in this research. Therefore standard for bedroom is reserved for sleeping and storing-3.

- Standard for watching TV is referred from the standard for living room, but in this case only the space for watching TV is taken.

With the above explanation, it is assumed that from nine referred standards, three of which can be used for two activities. So, twelve standards for activities can be obtained based on the available Indonesian (national) design standards that will be described in the following table.

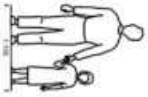
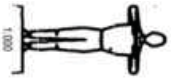
Table 5. 11: Standard space for activities based on the Indonesian standards

	ACTIVITY		SOURCE	ILLUSTRATION	INFORMATION	DIMENSION and SIZE
1	**WASHING**	**A**	National standard for washing room			1x1.5= 1.5 m2
	DRYING	**B**		**NOT INCLUDED**		
2	**IRONING**	**C**	National standard for ironing room			1x1.5= 1.5 m2
3	**STORING-1**	**D**	National standard for storage		One cubicle of the national standard for storage	0.55x1= 0.55 m^2
4	**COOKING**	**F**	National standard for kitchen		Half the national standard for kitchen	1.4x1.1 = 1.54 m2 (minimum) 2x1.1= 2.2 m2 (optimum)
5	**EATING / DINING**	**G**	National standard for dining room			1.8x1.2= 2.16 m2
6	**DISH-WASHING**	**H**	National standard for kitchen		Half the national standard for kitchen	1.4x1.1= 1.54 m2
	STORING-2	**I**		**NOT INCLUDED**		
7	**BATHING and TOILETTING**	**J**	National standard for bathroom and toilet			1.2x1.6= 1.92 m2

	ACTIVITY		SOURCE	ILLUSTRATION	INFORMATION	DIMENSION and SIZE
8	**SLEEPING**	**K**	National standard for bedroom 9m2		National standard for bedroom minus the storing for clothes	3x2.4= 7.2 m2
	PRAYING	**L**		**NOT INCLUDED**		
	STUDYING	**M**		**NOT INCLUDED**		
	CHILD-CARE	**N**		**NOT INCLUDED**		
9	**STORING-3**	**O**	National standard for bedroom		The storing space in the national standard for bedroom	3x0.6= 1.8 m2
10	**WATCHING TV**	**P**	National standard for living room		Only the space for watching TV of national standard for livingroom	3x1.6= 4.8 m2
	RELAXING	**Q**		**NOT INCLUDED**		
	PLAYING	**R**		**NOT INCLUDED**		
11	**ENTERTAINING**	**S**	National standard for sitting room			1.5x2.2= 3.3 m2
12	**STORING-4**	**T**	National standard for storage		One booth plus the center space of the national standard for storage	1.95x1= 1.95 m2

There are seven activities for which standards cannot be found in the Indonesian standards. It is proposed to add these activities by referring to international literature: Metric Handbook and Neufert, as well as using anthropometric studies. These activities include: drying, storing-2, praying, studying, child-caring, TV-watching, and relaxing. The floor areas of space based on international standards and the use of anthropometric analyses are revealed in the following.

Table 5. 12: The standards that are referred from international literature and based on anthropometric studies

ACTIVITY			SOURCE	ILLUSTRATION	INFORMATION	DIMENSION and SIZE
13	**DRYING**	**B**	Determined based on arrangement of needed furniture: the drying equipment (two clothesline size)		to anticipate accumulation of drying items in the raining season, availability of two clothesline is suggested	1.2x1.5= 1.8 m2
14	**STORING-2**	**I**	Neufert Architects' Data (1999) for refrigerator plus food storing table or rack or cupboard (p.59)		To keep the food fresh and not stale, as well as to serve the newly cooked dishes Households require refrigerator and serving table or rack, or cupboard	1.6x0.75= 1.2 m2
15	**PRAYING**	**L**	Determined based on arrangement of needed furniture: the average praying mat size			1x1.5 1.5 m2
16	**STUDYING**	**M**	AJ Metric Handbook (Section 12, Office page 69)			1.8x1.5= 2.7 m2
17	**CHILD-CARING**	**N**	Determined based on anthropometric size of a mother and her baby in lying position (Metric Handbook Planning & Design Data 1999)		Child-caring prioritize breast feeding the baby 	1.8x1.5= 2.7 m2
18	**RELAXING**	**Q**	Determined based on the dimension of spacious lying position (Metric Handbook Planning & Design Data 1999)			2x1.2= 2.4 m2
19	**PLAYING**	**R**	Determined based on anthropometric of 2 playing child sizes (Metric Handbook Planning & Design Data, 1999)			$2x(1.2)^2$ 2.88 m2

Household's Requirements for Space Based on Indonesian Standards

In the following table, the household's requirements of space based on standards for activities which have been revealed above are presented on the table below.

Table 5. 13: The Indonesian standard for carrying out each activity

ACTIVITY			DIMENSION	SIZE	SOURCE
1	WASHING	A	1x1.5	1.5	Indonesian standards—Ministry of Public Works No. 306/1989
2	DRYING	B	1.2x1.5	1.8	Arrangement of needed furniture
3	IRONING	C	1x1.5	1.5	Indonesian standards—Ministry of Public Works No. 306/1989
4	STORING-1	D	0.55x1	0.55	Indonesian standards—Ministry of Public Works No. 306/1989
5	COOKING	F	1.4x1.1	1.54	Indonesian standards—Ministry of Public Works No. 306/1989
6	EATING / DINING	G	**1.8x1.2**	2.16	Indonesian standards—Ministry of Public Works No. 306/1989
7	DISH-WASHING	H	1.4x1.1	1.54	Indonesian standards—Ministry of Public Works No. 306/1989
8	STORING-2	I	0.75x1.6	1.2	Neufert
9	BATHING	J	1.2x1.6	1.92	Indonesian standards—Ministry of Public Works No. 306/1989
10	SLEEPING	K	3x2.4	7.2	Indonesian standards—Ministry of Public Works No. 306/1989
11	PRAYING	L	1x1.5	1.5	Arrangement of needed furniture
12	STUDYING	M	1.8x1.5	2.7	A.J. Metric
13	CHILD-CARING	N	1.8x1.5	2.7	Anthropometric study
14	STORING-3	O	3x0.6	1.8	Indonesian standards—Ministry of Public Works No. 306/1989
15	TV-WATCHING	P	3x1.6	4.8	Indonesian standards—Ministry of Public Works No. 306/1989
16	RELAXING	Q	2x1.2	2.4	Anthropometric study
17	PLAYING	R	2.4x1.2	2.88	Anthropometric study
18	ENTERTAINING	S	2x1.2	2.4	Indonesian standards—Ministry of Public Works No. 306/1989
19	STORING-4	T	1.95x1	1.95	Indonesian standards—Ministry of Public Works No. 306/1989
				44.94	

The total space used for activities based on the Indonesian standards of minimum space requirements is 44.94m^2, while the actual average provided space in the fourteen LCRAs in this research is 23.14m^2.

5.5. CONCLUSION

- The list of households' activities in this research is specifically for low income families in Surabaya. It consists of twenty-seven activities, four of which are business activities. three activities: celebrating, religious gathering, and organization participating occur incidentally, and cleaning does not have specific space requirement. Total of activities that occur daily is thus nineteen (available at table 5.2).

- Data of design standards in this chapter are adapted from the Indonesian ministerial decree of Public Works 1989. The national standards should be obeyed as they are formalized standards. 9 functional areas are applicable to be referred by this research.

- The list of household activities together with the general design standards, gives household activity based design requirements in terms of space for each activity. From nineteen activities, twelve of which can be referred from the national standard. This condition offers possibility to recommend to the government to include extra design regulations for seven activities that are not included at present: drying, storing-2 (food), praying, studying, child-caring, relaxing, and playing. The sum is theoretically larger than that standardized by Public Works Ministry in 1989 (the original is 29.76m^2 and the adapted is 44.94m^2).

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PART TWO
Results & Data Analyses

CHAPTER 6
The Use of Space

PART TWO
Results & Data Analyses

CHAPTER 6
The Use of Space

6.1. INTRODUCTION

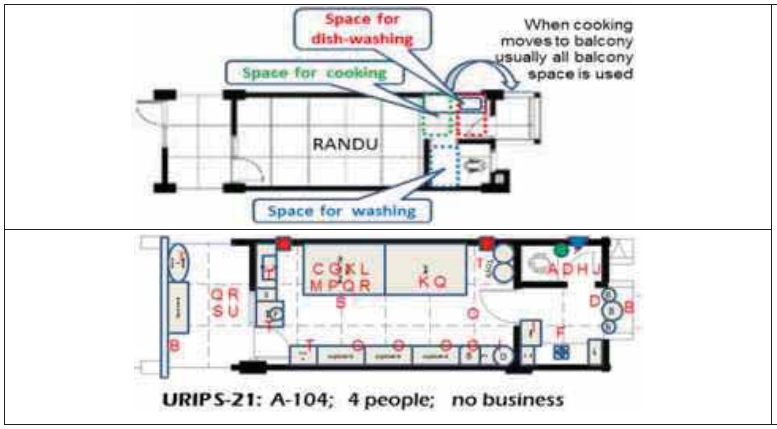
This chapter describes sub-study 5: the use of space. The chapter begins with a section of the space used for activities followed by the use of space of unit parts. Then a section deals with findings in the use of multi-functional space continues. Afterwards, the space used for income generation and for storing-1 up to storing-4, as well as the use of communal spaces are presented. The remaining section finalizes this chapter by conclusion that answers Research Question 3: “How is the use of space of low income households of low cost apartments in Surabaya, Indonesia?”

6.2. THE ACTUAL SPACE USED BY HOUSEHOLDS FOR ACTIVITIES

This section describes the other one of the households’ requirements: the space that actually used by households to carry out their activities. Based on its location, the use of space of each activity can be found. The households’ spatial needs were determined based on the factual space used by households in conducting each activity as revealed in the following.

6.2.1. Methods in Determining the Use of Space

Before revealing the use of space of each activity, the method that applied for determining the space use is going to be presented. The use of space in this research is determined based on the actual space used, considering the movement of the actor as well as the furniture and means involved in conducting the activity. The space available at the location where the activity conducted is considered very influential and determining for the space that is actually used for this activity. The use of space is determined / chosen from the greater size between average yield and the median. The following figure is expected to provide an explanation regarding how the use of space of each activity in this research was determined (also available in appendix 3).



A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1.4x1.5	2.1
D	store-1	0.5x1	0.5
F	cook	1.5x1.5	2.3
G	eat	2x1.4	2.8
H	d-wash	1x1	1
I	store-2	0.5x2	1
J	bath	1x2	2
K	sleep	2(2x1.4)	5.6
L	pray	1x2	2
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	2x2	4
Q	relax	2x1.4	2.8
R	play	1x3	3
S	enter	2x1.4	2.8
T	store-4	0.5x4.5	2.3

Figure 6- 1: Determining the actual space used for doing activities

6.2.2. Use of Space of Each Activity

A. WASHING

Not all households in this research did washing. Table 6.1 shows that among 288 households who did washing, 174 washed their laundry in the toilet. 71 did this activity in the common space. These must be households living in the units with collective service. The remaining 38 households washed their laundry in the balcony. These were done by households living in the units with collective service who created a washing place in their balcony. Averagely the use of space for washing is 1.23m^2.

Table 6. 1: Use of space for washing

DOMINANT FURNITURE & MEANS USED BY 288 HOUSEHOLDS DID WASHING ACTIVITY

Units using bucket	278	96%
Units using water	280	97%
Units using sewer	281	97%
Using washing machine	25	9%

	LCRA	A. WASHING
1	SOMBO	**1.35**
2	SIMO	
3	DUPAK	1.41
4	PENJAR-1	**1.15**
5	PENJAR-2	**1.37**
6	WONO R	**1.36**
7	RANDU	**1.17**
8	GN-SARI	**1.01**
9	WARU G	**1.49**
10	URIP-S	**1.04**
11	T-MERAH	**1.2**
12	PENJAR-3	**1.2**
13	ITS	**1**
14	UNESA	
	AVERAGE	**1.23**

Dominantly washing was carried out in the bathroom/toilet. No units of LCRA in this research had their own washing room. Each unit was only equipped with a bathroom/toilet. The space for washing is highly dependent on the availability of space in the bathroom. In reality they needed more space as most households washed in a traditional way. Only 9% or 25 households in this research applied washing machine. Table 6.1 says that 96% households used buckets for traditional washing. Usually households need at least 2 buckets, one for washing, and one for rinsing.

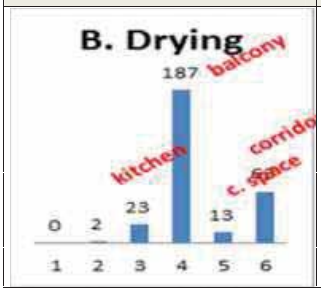
Washing at the toilet	Washing at the communal space	Washing at the balcony	Washing at the kitchen

Figure 6- 2: Illustration of where washing activity occurred

B. DRYING

Not all households in this research did drying. Table 6.2 indicates that among 288 households who did drying, 187 dried their laundry in the balcony. 63 did this activity in the corridor, 23 in the kitchen, and the remaining 13 dried in the common-space. Drying was also done in a traditional way by relying on the sun heat. The average use of space for drying is 1.34m^2.

Table 6. 2: Use of space for drying



DOMINANT FURNITURE & MEANS USED BY 290 HOUSEHOLDS WHO DID DRYING ACTIVITY

Units using bucket	257	89%
Units using hanger	254	88%
Units using basket	52	18%

	LCRA	B DRY
1	SOMBO	1.27
2	SIMO	1.26
3	DUPAK	1.53
4	PENJAR-1	1.03
5	PENJAR-2	1.2
6	WONO R	1.2
7	RANDU	1.47
8	GN-SARI	1.59
9	WARU G	1.80
10	URIP-S	1.25
11	T-MERAH	1.8
12	PENJAR-3	1.80
13	ITS	0.8
14	UNESA	0.8
AVERAGE		**1.34**

Drying at the balcony	At the corridor	Drying at the kitchen	Drying at the communal space

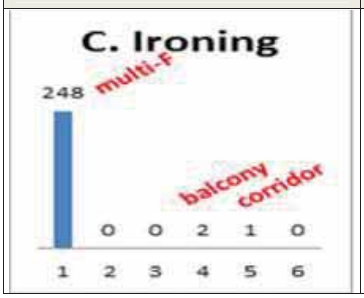
Figure 6- 3: Illustration of where drying activity occurred

Dominantly drying took place in the balcony. The most equipment needed for drying was the tool for hanging the laundry that can simply be substituted by strings. Problem arises in the rainy season, as the clothesline would accumulate. Table 6.2 shows that 88% or 254 households used hangers. Therefore although all illustrations show only one, at least two clotheslines must be available in the balcony.

C. IRONING

Not all households in this research did ironing in their units. Table 6.3 shows that among 251 households who did ironing, 248 ironed their laundry in the multi-functional space. Two did this activity in the balcony, and the remaining one ironed in the corridor. Mostly, ironing was carried out just using a mattress on the floor instead of ironing table. Averagely, the use of space for ironing is 2.15m^2.

Table 6. 3: Use of space for ironing



DOMINANT MEANS FOR IRONING USED BY 251 HOUSEHOLDS WHO DID IRONING ACTIVITY		
Units using table	15	5%
Units using mattress	238	95%
Units using iron	245	90%
Units using basket	40	16%
Units using electricity	230	92%

	LCRA	C IRONING
1	SOMBO	**2.45**
2	SIMO	**2.31**
3	DUPAK	**2.04**
4	PENJAR-1	**2.19**
5	PENJAR-2	**1.81**
6	WONO R	**2.19**
7	RANDU	**1.87**
8	GN-SARI	**2**
9	WARU G	**2.12**
10	URIP-S	**1.95**
11	T-MERAH	**1.95**
12	PENJAR-3	**2.23**
13	ITS	**2.92**
14	UNESA	**2.12**
AVERAGE		**2.15**

None of LCRA had ironing room. Ironing is actually considered as activity which is conducted in the service area, together with washing and drying activities. However, in this research, ironing took place in the multi-functional space. Since the duration of this activity was less than an hour, it could be done alternately with the other less time consuming activities in the same space. There were no special furniture required for ironing except a mattress. Table 6.3 tells that although 5% or 15 households applied ironing table, most households just ironed on a mattress.

Ironing at the multi-functional space

Ironing at the balcony

Ironing at the corridor

Figure 6- 4: Illustration of ironing at several locations

D. STORING-1

Not all households in this research did sroring-1 in their units. Table 6.4 indicates that among 296 households who did storing-1, 87 stored their cleaning and washing equipments in the balcony. 85 stored their storing-1 items in the multi-functional space, 62 in the bathroom/toilet, 42 in the kitchen, 12 in the corridor, and the remaining 8 stored them in the common space. The average use of space for storing-1 is 0.56m^2.

Table 6. 4: use of space for storing-1

		LCRA		D STORING-1
		1	SOMBO	0.54
		2	SIMO	0.52
		3	DUPAK	0.51
		4	PENJAR-1	0.83
		5	PENJAR-2	0.54
		6	WONO R	0.58
		7	RANDU	0.74
		8	GN-SARI	0.49
		9	WARU G	0.48
		10	URIP-S	0.54
		11	T-MERAH	0.5
		12	PENJAR-3	0.39
		13	ITS	0.66
		14	UNESA	0.57
		AVERAGE		0.56

Storing-1 keeps cleaning and washing kits. Although storing-1 mostly took place in the balcony, it could not be denied that people often put a broom or duster haphazardly at any place after they finished cleaning. This activity only needed a small storing space.


Storing-1 at balcony


Storing-1 at multi-f space


Storing-1 at bathroom


Storing-1 at kitchen

Figure 6- 5: Illustration of storing -1 at several locations

E. CLEANING is not evaluated as it does not take any specific space area.

F. COOKING

Not all households in this research did cooking. Table 6.5 indicates that among 287 households who did cooking in their unit, 110 cooked in the kitchen. 93 did this activity in the balcony as they created a cooking space in their balcony. 50 cooked in the multi-functional space. The remaining 33 cooked in the common space as they lived in units with collective pantry. Although these households cooked in a traditional way, most of them used rice cookers, and refrigerators. The median use of space for cooking is 1.78m^2.

Table 6. 5: Use of space for cooking

		LCRA		F COOKING
		1	SOMBO	1.88
		2	SIMO	1.99
		3	DUPAK	1.62
		4	PENJAR-1	1.46
		5	PENJAR-2	2.24
		6	WONO R	2.40
		7	RANDU	1.69
		8	GN-SARI	1.31
		9	WARU G	1.2
		10	URIP-S	1.94
		11	T-MERAH	1.9
		12	PENJAR-3	1.92
		13	ITS	1.05
		14	UNESA	0.78
		MEDIAN		1.78

Cooking mostly occured in the kitchen. However, those who lived in units with kitchen provided collectively mostly cooked in the communal pantry, balcony or corridor. Most households cooked the food traditionally. When the meal time came the rice cooker as well as the side dishes and plates were brought to the multi-functional space to dine together. The most important equipment that should be available in the kitchen was a simple sink and a stove which typically applied an LPG (liquid petroleum) gas tank.

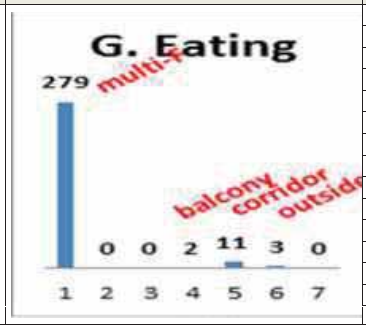
Cooking at the kitchen	at the balcony	at the multi-f space	Cooking at the communal space

Figure 6- 6: Illustration of cooking at several locations

G. EATING

Not all households in this research did dining in their units. Table 6.6 shows that among 295 households who did dining, 279 dined in the multi-functional space. 11 did this activity in the corridor, 2 in the balcony, and the remaining 3 dined outside. Unlike dining in general, households in this research did not have their meals on a dining table. They just ate on a mattress or on a bed. The average use of space for eating / dining is 2.50m^2.

Table 6. 6: use of space for eating / dining

		LCRA		G EATING
		1	SOMBO	2.91
		2	SIMO	2.70
		3	DUPAK	2.55
		4	PENJAR-1	2.72
		5	PENJAR-2	1.85
		6	WONO R	2.32
		7	RANDU	2.2
		8	GN-SARI	2.72
		9	WARU G	2.17
		10	URIP-S	2.34
		11	T-MERAH	2.28
		12	PENJAR-3	2.36
		13	ITS	3.00
		14	UNESA	2.96
		AVERAGE		2.50

None of apartments in this research had a private dining room. The households always ate in the multi-functional space although there were some households that occasionally took their meal to the corridor. When the food was available readily, anyone who felt hungry could just get the food in the kitchen and eat at any place. When they wanted to eat together, they would bring along the plates and the food to the multi-functional space and dine together on a mattress or on a bed there. Figure 6-7 illustrates how these households did dining.


Eating at the public sub-space


Eating at the private sub-space


Eating at the corridor

Figure 6- 7: Illustration of eating / dining at several locations

H. DISHWASHING

Almost all households in this research did dishwashing in their units. Table 6.7 tells that among 299 households who did dishwashing, 109 dishwashed in the kitchen. 77 did this activity in the balcony, 68 in the common space, 43 did in the bathroom, and the remaining 2 dishwashed in the corridor. The median use of space for dishwashing is 1.20m^2.

Table 6. 7: use of space for dishwashing

	LCRA	H. DISH-WASHING
1	SOMBO	1.50
2	SIMO	
3	DUPAK	1.33
4	PENJAR-1	0.94
5	PENJAR-2	1.07
6	WONO R	1.1
7	RANDU	1.2
8	GN-SARI	1.29
9	WARU G	1
10	URIP-S	1.1
11	T-MERAH	1.19
12	PENJAR-3	1.2
13	ITS	1
14	UNESA	
	MEDIAN	1.20

Together with cooking, dishwashing activity shared the same equipment (sink) in the kitchen. The space used for dishwashing was measured only based on the movement of the actor and the size of the main equipments / furniture i.e. the sink, as space for other related items such as the dish rack were calculated in storing-2 activity. The spaces used are figured below.


Dishwash at kitchen


Dishwash at balcony


Dishwash at c-space

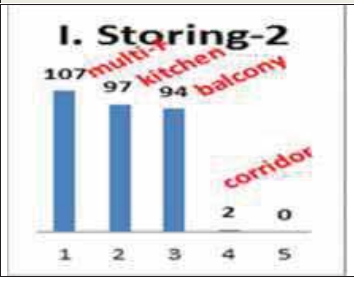

Dishwash at the bathroom

Figure 6- 8: Illustration of dish-washing at several locations

I. STORING-2

All households in this research did storing-2 in their units. Table 6.8 below indicates that among 300 households, 107 stored their food in the multi-functional space. 97 did this activity in the kitchen, 94 in the balcony, and the remaining 2 stored in the corridor. The average use of space for storing-2 is 1.12m^2.

Table 6. 8: Use of space for storing-2



	LCRA	I STORING-2
1	SOMBO	1.10
2	SIMO	1.30
3	DUPAK	1.54
4	PENJAR-1	1.85
5	PENJAR-2	1.18
6	WONO R	1.04
7	RANDU	0.8
8	GN-SARI	1.05
9	WARU G	1.18
10	URIP-S	1.15
11	T-MERAH	1.01
12	PENJAR-3	0.71
13	ITS	0.97
14	UNESA	0.75
AVERAGE		1.12

Storing-2 keeps raw and cooked food, as kitchen utensils were already stored in cooking utilities. Furniture needed by storing-2 was a refrigerator to store fruits, vegetables, etc, and a place to store cooked dishes. Most households stored their cooked food in the multi-functional space. The spaces used for storing-2 can be seen in figure 6-9.

Storing-2 at the multi-functional space	Storing-2 at the kitchen	Storing-2 at balcony

Figure 6- 9: Illustration of storing-2 at several locations

J. BATHING

Table 6. 9: Use of space for bathing

	LCRA	J BATHING/TOILETTING
1	SOMBO	1.90
2	SIMO	0.00
3	DUPAK	2.11
4	PENJAR-1	1.78
5	PENJAR-2	2.8
6	WONO R	2.80
7	RANDU	2.7
8	GN-SARI	2
9	WARU G	2.40
10	URIP-S	2
11	T-MERAH	2.3
12	PENJAR-3	2.60
13	ITS	2.00
14	UNESA	
AVERAGE		2.28

All households in this research did bathing in their units. Table 6.9 shows that among 300 households, 213 took their bath in the bathroom. 74 did this activity in the common space, and the remaining 13 showered in the balcony. This must be households lived in units with collective service who created bathroom in their balcony. The average use of space is 2.28m^2.

All households showered and defecated in their own private bathroom, except for those who lived in units with collective bathroom. Bathroom in this research was not only for bathing, but also washing as all units were only equipped with a bathroom without a separate washing room. All households washed in the bathroom/toilet. Therefore, the standard for bathroom should be a combination of standard for bathing and washing activities.

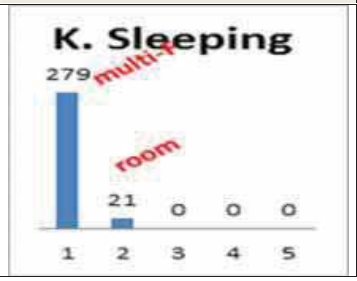
Bathing at the bathroom/toilet	Bathing at the communal space	Bathing at the balcony

Figure 6- 10: Illustration of bathing at several locations

K. SLEEPING

All households in this research slept in their units. Table 6.10 indicates that among 300 households, 279 slept in the multi-functional space, and the remaining 21 households who lived in fixed plan units slept in the room. The Median use of space for sleeping is 4.77m2.

Table 6. 10: Use of space for sleeping



	LCRA	K SLEEPING
1	SOMBO	5.22
2	SIMO	5.49
3	DUPAK	4.27
4	PENJAR-1	5.04
5	PENJAR-2	4.01
6	WONO R	4.90
7	RANDU	4.35
8	GN-SARI	4.49
9	WARU G	4.90
10	URIP-S	4.73
11	T-MERAH	4.81
12	PENJAR-3	5.51
13	ITS	2.40
14	UNESA	4.10
	MEDIAN	4.77

All but the aforementioned 21 households in this research slept in the multi-functional space, since no specific bedroom was available. In reality, averagely every unit had one or two beds. The beds which were usually just placed on the floor did not cater only for sleeping, but also for studying, dining, entertaining guests, etc. Sleeping is the most important activity to be held properly. It is related to health and should take place more than 4 hours. The spaces used for sleeping are presented in figure 6-11.

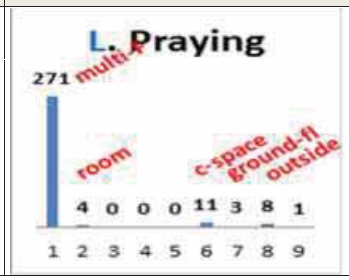
Sleeping at the multi-functional space | Sleeping at the room

Figure 6- 11: Illustration of sleeping at several locations

L. PRAYING

Not all households in this research did praying in their units. Table 6.11 shows that among 298 households who did praying, 271 prayed in the multi-functional space. 11 did this activity in the common space, 8 did it outside, and the remaining 3 prayed in the ground floor. The Median use of space for praying is 1.70m^2.

Table 6. 11: Use of space for praying

		LCRA		L PRAYING
		1	SOMBO	1.73
		2	SIMO	1.81
		3	DUPAK	1.77
		4	PENJAR-1	1.43
		5	PENJAR-2	1.62
		6	WONO R	1.76
		7	RANDU	1.68
		8	GN-SARI	1.86
		9	WARU G	1.54
		10	URIP-S	1.84
		11	T-MERAH	1.89
		12	PENJAR-3	1.54
		13	ITS	1.54
		14	UNESA	1.5
			MEDIAN	1.70

Praying is included as activities that do not take a long time. So it can share space with the other less time consuming activities that take place more frequently. However, a room that is isolated is more appropriate for praying. Only a few households whose member is 1 or 2 people can make a separate space like this, as basically the smallness of the living space does not allow this isolation. The space used for praying is indeed greater when they do it in congregation. A husband often asks his wife or children to pray together. The illustration is shown in figure 6-12.

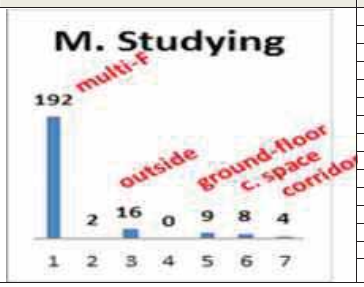
Praying at multi-f space | Praying at communal space

Figure 6- 12: Illustration of praying at several locations

M. STUDYING

Not all households in this research did studying in their units. Table 6.12 indicates that among 231 households who did studying, 192 studied in the multi-functional space. 16 did this activity outside, 9 on the ground floor, 8 at the common space, and the remaining 4 studied in the corridor. The average use of space for studying is 2.84m^2.

Table 6. 12: Use of space for studying

		LCRA		M STUDYING
		1	SOMBO	3.19
		2	SIMO	2.95
		3	DUPAK	2.58
		4	PENJAR-1	2.79
		5	PENJAR-2	2.01
		6	WONO R	2.68
		7	RANDU	2.06
		8	GN-SARI	3.01
		9	WARU G	2.18
		10	URIP-S	2.24
		11	T-MERAH	2.42
		12	PENJAR-3	2.58
		13	ITS	3.60
		14	UNESA	5.5
			AVERAGE	2.84

Studying mostly took place in the multi-functional space either on a mattress or on a bed. Only a few household members did this activity outside on the ground floor or corridor. This activity does not only mean learning for children, but also working on a computer, or reading, or preparing a script to work the next day for adults as illustrated in figure 6-13.

Studying at m-f space

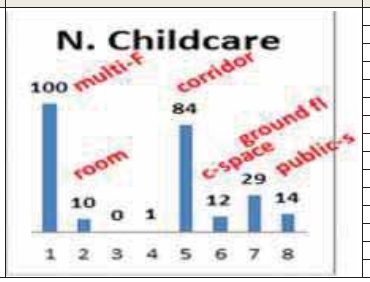
Studying at common space

Studying at corridor

Figure 6- 13: Illustration of studying at several places

N. CHILD-CARING

Table 6. 13: Use of space for child caring

		LCRA		N CHILD-CARING
		1	SOMBO	2.68
		2	SIMO	3.00
		3	DUPAK	3.28
		4	PENJAR-1	3.14
		5	PENJAR-2	2.9
		6	WONO R	2.82
		7	RANDU	2.83
		8	GN-SARI	3.35
		9	WARU G	2.97
		10	URIP-S	2
		11	T-MERAH	3.23
		12	PENJAR-3	3.25
		13	ITS	
		14	UNESA	
			MEDIAN	2.98

Not all households in this research did child-caring in their units. Table 6.13 shows that among 107 households who did child-caring, 100 took-care of their baby in the multi-functional space. 84 did this activity in the corridor, 29 on the ground floor, 14 in the public space, 12 in the common space, and the remaining 10 did child-care in the room. Each household might care for a child in more than 1 place, they would move around. The Median use of space is 2.98m^2.

Not only households having children did child-caring, elderly couple were often entrusted to look after their grandchildren by their son or daughter even though their children did not live there. Child-caring can take place everywhere: inside the unit in the multi-functional space or outside the unit in the corridor, or even on the ground floor depending on where the baby wants to go or play. So, the size to be used as a reference is uncertain. Therefore the space needed for breastfeeding a baby, where a mother often cannot just sit but has to sleep, is determining. By sleeping condition the baby also can sleep comfortably. The space used can be seen in figure below.

Child-caring at multi-functional space

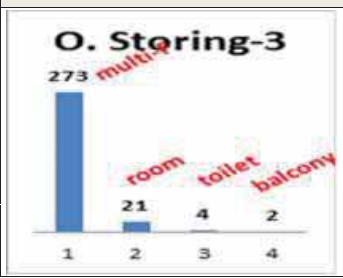
Child caring at corridor

Figure 6-14: Illustration of child-caring at several locations

O. STORING-3

All households in this research did storing-3 in their units. Table 6.14 shows that among 300 households, 273 stored their clothes in the multi-functional space. 21 households lived in fixedly planned units did this activity in the room, 4 in the bathroom, and the remaining 2 stored in the balcony. Storing-3 keeps clothes, sheets, towels, blankets, and alike, as well as money and documents. This kind of storing mostly took place in the multi-functional space. This storing is rather private as it deals with the saving of important documents, money etc. The space used by the households which averagely is 1.61m^2, is illustrated in figure 6-15.

Table 6. 14: Use of space for storing-3

		LCRA		O STORING-3
		1	SOMBO	1.68
		2	SIMO	1.60
		3	DUPAK	1.46
		4	PENJAR-1	1.85
		5	PENJAR-2	1.9
		6	WONO R	1.70
		7	RANDU	1.55
		8	GN-SARI	1.53
		9	WARU G	1.71
		10	URIP-S	1.81
		11	T-MERAH	1.54
		12	PENJAR-3	1.57
		13	ITS	1.24
		14	UNESA	1.4
		AVERAGE		1.61


Storing-3 at the m-f space



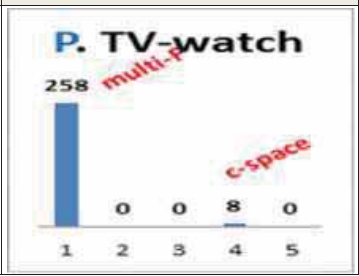
Storing-3 at the room

Figure 6- 15: Illustration of storing-3 at several locations

P. TV-WATCHING

Not all households in this research watched TV in their units. Table 6.15 shows that among 266 households who did watching TV, 258 watched in the multi-functional space. The remaining 8 watched TV in the common space. The average use of space for watching TV is 3.43m^2.

Table 6. 15: Use of space for TV-watching



	LCRA	P TV-WATCHING
1	SOMBO	3.30
2	SIMO	3.10
3	DUPAK	3.17
4	PENJAR-1	3.13
5	PENJAR-2	3.63
6	WONO R	3.00
7	RANDU	3.19
8	GN-SARI	4.87
9	WARU G	3.05
10	URIP-S	3.62
11	T-MERAH	4.08
12	PENJAR-3	3.88
13	ITS	3.34
14	UNESA	2.7
AVERAGE		3.43

Usually households placed their TV in the multi-functional space and watched together in the evening after the place has finished being used for studying. So the space for watching TV was most of the time shared with other activities such as studying, sleeping, ironing (figure 6-16).



Watching TV at the multi-functional space

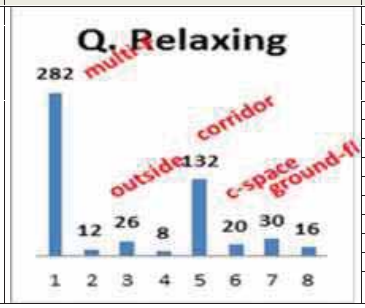

Watching TV at the communal space

Figure 6- 16: Illustration of watching TV at several locations

Q. RELAXING

All households in this research did relaxing in their units. Relaxing might take more than one place. Table 6.16 shows that among 300 households, 282 relaxed in the multi-functional space. 132 did this activity in the corridor, 30 in the ground floor, 26 did it outside, and the remaining 20 relaxed in the common space. The Median use of space for relaxing is 3.06m^2.

Table 6. 16: Use of space for relaxing



	LCRA	Q RELAXING
1	SOMBO	3.09
2	SIMO	3.05
3	DUPAK	2.99
4	PENJAR-1	3.09
5	PENJAR-2	2.84
6	WONO R	3.12
7	RANDU	2.83
8	GN-SARI	2.87
9	WARU G	3.18
10	URIP-S	2.7
11	T-MERAH	2.88
12	PENJAR-3	3.14
13	ITS	3.08
14	UNESA	3.59
MEDIAN		3.06

Relaxing is an activity to unwind, or to refresh the body and mind to be relieved from feeling tired or fatigue. Relaxing is also related to health especially when someone is not feeling well that he should immediately take a break and lie down so that his physical condition could be recovered and refreshed. In general, the place for relaxing can be in the living room, bedroom, or others. In this research relaxing mostly took place in the multi-functional space. The spaces used for relaxing are shown in figure 6-17 below.

Relaxing at the multi-functional space

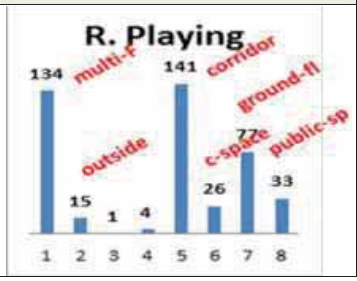
Relaxing at the corridor

Figure 6- 17: Illustration of relaxing at several locations

R. PLAYING

Not all households in this research had children who did playing. Playing also might take in more than one place. Table 6.17 shows that among 191 households whose children did playing, 141 played in the corridor. 134 did this activity in the multi-functional space, 77 on the ground floor, 33 in the public space, 26 in the common space, and the remaining 15 played outside the complex. The median use of space for playing is 3.10m^2.

Table 6. 17: Use of space for playing

		LCRA	R PLAYING
		1 SOMBO	3.07
		2 SIMO	3.13
		3 DUPAK	3.20
		4 PENJAR-1	3.20
		5 PENJAR-2	2.79
		6 WONO R	2.44
		7 RANDU	2.82
		8 GN-SARI	2.86
		9 WARU G	3.14
		10 URIP-S	2.56
		11 T-MERAH	4.46
		12 PENJAR-3	3.16
		13 ITS	
		14 UNESA	
		MEDIAN	3.10

Playing is meant for children who are no longer need to be child-cared. It could take place in either inside or outside the unit. The former usually includes games that may need support of computer or not. The latter is more related to games that require unimpeded movements therefore corridor or other outside place was more appropriate to do it (see figure 6-18).

Playing at the multi-functional space | Playing at the corridor

Figure 6- 18: Illustration of playing at several locations

S. ENTERTAINING

Table 6. 18: Use of space for entertaining

		LCRA	S ENTERTAINING
		1 SOMBO	3.05
		2 SIMO	2.74
		3 DUPAK	2.95
		4 PENJAR-1	2.70
		5 PENJAR-2	2.94
		6 WONO R	2.56
		7 RANDU	2.53
		8 GN-SARI	3.48
		9 WARU G	2.56
		10 URIP-S	2.67
		11 T-MERAH	2.75
		12 PENJAR-3	2.95
		13 ITS	3.08
		14 UNESA	3.01
		AVERAGE	2.85

Not all households in this research did entertaining in their units. Entertaining also might be carried out in more than one place. Table 6.18 shows that among 285 households who did entertaining, 261 entertained their guests in the multi-functional space. 54 did this activity in the

corridor, 20 on the ground floor, and the remaining 9 households served their guests in the common space. The average space used for entertaining is 2.85m^2

Most households in this research entertained their guests in the multi-functional space although some of them preferred to do it in the corridor. The way households received their guests did not need a special space like a living room. Although the households in this study did not provide seating and coffee table except a mat or mattress, the place must provide space for serving some drinks, and snacks. The size of the mat / mattress or bed often determines the space size required for this activity. The spaces used for entertaining are illustrated below.

Entertaining at m-f space

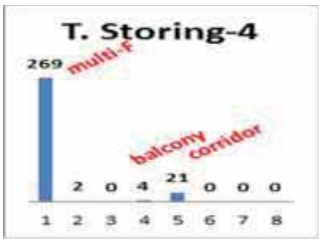
Entertaining at the corridor

Figure 6- 19: Illustration of entertaining at several locations

T. STORING-4

Not all households in this research did storing-4 in their units. Table 6.19 shows that among 296 households who did storing-4, 269 stored their school and work items, electronics and else in the multi-functional space. 21 did this activity in the corridor, 4 in the balcony, and the remaining 2 stored in other place. The average use of space for storing-4 is 1.41m^2.

Table 6. 19: Use of space for storing-4



	LCRA	T STORING-4
1	SOMBO	1.20
2	SIMO	1.55
3	DUPAK	0.98
4	PENJAR-1	1.37
5	PENJAR-2	1.43
6	WONO R	1.15
7	RANDU	1.31
8	GN-SARI	1.2
9	WARU G	1.27
10	URIP-S	1.53
11	T-MERAH	1.15
12	PENJAR-3	1.46
13	ITS	1.96
14	UNESA	2.23
	AVERAGE	1.41

Storing-4 is for keeping school supplies, work tools, electronics, and all items that are not included in the storing-1, 2, and 3. Electronics, school and office books and equipments were usually kept in a cupboard or shelves that were placed in the multi-functional space. Shoe rack was usually placed in the corridor. All stuffs that were no longer used were kept in the balcony. For households having mezzanine these items were stored up stairs. The illustration of the spaces used for this activity can be seen in the following figure.

Storing-4 at m-f space

Storing-4 at the corridor

Figure 6- 20: Illustration of storing-4 at several locations

SPACE USED FOR ACTIVITIES

Total space use is the accumulation of all space used for activities of each LCRA. It is indicated that the space used for activities in Penjar-3 which required 43.46m^2 is the largest. While Unesa by space use of 32m^2 required the smallest. The average use of space among all is 41.15m^2. The value indicates the extent each LCRA can accommodate the activities conducted by households. The total space used by all LCRA can be seen in table 6.20 below.

Table 6.20: Use of space of activities

LCRA		A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	TOTAL
		wash	dry	iron	stor1	cook	eat	dish	stor2	bath	sleep	pray	study	child	stor3	tv-w	relax	play	enter	stor4	
1	Sombo	1.35	1.27	2.45	0.54	1.88	2.91	1.50	1.10	1.90	5.22	1.73	3.19	2.68	1.68	3.30	3.09	3.07	3.05	1.20	43.11
2	Simo	0	1.26	2.31	0.52	1.99	2.70	0.00	1.30	0.00	5.49	1.81	2.95	3.00	1.60	3.10	3.05	3.13	2.74	1.55	38.46
3	Dupak	1.41	1.53	2.04	0.51	1.62	2.55	1.33	1.54	2.11	4.27	1.77	2.58	3.28	1.46	3.17	2.99	3.20	2.95	0.98	41.26
4	Penjar-1	1.15	1.03	2.19	0.83	1.46	2.72	0.94	1.85	1.78	5.04	1.43	2.79	3.14	1.85	3.13	3.09	3.20	2.70	1.37	41.68
5	Penjar-2	1.37	1.2	1.81	0.54	2.24	1.85	1.07	1.18	2.8	4.01	1.62	2.01	2.9	1.9	3.63	2.84	2.79	2.94	1.43	40.12
6	Wono R	1.36	1.2	2.19	0.58	2.40	2.32	1.1	1.04	2.80	4.90	1.76	2.68	2.82	1.70	3.00	3.12	2.44	2.56	1.15	41.16
7	Randu	1.17	1.47	1.87	0.74	1.69	2.2	1.2	0.8	2.7	4.35	1.68	2.06	2.83	1.55	3.19	2.83	2.82	2.53	1.31	39.00
8	Gn-Sari	1.01	1.59	2	0.49	1.31	2.72	1.29	1.05	2	4.49	1.86	3.01	3.35	1.53	4.87	2.87	2.86	3.48	1.2	42.96
9	Waru G	1.49	1.80	2.12	0.48	1.2	2.17	1	1.18	2.40	4.90	1.54	2.18	2.97	1.71	3.05	3.18	3.14	2.56	1.27	40.53
10	Urip-S	1.04	1.25	1.95	0.54	1.94	2.34	1.1	1.15	2	4.73	1.84	2.24	2	1.81	3.62	2.7	2.56	2.67	1.53	39.01
11	T-Merah	1.2	1.8	1.95	0.5	1.9	2.28	1.19	1.01	2.3	4.81	1.89	2.42	3.23	1.54	4.08	2.88	4.46	2.75	1.15	43.32
12	Penjar-3	1.2	1.80	2.23	0.39	1.92	2.36	1.2	0.71	2.60	5.51	1.54	2.58	3.25	1.57	3.88	3.14	3.16	2.95	1.46	43.46
13	Its	1	0.8	2.92	0.66	1.05	3.00	1.00	0.97	2.00	2.40	1.54	3.60		1.24	3.34	3.08		3.08	1.96	33.64
14	Unesa		0.8	2.12	0.57	0.78	2.96		0.75		4.10	1.5	5.5		1.4	2.7	3.59		3.01	2.23	32.00
AVERAGE		**1.23**	**1.34**	**2.15**	**0.56**	1.67	**2.50**	1.18	**1.12**	**2.28**	4.59	1.68	**2.84**	2.95	**1.61**	**3.43**	3.03	3.07	**2.85**	**1.41**	41.15
MEDIAN		1.2	1.26	2.12	0.54	**1.78**	2.45	**1.20**	1.07	2.20	**4.77**	**1.70**	2.63	**2.98**	1.58	3.24	**3.06**	**3.10**	2.85	1.34	41.10

FINDINGS:

Sleeping took the largest space by 4.77m^2, followed by watching TV that required 3.43m^2 and playing that spent 3.10m^2. The data of activity locations show that:

1. Among all nineteen domestic activities, only seven that were not conducted in the multi-functional space. They include: playing, bathing, dish-washing, cooking, stioring-1, drying, and washing. This means that the remaining twelve activities certainly must be conducted in the multi-functional space.
2. Space for storing was found to be a crucial problem. Although the standard is available, individual storing space was not provided in all LCRA units. Most households still relied on the multi-functional space to store their items that might increase the load of this space.
3. Activities that were mostly conducted in the corridor subsequently include: playing by 141 households, relaxing by 132, child-caring by 84, drying by 63, and entertaining by 54 households. This indicates that these activities are possible to be moved to the corridor to ease the burden on the multi-functional space.

6.2.3. Location of the Activities

One of the most important collected data in this research is where each activity was usually carried out by the users. As discussed in chapter 4, all units in this research consisted of the following unit parts: a multi-functional space, kitchen, bathroom/toilet, balcony, and corridor. The common space, ground floor, and public spaces, are included as additional zones outside the units. These are expected as the place where more social activities take place.

During the survey, the users had indicated to the surveyors in which of the unit parts they generally carried out each of their activities. These had been recorded on the drawings in the surveyor's checklist.

Each unit part thus has its own activity loads. The activity load per unit part is derived from the determination of the dominant activities that take place in such unit part. The following figures illustrate the activity loads per unit part.

6.2.3.1. Activities occurring in the multi-functional space

HOUSEHOLDS DID ACTIVITIES (DOMINANTLY) AT THE MULTI-FUNCTIONAL SPACE		
Eating	285	95%
Sleeping	282	94%
Relaxing	281	94%
Storing-3	279	93%
Storing-4	275	92%
Praying	272	91%
Entertaining	262	87%
TV-watching	258	86%
Ironing	245	82%
Studying	218	73%
Playing	135	45%
Child-caring	100	33%

Figure 6- 21: Total of users carried out (dominant) activities at the multi-functional space

From figure 6-21 can be noticed that multi-functional space in the low cost apartments has to facilitate varies of activities. Most activities are carried out by occupants in this space. Even activities that are considered as more private activities or those which require a peaceful environment, such as sleeping, relaxing, praying, and studying appear to take place in the multi-functional space. Only bathing takes place elsewhere and storing of cleaning materials as well as the more communal activities that seemingly require more space than available in the multi-functional space. Regarding the business activities, it can be noticed that only the storing of business materials takes place in the multi-functional space.

6.2.3.2. Activities occurring in the kitchen

AMONG 174 UNITS WITH OWN KITCHEN, HOUSEHOLDS DID ACTIVITIES (DOMINANTLY) IN THE KITCHEN		
Storing-2	116	67%
Cooking	114	66%
Dishwashing	102	59%

Figure 6- 22: Total of users carryout (dominant) activities at the kitchen

Figure 6-22 tells that the most activities carried out in the kitchen are storing of kitchen materials and food (67%); cooking (66%) and dishwashing (59%). Ironing and eating apparently never take place in the kitchen, and drying only seldom.

6.2.3.3. Activities occurring in the bathroom & toilet

AMONG 195 UNITS WITH OWN BATHROOM, HOUSEHOLDS DID ACTIVITIES (DOMINANTLY) IN THE BATHROOM		
Bathing	202	103%
Washing	178	91%
Storing-1	118	61%

Figure 6- 23: Total of users carryout (dominant) activities at the toilet

It might be more or less obvious that bathing is the major activity that takes place in the bath-room/toilet space (103%). Although only 195 apartment units had a bathroom, 202 households appeared to bath at their individual bathroom. This is because 7 households constructed their own bathroom in their unit whilst they lived in an apartment which was only provided with a collective bathroom. Those with an own bathroom in the apartment, also carried out washing here (91% or 178 households). Besides, 61% (118 households) stored their cleaning material and equipment in the bathroom space. Some also washed here in the bathroom/toilet.

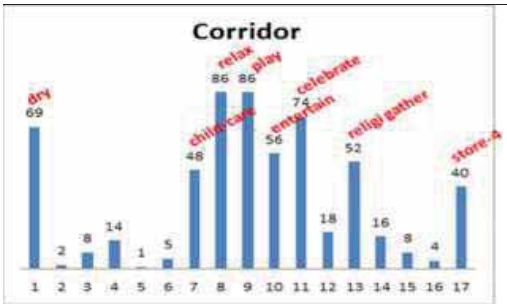
6.2.3.4. Activities occurring in the balcony

AMONG 216 UNITS HAVING OUTDOOR BALCONY, HOUSEHOLDS DID ACTIVITIES (DOMINANTLY) IN BALCONY		
Drying	184	85%
Storing-2	111	51%
Cooking	96	44%
Storing-1	91	42%
Dishwashing	77	36%

Figure 6- 24: Total of user carryout (dominant) activities at the balcony

Figure 6-24 indicates that the balcony is in majority used for laundry drying 85% (184 households). Also, storing of raw materials and food took place at the balcony by 51% (111 households) as well as cooking by 44% (96 households) and storing of cleaning materials and equipments by 42% (91 households); and dishwashing by 36% (77 households).

6.2.3.5. Activities occurring in the corridor



HOUSEHOLDS DID ACTIVITIES (DOMINANTLY) IN THE CORRIDOR		
Relaxing	86	29%
Playing	86	29%
Celebrating	74	25%
Drying	69	23%
Entertaining	56	19%
Religious gathering	52	17%
Child-caring	48	16%
Storing-4	40	13%

Figure 6- 25: The dominant activities as the activity loads take place in the corridor

Despite the function of the corridor as space for accessing to the apartments, it is also used by households to do activities such as relaxing and playing by 29% (86 households), as well as for drying their laundries by 23% (69 households, most of which were done by households living in units which balconies were indoor), and for child-caring by 16% (48 households). Most public activities took place in the corridor such as entertaining guests by 19% (56 households). The more public yet incidentally occurred activities were celebrations by 25% (74 households), and religious gatherings by 17% (52 households). The corridor was often also used for putting storing-4 items by 13% or 40 households (figure 6-25).

Based on the survey data (table 5.23) a calculation was made to find the greatest percentage of the total of households that carried-out the activities in a particular unit part of the apartment.

Table 6. 21: The dominant activities in each unit part as activity loads

	ACTIVITY	Multi-F	Kitchen	Toilet	Balcony	Corridor	C-space	Ground-fl	Public sp
A	Washing			1			1		
B	Drying				1	1			
C	Ironing	1							
D	Storing-1	1		1	1				
F	Cooking		1		1				
G	Eating	1							
H	Dishwashing		1		1		1		
I	Storing-2	1	1		1				
J	Bathing			1			1		
K	Sleeping	1							
L	Praying	1							
M	Studying	1							
N	Child-caring	1				1			
O	Storing-3	1							
P	TV watching	1							
Q	Relaxing	1				1			
R	Playing	1				1			
S	Entertaining	1				1			
T	Storing-4	1							
U	Celebrating					1	1		
V	Organization participation					1	1	1	
W	Religion gathering					1	1	1	
Total activities of each unit part		**14**	**3**	**3**	**5**	**8**	**6**	**2**	**0**

From table 6.21 above, it is seen that the unit part accommodating the most activity load is the multi-functional space. There are overlapping activities among those occur in unit parts. Therefore activity loads of each unit part are listed in the following table.

Table 6. 22: Activity loads of each unit part

Unit part	Multi-F	Kitchen	Bathroom/ Toilet	Balcony	Corridor	Common space
ACTIVITIES SHOULD BE MANAGED BY EACH UNIT PART	1. Eating 2. Sleeping 3. Relaxing 4. Storing-3 5. Storing-4 6. Praying 7. Entertaining 8. TV-watching 9. Ironing 10. Studying 11. Playing 12. Child-caring	1. Cooking 2. Dish-washing 3. Storing-2	1. Washing 2. Storing-1 3. Bathing	1. Drying 2. Storing-1 3. Storing-2	1. Child-caring 2. Playing 3. Entertaining 4. Celebrating 5. Religious gathering	1. Celebrating 2. Religious gathering

6.2.4. Use of Space of Each Unit Part

Different from average area of existing space that is determined directly by averaging all areas of the existing space, the average use of space of unit part is derived from the use of space areas of its activity loads. This is because the unit part space facilitates several activities dominantly carried out there based on the location discussed prior (table 6.22). Each activity may occupy the whole area of the unit part. This is possible when the activities take place one another in different time. It indicates that the user has the capacity to create the unit part area times as much as the existing space area. As a result, the unit part use of space is hypothetically larger than the existing space. Averagely, the unit parts' use of space is listed in the following table.

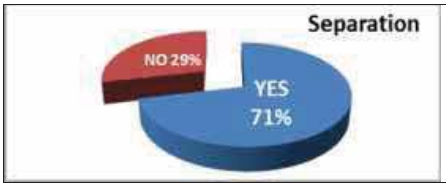
Table 6. 23: Average use of space of each unit part which derived from the total use of space of activity loads

UNIT PART		ACTIVITY		USE OF SPACE	UNIT PART AREA		TOTAL
MULTI FUNCTIONAL SPACE	Public sub-zone	S	Entertaining	2.85	19.98	32.41	41.91
		G	Eating	2.50			
		P	TV-watching	3.43			
		C	Ironing	2.15			
		R	Playing	3.10			
		M	Studying	2.84			
		L	Praying	1.70			
		T	Storing 4	1.41			
	Private sub-zone	K	Sleeping	4.77	12.42		
		Q	Relaxing	3.06			
		N	Child-caring	2.98			
		O	Storing 3	1.61			
KITCHEN		F	Storing-2	1.12	4.10		
		H	Cooking	1.78			
		I	Dishwashing	1.20			
BATHROOM / TOILET		A	Washing	1.23	3.51		
		J	Bathing	2.28			
BALCONY		B	Drying	1.34	1.9		
		D	Storing-1	0.56			

6.3. FINDINGS IN USE OF MULTI-FUNCTIONAL SPACE

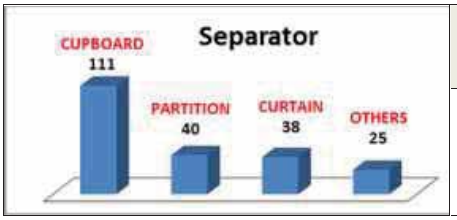
6.3.1. Tendency to separate into private and public sub-spaces

One of the findings from the survey indicates that most households tend to separate their multi-functional space into two parts. Figure 6-26 indicates that 71% (214 households) separated their multi-functional space into public and private sub-zones. Cupboard seemed to be the most desired separator. Figure 6-27 proves that of those separating their multi-functional space, 52% (111 households) separated the space by using cupboard; 19% (40 households) by using partitions; and 18% (38 households) by using curtain.



SEPARATION OF MULTI-FUNCTIONAL SPACE DONE AMONG 300 UNITS		
Units not separated Multi-F	86	29%
Units separated Multi-F	214	71%

Figure 6- 26: Households separated their multi-functional space into public and private zones



SEPARATOR USED AMONG 214 UNITS SEPARATING MULTI-FUNCTIONAL SPACE		
Cupboard	111	51%
Partition	40	19%
Curtain	38	18%
Other	25	12%

Figure 6- 27: Separation by cupboard, partition, curtain, or others

This finding suggests the division of multi-functional space into private and public sub-spaces as shown in the figure below.

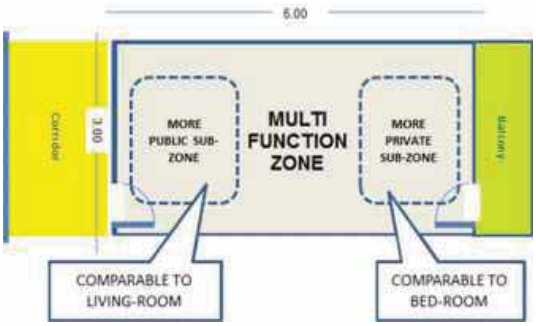
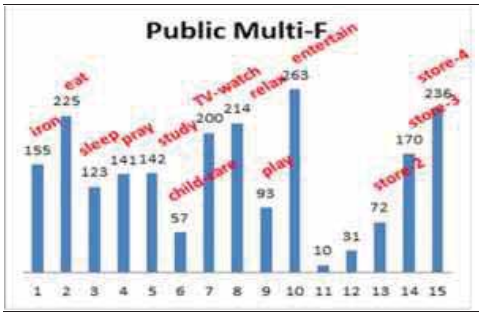


Figure 6- 28: Hypothetical division of multi-functional space into public and private sub-spaces

In the hypothetical division of multi-functional space, the public together with private sub-spaces support the execution of activity loads of multi-functional space. They are inter-related each other as described in figure 6-28. The dominant activities carried out in each sub-space are listed in the following figures.



ACTIVITIES OCCURRED (DOMINANTLY) IN THE PUBLIC SUB-ZONE OF MULTI-FUNCTIONAL SPACE		
Entertaining	263	88%
Storing-4	236	79%
Eating	225	75%
Relaxing	214	71%
TV-watching	200	67%
Storing-3	170	57%
Ironing	155	52%
Studying	142	47%
Praying	141	47%
Sleeping	123	41%
Playing	141	31%
Storing-2	72	24%
Child-caring	57	19%

Figure 6-29: Dominant activities of the public zone of multi-functional space

ACTIVITIES OCCURRED (DOMINANTLY) IN THE PRIVATE SUB-ZONE OF MULTI-FUNCTION		
Sleeping	289	96%
Storing-3	255	85%
Relaxing	209	70%
Storing-2	176	59%
Storing-4	176	59%
Praying	145	48%
Studying	124	41%
Eating	99	33%
TV watching	92	31%
Ironing	84	28%
Child-caring	65	22%

Figure 6-30: Dominant activities of the private zone of multi-functional space

Division into public and private sub-spaces by users is determined by selecting activities with greater percentage. From the above figures, it is seen that relaxing is ranked in the top both in the public and the private sub-spaces. However, in private sub-space relaxing is on the third rank while in public sub-space it is on the fourth. Therefore relaxing is listed as activity occurs in the private sub-space. Storing-2 (for keeping raw materials, food and kitchen utensils) already belongs to the kitchen. Child-caring position is at the most bottom both in the public and the private sub-spaces. Yet, the percentage in private sub-space is bigger therefore child-caring is listed in the private sub-space. Therefore the division of activities is listed as follows.

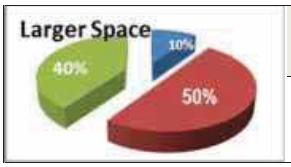
Table 6. 24: Activity loads of public and private sub-zones of multi-functional space

The public sub-space (outer zone)		The private sub-space (inner zone)	
1. Entertaining 2. Storing-4 3. Eating 4. TV-watching 5. Ironing 6. Studying 7. Praying 8. Playing	Comparable to a living-room	1. Sleeping 2. Storing-3 3. Relaxing 4. Child-caring	Comparable to a bedroom

.

6.3.2. Private Sub-Space is Larger than Public Sub-Space

It seems that most households prioritize their multi-functional space more for private rather than for public activities. Figure 6-31 proves that from 214 households divided their multi-functional space, 50% or 107 households set their sub-space size for public activities equals to that for private. 40% or 86 households made the zone size for private activities larger than that for public. Only 10% or 21 households set the space for public activities larger than that for private.



LARGER PART BETWEEN PUBLIC AND PRIVATE SUB-SPACES AMONG 214 DIVIDED MULTI-F SPACES		
Equals	107	50%
Private is larger	86	40%
Public is larger	21	10%

Figure 6-31: Which sub-space of multi-functional space is larger

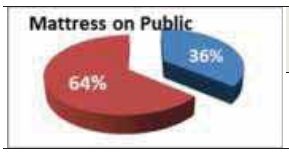
Area of Public > Private space	Area of Public = Private space	Area of Private > Public space

Figure 6-32: Illustration of area of public versus private sub-zone of multi-functional space

6.3.3. Sleeping in the Public Sub-Space

Sleeping is an activity that requires the most extensive space of all activities in this research. Therefore although it is a private activity, most households also used the public sub-space to sleep (at night). This research found that 108 households put mattress in their public sub-space to carryout various activities such as dining, praying, studying, watching TV, relaxing, entertaining, including for sleeping (figure 6-33 and 6-34).

Figure 6-33: Illustration of mattress existence at public multi-functional space

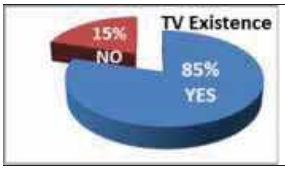


APPLICATION OF MATTRESS ON PUBLIC SUB-SPACE		
Mattress on public	108	36%
No mattress on public	192	64%

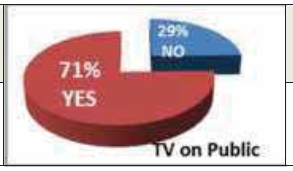
Figure 6-34: Existence of mattress on public zone of multi-functional space

6.3.4. Watching TV in the Public Sub-Space

Watching TV requires the second largest space after sleeping in this research. Different from sleeping, watching TV was mostly carried out in the public sub-space. Figure 6-35 left shows that 85% (256 households) had TV in their units. TV seemed an important in-house affordable entertainment to the low income households in this research. Figure 6-35 right shows that among the 256 households who had a TV in their units, 182 or 71% organized their TV set in the public sub-space, while 74 households or 29% preferred to put it in the private sub-space.



UNITS HAVING TV SET		
Units with TV	256	85%
Units with no TV	44	15%



LOCATION OF TV AMONG 256 UNITS HAVING TV IN THE UNIT		
TV on Public	182	71%
TV on Private	74	29%

Figure 6-35: Households having TV and its location within the unit

TV set on public multi-functional space | TV set on private multi-functional space

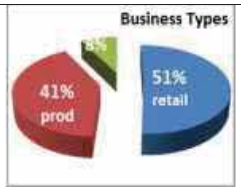
Figure 6-36: Illustration of TV set in public and private multi-functional space

6.4. SPACE USED FOR INCOME GENERATION

Producing | Retailing | Servicing

Figure 6-37: Illustration of activities on income generation

As indicated in chapter 4, there were 21% or 63 households that had business in their units. Among units with business, 51% or 32 households were retailers, 41% or 26 households were producers, and the rest 8% or 5 households did servicing (figure 6-38 left). Figure 6-38 right shows that the dominant location for doing business was public sub-space (by 29 households or 46%), followed by corridor (by 24 households or 38%), service area (by 8 households or 13%), and the least used area for doing business was the private sub space (only by 2 households).



RATIO OF BUSINESS TYPES AMONG 63 UNITS	
Units do retailing	32
Unitsdo producing	26
Units do servicing	5

LOCATION OF BUSINESS ACTIVITY AMONG 63 UNITS	
In public sub-space	29
In corridor	24
In service Area	8
In private sub-space	2

Figure 6-38: Ratio of income generation activities existed in the units and its locations

6.5. THE SPACE FOR STORING

Low income households tend to keep their old stuff as they believed they would need them someday. This research concerns with space design of apartments for the low income users, thus, the availability of space for storing their stuff is crucial. In reality all low cost apartments in this research did not have any private storing space in the units. In fact, the national standard already has the requirement for storage i.e. 2.5 m^2. The main problem found is that many units in this research still relied on multi-functional space for storing spaces especially storing-1 and storing-2. While storing 3 and 4 were certainly performed in the multi-functional space, the placement of the items that still have to share with the place to carry-out other activities may cause interference to the implementation of the activities.

The area required to be provided for storing space is determined by the use of space for storing activities i.e. storing-1, storing-2, storing-3, and storing-4. Therefore the descriptions of space for storing in this section are divided based on 4 storing items as elaborated in the following paragraphs. Although none of the low cost apartments in Surabaya were provided with particular space for storing individually, Waru-Gunung was found to have side walls that were equipped with holes that could be used as small storing spaces. Households living here used them effectively. It could be a good example in terms of intensification of the side walls as a storage as seen in figure 6-39 below.

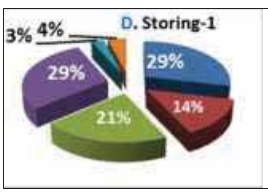
Figure 6-39: Side wall built in holes existed in Waru Gunung which were applied as small storing spaces

6.5.1. Illustration of the Use of Space for Storing-1

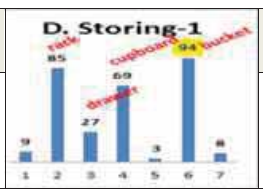
Storing-1 which according to literature should be provided in the bathroom & toilet, kitchen or storage, in this research still also occurred significantly in the multi-functional space. Figure 6-40 indicates that when viewed from the volume, the space required was only small, but the items included in storing-1 were disturbing and easily lead to an unclean impression.

Figure 6-40: Illustration of how storing-1 items still burden the multi-functional space

Figure 6-41 left shows that although 87 of 296 households who did storing-1 conducted it in the balcony, 85 households (almost equally) still kept storing-1 items in the multi-functional space. While households who did this activity in the bathroom & toilet was fewer i.e. 62. Households who put these items in the kitchen was only 42. Figure 6-41 right shows that the dominant mean used to keep storing-1 items was bucket, whereas storage in a bucket is prone to a dirty impression especially when there is water in the bucket. There were fewer households who used cupboards / drawers to store tools and materials for cleaning, bathing, and washing.



LOCATION OF STORING-1 AMONG 296 UNITS		
Balcony	87	29%
Multi-f space	85	29%
Toilet	62	21%
Kitchen	42	14%
Corridor	12	4%
Common-space	8	3%



FURNITURE USED TO KEEP STORING-1 ITEMS AMONG 296 UNITS		
Using bucket	94	32%
Using rack	85	29%
Using cupboard	69	23%
Using drawer	27	9%

Figure 6-41: Location and furniture / means used for keeping storing-1 items

6.5.2. Illustration of the Use of Space for Storing-2

All respondents did storing-2. Figure 6-42 shows that to keep storing-2 items, most households also still relied on the multi-functional space especially for storing cooked food, and fresh raw food materials like fresh fruits, vegetables etc. Figure 6-43 left verifies that multi-functional space was the location most used for keeping storing-2 items, whereas fewer households did storing-2 in the kitchen, which theoretically should be a place for this kind of storing. Kitchen was usually only used for storing cookwares. There were even fewer households who stored their raw food materials and kitchen utensils in the balcony. Figure 6-43 right shows that 227 households used rack for keeping and drying kitchen utensils. 120 households applied refrigerator for keeping fresh raw materials such as fruits, vegetables and leftover cooked food. 90 households just put the food on a table, while only 81 used cupboard to keep these items.

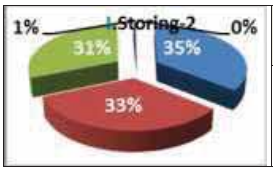

Storing kitchen utensils


Storing raw materials



Storing cooked and fresh food

Figure 6-42: Illustration of how storing-2 items still burden the multi-functional space



LOCATION OF STORING-2 AMONG 300 UNITS		
Multi-f space	107	35%
Kitchen	99	33%
Balcony	92	31%
Corridor	2	1%

FURNITURE USED TO KEEP STORING-2 ITEMS		
Using rack	227	76%
Using fridge	120	40%
Using table	90	30%
Using cupboard	81	27%

Figure 6-43: Location and furniture used to keep storing-2 items

The use of rack and fridge for food storage is better. However the storing of ready meal on a table is often followed by spills or splashes that leaves things wet, humid, and/or smelly, which may potentially disturb other activities occurring in the same table.

6.5.3. Illustration of the Use of Space for Storing-3

As discussed previously, storing-3 that deals with clothes, sheets, towels, blankets, etc mostly took place in the multi-functional space or room for households living in the fixedly planned units. Storing-3 that was done by all respondents involved valuable items too, such as money, gold (valuable treasures), as well as private important documents e.g. certificates. It is normal then that almost all households kept their storing-3 items in the multi-functional space and room as these spaces are considered the safest or most appropriate place to store items that are included in the category of storing-3. Cabinets were usually prioritized to save money and important documents as they could be locked, therefore making them safer. Clothes that were worn daily such as for school and working were usually hung. The rest were folded in piles, some were put inside a cupboard, but most of the time they were just put on a table or bed.



Hanged items of storing-3


Stacked items



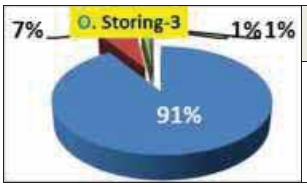
Folded items of storing-3





Figure 6-44: Illustration of storing-3 items may burden the implementation of activities take place in the multi-functional space

Figure 6-44 shows that clothes which were hung over indeed gave a more neat impression, nonetheless it took up the space for conducting activities below that might complicate the implementation of the activities especially when the available space is too small. Clothing or items that were stacked on a desk or a bed might reduce the flexibility or comfort of people / children who wanted to study or do other activities on it. Figure 6-45 indicates that while 283 households used a cupboard for keeping storing-3 items, 84 households used drawers / tables, and 83 households put their storing-3 items on a bed. Households who used buckets, baskets, and/or racks often also put these means on a bed or table. In this case more than one type of furniture / means may be used by households.



LOCATION OF STORING-3 AMONG 300 UNITS		
Multi-f space	273	91%
Room	21	7%
Toilet	4	1%
Balcony	2	1%

FURNITURE USED TO KEEP STORING-3 ITEMS	
Using cupboard	283
Using drawer	84
Using bed	83
Using basket	34
Using bucket	30
Using rack	29

Figure 6-45: Location and furniture / means used for keeping storing-3 items

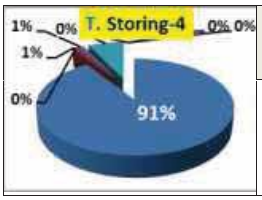
6.5.4. Illustration of the Use of Space for Storing-4

296 households in this research did storing-4 that deals with electronics, books, school or working equipments, and all other than the previous mentioned storing items. Electronics such as TV and radio or cassette recorder were usually set on a rack or table as users used, watched or enjoyed them in their daily leisure time. Books were usually stacked on a rack or cupboard or just put on a table. It was not infrequently found that the closet used to store storing items 3 and 4 also served as a room divider which is considered stationary (figure 6-46).

Figure 6-46: Illustration of how storing-4 items may burden the implementation of activities take place in the multi-functional space

Figure 6-47 left indicates that although dominantly households kept their storing-4 items in the multi-functional space, there were households who stored not too valuable items such as used goods, or goods of daily use such as a shoe rack and a broom box in the corridor. Items that were placed in corridors were often a problem when the size were too big. Figure 6-47 right shows that from 296 households who did storing-4, 172 used racks to keep their storing-4 items, 141 utilized cupboards, 91 just put the items on tables, 55 applied drawers, and only 26 of them used boxes. In this case the households might use more than one type of furniture. The same

as in the case of storing-3, activities that took place on a table had to share space with the items that were placed on it, that might potentially result in disturbance to the occurrence of the activities.



LOCATION OF STORING-4 AMONG 296 UNITS		
Multi-f space	269	91%
Corridor	21	7%
Common-space	4	1%
Kitchen	2	1%
Balcony	0	0%

FURNITURE USED TO KEEP STORING-4 ITEMS AMONG 296 UNITS		
Using rack	172	58%
Using cupboard	141	**47%**
Using table	91	31%
Using drawer	55	18%
Using box	26	9%

Figure 6-47: Location and furniture used to keep storing-4 items

6.6. THE USE OF COMMUNAL SPACE

6.6.1. Common Space of Units with Collective Services

The government is responsible for the maintenance of communal spaces. Although not yet all, some common spaces especially those of low cost apartments which services are provided collectively i.e. Sombo, Simolawang, Dupak, and Penjar-1, were renovated by the government. These common spaces include collective kitchen, collective bathroom & toilet, and collective praying place. This collective praying space is often used to accommodate guests from outside the area when occupants have a celebration. Some common spaces were still function well as they were, while some others were changed to other uses (figure 6-48 and 6-49).

Renovated & un-renovated kitchen	Renovated & un-renovated toilet	Renovated & un renovated praying place

Figure 6-48: Renovated and un-renovated common spaces in LCRA with collective services

Still effective collective washing place	Changed function of collective cooking place into storage

Figure 6-49: Still effective and changed function of common spaces in LCRA with collective services

In Penjar-1, although remain communal spaces yet the collective cooking spaces were no longer space as intended. At the ground-floor, they became mass parking place for motor cycles; at floor-2 it changed to sub-district office and bike parking; at floor-3 it turned to mass

praying space; and at floor-4 it changed to a place for table tennis and storing the collective items such as plates & glasses that can be borrowed or rented by residents when they need for celebration. However, the collective bathrooms remained function as they were (figure 6-50).

Motor parking at ground floor	Office at floor 2	Mass praying floor-3	Not effective cooking	Collective storage at floor-4

Figure 6-50: The new uses of common spaces at Penjar-1

Besides the above mentioned, common spaces in these types of low cost apartments also include corridors and stair halls which dimensions were mostly larger than the corridors and stair halls of apartments with individual services. Not a few families who took advantage of the breadth of this public space to be occupied to perform household activities. Pretty large areas of these common spaces were occupied, even considered in-tolerated. It is in-tolerated as the main function of the corridors and halls as common space and horizontal circulation is gone. People cannot conveniently pass through. The in-tolerated occupation is mostly for trading, producing, cooking, and drying. The illustrations of these can be seen in figure 6-51.

Corridor occupied for producing	Corridor occupied for preparing, cooking and eating / dining

Corridor occupied for trading and retailing	Corridor occupied for drying

Figure 6-51: Illustration of in-tolerated use of corridors or halls

However, there are also examples of tolerated corridor occupations. As resulted in the data processing, the daily activity loads of corridor as the common space were entertaining, relaxing, (children) playing, and child-caring. Although some households occupied the corridors for doing their daily activities, they used it neatly. The following figure 6-52 illustrates these.

Tolerated occupation for entertaining	Tolerated occupation for playing	Tolerated occupation for child-caring	Tolerated occupation for motor parking
Neat use of corridor for washing & ironing	Neat use of corridor	Neat use of corridor at the collective bathroom	Neat use of corridor at the collective cooking place

Figure 6-52: Illustration of tolerated occupation or proper use of common spaces

6.6.2. Common Space of Units with Individual Services

In low cost apartments which unit services are provided individually, the common spaces only consist of corridors and stair halls in every floor. Most of these common spaces are narrower or smaller than those which services provided collectively, except Gunungsari. Possibility for corridor occupation is thus lesser, as the space is just enough for circulation (figure 6-53).

Corridor of Tanah-Merah	Corridor of Randu	Corridor of Waru-Gunung	Corridor of Urip-S

Figure 6-53: Illustration of narrower corridor at LCRA which services provided privately

6.7. CONCLUSION

- The use of space of each activity is notified in area or size and location. The table shows multiple activities took place in each unit part or functional area: multi-functional space, kitchen, toilet, balcony, (and corridor). The location of each activity refers to where the users dominantly do their activities.

- Private storing spaces are not available although they are standardized nationally and proved crucially to be provided. The storing of items that mostly still relied on the multi-functional space often result in burden on the implementation of activities taking place there.
- Findings in use of space indicate that: households tend to separate multi-functional space into public and private sub-zones. Most private zones were larger than that of public zones. Income generation mostly took place in the public sub-space. Most families still relied on the multi-functional space to conduct their activities. Corridors of units with private services in single loaded blocks were narrower than those with collective services. For this, enlargement periodically as proposed in the figure below is required especially for household socialization and (children) playing.

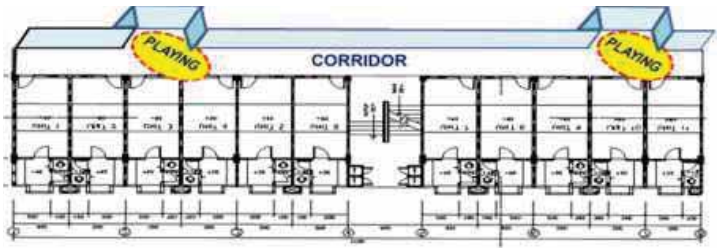


Figure 6-54: Example for periodical enlargement of narrow corridors

PART THREE
Synthesis

CHAPTER 7
Functionality of Space Design

PART THREE
Synthesis

CHAPTER 7
Functionality of Space Design

7.1. INTRODUCTION

This chapter describes the results of sub-study 6 (functionality of the apartment space designs). First, the design requirements that consist of design standard and the actual space use are presented. Then, the chapter continues with evaluation of functionality of space designs which is determined by: comparing the actual space used by the households in the apartments to the space design standards as formulated and regulated by the Indonesian government; and comparing the designed space as provided in the apartments to the households use of space and to the standard. The chapter is finalized by discussions and conclusions on the functionality of the space designs of the apartments. As such, the chapter answers Research Question 4: "How is the functionality of low cost apartment space designs in Surabaya Indonesia? To what extent do the currently applied space designs meet the users' demands?"

7.2. THE DESIGN REQUIREMENTS

Before revealing the comparisons due to evaluation of functionality of space design, the Indonesian design standards for activities that have been described in chapter 5 as well as the actual space used for carrying out the activities that has been calculated in chapter 6 are presented to provide data in the comparison.

7.2.1. The National Standard

In the following table, one of the design requirements as the indicator of functionality of space designs namely the national standards for activities that have been adapted in chapter 5 is presented in table 7.1. As already discussed in chapter 5, twelve standard activities can be referred directly from the national standard. While the other seven activities: drying, storing-2, praying, studying, child-caring, TV-watching, and playing are proposed to be added by referring to international literature and anthropometric study, as well as arrangement of needed furniture.

Table 7. 1: The Indonesian standard for carrying out each activity

ACTIVITY			DIMENSION	SIZE	SOURCE
1	WASHING	A	1x1.5	1.5	Indonesian standards—Ministry of Public Works No. 306/1989
2	DRYING	B	1.2x1.5	1.8	Arrangement of needed furniture
3	IRONING	C	1x1.5	1.5	Indonesian standards—Ministry of Public Works No. 306/1989
4	STORING-1	D	0.55x1	0.55	Indonesian standards—Ministry of Public Works No. 306/1989
5	COOKING	F	1.4x1.1	1.54	Indonesian standards—Ministry of Public Works No. 306/1989
6	EATING / DINING	G	**1.8x1.2**	2.16	Indonesian standards—Ministry of Public Works No. 306/1989
7	DISH-WASHING	H	1.4x1.1	1.54	Indonesian standards—Ministry of Public Works No. 306/1989
8	STORING-2	I	0.75x1.6	1.2	Neufert
9	BATHING	J	1.2x1.6	1.92	Indonesian standards—Ministry of Public Works No. 306/1989
10	SLEEPING	K	3x2.4	7.2	Indonesian standards—Ministry of Public Works No. 306/1989
11	PRAYING	L	1x1.5	1.5	Arrangement of needed furniture
12	STUDYING	M	1.8x1.5	2.7	A.J. Metric
13	CHILD-CARING	N	1.8x1.5	2.7	Anthropometric study
14	STORING-3	O	3x0.6	1.8	Indonesian standards—Ministry of Public Works No. 306/1989
15	TV-WATCHING	P	3x1.6	4.8	Indonesian standards—Ministry of Public Works No. 306/1989
16	RELAXING	Q	2x1.2	2.4	Anthropometric study
17	PLAYING	R	2.4x1.2	2.88	Anthropometric study
18	ENTERTAINING	S	2x1.2	2.4	Indonesian standards—Ministry of Public Works No. 306/1989
19	STORING-4	T	1.95x1	1.95	Indonesian standards—Ministry of Public Works No. 306/1989
				44.94	

7.2.2. The Actual Space Use

The use of space listed below is the actual space used by the households to carry out their activities. The list of use of space of each activity in table 7.2 is referred from chapter 6.

Table 7. 2: Average use of space of activities of LCRA in Surabaya

LCRA		A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	TOTAL
		wash	dry	iron	stor1	cook	eat	dish	stor2	bath	sleep	pray	study	child	stor3	tv-w	relax	play	enter	stor4	
1	Sombo	1.35	1.27	2.45	0.54	1.88	2.91	1.50	1.10	1.90	5.22	1.73	3.19	2.68	1.68	3.30	3.09	3.07	3.05	1.20	43.11
2	Simo		1.26	2.31	0.52	1.99	2.70		1.30		5.49	1.81	2.95	3.00	1.60	3.10	3.05	3.13	2.74	1.55	38.46
3	Dupak	1.41	1.53	2.04	0.51	1.62	2.55	1.33	1.54	2.11	4.27	1.77	2.58	3.28	1.46	3.17	2.99	3.20	2.95	0.98	41.26
4	Penjar-1	1.15	1.03	2.19	0.83	1.46	2.72	0.94	1.85	1.78	5.04	1.43	2.79	3.14	1.85	3.13	3.09	3.20	2.70	1.37	41.68
5	Penjar-2	1.37	1.2	1.81	0.54	2.24	1.85	1.07	1.18	2.8	4.01	1.62	2.01	2.9	1.9	3.63	2.84	2.79	2.94	1.43	40.12
6	Wono R	1.36	1.2	2.19	0.58	2.40	2.32	1.1	1.04	2.80	4.90	1.76	2.68	2.82	1.70	3.00	3.12	2.44	2.56	1.15	41.16
7	Randu	1.17	1.47	1.87	0.74	1.69	2.2	1.2	0.8	2.7	4.35	1.68	2.06	2.83	1.55	3.19	2.83	2.82	2.53	1.31	39.00
8	Gn-Sari	1.01	1.59	2	0.49	1.31	2.72	1.29	1.05	2	4.49	1.86	3.01	3.35	1.53	4.87	2.87	2.86	3.48	1.2	42.96
9	Waru G	1.49	1.80	2.12	0.48	1.2	2.17	1	1.18	2.40	4.90	1.54	2.18	2.97	1.71	3.05	3.18	3.14	2.56	1.27	40.53
10	Urip-S	1.04	1.25	1.95	0.54	1.94	2.34	1.1	1.15	2	4.73	1.84	2.24	2	1.81	3.62	2.7	2.56	2.67	1.53	39.01
11	T-Merah	1.2	1.8	1.95	0.5	1.9	2.28	1.19	1.01	2.3	4.81	1.89	2.42	3.23	1.54	4.08	2.88	4.46	2.75	1.15	43.32
12	Penjar-3	1.2	1.80	2.23	0.39	1.92	2.36	1.2	0.71	2.60	5.51	1.54	2.58	3.25	1.57	3.88	3.14	3.16	2.95	1.46	43.46
13	Its	1	0.8	2.92	0.66	1.05	3.00	1.00	0.97	2.00	2.40	1.54	3.60		1.24	3.34	3.08		3.08	1.96	33.64
14	Unesa		0.8	2.12	0.57	0.78	2.96		0.75		4.10	1.5	5.5		1.4	2.7	3.59		3.01	2.23	32.00
AVERAGE		1.23	1.34	2.15	0.56	1.67	2.50	1.18	1.12	2.28	4.59	1.68	2.84	2.95	1.61	3.43	3.03	3.07	2.85	1.41	41.51
MEDIAN		1.2	1.26	2.12	0.54	1.78	2.45	1.20	1.07	2.20	4.77	1.70	2.63	2.98	1.58	3.24	3.06	3.10	2.85	1.34	41.10
Use Of Space		**1.23**	**1.34**	**2.15**	**0.56**	**1.78**	**2.50**	**1.20**	**1.12**	**2.28**	**4.77**	**1.70**	**2.84**	**2.98**	**1.61**	**3.43**	**3.06**	**3.10**	**2.85**	**1.41**	**41.91**

7.3. COMPARISON BETWEEN SPACE USE VERSUS THE STANDARD

In this section, the space used by households is compared to the Indonesian standards that have been described in the previous section. This comparison is made in order to find the functionality of the standard as the requirements. The comparisons are presented as follows.

A. WASHING

The standard for washing is 1.50m^2, while the space used by households for this activity is averagely 1.23m^2. These households were forced to cope with the available space. The determination of the use of space for washing inevitably depended on the net space of bathroom after being reduced by the tank and the closet. Small bathroom space is just enough for washing using one bucket. In fact, to wash traditionally, one needs to use at least two buckets. By joining the space for washing to the bathroom, the combined standard space is expected to be more relieving. However, this means that the usage time for bathing should alternate with time for washing. Table 7.3 shows that the standard for washing is still acceptable as the spaces used by all LCRAs are still below the standard.

Table 7. 3: Comparison between the space used for washing and the standard

	LCRA	SPACE USED FOR WASHING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.35**	1.50	0.90	Accepted
2	SIMO		1.50		Accepted
3	DUPAK	1.41	1.50	0.94	Accepted
4	PENJAR-1	1.15	1.50	0.77	Accepted
5	PENJAR-2	1.37	1.50	0.91	Accepted
6	WONO R	1.36	1.50	0.91	Accepted
7	RANDU	1.17	1.50	0.78	Accepted
8	GN-SARI	1.01	1.50	0.67	Accepted
9	WARU G	1.49	1.50	0.99	Accepted
10	URIP-S	1.04	1.50	0.69	Accepted
11	T-MERAH	1.2	1.50	0.80	Accepted
12	PENJAR-3	1.2	1.50	0.80	Accepted
13	ITS	1	1.50	0.67	Accepted
14	UNESA		1.50		Accepted
	AVERAGE	**1.23**	1.50	0.82	Accepted

B. DRYING

The standard for drying is not given therefore it is proposed to be added. Based on the size of two clotheslines it is determined to be 1.8m^2. The space used for this activity is 1.34m^2 on average. There is no problem with the proposed standard as it is still above the space use. As the standard already provided space for two clotheslines, it is expected that the problem might arise due to drying items accumulation in rainy seson, could be solved. Table 7.4 shows that the standard for drying is still acceptable as the spaces used at all LCRAs are still below the standard.

Table 7. 4: Comparison between the space used for drying and the standard

	LCRA	SPACE USED FOR DRYING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	1.27	1.80	0.71	Accepted
2	SIMO	1.26	1.80	0.70	Accepted
3	DUPAK	1.53	1.80	0.85	Accepted
4	PENJAR-1	1.03	1.80	0.57	Accepted
5	PENJAR-2	1.2	1.80	0.67	Accepted
6	WONO R	1.2	1.80	0.67	Accepted
7	RANDU	1.47	1.80	0.82	Accepted
8	GN-SARI	1.59	1.80	0.88	Accepted
9	WARU G	1.80	1.80	1.00	Accepted
10	URIP-S	1.25	1.80	0.69	Accepted
11	T-MERAH	1.8	1.80	1.00	Accepted
12	PENJAR-3	1.80	1.80	1.00	Accepted
13	ITS	0.8	1.80	0.44	Accepted
14	UNESA	0.8	1.80	0.44	Accepted
	AVERAGE	**1.34**	1.80	0.74	Accepted

C. IRONING

The standard for ironing is 1.5m^2, while the average space used for ironing activity is 2.15m^2. Most households just iron on a mattress that usually takes place in the public sub-space. However, the space required is not only for the ironing activity alone. It also needs space for the laundries that are going to be ironed, as well as the pile of clothes that have been ironed. The standard for ironing is intended for ironing on a table. For ironing on the floor, the space size required is wider. Table 7.5 shows that the standard for ironing is not compatible. The spaces used by all LCRAs are already above the standard. Therefore the standard for ironing needs revision.

Table 7. 5: Comparison between the space used for ironing and the standard

LCRA		SPACE USED FOR IRONING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**2.45**	1.50	1.63	Not accepted
2	SIMO	2.31	1.50	1.54	Not accepted
3	DUPAK	2.04	1.50	1.36	Not accepted
4	PENJAR-1	2.19	1.50	1.46	Not accepted
5	PENJAR-2	1.81	1.50	1.21	Not accepted
6	WONO R	2.19	1.50	1.46	Not accepted
7	RANDU	1.87	1.50	1.25	Not accepted
8	GN-SARI	2	1.50	1.33	Not accepted
9	WARU G	2.12	1.50	1.41	Not accepted
10	URIP-S	1.95	1.50	1.30	Not accepted
11	T-MERAH	1.95	1.50	1.30	Not accepted
12	PENJAR-3	2.23	1.50	1.49	Not accepted
13	ITS	2.92	1.50	1.95	Not accepted
14	UNESA	2.12	1.50	1.41	Not accepted
	AVERAGE	**2.15**	1.50	1.43	Not accepted

D. STORING-1

The standard for storing-1 is sharing the national standard space for storage with storing-4. The standard for storage which is set at 2.5m^2 comprises an off space in the middle, and two booths at both ends, one of which is reserved for storing-1 that is found to be 0.55m^2. Storing-1 keeps cleaning, bathing and washing kits. The space used for this activity is averagely 0.56m^2. Table 7.6 shows that the standard is exceeded by the space use in Penjar-1, Wonorejo, Randu, Penjar-3, ITS and Unesa. This might be a signal that the standard needs re-adjustment

Table 7. 6: Comparison between the space used for storing-1 and the standard

LCRA		SPACE USED FOR STORING-1	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**0.54**	0.55	0.98	Accepted
2	SIMO	0.52	0.55	0.93	Accepted
3	DUPAK	0.51	0.55	0.93	Accepted
4	PENJAR-1	0.83	0.55	1.53	Not Accepted
5	PENJAR-2	0.54	0.55	0.98	Accepted
6	WONO R	0.58	0.55	1.02	Not Accepted
7	RANDU	0.74	0.55	1.35	Not Accepted
8	GN-SARI	0.49	0.55	0.89	Accepted
9	WARU G	0.48	0.55	0.87	Accepted
10	URIP-S	0.54	0.55	0.98	Accepted
11	T-MERAH	0.5	0.55	0.95	Accepted
12	PENJAR-3	0.39	0.55	0.71	Accepted
13	ITS	0.66	0.55	1.20	Not Accepted
14	UNESA	0.57	0.55	1.04	Not Accepted
	AVERAGE	**0.56**	0.55	1.02	Not Accepted

E. CLEANING is not taken into consideration as it does not take any specific space area

F. COOKING

The standard for cooking is sharing the standard space for kitchen with dishwashing by half the area of the kitchen which is found to be 1.54m^2. The standard space for the kitchen is divided into spaces for preparing, cooking, dishwashing, and storing. The former two divisions derive the space for cooking, while the remaining two are available for dishwashing. The median space used for cooking that mostly occurs in the kitchen is 1.78m^2. The space use for cooking is a bit beyond the standard. To be able to cook properly improvement of standard is recommended.

Table 7. 7: : Comparison between the space used for cooking and the standard

LCRA		SPACE USE OF COOKING	SANDARD		FUNCTIONALITY (MIN)		FUNCTIONALITY (OPT)	
			MIN	OPT	(%)	ACCEPTANCE		
1	SOMBO	1.88	1.54	2.2	1.22	Not Accepted	0.85	Accepted
2	SIMO	1.99	1.54	2.2	1.29	Not Accepted	0.90	Accepted
3	DUPAK	1.62	1.54	2.2	1.05	Not Accepted	0.74	Accepted
4	PENJAR-1	1.46	1.54	2.2	0.95	Accepted	0.66	Accepted
5	PENJAR-2	2.24	1.54	2.2	1.45	Not Accepted	1.02	Not accepted
6	WONO R	2.4	1.54	2.2	1.56	Not Accepted	1.09	Not accepted
7	RANDU	1.69	1.54	2.2	1.10	Accepted	0.77	Accepted
8	GN-SARI	1.31	1.54	2.2	0.85	Not Accepted	0.60	Accepted
9	WARU G	1.2	1.54	2.2	0.78	Accepted	0.55	Accepted
10	URIP-S	1.94	1.54	2.2	1.26	Not Accepted	0.88	Accepted
11	T-MERAH	1.9	1.54	2.2	1.23	Accepted	0.86	Accepted
12	PENJAR-3	1.92	1.54	2.2	1.25	Not Accepted	0.87	Accepted
13	ITS	1.05	1.54	2.2	0.68	Accepted	0.48	Accepted
14	UNESA	0.78	1.54	2.2	0.51	Accepted	0.35	Accepted
AVERAGE		1.67	1.54	2.2	1.08	Not Accepted	0.76	Accepted
MEDIAN		**1.78**	1.54	2.2	1.16	Not accepted	0.81	Accepted

Table 7.7 shows that the minimum standard for cooking is only compatible for some LCRAs: Penjar-1, Randu, Waru-Gunung, Tanah-Merah, ITS, and Unesa as only the space used in these LCRAs are below the standard while the space used in the other LCRAs exceed the standard. Comparison to the optimum standard also indicates that the space used in Penjar-2 and Wonorejo are already above the standard. Therefore the standard needs adjustments.

G. EATING / DINING

The space for dining in the national standard is 2.16m^2. This standard is based upon a dining room for four people consisting of a small dining table and four chairs. In fact none of the apartments in this research had a private dining room. Most of the time households ate in the multi-functional space although some households occasionally took their meal to the corridor.

Table 7. 8: Comparison between the space used for dining and the standard

LCRA		SPACE USED FOR EATING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**2.91**	2.16	1.35	Not Accepted
2	SIMO	2.70	2.16	1.25	Not Accepted
3	DUPAK	2.55	2.16	1.18	Not Accepted
4	PENJAR-1	2.72	2.16	1.26	Not Accepted
5	PENJAR-2	1.85	2.16	0.86	Accepted
6	WONO R	2.32	2.16	1.07	Not Accepted
7	RANDU	2.2	2.16	1.02	Not accepted
8	GN-SARI	2.72	2.16	1.26	Not Accepted
9	WARU G	2.17	2.16	1.00	Not Accepted
10	URIP-S	2.34	2.16	1.08	Not accepted
11	T-MERAH	2.28	2.16	1.06	Not accepted
12	PENJAR-3	2.36	2.16	1.09	Not Accepted
13	ITS	3.00	2.16	1.39	Not Accepted
14	UNESA	2.96	2.16	1.37	Not Accepted
	AVERAGE	**2.50**	2.16	1.16	Not Accepted

The average space used by households for dining that was found to be 2.50m^2 is larger than the standard space. Therefore the standard calls for adjustment as it is already below the real use of space. Although households do not always dine together formally, standard for dining is crucial to be improved. Table 7.8 above shows that the standard for dining is only compatible for Penjar-2 as only the space used by this LCRA which is below the standard while the others exceed the standard. Therefore the standard requires improvement.

H. DISHWASHING

The standard for washing the dishes is half the area of the standard kitchen which is set at 1.54m^2. Together with cooking, dishwashing activity shares the same equipment (sink) in the kitchen. The median space used for this activity is 1.20m^2 therefore the standard still meet the requirement. The space used for dishwashing was measured only based on the movement of the actor taking into account the size of the equipments or furniture i.e. the sink. While the dimension of a dish rack, or a dish cupboard was instead calculated in the storing-2 activity. Table 7.9 shows that the standard for dish-washing is still acceptable as the spaces used by all LCRAs are still below the standard.

Table 7. 9: Comparison between the space used for dish-washing and the standard

LCRA		SPACE USED FOR D-WASHING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.50**	1.54	0.97	Accepted
2	SIMO	0.00	1.54		
3	DUPAK	1.33	1.54	0.86	Accepted
4	PENJAR-1	0.94	1.54	0.61	Accepted
5	PENJAR-2	1.07	1.54	0.69	Accepted
6	WONO R	1.1	1.54	0.71	Accepted
7	RANDU	1.2	1.54	0.78	Accepted
8	GN-SARI	1.29	1.54	0.84	Accepted
9	WARU G	1	1.54	0.65	Accepted
10	URIP-S	1.1	1.54	0.71	Accepted
11	T-MERAH	1.19	1.54	0.77	Accepted
12	PENJAR-3	1.2	1.54	0.78	Accepted
13	ITS	1.00	1.54	0.65	Accepted
14	UNESA		1.54		
	AVERAGE	1.18	1.54	0.77	Accepted
	MEDIAN	**1.20**	**1.54**	0.78	Accepted

I. STORING-2

The standard for storing the food is determined by referring to Neufert Architect Data based on the size of furniture required i.e. refrigerator and serving table, shelves or cupboard. The size is found to be 1.2 m2. This kind of storing mostly took place in the multi-functional space instead of the kitchen. Most households stored and served their cooked food in the multi-functional space. In addition, foods such as fruit, meat etc were also stored in the refrigerator which was mostly placed in the multi-functional space. The average space used by households for this activity is 1.12m^2. Table 7.10 shows that although the standard for storing-2 is still acceptable for eleven LCRA, but it is not acceptable by the remaining three LCRAs: Simo, Dupak, and Penjar-2. However, as averagely the standard is still above the use of space, revision of the standard needs further consideration.

Table 7. 10: Comparison between the space used for storing-2 and the standard

LCRA		SPACE USED FOR STORING-2	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.10**	1.2	0.92	Accepted
2	SIMO	1.30	1.2	1.08	Not accepted
3	DUPAK	1.54	1.2	1.28	Not accepted
4	PENJAR-1	1.85	1.2	1.54	Not accepted
5	PENJAR-2	1.18	1.2	0.98	Accepted
6	WONO R	1.04	1.2	0.87	Accepted
7	RANDU	0.8	1.2	0.67	Accepted
8	GN-SARI	1.05	1.2	0.88	Accepted
9	WARU G	1.18	1.2	0.98	Accepted
10	URIP-S	1.15	1.2	0.96	Accepted
11	T-MERAH	1.01	1.2	0.84	Accepted
12	PENJAR-3	0.71	1.2	0.59	Accepted
13	ITS	0.97	1.2	0.81	Accepted
14	UNESA	0.75	1.2	0.63	Accepted
	AVERAGE	**1.12**	1.2	0.93	Accepted

J. BATHING and TOILETING

The space for bathroom and toilet is standardized at 1.92m^2 by the government. The average space used for taking a bath and toileting that spent 2.28m^2 exceeds the standard for bathroom & toilet by 119%. In this research, bathroom should also accommodate traditional washing. The combined standard is (1.92+1.50)= 3.42m^2. The combined space use (2.28+1.23) = 3.51m^2 exceeds the combined standard by 103%.

Table 7. 11: Comparison between the space used for bathing/toileting and the standard

LCRA		SPACE USED FOR BATHING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.90**	1.92	0.99	Accepted
2	SIMO				
3	DUPAK	2.11	1.92	1.10	Not Accepted
4	PENJAR-1	1.78	1.92	0.93	Accepted
5	PENJAR-2	2.8	1.92	1.46	Not Accepted
6	WONO R	2.80	1.92	1.46	Not Accepted
7	RANDU	2.7	1.92	1.41	Not Accepted
8	GN-SARI	2	1.92	1.04	Not Accepted
9	WARU G	2.40	1.92	1.25	Not Accepted
10	URIP-S	2	1.92	1.04	Not Accepted
11	T-MERAH	2.3	1.92	1.20	Not Accepted
12	PENJAR-3	2.60	1.92	1.35	Not Accepted
13	ITS	2.00	1.92	1.04	Not Accepted
14	UNESA				
	AVERAGE	**2.28**	1.92	1.19	Not Accepted

Table 7.11 shows that the standard for bathing/toileting is only compatible for Sombo and Penjar-1. The spaces used by the other LCRAs are already above the standard. Simo and Unesa do not have figures for the use of space as they did not have private bathrooms. Actually, Sombo and Penjar-1 were also included as units with collective bathroom, but many of the occupants built their own bathroom on their balcony. Averagely the standard for bathing alone is also exceeded by the space use, therefore this standard needs re-examination.

K. SLEEPING

The national standard for bedroom is 9m^2. However the space allocated for sleeping activity is 7.2m^2. The median space used for sleeping is 4.77m^2 therefore the standard is still functional. The use of space is found relatively in small size as many of households in this research used bunk beds that can accommodate double. Moreover, the space used by the households was measured only based on the sizes of the bed alone, while the standard for sleeping provides extra spaces for others. Table 7.12 shows that the standard for sleeping is still compatible. All spaces used are still below the standard therefore standard for sleeping does not need revision.

Table 7. 12: Comparison between the space used for sleeping and the standard

LCRA		SPACE USED FOR SLEEPING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**5.22**	7.20	0.73	Accepted
2	SIMO	5.49	7.20	0.76	Accepted
3	DUPAK	4.27	7.20	0.59	Accepted
4	PENJAR-1	5.04	7.20	0.70	Accepted
5	PENJAR-2	4.01	7.20	0.56	Accepted
6	WONO R	4.90	7.20	0.68	Accepted
7	RANDU	4.35	7.20	0.60	Accepted
8	GN-SARI	4.49	7.20	0.62	Accepted
9	WARU G	4.90	7.20	0.68	Accepted
10	URIP-S	4.73	7.20	0.66	Accepted
11	T-MERAH	4.81	7.20	0.67	Accepted
12	PENJAR-3	5.51	7.20	0.77	Accepted
13	ITS	2.40	7.20	0.33	Accepted
14	UNESA	4.10	7.20	0.57	Accepted
	AVERAGE	4.59	7.20	0.64	Accepted
	MEDIAN	**4.77**	7.20	0.66	Accepted

L. PRAYING

Since it is not considered in the national standard, based on the size of a praying mat, the standard for this activity is proposed to be 1.5m^2. The median space used by households for praying is 1.70m^2 which is larger than the standard. The space use for praying is indeed greater when they do it in congregation. A husband often asks his wife or children to pray together. Therefore, the standard is not enough. Table 7.13 shows that the standard for praying is not compatible. All spaces used except that of Penjar-1 exceed the standard by 113% therefore revision of standard is required.

Table 7. 13: Comparison between the space used for praying and the standard

LCRA		SPACE USED FOR PRAYING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.73**	1.50	1.15	Not Accepted
2	SIMO	1.81	1.50	1.21	Not Accepted
3	DUPAK	1.77	1.50	1.18	Not Accepted
4	PENJAR-1	1.43	1.50	0.95	Accepted
5	PENJAR-2	1.62	1.50	1.08	Not Accepted
6	WONO R	1.76	1.50	1.17	Not Accepted
7	RANDU	1.68	1.50	1.12	Not Accepted
8	GN-SARI	1.86	1.50	1.24	Not Accepted
9	WARU G	1.54	1.50	1.03	Not Accepted
10	URIP-S	1.84	1.50	1.23	Not Accepted
11	T-MERAH	1.89	1.50	1.26	Not Accepted
12	PENJAR-3	1.54	1.50	1.03	Not Accepted
13	ITS	1.54	1.50	1.03	Not Accepted
14	UNESA	1.5	1.50	1.00	Not Accepted
	AVERAGE	1.68	1.50	1.12	Not Accepted
	MEDIAN	**1.70**	1.50	1.13	Not accepted

M. STUDYING

The space for studying is not included in the national standard therefore it is proposed to be added. The size is determined by referring to A.J. Metric Handbook which is found to be 2.7m^2. The space used by households which averagely is 2.84m^2 exceeds the standard by 105%. This standard is not sufficient, especially when the space is used for more than one child studying together, and conducted on the floor instead of on learning table.

Table 7. 14: Comparison between the space used for studying and the standard

	LCRA	SPACE USED FOR STUDYING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**3.19**	2.70	1.18	Not Accepted
2	SIMO	2.95	2.70	1.09	Not Accepted
3	DUPAK	2.58	2.70	0.96	Accepted
4	PENJAR-1	2.79	2.70	1.03	Not Accepted
5	PENJAR-2	2.01	2.70	0.74	Accepted
6	WONO R	2.68	2.70	0.99	Accepted
7	RANDU	2.06	2.70	0.76	Accepted
8	GN-SARI	3.01	2.70	1.11	Not Accepted
9	WARU G	2.18	2.70	0.81	Accepted
10	URIP-S	2.24	2.70	0.83	Accepted
11	T-MERAH	2.42	2.70	0.90	Accepted
12	PENJAR-3	2.58	2.70	0.96	Accepted
13	ITS	3.60	2.70	1.33	Not Accepted
14	UNESA	5.5	2.70	2.04	Not Accepted
	AVERAGE	**2.84**	2.70	1.05	Not Accepted

Table 7.14 shows that although the standard for studying is still compatible for Dupak, Penjar-2, Wonorejo, Randu, Waru-Gunung, Urip, T-Merah and Penjar-3 but it is not acceptable for the other remaining LCRAs. The average use of space also exceeds the standard. Therefore the standard must be enlarged and adjusted.

N. CHILD-CARING

Child-caring is also one of the activities that are not standardized by the government. The standard for this activity is proposed to be added by using anthropometric study based on the size of a mother plus her baby in sleeping condition on a bed (1.5x1.8) = 2.7m^2. The standard is expected to be fitted for a mother breastfeeding her baby. However, the median space use for this activity that consumes 2.98m^2 is 110% larger than the standard. Table 7.15 shows that ITS and Unesa did not have the figure for use of space as there were no child in these LCRAs. The standard for child-caring is only compatible for Sombo and Urip. All the remaining spaces used already exceed the standard. Thus the standard for child-caring must be enlarged and adjusted to the size that is actually required for doing this activity.

Table 7. 15: Comparison between the space used for child-caring and the standard

	LCRA	SPACE USED FOR CH-CARING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**2.68**	2.70	0.99	Accepted
2	SIMO	3.00	2.70	1.11	Not Accepted
3	DUPAK	3.28	2.70	1.21	Not Accepted
4	PENJAR-1	3.14	2.70	1.16	Not Accepted
5	PENJAR-2	2.9	2.70	1.07	Not Accepted
6	WONO R	2.82	2.70	1.04	Not Accepted
7	RANDU	2.83	2.70	1.05	Not Accepted
8	GN-SARI	3.35	2.70	1.24	Not Accepted
9	WARU G	2.97	2.70	1.10	Not Accepted
10	URIP-S	2	2.70	0.74	Accepted
11	T-MERAH	3.23	2.70	1.20	Not Accepted
12	PENJAR-3	3.25	2.70	1.20	Not Accepted
13	ITS		2.70		
14	UNESA		2.70		
	AVERAGE	2.95	2.70	1.09	Not Accepted
	MEDIAN	**2.98**	2.70	1.10	Not accepted

O. STORING-3

The standard for storing clothes, sheets, towels, blankets, and alike is taken from the standard for bedroom by taking into account only the cupboard size which is found to be 1.8m^2. The space used by the households is averagely 1.61m^2. Thus, the standard for this storing activity can meet the space requirement by functionality of 89%. Table 7.16 shows that although the standard for storing-3 is still compatible for most LCRAs, it is not acceptable by Penjar-1, Penjar-2, and Urip. However, since the average use of space is still below the standards, the revision of the standard needs further consideration.

Table 7. 16: Comparison between the space used for storing-3 and the standard

LCRA		SPACE USED FOR STORING-3	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.68**	1.80	0.93	Accepted
2	SIMO	1.60	1.80	0.89	Accepted
3	DUPAK	1.46	1.80	0.81	Accepted
4	PENJAR-1	1.85	1.80	1.03	Not Accepted
5	PENJAR-2	1.9	1.80	1.06	Not Accepted
6	WONO R	1.70	1.80	0.94	Accepted
7	RANDU	1.55	1.80	0.86	Accepted
8	GN-SARI	1.53	1.80	0.85	Accepted
9	WARU G	1.71	1.80	0.95	Accepted
10	URIP-S	1.81	1.80	1.01	Not Accepted
11	T-MERAH	1.54	1.80	0.86	Accepted
12	PENJAR-3	1.57	1.80	0.87	Accepted
13	ITS	1.24	1.80	0.69	Accepted
14	UNESA	1.4	1.80	0.78	Accepted
	AVERAGE	**1.61**	1.80	0.89	Accepted

P. TV-WATCHING

Standard for watching TV refers to the national standard for the living room, by only taking into account the space for watching TV. The size is found to be 4.80m^2. The space used for this activity is 3.43m^2 on average. Therefore the standard still meets the requirement. The standard is still adequate even when the TV is sized in larger inches where longer distance is required. Table 7.17 shows that the standard for watching TV is still compatible for all most LCRAs, except for Gunung-Sari. All spaces used are still below the standard except for this one. However, the standard is not exceeded by the average use of space.

Table 7. 17: Comparison between the space used for watching TV and the standard

LCRA		SPACE USED FOR WTACHING-TV	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**3.30**	4.80	0.69	Accepted
2	SIMO	3.10	4.80	0.65	Accepted
3	DUPAK	3.17	4.80	0.66	Accepted
4	PENJAR-1	3.13	4.80	0.65	Accepted
5	PENJAR-2	3.63	4.80	0.76	Accepted
6	WONO R	3.00	4.80	0.63	Accepted
7	RANDU	3.19	4.80	0.66	Accepted
8	GN-SARI	4.87	4.80	1.01	Not Accepted
9	WARU G	3.05	4.80	0.64	Accepted
10	URIP-S	3.62	4.80	0.75	Accepted
11	T-MERAH	4.08	4.80	0.85	Accepted
12	PENJAR-3	3.88	4.80	0.81	Accepted
13	ITS	3.34	4.80	0.70	Accepted
14	UNESA	2.7	4.80	0.56	Accepted
	AVERAGE	**3.43**	4.80	0.71	Accepted

Q. RELAXING

The standard for relaxing is not specified in the national standard. It is proposed to be included by using anthropometric for a man who was lying. The standard is determined to be 2.4m^2. However, the median space used by households which is 3.06m^2 exceeds the standard by 128%. Table 7.18 shows that the standard for relaxing is not compatible. All spaces used by LCRAs are already above the standard. Therefore the standard needs to be improved.

Table 7. 18: Comparison between the space used for relaxing and the standard

LCRA		SPACE USED FOR RELAXING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**3.09**	2.40	1.29	Not Accepted
2	SIMO	3.05	2.40	1.27	Not Accepted
3	DUPAK	2.99	2.40	1.25	Not Accepted
4	PENJAR-1	3.09	2.40	1.29	Not Accepted
5	PENJAR-2	2.84	2.40	1.18	Not Accepted
6	WONO R	3.12	2.40	1.30	Not Accepted
7	RANDU	2.83	2.40	1.18	Not Accepted
8	GN-SARI	2.87	2.40	1.20	Not Accepted
9	WARU G	3.18	2.40	1.33	Not Accepted
10	URIP-S	2.7	2.40	1.13	Not Accepted
11	T-MERAH	2.88	2.40	1.20	Not Accepted
12	PENJAR-3	3.14	2.40	1.31	Not Accepted
13	ITS	3.08	2.40	1.28	Not Accepted
14	UNESA	3.59	2.40	1.50	Not Accepted
	AVERAGE	3.03	2.40	1.26	Not Accepted
	MEDIAN	**3.06**	2.40	1.28	Not Accepted

R. PLAYING

The standard for playing is not specified by the national standard therefore it is proposed to be included based on anthropometric study for two children which is found to be 2.88m^2. However, the median space used for playing by the children which size is 3.10m^2 exceeds the standard by 108%. Table 7.19 shows that the standard for playing is only compatible for five LCRAs: Penjar-2, Wonorejo, Gunungsari, Randu and Urip. All the remaining spaces used are above the standard. Therefore the standard space for playing should be repaired.

Table 7. 19: Comparison between the space used for playing and the standard

LCRA		SPACE USED FOR PLAYING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**3.07**	2.88	1.07	Not Accepted
2	SIMO	3.13	2.88	1.09	Not Accepted
3	DUPAK	3.20	2.88	1.11	Not Accepted
4	PENJAR-1	3.20	2.88	1.11	Not Accepted
5	PENJAR-2	2.79	2.88	0.97	Accepted
6	WONO R	2.44	2.88	0.85	Accepted
7	RANDU	2.82	2.88	0.98	Accepted
8	GN-SARI	2.86	2.88	0.99	Accepted
9	WARU G	3.14	2.88	1.09	Not Accepted
10	URIP-S	2.56	2.88	0.89	Accepted
11	T-MERAH	4.46	2.88	1.55	Not Accepted
12	PENJAR-3	3.16	2.88	1.10	Not Accepted
13	ITS		2.88		
14	UNESA		2.88		
	AVERAGE	3.07	2.88	1.07	Not Accepted
	MEDIAN	**3.10**	2.88	1.08	Not Accepted

S. ENTERTAINING

The standard for entertaining is taken from the national standard for sitting room which size is 3.3m^2, while the average space use for this activity is 2.85m^2. Thus the standard is still above the required space. Table 7.20 shows that the standard for entertaining is still compatible, except for Gunungsari. All the other spaces used as well as the average size are still below the standard. Averagely, the standard is still 86% the standard space.

Table 7. 20: Comparison between the space used for entertaining and the standard

LCRA		SPACE USED FOR ENTERTAINING	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**3.05**	3.30	0.92	Accepted
2	SIMO	2.74	3.30	0.83	Accepted
3	DUPAK	2.95	3.30	0.89	Accepted
4	PENJAR-1	2.70	3.30	0.82	Accepted
5	PENJAR-2	2.94	3.30	0.89	Accepted
6	WONO R	2.56	3.30	0.78	Accepted
7	RANDU	2.53	3.30	0.77	Accepted
8	GN-SARI	3.48	3.30	1.05	Not Accepted
9	WARU G	2.56	3.30	0.78	Accepted
10	URIP-S	2.67	3.30	0.81	Accepted
11	T-MERAH	2.75	3.30	0.83	Accepted
12	PENJAR-3	2.95	3.30	0.89	Accepted
13	ITS	3.08	3.30	0.93	Accepted
14	UNESA	3.01	3.30	0.91	Accepted
	AVERAGE	**2.85**	3.30	0.86	Accepted

T. STORING-4

The standard for storing-4 (school supplies, work tools, electronics, and all other items that are not included in storing-1, 2, and 3), is taken from the national standard for storage, by taking one booth and the centre space which size is 1.95m^2. The space used by households for this activity is averagely 1.41m^2. So, the standard is still acceptable. Table 7.21 indicates that the standard for storing-4 is still compatible except for two LCRAs: ITS and Unesa. The spaces used of these two exceed the standard, but averagely it is still compatible. The standard is still functional as the average use of space is still 72% of the standard size.

Table 7. 21: Comparison between the space used for storing-4 and the standard

LCRA		SPACE USED FOR STORING-4	STANDARD	FUNCTIONALITY	ACCEPTANCE
1	SOMBO	**1.20**	1.95	0.62	Accepted
2	SIMO	1.55	1.95	0.79	Accepted
3	DUPAK	0.98	1.95	0.50	Accepted
4	PENJAR-1	1.37	1.95	0.70	Accepted
5	PENJAR-2	1.43	1.95	0.73	Accepted
6	WONO R	1.15	1.95	0.59	Accepted
7	RANDU	1.31	1.95	0.67	Accepted
8	GN-SARI	1.2	1.95	0.62	Accepted
9	WARU G	1.27	1.95	0.65	Accepted
10	URIP-S	1.53	1.95	0.78	Accepted
11	T-MERAH	1.15	1.95	0.59	Accepted
12	PENJAR-3	1.46	1.95	0.75	Accepted
13	ITS	1.96	1.95	1.01	Not Accepted
14	UNESA	2.23	1.95	1.14	Not Accepted
	AVERAGE	**1.41**	1.95	0.72	Accepted

Recapitulation of the Comparison

Table 7. 22: Recapitulation of space required that compared to the standard

ACTIVITIES		STANDARD	SPACE USED	UOS /STANDARD	STANDARD / UOS	UOS EXEEDS STANDARD
A	Washing	**1.50**	**1.23**	0.75	1.33	
B	Drying	**1.80**	**1.34**	0.74	1.34	
C	Ironing	**1.50**	**2.15**	1.43	0.70	Not functional
D	Storing-1	**0.55**	**0.56**	1.02	0.98	Not functional
F	Cooking	**1.54**	**1.78**	1.16	0.87	Not functional
G	Eating/dining	**2.16**	**2.50**	1.16	0.86	Not functional
H	Dishwashing	**1.54**	**1.20**	0.77	1.29	
I	Storing-2	**1.20**	**1.12**	0.93	1.07	
J	Bathing	**1.92**	**2.28**	1.10	0.91	Not functional
K	Sleeping	**7.20**	**4.77**	0.66	1.51	
L	Praying	**1.50**	**1.70**	1.13	0.88	Not functional
M	Studying	**2.70**	**2.84**	1.05	0.95	Not functional
N	Child-Caring	**2.70**	**2.98**	1.10	0.91	Not functional
O	Storing-3	**1.80**	**1.61**	0.89	1.12	
P	TV-Watching	**4.80**	**3.43**	0.71	1.40	
Q	Relaxing	**2.40**	**3.06**	1.28	0.78	Not functional
R	Playing	**2.88**	**3.10**	1.08	0.93	Not functional
S	Entertaining	**3.30**	**2.85**	0.86	1.16	
T	Storing-4	**1.95**	**1.41**	0.72	1.38	
	TOTAL	**44.94**	**41.91**	0.98	1.07	

FINDINGS

- Table 7.22 shows that the spaces used for washing, drying, dishwashing, storing-2, sleeping, storing-3, TV-watching, entertaining and storing-4 are still below the standard. However, although the total standard is larger than the total of use of space, the spaces used for ironing, storing-1, cooking, dining, bathing, praying, studying, child-caring, relaxing, and playing exceed the standard.
- The use of space which totally is 41.91m^2 has to be accommodated by average provided space of only 23.14m^2. This indicates that some activities are carried out in the same space. This condition is prone to the risk of conflict, which led to the need for adaptation.

7.4. COMPARISON BETWEEN THE PROVIDED SPACE, STANDARD, AND THE USE OF SPACE

This section discusses the functionality of the available space provided by the government which is obtained by comparing the space provided to the standard, as well as to the space required as described in the following.

7.4.1. Functionality of the Current Space Design of the Whole Unit

Table 7.23 shows that averagely the whole unit was only provided 51% of the standard space by the government. Whereas the average effectiveness of the whole unit is 181%, and the space use of Waru-Gunung can even reach almost twice the existing space by 194%. The high effectiveness of space is mainly due to the creativity of the occupants in setting the time in conducting the activity. However, the average space use is still 93% or below the standard.

Table 7. 23: Comparison of provided space, standard, and the use of space for the whole unit

	WHOLE UNIT								SPACE USE EXCEEDS THE STANDARD
	LCRA	PROVIDED SPACE	STANDARD	PROVIDED / STANDARD	SPACE USE	PROVIDED / SPACE USE	SPACE USE / PROVIDED	SPACE USE /STANDARD	
1	SOMBO	**22.50**		0.50	**43.11**	0.52	1.92	0.96	
2	SIMO	**22.50**		0.50	**38.46**	0.58	1.71	0.86	
3	DUPAK	**22.50**		0.50	**41.26**	0.55	1.83	0.92	
4	PENJ-1	**22.50**		0.50	**41.68**	0.54	1.85	0.93	
5	PENJ-2	**22.50**		0.50	**40.12**	0.56	1.78	0.89	
6	WONO-R	**22.50**		0.50	**41.16**	0.55	1.83	0.92	
7	RANDU	**22.80**	**44.94**	0.51	**39.00**	0.58	1.71	0.87	
8	GN-SARI	**31.40**		0.70	**42.96**	0.73	1.37	0.96	
9	WARU-G	**20.90**		0.47	**40.53**	0.52	1.94	0.90	
10	URIP-S	**24.00**		0.53	**39.01**	0.62	1.63	0.87	
11	T-MERAH	**22.50**		0.50	**43.32**	0.52	1.93	0.96	
12	PENJ-3	**26.90**		0.60	**43.46**	0.62	1.62	0.97	
13	ITS	**21.70**		0.48	**33.64**	0.65	1.55	0.75	
14	UNESA	**18.70**		0.42	**32.00**	0.58	1.71	0.71	
		23.14		**0.51**	**39.98***	**0.58**	**1.73**	**0.89**	
					41.91**	**0.55**	**1.81**	**0.93**	

7.4.2. Functionality of the Current Space Design of the Multi-Functional Space

From table 7.24 it is seen that averagely the multi-functional space was only provided 50% of the standard by the government. In fact, the average effectiveness of the multi-functional space is 186%, and the space use of Waru-Gunung and Tanah-Merah even reached more than twice the existing space by 205% and 251%. This could happen due to the occupants' creativity in utilizing the space by arranging the best time in carrying out their activities. The space use is averagely still 93% of the standard, but the use of space in Gunungsari is equal to the standard.

Table 7. 24: Comparison of existing, standard, and the use of space for the multi-functional space

	MULTI-FUNCTIONAL SPACE								SPACE USE EXCEEDS THE STANDARD
	LCRA	PROVIDED SPACE	STANDARD	PROVIDED / STANDARD	SPACE USE	PROVIDED/ SPACE USE	SPACE USE / PROVIDED	SPACE USE /STANDARD	
1	SOMBO	18.00		0.52	**33.70**	0.53	1.87	0.97	
2	SIMO	18.00		0.52	**33.43**	0.54	1.86	0.96	
3	DUPAK	18.00		0.52	**31.63**	0.57	1.76	0.91	
4	PENJ-1	18.00		0.52	**32.61**	0.55	1.81	0.93	
5	PENJ-2	16.50		0.47	**30.80**	0.54	1.87	0.88	
6	WONO-R	16.50		0.47	**30.87**	0.53	1.87	0.88	
7	RANDU	15.60	**34.89**	0.45	**29.61**	0.53	1.90	0.85	
8	GN-SARI	23.40		0.67	**35.00**	0.67	1.50	1.00	V
9	WARU-G	15.20		0.44	**31.22**	0.49	2.05	0.89	
10	URIP-S	18.00		0.52	**30.36**	0.59	1.69	0.87	
11	T-MERAH	13.50		0.39	**33.87**	0.40	2.51	0.97	
12	PENJ-3	17.40		0.50	**34.23**	0.51	1.97	0.98	
13	ITS	17.60		0.50	**26.24**	0.67	1.49	0.75	
14	UNESA	18.00		0.52	**29.14**	0.62	1.62	0.84	
		17.41		**0.50**	**31.62***	**0.55**	**1.82**	**0.91**	
					32.41**	**0.54**	**1.86**	**0.93**	

7.4.3. Functionality of the Current Space Design of the Kitchen

For the kitchen it is seen from table 7.25 that averagely the government only provided 55% of the standard size, whereas the average effectiveness of the kitchen is 174%. Even the space used for the kitchen in Penjar-2, Wonorejo, Waru-Gunung and Urip-S could reach more than twice the existing space. The high space effectiveness is mainly due to the creativity of the occupants in setting the time of activity occurrences. Although the space used by households is averagely still below the standard size by 96%, the space used in Sombo, Dupak, Penjar-2, and Wonorejo exceeds the standard by 105%-107%, therefore the standard needs re-examination.

Table 7. 25: Comparison of existing, standard, and the use of space for the kitchen / pantry

	KITCHEN / PANTRY								SPACE USE EXCEEDS THE STANDARD
	LCRA	PROVIDED SPACE	STANDARD	PROVIDED / STANDARD	SPACE USE	PROVIDED / SPACE USE	SPACE USE / PROVIDED	SPACE USE /STANDARD	
1	SOMBO				4.48			1.05	V
2	SIMO				3.29			0.77	
3	DUPAK				4.49			1.05	V
4	PENJ-1				4.25			0.99	
5	PENJ-2	1.80		0.42	4.49	0.40	2.49	1.05	V
6	WONO-R	1.80		0.42	4.58	0.39	2.55	1.07	V
7	RANDU	2.70	4.28	0.63	3.69	0.73	1.37	0.86	
8	GN-SARI	2.80		0.65	3.64	0.77	1.30	0.85	
9	WARU-G	1.50		0.35	3.58	0.42	2.39	0.84	
10	URIP-S	2.00		0.47	4.19	0.48	2.09	0.98	
11	T-MERAH	2.25		0.53	4.10	0.55	1.82	0.96	
12	PENJ-3	4.05		0.95	3.83	1.06	0.95	0.90	
13	ITS				3.02			0.70	
14	UNESA				1.54			0.36	
		2.36		**0.55**	**3.80***	**0.62**	**1.61**	**0.89**	
					4.10**	**0.58**	**1.74**	**0.96**	

* Average use of space of all LCRA
** When the use of space is a mixture of average and median

7.4.4. Functionality of the Current Space Design of the Bathroom & Toilet

Table 7.26 indicates that for the bathroom/toilet the government provided 75% the standard. The average effectiveness of the bathroom/toilet is 137%. The spaces used for bathroom/toilet in Dupak, Penjar-2, Wonorejo, Randu, Waru-Gunung, Tanah-Merah, and Penjar-3 are already above the standard. Moreover, the average space use exceeds the standard by 103%. The compatibility of standard must be re-adjusted. Bathroom is also used for traditional washing.

Table 7. 26: Comparison of existing, standard, and the use of space for the bathroom / toilet

	BATHROOM / TOILET								SPACE USE EXCEEDS THE STANDARD
	LCRA	PROVIDED SPACE	STANDARD	PROVIDED / STANDARD	SPACE USE	PROVIDED / SPACE USE	SPACE USE / PROVIDED	SPACE USE /STANDARD	
1	SOMBO				**3.25**			0.95	
2	SIMO								
3	DUPAK				**3.51**			1.03	V
4	PENJ-1				**2.94**			0.86	
5	PENJ-2	2.40		0.70	**4.17**	0.58	1.74	1.22	V
6	WONO	2.40		0.70	**4.16**	0.58	1.73	1.22	V
7	RANDU	2.70	3.42	0.79	**3.87**	0.70	1.43	1.13	V
8	GN-SARI	2.40		0.70	**3.01**	0.80	1.25	0.88	
9	WARU-G	2.70		0.79	**3.89**	0.69	1.44	1.14	V
10	URIP-S	2.00		0.58	**3.04**	0.66	1.52	0.89	
11	T-MERAH	2.25		0.66	**3.50**	0.64	1.56	1.02	V
12	PENJ-3	2.70		0.79	**3.80**	0.71	1.41	1.11	V
13	ITS	3.50		1.02	**3.00**	1.17	0.86	0.88	
14	UNESA			0.00					
		2.56		**0.75**	**3.51**	**0.73**	**1.37**	**1.03**	**V**

7.4.5. Functionality of the Current Space Design of the Balcony

Table 7.27 shows that averagely the balcony of LCRA in Surabaya was provided sufficiently by 116% of the standard space. Average effectiveness of the balcony is only 70%, even balcony effectiveness of 6 LCRAs were smaller than 50% of the existing space. However, Waru-Gunung and Unesa used the balcony very effectively, and ITS even reached more than twice the existing space. The space used by households is averagely still below the standard size i.e. 81%. So, there is no problem with the standard and provision for the balcony space.

Table 7. 27: Comparison of existing, standard, and the use of space for the balcony

		BALCONY							SPACE USE EXCEEDS THE STANDARD
	LCRA	PROVIDED SPACE	STANDARD	PROVIDED / STANDARD	SPACE USE	PROVIDED / SPACE USE	SPACE USE / PROVIDED	SPACE USE /STANDARD	
1	SOMBO	4.50	2.35	1.91	**1.81**	2.49	0.40	0.77	
2	SIMO	4.50		1.91	**1.78**	2.53	0.39	0.76	
3	DUPAK	4.50		1.91	**2.04**	2.21	0.45	0.87	
4	PENJ-1	4.50		1.91	**1.85**	2.43	0.41	0.79	
5	PENJ-2	1.80		0.77	**1.74**	1.03	0.97	0.74	
6	WONO-R	1.80		0.77	**1.78**	1.01	0.99	0.76	
7	RANDU	1.80		0.77	**2.21**	0.81	1.23	0.94	
8	GN-SARI	2.80		1.19	**2.08**	1.35	0.74	0.89	
9	WARU-G	1.50		0.64	**2.28**	0.66	1.52	0.97	
10	URIP-S	2.00		0.85	**1.79**	1.12	0.89	0.76	
11	T-MERAH	4.50		1.91	**2.30**	1.95	0.51	0.98	
12	PENJ-3	2.70		1.15	**2.19**	1.24	0.81	0.93	
13	ITS	0.60		0.26	**1.46**	0.41	2.43	0.62	
14	UNESA	0.72		0.31	**1.37**	0.53	1.90	0.58	
		2.73		**1.16**	**1.91**	**1.43**	**0.70**	**0.81**	

FINDINGS:

- The current space design provided by the government was only 50-55% of the standard size either for the whole unit, the multi-functional space, or the kitchen. Even the whole unit of Unesa was provided only 42% and Waru-Gunung 47% of the standard size. Waru-Gunung with available space only 20.7m^2 was able to utilize the space up to 40.05m^2. Multi-functional space of Tanah-Merah was only provided 39% of the standard size. With provided space of 13.5m^2 it could multiply the utilization of the existing space up to 2.47 times. Waru-Gunung with kitchen area provided only 32% of the standard, managed to increase the use of the available space 2.39 times.

- Provision of bathroom/toilet area was a slightly larger i.e. 75% of the standard size except for Urip-S which was provided only 58%, and Tanah-Merah 66%. The average use of space of bathroom exceeds the standard by 103% therefore standard adjustment for bathroom must be made.

- Only the balcony was provided more than the standard even almost twice the standard size for Sombo, Simo, Dupak, Penjar-1, and Tanah-Merah. However the balcony of ITS and Unesa were provided only 26% and 31%, and the occupants intensified in quite high effectiveness by using the space approximately reaching twice the provided space.

- However, the significant effectiveness means the increasing number of activities that must be accommodated by a space. The large number of activities that must be accommodated, result in overlap between the activities, especially when they take place simultaneously in the same place. The overlap is not only due to the amount of activities, but also coupled with the number of members within the households who carry out the activities. These conflicts require adaptation.

- When viewed from the average space adequacy in meeting the real needs of the family, all the standard for unit parts are averagely still above the use of space except for bathroom & toilet.

Recapitulation of the Comparison

- The space requirements that have been examined in the previous section are compared to the activity and room (unit part) standards, as well as to the provided space.

Table 7. 28: Adapted standard to the space use and to the provided space

PROVIDED SPACE		USE OF SPACE		RELEVANT ACTIVITIES			NATIONAL STANDARD			
UNIT PART	SIZE	UNIT-PART	SIZE				SIZE	ADAPTED	ORIGINAL	FUNCTIONAL-AREA
MULTI-FUNCTIONAL SPACE	17.41	32.4	2.15	C	Ironing	**1.50**	**34.89**	1.5	IRONING
			2.50	G	Eating/dining	**2.16**		2.16	DINING
			4.77	K	Sleeping	7.20		9	BEDROOM
			1.61	O	Storing-3	1.80			
			2.98	N	Child-caring	**2.70**			top-up
			3.06	Q	Relaxing	**2.40**			top-up
			1.70	L	Praying	**1.50**			top-up
			2.84	M	Studying	**2.70**			top-up
			3.10	R	Playing	**2.88**			top-up
			3.43	P	TV-watching	4.80		4.8	TV WATCHING
			2.85	S	Entertaining	3.30		3.3	SITTING
			1.41	T	Storing-4	1.95		2.5	STORAGE
BALCONY	2.73	1.9	0.56	D	Storing-1	**0.55**	**2.35**		
			1.34	B	Drying	1.80			top-up
KITCHEN	2.36^ **1.35****	4.10	1.78	F	Cooking	**1.54**	**4.28**	3.08	KITCHEN
			1.20	H	Dishwashing	1.54			
			1.12	I	Storing-2	1.20		1.68	
BATHROOM & TOILET	2.56* **1.65****	3.51	2.28	J	Bathing	**1.92**	**3.42**	1.92	BATHROOM
			1.23	A	Washing	1.50		1.5	WASHING
WHOLE UNIT	25.06* **23.14****	**41.91**	**41.91**			**44.94**	**44.94**	**29.76**	

*) The first set of figures are larger because they use the average of only eight LCRAs for kitchen and bathroom & toilet since the other six did not have individual kitchen, bathroom & toilet in their unit. These figures will be used when dealing with kitchen and bathroom & toilet.

**) The second set of figure are smaller because they use the average of the real data meaning zero for kitchen and bathroom & toilet in six LCRAs that did not have individual kitchen & bathroom in their units. The second figure of the whole unit space will be used since this reflects the real average total space.

FINDINGS:

- The comparison between the standard, the space use, and the available space provided by the government indicated in table 7.28 above shows that the standard which original size is 29.76m^2, is adapted to 44.94m^2, whereas the use of space is 41.91m^2, and the average provided space is 23.14m^2.
- The provision of spaces in the units fall significantly behind the national standards except for the balcony: the whole unit (51%), multi-functional space (50%), kitchen (55%), and the bathroom/toilet (75%). The median size of spaces measure 55% of the national standards in terms of provided space.
- Standard for bathroom & toilet is smaller than the use of space therefore it needs revision. When viewed from standard per activity, ten standards of nineteen activities are below the actual space use.

7.5. REVISION OF THE INDONESIAN STANDARDS

In the evaluation above, it is proved that the adapted Indonesian standard needs to be revised as several spaces use of some activities exceeds the standard size.

7.5.1. Revision of the Adapted Standards

The improvement should maintain the standards that meet the actual space use and replace those that have been outgrown by the actual use of space. Through this revision, the previous findings regarding the standards for activities that have been exceeded by the use of space are repaired. The revision of the standard can be seen in the following table.

Table 7. 29: revision of the adapted standards

PROVIDED SPACE		USE OF SPACE		HOUSEHOLD ACTIVITIES		STANDARD					
UNIT PART	SIZE	UNIT PART	SIZE			SIZE	ADAPTED	ORIGINAL	FUNCTIONAL AREAS	REVISED	
MULTI-FUNCTIONAL SPACE	17.41	32.4	2.15	C	Ironing	**1.5**	34.89	1.5	IRONING	**2.15**	**37.38**
			2.5	G	Eating/dining	**2.16**		2.16	DINING	**2.5**	
			4.77	K	Sleeping	7.2		9	BEDROOM	7.2	
			1.61	O	Storing-3	1.8				1.8	
			2.98	N	Child-caring	**2.7**			*top-up*	**2.98**	
			3.06	Q	Relaxing	**2.4**			*top-up*	**3.06**	
			1.7	L	Praying	**1.5**			*top-up*	**1.7**	
			2.84	M	Studying	**2.7**			*top-up*	**2.84**	
			3.1	R	Playing	**2.88**			*top-up*	**3.1**	
			3.43	P	TV-watching	4.8		4.8	TV-WATCHING	4.8	
			2.85	S	Entertaining	3.3		3.3	SITTING ROOM	3.3	
			1.41	T	Storing-4	1.95		2.5	STORAGE	1.95	
BALCONY	2.73	1.9	0.56	D	Storing-1	**0.55**	2.35			**0.56**	**2.73**
			1.34	B	Drying	1.8			*top-up*	1.8	
KITCHEN	2.36	4.10	1.78	F	Cooking	**1.54**	4.28	3.08	KITCHEN	**1.78**	**4.52**
			1.20	H	Dishwashing	1.54				1.54	
			1.12	I	Storing-2	1.2				1.2	
BATHROOM & TOILET	2.56	3.51	2.28	J	Bathing	**1.92**	3.42	1.92	BATHROOM	**2.28**	**3.78**
			1.23	A	Washing	1.5		1.5	WASHING	1.5	
WHOLE UNIT	**25.06**	**41.91**	**41.91**			**44.94**	**44.94**	**29.76**		**48.04**	**48.41**

From table 7.29 can be seen that ten of nineteen adapted standards for activities are exceeded by the actual space use, therefore they are revised and replaced with the size of the use of space. When looking at the sizes for the unit parts, adapted standard for bathroom is below the use of space which is 3.51m^2, therefore the standard is revised from 3.42m^2 to 3.78m^2. Thus, the adapted standard for whole unit which size is 44.94m^2 is no longer eligible for both the unit parts and activities. Although the use of space for the whole unit which is 41.91m^2 is still below the standard, there are ten standards for activities that must be corrected as they are exceeded by the space use. To be design requirements the standard is revised to 48.41m^2. Actually, the total size for the whole unit is 48.04m^2. However, the provided spacious balcony which averagely is 2.73m^2 is to be maintained in order to cover the needs of larger space or changing spatial needs in the future. Therefore the final revised standard for the whole unit is 48.41m^2.

7.5.2. Validation of the Revised Standards

To give an idea of the feasibility, the proposed national standards resulted in this research are validated by comparing it to the relevant international standards and best practices which were presented in chapter 5 (section 5.3.2). The comparison will be described in the following table.

Table 7. 30: The proposed standards compared with relevant international standards (in square meters)

UNIT PART	Research Proposal	ACT Australia	Building Centre Japan	UFC USA	INDIA	MALAYSIA	SRI-LANKA	ALBERTA CANADA	Parker Morris Australia
Whole unit area	48.24	40	50		42.91	46.8	46.5		
Multi-F space	37.38							38	
Kitchen	4.52			4.50		7.2	5		
Bathroom + WC	3.61			2.80			1.62		
Storing space	5.50						2.5		4 to 5
Unit height	3.70			2.75	3.11		2.8		

Table 7.30 shows that the proposed standard for the whole unit size is 48.41m^2. This size is between the standard of ACT Planning & Land Authority Australia i.e. 40m^2 as the smallest size, and the standard of Building Centre Japan i.e. 50m^2 as the largest. The proposed standard is comparable with that applied in Malaysia which size is 46.8m^2, and in Sri Lanka which size is 46.5m^2. The difference from that applied in India is a little bigger as India applied standard size of 42.91m^2. But all the standard sizes either which is proposed by this research or which are applied in India, Malaysia, and Sri Lanka all are considered still comparable.

Standard for multi-functional space in this research is proposed to be 37.38m^2. According to Alberta Health and Wellness Canada (1999): “A housing premises shall be deemed to be overcrowded if a habitable room in it that is not a bedroom but is used for sleeping purposes in combination with any other use has less than 9.5m^2 of floor space for each adult sleeping in the habitable room”. As the multi-functional space in this research can be considered as similar to habitable room, the multi-functional space that should accommodate four persons cannot be less than 38m^2. This is still comparable to what is proposed by this research.

The standard for the kitchen proposed by this research is 4.52m^2. The size of standard kitchen suggested by UFC is 3.5m^2, while that applied in Sri Lanka is 5m^2. So, the proposed standard can be considered feasible as it is in between the two sizes. The standard size for the bathroom & toilet which is proposed to be 3.78m^2 is slightly larger than that suggested by the UFC which is set at. 2.80m^2. The difference is greater when compared to Sri Lanka which standard for bathroom & toilet is only 1.62m^2. This difference is mainly due to the reality that the bathroom & toilet in this research did not only accommodate bathing activity, but also traditional washing. The standard size for kitchen applied in Malaysia is combined with the size of bathroom & toilet which is determined as 7.2m^2. The combined size proposed by this research is 8.30m^2, while the combined size suggested by UFC is 7.30m^2. It is then acceptable that the standard size proposed here is bigger than the other two, as the bathroom & toilet in this research is also used for traditional washing.

The standard for storage proposed by this research i.e. the total of storing 1, 2, 3, and 4 is 5.5m^2. According to Morris (2010), storage facilities for a studio or one bedroom apartment in Aussie is 4m^2, and it takes 5m^2 when there are two or three bedrooms. So the size 5.5m^2 proposed in this research makes sense as despite the average household size in this research is four, it ranges from one to seven. However, what is actually meant as storage in general is only storing-1 and storing-4, as storing-3 is usually included in the bedroom, and storing-2 is part of the kitchen. Therefore in Sri-Lanka the standard for storage as recommended in (Shaw,

2010) is 2.5m^2, which is exactly the same as proposed for storing-1 and storing-4 by this research (0.55+1.95)=2.5m^2.

Regarding the unit space height, UFC in USA recommends a minimum height of 2.75m for a habitable room, and 2.20m for bathroom/toilet and storage. This is similar to that recommended in Sri-Lanka. Meanwhile, average height of low cost apartments in Mumbai India was found to be 3.11m. So, it is acceptable when this research proposes a minimum height of 3.70m to be an adaptable space. By this height it is expected that an expansion of space because of a change or an increase of space needs in the future, can be met through the installation of a mezzanine.

The measurement applied in this research is thus ranging from the provided space as the smallest size to the proposed standards as the largest size as figured below.

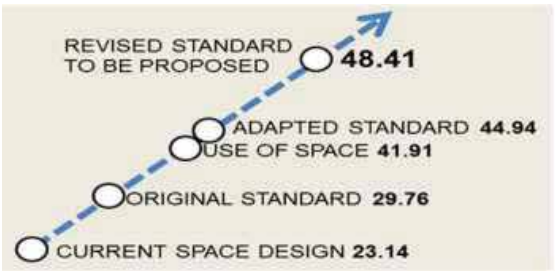


Figure 7- 1: The gradation of sizes in this research

7.6. HOUSEHOLDS' CHARACTERISTICS RELATED TO THE SPACE USE

Having the repaired national standards, it is important to see the space requirements of the households based on their characteristics: number of occupants, duration of the households' occupancy in the apartment units, and the monthly rent rate. It is expected that the outcome of this relationship can support the determination of the space design.

7.6.1. Relation between the Space Requirement and the Household's Size

This research found that the relationship between a household's size and the space requirements is characterized by an ascending graph which indicates that the more the occupants of the apartment unit the larger the space required (figure 7-2). Units that are occupied by a single person only require 23.8m^2, while units with seven household members need 36.8m^2 on average. However, the rise of the graph tends to decline when the household's size reaches five. The rise of the space required from residential for five to seven people is very small. This means that although the average household's size is found to be four, possibilities of residential for over four have to be anticipated since the space requirement increases as the number of occupants develops. Consideration is necessary especially to anticipate residential of units with five occupants as the increase of the space requirements for the next occupant addition is not too big / meaningful.

LCRA		SPACE REQUIREMENT (m^2) BASED ON HOUSEHOLD SIZE						
		1	2	3	4	5	6	7
1	SOMBO	11.6	19.4	23.9	28.1	36.1	30.8	32.5
2	SIMO	20.7	25.4	25.2	27.7	27.9		27.9
3	DUPAK	25.9	26.9	33.4	34.7	37.2	30.7	
4	PENJAR-1		28.4	33.3	34	40.5	34.1	
5	PENJAR-2	28.7	33.9	32.9	33.9	34		
6	WONOREJO		29.2	32.2	34.9	34.5	31.5	39.1
7	RANDU	22.4	28.7	34.9	33.4	35.9	37.2	
8	GN-SARI	23.3	33.9	38	38.5	40.8	48.5	45
9	WARU-G		32.1	36.9	35.3	38.3		
10	URIP	31.9	28.8	31.5	36.3	39.3	33.9	
11	TANAH-M	23.9		36.7	37.9	38.7		42.2
12	PENJAR-3	24.9		33.3	34.7	36.9		34.3
13	ITS	25.1	25.5					
14	UNESA			24.5	24.3			
	SPACE USE	23.8	28.4	32.0	33.3	36.7	35.2	36.8

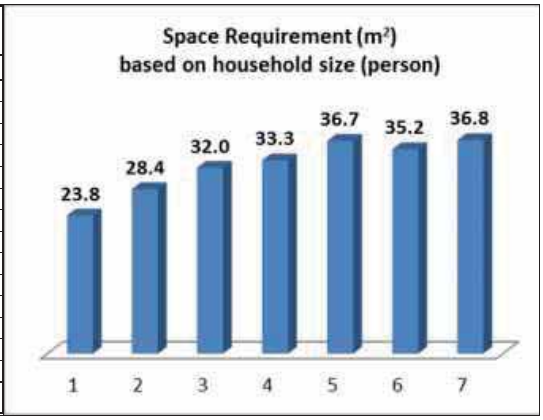


Figure 7- 2: Relation between **s**pace requirement and the household size

7.6.2. Relation between the Space Requirement and the Length of Stay

When related to the duration of the dwellers' occupancy in the apartment, the space requirements tend to develop straightly with a relatively gentle rise. The graph starts to decline when ten years of occupancy is achieved. However, it begins to rise again when the households have lived in the apartment for twenty years. Figure 7-3 shows that in the first three year living in the unit, the use of space of the households is 32.1m^2. The space use increases for a small enhancement up to ten years of living where the required space becomes 33.3m^2. Thereafter it decreases up to year twenty where the need for space shrinks to 25.6m^2, and then it increases again. The graph indicates that the increase of space requirements occur in the first ten years. It seems that adaptations tend to occur in this period at which time the household is growing. The sloping rise may be due to the smallness of the changing capacity. After year ten, the children begin to grow up, get their own job or get married, and have their own life, so the family member is reduced. However, after year twenty, old parents are often asked by their daughters and sons to take care of the grandchildren therefore additional space is required. Otherwise, the unit changed hands to a new family as old parents stay with their children who have their own home.

LCRA		SPACE REQUIREMENT (m^2) BASED ON LENGTH OF STAY					
		1-3	4-6	7-10	11-15	16-20	>20Y
1	SOMBO		21.9	28.2	28.2	21.5	28.6
2	SIMO		26.25	33	27.7	23.2	27.1
3	DUPAK	29.7	39.8	33.2		29.3	30.9
4	PENJAR-1	35.6	37.8	32.6	30.16	28.3	
5	PENJAR-2	30.0	34.3	34.4			
6	WONOREJO	33.2	33.6				
7	RANDU	34.5	32.3				
8	GN-SARI	36.0					
9	WARU-G	37.3	37.1	35.9	36.3		
10	URIP	30.3	32.0	35.9			
11	TANAH-M	36.7	43.1				
12	PENJAR-3	33.5					
13	ITS	24.8	25.9				
14	UNESA	24.1	27.1				
	SPACE USE	32.1	32.6	33.3	30.6	25.6	28.9

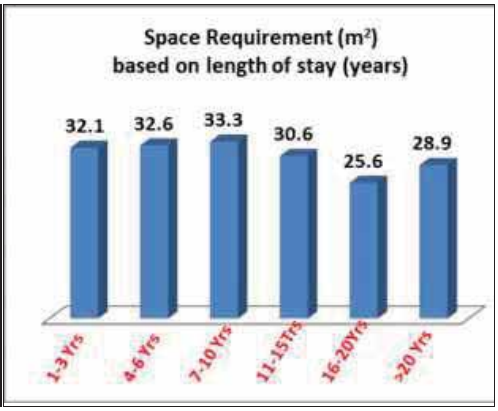


Figure 7- 3: Relation between space requirement and the length of stay

7.6.3. Relation between the Space Requirement and the Rent Rate

Different from the two previous relationships, the graph of the space requirement based on the rent rate fluctuates irregularly from the cheapest up to the most expensive rent. No prediction can be made from the graph. There are no signs indicates that the least expensive cost of the rent requires the least amount of space or vice versa. It can only be explained that the most extensive space i.e. 34.9m^2 is needed by the units with a rental rate of IDR 120 thousands. While the least space i.e. 24.4m^2 is required by units which rent is IDR160 thousands / month.

LCRA		SPACE REQUIREMENT (m^2) BASED ON RENT RATE (IDR 000)					
		20	40-60	70-80	120	160	>200
1	SOMBO	27.2					
2	SIMO	26.8					
3	DUPAK	32.4					
4	PENJAR-1	33.3					
5	PENJAR-2		33.1				
6	WONOREJO		33.4				
7	RANDU		32.9				
8	GN-SARI						36.1
9	WARU-G		36.5				
10	URIP				34.9		
11	TANAH-M		36.9				
12	PENJAR-3			33.5			
13	ITS						25.5
14	UNESA					24.4	
	SPACE USE	29.9	34.6	33.5	34.9	24.4	30.8

Figure 7- 4: Relation between space requirement and the rent rate

7.7. THE EXTENT TO WHICH THE CURRENT SPACE DESIGNS MEET THE USERS' DEMANDS

This section presents the evaluation of the current space design in meeting the proposed standard which finally becomes the households' requirements that meet the actual space used to do all the daily activities. The evaluation is done by comparing the current space size to the proposed standard size. The comparison is described in the following table.

Table 7. 31: The extent to which the current space design meets the users' demands

LCRA		WHOLE UNIT			MULTI-F SPACE			KITCHEN			BATHROOM/TOILET			BALCONY		
		SIZE	STD	%	SIZE	STD	%	SIZE	STD	%	SIZE	STD	%	SIZE	STD	%
1	SOMBO	22.5	48.41	**0.46**	18	37.38	**0.48**							4.5	2.73	**1.65**
2	SIMO	22.5	48.41	**0.46**	18	37.38	**0.48**							4.5	2.73	**1.65**
3	DUPAK	22.5	48.41	**0.46**	18	37.38	**0.48**							4.5	2.73	**1.65**
4	PENJ-1	22.5	48.41	**0.46**	18	37.38	**0.48**							4.5	2.73	**1.65**
5	PENJ-2	22.5	48.41	**0.46**	16.5	37.38	**0.44**	1.8	4.52	**0.40**	2.4	3.78	**0.63**	1.8	2.73	**0.66**
6	WONO-R	22.5	48.41	**0.46**	16.5	37.38	**0.44**	1.8	4.52	**0.40**	2.4	3.78	**0.63**	1.8	2.73	**0.66**
7	RANDU	22.8	48.41	**0.47**	15.6	37.38	**0.42**	2.7	4.52	**0.60**	2.7	3.78	**0.71**	1.8	2.73	**0.66**
8	GN-SARI	31.4	48.41	**0.65**	23.4	37.38	**0.63**	2.8	4.52	**0.62**	2.4	3.78	**0.63**	2.8	2.73	**1.03**
9	WARU-G	20.9	48.41	**0.43**	15.2	37.38	**0.41**	1.5	4.52	**0.33**	2.7	3.78	**0.71**	1.5	2.73	**0.55**
10	URIP-S	24	48.41	**0.50**	18	37.38	**0.48**	2	4.52	**0.44**	2	3.78	**0.53**	2	2.73	**0.73**
11	T-MERAH	22.5	48.41	**0.46**	13.5	37.38	**0.36**	2.25	4.52	**0.50**	2.25	3.78	**0.60**	4.5	2.73	**1.65**
12	PENJ-3	26.9	48.41	**0.56**	17.4	37.38	**0.47**	4.05	4.52	**0.90**	2.7	3.78	**0.71**	2.7	2.73	**0.99**
13	ITS	21.7	48.41	**0.45**	17.6	37.38	**0.47**		4.52		3.5	3.78	**0.93**	0.6	2.73	**0.22**
14	UNESA	18.7	48.41	**0.39**	18	37.38	**0.48**		4.52			3.78		0.72	2.73	**0.26**
		23.14	**48.41**	0.48	**17.4**	**37.38**	0.47	**2.36**	**4.52**	**0.52**	**2.56**	**3.78**	**0.68**	**2.73**	**2.73**	**1.00**

Table 7.31 above indicates that for the whole unit, Unesa had the smallest extent in meeting the users' demands by 39%. By only 36% Tanah-Merah was the lowest LCRA in meeting the space demands for multi-functional space. For the kitchen, Waru-Gunung by 33% achieved the smallest extent in meeting the requirements. For the provided balcony ITS had the smallest by only 22% the standard size. However, the provided whole unit, multi-functional space, and kitchen meet approximately half the standard, while the bathroom & toilet can meet higher by 68% averagely. Different from the other functional areas which are provided lower than the standard (with median size of 52%), the balcony are provided equal to the standard (100%).

DISCUSSION:

The fulfillment of standards which ensure no more sizes are below the requirements does not mean that matters relating to the functionality are solved. There are still problems associated with the overlapping of activities that are carried out in the same space. It is not only in regards to the amount of the activity which is plural, but the number of persons doing the activity that is also plural. Moreover, the nature of activities is also plural. Some activities are public and some are private. Households often have to postpone or cancel one activity, as they have to do another activity which is coming in suddenly. LCRA units in this study only have one (open plan) space i.e. the multi-functional space. Families do not have any other space or place where they can move the on-going activity when another activity takes place suddenly except corridor. The problem will be more difficult to solve when the only one space is too small, as other activities cannot share space with the ongoing activity. Therefore adaptation is inevitably to occur. This case will be discussed in chapter-8. Compliance of the above standards is essential but should be accompanied by the provision of changing capacity to sustain the functionality.

7.8. CONCLUSION

1. Functionality of each activity is assessed by comparing the actual space use to the national standard. Standards that are exceeded by the space use must be adjusted and revised, as they are no longer functional requirements. This research proposes the revision of the national standard of the whole apartment unit which is originally 29.76m^2, then is adapted to 44.94m^2 (where seven activities are added), and finally is revised to 48.41m^2 (table 7.29).
2. The number of activities accommodated especially in the multi-functional space produced a high effectiveness, however, led to conflicts that easily arise not only between the activities, but also among family members. This resulted in the need for (functional) adaptation.
3. Comparison of the space use to the provided space evaluates the adequacy of spaces that were provided by the government. This research found that all unit parts of LCRA were provided below the (adapted) national standards, except for the balcony, with the median size of provided unit parts measure 55% of the standards.
4. Based on the household's size, the most crucial space requirement needs to be considered is the size of units with five occupants as the rise in the space required decreases for the next number of occupants. When associated with length of stay, the space requirement rises gently during the first ten years of occupancy indicating that adaptations occur during this period with small changing capacity.
5. Based on the proposed national standards, only the balcony meets the standard (100%), while the median size of provided functional areas measure 52% of the standards.

PART THREE
Synthesis

CHAPTER 8
Adaptability of Space Design

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Adaptability of Space Design

8.1. INTRODUCTION

This chapter describes the analysis of the adaptability of current space design (sub-study-7). The chapter that uses the definition of adaptability in this research, which primarily refers to the changing capacity of space in size and function, comprises of two main parts. The first part, that concerns with analyzing and synthesizing the data (sections 8.2 up to 8.5), contains sections presenting: the types of adaptations that have been made by the households, followed by the reason why adaptation had to be made, the influences of households' characteristics on the need for adaptation, and the use of space resulted from the adaptation. The second part (section 8.6) tends to be the indications for improvement or solution by revealing the changing capacity of spaces that involves: possibility for partitioning horizontally, possibility for extending horizontally by corridor occupation, possibility for extending vertically by mezzanine installment, possibility to change the function of the balcony into a bathroom, and possibility to change the function of the balcony into a bedroom. Presented afterwards (section 8.7) is the result i.e. the extent to which the provided space allows changes to meet the needs of the households. The chapter closes with discussions and conclusions on the adaptability of the apartments to cater for the household requirements for space. As such this chapter answers Research Question 5: "How is the adaptability of low cost apartment space designs in Surabaya? To what extent do the current space designs allow changes to meet the users' demands?"

8.2. TYPES OF ADAPTATIONS MADE

There were five types of adaptations made by the households to their apartments: horizontal partitioning, corridor occupation, mezzanine construction, balcony change, and balcony extension. The pie chart of figure 7-1 shows that seventy-seven percent or 231 units had already adapted their apartments. There could be more than one type of adaptation in each apartment. The most adaptations made by households were the separation of multi-functional space. Seventy-one percent or 214 households divided their multi-functional space by putting a partition in the middle of the space. This horizontal partitioning is found to be necessary as they only have this one open plan multi-functional space, where twelve activities, either private or public, generally take place. Privacy is found to be a major requirement of the households for the design of the LCRA. Households can divide the multi-functional space in a rather inexpensive and easy manner by horizontal partitioning to have more privacy in their apartment.

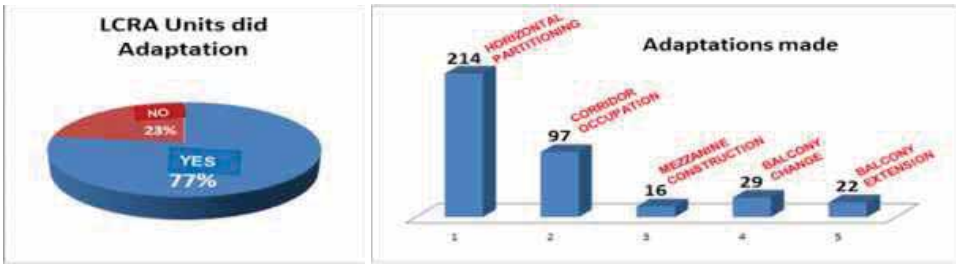


Figure 8- 1: Types of adaptations have been made

The next most often found adaptation was corridor occupation. Thirty-two percent or 97 households occupied the corridor although it is legally not allowed. It is not difficult to occupy the corridor, just by putting the necessary equipment or furniture or tools, household members can then directly carry out their activities there. The other three types of adaptations i.e. mezzanine construction, balcony change and balcony extension were fewer made by the housholds as these were adaptations that require funds especially for the mezzanine construction.

The following figure shows that households of Wonorejo adapted their space mostly by horizontal partitioning. There were twenty-five respondents who separated their private space from public space. Corridor occupations were mostly done in Sombo, fifteen households here used the corridor. Most balcony extension occurred in Penjar-1. Fifteen households extended the depth of their balcony towards the outside. Vertical adaptations mostly occurred in Simo. Nine households installed a mezzanine in their multi-functional space. In Randu, adaptation applied was only that of horizontal partitioning. Twenty families did this. Only in Unesa did adaptation not occur at all.

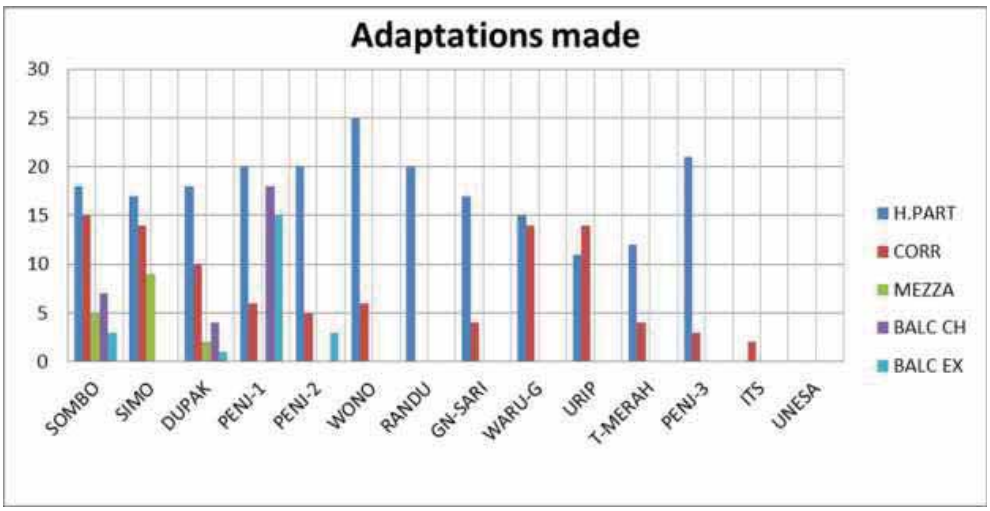


Figure 8- 2: Adaptations made by LCRA in Surabaya

8.3. FACTORS THAT LEAD TO ADAPTATION

As stated before, seventy-seven percent or 231 households changed their units and adapted the original space design. The need for privacy was the most occurring cause that led to adaptation (figure 8-3). The next cause was the change or addition of household activities. Increase or change in the composition of the household was the third cause, and the presence of business in the unit was the fourth. There were only eleven households that adapted their apartment because of the increase of income.

	LCRA	Adapt	Privacy	Activity	Business	HH-Size
1	SOMBO	20	9	10	6	7
2	SIMO	20	16	10	3	6
3	DUPAK	18	19	15		2
4	PENJ-1	21	19	5	2	1
5	PENJ-2	20	20	3		1
6	WONO	26	15			2
7	RANDU	20	12			0
8	GN-SARI	16	16			3
9	WARU-G	18	9			
10	URIP-S	15	7			1
11	T-MERAH	12	6			2
12	PENJ-3	21	3			1
13	ITS	2				
14	UNESA	0				
		231	151	43	11	26

Figure 8- 3: Factors lead to the occurrence of adaptations

8.4. HOUSEHOLDS' CHARACTERISTICS RELATED TO ADAPTATIONS

This section will discuss the influences of the households' characteristics on adaptations of the apartment space. The characteristics that were considered to influence the adaptation include: the household size, the density which is indicated by square meter per person, household income that is represented by the rent rates, the length of stay, and the presence of business.

8.4.1. Influence of Household Size

The majority of households in this research had four members. The four-person households also made the largest number of adaptations particularly that of horizontal partitioning, 71% of these households divided their multi-functional space. A total of 214 units underwent this kind of adaptation. There appear to be a relationship between household size and number of horizontal partitions made. Nearly 84% of the five-person households made horizontal partitions, so did all of the six-person households. Similarly nearly 66% of the six-person households occupied the corridor for extra space, whereas only 38% of the four-person households did so. A mezzanine construction was made by 11% of the six-person households, and 9% of the five-person households. 20% of the seven-person households changed their balcony, while 11% of four-person as well as six-person households extended their balcony as listed in table 8.1.

Table 8. 1: Distribution of household size versus the adaptations made

HOUSEHOLD-MEMBERS	1	2	3	4	5	6	7	TOTAL
TOTAL OF UNITS	**19**	**49**	**72**	**98**	**43**	**9**	**10**	**300**
HORIZONTAL-PARTITION	11	25	56	70	36	9	7	**214**
CORRIDOR-OCCUPATION	5	9	19	37	18	6	3	**97**
MEZZANINE CONSTRUCTION	1	1	1	7	4	1	1	**16**
BALCONY-CHANGE	2	3	8	13	1	0	2	**29**
BALCONY-EXTTENSION	0	3	5	11	2	1	0	**22**

8.4.2. Influence of Density (Square Meter per Person)

Density of space in a home is affected by the ratio of the number of occupants compared with the area of existing space. The more inhabitants, the more crowded the atmosphere of space is. Each LCRA in this research had its own whole unit area that was populated by different numbers of occupants. In figure 8-4 below it is seen that there were still many living spaces that were found below five square meters per person. The average density is 8.07 and the mean is 5.67 square meters per person, with figures ranging from 3.21 the smallest to 31.4 square meters per person the highest

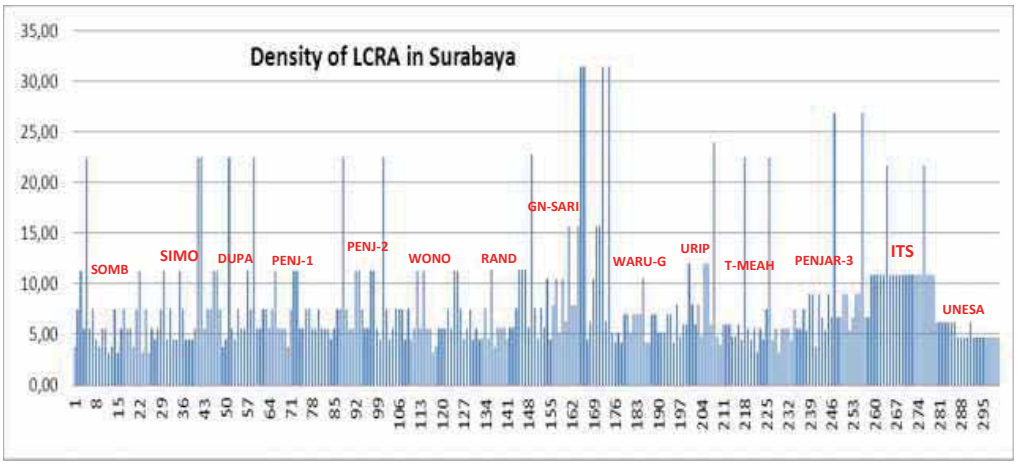


Figure 8- 4: The square meter per person of LCRA in Surabaya

In order to find out whether the adaptations were made because of lack of space, the following analysis only considers adaptations that produce extra space: corridor occupation, mezzanine installation, and balcony extension. By assuming that the units in this research were provided for four people and eight square meters per person is the requirement for density, the analysis in table 8.2 looked for the number of units with household size larger than four that performed these adaptations. The result shows that units with more than four occupants that did these adaptations were only 31%. However, analysis based on density shows that 84% of units that performed these adaptations were those with living space of smaller than eight square meters per person. It can be concluded that units with smaller living space per person have a higher level of need for adaptation compared with units with greater numbers of occupants. In other words, the living space in square meters per person has more influence on the need for adaptation compared to the number of occupants.

In this case, the provided space becomes central. When the number of occupants was only four for example, if the available space was twenty square meters, then it would provide only five square meters per person. Yet, units with even seven household members, when the provided space was fifty square meters, more relieving living space could be provided as each member had about seven square meters. Thus, compared with the household size, density is a more effective factor to be used to consider the space demand.

Table 8. 2: Distribution of adaptation made versus household size <4 and density of <8 sqm per person

		ADAPTATION DONE	AVERAGE HH-SIZE(P)	AVERAGE SQM / P	HH-SIZE >4 P		DENSITY < 8m^2/ P		100% OF SQM / P
					TOTAL	%	TOTAL	%	
1	SOMBO	17	4.2	6.50	7	41%	15	88%	
2	SIMO	18	3.9	7.79	9	50%	14	78%	
3	DUPAK	13	3.3	8.46	3	23%	13	100%	X
4	PENJ-1	19	3.6	6.73	2	11%	17	89%	
5	PENJ-2	8	3.1	8.73	2	25%	7	88%	
6	WONO R	6	3.9	6.51	1	17%	4	67%	
7	RANDU		3.6	7.65					
8	GN-SARI	4	3.7	13.66	2	50%	2	50%	
9	WARU-G	14	3.8	5.97	2	14%	13	93%	
10	URIP-S	14	4.1	7.62	6	43%	11	79%	
11	T-MERAH	4	3.4	7.00	3	75%	4	100%	X
12	PENJ-3	3	3.6	9.17	2	67%	2	67%	
13	ITS	2	1.9	11.88					
14	UNESA		3.6	5.27					
		122	3.55	8.04	39	32%	102	84%	

8.4.3. Influence of Rent Rate

In this research, the level of income is represented by the rent rate as it reflects the ability of the family to pay the rental fee. LCRA rental costs varied. The most and the least expensive rates are very much different. The most expensive monthly rental fee was that of ITS that was set at IDR 250,000. The cheapest rents, IDR 20,000/month, were those set in Sombo, Simo, Dupak and Penjar-1 as the oldest LCRA. The left part of table 8.3 shows that when referring to all adaptations made, among 231 households who did adaptations, 34% were those with rent rates cheaper than IDR 40,000. The other 51% were those who paid rent between IDR 40,000 and 80,000. The rest 15% were those with the highest rent or more than IDR 80,000. The percentage found here does not picture a high influence of rent rate on the need for adaptation.

Table 8. 3: Distribution of adaptation made versus rent rate

LCRA		RATE / MONTH	ALL ADAPTATIONS							ONLY ADAPTATIONS WITH EXTRA SPACE						
			ADAPTATION	RENT <40	%	RENT 40-80	%	RENT >80	%	ADAPTATION	RENT <40	%	RENT 40-80	%	RENT >80	%
1	SOMBO	20.000	20	20	100%					17	17	100%				
2	SIMO	20.000	20	20	100%					18	18	100%				
3	DUPAK	20.000	18	18	100%					13	13	100%				
4	PENJAR-1	20.000	21	21	100%					19	19	100%				
5	PENJAR-2	59.000	20			20	100%			8			8	100%		
6	WONO R	59.000	26			26	100%			6			6	100%		
7	RANDU	48.000	20													
8	GN-SARI	235.000	18					18	100%	4					4	100%
9	WARU-G	54.000	18			18	100%			14			14	100%		
10	URIP-S	120.000	15					15	100%	14					14	100%
11	T-MERAH	51.000	12			12	100%			4			4	100%		
12	PENJAR-3	76.000	21			21	100%			3			3	100%		
13	ITS	250.000	2					2	100%	2					2	100%
14	UNESA	160.000														
		85.140	231	79	34%	117	51%	35	15%	**122**	67	**55%**	35	29%	20	16%

However, by only referring to adaptations that result in additional or extra space, the right part of table 8.3 shows that among the units that did the adaptation, 55%t were those with rent rates below IDR 40,000, while the other 29% were those with rent set between IDR 40,000 to 80,000. The rest 16% were those whose rent was more than IDR 80,000. It is assumed that adaptations were more needed by households with cheaper rent rates rather than those with higher rents.

8.4.4. Influence of Length of Stay

The average length of stay in LCRA in this research is 7.3 years. Figure 8-5 illustrates the length of stay of the three hundred households researched. As seen in the figure, the shortest length of stay was experienced by residents living in Gunungsari and Penjar-3 where households had only lived there for two years on average. Households living in Sombo and Dupak were those who had stayed the longest with average length of stay nineteen years.

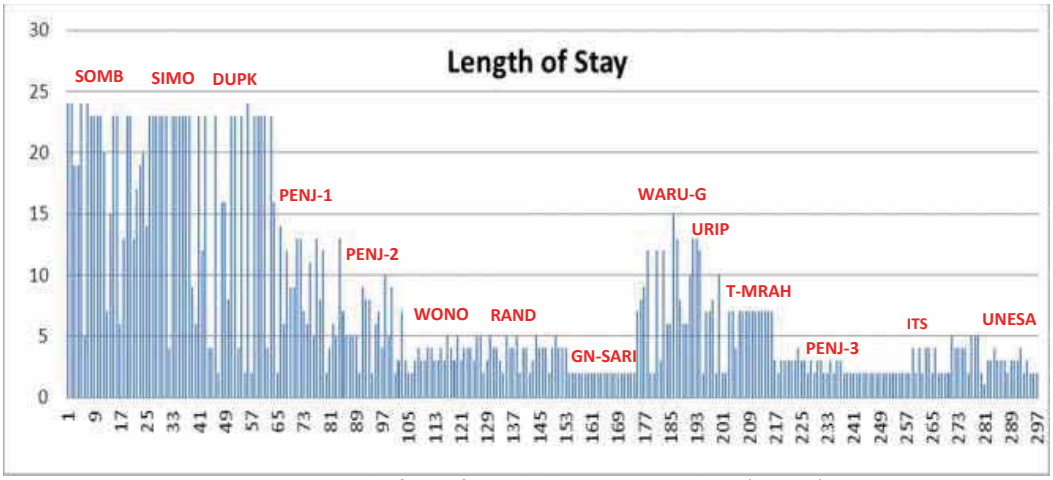


Figure 8- 5: Length of stay of households in LCRA in Surabaya (in years)

The left part of table 8.4 shows that when referring to all adaptations made, among two hundred and thirty-one households who performed adaptations, 43% of which were those who had stayed there for more than seven years. Another 23% of them were those who had lived there between four and six years. The other 34% were those with length of stay shorter than three years. The percentage found here does not really show the influence of length of stay on the need for adaptation.

Table 8. 4: Distribution of adaptation made versus length of stay

LCRA		AVRG LENGTH OFSTAY	ALL ADAPTATIONS							ONLY ADAPTATIONS WITH EXTRA SPACE						
			ADAPTATION	STAY >7Y	%	STAY 4-6Y	%	STAY <3Y	%	ADAPTATION	STAY >7Y	%	STAY 4-6Y	%	STAY <3Y	%
1	SOMBO	19	20	19	95%	1	5%			17	16	94%	1	6%		
2	SIMO	19	20	18	90%	2	10%			18	16	89%	2	11%		
3	DUPAK	15	18	14	78%	3	17%	1	6%	13	10	77%	2	15%	1	8%
4	PENJAR-1	8.9	21	13	62%	6	29%	2	10%	19	11	58%	6	32%	2	11%
5	PENJAR-2	5.4	20	8	40%	8	40%	4	20%	8	6	75%	1	13%	1	13%
6	WONO-R	3.7	26	-		14	54%	12	46%	6			2	33%	4	67%
7	RANDU	3.7	20	-		14	70%	6	30%	-	-		-		-	
8	GN-SARI	2	18	-		-		18	100%	4			-		4	100%
9	WARU-G	8.4	18	13	72%	3	17%	2	11%	14	10	71%	3	21%	1	7%
10	URIP-S	6.3	15	14	93%	1	7%	-		14	13	93%	1	7%	-	
11	T-MERAH	2.8	12	-		1	8%	11	92%	4	-				4	100%
12	PENJAR-3	2	21	-		-		21	100%	3					3	100%
13	ITS	3.4	2	-		1	50%	1	50%	2			1	50%	1	50%
14	UNESA	2.6														
		7.23	231	99	**43%**	54	**23%**	78	**34%**	122	82	**67%**	19	16%	21	17%

However, when only taking into account the adaptations that resulted in extra space, in the right part of table 8.4 it can be seen that among 122 units experiencing adaptations, 67% of which were households who had lived there for more than seven years. Another 21% of them were those whose length of stay was between four and six years. The other 17% were those who had spent their life there for shorter than three years. This fact indicates that households who had stayed longer tend to carryout more adaptations compared to those with shorter length of stay. Additional space is more required by households had stayed longer.

8.4.5. Influence of the Presence of Business

The total of units with business in this research is sixty-three. Table 8.5 shows that of those units with in-house business and income generation, 90% or fifty-six households, made adaptations to their apartments. This indicates that the existence of in-house economic activities has a strong influence on the need for adaptation.

Table 8.5: Analysis of units with business that performed adaptations

LCRA		ALL ADAPTATION	TOTAL OF UNITS WITH BUSINESS	UNITS WITH BUSINESS DID ADAPTATION	%
1	SOMBO	20	8	8	100%
2	SIMO	20	4	2	50%
3	DUPAK	18	7	5	71%
4	PENJAR-1	21	4	4	100%
5	PENJAR-2	20	6	6	100%
6	WONO-R	26	8	8	100%
7	RANDU	20	2	2	100%
8	GN-SARI	18	10	8	80%
9	WARU-G	18	4	4	100%
10	URIP-S	15	5	4	80%
11	T-MERAH	12	2	2	100%
12	PENJAR-3	21	2	2	100%
13	ITS	2	1		
14	UNESA				
		231	63	56	90%

FINDINGS:

- Density or living space (square meters per person) has more influence on the need for adaptation compared to the number of occupants or household size.
- Adaptations were more needed by households with lower rent rates rather than those with higher rents.
- Households who had stayed longer tend to require adaptation compared to those with shorter length of stay.
- The existence of business activity has a strong influence on the need for adaptation.

8.5. THE USE OF THE ADAPTED SPACE

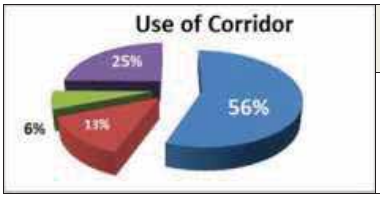
Different from the other kinds of adaptation which can provide additional spaces, horizontally partitioning and balcony change only result in some kind of advantages which are not less important than the extra space. The benefits of doing the adaptations in the units at LCRA can be seen in the following reviews.

8.5.1. The Use of Space after Horizontal Partitioning

Two hundred and fourteen households partitioned their multi-functional space. In addition to separating private from public activities, it is found that each household in extended families required its own cubicle that was solved by partitioning. The other use of partition is seen in the units with economic activities. From sixty-three units with business, only three did not do partitioning. Twenty-nine of them did this to cover the dirty impression of producing space as well as to protect their privacy of business from clients' observations. The rest thirty-one households did this just for separating their business from private activities.

8.5.2. The Use of Space Resulted from Corridor Occupation

As stated before, ninety-seven households occupied the corridor to enlarge the space of their apartments. The widths of the corridors occupied by households differed. The most common occupation, in 56% of the cases, were occupation of corridor narrower than one meter that usually served as a place for putting extra stuff such as a shoe rack or broom box, without any activities actually performed there. In 13% of the cases, households occupied the corridor between one and 1.25 meters, not only for placing furniture but also for conducting activities, for example, receiving guests, studying, child caring, eating. Occupation of a larger corridor width, between 1.25 and 1.5 meters, was made by six households that usually utilize them for business activities. The rest of the cases (25%) were occupation of wider than 1.5 meters that was usually applied for a particular function, such as for a living room or business.



USE OF CORRIDOR SPACE AMONG 97 OCCUPYERS		
Narrower than 1 m	54	56%
Between 1 – 1.25 m	13	13%
Between 1.25 –1.5 m	6	6%
Wider than 1.5 m	24	25%

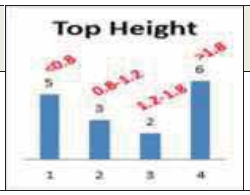
Figure 8- 6: The width of corridor space occupied by the households

Figure 8- 7: Illustration of the use of space of the occupied corridor

8.5.3. The Use of Extra Space Resulting from Mezzanine Construction

Sixteen households installed mezzanines in their multi-functional space. Mezzanines with a height lower than 0.8 meters (in thirty-one percent of the cases) were used as storing spaces. Mezzanines with a height of 0.8m to 1.2m (in nineteen percent of the cases) were also used as storing spaces. Mezzanines with a height between 1.2 and 1.5m (in twelve percent of the cases) are livable, however, they allow only sitting or sleeping activities. Mezzanines higher than 1.5m (in thirty-eight percent of the cases) can be used for more varied activities.

HEIGHT OF BOTTOM SPACE AMONG 16 INSTALLERS		
Lower than 1.6 m	0	0%
Between 1.6 --1.8 m	2	12%
Between 1.8 – 2.0 m	6	38%
Higher than 2.0 m	8	50%



HEIGHT OF TOP SPACE AMONG 16 INSTALLERS		
Lower than 0.8 m	5	31%
Between 0.8 – 1.2m	3	19%
Between 1.2 – 1.5 m	2	12%
Higher than 1.5 m	6	38%

Figure 8- 8: The height of bottom and top spaces after mezzanine construction

Mezzanine that takes place in multi-functional space	Mezzanine elevation	Bottom space allowing standing inhabitants freely	Top space with height only sufficient for sitting activities

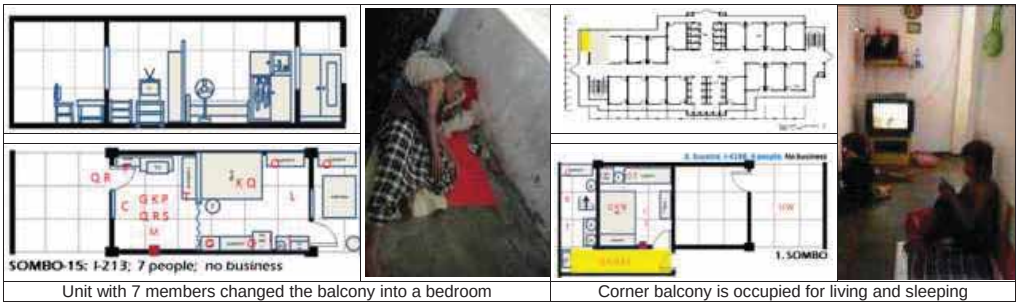
Figure 8- 9: Illustration of mezzanine construction use for

8.5.4. The Use of Space Resulting from Balcony Changes

Twenty-nine households made changes to their balconies. Six of these created a space for washing on their balcony. The establishment of private bathroom that only occurred in units with collective services dominated this kind of adaptation, eighteen households did this. Balcony change into a bedroom and or living room was only done by five households.

BALCONY CHANGE		%
Washing space	6	21%
Bathroom	18	62%
Living / Sleeping	5	17%
	29	100%

Figure 8- 10: Utilization of space due to balcony Change



Unit with 7 members changed the balcony into a bedroom | Corner balcony is occupied for living and sleeping

Figure 8- 11: Illustration of the changing function of the balcony into a bedroom and living room

8.5.5. The Use of Extra Space Resulting from Balcony Extension

Twenty-two households extended their balcony. Extensions on the ground floor were mostly used for the establishment of private kitchens. The main use of the balcony extension at the upper floors was for drying. Most balcony extensions were used for storing and drying things such as laundries, pillows, hanging bird cage. Extensions shorter than 0.8 meters (as done by 16 households) were usually implemented only by using a board placed on the cantilever wall of the balcony. Extensions of 0.8m to 1m (by 3 households) were usually supported by using steel bars. Extensions longer than 1m (by 13 households) were protected by grilling half the balcony.

BALCONY EXTENSION		%
Extended < 0.8m	16	73%
Extended 0.8m-1m	3	14%
Extended >1m	3	14%
	22	100%

Figure 8- 12: The distance of extended balcony

Extension for putting kitchen utensils | Extension for drying pillows/bolsters | Extension for drying laundries

Figure 8- 13: Illustration of the use of space of the extended balcony

8.6. CHANGING CAPACITY OF SPACE AS THE SOLUTION

The foregoing sections in the first part above (8.2 up to 8.5) indicate that with the background of space shortage, based on several reasons, many apartment dwellers had to do adaptations in order to expand their unit space so that their space requirement can be met. Households' characteristics that include: the number of family members, the living space per person in the unit, the length of household residence time, household income level, and the presence of business in the unit, shown to affect whether or not adaptation is required to be performed. Therefore ways to overcome the space inadequacy is important to be discussed.

The following section, which is the second part, is meant to provide solutions by analyzing the capacity of the space in the apartment units in adjusting the available space to space demands. The indicator is thus the use of space. The adaptations made include: changing horizontally by partitioning, changing horizontally by occupying the corridor, changing vertically by constructing a mezzanine, changing the function of balcony to a bathroom/kitchen, and changing the function of balcony to a bedroom.

8.6.1. Changing in Size Horizontally by Partitioning

This kind of adaptation does not result in additional space, but is applied to solve the problem of privacy. Clashes between private and public activities in multi-functional space required adaptation which called for separation of the space by horizontal partitioning. Whether the space is adequate or not, this separation is crucial for privacy. As indicated in chapter-5, seventy-one percent respondents separated their multi-functional space into public and private sub spaces (figure 8-14).

When the living space is sufficient, there is no problem with the separation of the space. It could be done by just putting a partition in the space. However, when the space was inadequate to accommodate the activities, further adaptations are required. So the judgment of the capacity of the multi-functional space to subdivide it horizontally is based on the adequacy of the provided multi-functional space to offer sufficient space for all activities that are supposed to be carried out there following the real space use for these activities.

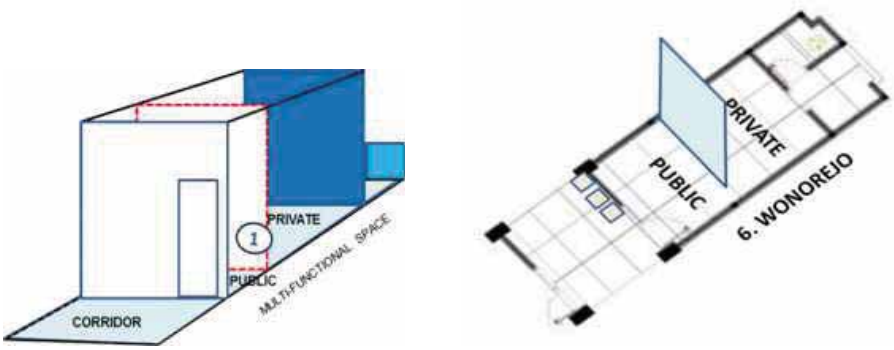


Figure 8- 14: Horizontal partitioning which is occurred in the multi-functional space

Table 8.6: Capacity of multi-f space in accommodating activities (adaptability is existing divided by use of space)

LCRA		EXISTING SPACE	NEW SPACE	CHANGING CAPACITY	USE OF SPACE	ADAPTABILITY
1	SOMBO	18	18	1	33.57	0.54
2	SIMOLAWANG	18	18	1	33.39	0.54
3	DUPAK	18	18	1	31.22	0.58
4	PENJAR-1	18	18	1	32.64	0.55
5	PENJAR-2	16.5	16.5	1	29.71	0.56
6	WONOREJO	16.5	16.5	1	30.63	0.54
7	RANDU	15.6	15.6	1	29.28	0.53
8	GUNUNG-SARI	23.4	23.4	1	34.23	0.68
9	WARU-GUNUNG	15.2	15.2	1	30.84	0.49
10	URIP-S	18	18	1	30.02	0.60
11	TANAH-MERAH	13.5	13.5	1	33.40	0.40
12	PENJAR-3	17.4	17.4	1	33.64	0.52
13	ITS	17.6	17.6	1	26.16	0.67
14	UNESA	18	18	1	29.10	0.62
AVERAGE		**17.41**	**17.41**	**1**	**32.41**	**0.54**

FINDING: Table 8.6 shows that the adaptability of the space to be sub-divided to enable the conduction of the activities is averagely only fifty-four percent of the space use that ranged from forty percent at the worst up to sixty-eight percent at the best. Since there is no extra space created, changing capacity is one (there is no changing capacity).

8.6.2. Changing in Size Horizontally by Occupying the Corridor

When the households use the corridor space only for placing small furniture such as a bench for relaxing or entertaining, the occupied corridor space is not too large. But when the households use the corridor for trading, the occupation of the corridor is larger that may disturb the main function of the corridor as horizontal circulation through which households can reach the stair halls from their individual units. The occupation takes place along the unit width.

8.6.2.1. Capacity of the corridor to be occupied

The key element in the assessment of the capacity of the corridor to offer additional space to the apartment units is the width of the human body that according to (de Chiara et al 1992, Neufert 1980, Fairweather, Sliwa 1972) is 0.6m. Based on this, a corridor width of 1.2m or less, gives no possibility to be occupied, as the space is only sufficient for two-way traffic passengers or the minimum width for public circulation. The possible width to be occupied is the remaining corridor width after being reduced by 1.2m. For a double loaded building the remaining space is shared between the adjacent units as shown in the figure below. For units of single loaded and twin block buildings, the remaining space width after reduced by 1.2m is directly applied.

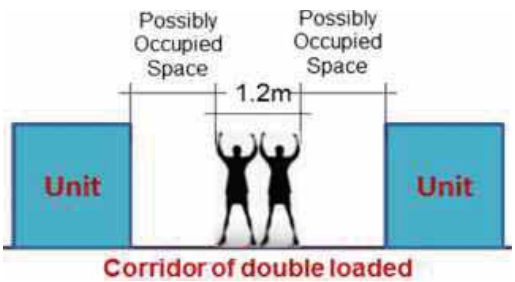


Figure 8- 15: Example in determining possibly occupied corridor space

Table 8.7: Possible corridor area to be occupied

LCRA		Corridor Width	Remaining After reduced by 1.2m	Corridor Type	Possible occupied width	Unit Width	Occupied Area (m^2)
1	SOMBO	3	**1.8**	double loaded	0.9	3	2.7
2	SIMO	3	**1.8**	double loaded	0.9	3	2.7
3	DUPAK	2	**0.8**	double loaded	0.4	3	1.2
4	PENJAR-1	3	**1.8**	double loaded	0.9	3	2.7
5	PENJAR-2	3	**1.8**	double loaded	0.9	3	2.7
6	WONO-R	3	**1.8**	double loaded	0.9	3	2.7
7	RANDU	2	**0.8**	double loaded	0.4	3	1.2
8	GN-SARI	3	**1.8**	double loaded	0.9	4	3.6
9	WARU-GN	1.5	**0.3**	single loaded	0.3	3.8	1,14
10	URIP-S	2	**0.8**	single loaded	0.8	3	2.4
11	TANAH-M	1.5	**0.3**	single loaded	0.3	3	0.9
12	PENJAR-3	1.5	**0.3**	twin blocks	0.3	4.5	1.35
13	ITS	1.5	**0.3**	twin blocks	0.3	3.6	1.08
14	UNESA	1.5	**0.3**	twin blocks	0.3	4	1.2
Total average		2.25			0.6		1.97

Table 8.7 shows that averagely, the width of corridor that might be occupied is 0.6m. The largest area for corridor occupation, $3.6m^2$, is achieved by Gunungsari as it has the widest corridor width and relatively wide unit. The smallest possible occupation, $0.9m^2$ is found in Tanah Merah as it has narrow corridor and small unit width. Average occupied area is $1.97m^2$.

8.6.2.2. Functionality of space when the corridor is occupied

The new or adapted area after occupying the corridor is the multi-functional space plus the area of occupied corridor space. The adaptability is the new area divided by the use of space.

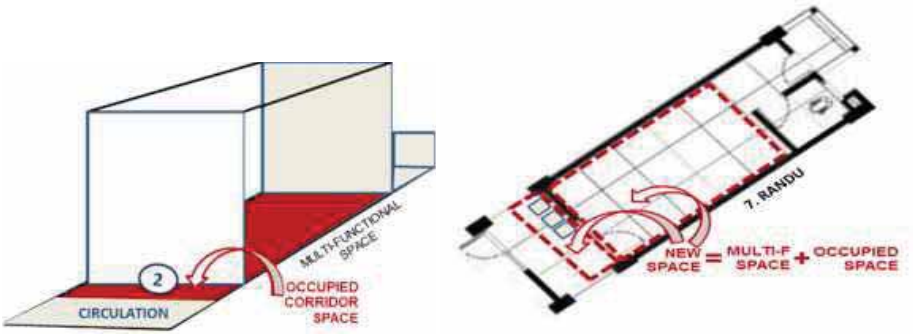


Figure 8- 16: The new space area after corridor occupation

Table 8. 8: Adaptability of space after corridor occupation

LCRA		MULTI-F (M^2)	OCCUPIED SPACE	NEW MULTI-F (M^2)	CHANGING CAPACITY	USE OF SPACE M^2	ADAPTABILITY (%)
1	SOMBO	18	2.7	20.7	1.15	33.57	**0.62**
2	SIMO	18	2.7	20.7	1.15	33.39	**0.62**
3	DUPAK	18	1.2	19.2	1.07	31.22	**0.61**
4	PENJAR-1	18	2.7	20.7	1.15	32.64	**0.63**
5	PENJAR-2	16.5	2.7	19.2	1.16	29.71	**0.65**
6	WONO-R	16.5	2.7	19.2	1.16	30.63	**0.63**
7	RANDU	15.6	1.2	16.8	1.08	29.28	**0.57**
8	GN-SARI	23.4	3.6	27	1.15	34.23	**0.79**
9	WARU-G	15.2	1.14	16.34	1.08	30.84	**0.53**
10	URIP-S	18	2.4	20.4	1.13	30.02	**0.68**
11	T-MERAH	13.5	0.9	14.4	1.07	33.4	**0.43**
12	PENJAR-3	17.4	1.35	18.75	1.08	33.64	**0.56**
13	ITS	17.6	1.08	18.68	1.06	26.16	**0.71**
14	UNESA	18	1.2	19.2	1.07	29.1	**0.66**
AVERAGE		17.41	1.97	19.28	1.11	32.41	**0.59**

The result on table 8.8 above shows that in terms of corridor occupation Gunungsari obtained the highest adaptability by seventy-nine percent of the space use followed by ITS with seventy-one percent, and Urip with sixty-eight percent. The smallest adaptability, forty-three percent, is found in Tanah Merah. Averagely after occupying the corridor, the units could meet fifty-nine percent of their space use. The average changing capacity is 1.11, ranging from 1.06 to 1.15 times the available space.

8.6.3. Changing in Size Vertically by Constructing a Mezzanine

Sixteen households or five percent of the respondents constructed a mezzanine. The patterns in constructing were: installing a mezzanine above the whole multi-functional space (full area); and installing mezzanine above half the area of multi-functional space. The possibility of the use of the top space of mezzanine depends on the volume of the unit.

8.6.3.1. Capacity of the space to be extended upward

Not all apartments fitted with a mezzanine can provide a liveable top space. The possibility depends on the height of the unit space. The height of the bottom space should be at least two meters. To be able to accommodate activities by standing freely up-right (liveable space), the net height of top space should not be lower than one point seven meters that is similar to the average Indonesian human height (BPS, UGM, 2001). So the ideal net height of the adaptable space for LCRA units in Indonesia is at least (2+1.7) meters or three point seven meters.

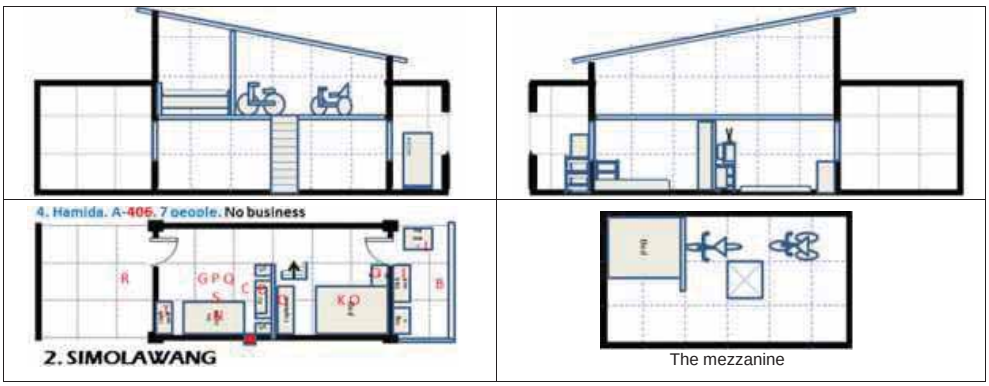


Figure 8- 17: Advantages of units located on top floor in terms of mezzanine construction

As the greatest unit height of LCRA in this study is only 3.4m (table 8.9), the ideal height 3.7m can only be achieved by the units located on top floors. Despite being illegal, here households could heighten their ceiling by breaking into the roof space / attic (figure 8-17). Therefore, normally the top spaces in this research can only allow sitting activities where the required height is 1.2m. For this, top spaces with net height between 0.8m to 1.2m are only able to be used as flexible storing space, which in urgent situations often be used as sleeping area. Top spaces lower than 0.8m can only be utilized as limited storing space which depth must only be within human reach. Table 8.9 presents the possible uses of top spaces at each LCRA resulting from mezzanine construction.

.Table 8. 9: **Capacity of the space height determines the use of the top space of mezzanine**

LOW COST APARTMENT		UNIT HEIGHT	Flooring Thickness 15 Cm	BOTTOM SPACE SET AS 2M HEIGHT		BOTTOM SPACE SET AS 1.8M HEIGHT	
				TOP SPACE M	USE OF TOP SPACE	TOP SPACE M	USE OF TOP SPACE
1	SOMBO	3	2.85	0.85	Flexible storing space	1.05	Limited livable space
2	SIMO	3	2.85	0.85	Flexible storing space	1.05	Limited livable space
3	DUPAK	3.05	2.90	0.90	Flexible storing space	1.10	Limited livable space
4	PENJAR-1	2.80	2.65	0.65	Limited storing space	0.85	Flexible storing space
5	PENJAR-2	2.80	2.65	0.65	Limited storing space	0.85	Flexible storing space
6	WONO-R	2.80	2.65	0.65	Limited storing space	0.85	Flexible storing space
7	RANDU	3.40	3.25	1.25	Livable space	1.45	Livable space
8	GN-SARI	3.40	3.25	1.25	Livable space	1.45	Livable space
9	WARU-GN	2.75	2.60	0.60	Limited storing space	0.80	Flexible storing space
10	URIP-S	3.15	3.00	1.00	Limited livable space	1.20	Livable space
11	TANAH-M	2.85	2.60	0.60	Limited storing space	0.80	Flexible storing space
12	PENJAR-3	2.65	2.50	0.50	Limited storing space	0.70	Storing space
13	ITS	2.65	2.50	0.50	Limited storing space	0.70	Storing space
14	UNESA	2.80	2,65	0.65	Limited storing space	0.85	Flexible storing space
Total average		2.9	2.75				

Here the structural thickness of mezzanine flooring is considered 15cm and 1m high top space is acceptable as limited livable space. The left columns of table 8.9 shows when the height of the bottom space is set 2m, only three LCRA top spaces are considered limited and livable space. By lowering the bottom space to 1.8m the total of limited and livable spaces becomes six, but the other six are flexible storing space which can be used as sleeping area in urgent situations. Penjar-3 and ITS were the only ones did not allow their top spaces as livable space as their unit height is just 2.65m.

8.6.3.2. Functionality of the space when mezzanine is installed

The new or adapted size of multi-functional space after the construction is either 1.5 times (adaptability-1) or twice the original area of multi-functional space (adaptability-2).

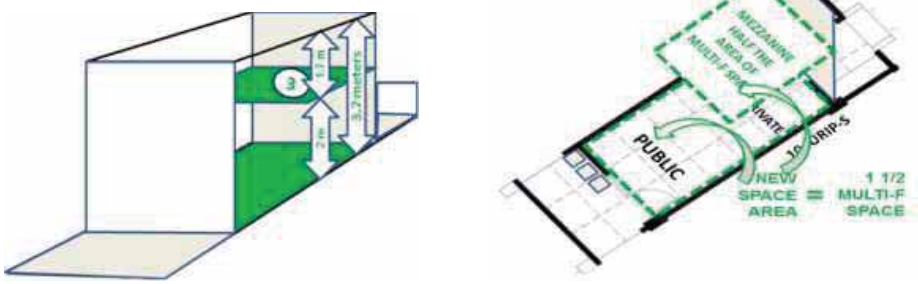


Figure 8- 18: The new space area after mezzanine construction

The result indicates that by installing mezzanine half the area of multi-functional space, only Gunungsari and I.T.S. could meet the use of space, while the rests only achieved 61% up to 93% (adaptability-1). However, by installing a full-size mezzanine it is found that all LCRAs met the requirements except Tanah-Merah that only reached 81%. Full mezzanine construction is thus effective to functionalize the space. Average changing capacity of space when half mezzanine is installed is 1.5 times, and when the constructed mezzanine is full the changing capacity is twice the available space.

Table 8. 10: Adaptability of space after mezzanine construction

LCRA		Multi-F space	With Half Mezzanine (1)	Changing Capacity (1)	With Full Mezzanine (2)	Changing Capacity (2)	Use of Space	Adapt ability-1	Adapt ability-2
1	SOMBO	18	27	1.5	36	2	33.57	**0.80**	**1.07**
2	SIMO	18	27	1.5	36	2	33.39	**0.81**	**1.08**
3	DUPAK	18	27	1.5	36	2	31.22	**0.86**	**1.15**
4	PENJ-1	18	27	1.5	36	2	32.64	**0.83**	**1.10**
5	PENJ-2	16.5	24.75	1.5	33	2	29.71	**0.83**	**1.11**
6	WONO-R	16.5	24.75	1.5	33	2	30.63	**0.81**	**1.08**
7	RANDU	15.6	23.4	1.5	31.2	2	29.28	**0.80**	**1.07**
8	GN-SARI	23.4	35.1	1.5	46.8	2	34.23	**1.03**	**1.37**
9	WARU-G	15.2	22.8	1.5	30.4	2	30.84	**0.74**	**0.99**
10	URIP-S	18	27	1.5	36	2	30.02	**0.90**	**1.20**
11	T-MERAH	13.5	20.25	1.5	27	2	33.4	**0.61**	**0.81**
12	PENJ-3	17.4	26.1	1.5	34.8	2	33.64	**0.78**	**1.03**
13	ITS	17.6	26.4	1.5	35.2	2	26.16	**1.01**	**1.35**
14	UNESA	18	27	1.5	36	2	29.1	**0.93**	**1.24**
		17.41	26.11	1.5	34.81	**2**	**32.41**	**0.81**	**1.07**

8.6.4. Changing the Function of Balcony into a Bathroom

Units that already have services privately no longer need to add any bathroom. Completion of these unit parts is only needed by units which services are provided collectively. The balconies of this category are all sized 3x1.5= 4.5m^2. So, in terms of size there is no problem to build a bathroom or washing place in the balcony as the width and length are still considered adequate. However, in the case of piping and plumbing, only units on the ground floor allow this change. Vertically mechanical equipment problems do not allow this development in the units on the upper floors. Moreover, this kind of adaptation is considered illegal, and it does not affect the area of multi-functional space. Therefore, adaptability of this changing is not evaluated.

8.6.5. Changing the function of Balcony into a Bedroom

The changing in function is not only in order to complete the functional areas within the unit, but also to meet the changing demands. It includes the increase of household members as well as the need to solve clashes between private and public activities. The space that usually needs to be expanded is bedroom, living room, or storage. The most possible unit part and likely to be changed is the balcony. The private space in need of expansion is usually the sleeping area. Therefore this evaluation assessed the possibility of balcony to be changed into a bedroom

Functionality of the space when the balcony function is changed into a bedroom

Households who performed this change were mostly those who lived in units with collective services as they had fairly large balcony. The pattern of doing this is usually by changing the entire space of the balcony into a bedroom. The broad space after the changing of function or the new area equals to the area of the multi-functional space plus the area of the balcony.

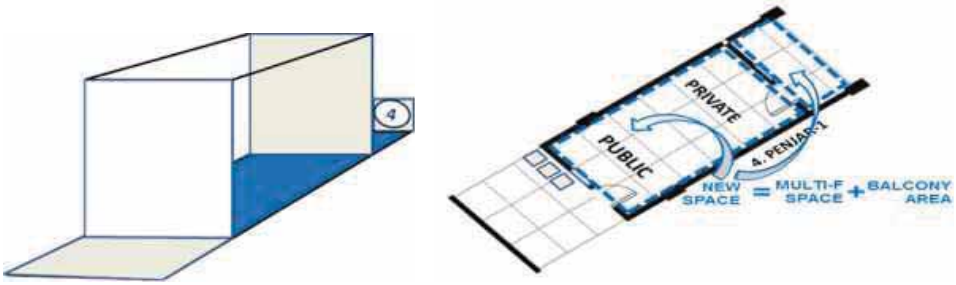


Figure 8- 19: The new space area after changing the balcony into a bedroom

The functionality of the adapted space is the new area divided by the use of space. The result in table 8.11 shows that Gunungsari with 77% in meeting the use of space has the best functionality, followed by Dupak with 72%. The least functionality belongs to Waru Gunung and Tanah Merah by 54%. Averagely, after changing the function of the balcony into a bedroom, the provided space can meet 62% of the use of space. The average changing capacity is 1.16. The highest capacity was obtained by Tanah-Merah with 1.33, while ITS had the lowest by 1.03.

Table 8. 11: Adaptability of space after changing the function of balcony into a bedroom

LCRA		Multi-F Space	Balcony Area	New Area	Changing Capacity	Use of Space	Adaptability
1	SOMBO	18	4.5	22.5	1.25	33.57	**0.67**
2	SIMO	18	4.5	22.5	1.25	33.39	**0.67**
3	DUPAK	18	4.5	22.5	1.25	31.22	**0.72**
4	PENJ-1	18	4.5	22.5	1.25	32.64	**0.69**
5	PENJ-2	16.5	1.8	18.3	1.11	29.71	**0.62**
6	WONO-R	16.5	1.8	18.3	1.11	30.63	**0.60**
7	RANDU	15.6	1.8	17.4	1.12	29.28	**0.59**
8	GN-SARI	23.4	2.8	26.2	1.12	34.23	**0.77**
9	WARU-G	15.2	1.5	16.7	1.10	30.84	**0.54**
10	URIP-S	18	2	20	1.11	30.02	**0.67**
11	T-MERAH	13.5	4.5	18	1.33	33.4	**0.54**
12	PENJ-3	17.4	2.7	20.1	1.16	33.64	**0.60**
13	ITS	17.6	0.6	18.2	1.03	26.16	**0.70**
14	UNESA	18	0.72	18.72	1.04	29.1	**0.64**
		17.41	2.73	20.14	**1.16**	**32.41**	**0.62**

FINDINGS: All the three adaptations with additional (extra) space cannot make the provided space meet the space requirements except that of full mezzanine installation.

8.7. THE EXTENT TO WHICH THE CURRENT SPACE DESIGNS ALLOW CHANGES TO MEET THE DEMANDS

This section shows the result of problem solving that was discussed in the previous section (second part). By this, the extent to which the spaces allow changes to meet its spatial needs can be found. As already discussed earlier, LCRA in this research have the opportunity to be adapted to meet the needs. The most legal adaptation that can be made is through vertical extension. Mezzanine installation does cost some, whether expensive or not it is relative. But in order to build a mezzanine the net space should be at least three meter high with the height of the lower space not less than 1.8m, and the use of the top space depends on its height. This research found that all top spaces were only able to be used for storage or non-standing activities. A full mezzanine construction could double the floor area. It is thus very effective to improve the functionality of the space.

To maintain the comfort of the whole space, only on units with space higher than 3.5m high, a full mezzanine might be installed. Even this must be supported by openings on the top space for ventilation. Units with space height lower than this only allow a mezzanine installation with half the size of multi-functional space. In this research, none of LCRA units had space height achieving 3.5m. Even only Dupak, Randu, Gunungsari, and Urip, that had unit space higher than three meters. The rest were units with lower space height.

The following table shows the functionality of space when installation of full mezzanine is performed. Functionality of space here is the adaptability in order to meet the space requirements. By original adaptability (no adaptation made) none of the LCRA units can meet their space requirements. However, the installation of full mezzanine can make all the LCRA space meet the households' requirements except Tanah-Merah. Since the adaptability of Waru Gunung after a full mezzanine installation is almost one it is considered meeting the requirements. The smallness adaptability of Tanah Merah is as a result of too small available space coupled with too large use of space.

Table 8. 12: Functionality of space that can be achieved because of the adaptability of space

	LCRA	Multi-Functional Space Area	USE OF SPACE	ORIGINAL ADAPTABILITY	By addition of full Mezzanine Floor	NEW ADAPTABILITY	FUNCTIONALITY
1	SOMBO	18	32.57	0.54	36	1.07	Meet the need
2	SIMO	18	33.39	0.54	36	1.08	Meet the need
3	DUPAK	18	31.22	0.58	36	1.15	Meet the need
4	PENJ-1	18	32.64	0.55	36	1.10	Meet the need
5	PENJ-2	16.5	29.71	0.56	33	1.11	Meet the need
6	WONO-R	16.5	30.63	0.54	33	1.08	Meet the need
7	RANDU	15.6	29.28	0.53	31.2	1.07	Meet the need
8	GN-SARI	23.4	34.23	0.68	46.8	1.37	Meet the need
9	WARU-G	15.2	30.84	0.49	30.4	0.99	Meet the need
10	URIP-S	18	30.02	0.60	36	1.20	Meet the need
11	T-MERAH	13.5	33.40	0.40	27	0.81	**Not meet**
12	PENJ-3	17.4	33.64	0.52	34.8	1.03	Meet the need
13	ITS	17.6	26.16	0.67	35.2	1.35	Meet the need
14	UNESA	18	29.10	0.62	36	1.24	Meet the need
		17.41	32.41	0.54	34.81	1.07	

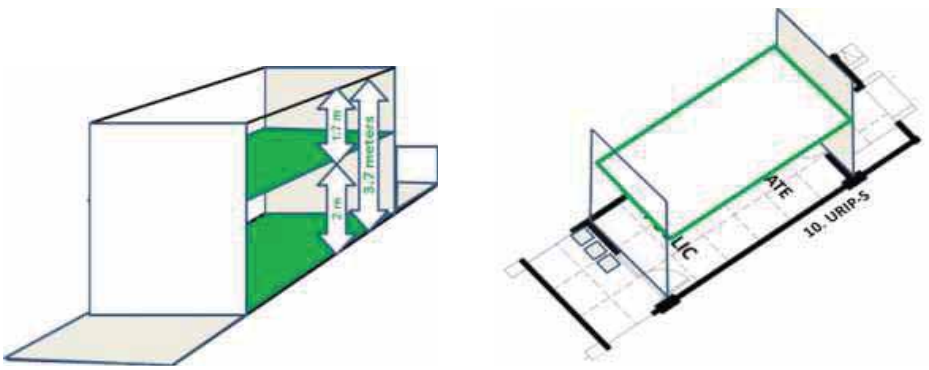


Figure 8- 20: Full mezzanine construction is able to make the provided space meet the requirements

However, not all LCRA can take advantage of these opportunities, as the top space of LCRA with limited space height can only be used as storing spaces or limited liveable space, instead of free standing activities. Limited liveable top space only allows sitting and sleeping activities. Appropriate use of top space can be referred from table 8.9.

FINDINGS:

Installation of full mezzanine is the only adaptations that can make all LCRA space meet the households' requirements except Tanah-Merah.

Figure 8-21 illustrates an example of how adaptation in this research supposed to be applied. Indeed installation of a non-full floor of mezzanine is more recommended as the air flow can be better and easier.

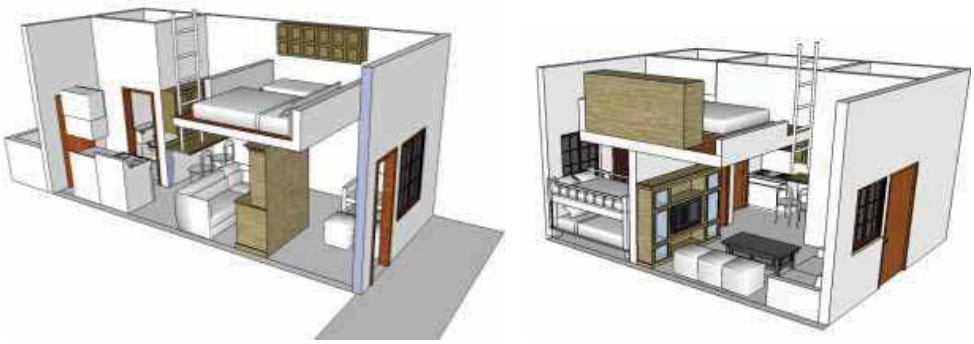


Figure 8- 21: Illustration of adaptable unit

The following figure indicates the position of adaptability as a variable included in the theoretical framework that is applied in this research. It shows that the most direct determinants of adaptability are the space provided and space required that resulted from the households' activities. However, it also indicates that through the required space, households' characteristics may indirectly influence the adaptability and these characteristics are proven to be majorly influencing the need for adaptation.

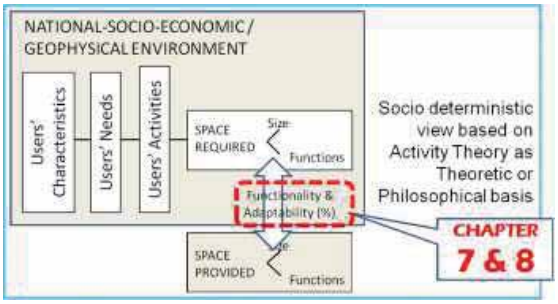


Figure 8- 22: The stage in which the theoretical framework is revealed in this chapter

8.8. CONCLUSION

1. The most widely found adaptation was horizontal partitioning. 214 families divided their multi-functional space, followed by corridor occupations that were done by 97 households. Balcony changes in function were performed by 29 households, balcony extension by 22 families, and mezzanine construction by 16 families. The main drivers of the importance of adaptation were privacy, changes in activity, changes in family structure, and the presence of income generation.

2. Findings on influence of households' characteristics on adaptation indicate that the density or living space (square meters per person) has more influence on the need for adaptation compared to the household size. Adaptations were more needed by households with lower rent rate rather than those with higher rent. Households who had stayed longer tend to require to do adaptation compared to those with shorter length of stay. The existence of economic activity, has strong influence on the need for adaptation.

3. All the three adaptations with additional space cannot make the provided space meet the space requirements. All uses of space were not met by the provided space except by the installation of full mezzanine. This vertical adaptation can make all the LCRA meet the households' requirements except Tanah-Merah.

4. It can be concluded that providing changing capacity is an important key solution to make the functionality of the provided space more sustainable. To give a better adaptability due to functionality, extra room or space should be made available to give them a chance for adaptation horizontally or vertically, or in case the space is not enough for individual activities they can make room divisions.

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PART THREE
Synthesis, Conclusions & Recommendations

CHAPTER 9
Overall Conclusions & Recommendations

PART THREE
Synthesis, Conclusions & Recommendations

CHAPTER 9
Overall Conclusions & Recommendations

9.1. INTRODUCTION

This chapter discusses the overall conclusions of this research as well as the efficacy of the theories, theoretic framework and methods in solving the problems in this research project. The chapter starts with a discussion about the findings of the sub-studies concerning the characteristics of the local context, the current space design, the households, and the functionality and adaptability. In addition, the interaction between these concepts will be revealed. The next section presents a reflection on this research project including the findings on the usefulness of the theories, theoretic framework and tools that are applied. The chapter is finalized with recommendations based on the research conclusions.

9.2. DISCUSSION ON THE FINDINGS ON THE SUB-STUDIES

9.2.1. The Context and the Current Space Designs

This sub-section answers Research Question 1: What are the characteristics of the currently applied space designs of low cost apartments in Surabaya Indonesia? The findings are summarized from chapter 4 that deals with the Indonesian context and the current housing situation.

Findings on the context:
Although economically Indonesia had improved and advanced to a higher standard of living, generally with an increase in the prosperity among the poor, the socio-economic situation remains at the level of a developing country especially with regards to the housing for the urban poor, To alleviate housing problems, the Indonesian government through the Housing Ministry provided low cost rental apartments (LCRA) for the urban poor, it was even planned to be provided semi furnished recently. As a result of increasing land costs, higher densities in urban areas, and deficits of green and open spaces in the city, the government developed LCRA rather than grounded individual dwellings for low-income urban housing. Two hundred and fifty twin blocks had been planned for in the 2010-2014 strategic plan. An additional one hundred and forty were planned for 2013-2014. The local governments were given the responsibility of

implementating these developments. The intention was not only to give prime services to all citizens but also to beautify the urban environment and to contribute to fulfilling the nation's commitment to the World Forum's goal of freeing Indonesia from slum areas by 2020 (Public Works Ministry, 2012).

The low cost apartments (Rusunawa) are walk-up flats not higher than five stories since elevators are not provided. They are called *Rusunawa" a word that means "simple rental multi-storey to house the urban poor". Rusunawa are not only solving the problems of land price and its scarcity, population density and the lack of green open space, but also result in a win-win solution for housing the urban poor. Rusunawa can be seen as a mutually beneficial settlement. By housing the poor in rusunawa, the government can more easily regulate and control the urban poor. These poor people won't make any troubles in case of (illegal) urban land use: they no longer live on the riverbank or under the bridges or other vulnerable landspaces that are prone to disaster such as flooding, landslides and fire. Such an urban plan can also be better organized. Under such a scheme, the government need only to contact the rusunawa district office as the representative agency of the poor residents for information concerning the housing units and their residents. On the other side, low income residents can secure land for their dwellings more easily and enjoy a more peaceful life in a higher quality living environment. The location of rusunawa is also usually arranged in close proximity to their work place. In situations where this is not the case, transportation is provided.

By being provided semi furnished LCRAs, prospective residents do not need to bother about household's main furniture. What needs to be considered then, concerns the means and furniture that are primarily needed to be provided for them. Findings of this research indicated that mattresses, electricity, beds, fans, water, sewer, buckets, TV, cupboards, and shelves, were the top ten required items (table 4.8). In order to save space, the main furnishings provided to LCRA residents should be designed to be as multiple-purpose as possible. Through the provision of proper dwellings, low income residents could have a better life. Yet, this research found that there are still two essential aspects that require a solution namely, adaptable apartment spaces that provide changing capacity, and more individual spaces for storage. These two aspects should be well considered as the average size of the current space design was found to be inadequate (and therefore, less functional) consequently cannot accommodate all activities desired or required by the households.

Findings on the current space designs:

The main space characteristics of all LCRA are:

- The functional spaces in the LCRA include: a multi-functional space, kitchen, bathroom/ toilet, and balcony. The formerly developed LCRA: Sombo, Simo, Dupak, and Penjar-1 did not have private service such as a bathroom and pantry. These were provided collectively.
- The provided whole units' size is 23.14m^2 on average, ranging from 18.7m^2 to 31.4m^2.
- The average size of the provided multi-functional space is 17.41m^2, ranging from 13.5m^2 to 23.4m^2. The average size of current kitchen is 2.36m^2 ranging from 1.5m^2 to 4.05m^2. The bathroom is averagely 2.56m^2 ranging from 2m^2 to 3.5m^2, and the average balcony size is 2.73m^2 ranging from 0.6m^2 to 4.5m^2.

A complete and more detailed explanation regarding the current space design is presented in the conclusions of chapter 4. To summarize these, the following focuses on conclusions on how the communal space and individual space in the apartment blocks are expected to be.

The provision of communal spaces is intended to maintain harmony amongst community. From the fourteen case study apartment blocks, eight were designed as double loaded blocks (apartment units at two sides of one corridor that gives access to the individual units), three as single loaded blocks (apartment units at only one side of a corridor that gives access to the individual units), and the remaining three were twin blocks. Based on the availability of communal spaces, the buildings in this research were divided into: buildings with communal spaces: Sombo, Simo, Dupak, Penjar-1, and Unesa; and buildings with no communal space: Penjar-2, Wonorejo, Randu, Gunungsari, Waru-Gunung, Tanah-Merah, Penjar-3, and ITS. The first type apartments was provided not only with a wider corridor space but also with communal spaces such as collective kitchens, bathrooms or toilets and praying space. The second type only had a corridor as the communal space, the size of which is relatively narrower than that of the apartment blocks with collective services. The apartment blocks with communal spaces were developed first. Later, the government decided to continue the development of apartment units with private services in twin blocks.

However, this research found that communal spaces should also continue to be provided. The width of the corridor should at least allow the inhabitants to keep socializing with one another. If for economic reasons the corridor width must remain narrow, then there should be periodical widening at certain interval that enables residents to socialize and strengthen their kinship relationships.

Individual space in the LCRA unit is represented by the multi-functional space as the other spaces in the apartment are themselves in-habitable. When talking about individual space, the most important aspect is the privacy for the household members. In case there is not enough space in the LCRA unit, public activities are often carried out in the corridor space. For private living, there is no other spare space inside the apartment except from balcony. If the balcony were adapted into a private space, the fresh, outdoor air that flows freely through the apartment would be lost. Otherwise the only possibility is by extending the apartment space upward. This calls for attention of the government to provide a larger multi-functional space to allow households to carry out their private activities properly. The multi-functional space should suffice the conduction of all activities that generally take place there and that allows easy partitioning to separate private from public activities. Inadequacy of space results in the need for adaptation. Therefore the space design should be based on the space that is actually required or as used by households for doing their activities.

Findings on households' characteristics:
Low income households in Surabaya are characterized by their good community harmony, where communal aspects are equal to, instead of below their individual aspects. Users of the apartments in this research were low income households in Surabaya that are characterized by a household size of three point five-four. This implies that the investigation of functionality takes into account that the units generally accommodate four household members. The households in

the community were ninety-four point three percent Moslem, so Moslem lifestyle should be taken into account in the design of living spaces, especially in terms of providing space within the units where residents can pray five times each day. The provision of a collective praying space for men to use on Fridays should also be considered in the communal space. The composition of households was dominated by children. However, the dominant average age was between fifteen and seventy years old. This suggests that the sons and daughters of the households in this research were grown up. Although child-caring and children's playing rarely occurred, the space for these activities should be provided for adequately. The density of units was on average eight point zero-four square meters per person, ranging from five point two-seven to thirteen point six-six square meters per person. Rent rates average IDR 85,140 ranging from IDR 20,000 to 250,000 (as a comparison, currently one USD equals to 11,500 IDR). Length of stay was on average seven point two-nine years ranging from two to nineteen years. There were a total of sixty-three units that also served as business.

The relation between the household's size and the space requirements indicates that any increase in the number of occupants is always followed by accretion of the space required. It begins with a single occupant unit that only requires a space of twenty-three point eight square meters. This space use keeps increasing until thirty-six point eight square meters for units with seven family members. Attention needs to be paid to the space design for five-person units as the increase of the space requirements declines on the following household's size. Relation with the length of stay indicates that the space required increases smoothly from the first up to year ten of occupancy where it starts to decrease. But the graph starts rising again when the length of stay reaches twenty years. This signals that adaptations have occurred within the first ten year period. The smooth slope of the increase of space needs could be due to the smallness of the changing capacity of the unit physically. Then the space used decreases as the occupants were reduced due to the release of the children when they start having their own life and home. Thereafter, as many old parents are entrusted with grandchildren, the need for space rises again after year twenty. Alternately the occupier has changed to a new family.

9.2.2. Households' Activities and Standard Requirements

This section answers Research Question 2: What are the activities of low income households in Surabaya Indonesia, and how are the standard requirements for space design (chapter 5).

Findings on Activities:

Households in this research were characterized by similar activities that they have in common. There were a total of twenty-seven households' activities that consisted of twenty-three domestic and four business activities. Among the twenty-three domestic activities, one activity was cleaning, an activity that is considered not to require space. Three of them were no daily activities, but occurred periodically. Besides these activities, there were daily events that may enhance the community harmony among neighbours such as household chats and gathers, that always took place at the communal space such as the corridor. The nineteen daily activities were included in the evaluation of functionality and adaptability. Twelve of these activities were found to be carried out in the multi-functional space, three in the kitchen, two in the bathroom or toilet, and two in the balcony. Activities that occur in the multi-functional space include public activities (entertaining, playing, TV-watching, studying, ironing, praying, eating, and storing-4);

and private activities (sleeping, child-caring, relaxing, and storing-3). Activities that occur in the kitchen include dishwashing, cooking, and storing-2. Activities taking place in the bathroom/ toilet: bathing and washing. The balcony facilitates drying and storing-1, and was often also used as extra storage space.

Findings on standard requirements:

- Based on literature reviews it was found that the range of the size of the apartment unit with four household members is from forty square meters to fifty square meters.
- Seven activities are not taken into account in the national standards. These activities include drying, storing-2, praying, studying, child-caring, relaxing, and playing. Since they do take place, they are added in this research. The standard space sizes for these activities are determined by referring to the international standards or through anthropometric study.

For the evaluation of the functionality of the apartment spaces, this research took two types of design requirements into account: the Indonesian design standards for household activities; and the use of space or the space that is actually used by households to carry out the activities. The Indonesian standard size for the whole unit was originally twenty-nine point seven-six square meters. This standard was then adapted to become activity based design standards. The final improved standard size for the whole unit to be proposed by this research is forty-eight point four-one square meters.

9.2.3. The use of Space

This section describes the answer to Research Question 3: How is the use of space of low income households of low cost apartments in Surabaya, Indonesia (chapter 6).

Findings on use of space:

The use of space was determined based on the real space used by households for carrying out the activities. Each activity had its own use of space. Since each activity had own location, each unit part had its own activity loads, therefore also had its own use of space. Detailed size of space used can be seen on table 6.20 in chapter 6. Average use of space of the whole unit was 41.91m^2, while the average existing area of the whole unit was 23,14m^2. Finding indicates that seventy one percent households separated their multi-functional space into private and public sub-spaces. Allocation for private sub-space that was found larger than that for public indicates that households prioritize privacy. Among two hundred and thirty-one households who did adaptations, one hundred and fifty-one were caused by the need for privacy.

Mattresses seemed to be a specific required item for the low-income households, and a TV was also considered as an important in-house entertainment needed by residents. Most households with income generation activities at home used the corridor or communal space for conducting their business. Private storage space was not provided in the unit, in fact, the space that was used for storing 1, 2, 3, and 4 indicated the need for private storage, and standard for storage is already specified in the national standard. This research found that communal space that can be used by households for socializing are only provided in the LCRA that were developed earlier. The more recently developed LCRA had no communal spaces.

9.2.4. Functionality of Space Design

This sub-section answers Research Question 4: How is the functionality of the currently applied space designs of low cost apartments in Surabaya, Indonesia? To what extent do the current space designs meet the users' demands? (chapter-7).

Findings on functionality:

- The use of spaces of ironing, storing-1, cooking, dining, bathing, praying, studying, child-caring, relaxing, and playing exceed the standard therefore they are not functional and need improvement.
- The government provided less space than the standard, for the whole unit 50%, the multi-functional space 51%, the kitchen 55%, and the bathroom / toilet 75% of the national standard. Only the space for balcony was provided more sufficiently than the standard. However households could present high effectiveness on the use of space.
- The standard for the bathroom which is 3.42m^2 requires adjustment as the average space use already exceeds it with 3.51m^2. Moreover, as the bathroom is used not only for bathing but also washing, the default should also be determined based on the combined standard.

The spaces used for washing, drying, dishwashing, storing-2, sleeping, storing-3, TV-watching, entertaining and storing-4 are still below the standard. However, standards for the rest (ten activities) need improvement. Some activities that must be carried out in the same space are at risk of conflict and led to the need for adaptation of the space. Effectiveness of the space means that an increasing number of activities can be facilitated by the space. The large number of activities that must be accommodated in the provided apartments, result in overlap between the activities, especially when they take place simultaneously in a same place. In fact, this study found twelve activities that must be carried out preferably in the multi-functional space. Overlap of activities is not only due to the amount of activities, but also due to the number of household members who carry out the activities. These conflicts require adaptation of the space. When viewed from the space adequacy in meeting the real needs, all of the required spaces for the unit parts are still below the adapted standards except for the bathroom/toilet.

Regarding the extent to which the current space design meets the (ultimate) demands the following was found. For the whole unit, Unesa had the smallest extent which the users' demands are met (i.e. 39%). With only 39% Tanah-Merah was the LCRA with the lowest score in meeting the space demands for the multi-functional space. For the kitchen, Waru-Gunung achieved the smallest extent in meeting the requirements (i.e. by 36%). For the balcony ITS had the smallest size by only meeting 22% of the standard. However, on average the provided space of the whole unit, the multi-functional space, and the kitchen could meet approximately 50% of the requirements, while the bathroom / toilet can meet higher (i.e. by 68% averagely). Different from the other functional areas that are provided lower than the standard, the balconies are provided equal to the standard size (i.e. by 100% of the requirement).

9.2.5. Adaptability of Space Design

This sub-section answers Research Question 5: How is the adaptability of the currently applied space designs of low cost apartments in Surabaya, Indonesia? To what extent do the current space designs allow changes to meet the users' demands? (chapter 8).

Findings on adaptability:

- Density or living space (square meters per person) proved to have influenced the need for adaptations more than the household size. So, deciding the space size based on the density is better than on household size.
- Adaptations were more needed by households with lower rent than those with higher rent.
- Households who lived longer tend to require to do adaptation compared to those with shorter length of stay.
- The existence of business has strong influence on the need for adaptation. So, units having business at home requires larger and more adaptable spaces.
- All the three adaptations with extra space (corridor occupation, mezzanine construction, and balcony extension) could not make the provided space meets the space requirements except by installation of a full mezzanine.
- Only two significant functional adaptations were needed during one day in the public sub-space of multi-functional space: the space functions for studying in the afternoon up till the evening, and watching TV in the evening throughout the night.
- The inclusion of analysis on time management of activities can reduce the space demand.
- Installation of full mezzanine makes all LCRA meet the requirements except Tanah-Merah.

Functional adaptation or change of functions during day time occurred in the public sub-space. From the twelve activities taking place in the multi-functional space, storing-3 and storing-4 are seen as stationary activities. Space requirements are there for calculation, i.e. by taking the space for cupboards or shelves into account. From the remaining ten activities, three are accommodated in the private sub-space: sleeping, child-caring, and relaxing. Among seven semi public and public activities, playing and entertaining are tolerated to take place in the corridor. The other three: ironing, eating and praying are considered less time consuming therefore they can share the public sub-space respectively when studying and watching TV are not occurred. Thus in the evening and night-time, the public sub-space is significantly provided for only these remaining two activities: studying and watching TV.

As stated by Alberta Health and Wellness (1999), housing premises shall be deemed to be overcrowded if a bedroom in it has less than $3m^2$ of total area for each adult sleeping in the bedroom. The household size in this research ranged from one to seven members. Based on the principle mentioned above, the allocation for private sub-space in this research then must be from $12m^2$ (for four members) to $21m^2$ (for seven members). The final size of multi-functional space proposed in this research is $37.38m^2$. The remaining size for public sub-space is ranged from (37-21) $=16m^2$ up to (37-12) $=25m^2$. Public sub-space of $16m^2$ must be adequate to be used for studying and watching TV, as well as for the other three activities: ironing, eating, and praying; even if the need for entertaining guests suddenly occurs.

Regarding the extent to which the current space allow changes to meet the demands the following is concluded: none of the investigated adaptations could make the provided space in LCRA in Surabaya meet the required space size based on the actual space used by the households except the installation of full mezzanine. Only Tanah Merah rated less than the households' requirements (i.e. by 81% of the use of space). Vertical extension by full mezzanine

could double the floor area. All LCRA could meet the requirements by this kind of adaptation but not Tanah-Merah. It is thus very effective to functionalize space. However, only Dupak, Randu, Urip, and Gunungsari, unit spaces are higher than three meters, making them more flexible in the use of top space.

9.3. POSSIBILITIES TO ADAPT TO THE PROVIDED SPACE

As it is found in this research, the space provided by the government on average only meets 56% of the space needed by households. The use of space that is almost twice as much complicates the households in performing their daily activities. This section means to provide direction on how to adjust the real needs with the space provided by the government.

9.3.1. Sharing One Open Plan Space by High Tolerance among Members

LCRA in this research only had one habitable space that serves multi-functions. Open plan spaces are more appropriate as they provide more choices to the residents in terms of functions and arrangement. If the area is wide enough, families share spaces more freely as desired. Problems arise, however, when the open space area is too small to accommodate all the activities that are desired for a single space. In some scenarios, there may be as many as 12 activities in one space. The same activities can even overlap if more than one family member carries-out this same activity. For example, receiving guests of the parent and guests of the children conducted in the same living room at the same time. In the case of LCRA, the multi-functional space also serves as living room. In the above case, one of them, either the child or the parent must be willing to tolerate to accept guests in the corridor. The following image refers to the condition of multi-functional space that generally presents as the focus in this research.

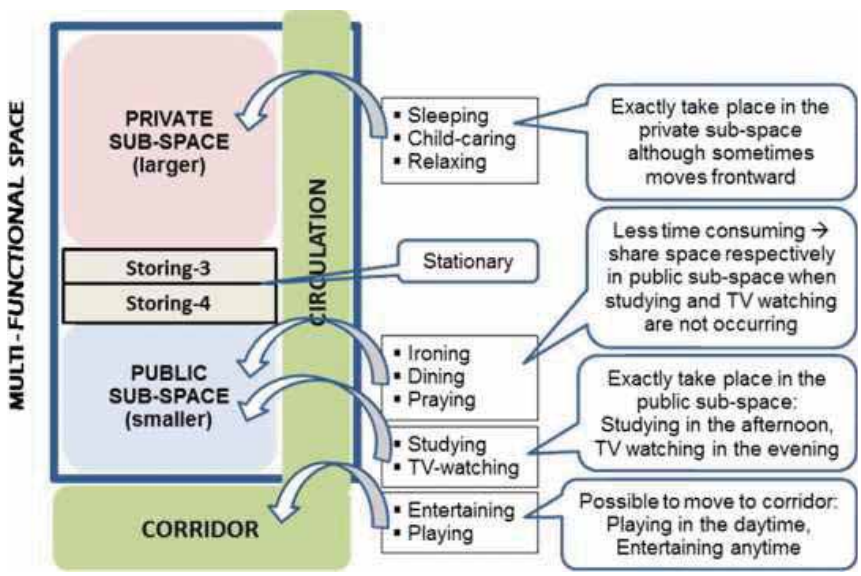

Figure 9-1: Effort to reduce the load of multi-functional space by distributing the activities properly

FINDINGS: Significant functional adaptations during day time in the public sub-space are needed only for two activities: studying in the afternoon through evening and watching TV in the evening through the nighttime.

9.3.2. Public Sub-Space of Multi-Functional Space for All

The public sub-space of the multi-functional space should accommodate all activities except those that are private. Its location that is at the front of the unit enables the ongoing activity to move or extend towards the corridor space any time needed. It is the only solution that can best be done to the existing condition. Therefore most of the occupants needed to insulate their multi-functional space. Overlapping between activities can still be tolerated as long as the natures of the activities are still among similar public activities. Separation into public and private sub-spaces is very important to protect the privacy of the family. Findings in this research suggest that 71% households divided their multi-functional space, and in dividing the space, most households gave a greater extent to the private sub-space than that of public sub-space.

Private sub-space must be larger than that of public, as the public activities can still extend towards the corridor, while private activities are not likely to be done in space other than inside the unit itself (the multi-functional space). In calculating the living space to be provided, consideration based on the adequacy of living space (square meters per person) is better than being based on the number of family members. All activities except those that are private activities, should take place in the public sub-space. Hence, eight activities including ironing, eating, praying, studying, watching TV, playing, receiving guests, and storing-4: school supplies, should all be able to be carried out in the public sub-space interchangeably. Storage of goods is stationary such as in cabinets, shelves, or else. Ironing, dining, and praying can take place at the time when the public sub-space is not used for studying and watching TV, while entertaining and playing can be moved to corridor anytime.

9.3.3. Greater Space Allocation for Private Sub-space

Private activities including clothes storing, child caring, relaxing and sleeping should be able to take place as sound as possible. The importance of private sub-space being made larger than the public sub-space is in order to ensure the comfort of private activities as well as accommodating the relocation of activities when there is a sudden need for other activities to be carried out. In addition, these private activities especially sleeping are closely related to health. Occupants should be able to sleep sufficiently in a good place. Bedroom size is then crucial.

In Sri-Lanka, the minimum bedroom size is set at $16m^2$ (Shaw, 2010). For four-person units, Alberta H&W (1999) recommends at least $12m^2$. PPR Malaysia (Goh, 2006) sets $18m^2$ for bedroom of units with four occupants and $22m^2$ for five-person units. Habitable room that is not a bedroom but is used for sleeping must not be less than $9.5m^2$ for each adult sleeping in it (Alberta H&W 1999). Multi-functional space which is proposed by this research to be $37m^2$, then meets the requirement for four-person space (according to Alberta). To ensure privacy, a larger bedroom ($22m^2$) allocation to the private sub-space is recommended. The remaining $15m^2$ is then provided to facilitate activities taking place in the public sub-space. For the current space of $17.4m^2$ on average, $12m^2$ must be served for private sub-space.

9.3.4. Scheduling and Prioritization of the Activities

Occupants of the apartments can actually learn from their own experience in regulating the use of the existing space. However, the provision of space must remain above the actual space requirements. Occupants must be clever in allocating the time of the use of space. Less time consuming activities should be done by sharing space respectively. Urgent activities should be prioritized. For this, the private sub-space is made larger than the public sub-space.

9.3.5. Making the Provided Space Sufficient by Time Management

Most households have a capacity to adapt their space demands to the provided space by means of their own creativity. This effort is considered as the adaptation of households themselves and their way of life in the LCRA that distinct LCRA in this research from those other kinds of apartments. Residents adapt their activities to the available space and time, so that the existing space can serve the need of all activities that occur there.

The most crucial activities that need to be managed are those that occur in the multi-functional space. Of all nineteen domestic activities, twelve must be conducted in multi-functional space. In this research, it was not only investigated WHERE each of the activities is carried out, but also WHEN it is occurred, and for HOW LONG. For that reason the time of activity occurrence in this research was divided into: (M) morning 04.00-10.00; (D) daytime 10.00-16.00; (E) evening 16.00-22.00; and (N) nighttime 22.00-04.00. Table 9.1 lists the dominant time occurrence of the activities.

Table 9. 1: Dominant time occurrence of activities conducted in the multi-functional space

SPACE	SUB-SPACE		ACTIVITY	SIZE	MORNING 04.00-10.00	DAYTIME 10.00-16.00	EVENING 16.00-22.00	NIGHT 22.00-04.00	DURATION (hours)			
									<1	<4	<8	>8
MULTI-FUNCTIONAL SPACE	PUBLIC	R	Playing	2.75		1				1		
		S	Entertaining	2.60	1	1	1			1		
		P	TV-watching	3.60			1			1		
		C	Ironing	1.75	1	1			1			
		G	Eating/dining	2.17	1	1	1		1			
		L	Praying	1.64	1	1	1	1	1			
		M	Studying	2.39			1			1		
		T	Storing-4	1.42	1	1	1	1				1
	PRIVATE	K	Sleeping	3.98			1	1			1	
		N	Child-caring	2.36	1	1	1	1				1
		O	Storing-3	1.63	1	1	1	1				1
		Q	Relaxing	2.73		1	1			1		
TOTAL ACTIVITIES		**12**	**Activities**	**29.02**	**7**	**9**	**10**	**4**	**3**	**5**	**1**	**3**

Of all twelve activities carried-out in the multi-functional space, ten that take place in the evening making it the largest number compared to the other time periods (table 9.1). Total activities that occur in other time periods: morning, day, and night time, are less than that occur in the evening. The total area used for twelve activities taking place in multi-functional space is 32.4m^2. However, when the area for evening is met, it will suffice to cover the need for the use of space in the morning, day, and night. Table 9.2 explains the issues in more detail.

Table 9.2 shows the total area needed in each of the four time range based on what activities occur at that time. It can be seen that in the evening, the demand for space is greatest. In the morning, day, and night-time, less space is needed. Therefore, providing space by total area needed in the evening is proved to be adequate to represent the area needed for the multi-functional space. The provision of space only needs 27.15m^2. The time management has freed the space from two activity loads: playing 3.1m^2 and ironing 2.15m^2. So on average the total space has been saved is 5.25m^2. Table 9.2 also indicates that averagely in the evening the provided space only sufficient for 64% of the space required.

Table 9. 2: Dominant area required to conduct activities in multi-functional space occurred in the evening

MULTI-FUNCTIONAL SPACE							17.41
MORNING 04.00-10.00		**DAYTIME 10.00-16.00**		**EVENING 16.00-22.00**		**NIGHT 22.00-04.00**	
ENTERTAIN	2.85	ENTERTAIN	2.85	ENTERTAIN	2.85	SLEEP	4.77
EAT	2.50	EAT	2.50	EAT	2.50	PRAY	1.70
IRON	2.15	IRON	2.15	PRAY	1.70	CHILD-CARE	2.98
PRAY	1.70	PRAY	1.70	STORE-4	1.41	STORE-4	1.41
STORE-4	1.41	STORE-4	1.41	STORE-3	1.61	STORE-3	1.61
STORE-3	1.61	STORE-3	1.61	STUDY	2.84	140%	**12.47**
CHILD-CARE	2.98	CHILD-CARE	2.98	CHILD-CARE	2.98		
SLEEP	4.77	PLAY	3.10	RELAX	3.06		
87%	**19.97**	RELAX	3.06	SLEEP	4.77		
		82%	**21.36**	TV-WATCH	3.43		
				64%	**27.15**		

Table 9.3 shows that average space reduction is 5.25m^2. The most reduced space is made in Tanah-Merah by 6.41m^2, while Unesa and ITS made the least reduction as they do not have playing activity. The space provided by the government is averagely 65% of the space use.

Table 9. 3: Reduction of space demand because of representation of activities occurred in the evening

	LCRA	EXISTING MF-SPACE	USE OF SPACE	FREED ACTIVITIES FROM MF-SPACE		REDUCED AREA (m2)	TOTAL EVENING ACTIVITIES	PROVIDED SPACE (%)
				C (IRONING)	R (PLAYING)			
1	SOMBO	18.00	**33.70**	**2.45**	**3.07**	5.53	28.18	0.64
2	SIMO	18.00	**33.43**	2.31	3.13	5.44	27.99	0.64
3	DUPAK	18.00	**31.63**	2.04	3.20	5.24	26.39	0.68
4	PENJ-1	18.00	**32.61**	2.19	3.20	5.39	27.22	0.66
5	PENJ-2	16.50	**30.80**	1.81	2.79	4.59	26.21	0.63
6	WONO-R	16.50	**30.87**	2.19	2.44	4.63	26.24	0.63
7	RANDU	15.60	**29.61**	1.87	2.82	4.69	24.91	0.63
8	GN-SARI	23.40	**35.00**	2.00	2.86	4.86	30.14	0.78
9	WARU-G	15.20	**31.22**	2.12	3.14	5.26	25.97	0.59
10	URIP-S	18.00	**30.36**	1.95	2.56	4.51	25.84	0.70
11	T-MERAH	13.50	**33.87**	1.95	4.46	6.41	27.46	0.49
12	PENJ-3	17.40	**34.23**	2.23	3.16	5.39	28.84	0.60
13	ITS	17.60	**26.24**	2.92		2.92	23.33	0.75
14	UNESA	18.00	**29.14**	2.12		2.12	27.02	0.67
	AVERAGE	**17.41**	**31.62**	**2.15**	**3.07 →3.1**	**5.25**	26.84	0.65

Setting the Time of Activities to Make the Provided Space Sufficient

Examination based on occurrence time of activities showed that the most activities conducted in the multi-functional space are no longer twelve, but ten. Playing takes place in the daytime, while ironing in the morning and or daytime. In the evening, multi-functional space is only used for two public activities instead of three: entertaining and TV watching; four private activities: sleeping, child-caring, storing-3 and relaxing; and four semi public instead of five: eating, praying, studying and storing-4. Activities which occurrence takes less than an hour including: ironing, eating and praying, can share the same place one another respectively. Spaces for storing-3 and 4 are stationary as the items are stored fixedly such as in cupboards, racks, etc.

Figure 9-2 shows that in the early morning time, the public sub-space was used for breakfast and was later used for ironing. In the same time, some household members could still be sleeping in the private sub-space. This space was subsequently used for relaxing and child-caring in the later morning. This household preferred to entertain their guests in the corridor. Otherwise this activity could share the public sub space. Praying could take place either in the public sub-space or in the circulation space.

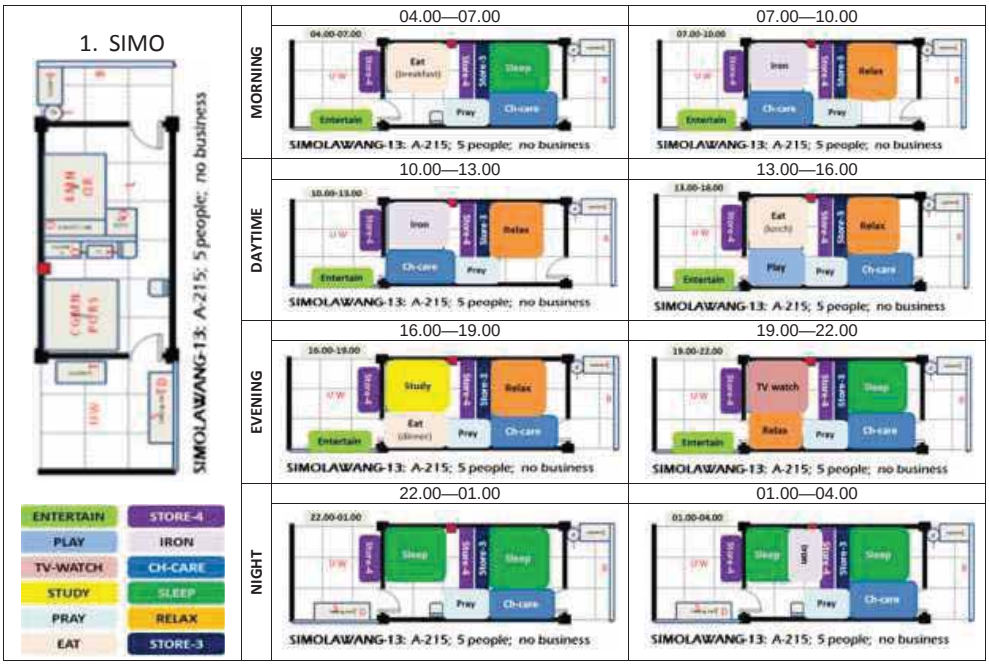

Figure 9-2: Three hourly use of space at multi-f space (daily functional adaptation) represented by SIMO-13

Earlier in the day, ironing activities could still be on going. Later in the day this public sub-space was ready for lunch. Child-caring usually moves frontward at this time, as the baby likes to play outside in the corridor. However, when the baby wants to sleep, a part of the private sub-space was ready for laying the baby down as well as allowing the mother to relax. Playing activity then took place in the public sub-space in the later daytime replacing the previous activity. In the earlier evening, the public sub-space was occupied for studying, sharing the space with dinning activities. In the later evening, the space was used by the household for watching television, and at night time, all spaces were used for sleeping, child-caring, and praying.

FINDINGS: Limited spaces of the apartment force the household members to adapt the way in which they carry out their activities. This requires that the activities and the use of space are carefully managed so that the same space can accommodate all activities. The adapting capacity of the households can reduce space needed. Managed properly, and adaptable to the individual use requirements of the households, the amount of space needed is smaller.

SUMMARY OF THE FINDINGS

Families living in the LCRAs (low cost rental apartments) in this research were low income households with all their problems. Their main problem was of course dealing with deficiencies in terms of economics that had impacts on the conditions they face. Due to economic weakness, they once had to live under bridges, in marginal settlements, slums and overcrowded areas, before they were finally resettled by the government to LCRAs.

In the beginning of their stay in the LCRA units, they had to adjust their old way of living to living in the apartments. They had to stay in a unit that was not only small but also had only one living space (i.e. the multi-functional space), as the other spaces were kitchen, bathroom and balcony. These families had to perform their domestic daily activities that were found to be as many as nineteen. Most of the daily activities took place in the multi-functional space. Out of nineteen, twelve activities had to be carried out in this space. Households should adjust their space needs to the available space.

The activity types vary in nature. Therefore these households must also protect and separate their private activities from public activities. In the multi-functional space that was relatively small, the existence of space that could provide privacy was highly needed. This research found that 71% households divided their multi-functional space. Most of the households allocated space for private larger than that for public. They separated these spaces by various separators such as cabinets, shelves, drapery, multiplex, or others.

Moreover, results of this research found that the space of LCRA units was only provided approximately 56% of the standardized space by the government. The adapted standard for total space area was found to be 44.94m^2 while the provided space for the whole unit was averaged 23.14m^2. The average use of space for the whole unit was 41.91m^2. The standards available are not enough to be the reference of all the activities required in this research.

To cover the shortage of space that occurred, as well as fulfill the need for privacy, the households performed adaptations in the form of:

- Transformation or physical adaptation that can be horizontally through partitioning, corridor occupation, balcony extension, and balcony change; or vertically through constructing a mezzanine in the multi-functional space. Households not performing transformations were not necessarily because of economic reasons. It could be due to other reasons such as insufficiency of space dimensions.
- Besides physical adaptations, these households also did functional adaptations that relied on time management towards the occurrence of the activities.

9.4. REFLECTION

9.4.1. Research Findings vis-à-vis Theories

Activity Theory and Theoretic Framework

The research findings suggest that there is a relationship between the living spaces and the activities of users living in the space. The main objective of this research was to achieve sustainable housing that in turn promotes a better quality of human life. Therefore the principle of how households could live in the currently applied space, as well as what these spaces role are and how they serve the occupants and vice versa is important in order to know the extent to which the space is able to meet the space needs of its inhabitants.

There has been much research completed as well as theories and methods on relation and interaction between man and his environment or the space he occupies. It is seen as a man-environment system. The activity theory that was used in this research provides a method of understanding and analyzing the interaction between household activities and the available space.

The theoretical framework (derived from the activity theory) includes the core concepts and gave the guidelines for this research as it indicates linkages between the involved variables (i.e. the context, the characteristics, the needs, the activities, and the space demands, including the attributes). The framework is used to assess the functionality and to see the extent to which the space meets the users' demands, while the adaptability is assessed to see the extent to which the space allow changes in meeting the demands.

Functionality and adaptability of space in this research was determined by the gap between the attributes of provided and required spaces. On one side, it is determined by activities and needs affected by households' characteristics. On the other side, socio-economic conditions in Indonesia as the context in this study, as well as regulations and standards applied by the designer also has an impact on functionality and adaptability of space.

The Activity Concept

The theories indicate that the main aspect that distinguishes one activity from another is the difference of their objectives. It is the objective of an activity that gives it a determined direction.

An action being carried out is adequate to task, the task then has a goal assigned in specific circumstances. For this reason, the action has a specific quality that formulates it specifically and the particular methods by which it is accomplished. The method for accomplishing actions is called operations. Actions are related to goals, while operations are related to conditions (Leont'ev 1978 p.12).

The concept of activity is necessarily connected with the concept of motive. According to the terminology proposed, the objective of the activity is its true motive. The motive may be either material or ideal, either present in the perception or exclusively in the imagination or in thought. The main thing is that behind activity there should always be a need i.e. that the activity should always answer one need or another.

Activity does not exist without a motive; non-motivated activity is not activity without a motive, but activity with a subjectively and objectively hidden motive. A process is an action if it is subordinated to the representation of the result that must be attained, that is, if it is subordinated to a conscious purpose. Similarly, just as the concept of motive is related to the concept of activity, the concept of purpose is related to the concept of action.

The activity theory mentions the types of activity which may differ in characteristics including their time and space requirements, but it is concerned only with one activity at a time. There is no part of the theory that takes into account when two or more activities which nature and operations are in contradiction to each other should occur simultaneously in the same space. The operation of actions of each activity may disturb each other.

Space as a Tool to Support Living

According to activity theory (Vygotsky, 1993), the subject is the household who lived in the LCRA unit. The objective is the intention of the household, or, the execution of activities to stay alive. To achieve the objective there is a need for sufficiency of the space in which the activities take place (a functional space). So according to the activity theory terminology, “sufficing the available space” mediates interaction between the low income households of LCRA as the subject and their objectives. The available or provided space in this case becomes the media or tool to achieve their objectives.

The tool empowers the subject in the transformation process with the historically collected experience and skill crystallized to it. But it also restricts the interaction when it remains invisible to the subject. So, the tool can support the successfulness of objective achievement, but it can also inhibit when this tool complicates the achievement of the goal. This implies that the space will support the activities carried out by the households when it is adequately provided. When the space is provided insufficiently, this space as a tool, could even hinder the households in achieving their objectives. Households will be looking for another place that supports the activity, such as was found in this research by moving to the corridor.

This research showed that there is not enough space in the LCRA for the households to perform all day-to-day activities to properly respond to their needs. Households were forced to adapt to their apartments by changing the function of the same space (sometimes based on the time at which it is used), or by physical adaptation of the space such as constructing partitions or mezzanines. This research also showed that the availability of space has influenced the way on which households carry out the activities that occur daily.

However, in contrast to the above, space becomes an important medium for achieving privacy. Without space there will be no privacy. Households create privacy by installing partitions in the available space. The space must not only be available, but also sufficient. The smaller the space, the more difficult it is to create privacy. In this narrow space, one activity must share the space with other activities. Thus, in case of privacy creation, the space as a tool as well as the outcome is essential, not optional.

Household's Reaction to the Available Space

Findings in this research suggest that most households faced problems of space shortage. The first time dealing with the huge space shortage might have put the households into shock as it is very difficult to make the space functional when the available space is too small. To replenish the available space in order to accommodate all the activities, households performed daily functional adaptation.

The households had to carefully consider and organize the execution of each activity to match it with the available space. In undertaking their daily activities, households do not directly carry out the activities, but they need to use their consciousness and think which space or place could reasonably be used to implement the activities. They also need to think about when the best time is to conduct these activities. Even in cases where households did not have the necessary space to undertake certain activities inside the unit, these activities were done outside or in the corridor or perhaps in other communal spaces outside the unit.

In addition, the consciousness of LCRA occupants is also related to the attitude that they accept what has been given to them by the government. This happens because they compare the current conditions with the former condition when they were still living in informal settlements. The family considers the current condition as an improved quality of life. Therefore the functionality of space here is more a matter of humanity i.e. how to make the space they occupy more humane. Of course this needs to be associated with the applicable standards. During the time of this research none of the households ever complained about the problem of space size.

For households, however, the continuity of the daily activities is much more important than the functionality of the existing space. As such, households are no longer concerned with the adequacy of space. For them, the more essential thing is that all the daily activities can take place. In this case, consciousness of the households on the space insufficiency over time gives them experience, because of which they then become able to perform the activities although the available space is not enough. The space that acts as a tool for the implementation of the daily activities becomes insignificant. Therefore, as the name suggests, the multi-functional space of LCRA in this research functions according to what activities are done there. The function of space is dictated by the activities that take place there. So, eventually it is not the function of space that determines which activities can take place there, but like its position as only an intermediary, what the space is reserved for is determined by the activity.

Households, Community, Social Relations and Space

Activity Theory indicates that the individual activities are not separated from the social system. So, human activities must not be considered as isolated from social relations. The households live in their community, which is part of a whole social system. The space design must also consider the involvement of society. Therefore, the whole unit in this research was divided into four areas: service area i.e. kitchen, bathroom and balcony that accommodate service activities; private sub-space that accommodates private activities; public sub-space that accommodates semi-public and public activities; and corridor that accommodates particularly the public activities. The involvement of the community (social interaction) takes place either in the public sub-space or corridor.

The public sub-space should in reality undergo daily functional adaptation. According to the theory, the other three areas, (because they accommodate activities that are always the same), they are considered as having constant operation. While the public sub-space has to overcome daily functional adaptation to accommodate the varying nature of the activities take place there, which is said to be operating differently or changing. Public sub-space must accommodate activities such as ironing which is a service (semi public); sleeping, which is private; watching television which is public activity etc.

From twelve Activities concentrated in the multi-functional space, two of which are stationary i.e. storing-3 and storing-4, the other three: sleeping, child-caring and relaxing are conducted in the private sub-space. The remaining seven activities which must take place in the public sub-space can be classified into: activities that are possible to be carried out or moved to the corridor i.e. entertaining and playing; activities that are less time consuming: ironing, praying and dining; and activities that exactly must take place in the public sub-space: studying and watching TV.

According to activity theory, the individual together with the social system influence the final result. The daily functional adaptation noted above allows more than a single type of activity to take place at the same time in the public sub-space.

The public sub-space therefore not only accommodates the transition between private and public activities, but is also likely to have more than one goal in the same space. Although it can be arranged through scheduling, it is not impossible that these activities must necessarily occur simultaneously. When the activities are incompatible and have different operational conditions such as studying and watching television, one can interfere with the other. This becomes a problem in the final result of this research.

Households, Apartment Developers, Designers and Space Design

The Activity Theory in principle involves only two components: the individual (household) and their direct environment (apartment space). However, in this research, the society in which the interaction between the households and the space takes place has also been taken into consideration, including the involvement of actors in the society. This particularly concerns the provider of the space: the government and the designers of the spaces. Each of them carryout activities and each of them have their particular objectives.

The goal-directed processes or actions in activity came about historically as the result of the transition of man to life in society. When activities are carried out in a joint effort, the activities of the participants satisfies each of their individual needs. However, the development of even the simplest technical division of work necessarily leads to isolation of intermediate partial results that are achieved by separate participants of collective work objectives. These separate participants, by themselves however, cannot satisfy the needs of all (Leont'ev 1978). As a result, the needs of each participant will not be satisfied by these "intermediate" results but should be satisfied by sharing a collective objective, (in this research the design of the apartment unit) through binding them to another, in social relationships.

The LCRA is a public product that is established in a society with its particular social features such as regulations and standards. The latter determine the features of the space designs of the apartments. This supports the basic principle that is used in this research that indicates that the features of the society (including its individual actors) under which the activities are carried out, need to be taken into account such as indicated by Engestrom (1987).

The text above indicates that the apartment developers and designers must take the demand side (users') requirements into consideration instead of only considering the supply side requirements (the current national standards and regulations). By this way of designing, it is expected that the product will be more functional and adaptable. The supply of LCRA units will not only be in favor of the developers / providers of the apartments but also will meet the needs of the apartment users.

9.4.2. Conclusions on the Used Theory, Theoretic Framework, and Tools

In accordance with the activity theory, this research found that consciousness or internal activity is not only inseparable from (external) activity, as mentioned in the arguments of the theory by Leont'ev, but it determines the implementation of (external) activity. Without the wise decision from the household consciousness, the daily activities can not necessarily take place properly. The (external) daily activities are exactly dependent on the discretion of the household that is decided based on consciousness of lack of space, so that they can decide exactly where the right space is to carry out their respective activities.

Regarding the space, this research found that "space" as a tool or medium in the activity system of activity theory, is not important or not influential. Households do not care about the availability or the sufficiency of space when they have to carry out their daily activities. However, as an outcome either as private space, functional space or adaptable space it is found that the "space" is highly essential. The space as a result of their efforts in creating the privacy and additional space is exactly needed by the households.

LCRA has to be seen as public product by involving society. The developer must apply activity based planning and consider both supply and demand side requirements to produce space design that meet the needs of all parties. Besides, the problem regarding daily functional adaptation that occurs in the public sub-space in this research cannot be solved by using activity theory. When there is more than one activity taking place simultaneously in one space, one or both are likely to interfere with the other. Each activity has its own objective or motive goal. In fact, each activity also consists of actions which operations are likely to disturb one another.

From the above discussion can be concluded that the influence of individual households play a greater role in determining the final outcome pattern of space design compared to that the influence of public or society. The most influential consideration on the final outcome in this research is the spatial need (the space used by households living in the apartment units to carry out the activities).

This research has produced research tools that can be utilized by others particularly for investigating similar research on activity based space design in low cost housing. The tools consist of framework, the list of household activities, the questionnaire including the checklist, and design standards for activities. The requirements were formulized based on the Indonesian context and are therefore applicable and ready to be used as instruments in any field research in Indonesia.

This research contributed to improved insight on the attributes of innovative physical environments that are required by the end-users: buildings in which the human needs including the standards keep rising. History has shown that socio-economic development goes hand-in-hand with ongoing innovations of technologies that often include practical tools or instruments. Such tools or instruments are characterized by being simpler and of smaller size and have simplified household activities, thereby requiring less space and less time. For example, washing machines require less space than traditional washing. In this research, although only 9% or 25 households applied a machine for washing, it was indicated that there is an increase of mechanical washing noticeable. Another more recent example is the shape of televisions that are thinner and some that can even only be hung on the wall instead of standing on the floor so that no more floor space is required. All electronic home equipments currently require less space. Therefore, functionality that depends on the adequacy of space will meet its saturation point of space demanded, where the line of continually increasing human needs meets the line of development of tools / means for doing the activities that continues to decrease.

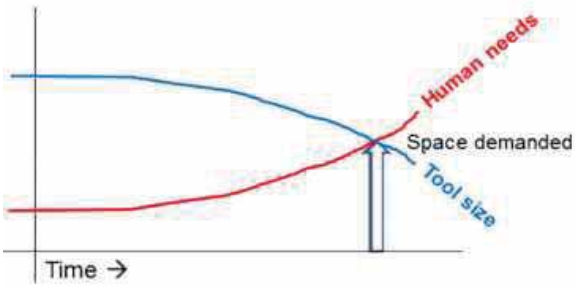

Figure 9-3: Meeting point of space demanded enables the government to fulfill functional space required in LCRA

Additionally, this activity based research directly investigated the location of each activity and measured each floor plan as it occurred in real terms of location and dimensions of the furniture arrangements. Thus the determination of the space used for doing the activities is based on the most precise situation, so that it best fits the conduction of the activity. This kind of demand-side approach in the research in a typical context is proclaimed to be preferable than the supply side approach (Galster 1997) and had not yet been done or had still been rarely carried out in developing countries. .

Moreover the space demanded by households that is determined based on the activities is minimized by considering the space required within periodical time: morning, day, evening, and night. This is possible as not all activity loads of each unit part occurred within all periodical time. By selecting the largest space required on the crucial time, smaller space can be offered.

This suggests that the original use of space is lessened, therefore easier to achieve. The use of space for multi-functional space is reduced by providing only the area required in the peak time (i.e. in the evening). By collecting the data of time occurrence and analyzing the activities based on these data, the size of space used is reduced. This households' ability to adapt results in them having more functional space. Further, if the household happens to be a family with a business in the house, then economically the multiplication of the use of space might generate income times as much to the households. This is a key characteristic of households in these LCRAs. This specific characteristic made these LCRAs different from others, which is a novelty to this research.

FINDINGS: The framework used in this research shows its benefits, especially in order to find the strengths, weaknesses, opportunities and constraints for improving the functionality and adaptability of space according to the location of the applied context.

RESEARCH QUESTION THAT SHOULD ARISE:
The phenomenon that has been explained previously illustrates how the situation of initial conditions of the households and the space up to this research was started. This research aims to find the amount of space needed by the households whilst making recommendations for improving the standards relevant to these concerns. The study's research questions should fill the gap between the two. Therefore the right question for this research is: "To what extent do the current space designs meet and allow changes to meet the demands?" This main question will be answered by answering the sub-questions that can be found in chapter 4, 5, 6, 7, and 8.

9.5. CONCLUDING DISCUSSIONS

This part provides concluding discussions which summarized in five key principles:

- Privacy to ensure the functionality
- Adequate size to make the space design functional
- Changing capacity to sustain the functionality
- Functional adaptation to make the provided space sufficient
- Tolerance among household members

9.5.1. Privacy to Ensure the Functionality

In this research, functionality of the space design is met not only by the adequacy of space size, but also by non-clashes between public and private activities within the same space at the same time. Privacy can be realized by separating these contradictive natures of activities. In the case of LCRA, most activities, either public or private, are held in the multi-functional space. These activities may occur within the same time. Functionality should also be supported by the condition where households can conduct their private activities free from stresses, and separate from public activities. To be functional, there should be a private space that is separated from public activities. Privacy can be achieved through manners, rules, time scheduling, physical barriers, or spatial organization (Rapoport, 1994). In this research, privacy relied on time scheduling and partitioning. Therefore horizontal partitioning was required. Seventy-one percent or 214 households applied this kind of adaptation.

The space allocation must be made larger for the sub-space accommodating private activities than that for public activities or at least, private-sub-space should accommodate all the private activities adequately. This is important as the public activities could move into the corridor when required, while private activities cannot be done outside the private sub-space. Moreover, private sub-space should be able to accommodate activities transferred suddenly from the public sub-space when the public sub-space had to accommodate other urgent activities.

When multi-functional space area can accommodate all activities adequately, partitioning is applied easily. This research found that the existing space only provided 56% of the space required. The problem of space shortage requires solution such as by adaptation that can be either by extending upward in the multi-functional space, by extending frontward or backward, by changing the function of balcony to a more private space; or by functional adaptation.

9.5.2. Adequate Size to Make the Space Design Functional

All LCRA's in this research were designed in the same size regardless of the number of different occupants. All units were designed with the same capacity, as proposed by Russell (2008) "one-size-fits-all approach". This means that one standard-sized unit is applied to all units with widely varying numbers of household members. For multi-storey residential building, (like the LCRA in this research) where land is limited, this approach can be a problem especially to households with a large number of occupants or households that require greater space. Sooner or later if possible, they will change or expand their units in order to adjust to their needs.

Activity based research is the most potential tool to determine the dwelling space designs for low income households to meet their demands. However, for a space to be functional, the design should allow changes in size and in function to anticipate the larger needs or changing needs of household overtime. Adequate space size or dimension is the most important factor in realizing functional space. Design standards, by which functionality of space can be evaluated, is the key rule. The standards need to be monitored and require periodical evaluation to keep them adapted to actual users' needs.

The other crucial indicator to be referred to is the space used by households. The evaluation should not always be determined by top-down or only from the supply side. The bottom-up procedure or through directly investigating the space demanded by households in conducting the daily activities is the most effective action. This means that continued observation on the space used by households is necessary. The result can be as precise as what users actually need. Sensitivity of the government to the needs of its citizens is required. When the use of space exceeds that of the standardized size, the government needs to re-evaluate its standards for enlargement. This is important as space size is the main factor influencing functionality. The larger size a space is, the more functional the space will be. In a system of decentralization (such as Indonesia), the local government may be able to propose for standard improvement, revision or correction to the central government. From the relationship between household's size and the space requirements, it is recommended that space requirements for households of five be anticipated, as the increase of space requirements for the next additional household size is insignificant.

9.5.3. Changing Capacity to Sustain the Functionality

This research found that none of the adaptation types that had been applied could make the space required met except that of installation of a full mezzanine. However, not all unit heights allowed the top space to be used as habitable space especially Penjar-3 and ITS with space height of only 2.65 meters. To be sustainable, the dwelling units should not only be provided functionally, but should also allow (physical) adaptation to anticipate the changing demands. Findings in this research indicated that when the space demands change, adaptations that were made by households include: expanding the space horizontally frontward by occupying the corridor space; expanding horizontally backward by small balcony extension; expanding vertically by constructing a mezzanine at the multi-functional space; and by changing the function of the balcony to a bedroom. Therefore, space size adequacy concerns not only the whole unit area, but also the corridor width, the unit width, the unit height, and the balcony size.

Extendable units with a structural core that allows building another floor without compromising the strength of the structure as proposed by (Greenblott 2007) would be a good example. It is a built-in partial extension on the second level that allows occupants to complete another living unit on that level for an extended family. Column stubs extending into the upper level as well as a staircase for accessing the second level would make building and inhabiting an extra floor easy. By this, all the households can continue to live in the original units without needing to make any extension. Otherwise, at least government can provide some structural hooks for the purpose of mezzanine flooring installation, of course with a sufficient space height.

9.5.4. Functional Adaptation to Make the Provided Space Sufficient

The availability of low cost rental apartments is provided by the (local) government. The adequacy of space design thus depends on the capacity of the government. When the dimension of the provided space cannot allow physical changes for adaptation, households should do daily functional adaptation by managing the activity occurrence based on their own creativity in scheduling. The lack of adequate space as well as the occurrence of clashes between private and public activities can be avoided by setting the occurrence time of activities. The space location for carrying out the activities may be the same, however, they may take place at different times. Therefore there is a possibility for users to fulfil their space demands by relying on their own capacity in time management.

The available space must be made sufficient to conduct all activities by regulating the time of the use of space from one to another activity within a day. In this research the space with the highest activity loads is the multi-functional space. Twelve of all nineteen household activities must occur in this single living space. In the previous description regarding functional adaptation, it has been discussed that three activities took place in the private sub-space and storing 3 and 4 were stationary. Playing and entertaining could be done in the corridor. This leaves two main activities as loads that must be accommodated by the public sub-space: studying (2.84m^2) and watching TV (4.8m^2). However, it is not impossible that the other three activities that do not take a long time: ironing (2.15m^2), eating (2.5m^2) and praying (1.7m^2) can occur simultaneously. So, although it can be done alternately, the public sub-space must be able to accommodate five activities which space provided must be at least 14m^2 on average.

9.5.5. Tolerance among Household Members

As described earlier, in LCRA units there is only one living space i.e. the multi-functional space. This space not only has to accommodate a lot of activities with different natures, but also several members of the households. Therefore it is not impossible for an overlap to occur in the same space, not only between activities, but also coupled between family members. Overlap between different activities may interfere with each other. For this, a high tolerance among fellow members within the household is required. Most of the time, one must be willing to move to the corridor, or if possible, to the private sub-space. This is the only possibility that could be made by occupants living in the LCRA as they have no other alternative space options.

9.6. RECOMMENDATIONS

9.6.1. Recommendations to the Space Design Guidelines

This section answers Research Question 6: What are the recommendations for the space designs of low cost apartments in Indonesia that comply with the users' demands? The results are concluded from chapter 4, 5, 6, 7 and 8 of this research.

The space designs that comply with the actual space required by the households include: the whole unit size, 48.41m^2 that consists of: (1) multi-functional space 37.38m^2, (2) kitchen 4.52m^2, (3) bathroom 3.78m^2 and (4) balcony 2.73m^2. Based on the research findings and conclusions in the previous sections of this chapter this research proposes recommendations for guidelines to the three authorities.

9.6.1.1. Recommendations to the government

Regarding standards and space requirements, this research found that in the current national standard seven household activities: child caring, storing-2, relaxing, praying, studying, playing, and drying are not listed and should be added. The standards for multi-functional space and a bathroom on the LCRA should be corrected / adjusted to the space required by the households.

a. Multi-functional space of low cost rental apartments accommodates four functional areas: (1) living room, (2) bedroom, (3) dining room, and (4) ironing room. The space is originally standardized only 20.76m^2, adapted to 34.89m^2 by adding the activities that were not included, and finally revised to 37.38m^2.
b. Kitchen which original standard is between 3.08m^2 and 4.4m^2 is revised to 4.52m^2.
c. Bathroom & toilet that was originally standardized at 1.92m^2 should be combined with washing, which space size is standardized at 1.5m^2. The combined standard 3.42 m^2 is still revised to 3.78m^2.
d. Balcony size is suggested to maintain the average provided area 2.73m^2 to be used to add sleeping space when needed.

9.6.1.2. Recommendations to the architects or designers

- The space design for LCRA needs to be made as a design that can grow, especially for vertically. Therefore the size of the space height as well as structural opportunities for vertical adaptation should be well designed.

- Bathroom should facilitate not only bathing but also traditional washing.
- The main furniture such as the bed might be provided in the form of a hidden multi-use design that could be opened as dining table during daytime and as a bed during the night.
- The spaces for storing should not be provided based on the current national standard that is set at only 1.3 m^2 for units with four household members and 2.5m^2 for five-person units. The proposed standard is 5.5m^2. Minimum storing space by Parker Morris (table 5.3.2.3) is 4m^2 for a studio and 5m^2 for a two-bedroom apartment. It is recommended that storing space of at least 5m^2 be provided as the average use of space for all storing is 4.7m^2.
- The existence of communal spaces should also continue to be provided. The width of the corridor should at least allow the inhabitants to keep socializing with each other. Otherwise, corridor widening at certain interval along the corridor is urgently recommended.

9.6.1.3. Recommendations to the community

Low Cost Rental Apartments (LCRA) should be considered as adaptable units. Therefore adaptation in order to adjust the needs that extend out into the corridor and out to the balcony border should be tolerated. Tolerance is also required in terms of attic occupancies. However, the extensions for the sake of adaptations should be made without any destruction. Therefore, the provided units must be prepared to be extendable without damaging the existing buildings and the environment.

Multi-functional space which is the only space in this apartment unit should accommodate four functions at the same space as a family room, bedroom, dining room, and ironing room. So it should be understandable if any one or more of these functions, except bedroom, must be carried out in the corridor anytime.

9.6.2. Possible Research in the Future

In terms of theory, there are chances in developing the adoption of Activity Theory as the basic theory in the framework of research. Urban planning has also used this theory as the basic theoretical framework (Fjeld, 2002). Architectural science perhaps can apply this theory as well, for determining requirements such as the required ventilation etc.

Since the final goal of all investigation should be concerned with sustainable design, the possible future research may concern the two other focuses of sustainability. While this research focused on the aspect of social equity, possible future studies may deal with environmental quality or economic prosperity. Possible future research can be based on the results in this study that include adaptability in dealing with thermal and visual environments as well as its construction. The adaptations may deal with horizontal partitioning, mezzanine instalment, and/or the alteration of balcony to bedroom.

There are also possibilities dealing with seeking the most advantageous building block space design from the similar point of views: environmentally and structurally. There are three types of building blocks: double loaded, single loaded and twin blocks. In addition, there is the possibility for research to focus storing space such as which storing space design is more advantageous, along the left and right side walls or by providing one storing space (storage).

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Epilogue

APPENDICES

Appendix-1
THE QUESTIONNAIRES

Appendix-2
THE USE OF SPACE

Appendix-3
THE CHECK-LISTS
1. Sombo
2. Simo
3. Dupak
4. Penjaringan-1
5. Penjaringan-2
6. Wonorejo
7. Randu
8. Gunungsari
9. Waru Gunung
10. Urip-S
11. Tanah Merah
12. Penjaringan-3
13. ITS
14. UNESA

Appendix-4
THREE HOURLY USE OF SPACE
(DAILY FUNCTIONAL ADAPTATION)

FIGURES

TABLES

GLOSSARY

APPENDIX-1

THE QUESTIONNAIRES

This survey is held in order to support S3 thesis entitled "Functionality and Adaptability of Low Cost Apartment Space Design, A Case of Surabaya Indonesia". The questionnaire is addressed to residents as the users of low cost rental apartments in Surabaya to collect data of users' demands for space design allowing all of their household activities, particularly concerning the space size and space layout. That is why honest statement regarding users' demands and careful observation towards existing space reality is really required.

Date:			Built Year	Developer	Unit dimension W x L x H	Available Facilities				
Time:						Toilet	Pantry	Balcony	Storage	Common-S
Low cost apartment (circle one)	1	Sombo								
	2	Simolawang								
	3	Dupak								
	4	Penjaringan-1								
	5	Penjaringan-2								
	6	Wonorejo								
	7	Randu								
	8	Gunungsari								
	9	Waru Gunung								
	10	Urip Sumoharjo								
	11	Tanah Merah								
	12	Penjaringan-3								
	13	I.T.S.								
	14	UNESA								
Handled by surveyor		T(Tia); A (Adisty); S (Suci)								
Address of respondent										
Name of interviewee										
Start living year in unit										
Adaptation made										

I. GENERAL INFORMATION

HH NO	RELATION	SEX		AGE GROUP				RELIGION					INCOME GENERATION INSIDE			TYPE OF INCOME GENERATION			
		M	F	<5	<15	<70	>70	M	C	H	B	Other	No	Yes	Name of activity	Retail	Service	Product	Other
1																			
2																			
3																			
4																			
5																			
6																			
7																			

RELATION: Father, Mother, Child, Grand-Child, Grand-Parent, Relative, Servant. **RELIGION**: Moslem, Christian, Hindu, Budha

II. DOMESTIC ACTIVITIES

		DOMESTIC ACTIVITY	WHERE										PEOPLE			WHY										WHEN					HOW LONG			
			M	Br	K	T	B	C	G	S	P	O	1	<4	>4	E	Q	P	L	C	B	W	E	S	Other	04-10	10-16	16-22	22-04	Other	<1	<4	<8	>8
Household Chores	A	Washing																															
	B	Drying																															
	C	Ironing																															
	D	**Storing-1**																															
	E	Cleaning																															
	F	Cooking																															
	G	Dining																															
	H	Dishwashing																															
	I	**Storing-2**																															
Private/peace	J	Bathing																															
	K	Sleeping																															
	L	Praying																															
	M	Studying/Read																															
	N	Child Caring																															
	O	**Storing-3**																															
Communal	P	TV watching																															
	Q	Relaxing																															
	R	Playing																															
	S	Entertaining																															
	T	Celebrating																															
	U	**Storing-4**																															
	V	Organization																															
	W	Religion gather																															

WHERE: Multi-function, Bedroom, Kitchen, Toilet, Balcony, Corridor, Ground, c-Space, Public, Outside. **WHY:** Easier, Quiet, Private, Larger, Cooler, Brighter, Water, Electricity, Sewer, Other

. Furniture, Equipments, and Means required in conducting the activities

	ACTIVITY		FURNITURE/EQUIPMENT NEEDED																							MEANS			
			Table	Sink	Bucket	Hanger	Chair	Iron	Rack	Drawer	Cupboard	Cabinet	Broom	Mop	Garbage	Stove	Freezer	rice cooker	Bed	Mattress	Fan	Tank	TV	Toys	Other	Gas	Water	Sewer	Electricity
Household Chores	A	Washing																										
	B	Drying																										
	C	Ironing																										
	D	**Storing-1**																										
	E	Cleaning																										
	F	Cooking																										
	G	Dining																										
	H	Dishwashing																										
	I	**Storing-2**																										
Private	J	Bathing																										
	K	Sleeping																										
	L	Praying																										
	M	Studying/Reading																										
	N	Child Caring																										
	O	**Storing-3**																										
Communal	P	TV watching																										
	Q	Relaxing																										
	R	Playing																										
	S	Entertaining																										
	T	Celebrating																										
	U	**Storing-4**																										
	V	Doing organization																										
	W	Religion gathering																										
Business																												
	X1	Storing materials																										
	X2	Storing products																										
	Y	Storing equipments																										
	Z	Business working																										

III. INCOME GENERATION ACTIVITIES

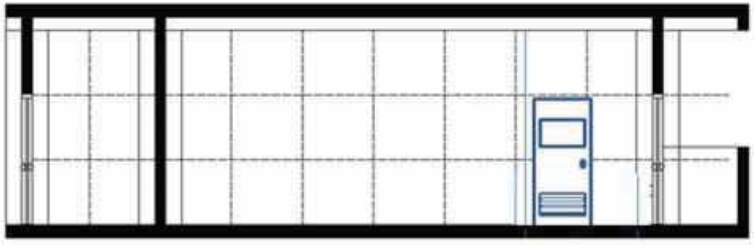
	BUSINESS ACTIVITY		WHERE										PEOPLE			WHY										WHEN					HOW LONG			
			M	Br	K	T	B	C	G	S	P	O	<1	<4	>4	E	Q	P	L	C	B	W	E	S	Other	04-10	10-16	16-22	22-04	Other	<1	<4	<8	>8
Product	X1	Storing materials																															
	X2	Storing products																															
	Y	Storing the misuse																															
	Z	Business working																															
Retail	X1	Storing display																															
	X2	Displaying																															
	Z	Keeping retail																															
Serve	X	Temporary storing																															
	Z	Business working																															

WHERE: Multi-function, Bedroom, Kitchen, Toilet, Balcony, Corridor, Ground, C-Space, Public-space, Outside. **WHY:** Easier, Quiet, Private, Larger, Cooler, Brighter, Water, Electricity, Sewer, Other.

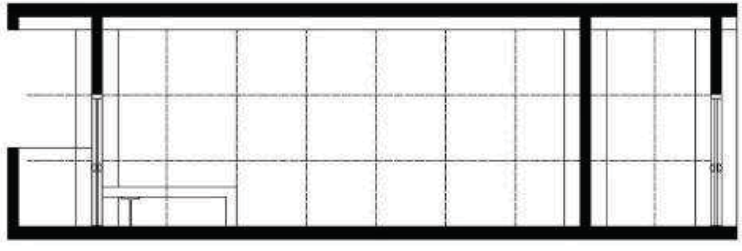
DEFINITION OF EACH ACTIVITY				MEANS
Household Chores	A	Washing	Washing dirty or after use clothes, sheets	Water, drain, detergent, buckets
	B	Drying	Drying the wet laundry after being washed to be dried naturally outside	String or drying rack in open air, sun heat
	C	Ironing	Ironing the dry laundry	Electricity, iron, ironing table, place/store for ironed clothes
	D	**Storing-1**	**Storing-1** is for washing, drying, ironing and cleaning the house equipments	Big size storage
	E	Cleaning	Cleaning the house: sweeping, wiping furniture and the floor	Broom, wiper,
	F	Cooking	Preparing and making food for all meal time: breakfast, lunch, and dinner	Water, stove, refrigerator, spicy, ingredients
	G	Dining	Eating at meal time	Dining table, chairs, kitchen wares, and the served food
	H	Dishwashing	Washing the dirty dishes or the kitchen wares	Water, kitchen ware rack, store
	I	**Storing-2**	**Storing -2** is for keeping food, kitchen wares, kitchen utensils, raw food material	Rack, cabinet, drawer,
Private	J	Bathing	Washing hygiene the body	Water, soap, towel,
	K	Sleeping	Taking rest by lying on the bed or mattress	Bed, sheet, pillow, bolster, blanket
	L	Praying	Doing religion obligation	For moslem: praying mats, praying robe, Qiblat orientation
	M	Studying/Reading	Studying, reading, computer working	Table, chair, books, computer,
	N	Child Caring	Breast feeding, feeding, bathing, story reading,	Chair, bed
	O	**Storing-3**	**Storing-3** is for keeping clothes, sheets, towels, blankets etc	Cupboard, wardrobe, drawer, cabinet, rack
Communal	P	TV watching	Watching television	Electricity, TV
	Q	Relaxing	Chatting, relaxing, refreshing , message	Chair, sofa, music, radio,
	R	Playing	Children playing	Toys
	S	Entertaining	Entertaining guests, serving drinks, cookies,	Table, chair or sofa
	T	Celebrating	Celebrating success, child birth, circumcision, marriage, cure from disease, etc	Mats, open space
	U	**Storing-4**	**Storing-4** is for keeping books, school equipments, toys,	Rack, cupboard, drawer, cabinet
	V	Doing organization	Attending social or local organization activities: Women meeting	
	W	Religion gathering	Attending religion activities: Routine Qur'an reading,	
Business	PRODUCING		Generating income by producing products: cookies, clothes, handbag, etc	
	RETAILING		Generating income by retailing or opening small shop: retailing cigarette, candies	
	SERVICING		Generating income by selling service: repairing electronics, vehicles, etc	
	X1	Storing raw materials	Storing the raw materials / ingredients for producing products	Rack, cabinet, drawer, tank, bucket, mattress, etc
	X2	Storing products	Storing the products (goods / things produced)	Rack, cabinet, drawer, tank, bucket, mattress, etc
	Y	Storing equipments	Storing after use equipment of income generating activity	Rack, cabinet, drawer, tank, bucket, mattress, etc
	Z	Business working	Working for producing products / keeping small shop / servicing	Table, kitchen, open space, water, electricity, sewer, etc

IV. CHECKLIST of EXISTING PLAN and ACTIVITY LOCATION (7. RANDU)

Sketch the existing furniture, means layout (▲, ■, ○), and locations of activities



SECTION-A-A



SECTION B-B

UNIT PLAN

DOMESTIC ACTIVITIES	
A	Washing
B	Drying
C	Ironing
D	**Storing-1** for cleaning items
E	Cleaning
F	Cooking
G	Dining
H	Dishwashing
I	**Storing-2** for food
J	Bathing
K	Sleeping
L	Praying
M	Studying/Reading
N	Child Caring
O	**Storing-3** for clothes, money
P	TV watching
Q	Relaxing
R	Playing
S	Entertaining
T	Celebrating
U	**Storing-4** for all else items
V	Doing organization
W	Religion gathering

BUSINESS ACTIVITIES (produce, retail and service)	
X1	Storing materials
X2	Storing products / merchandise
Y	Storing equipments
Z	Producing / Retailing

DIMENSION			
H1	Height of floor-1		m
H2	Height of floor-2		m
MF1	Area of MF floor-1	x	m^2
MF2	Area of mezzanine	x	m^2
B+WC	Area of toilet	x	m^2
B	Area of balcony	x	m^2
P	Area of pantry	x	m^2
C	Area of corridor	x	m^2

APPENDIX - 2
THE USE OF SPACE

THE USE OF SPACE

1. SOMBO

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBERS	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	43.11	U	V	W	X1	X2	Y	Z
1	Amina	I 107	T	1989	6		1.5	2.3	0.6	1.5	2.3		1.3		6	1.5	3	3	2.2	2.3	3		2.8	1.2	34.5	9		9				
2	Jumani	I 118	T	1989	3	1.2	1.5	2	0.3	1.5	3	1.5	1	2.3	5	2	3		1	3	3			1.8	33.1							
3	Muninten	I 404	T	1994	2		1.2	2	0.3		3		0.8		3	2			0.5	3	3		3	0.9	22.7				1.5	1.5		
4	Zumiah	I 408	T	1994	4		1.5	2	1.5		3		1		8	2			2	3			3	1.5	28.5							
5	Mukhaji	I 207	T	1989	1						1.5		0.4		3	1.5			0.4	3	3			0.3	13.1							
6	Suyama	I 416	T	2008	4		1.5	2	0.5		3		1		3	2			1.5	3	3	3	3	1.5	28	9		9				
7	Nagrim	I 206	T	1989	3		1.5	3	0.5		3		1.5		3.6	1.5			1	4	3	4	3	1	30.6	9		9				
8	Agus Sulis	I 307	A	1990	5		0.9	2.3	0.5	1.5	4		1.7		6	2	4	3.2	2.4	4	4	4	4	2.5	47	9		9				
9	Sainah (ibu)	I 308	A	1990	6		1.2	3	0.5		4		1.5		6	2	4		2	4	4	4	4	2.2	42.4	9		9				
10	Landep (Ibu)	I 314	A	1990	4		1.2	1.8		2	3		1		6	0.8	1.2		2.5	3	3	3	3	2.5	34	9		9		0.5		
11	Ningsih (Ibu)	I 311	A	1990	4		1.2	2.3		3	3		1		3.6	1.2	3	3	1	3	3	3	3	1	35.3	9	9	9		5		2.2
12	Koni'ah (Ibu)	I 312	A	1993	7		1.5	3			3.6		1		8.6	1.5	3.6		2.5	3.6	3.6		3.6	1.2	37.3	9		9				3
13	Posmiah (Ibu)	I 313	A	2006	6		0.9	2.8	0.3	3	2.8		2.5		7.6	2	2.8		1.5	4	2.8	2	2	0.8	37.8	9		9				
14	Muniteh (Ibu)	I 305	A	1998	3		1.5		0.8		2.7		1		5.7	2	2.7	2.7	1	2.7	2.7	2.7	2.7	0.8	31.7	9		9				
15	Fatimah	I 213	S	1990	7			3			4		1		5.7	1.5	3		2.2	4	3	4	4	0.8	36.2							
16	Tijah	I 103	S	1990	4	1.5	1.2		1	1.5	3	1.5	0.9	1.5	6	2	4		1.2	4	3	3	3	1.5	39.8	9				1.5		1.5
17	Tarmi	I 409A	S	2007	3				0.3	1.5	1.5		0.5		3.5	1.5		2	1	2	2	2	2	0.5	20.3							
18	Sulikha	I 212	S	2000	4		1.5	3	0.5	2.3	3		1.2		4.2	1.5	4	1.5	1	4	3	3	4	0.5	38.2							
19	Saiful Anwar	I 407	S	1990	4		0.9	1.2	0.3	1.8	1.8		1		6.6	1.8	3.6		1.7	3.6	3.6	2.4	1.8	0.7	32.8	9						
20	Fauzi	I 414	S	1990	6		0.9	3	0.3	1.5	3		1		5.4	2	3	3	5.2	3	3	3	3	1.5	41.8	9		9				
21	Saudah	I 215	S	2000	3		1.2	3	0.5	1.5	3		0.8		3.2	2	3	3	1.5	3	3	3	3	0.5	35.2	6						
AVERAGE					4.24	1.35	1.27	2.45	0.54	1.88	2.91	1.50	1.10	1.90	5.22	1.73	3.19	2.68	1.68	3.30	3.09	3.07	3.05	1.20	43.11	8.79	9	9	1.5	2.67	0.5	2.23

THE USE OF SPACE

2. SIMOLAWANG

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	38.46	U	V	W	X1	X2	Y	Z
1	Aliya	A 312	T	1996	2	0	1.5	2.3	0.5	1.5	2.3	0	0.6	0	3	2			1.2	3	3		4	2	26.9	9		9				
2	Isa	A 409	T	1994	7	0	1.5	1.5	0.3		2.3	0	1	0	6	1.5	2.3	3	2	3	3		3	1	31.4	9		9				
3	Safi	A 402A	T	1993	3	0	0.9	2.3	0.5		3	0	0.3	0	3				0.5	3	3		3	1.2	20.7	9						
4	Hamida	A 406	T	1999	7	0	1.8	3	0.4		3	0	1	0	9			3	1.7	4	3	3	3	0.8	36.7							
5	Khodija	A 303	T	1990	4	0	1.2	2	0.8		4	0	1.5	0	6	1.5	3	3	2.5	4	3		3	1	36.5			9				
6	Nurhamida	A 309	T	1990	5	0	1.2	1.8	0.5	1.5	3.6	0	2	0	7.2	1	3.6		3	3.6	3.6		3.6	2.5	38.7	9		9				
7	Siti Nafiah	A 402B	T	1990	4	0	1.2	2.7	0.5		1.8	0	1.3	0	7.2	1.2	3.6		2.3	3.6	3.6		3.6	1	33.6	9		9				
8	siti (bu)	A 401	A	1990	3	0	1.8	3	0.7	2.3	3	0	0.8	0	6	2	3		1.5	3	3	3	1.5	0.8	35.4	9		9				
9	Chusnul (bu)	A 407	A	1990	2	0	1.2	2.3	0.5		1.8	0	2	0	5.4	2.3	2.4		1.2	2.4	2.4		2.3	3.7	29.9				0.4	0.7	1.3	2.4
10	Simin (Pak)	A 315	A	1990	5	0	1.2	2.3	0.6		3	0	1.5	0	6	1.5	3		2	3	3		3	0.7	30.8	9		9				
11	Wardatul	A 416	A	2009	3	0	1.2		0.5	2.3	2.4	0	0.8	0	5.4	2	3		2.5	4	3		3	0.9	31		9	9				
12	Sumaiyah	A 415	A	1990	5	0	1.2		0.5		3	0	1.5	0	6	3	3		3.7	3	3	3	3	1.2	35.1	9		9				
13	Kholifah (Bu)	A 215	A	1990	5	0	1.5	2.3	1		3.6	0	0.8	0	6.6	2.3	3	3.6	1.5	4	3.6	3.6	2	1.5	40.9	9		9				
14	Maryam (Bu)	A 207	A	1990	2	0	0.9		0.5		2	0	1.5	0	4.8	1.5	1.8		1.2	2.4	2.8		2	1	22.4	9		9				
15	Hatimah	A 308	S	1990	3	0	1.2		0.3	2	3	0	2	0	5.4	1.5			1.2	3	3		3	1.5	27.1	9				1.5	5.2	3
16	Suliha	A 302	S	1990	5	0	1.2	1.8			3	0	1.8	0	6.6	1.8	3.6		0.7	0	3.6		2	4.5	30.6	9		9				
17	Satimah	A 314	S	1990	5	0	1.2	2.3	0.3	2.5	3	0	1.7	0	5	1.2	3	3	1	3	3	3	2	2.5	37.7	6		6				
18	Manirah	A 413	S	2004	5	0	1.2	2.3	0.3	1.8	3	0	1.2	0	6	2		3	1.6	4	3	4	3	1.1	37.5	6			0.6	0.4	0.5	1.5
19	Mu'sidah	A 408	S	2007	4	0	1.2	2.3	0.4		2.4	0	2.5	0	4.8	2		2.4	0.8	3	2.4	2.3	2.3	0.5	29.3	9		9				
20	Dira	A 410	S	1990	1	0	0.9		0.5		1.2	0	0.5	0	3	2			0.6	3	3		2.2	0.8	17.7	6		6				
21	Suidah	A 404	S	2001	1	0	1.2	2.8	0.8		2.3	0	1	0	2.8	2			0.8	3	3		3	2.3	25	6		6		1.4	0.8	
AVERAGE					3.86	0.00	1.26	2.31	0.52	1.99	2.70	0.00	1.30	0.00	5.49	1.81	2.95	3.00	1.60	3.10	3.05	3.13	2.74	1.55	38.46	8.29	9	8.44	0.5	1.00	1.95	2.30

THE USE OF SPACE

3. DUPAK

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	41.27	U	V	W	X1	X2	Y	Z
1	Suparmin	E 336	T	1990	4		1.5	2.3			2.4		1.5		5.2	1.5	3.2		2	3.2	3.2		3.2	1.2	30.4							
2	Siti	C 118	T	2009	3	1.5	2	1	0.5		3		2	2.2	4	2		4	1.7	3	4		4	0.5	35.4							
3	Ningsri	E 140	T	2009	3	**1.2**	2	2.3	0.7	1.5	3	1.5	1	2.2	5.2	1.5		3.2	1.5	3	3.2	3	3	1	40					1.4		
4	Sulkan	F 152	T	1990	2	1.5	1.8	2	0.3	1.5	2	1.5	2.9	2.2	2.8	1.4			0.6	3	2.8		4	0.7	31							
5	Miskari	E 139	T	2011	2	1.8	1.2		0.3	3	2	2	1.2	2.3	3				1	4	3		0	0	24.8							
6	Emi	C 119	T	1997	3	1.5	1.8	1	0.7	1	2.3		0.9	2.2	3	2	2.3		1.9	2.3	2.3		2.3	0.5	28				1	1	1.5	3
7	Barokah	C 313	T	1997	6	**1.2**	1.2	2.3	0.3	1.8	4		1.7		2.8	1.5	4		1.7	4	4	4	4	0.7	39.2	6						
8	Nahdia (Bu)	A 103	A	2005	5	**1.2**	1	2	0.5	1.5	2.8	1	1.5	2.2	6.4	2	2.8	2.8	1.5		2.8	2.8	2.8	0.7	38.3							
9	Tarmin	A 104	A	1990	1	1.2	1.5		0.5		1	1.2	1	2.2	3	2	1		1	3	3		3	0.7	25.3							
10	Kabin (Pak)	F 154	A	1990	4	1.5	1.8	1.5	0.6	1.5	3	1.8	1.5	2.2	6	2	3		2.5	4	3	3	3	1	42.9							
11	Winardi (Bu)	F 147	A	2009	5	1.5	1.8	2.3	0.6	1.2	3	0.5	1.1	2.2	6.2	2	3	3	1.7	3	3	3	4	2	45.1				1.5	1.2	0.3	1
12	Budi (Pak)	C 117	A	1990	3	1.5	1.8	1.4	0.8	1.2	3	1.5	1	2.2	3	1.8	2.3		1	4	3		3	1.5	34							
13	Ari (Bu)	E 141	A	2011	4	1.5	1.5	3	0.5	2.2	3	1.2	2	2.2	6.4	2	2.4	3.6	1.7	3	3	3	3	1.2	46.4							
14	Anjer (Pak)	D 131	A	1989	4	1.5	1.5	2.8	0.5	1.5	2.8	2.3	1.5	2.2	6	1.4	2.8	2.8	1.7	2.8	2.8	2.8	2.8	1.4	43.9							
15	Murnia	E 235	S	2011	2		1.5		0.4	1.5	2		1		3	2			1.5	3.8	3		4	0.5	24.2				0.5	0.5	0.5	3
16	Surono	D 328	S	1990	3		1.2	1.5	0.6		2.4		2		3.6	1.5	2.3		1.6	3	2.4		2.4	0.9	25.4	6						
17	Setyo Darmo	D 136	S	1990	1	1.5	1.2	2.4	0.3	1.5	1.5	0.5	1.1	1.5	2.4	1.5	1.6		1.5	1.5	1.5		1.5	0.6	23.6	6						
18	Lisa (bu)	D 229	S	1990	4		1.5	2.3	0.7	2.3	3		2		3.2	2.3	3.2		1.2	3	3		4	0.7	32.4	6		6				
19	Riwan	D 133	S	1990	4	**1.2**	1.2	2.3	0.5	1.8	3	1.5	1.5		5.6	1.5	3		0.6	3	3		3	0.7	33.4	6		6				
20	Dewi	E 138	S	2009	3	1.5	2	2.3	0.5	1	2.3	1.5	2	1.5	3.2	2	2.3	3.6	1.7	3.6	3.6	4	3	3.3	44.9					1.7		1
21	Khalifah	E 234	S	1990	3	**1.2**	1.2		0.3	1.5	2	0.6	2		5.6	1.5	2	3.2	1	3.2	3.2	3.2	2	0.7	34.4	2				0.6		
AVERAGE					**3.29**	**1.41**	**1.53**	**2.04**	**0.51**	**1.62**	**2.55**	**1.33**	**1.54**	**2.11**	**4.27**	**1.77**	**2.58**	**3.28**	**1.46**	**3.17**	**2.99**	**3.20**	**2.95**	**0.98**	**41.27**	**5.33**		**6**	**1**	**1.07**	**0.77**	**2.00**

THE USE OF SPACE

4. PENJARINGAN-1

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	41.67	U	V	W	X1	X2	Y	Z
1	Samiri	C303	T	1997	4			2.3	1	2.3	3	0.6	1.5		3	1.5	3		1.8	3	3	3	2	0.9	31.9	9	9	9			3	3
2	Sunarshi	C311	T	2011	3	1	0.9	2.3	0.5	1.5	3	0.5	2	1.5	5		3		1.8	3.8	3	4	4	0.7	38.5	9	9	9				
3	Siti Husnia	C317	T	1999	2			2.3	0.8	1.5	2.3		2	1.5	3			3	2	3.8	3	3	2.3	0.7	31.2	9	9	9		2.5		
4	darwaji	C305	T	2007	4	**1.2**	0.9	2.3	1.2	1.5	3	1	2.5	2.2	5	1.5	3	3	1.5	2	3	3	3	0.7	41.5							
5	Munir	C318	T	2001	4	1.5	0.9		0.5	1.5	2.3	1.5	1.5		5.2	1.5		3.2	3	3	3.2	3	4	0.6	36.4	9	9	9				
6	Heriana	C413	T	2004	4	1.5		1.2	1	2.2	3	1.5	1.2	1.5	6		3		2	5		3	1.8	1.7	35.6	9	9	9				
7	Ismail	C402	T	2004	6	1	0.9	2.4	0.8	1	2.4	1	2		5.2	1.5	2.4		2.5	2.4	2.8	2.4	2.4	1.5	34.6	9	9	9				
8	silalahi (pak)	C105	A	2000	3	1.5	0.8	2.3	1.3	0.9	2.3	1	1.5	2.2	3.6				1.5	3.8	3.6		2.3	0.5	29.1							
9	muhsin (pak)	C216	A	2000	2		0.9	2.3	1.3	1	2	0.7	1.5	2.2	3.6	2			1	3	3.6		3	0.8	28.9	9		9				
10	Wiwik (Ibu)	C207	A	2006	2	1	0.9	2.3	0.8	0.9	2.3	0.8	3	1	3.2			2.7	1.5	2.7	2.7	2.7	2.7	1.5	32.7		9					
11	Weny (ibu)	C401	A	2007	4	1.5	1.5	2.3	0.8	1.5	3	1	2	1.5	6	1.5	3	3.2	2.7	3	3	3	3	1.7	45.2	9	9	9				
12	Sri utami (Ibu)	C 302	A	2002	4		0.9	2.3	0.6	2	3		1.5		5.6	1.5	2.8		3	3	3	3	3	1.5	36.7	9	9	9				
13	Ida Susanti	C301	A	2008	3	**1.2**	1	1.8	2	1	2.7	0.3	2		6.3	1.2	1.8	3	2	3	3	3	3	1	39.3	9	9	9				
14	Johannes	C313	A	2000	3	1	1.2	2.1	0.3	1.3	2.7	1	2		5.1	1.5			2	2.7	2.4		2.7	1.5	29.5							
15	Mulyati	C4-16	S	2005	4		1.2	1.8	0.8	1.5	1.8	1	2.5		5.1	1.5	1.5	3.6	2	2.1	3.6	2.3	2.3	2	36.6	9		9	0.7	0.7		1.5
16	Sarmi	C3-14	S	2001	4			2.3	0.2	1.2	2.3		2		5.4	1.2	2.4		1.5	4	3		2.4	2.7	30.6	9		9				
17	Supani	C2-03	S	2011	3	1		2.3	0.5	1.5	3	1	2.5	1.5	5	0.8	3		1	3	3	3	3	3	38.1			9	1	0.5	0.7	0.7
18	Darmono	C1-12	S	2009	4	1	0.9	2.3	0.7	1.5	3	1	1.2	1.5	5.4	0.9	3		1.5	3	3	3	3	2.2	38.1	3						
19	Sulastri	C1-06	S	2007	4	1	1.5	2.3	0.8	1.5	3	1	2	2.2	6.6	1.2	3	3.6	1.5	3	3.6	3	2	1.2	44			9				
20	Muhadi	C1-10	S	2008	4	0.8	1	2.3	0.5	1.5	3	1	1.5	2.2	6	1.5	3		1.5	3.2	3.2	4		1.2	37.4		9	9				
21	Asian	C1-03	S	2000	5	1	1	2.3	1	1.8	4	1	1	2.2	6.6	2	4	3	1.5		3	6	2	1.2	44.6							
AVERAGE					**3.62**	**1.15**	**1.03**	**2.19**	**0.83**	**1.46**	**2.72**	**0.94**	**1.85**	**1.78**	**5.04**	**1.43**	**2.79**	**3.14**	**1.85**	**3.13**	**3.09**	**3.20**	**2.70**	**1.37**	**41.67**	**8.54**	**9**	**9**	**0.85**	**1.23**	**1.85**	**1.73**

THE USE OF SPACE

5. PENJARINGAN-2

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religion	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	40.12	U	V	W	X1	X2	Y	Z
1	Sujono	DA 210	T	2006	4	1.4	1.2	2	0.6	2.4	2	1.2	1.3	2.8	6	2	2.8	2.8	2.5	3.8	2.8	2.8	2.8	2.4	45.6	9						
2	Sauma	DA 203	T	2008	3	1.4	1.2	1.4	1	2.4	1	1.2	1	2.8	5.6				2.5	5	2.8		1.8	1	32.1	9						
3	Tohary	DB 304	T	2008	3	**1.4**	1.2	1.2	0.3	2	2	1	1	2.8	3.2	1.6	2.3		2	4	3	2	3	1	35							
4	Saumu	DA 204	T	2008	1	1.4	1.2		0.4	1.8	1.5	0.6	1	2.8	3				2	4	1.5		3.8	1.9	26.9	9	9	9				
5	Ibu Pipi Fajar	DA 215	T	2008	3	1.4	1.2	2.3	0.3	2.4	1.5	1.2	1.5	2.8	3.2	1.5	3.6		1.5	3.6	3.6		3.6	2	37.2	3.6						
6	Retno / Irwan	DB 311	T	2011	2					2.4	2.3	1.2	1.3	2.8	3.6	1.2			2.3	2.3	2.3		2.3	1.1	25.1					0.9		2.2
7	Suprihatin	FB 216	T	2004	4	1.4	1.2	2	0.6	2.4	2	1.2	1	2.8	2.4	2	0.6		2.5	2.5	2.4	4	3	1	35				0.5	1	3.6	3.6
8	Jaenal	DA 403	A	2005	2	1.4	1.2	2	0.3	2.4	1.2	0.3	1.1	2.8	3.6	1.5	2		1	2.7	3.6		2.7	0.4	30.2	9		9				
9	Nanik	DA 405	A	2005	2	1.4	1.2	1.5	0.7	1.8	1.5	1	1.3	2.8	3	1.5	1.5		2.3	5		3	2.1	3	34.6	9		9				
10	Istiqomah	DB 405	A	2011	3	1.4	1.2	1.5	0.8	1.8	1.5	1	1.8	2.8	3.2	1.5	2.1		1.2	3.2	3.2		2.4	1	31.6	9		9		0.5		1.5
11	Marfu'ah	FB 215	A	2007	4	1.4	1.2	2.4	0.3	2.4	2.8	1.2	2	2.8	6	1.5	2.4		2	3.2	3.2	2.8	2.8	2.2	42.6	9	9	9				
12	Kanti	DA 308	A	2006	4	0.8	1.2		0.5	2.4	1.5	1.2	1.5	2.8	3.6	1.5	2.4		2.3	3.5	3.6		3	0.8	32.6	9	9	9				
13	Muh. Naskar	EB 214	A	2009	2	1.4	1.2	1.5	0.5	1.8	2	1	0.6	2.8	6	1.5	1.2		2.5	3	3		3	0.8	33.8							
14	Sarti	DB 207	A	2003	2	1.4	1.2	1.5	0.3	1.8	1.5	1	1.5	2.8	3	2.4	2		1.5	4	2		5	1.1	34	9		9				
15	Marsih	FB 205	S		4	1.4	1.2	1.8	1.1	2.4	1.8	1.2	0.8	2.8	3.2	1.2	2		2.4	4	3.2	1.5	2.7	1.4	36.1					2		
16	Sumini	EB 209	S	2004	5	1.4		1.5	0.3	2.4	2	1.2	1.5	2.8	5.4	1.2	2		0.8	5	3		3	1	34.5	9		9	1.2	1.5	0.8	2.4
17	Hj. Maimunnah	DA 213	S	2011	1	1.4	1.2		0.4	2.4	0.9	1.2	1	2.8	3.6	1.8			2.2	2.8	2.8		3.6	2	30.1	9						
18	Sugianti	DA 201	S	2010	3	1.4	1.2	1.5		2.4	2	1.2	0.5	2.8	2.8	2		3	1.7	4		3	3	1.4	33.9							
19	Sayuti	DA 208	S	2006	5	1.4	1.2	2	1.3	2.4	3.2	1.2	0.6	2.8	6.2	1.8	2		1	4	3.2		1.2	1.3	36.8	9		9				
20	Subyono	DB 209	S	2010	4	1.4	1.2	2.3	0.3	2.4	2.3	1	1.5	2.8	3.2	1.5	2.4		2			3.2	4	1.8	33.3		9					
21	Jefry	DB 211	S	2011	3		1.2	2.3	0.3	2.4	2.3	1.2	1	2.8	4.4		0.8		1.6	3	2		3	1.4	29.7	9	9	9				
AVERAGE					**3.05**	**1.37**	**1.20**	**1.81**	**0.54**	**2.24**	**1.85**	**1.07**	**1.18**	**2.80**	**4.01**	**1.62**	**2.01**	**2.90**	**1.90**	**3.63**	**2.84**	**2.79**	**2.94**	**1.43**	**40.12**	**8.61**	**9**	**9**	**0.85**	**1.18**	**2.2**	**2.43**

THE USE OF SPACE

6. WONOREJO

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	41.16	U	V	W	X1	X2	Y	Z
1	Agus	WC/203	T	2011	3	1.4	1.2	2.1	0.5	2.4	2.1	1.2	2	2.8	5.6	2.1	2.1		1.5	2.8	2.8	2	2.8	1.1	38.5	9						
2	Suprihatin	WC/308	T	2010	3	1.4	1.2	2.3	0.9	2.4	2.3	1.2	1	2.8	3	2.4	3		1.3	3	3	2.8	3	0.5	37.5	9						
3	Prihatini	WC/316	T	2009	5	**1.1**	1.2	2.8		2.4	2.8	1	0.8	2.8	5.6	1.5	2.8	2.8	1.7	3	2.8	2.8	2.8	0.6	41.3	9						
4	Wahyu (bu)	WC/311	T	2010	3	1.4	1.2	2.3	0.3	2.4	1.2	1.2	1	2.8	3	1.2		3	2.4	3	3	3	2.4	1	35.8	9						
5	Yeni (bu)	WC/315	T	2010	5	**1.1**	1.2	1.5	0.3	2	2.3	1	0.5	2.8	3	1.5	3		1.8	3	5		3	1.4	34.4							
6	Lisa (bu)	WC/210	T	2009	4	1.1	1.2	2.3	0.3	2	2.7	1	2	2.8	5	1.2	2.7		1.5	2.7	3	2.7	2.7	1.8	38.7							
7	Ninin	WC/307	T	2009	2	1.4	1.2	2	0.3	2.4	2	1.2	0.5	2.8	3	2	2.4		1.9	3	3	1.8	1.8	1.4	34.1	9			1	1.6	0.5	1.8
8	Luky	WE/204	T	2010	4	1.4	1.2	2.4	0.3	3.2	2.4	1.2	1.3	2.8	5	1.6	1.8		1.2	3	3	3	3	1.3	39.1	9				1		3.6
9	Riani	WE/216	T	2010	2	1.4	1.2	2.3	0.3	3.2	1.5	1.2	0.8	2.8	3	1.5			2.4		3		4	1.2	29.8							
10	Arum (ibu)	WC/309	A	2009	4	1.4	1.2	2.4	1	1.8	2.4	1	1.5	2.8	3	1.2	3		1.2	3	3		2	1	32.9	9		9	0.5	0.5	0.8	3
11	Isma (bu)	WC/306	A	2010	4	1.4	1.2	2	0.3	2.4	2	1.2	0	2.8	6.4	2	2	3.2	2	3.2	3.2	2	2	1.1	40.4	9		9				
12	Sumiati (bu0	WC/401	A	2008	7	1.4	1.2	2.3	0.3	1.8	2.7	1	0.5	2.8	5.9	1.6	3.2	3.2	3	2.7	3.2		2.7	0.6	40.1	9		9				
13	Wanda Grace	WC/413	A	2009	6	**1.1**	1.2	1.8	0.7	2	2.4	1.2	1.3	2.8	6.6		3.2	3.2	2	2.4	3.2	2.4	2.4	1.2	41.1							
14	Tri Susilowati	WC/310	A	2010	4	1.4	1.2	2	0.8	2.4	2.4	1.2	0.5	2.8	5.6	2	3.2	3.2	1.3	3.2	3.2	2	2.4	0.7	41.5			9	1	2.8		2
15	Slamet	WC/302	A	2008	4	1.4	1.2	2.3	0.8	2.4	2.4	1.2	0	2.8	5.8	2	2.4	3.8	1	3.8	3.8	2	2	1.2	42.3	9		9	1.2	1.2	2.1	4
16	Mosfir (Bu)	WE/208	A	2010	4	1.4	1.2	1.8	0.4	3.2	2.7	1.2	2	2.8	5.4	3	2.7		2.5	2.7	4		4	2.6	43.6	9	9	9				
17	Tatik (Bu)	WE/309	A	2009	3	1.4	1.2	2.4	0.8	1.5	2.3	1.2	1.5	2.8	5.6	1.8	2.4		0.8	3.2	2.4		2.4	2	35.7	9		9				
18	Nini Setiawati	WC/415	A	2009	4	1.4	1.2	2.3	0.3	2.4	2.4	1.2	0.5	2.8	5.6	2	3		2.1	3	3.2	2	3	1.2	39.6	9		9				
19	Sulika	WC/203	S	2009	2	1.4	1.2	2.4	0.4	2.4	2	1.2	1	2.8	3	2			0.8	3	3		2	1	29.6		9					
20	Sri Septi	WE/203	S	2010	2	1.4	1.2	2.3	0.6	2.4	2	1.2	1.3	2.8	5.2	1.5			2	2.8	2.8		3	1.3	33.8		9		0.6	1.3	0.6	3
21	Sami	WE/413	S	2008	3	1.4	1.2	2.3	0.8	3.2	2.4	1	2	2.8	5.2	2			1.5	2.4	2.8		2.3	0.4	33.7	3		9				
22	Dujalal	WC/205	S	2008	5	1.4	1.2	2.1	0.8	2.4	3	1	1	2.8	5.8	1.4	2.8		1.8	3	3		1.2	1.1	35.8			9				
23	Ari Kurnia	WC/408	S	2011	4	1.4	1.2	2.4	0.8	2.4	2.4	1.2	1.5	2.8	6	1.2	2.4	3	0.8	3	3	2	2.4	1.2	41.1	9		9				
24	Siti Alik	WC/206	S	2010	3	1.4	1.2	2.3	0.8	2.4	2.4	1.2	0.5	2.8	4.5	1.5	2	1.8	1.5	3	2.7	3	3	0.6	38.6	9						
25	Ninok	WC/414	S	2008	5	1.4	1.2	1.6	0.8	2.4	3	1.2	1	2.8	5	1.6	3	1.8	1.5	3	2	2	2	1	38.3	9			1	1		1.8
26	Rujiah	WC/215	S	2009	4	1.4	1.2	2	0.8	2.4	2	1.2	1	2.8	6	2	2.8		2.3	3.2	3.2	2	2.8	1.5	40.6	9	9			0.6		2.4
27	Yusni	WC/212	S	2009	5	1.4	1.2	2.4	0.8	2.4	2.4	1.2	1	2.8	5.6	2	3	2	2.1	4	4	4	2	1	45.3		9					
AVERAGE					**3.85**	**1.36**	**1.20**	**2.19**	**0.58**	**2.40**	**2.32**	**1.15**	**1.04**	**2.80**	**4.90**	**1.76**	**2.68**	**2.82**	**1.70**	**3.00**	**3.12**	**2.44**	**2.56**	**1.15**	**41.16**	**8.67**	**9**	**9**	**0.88**	**1.25**	**1.00**	**2.70**

THE USE OF SPACE

7. RANDU

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	39	U	V	W	X1	X2	Y	Z
1	Suparman	F 206	T	2010	5	1.2	1.8		0.9	1.2	3	1.2	1.3	2.7	5.4	2	2.1		1.9	3	3	3	3	2	38.7							
2	Supartin	F 405	T	2011	3	1.2	1	2	0.9	2.4	1.2	1.2	1	2.7	3.2	2			2	3	3	3	3	1	33.8							
3	Mariaty	F 412	T	2008	5	1.2	1.8	1.6	1.4	1.2	2.3	1.2	0.8	2.7	5.4	1.2	4		1.8		3	4	4	0.6	38.2							
4	Kadri	F 404	T	2009	2	0.7	1.8	2	0.9	1.2	3	1.2	1	2.7	3.2	1.2			1.8	3.2	3.2		2.3	1	30.4							
5	Sairah	F 411	T	2009	6	1.2	1.8	1.5	0.8	1.2	3	1.2	0.8	2.7	6	1.2		3	2	4	3	3	3	1.3	40.7							
6	Siti Mariam	F 403	T	2008	4	1.2	1.8	2	0.5	1.2	2.3	1.2	0.6	2.7	3.6	2			1.5	4	3.6	3	1.5	1.8	34.5							
7	Agus	F 509	T	2011	4	1.2	1.8	2	0.5	1.2	2.3	1.2	1.3	2.7	3.2	2	3.2		1.5	4	3.2	3	2	1	37.3							
8	Fatimah (Bu)	F 409	A	2009	4	1.2	0.9	1.8	0.9	2.7	2.4	1.2	1.1	2.7	5.4	1.5	1.5		0.8	4	2.4	1.8	1.5	1.8	35.6							
9	Sumiati (Bu)	F 312	A	2009	5	1.2	1.8		0.8	1.2	2.3	1.2	0.8	2.7	4.8	1.5	1.6		1.5	1.2	3.2	3	1.5	1.6	31.9							
10	Kartika (Bu)	F 210	A	2011	4	**1.1**	0.9	1.2	0.4	2.7	2.3	1.2	1	2.7	5	1.2	1.5	2.3	1.5	2.3	2.3	1.5	2.3	1.1	34.5	9	9	9				
11	Nanik (Bu)	F 211	A	2010	4	1.2	0.9	2	0.8	2.4	3	1.2	0.5	2.7	3	2	2		1.4	3	3	3	3	1.6	36.7	9	9	9				
12	Muinayah	F 303	A	2008	3	1.2	1.8	2	0.5	1.2	1.2	1.2	0.6	2.7	5	1.5	2	3	1.5	3	3	3	3	1.8	39.2	7.5						
13	Sunandar	F 311	A	2009	2	1.2	1.8	2.4	0.5	2.4	2.4	1.2	0.5	2.7	4.8	2			1.7	3	2.4		2.4	1	32.4							
14	Samijem (Bu)	F 511	A	2009	2	1.2	1.8	2	0.5	1.2	1.8	1.2	0	2.7	3	2			2	3	3		3	1.5	29.9							
15	Jufran	F 306	S	2009	2	1.2	1.8		0.5	1.2	1.6	1.2	0.9	2.7	3.2		1.6		1	3	3		3	1.6	27.5	9		9				
16	Wati	F 304	S	2011	4	1.2	1		1.5	2.4	2.3	1.2	0.5	2.7	5	2		3	1.4		3	3		0.5	30.7							
17	Mat Sa'in	F 305	S	2009	1	1.2	0.9		0.5	1.2	1.2	1.2	0.8	2.7	2.4	2			1.5	2.4	2.4		4	0.8	25.2	9	9	9				
18	Tri Rahayu	F 209	S	2008	3	1.2	0.9	1.6	0.5	2.4	1.2	1.2	1	2.7	5.2	1.2			1.3	4	2.4	3	1.5	0.7	32	9		9		1.8		1.5
19	Saruni	F 201	S	2009	5	1.2	1.8	2	0.5	1.2	3.6	1.2	1	2.7	5.7	2	2		2.4	3.6	3.6	3	2	1.8	41.3	9	9					
20	Fitri	F 308	S	2009	3	1.2	1	2	0.9	2.4	2	1.2	0.5	2.7	4	1.5			1.6	4	2	3	2	2.1	34.1	9						
21	Amina	F 503	S	2009	4	1.2	1.8		0.9	1.2	1.8	1.2	0.8	2.7	4.8	1.5	1.2		0.5	3	1.8	1.8		1	27.2	9				1.5		2.5
AVERAGE					**3.57**	**1.17**	**1.47**	**1.87**	**0.74**	**1.69**	**2.20**	**1.20**	**0.80**	**2.70**	**4.35**	**1.68**	**2.06**	**2.83**	**1.55**	**3.19**	**2.83**	**2.82**	**2.53**	**1.31**	**39**	**8.83**	**9**	**9**		**1.65**	**0**	**2**

THE USE OF SPACE

8. GUNUNGSARI

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																					INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religion	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	42.96	U	V	W	X1	X2	Y	Z
1	Hasan	A 308	T	2011	3					1.5	3	1.2	1.3	2	3	2		3	1.5	6.6	3	3.3	3.3	0.8	35.5					1.7		2.2
2	Sulistiowati	B 419	T	2011	7	1	1.2	1.5	0.5	1.8	3	1.2	0.8	2	7	1.5	4	3	2	5	3		3	0.6	42.1				1.3	0.5		2
3	Diah	B 417	T	2011	4	1	1.8		0.5	1.8	2	1.2	1	2	3.6	1.5		3.6	1.7	6	3.6		1.5	1	33.8					0.8		1.5
4	Fatma	A 419	T	2011	3	1	1.8		0.5	1.2	2	1.2	1	2	4	2	4		1.3	7	4	1.5	4	1.6	40.1		12					
5	Liana	B 408	T	2011	6	1	1.8	1.5	0.5	1.2	4.8	1.2	0.8	2	3.6	2	4.8	3.6	1.8	6	3.6	2.4	4.8	1	48.4	12						
6	Iis	B 310	T	2011	3	1	1.2	2	0.5	1.2	3	1.2	1	2	4	2	3		1	3.8	4	1.5	3	1.8	37.2		12			1.8		3
7	Siti Fatimah	B 306	T	2011	5	1	1.8	2	0.3	1.2	3.6	1.2	1.5	2	6.6	1.5			2.5	4	3		3	1.4	36.6							
8	Sri Martini	H 219	A	2011	2	1	1.8	2	0.3	1.2	4	1.2	1	2	4.4	2	4		1.5	6	2		4	1.5	39.9	12	12	12				
9	Lulu (Bu)	H 211	A	2011	4	**1.1**	1.8	2	0.5	1.2	1.8	1.2	1.5	2	5.4	2	2.4	2.4	1.3	6	2.4	3	3	2.1	43.1							
10	Mukian (Bu)	H 207	A	2011	4	1	1.2	2	0.5	1.2	3	1.2	1.5	2	4.8	2	2.4	2.4	1.9	3	2.4		2.1	1.5	36.1	12		12	1.2	1.2		3
11	Masriah (Bu)	H 218	A	2011	2	1	1.8	2	0.5	1.2	2.4	1.2	0.8	2	7	2	2.4		0.8	2.4	3		6	1	37.5	6						
12	Hastuti (Bu)	H 201	A	2011	1	1	1.8		0.5	1.2	1.5	1.2	1.5	2	2.4	1.6			2.2	5	2		5	1.1	30	7.5	7.5	12				
13	Sri (Bu)	H 214	A	2011	1	1	1.8	3	0.5	1.2	1.5	1.2	1	2	1.4	2	2.8		1.5	2.5	2.8		2.5	0.5	29.2	12		12	3.9	3.9		2
14	Sutik (Bu)	H 219	A	2011	7	**1.1**	1.8	2	0.4	1.2	4	1.2	1	2	6.4	2	2.8	6	2	5	2.8		5	0.6	47.3	8.4						
15	Suyati	B 408	S	2011	5	1	1.2	2	0.5	1.2	3.3	1.2	1	2	5.2	2	4	2.8	1.8	5.5	2.8	6	5	1	49.5				0.8	0.8	2.4	
16	Mita	A 411	S	2011	3	1	1.8	2	0.5	1.2	4	1.2	2	2	5.2	2	1.5		2.1	4.4	2	2.3	4	1	40.2				1.2	1.6	0.8	3
17	Endro	B 412	S	2011	2	1	1.8	2	0.8	1.2	1	1.2	0.8	2	6	1.4	2.8		0.6		2.8		4	0.5	29.9							
18	Asrya	B 409	S	2011	2	1	1.2	2	0.5	1.2	3	1.2	1	2	3.2	2			1.5	5	3.2		0	2	30				1.2	2.4		3
19	Imam Sumantri	B 411	S	2011	1	1	1.2		0.5		0.6	1.8	0.5	2	2	2			0.8		2		3.6	1.3	19.3	3.6			0.3		3.6	6
20	Retno	B 402	S	2011	5	1	1.2	2	0.5	1.8	2.8	1.8	0.5	2	6	2	2.8		1	4.5	2.8		2.8	2	37.5							
21	Didik	A 414	S	2011	1	1	1.8		0.5			1.8	0.5	2	3	1.5	1.5		1.3		3			1	18.9							
AVERAGE					**3.38**	**1.01**	**1.59**	**2.00**	**0.49**	**1.31**	**2.72**	**1.29**	**1.05**	**2.00**	**4.49**	**1.86**	**3.01**	**3.35**	**1.53**	**4.87**	**2.87**	**2.86**	**3.48**	**1.20**	**42.96**	**9.19**	**10.9**	**12**	**1.41**	1.63	2.27	2.86

THE USE OF SPACE

9. WARU-GUNUNG

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	40.53	U	V	W	X1	X2	Y	Z
1	Ulfa	A 310	T	2006	4	1.6	1.8	2.4	0.3	1.2	2.4	1.2	1.5	2.4	6.3	1.5	3.6	3.6	2	2.7	3.6	3.6	1.8	0.8	44.3	5.4		5.4				
2	Siti (bu)	B 402	T	2005	5	1.6	1.8	2.4	0.6	1.2	2.4	1.2	1	2.4	5.4	1.5	2.4		1.4	2.4	3.6	3.6	2.4	0.5	37.8	3					0.5	2
3	Purwito	A 204	T	2004	4	1.6	1.8	2.3	0.3	1.2	2.3	1.2	1.5	2.4	6	1.5	3		2.5	3	3	3	3	1.5	41.1	5.4						
4	Trivena Upik	B 112	T	2001	5	**1.2**	1.8	2.3	1	1.2	3	1.2	1.5	2.4	6		3		2.3	4.5	3	3	3	1.5	41.9							
5	Nur Widya	B 104	T	2011	3	1.6	1.8	2.3	0.3	1.2	2	1.2	1	2.4	3.6	2		3.6	1	3.6	3.6	4	4	1.5	40.7							
6	Nova	B 404	T	2011	3	1.6	1.8	2.3	0.3	1.2	1.6	1.2	0.5	2.4	3.2	1.5		3.2	0.8	3.2	3.2			0.4	28.4							
7	Sulastri	B 502	T	2001	4	1.6	1.8	2.3	0.5	1.2	2.3	1.2	1.5	2.4	5.4	2	1.2	3	0.9	3	3	3	2.3	1.5	40.1	5.4						
8	Ngesti (Bu)	A 201	A	2010	3	**1.2**	1.8	1.8	0.3	1.2	1.8	1.2	1.5	2.4	3.2	1.5	1.8	3.2	2	3.2	3.2	3.2	1.8	0.5	36.8	4.5	4.5	4.5				
9	Listiani (Bu)	B 405	A	2001	3	**1.2**	1.8	2.3	0.5	1.2	2.3	1.2	1	2.4	3.6		1.8	3.6	2.1	3	3.6	3	3	1.8	39.4				0.5	0.5	0.5	3.6
10	Umi (Bu)	B 509	A	2007	3	1.6	1.8	2.3	0.5	1.2	2.3	1.2	0.5	2.4	3.2	1.5	1.6	3.2	1.7	3.2	3.2	5.4	2.7	1	40.5	5.4			0.7		0.6	0.9
11	Hayati (Bu)	A 206	A	2007	2	1.6	1.8	1.8	0.5	1.2	1.2	1.2	2	2.4	3.6	1.2	2		4.8	2.4	3.6		2.3	2.4	36	3.6						
12	Mahmudah	A 207	A	1998	5	1.6	1.8	0.8	0.5	1.2	3	1.2	0.5	2.4	6	1.5	3	3	1.7	3.6	3	3	2.4	1.4	41.6							
13	Rita (Bu)	B 306	A	2000	5	1.6	1.8	2.3	0.5	1.2	2.7	1.2	1.5	2.4	6	1.5	2.7		1.5	3	3	3	3	2.4	41.3							
14	Masrukin	B 310	A	2005	3	**1.2**	1.8	1.5	0.5	1.2	1.5	1.2	0.5	2.4	4.5	1.5	1.2	1.5	1	2.5	3	2.3	2	1.6	32.9							
15	Rini	A 2I9	S	2007	3	1.6	1.8	2.3	0.5	1.2	2.3	1.2	1.5	2.4	5.2	1.5	2.3	3	1	3	3.2	3	3	0.8	40.8							
16	Cici	B 2I6	S	2007	4	**1.2**	1.8	2.3	0.5	1.2	2.3	1.2	1	2.4	5.4	1.5	2		1.4	3	3	3	3	0.9	37.1	6						
17	Siti Aminah	A 2I8	S	2003	4	1.6	1.8	2.3	0.5	1.2	2.3	1.2	1.5	2.4	6	1.5	2.3		1.8	3	3.6	2.3	2.4	1.5	39.2							
18	Lasmini	B 2I3	S	2000	4	**1.2**	1.8	1.8	0.5	1.2	1.8	1.2	1	2.4	6	1.5	2		1.5	2.4	3.6	1.8	1.8	1.7	35.2					0.4	0.8	0.7
19	Widi	B 2I9	S	2000	3	1.6	1.8	2.3	0.5	1.2	1.8	1.2	1.5	2.4	4.8	1.5	1		2	3	3	3	3	1	36.6							
20	Suwarni	A 510	S	2001	3	1.6	1.8	2.4	0.5	1.2	2.4	1.2	1	2.4	4	1.5		2.3	1.3	2.4	2.4	2.4	1.2	1	33							
21	Yunani	B 2I7	S	2011	5	1.6	1.8	2	0.5	1.2	1.8	1.2	1.3	2.4	5.6	1.5	2.4	2.4	1.2	4	2.4	4	3	1	41.3							
AVERAGE					**3.71**	**1.49**	**1.80**	**2.12**	**0.48**	**1.20**	**2.17**	**1.20**	**1.18**	**2.40**	**4.90**	**1.54**	**2.18**	**2.97**	**1.71**	**3.05**	**3.18**	**3.14**	**2.56**	**1.27**	**40.53**	**4.84**	**4.5**	**4.94**	**0.6**	**0.45**	**0.60**	**1.80**

THE USE OF SPACE

10. URIP-SUMOHARJO

Household	INTERVIEWEE NAME	UNIT	Surveyor	START LIVING YEAR	HH Member	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	39.01	U	V	W	X1	X2	Y	Z
1	Saudah S	A 107	T	2006	3	**1.2**	1.8	2	0.5	1.4	1.5	1	1.5	2	4.8	2			1.5	5	2.8		4	1.8	34.8	6		6				
2	Nurhayati	A 307	T	2006	5	1	1.1	2.3	0.5	1.8	3	1.2	0.5	2	6	2	3		1.8	5	3	3	3	2.1	42.3	6		6				
3	Elvi	A 409	T	2005	4	**1.2**	1.8	2.3	0.5	1.8	3	1.2	1.5	2	6	1.5			1.5	**3.8**	3	3	3	1.4	38.5	6						
4	Jeny	A 406	T	2011	2	1	1.1	1.5	0.5	2.4	3	1.2	0	2	4.4				1	**4**	2	3	3	1.2	31.3							
5	Kastini	A 304	T	2003	2	1	1.1		0.5	1.8	1.5	1.2	2	2	4.4	2			1.2		2.4		2.3	1.1	24.5	6						
6	Mba Asri	A 102	T	2011	3	1	1.8	2.4	0.3			1.2	2	2	4.8	2			1.5	3	2.4			1	25.4							
7	Santy	C 401	T	2011	4	1	1.1		0.5		3	1.2	1.5	2	6				1.6	5	3	3		1.8	30.7							
8	Ida (Ibu)	B 401	A	2006	3	1	1.2	1.5	0.5	2.4	2.1	1.2	0.5	2	5.7	2	1.8		2	2.7	2.1		2.1	1	31.8	6		6				
9	Suci (ibu)	C 204	A	2006	5	1	1.1	1.5	0.5	1.8	2.7	1.2	1	2	7	2	2.7		2.4	3	2.7	1	2.3	2	37.9	6		6				
10	Galuh (Ibu)	C 104	A	2009	2	1	1.8	1.5	0.5	2.4	1.2	1.2	1	2	2.8	2	2.8		1.8	3	2.8		1.5	0.5	29.8	6		6	0.9	1.5		3
11	Sukemi	A 105	A	2006	2	**1.2**	1.1		0.8	1.8	1.5	1	1	2	2.8	2	1.8		1.3	3	2.8		3	1	28.1	6		6	1.5	1.5		2
12	Sumiarti	C 403	A	2006	4	1	1.1	2	0.5	1.8	2.4	1.2	1.5	2	2.8	2	1.2		1.5	3	3	3	3	2.1	35.1	6		6		1.2		1
13	Rike (pak)	A 402	A	2006	1	1	1.1	2	1		1.5	1	2	2	2.8	2	1.2		1.4	2.8	2.8		1.5	2.8	28.9							
14	Wigati (Ibu)	C 404	A	2006	5	**1.2**	1.1	2	0.5	1.8	3	1	1	2	4.8	2	3		2.7	4	3		3	0.8	36.9	6		6	1.5	1.5		3
15	Juariah	C 408	S	2006	6	1		2	0.5	2.4	3	1	0.8	2	7	2	3		2.2	4	3		1.5	1.3	36.7	6		6				
16	Asmarawati	B 208	S	2006	4	1	1.1	2	0.5	2.4	2.3	1	1	2	2.8	1	2.3		2.7	3	3		3	1.5	32.6	6						
17	Zainab	B 309	S	2006	4	1	1.1	2	0.5	1.8	2	1	1	2	3.2	1.5	2		1.6	3	1.4	1.5	2	1.1	29.7	6.3		6.3	0.6	0.6		3
18	Suparman	B 207	S	2006	4	1	1.1	2	0.5	1.8	1.5	1	1	2	4.1	1.4	2		2.5	3	3		4	0.6	32.5	3.8		3.8				
19	Sulis	B 203	S	2006	5	1	1.1	2	0.5	1.8	2.8	1	1.3	2	5.6	2	1	2	2	**4**	2.8		2.8	2.3	38	6		6				
20	Mila	B 209	S	2006	5	1	1.1	2	0.8	1.8	3	1	1	2	6	1.5	3		2	**4**	3		3	2.5	38.7	6		6				
21	Nani	A 104	S	2006	4	1	1.1	2.1	0.5	1.8	2.8	1	1	2	5.6	2	2.8		1.8	4	2.8	3	2.8	2.3	40.4	6						
AVERAGE					**3.67**	**1.04**	**1.25**	**1.95**	**0.54**	**1.94**	**2.34**	**1.10**	**1.15**	**2.00**	**4.73**	**1.84**	**2.24**	**2.00**	**1.81**	**3.62**	**2.70**	**2.56**	**2.67**	**1.53**	**39.01**	**5.89**	**0**	**5.85**	**1.13**	**1.26**	**0**	**2.4**

THE USE OF SPACE

11. TANAH MERAH

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																			INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celeb	org	religion	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	43.32	U	V	W	X1	X2	Y	Z
1	Suharnowo	C 205	T	2010	5	1.2	1.8		0.3	1.5	1.5	1.2	1	2.3	5.4	2		4.5	1.8		3	4.5	3.6	0.5	36.1							
2	Siti (bu)	D 504	T	2011	1	1.2	1.8	2	0.8	1.5	0.6	1.2	0.8	2.3	3	2			0.6	2.6	2		2	0.5	24.9				1.3	1.2		2.7
3	Winarsih (bu)	D 501	T	2010	4	1.2	1.8	2	0.5	1.5	2.3	1.2	1	2.3	5.6	2	1		1.3	3.2	3.2		1	1.4	32.5							
4	Saidah	C 309	T	2010	5	1.2			0.8	1.5	3	1.2	0.5	2.3	6	2	3		1.4	4.5	2.5	4.5	2.5	0.6	37.5							
5	M.Rokib	D 407	T	2010	4	1.2	1.8	2	0.3	1.8	3	1.2	1	2.3	5.2	2			2.2	4.5	4.5	4.5	3	1.3	41.8							
6	Mariani (bu)	C 207	T	2010	7	**1.2**	1.8		0.3	1.8	3	1.2	1.3	2.3	5.6	2	3		2.5	3	4.5	4.5	2	1	41							
7	Sahro (bu)	C 406	T	2010	4	1.2		2	0.9	1.5	4.4	1.2	0.8	2.3	5.6	2	4.4		1.9	6	3.6	5.4	3	1.4	47.6	4.5						
8	Ifa (ibu)	D 207	A	2009	5	1.2	1.8	2	0.3	1.2	2.3	1.2	0.5	2.3	5.6	2	3.2	4.5	1.4	4	3.2	4.5	4	1	46.2	4.5	4.5	4.5				
9	Sutrisno	D 202	A	2010	3	1.2	1.8	2	0.4	2.3	2	1.2	1	2.3	2.8	2	1		1.4	3.5	2	4.5	3	1.1	35.5	4.5		4.5				
10	Suarti	D 208	A	2010	1	1.2	1.8	1.8	0.3	2.3	0.9	1.2	0.8	2.3	1.8				1.3	1.5	1.8		4.5	1.3	24.8	4.5						
11	Yuni (bu)	D 203	A	2011	5	1.2	1.8	2	0.3	2.3	1.5	1.2	1	2.3	5.4	2	1	4.5	1.5	6	3.6	4.5	1.5	1.6	45.2	4.5						
12	Rofiq	C 213	A	2010	4	1.2	1.8	1.8	0.9	2.3	2.7	1.2	1	2.3	5.4	2	2.7	2.7	2.1	3	2.7	4.5	2.7	2.7	45.7							
13	Darwati bu	C 212	A	2011	7	1.2	1.8	2	0.3	1.5	4.5	1.2	0.5	2.3	6.8	2	4.5	2.3	2.3	6	2.3	4.5	2	1.3	49.3	4.5		4.5				
14	Purnomo	D 201	A	2010	4	1.2	1.8	2	0.5	1.5	1.2	1.2	1	2.3	5.6	1.5	2.4	3.6	1	2.7	3.6	4.5	2.3	0.6	40.5	4.5		4.5	1.3	1.3	1.4	1.4
15	Mardiana	D 304	S	2010	4	1.2	1.8	2	0.4	2.3	2	1.2	0.5	2.3	5	2	1.6		1.8	4	3	4.5	2.4	1.9	39.9							
16	Rita	C 203	S	2011	4	1.2	1.8	2	0.4	2.3	2.5	1.2	2.5	2.3	5.6	1.5	2.8		1.3	5	2	4.5	4	0.5	43.4	6.3						
17	Lia	D 510	S	2011	5	1.2	1.8	2	0.7	2.3	2.5	1.2	1	2.3	5.6	2	1.5	3	1.4	5	3.2	4.5		0.6	41.8							
18	Heni	D 309	S	2010	3	1.2	1.8	2	0.8	2.3	2	1.2	1.5	2.3	4	1.2			1.8	4	2		2	1	31.1							
19	Susanto	D 509	S	2011	4	1.2	1.8	2	0.4	2.3	2.4	1	1.5	2.3	5.2	1.5		2.4	1	5	2.4	4.5		0.8	37.7							
20	Yeni (bu)	D 305	S	2010	4	1.2	1.8	1.5	0.4	2.3	1.2	1.2	1	2.3	2.8	2	1.2	1.8	1	4	2.3	3		1.5	32.5							
21	Sri Endah	D 307	S	2010	3	1.2	1.8	2	0.6	1.5	2.3	1.2	1	2.3	3	2	3	3	1.3	4	3	4.5	4	1.5	43.2							
AVERAGE					**4.10**	**1.20**	**1.80**	**1.95**	**0.50**	**1.90**	**2.28**	**1.19**	**1.01**	**2.30**	**4.81**	**1.89**	**2.42**	**3.23**	**1.54**	**4.08**	**2.88**	**4.46**	**2.75**	**1.15**	**43.32**	**4.73**	**4.5**	**4.5**	**1.3**	**1.25**	**1.4**	**2.05**

THE USE OF SPACE

12. PENJARINGAN-3

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																			INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	Religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	43.46	U	V	W	X1	X2	Y	Z
1	Nurul Cahyani	501	T	2011	5					1.8	4	1.2	0.5	2.6	6.6	1.5	3		2.1	5	3.6	4	3	1.3	40.2							
2	Mida	502	T	2011	3	1.2	1.8	2.3	0.4	1.8	3	1.2	0.5	2.6	3.6	1.5			0.5		3.6		3	4	31							
3	Titis	304	T	2011	3			2.3	0.2	1.8	2.3	1.2	0.5	2.6	5	1.5			1.5	4	3		4	1.5	31.4	5.4						
4	Munik	503	T	2011	7	1.2	1.8	2.3	0.4	1.8	3	1.2	0.5	2.6	7.2	2	3	3.2	2	3	3.2		3	0.8	42.2							
5	Yanto s	222	T	2011	3	1.2	1.8	2.3	0.4	1.8	2	1.2	0.5	2.6	5	1.5		4	1.2	4	4	4	4	1	42.5							
6	Dayat	302	T	2011	4	1.2	1.8	2.3	0.2	1.8	3	1.2	1.3	2.6	6.4	2	2.4	3.6	1.6	4	3.6	4	4	1.5	48.5							
7	Kamary	524	T	2011	5	1.2	1.8	2.3	0.4	1.8	3	1.2	1	2.6	6.4	1.5	3	3	1.4	3.8	3	3	3	1.7	45.1	5.4						
8	Danis (Bu)	5-17	A	2011	3	1.2	1.8	1.8	0.3	1.8	2.2	1.2	0.5	2.6	5.8	1.5	2.4	3.6	1	4	3.6	3.6	2.2	0.9	42	5.4		5.4				
9	Mul (Pak)	5-21	A	2011	4	1.2	1.8	2.3	0.5	1.8	2.3	1.2	1.3	2.6	6	1.5	3		1.2	3	3	3	3	1.2	39.9	5.4		5.4				
10	Umi Harti	3-11	A	2011	1				0.2	1.8	1.4	1.2	0.8	2.6	3	1.5	2.4		0.8	2.4	3		2.4	0.9	24.4	5.4		5.4				
11	Susanti (Bu)	5-19	A	2011	4	1.2	1.8	1.8	0.2	3	2.4	1.2	0	2.6	6	1.5	2.4	2.4	1.8	4.5	3.6	2.4	2.4	1.3	42.5							
12	Suminah (Bu)	3-12	A	2011	4	1.2	1.8		0.5	3	2.4	1.2	0.5	2.6	5.6	1.5	2.4		1.5	3.8	2.4		2.4	1	33.8							
13	Muhin (Pak)	5-20	A	2011	3	1.2	1.8	2.3	0.4	1.8	2	1.2	1.3	2.6	5.6	1.5	2.3	3.2	1	5	3.2		4	0.5	40.9							
14	Jumiati (Bu)	2-18	A	2011	3	1.2	1.8	2.3	0.3	1.8	1.8	1.2	1	2.6	5.6	1.5			2.3	4	3.2		2.4	1.2	34.2							
15	Santi	201	S	2011	5	1.2	1.8	2.3	0.4	1.8	1.8	1.2	0.5	2.6	6.4	1.2		3.6	1.8	4.5	3.6	2.8	2.8	1.3	41.6							
16	Lilik	305	S	2011	4	1.2	1.8	2.3	0.4	1.8	2	1.2	1	2.6	6.4	1.5	2.4		1.7	4.5	3.2		4	1.4	39.4	5.4			0.6	0.6		1.8
17	Widya	415	S	2011	3				0.4	1.8	2.4	1.2	0.5	2.6	5.6	1.6		3.2	1.4	3.8	2.4	2.4	2.4	2.1	33.8							
18	Yani	410	S	2011	3	1.2	1.8	2.3	0.4	1.8	1.8	1.2	0.5	2.6	5.6	1.5	2.4	3.2	1.5	3.8	3.2	2.4	2.4	2.8	42.4	5.4						
19	Abdi	409	S	2011	1				0.4			1.2	1	2.6	2.4	1.5	1.8		2.3	3	1.8		1.8	2.1	21.9							
20	Eli	407	S	2011	4	1.2	1.8	2.1	0.9	1.8	2.1	1.2	0.8	2.6	5.6	1.5	2.8	2.8	2.2	4.5	2.8		2.8	1.2	40.7							
21	Yuniani	513	S	2011	4	1.2	1.8	2.3	0.4	1.8	2.3	1.2	0.5	2.6	6	1.5	3		2.2	3	3		3	**0.9**	36.7				0.7	0.9	0.7	1.2
AVERAGE					**3.62**	**1.20**	**1.80**	**2.23**	**0.39**	**1.92**	**2.36**	**1.20**	**0.71**	**2.60**	**5.51**	**1.54**	**2.58**	**3.25**	**1.57**	**3.88**	**3.14**	**3.16**	**2.95**	**1.46**	**43.46**	**5.4**	**0**	**5.4**	**0.65**	**0.75**	**0.70**	**1.50**

THE USE OF SPACE

13. ITS

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	33.64	U	V	W	X1	X2	Y	Z
1	Elsa	H 209	T	2009	2	1	0.8	3	0.4	0.8	3	1	0.8	2	2.4	2.4	3.6	0	1.5		3	0	3	1	29.7							
2	Intan	H 237	T	2011	2	1	0.8	3	0.4	0.8	3	1	1.1	2	2.4	1.5	3.6	0	1.4		3	0	3	1.8	29.8							
3	Wiwid	H 308	T	2009	2	1	0.8	3	0.6		3	1	0.8	2	2.4	1.5	3.6	0	2		3	0	3	2.2	29.9							
4	Clara Fauzi	H 222	T	2011	2							1	1.2	2	2.4	1.5	3.6	0	1		4	0	4	1	21.7							
5	Hana	H 319	T	2009	2							1	0.6	2	2.4	1.5	3.6	0	1.3	3.8	3.6	0	3.6	1.8	25.2							
6	Qory	H 221	T	2009	1	1	0.8	3	0.5			1	0.6	2	2.4	1.5	3.6	0	1.2	3.6	3	0	3	2.3	29.5							
7	Al-Jumriana	H 303	T	2011	2				0.8	1.2	3	1	1.3	2	2.4	1.5	3.6	0	1.2		3	0	3	1.9	25.9							
8	Dita	H 326	A	2009	2	1	0.8	1.5	0.5	0.4	3	1	0.7	2	2.4	1.5	3.6	0	1.8		3	0	3	1	27.2							
9	Anita	H 309	A	2011	2	1	0.8	3	0.5	1	3	1	0.9	2	2.4	1.5	3.6	0	1.7	3	3	0	3	1.6	33							
10	Linda	H 307	A	2011	2	1	0.8	3	0.5	1	3	1	1.2	2	2.4	1.5	3.6	0	1.3	3	3	0	3	2.3	33.6							
11	Arun	H 315	A	2011	2	1	0.8	3	1		3	1	0.6	2	2.4	1.5	3.6	0	0.8		3	0	3	3.2	29.9							
12	Gadis	H 321	A	2011	2	1	0.8	3	1	0.8	3	1	0.4	2	2.4	1.5	3.6	0	0.8		3	0	3	1.7	29							
13	Nisa	H 325	A	2008	2	1	0.8	3	0.3	1.5	3	1	1.3	2	2.4	1.5	3.6	0	0.8		3	0	3	1.7	29.9							
14	Siti	H 225	A	2009	2	1	0.8	3	1		3	1	0.8	2	2.4	1.5	3.6	0	1		3	0	3	2.8	29.9							
15	Ulfi	H 212	S	2009	2	1	0.8	3	0.5	1.5	3	1	1.4	2	2.4	1.5	3.6	0	1.3		3	0	3	1.9	30.9				1.2	0.6	1	2.3
16	Rindang	H 227	S	2009	2	1	0.8	3	0.5	0.4	3	1	0.2	2	2.4	1.5	3.6	0	1.7	3	3	0	3	3	33.1							
17	Arum	H 313	S	2009	2	1	0.8	3	1	2	3	1	1.2	2	2.4	1.5	3.6	0	0.8		3	0	3	2.4	31.7							
18	Qisthy	H 304	S	2011	1	1	0.8	3	0.5			1	0.6	2	2.4	1.5	3.6	0	1	3	3	0	3	1.7	28.1							
19	Andina	H 301	S	2008	2	1	0.8	3	1	0.8	3	1	1.4	2	2.4	1.5	3.6	0	0.8	4	3	0	3	1.5	33.8							
20	Nur azizah	H 202	S	2008	2	1	0.8	3	1	1	3	1	1.5	2	2.4	1.5	3.6	0	1.5		3	0		2.1	28.4							
21	Ove	H 312	S	2008	2	1	0.8	3	0.5	1.5	3	1	1.7	2	2.4	1.5	3.6	0	1.2		3	0	3	2.3	31.5							
AVERAGE					1.90	1	0.80	2.92	0.66	1.05	3.00	1.00	0.97	2.00	2.40	1.54	3.60	0.00	1.24	3.34	3.08	0.00	3.08	1.96	33.64	0	0	0	1.2	0.60	1.00	2.30

THE USE OF SPACE

14. UNESA

HOUSEHOLD	INTERVIEWEE NAME	UNIT	SURVEYOR	START LIVING YEAR	HH MEMBER	DOMESTIC ACTIVITIES																				INCIDENTAL			BUSINESS			
						wash	dry	iron	store-1	cook	eat	dish-wash	store-2	bath	sleep	pray	study	childcare	store-3	TV-w	relax	play	entertain	store-4		celebrate	organize	religious	material	product	equipment	work
						A	B	C	D	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	32.00	U	V	W	X1	X2	Y	Z
1	Ridma	220	T	2011	3	0	0.8	2.3	1	0.6	2	0	0.6	0	4	1.5	4.5	0	4.5		3	0	2.4	3	30.2							
2	Putri	217	T	2012	3	0	0.8	2.3	1	1	2	0	0.8	0	4	1.5	4.5	0	2.3		3	0	3	1.5	27.7							
3	Norma	203	T	2010	3	0	0.8	2.3	0.4		3	0	1.1	0	4	1.5	4.5	0	1.5		3	0	3	2.9	28							
4	Dini	210	T	2010	3	0	0.8	2.3	1.4	0.8	3	0	0.8	0	4	1.5	4.5	0	1.5		3	0	3	1.5	28.1							
5	Lailatul	201	T	2009	3	0	0.8	2.3	1	0.8	2.3	0	0.9	0	4	1.5	4.5	0	1.5		3	0	3	2.5	28.1							
6	Naila	208	T	2010	3	0	0.8	1.8	0.8	0.6	3	0	0.5	0	4	1.5	4.5	0	2		3	0	3	2	27.5							
7	Tita	224	T	2010	3	0	0.8	2.3	0.5	1	2.3	0	1	0	4	1.5	4.5	0	1.5		3	0	3	2	27.4							
8	Rinda (Mbak)	308	A	2010	4	0	0.8	1.5	0.5		2.4	0	0.5	0	4	1.5	6	0	1	2.4	2.4	0	2.4	2	27.4							
9	Anisa (Mbak)	305	A	2011	4	0	0.8	2.3	0.4	1	2.3	0	1.8	0	4	1.5	6	0	1		4	0	2.3	3	30.4							
10	Arini (Mbak)	322	A	2010	4	0		2.3	0.4	0.6	2	0	0.6	0	4	1.5	6	0	1		4	0		2	24.4							
11	Ica (Mbak)	324	A	2010	4	0	0.8	0	0.3		3	0	0.4	0	4	1.5	6	0	1		4	0	3	2	26							
12	Vira (Mbak)	309	A	2010	3	0		2.3	0.4		4	0	0.4	0	4	1.5	6	0	1		4	0		1.5	25.1							
13	Dwi (Mbak)	320	A	2009	4	0	0.8	2.3	0.3		4	0	0.2	0	4	1.5	6	0	1	3	4	0	4	2.3	33.4							
14	Retno (Mbak)	302	A	2011	4	0		2.1	0.3		2.8	0	0.6	0	4	1.5	6	0	1		4	0		2.5	24.8							
15	Nuraisyah	416	S	2010	4	0	0.8	2.3	0.5	0.8	3	0	1.3	0	4	1.5	6	0	1.2		4	0	4	2.3	31.7							
16	Winda	201	S	2011	4	0	0.8	2.3	0.5		4	0	1.6	0	4	1.5	6	0	1.3		4	0		2.5	28.5							
17	Tia	418	S	2011	4	0	0.8	2.3	0.4	1	4	0	0.8	0	4	1.5	6	0	1		4	0	3	2	30.8							
18	Imatul	420	S	2011	4	0	0.8	2.3	0.6	0.3	4	0	0.7	0	4	1.5	6	0	1		4	0		2.3	27.5							
19	Erna	422	S	2011	4	0	0.8	2.3	0.4	1.5	4	0	0.2	0	4	1.5	6	0	1		4	0		2	27.7							
20	Ika	424	S	2011	4	0	0.8	2.3	0.5	0.2	2.7	0	0.8	0	4	1.5	6	0	1	2.7	4	0		3	29.5							
21	Vita	423	S	2011	4	0	0.8	2.3	0.3		2.4	0	0.2	0	6	1.5	6	0	1		4	0		2	26.5							
AVERAGE					3.62	0.0	0.8	2.1	0.6	0.8	3.0	0.0	0.8	0.0	4.1	1.5	5.5	0.0	1.4	2.7	3.6	0.0	3.0	2.2	32.00	0	0	0	0	0	0	0

APPENDIX-3

THE CHECKLISTS

1. SOMBO

SOMBO-1: I-107; 6 people; no business

A	wash		
B	dry	0.6x2.5	1.5
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.2	0.6
F	cook	1x1.5	1.5
G	eat	1.5x1.5	2.3
H	d-wash		
I	store-2	0.8+0.5	1.3
J	bath		
K	sleep	2(1.5x2)	6
L	pray	1x1.5	1.5
M	study	1.5x2	3
N	ch-care	1.5x2	3
O	store-3	1.5x1.5	2.2
P	watch	1.5x1.5	2.3
Q	relax	1.5x2	3
R	play		
S	enter	2x1.4	2.8
T	store-4	0.8x1.5	1.2
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SOMBO-4: I-408; 4 people; rice food seller

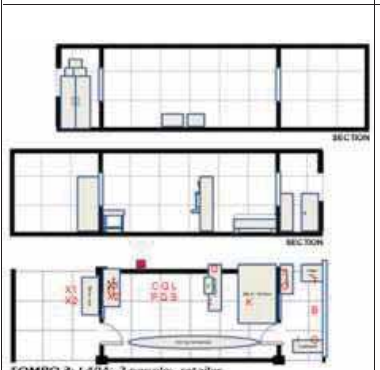
A	wash		
B	dry	1X1.5	1.5
C	iron	2x1	2
D	store-1	1X1.5	1.5
F	cook		
G	eat	1.5X2	3
H	d-wash		
I	store-2	0.5+0.5	1
J	bath		
K	sleep	3+2+3	8
L	pray	1X2	2
M	study		
N	ch-care		
O	store-3	0.5X4	2
P	watch	2X1.5	3
Q	relax		
R	play		
S	enter	2X1.5	3
T	store-4	0.5X3	1.5
U	celebra		
V	organiz		
W	religion		

SOMBO-2 : I-118; 3 people; retailer

A	wash	0.8x1.5	1.2
B	dry	1.5x1	1.5
C	iron	2X1	2
D	store-1	0.5X0.5	0.3
F	cook	1.5X1	1.5
G	eat	2X1.5	3
H	d-wash	1.5X1	1.5
I	store-2	0.5+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.5 +1)	5
L	pray	1x2	2
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5X2	1
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play		
S	enter		
T	store-4	0.5X3.5	1.8
U	celebra		
V	organiz		
W	religion		

SOMBO-5: I-207; 1 people; no business

A	wash		
B	dry		
C	iron		
D	store-1		
F	cook		
G	eat	1X1.5	1.5
H	d-wash		
I	store-2	0.5X0.75	0.4
J	bath		
K	sleep	2X1.5	3
L	pray	1X1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5X0.75	0.4
P	watch	2x1.5	3
Q	relax	1.5X2	3
R	play		
S	enter		
T	store-4	0.5X0.6	0.3
U	celebra		
V	organiz		
W	religion		



SOMBO-3: I-404; 2 people; retailer

A	wash		
B	dry	0.6x2	1.2
C	iron	2X1	2
D	store-1	0.5X0.5	0.3
F	cook		
G	eat	2X1.5	3
H	d-wash		
I	store-2	0.5X1.5	0.8
J	bath		
K	sleep	1.5X2	3
L	pray	1X2	2
M	study		
N	ch-care		
O	store-3	0.5X1	0.5
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play		
S	enter	2X1.5	3
T	store-4	0.4+0.5	0.9
U	celebra		
V	organiz		
W	religion		
X1	material	0.5x3	1.5
X2	product	0.5x3	1.5

SOMBO-6: I-416; 4 people; no business

A	wash		
B	dry	0.5X2	1
C	iron	1X2	2
D	store-1	0.5X1	0.5
F	cook		
G	eat	1X3	3
H	d-wash		
I	store-2	1X1	1
J	bath		
K	sleep	1.5X2	3
L	pray	1X2	2
M	study		
N	ch-care		
O	store-3	0.5X3	1.5
P	watch	1X3	3
Q	relax	1X3	3
R	play	1X3	3
S	enter	1X3	3
T	store-4	0.5x3	1.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SOMBO-7: I-206; 3 people; no business

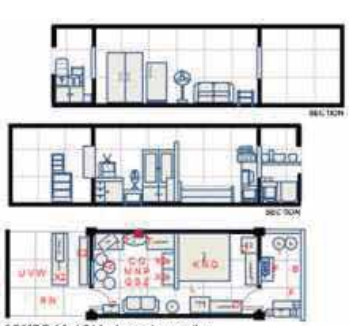
A	wash		
B	dry	0.6X2.5	1.5
C	iron	1.5X2	3
D	store-1	0.5X1	0.5
F	cook		
G	eat	1.5X2	3
H	d-wash		
I	store-2	0.5+0.5 X2	1.5
J	bath		
K	sleep	1.8X2	3.6
L	pray	1X1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5X2	1
P	watch	2x2	4
Q	relax	1.5X2	3
R	play	2x2	4
S	enter	2x1.5	3
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SOMBO-10: I-314; 4 people; batok seller

A	wash		
B	dry	0.5X2	1
C	iron	0.6X1.5	0.9
D	store-1		
F	cook	1X2	2
G	eat	2X1.5	3
H	d-wash		
I	store-2	0.5X2	1
J	bath		
K	sleep	2X3	6
L	pray	0.8X1	0.8
M	study	0.8X1.5	1.2
N	ch-care		
O	store-3	0.5X3+1	2.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	1X2+0.5 X1	2.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9
Y	equip	0.5x1	0.5

SOMBO-8: I-307; 5 people; no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X1	0.5
F	cook	1X1.5	1.5
G	eat	2X2	4
H	d-wash		
I	store-2	0.5X3.5	1.7
J	bath		
K	sleep	2(1.6+1.4)	6
L	pray	2X1.	2
M	study	2X2	4
N	ch-care	2X1.6	3.2
O	store-3	0.5X4+0.4	2.4
P	watch	2X2	4
Q	relax	2X2	4
R	play	2X2	4
S	enter	2X2	4
T	store-4	0.5X5	2.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9



SOMBO-11: I-311; 4 people; retailer

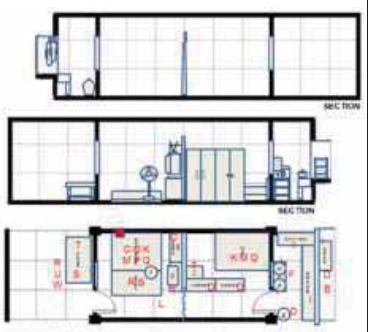
A	wash		
B	dry	0.6x2	1.2
C	iron	1.5X1.5	2.3
D	store-1		
F	cook	2X1.5	3
G	eat	2X1.5	3
H	d-wash		
I	store-2	0.5+0.5X1	1
J	bath		
K	sleep	1.8X2	3.6
L	pray	0.6X2	1.2
M	study	2X1.5	3
N	ch-care	2X1.5	3
O	store-3	0.5+0.5X1	1
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9
X2	product	3+1.5+0.5	5
Z	work	2X1.5	3

SOMBO-9: I-306; 6 people; no business

A	wash		
B	dry	0.6X2	1.2
C	iron	1.5X2	3
D	store-1	0.5X1	0.5
F	cook		
G	eat	2X2	4
H	d-wash		
I	store-2	0.5+0.5X2	1.5
J	bath		
K	sleep	(1.8+1.2)2	6
L	pray	1X2	2
M	study	2X2	4
N	ch-care		
O	store-3	0.5X4	2
P	watch	2X2	4
Q	relax	2X2	4
R	play	2X2	4
S	enter	2X2	4
T	store-4	0.5X4.5	2.2
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SOMBO-12: I-312; 7 people; retailer

A	wash		
B	dry	0.6X2.5	1.5
C	iron	1.5x2	3
D	store-1		
F	cook		
G	eat	2x1.8	3.6
H	d-wash		
I	store-2	0.5x1+0.5	1
J	bath		
K	sleep	3.6+2+3	8.6
L	pray	1.5X1	1.5
M	study	2x1.8	3.6
N	ch-care		
O	store-3	0.5X5	2.5
P	watch	2x1.8	3.6
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.8	3.6
T	store-4	0.5X2.5	1.2
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9
X2	product	1.5x2	3

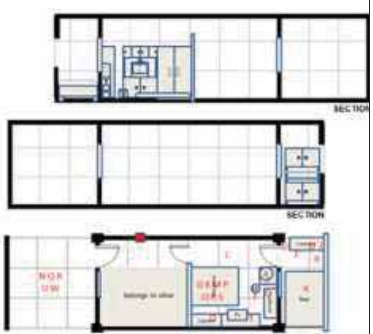


SOMBO-13: I-313; 6 people; no business

A	wash		
B	dry	0.6x1.5	0.9
C	iron	1.4x2	2.8
D	store-1	0.5x0.5	0.3
F	cook	2x1.5	3
G	eat	1.4x2	2.8
H	d-wash		
I	store-2	0.5x5	2.5
J	bath		
K	sleep	2+2.8+2.8	7.6
L	pray	1x2	2
M	study	1.4x2	2.8
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2	4
Q	relax	1.4x2	2.8
R	play	1x2	2
S	enter	1x2	2
T	store-4	0.5x1.5	0.8
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

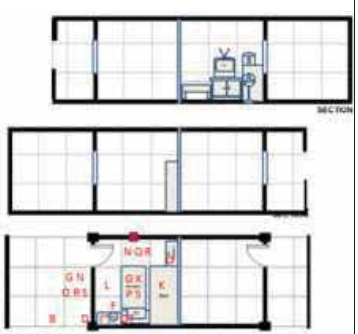
SOMBO-16: I-103; 4 people; retailer

A	wash	1X1.5	1.5
B	dry	0.6X2	1.2
C	iron		
D	store-1	1X1	1
F	cook	1.5X1	1.5
G	eat	1.5x2	3
H	d-wash	1X1.5	1.5
I	store-2	0.5+0.4	0.9
J	bath	1X1.5	1.5
K	sleep	2(2X1.5)	6
L	pray	1X2	2
M	study	2X2	4
N	ch-care		
O	store-3	0.5X2.5	1.2
P	watch	2X2	4
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5X3	1.5
U	celebra	3X3	9
V	organiz		
W	religion		
X2	product	0.5x3	1.5
Z	work	1.5x1.5	2.3



SOMBO-14: I-305; 3 people; no business

A	wash		
B	dry	0.6X2.5	1.5
C	iron		
D	store-1	0.5X1.5	0.8
F	cook		
G	eat	1.8X1.5	2.7
H	d-wash		
I	store-2	0.5X2	1
J	bath		
K	sleep	2.7+3	5.7
L	pray	1X2	2
M	study	1.8X1.5	2.7
N	ch-care	1.8X1.5	2.7
O	store-3	0.5X2	1
P	watch	1.8X1.5	2.7
Q	relax	1.8X1.5	2.7
R	play	1.8X1.5	2.7
S	enter	1.8X1.5	2.7
T	store-4	0.5X1.5	0.8
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9



SOMBO-17: I-409; 3 people; no business

A	wash		
B	dry		
C	iron		
D	store-1	0.5x0.5	0.3
F	cook	1x1.5	1.5
G	eat	1.5x1	1.5
H	d-wash		
I	store-2	0.5x1	0.5
J	bath		
K	sleep	2+1.5	3.5
L	pray	1x1.5	1.5
M	study		
N	ch-care	1x2	2
O	store-3	0.5x2	1
P	watch	1x2	2
Q	relax	1x2	2
R	play	1x2	2
S	enter	1x2	2
T	store-4	0.5x1	0.5
U	celebra		
V	organiz		
W	religion		

SOMBO-15: I-213; 7 people; no business

A	wash		
B	dry		
C	iron	1.5X2	3
D	store-1		
F	cook		
G	eat	2X2	4
H	d-wash		
I	store-2	0.5X1+0.5	1
J	bath		
K	sleep	1.5 (2+1.8)	5.7
L	pray	1X1.5	1.5
M	study	1.5X2	3
N	ch-care		
O	store-3	0.5X4.5	2.2
P	watch	2X2	4
Q	relax	1.5X2	3
R	play	2X2	4
S	enter	2X2	4
T	store-4	0.5X1.5	0.8
U	celebra		
V	organiz		
W	religion		

SOMBO 18: I-212; 4 people; no business

A	wash		
B	dry	0.6X2.5	1.5
C	iron	2X1.5	3
D	store-1	0.5X1	0.5
F	cook	2X1.5	3
G	eat	1.5x1.5	2.3
H	d-wash		
I	store-2	0.5X2.5	1.2
J	bath		
K	sleep	3+1.2	4.2
L	pray	1X1.5	1.5
M	study	2X2	4
N	ch-care	1X1.5	1.5
O	store-3	0.5X2	1
P	watch	2x2	4
Q	relax	1.5X2	3
R	play	2x2	4
S	entertai	2X2	4
T	store-4	0.5X1	0.5
U	celebra		
V	organiz		
W	religion		

2. SIMOLAWANG

SOMBO-19: I-402; 4 people; no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron	1.5X0.8	1.2
D	store-1	0.5X0.5	0.3
F	cook	1.8X1	1.8
G	eat	1X1.8	1.8
H	d-wash		
I	store-2	0.5+0.5 X1	1
J	bath		
K	sleep	2(1.8+ 1.5)	6.6
L	pray	1X1.8	1.8
M	study	2X1.8	3.6
N	ch-care		
O	store-3	0.5X3.5	1.7
P	watch	2X1.8	3.6
Q	relax	2X1.8	3.6
R	play	1.2X2	2.4
S	enter	1.5X1.2	1.8
T	store-4	0.5X1.5	0.7
U	celebra	3X3	9
V	organiz		
W	religion		

SIMOLAWANG-1: A-312; 2 people; no business

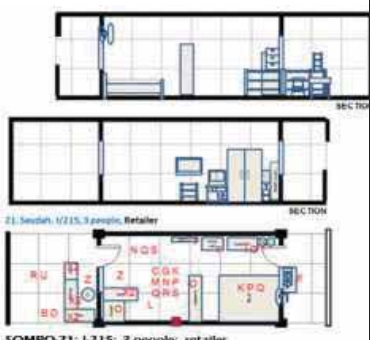
A	wash		
B	dry	0.6x2.5	1.5
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1.5x1	1.5
G	eat	1.5x1.5	2.3
H	d-wash		
I	store-2	0.5x1.2	0.6
J	bath		
K	sleep	1.5x2	3
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x2.5	1.2
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play		
S	enter	2x2	4
T	store-4	0.5x4	2
U	celebra	3x3	9
V	organiz		
W	religion	3X3	9

SOMBO-20: I-414; 6 people; no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron	2x1.5	3
D	store-1	0.5X0.5	0.3
F	cook	1X1.5	1.5
G	eat	2x1.5	3
H	d-wash		
I	store-2	0.5+0.5	1
J	bath		
K	sleep	1.5X3.6	5.4
L	pray	1X2	2
M	study	2x1.5	3
N	ch-care	2x1.5	3
O	store-3	0.5X3.5	5.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5X3	1.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-2: A-409; 7 people; no business

A	wash		
B	dry	0.6X2.5	1.5
C	iron	1.5X1	1.5
D	store-1	0.5x0.6	0.3
F	cook		
G	eat	1.5X1.5	2.3
H	d-wash		
I	store-2	0.5X2	1
J	bath		
K	sleep	2X3	6
L	pray	1x1.5	1.5
M	study	1.5X1.5	2.3
N	ch-care	1.5X2	3
O	store-3	0.5X4	2
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play		
S	enter	1.5X2	3
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9



SOMBO-21: I-215; 3 people; retailer

A	wash		
B	dry	0.6X2	1.2
C	iron	2x1.5	3
D	store-1	0.5x1	0.5
F	cook	1.5x1	1.5
G	eat	2x1.5	3
H	d-wash		
I	store-2	0.5x1.5	0.8
J	bath		
K	sleep	2x1.6	3.2
L	pray	1x2	2
M	study	2x1.5	3
N	ch-care	2x1.5	3
O	store-3	0.5x3	1.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0..5x1	0.5
U	celebra	2x3	6
V	organiz		
W	religion		

SIMOLAWANG-3: A-402A; 3 people; no business

A	wash		
B	dry	0.6x1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X1	0.5
F	cook		
G	eat	1.5X2	3
H	d-wash		
I	store-2	0.5X0.5	0.3
J	bath		
K	sleep	1.5X2	3
L	pray		
M	study	out	
N	ch-care		
O	store-3	0.5x1	0.5
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x2.5	1.2
U	celebra	3X3	9
V	organiz		
W	religion		

A	wash		
B	dry	0.6x3	1.8
C	iron	1.5x2	3
D	store-1	0.5x0.8	0.4
F	cook		
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5x1+0.5	1
J	Bath		
K	sleep	3x(1.5x2)	9
L	pray		
M	study	out-side	
N	ch-care	1.5x2	3
O	store-3	0.5x3.5	1.7
P	watch	2x2	4
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5X2	3
T	store-4	0.5X1.5	0.8
U	celebra	c. space	
V	organiz		
W	religion		

SIMOLAWANG-7: A-402B; 4 people; no business

A	wash		
B	dry	0.6X2	1.2
C	iron	1.8X1.5	2.7
D	store-1	0.5X1	0.5
F	cook		
G	eat	1X1.8	1.8
H	d-wash		
I	store-2	0.75+0.5	1.3
J	bath		
K	sleep	2(1.8+1.2)	6
L	pray	0.8X1.5	1.2
M	study	2X1.8	3.6
N	ch-care		
O	store-3	0.5X1.5	2.3
P	watch	2X1.8	3.6
Q	relax	2X1.8	3.6
R	play		
S	enter	2X1.8	3.6
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-5: A-303; 4 people; no business

A	wash		
B	dry	0.6x2	1.2
C	iron	2x1	2
D	store-1	0.5x1.6	0.8
F	cook		
G	eat	2x2	4
H	d-wash		
I	store-2	0.5x2+0.5	1.5
J	bath		
K	sleep	2(2x1.5)	6
L	pray	1.5x1	1.5
M	study	2x1.5	3
N	ch-care	2x1.5	3
O	store-3	0.5x5	2.5
P	watch	2x2	4
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2	1
U	celebra	C. space	
V	organiz		
W	religion	3x3	9

SIMOLAWANG-8: A-401; 3 people; no business

A	wash		
B	dry	0.6x3	1.8
C	iron	1,5X2	3
D	store-1	0.5X1.5	0.7
F	cook	1.5X1.5	2.3
G	eat	1,5X2	3
H	d-wash		
I	store-2	0.5X1.5	0.8
J	bath		
K	sleep	2(2X1.5)	6
L	pray	1X2	2
M	study	1,5X2	3
N	ch-care		
O	store-3	0.5X3	1.5
P	watch	1.5x2	3
Q	relax	1,5X2	3
R	play	2x1.5	3
S	enter	1,5X1	1.5
T	store-4	0.5x1.5	0.8
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-6: A-309; 5 people; no business

A	wash		
B	dry	0.6x2	1.2
C	iron	1.2x1.5	1.8
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	2x1.8	3.6
H	d-wash		
I	store-2	0.5x3+0.5	2
J	bath		
K	sleep	2x3.6)+3	7.2
L	pray	0.5x2	1
M	study	2x1.8	3.6
N	ch-care		
O	store-3	0.5x6	3
P	watch	2x1.8	3.6
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.8	3.6
T	store-4	0.5X5	2.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-9: A-407; 2 people; tailor

A	wash		
B	dry	0.6X2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5x1	0.5
F	cook		
G	eat	1.5x1.2	1.8
H	d-wash		
I	store-2	0.5x3+0.5	2
J	bath		
K	sleep	2(1.2+1.5)	5.4
L	pray	1.5X1.5	2.3
M	study	1.2x2	2.4
N	ch-care		
O	store-3	0.5x2.5	1.2
P	watch	1.2x2	2.4
Q	relax	1.2x2	2.4
R	play		
S	enter	1.5X1.5	2.3
T	store-4	0.5x2.5	3.7
X1	material	0.5x0.8	0.4
X2	product	0.5x1.5	0.7
Y	equip	0.5x2.6	1.3
Z	work	3x0.8x1	2.4

SIMOLAWANG-10: A-315; 5 people; no business

A	wash		
B	dry	0.6x2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.6
F	cook		
G	eat	2x1.5	3
H	d-wash		
I	store-2	0.5x2+0.5	1.5
J	bath		
K	sleep	2(2x1.5)	6
L	pray	1x1.5	1.5
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x3+5	2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x1.5	0.7
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

SIMOLAWANG-13: A-215; 5 people; no business

A	wash		
B	dry	0.6X2.5	1.5
C	iron	1.5X1.5	2.3
D	store-1	0.5X2	1
F	cook		
G	eat	2x1.8	3.6
H	d-wash		
I	store-2	0.5X1.5	0.8
J	bath		
K	sleep	2(1.8+1.5)	6.6
L	pray	1.5X1.5	2.3
M	study	2X1.5	3
N	ch-care	2x1.8	3.6
O	store-3	0.5X3	1.5
P	watch	2X2	4
Q	relax	2x1.8	3.6
R	play	2x1.8	3.6
S	enter	1X2	2
T	store-4	0.5X3	1.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-11: A-416; 3 people; no business

A	wash		
B	dry	0.6X2	1.2
C	iron		
D	store-1	0.5X1	0.5
F	cook	1.5X1.5	2.3
G	eat	1.2X2	2.4
H	d-wash		
I	store-2	0.5X1.5	0.8
J	bath		
K	sleep	2(1.2x1.5)	5.4
L	pray	2x1	2
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x4+0.5	2.5
P	watch	2x2	4
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x1.8	0.9
U	celebra	c. space	
V	organiz	3x3	9
W	religion	3x3	9

SIMOLAWANG-14: A-207; 2 people; no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron		
D	store-1	0.5X1	0.5
F	cook		
G	eat	1X2	2
H	d-wash		
I	store-2	0.5X3	1.5
J	bath		
K	sleep	2(1.4+1)	4.8
L	pray	1X1.5	1.5
M	study	1X1.8	1.8
N	ch-care		
O	store-3	0.5X2.5	1.2
P	watch	2X1.2	2.4
Q	relax	2X1.4	2.8
R	play		
S	enter	2X1	2
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-12: A-415; 5 people; no business

A	wash		
B	dry	0.6x2	1.2
C	iron		
D	store-1	0.7x0.7	0.5
F	cook		
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5x3	1.5
J	bath		
K	sleep	2(1.5x2)	6
L	pray	1.5x2	3
M	study	1.5X2	3
N	ch-care		
O	store-3	0.5X7.7	3.7
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5x2	3
S	enter	1.5X2	3
T	store-4	0.5X2.5	1.2
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-15: A-108; 3 people; porridge seller

B	dry	0.6X2	1.2
C	iron		
D	store-1	0.5X0.5	0.3
F	cook	1x2	2
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5x4	2
J	bath		
K	sleep	2x2.7	5.4
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x2.5	1.2
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3	1.5
U	celebra	3x3	9
V	organiz		
W	religion	outside	
X2	product	0.5x3	1.5
Y	equip	0.5x3.5	5.2
Z	work	1.5x2	3

SIMOLAWANG-16: A-3028; 5 people; no business

A	wash		
B	dry	0.6x2	1.2
C	iron	1.2x1.5	1.8
D	store-1		
F	cook		
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5x3.5	1.8
J	bath		
K	sleep	2(1.8+1.5)	6.6
L	pray	1.2X1.5	1.8
M	study	2x1.8	3.6
N	ch-care		
O	store-3	0.6x1.2	0.7
P	watch		
Q	relax	2x1.8	3.6
R	play		
S	enter	1X2	2
T	store-4	1.5X3	4.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-19: A-408; 4 people; no business

A	wash		
B	dry	0.6X2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5X0.8	0.4
F	cook		
G	eat	2X1.2	2.4
H	d-wash		
I	store-2	0.5X5	2.5
J	bath		
K	sleep	2X2.4	4.8
L	pray	1x2	2
M	study		
N	ch-care	2X1.2	2.4
O	store-3	0.5X1.5	0.8
P	watch	1.5X2	3
Q	relax	2X1.2	2.4
R	play	1.5x1.5	2.3
S	enter	1.5X1.5	2.3
T	store-4	0.5X1	0.5
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

SIMOLAWANG-17: A-314; 5 people; no business

A	wash		
B	dry	0.6X2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5X0.6	0.3
F	cook	1+1.5	2.5
G	eat	2x1.5	3
H	d-wash		
I	store-2	1.2+0.5	1.7
J	bath		
K	sleep	2(1+1.5)	5
L	pray	0.6x2	1.2
M	study	2x1.5	3
N	ch-care	2x1.5	3
O	store-3	0.5x2	1
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1	2
T	store-4	0.5x5	2.5
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6

SIMOLAWANG-20: A-410; 1 people; no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron		
D	store-1	0.5X1	0.5
F	cook		
G	eat	0.8X1.5	1.2
H	d-wash		
I	store-2	0.5X1	0.5
J	bath		
K	sleep	2X1.5	3
L	pray	1X2	2
M	study		
N	ch-care		
O	store-3	0.5X1.2	0.6
P	watch	1.5X2	3
Q	relax	2X1.5	3
R	play		
S	enter	1.51.5	2.3
T	store-4	0.5X1.6	0.8
U	celebra	2X3	6
V	organiz		
W	religion	2X3	6

SIMOLAWANG-18: A-413; 5 people; cookies maker

A	wash		
B	dry	065x2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5X0.5	0.3
F	cook	1.5X1.2	1.8
G	eat	2X1.5	3
H	d-wash		
I	store-2	0.5X2.5	1.2
J	bath		
K	sleep	2(2X1.5)	6
L	pray	1X2	2
M	study		
N	ch-care	2X1.5	3
O	store-3	0.5X3.2	1.6
P	watch	2X2	4
Q	relax	2X1.5	3
R	play	2x2	4
S	enter	2X1.5	3
T	store-4	0.5X2.2	1.1
U	celebra	2X3	6
V	organiz		
W	religion		
X1	material	0.5X1.2	0.6
X2	product	0.5X0.8	0.4
Y	equip	0.5X1	0.5
Z	work	1X1.5	1.5

SIMOLAWANG-21: A-404; 1 people; cookies seller

A	wash		
B	dry	0.6X1	0.6
C	iron	1.4X2	2.8
D	store-1	0.5X1.6	0.8
F	cook		
G	eat	1.5X1.5	2.3
H	d-wash		
I	store-2	0.5X2	1
J	bath		
K	sleep	2X1.4	2.8
L	pray	1X2	2
M	study		
N	ch-care		
O	store-3	0.5X1.5	0.8
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play		
S	enter	1.5X2	3
T	store-4	0.5X4.5	2.3
U	celebra	2X3	6
V	organiz		
W	religion	2X3	6
X1	material		
X2	product	0.7X2	1.4
Y	equip	0.5X1.5	0.8
Z	work		

3. DUPAK

DUPAK-1: E-336, 4 people, no business

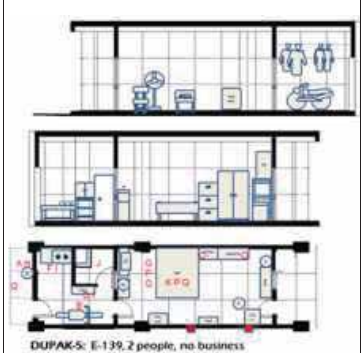
A	wash		
B	dry	0.6x2.5	1.5
C	iron	1.5X1.5	2.3
D	store-1	c. space	
F	cook	c. space	.
G	eat	2X1.2	2.4
H	d-wash		
I	store-2	0.5x2+0.5	1.5
J	bath		
K	sleep	2(1.6+1)	5.2
L	pray	1X1.5	1.5
M	study	2X1.6	3.2
N	ch-care		
O	store-3	0.5X4	2
P	watch	2X1.6	3.2
Q	relax	2X1.6	3.2
R	play		
S	enter	2X1.6	3.2
T	store-4	0.5X2.5	1.2
U	celebra	c. space	
V	organiz	public	
W	religion	ground	

DUPAK-4: F-152, 2 people, no business

A	wash	1x1.5	1.5
B	dry	1x2	2
C	iron	1.5x1.3	2
D	store-1	0.5X0.5	0.3
F	cook	1X1.5	1.5
G	eat	2X1	2
H	d-wash	1X1.5	1.5
I	store-2	0.5+2.4	2.9
J	bath	1.5X1.5	2.2
K	sleep	2X1.4	2.8
L	pray	1X1.4	1.4
M	study		
N	ch-care		
O	store-3	0.5X1.2	0.6
P	watch	2X1.5	3
Q	relax	2X1.4	2.8
R	play		
S	enter	2X2	4
T	store-4	0.5X1.5	0.7
U	celebra		
V	organiz		
W	religion		

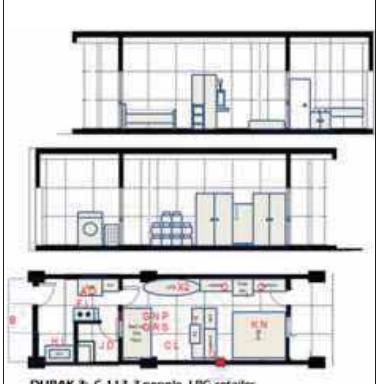
DUPAK-2: C-118, 3 people, no business

A	wash	1x1.5	1.5
B	dry	1x2	2
C	iron	1x1	1
D	store-1	0.5x1	0.5
F	cook		.
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5x3+0.5	2
J	bath	1.5X1.5	2.2
K	sleep	2X2	4
L	pray	1X2	2
M	study		
N	ch-care	2X2	4
O	store-3	0.5X3.5	1.7
P	watch	1.5x2	3
Q	relax	2X2	4
R	play	public	
S	enter	2X2	4
T	store-4	0.5X1	0.5
U	celebra	Public	
V	organiz	ground	
W	religion	ground	



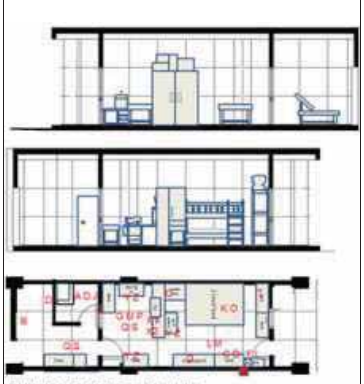
DUPAK-5: E-139, 2 people, no business

A	wash	1X1.8	1.8
B	dry	0.6X2	1.2
C	iron		
D	store-1	0.3X1	0.3
F	cook	1.5X2	3.
G	eat	1X2	2
H	d-wash	1X2	2
I	store-2	0.5X2.5	1.2
J	bath	1.5X1.5	2.3
K	sleep	2X1.5	3
L	pray		
M	study		
N	ch-care		
O	store-3	0.5X2	1
P	watch	2X2	4
Q	relax	2X1.5	3
R	play		
S	enter		
T	store-4		
U	celebra		
V	organiz		
W	religion		



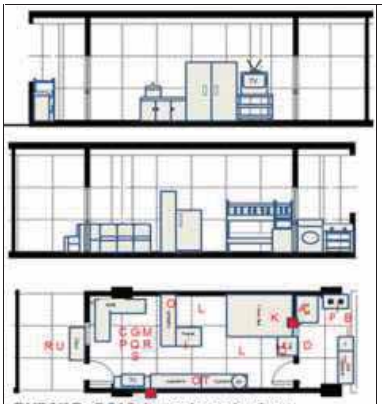
DUPAK-3: C-113, 3 people, LPG retailer

A	wash	0.8x2	1.6
B	dry	1x2	2
C	iron	1.5X1.5	2.3
D	store-1	0.3X1.5	0.7
F	cook	1X1.5	1.5
G	eat	1.5X2	3
H	d-wash	1X1.5	1.5
I	store-2	0.5X1+0.5	1
J	bath	1.5X1.5	2.3
K	sleep	2(1+1.6)	5.2
L	pray	1X1.5	1.5
M	study		
N	ch-care	2x1.6	3.2
O	store-3	0.5X3	1.5
P	watch	1.5X2	3
Q	relax	2x1.6	3.2
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5X2	1
U	celebra	Public	
V	organiz	public	
W	religion	Public	
X1	material		
X2	product	0.7x2	1.4
Y	equip		
Z	work		



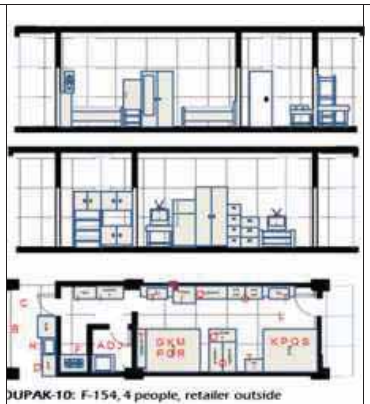
DUPAK-6: C-119, 3 people, tailor

A	wash	1x1.5	1.5
B	dry	1.5x1.2	1.8
C	iron	1X1	1
D	store-1	0.3X1.5	0.7
F	cook	1X1	1
G	eat	1.5X1.5	2.3
H	d-wash		
I	store-2	0.5X1.8	0.9
J	bath	1.5X1.5	2.2
K	sleep	1.5X2	3
L	pray	1X2	2
M	study	1.5x1.5	2.3
N	ch-care		
O	store-3	0.5X3.8	1.9
P	watch	1.5x1.5	2.3
Q	relax	1.5x1.5	2.3
R	play		
S	enter	1.5x1.5	2.3
T	store-4	0.5X1	0.5
U	celebra	Public	
V	organiz	public	
W	religion	Public	
X1	material	0.5x2	1
X2	product	0.5x2	1
Y	equip	0.5x3	1.5
Z	work	3x1x1	3



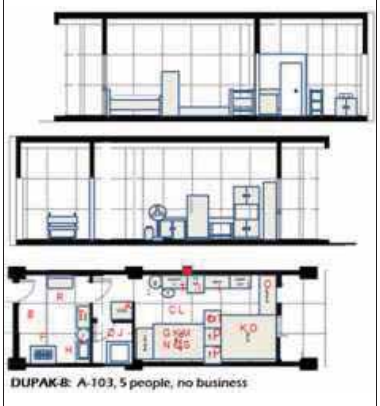
DUPAK-7: C-313, 6 people, no business

A	wash	0.8X1.5	1.2
B	dry	0.6X2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.3X1	0.3
F	cook	1.5X1.2	1.8
G	eat	2X2	4
H	d-wash		
I	store-2	0.5+1.2	1.7
J	bath		
K	sleep	2X1.4	2.8
L	pray	1X1.5	1.5
M	study	2X2	4
N	ch-care		
O	store-3	0.5X3.5	1.7
P	watch	2X2	4
Q	relax	2X2	4
R	play	2X2	4
S	enter	2X2	4
T	store-4	0.5X1.5	0.7
U	celebra	2X3	6
V	organiz		
W	religion		



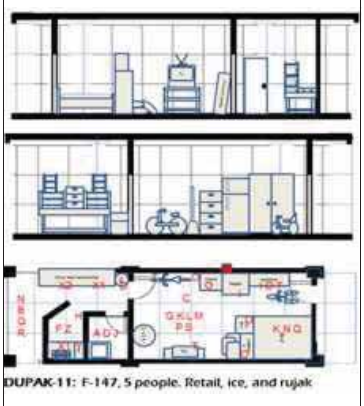
DUPAK-10: F-154, 4 people, retailer outside

A	wash	1X1.5	1.5
B	dry	0.6X3	1.8
C	iron	1X1.5	1.5
D	store-1	0.3X2	0.6
F	cook	1X1.5	1.5.
G	eat	1.5X2	3
H	d-wash	1.5X1.2	1.8
I	store-2	0.5X3	1.5
J	bath	1.5X1.5	2.2
K	sleep	2X3	6
L	pray	1X2	2
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5X5	2.5
P	watch	2X2	4
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5X2	1
U	celebra		
V	organiz		
W	religion		
X1	material		
X2	product		
Y	equip		
Z	work		



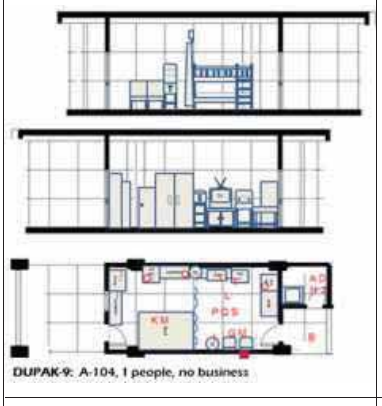
DUPAK-8: A-103, 5 people, no business

A	wash	0.8X1.5	1.2
B	dry	1X1	1
C	iron	1X2	2
D	store-1	0.3X1.5	0.5
F	cook	2x1.5	1.5
G	eat	2X1.4	2.8
H	d-wash	1X1	1
I	store-2	0.5X2+0.5	1.5
J	bath	1.5X1.5	2.2
K	sleep	2(1.8+1.4)	6.4
L	pray	1X2	2
M	study	2X1.4	2.8
N	ch-care	2X1.4	2.8
O	store-3	0.5X3	1.5
P	watch		
Q	relax	2X1.4	2.8
R	play	2X1.4	2.8
S	enter	2X1.4	2.8
T	store-4	0.5X1.5	0.7
U	celebra		
V	organiz		
W	religion		



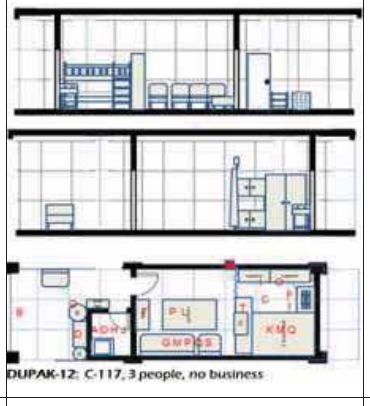
DUPAK-11: F-147, 5 people. Retail, ice, and rujak

A	wash	0.8X1.5	1.2
B	dry	0.6X3	1.8
C	iron	1.5X1.5	2.3
D	store-1	0.3X2	0.6
F	cook	1X1.2	1.2
G	eat	2X1.5	3
H	d-wash	1X0.5	0.5
I	store-2	0.6+0.5	1.1
J	bath	1.5X1.5	2.2
K	sleep	2(1.5+1.6)	6.2
L	pray	1X2	2
M	study	2X1.5	3
N	ch-care	2X1.5	3
O	store-3	0.5X3.5	1.7
P	watch	1.5X2	3
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X2	4
T	store-4	0.5X1.3	2
U	celebra		
V	organiz		
W	religion		
X1	material	0.5X3	1.5
X2	product	0.5X2.5	1.2
Y	equip	0.5X0.6	0.3
Z	work	1X1	1



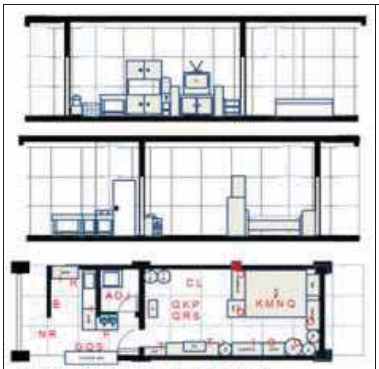
DUPAK-9: A-104, 1 people, no business

A	wash	1.5X1	1.5
B	dry	1.5X1	1.5
C	iron		
D	store-1	0.3X1.5	0.5
F	cook		.
G	eat	1X1	1
H	d-wash	0.8X1.5	1.2
I	store-2	0.5+0.5	1
J	bath	1.5X1.5	2.2
K	sleep	2X1.5	3
L	pray	1X2	2
M	study	1X1	1
N	ch-care		
O	store-3	0.5X2	1
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play		
S	enter	2X1.5	3
T	store-4	0.5X1.5	0.7
U	celebra		
V	organiz		
W	religion		



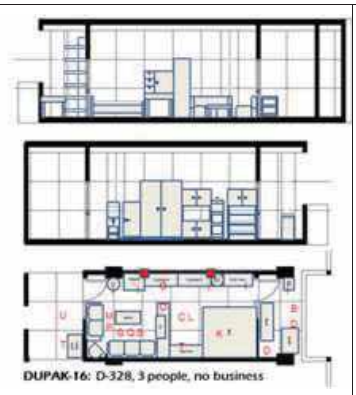
DUPAK-12: C-117, 3 people, no business

A	wash	1X1.5	1.5
B	dry	0.6x3	1.8
C	iron	1.2X1.2	1.4
D	store-1	0.3X2.5	0.8
F	cook	1X1.2	1.2
G	eat	2X1.5	3
H	d-wash	1X1.5	1.5
I	store-2	0.5X2	1
J	bath	1.5X1.5	2.2
K	sleep	2X1.5	3
L	pray	1X1.2	1.2
M	study	1.5X1.5	3
N	ch-care		
O	store-3	0.5X2	1
P	watch	2X2	4
Q	relax	2X1.5	3
R	play		
S	enter	2X1.5	3
T	store-4	0.5X3	1.5
U	celebra		
V	organiz		
W	religion		



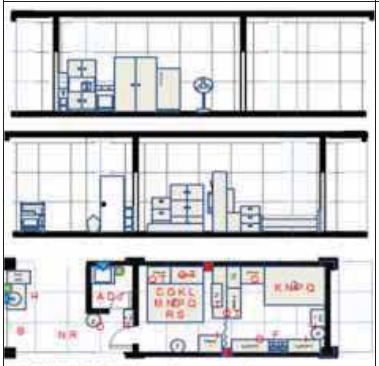
DUPAK-13: E-141, 4 people, no business

A	wash	1X1.5	1.5
B	dry	1X1.5	1.5
C	iron	1.5X2	3
D	store-1	0.3X1.5	0.5
F	cook	1.5X1.5	2.2.
G	eat	1.5X2	3
H	d-wash	1X1.2	1.2
I	store-2	0.5X4	2
J	bath	1.5X1.5	2.2
K	sleep	2(1.4+1.8	6.4
L	pray	1X2	2
M	study	2X1.2	2.4
N	ch-care	2X1.8	3.6
O	store-3	0.5X3.5	1.7
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5X2.5	1.2
U	celebra		
V	organiz		
W	religion		



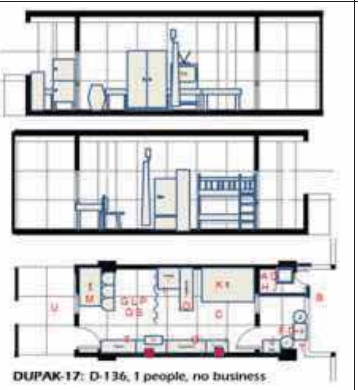
DUPAK-16: D-328, 3 people, no business

A	wash		
B	dry	0.8x1.5	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x1.2	0.6
F	cook		.
G	eat	2x1.2	2.4
H	d-wash		
I	store-2	0.5x3+0.5	2
J	bath		
K	sleep	2x1.8	3.6
L	pray	1x1.5	1.5
M	study	1.5x1.5	2.3
N	ch-care		
O	store-3	0.5x3.2	1.6
P	watch	2x1.5	3
Q	relax	2x1.2	2.4
R	play		
S	enter	2x1.2	2.4
T	store-4	0.5x1.8	0.9
U	celebra	2x3	6
V	organiz		
W	religion		



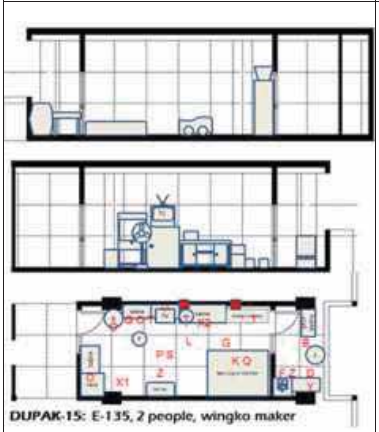
DUPAK-14: D-131, 4 people, no business

A	wash	1.5X1	1.5
B	dry	1X1.5	1.5
C	iron	2x1.4	2.8
D	store-1	0.3X1.5	0.5
F	cook	2X1.5	3
G	eat	2X1.4	2.8
H	d-wash	1.5X1.5	2.2
I	store-2	0.5X2+0.5	1.5
J	bath	1.5X1.5	2.2
K	sleep	2(1.4+1.6	6
L	pray	1X1.4	1.4
M	study	2X1.4	2.8
N	ch-care	2X1.4	2.8
O	store-3	0.5X3.5	1.7
P	watch	2X1.4	2.8
Q	relax	2X1.4	2.8
R	play	2X1.4	2.8
S	enter	2X1.4	2.8
T	store-4	0.5X2.8	1.4
U	celebra		
V	organiz		
W	religion		



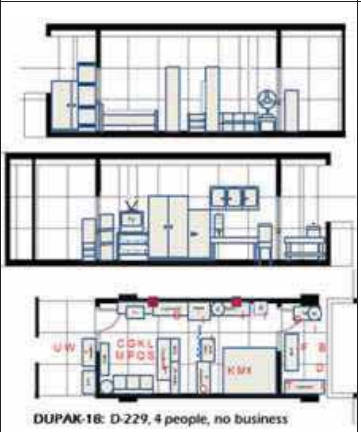
DUPAK-17: D-136, 1 people, no business

A	wash	1X1.5	1.5
B	dry	1X1.5	1.5
C	iron	2X1.2	2.4
D	store-1	0.5X0.6	0.3
F	cook	1x1.5	1.5
G	eat	1X1.5	1.5
H	d-wash	1X0.5	0.5
I	store-2	0.5+0.6	1.1
J	bath	1X1.5	1.5
K	sleep	2X1.2	2.4
L	pray	1.5x1	1.5
M	study	0.8X2	1.6
N	ch-care		
O	store-3	0.5X3	1.5
P	watch	1X1.5	1.5
Q	relax	1X1.5	1.5
R	play		
S	enter	1X1.5	1.5
T	store-4	0.5X1.2	0.6
U	celebra	2X3	6
V	organiz		
W	religion		



DUPAK-15: E-135, 2 people, wingko maker

A	wash		
B	dry	0.6x2.5	1.5
C	iron		
D	store-1	0.5x0.8	0.4
F	cook	1x1.5	1.5
G	eat	1x2	2
H	d-wash		
I	store-2	0.5x2	1
J	bath		
K	sleep	2x1.5	3
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2.5x1.5	3.8
Q	relax	2x1.5	3
R	play		
S	enter	2x2	4
T	store-4	0.5x1	0.5
U	celebra		
V	organiz		
W	religion		
X1	material	0.5x1	0.5
X2	product	0.5x1	0.5
Y	equip	0.5x1	0.5
Z	work	1.5x2	3



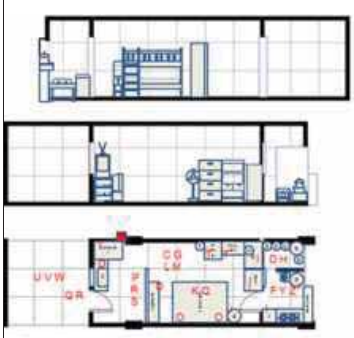
DUPAK-18: D-229, 4 people, no business

A	wash		
B	dry	0.7X2	1.4
C	iron	1.5X1.5	2.3
D	store-1	0.5X1.5	0.7
F	cook	1.5X1.5	2.2
G	eat	2X1.5	3
H	d-wash		
I	store-2	0.5X3+0.5	2
J	bath		
K	sleep	2x1.6	3.2
L	pray	1.5x1.5	2.3
M	study	2x1.6	3.2
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x2	4
T	store-4	0.5x1.5	0.7
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6

4. PENJARINGAN-1

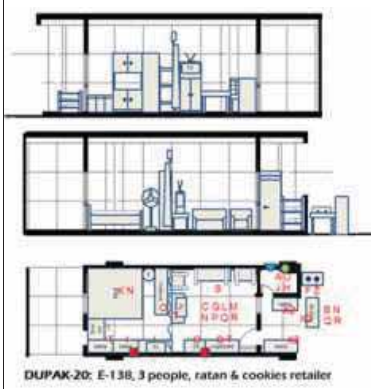
DUPAK-19: D-133, 4 people, no business

A	wash	0.8X1.5	1.2
B	dry	0.6x2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.3x1.5	0.5
F	cook	1.5X1.2	1.8
G	eat	1.5X2	3
H	d-wash	1X1.5	1.5
I	store-2	0.5X2+0.5	1.5
J	bath		
K	sleep	2(1+1.8)	5.6
L	pray	1x1.5	1.5
M	study	1.5X2	3
N	ch-care		
O	store-3	0.5X1.2	0.6
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play		
S	enter	1.5X2	3
T	store-4	0.5X1.5	0.7
U	celebra	2X3	6
V	organiz		
W	religion	2X3	6



PENJARINGAN 1-1: C-303, 4 people, pecel seller out

A	wash		
B	dry		
C	iron	1.5x1.5	2.3
D	store-1	0.5X1+0.5	1
F	cook	1.5x1.5	2.3
G	eat	1.5x2	3
H	d-wash	0.6X1	0.6
I	store-2	0.5x2+0.5	1.5
J	bath		
K	sleep	1.5x2	3
L	pray	1x1.5	1.5
M	study	1.5x2	3
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	1.5x2	.3
Q	relax	2x1.5	3
R	play	2X1.5	3
S	enter	2x1	2
T	store-4	0.4+0.5	0.9
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9
X1	Meterial		
X2	Product		
Y	Equip	1x1.5	3
Z	Work	1x1.5	3

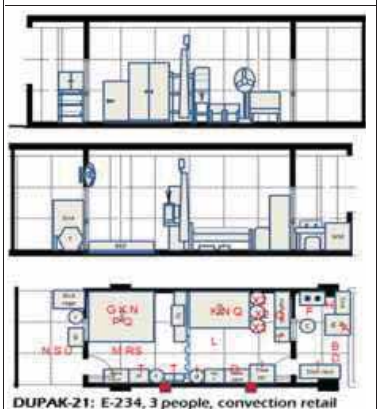


DUPAK-20: E-138, 3 people, ratan & cookies retailer

A	wash	1X1.5	1.5
B	dry	1X2	2
C	iron	1.5X1.5	2.3
D	store-1	0.3X1.5	0.5
F	cook	1X1	1
G	eat	1.5X1.5	2.3
H	d-wash	1X1.5	1.5
I	store-2	0.5X3+0.5	2
J	bath	1X1.5	1.5
K	sleep	2X1.6	3.2
L	pray	2X1	2
M	study	1.5x1.5	2.3
N	ch-care	2X1.8	3.6
O	store-3	0.5X3.5	1.7
P	watch	2X1.8	3.6
Q	relax	2X1.8	3.6
R	play	2X2	4
S	enter	3X1	3
T	store-4	0.5X2.2	3.3
U	celebra		
V	organiz		
W	religion		
X1	material		
X2	product	0.5X3.5	1.7
Y	equip		
Z	work	1X1	1

PENJARINGAN 1-2: C-311, 3 people, no business

A	wash	1X1	1
B	dry	0.6X1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X1	0.5
F	cook	1X1.5	1.5
G	eat	2x1.5	3
H	d-wash	0.5X1	0.5
I	store-2	0.5X2+0.5	1.5
J	bath	1X1.5	1.5
K	sleep	2(1+1.5)	5
L	pray	C-space	
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5X3.5	1.8
P	watch	1.5X2.5	3.8
Q	relax	1.5X2	3
R	play	2X2	4
S	enter	2X2	4
T	store-4	0.5X1.5	0.7
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9



DUPAK-21: E-234, 3 people, convection retail

A	wash	0.8X1.5	1.2
B	dry	0.6X2	1.2
C	iron		
D	store-1	0.5X0.5	0.3
F	cook	0.75X2	1.5
G	eat	2X1	2
H	d-wash	0.8X0.8	0.6
I	store-2	0.5X3+0.5	2
J	bath		
K	sleep	2(1.6+1.2)	5.6
L	pray	1X1.5	1.5
M	study	2X1	2
N	ch-care	2X1.6	3.2
O	store-3	0.5X2	1
P	watch	2X1.6	3.2
Q	relax	2X1.6	3.2
R	play	2X1.6	3.2
S	enter	2X1	2
T	store-4	0.5X1.5	0.7
U	celebra	1x2	2
V	organiz		
W	religion		
X1	material		
X2	product	0.5X1.2	0.6
Y	equip		
Z	work		

PENJARINGAN 1-3: C-317, 2 people, sembako retailer

A	wash		
B	dry		
C	iron	1.5X1.5	2.3
D	store-1	0.5X1.5	0.8
F	cook	1.5x1	1.5
G	eat	1.5X1.5	2.3
H	d-wash		
I	store-2	0.5+0.5+3	2
J	bath	1X1.5	1.5
K	sleep	1.5X2	3
L	pray	C-space	
M	study		
N	ch-care	1.5x2	3
O	store-3	0.5X4	2
P	watch	1.5x2.5	3.8
Q	relax	2X1.5	3
R	play	2x1.5	3
S	enter	1.5x1.5	2.3
T	store-4	0.5X1.5	0.7
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9
X1	Material		
X2	Product	0.5x5	2.5
Y	Equip		
Z	work	1x2	2

PENJARINGAN 1-4: C-305, 4 people, no business

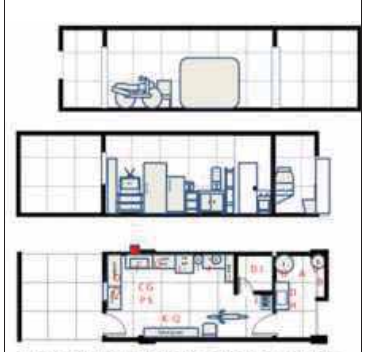
A	wash	0.8x1.5	1.2
B	dry	0.6x1.5	0.9
C	iron	1.5x1.5	2.3
D	store-1	0.7+0.5	1.2
F	cook	1x1.5	1.5
G	eat	2x1.5	3
H	d-wash	1x1	1
I	store-2	0.5x4+ 0.5	2.5
J	bath	1.5x1.5	2.3
K	sleep	2(1+1.5)	5
L	pray	1x1.5	1.5
M	study	2x1.5	3
N	ch-care	1.5x2	3
O	store-3	0.5x2+0 .5	1.5
P	watch	2x1	2
Q	relax	1.5X2	3
R	play	1.5x 2	3
S	enter	2x1.5	3
T	store-4	0.5x1.5	0.7
U	celebra		
V	organiz		
W	religion		

PENJARINGAN 1-7: C-402, 6 people, no business

A	wash	1X1	1
B	dry	0.6X1.5	0.9
C	iron	2X1.2	2.4
D	store-1	0.5X1.5	0.8
F	cook	0.5+0.5	1
G	eat	2x1.2	2.4
H	d-wash	1X1	1
I	store-2	0.5X3+. 0.5	2
J	bath		
K	sleep	2X2.6	5.2
L	pray	1X1.5	1.5
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5X5	2.5
P	watch	2x1.2	2.4
Q	relax	2x1.4	2.8
R	play	2x1.2	2.4
S	enter	2X1.2	2.4
T	store-4	0.5X3	1.5
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9

PENJARINGAN 1-5: C-318, 4 people, no business

A	wash	1x1.5	1.5
B	dry	0.6x1.5	0.9
C	iron		
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	1.5x1.5	2.3
H	d-wash	1x1.5	1.5
I	store-2	0.5x2+ 0.5	1.5
J	bath		
K	sleep	2(1+1.6)	5.2
L	pray	1.5x1	1.5
M	study		
N	ch-care	1.6x2	3.2
O	store-3	0.5x6	3
P	watch	1.5x2	3
Q	relax	2X1.6	3.2
R	play	2X1.5	3
S	enter	2X2	4
T	store-4	0.5x1.2	0.6
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9



PENJARINGAN 1-8: C-105, 3 people, no business

A	wash	1.5X1	1.5
B	dry	0.6X1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X2.5	1.3
F	cook	0.6X1.5	0.9
G	eat	152X1.5	2.3
H	d-wash	1X1	1
I	store-2	0.5X2+ 0.5	1.5
J	bath	1.5X1.5	2.2
K	sleep	1.8x2	3.6
L	pray	outside	
M	study		
N	ch-care		
O	store-3	0.5X3	1.5
P	watch	1.5X2.5	3.8
Q	relax	1.8x2	3.6
R	play		
S	enter	1.5X1.5	2.3
T	store-4	0.5X1	0.5
U	celebra		
V	organiz		
W	religion		

PENJARINGAN 1-6: C-413, 4 people, no business

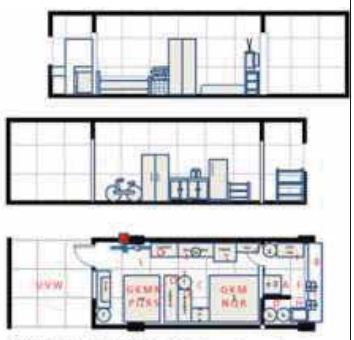
A	wash	1x1.5	1.5
B	dry		
C	iron	1.2x1	1.2
D	store-1	0.5+0.5	1
F	cook	1.5x1.5	2.2
G	eat	2x1.5	3
H	d-wash	1x1.5	1.5
I	store-2	0.5+0.7	1.2
J	bath	1x1.5	1.5
K	sleep	2x3	6
L	pray	outside	
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x4	2
P	watch	2x2.5	5
Q	relax		
R	play	2x1.5	3
S	enter	1.5x1.2	1.8
T	store-4	0.5X3.5	1.7
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9

PENJARINGAN 1-9: C-216, 2 people, no business

A	wash		
B	dry	0.6x1.5	0.9
C	iron	1.5x1.5	2.3
D	store-1	0.5x2.5	1.3
F	cook	1x1	1
G	eat	1x2	2
H	d-wash	1x0.7	0.7
I	store-2	0.5X2+0. 5	1.5
J	bath	1.5x1.5	2.2
K	sleep	2x1.8	3.6
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x2	1
P	watch	2x1.5	3
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.5	3
T	store-4	0.5X1.5	0.8
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9

PENJARINGAN 1-10: C-207, 2 people, no business

A	wash	1x1	1
B	dry	0.6X1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X2	1
F	cook	1.5x0.6	0.9
G	eat	1.5X1.5	2.3
H	d-wash	0.5X1.5	0.8
I	store-2	0.5X5+0.5	3
J	bath	1X1	1
K	sleep	2x1.6	3.2
L	pray	C-space	
M	study	C-space	
N	ch-care	1.8x1.5	2.7
O	store-3	0.5X3	1.5
P	watch	1.8x1.5	2.7
Q	relax	1.8X1.5	2.7
R	play	1.8x1,5	2.7
S	enter	1.8x1.5	2.7
T	store-4	0.5X3	1.5
U	celebra		
V	organiz	3X3	9
W	religion		

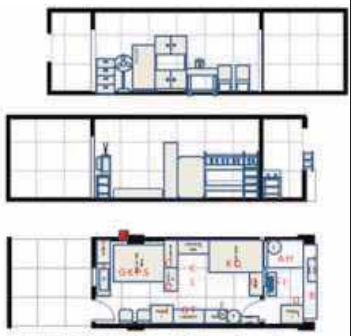


PENJARINGAN 1-13: C-301, 3 people, no business

A	wash	1X1.5	1.5
B	dry	0.5X1.4	0.7
C	iron	1.5X1.2	1.8
D	store-1	0.3X4	2
F	cook	1X1	1
G	eat	1.5X1.8	2.7
H	d-wash	0.5X0.5	0.3
I	store-2	0.5X4	2
J	bath		
K	sleep	1.8(1.5+2	6.3
L	pray	0.8X1.5	1.2
M	study	1.5X1.2	1.8
N	ch-care	1.5X2	3
O	store-3	0.5X4	2
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9

PENJARINGAN 1-11: C-401, 4 people, no business

A	wash	1x1.5	1.5
B	dry	0.6x3	1.8
C	iron	1.5X1.5	2.3
D	store-1	0.5X1.5	0.8
F	cook	1X1.5	1.5
G	eat	1.5X2	3
H	d-wash	1X1	1
I	store-2	0.5X3+ 0.5	2
J	bath	1X1.5	1.5
K	sleep	2x3	6
L	pray	1X1.5	1.5
M	study	2x1.5	3
N	ch-care	2x1.6	3.2
O	store-3	0.5X5.5	2.7
P	watch	1.5x2	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	1.5X2	3
T	store-4	0.5X3.5	1.7
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9



PENJARINGAN 1-14: C-313, 3 people, no business

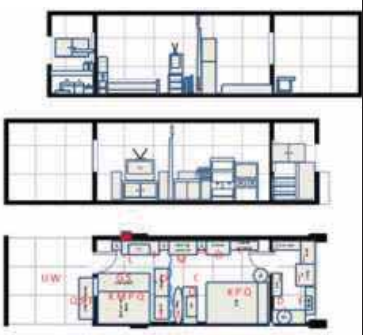
A	wash	1X1.5	1.5
B	dry	0.6x2	1.2
C	iron	1.5x1.4	2.1
D	store-1	0.3x 1	0.3
F	cook	1X1.3	1.3
G	eat	1.8x1.5	2.7
H	d-wash	1X1	1
I	store-2	0.5X2+ 1	2
J	bath		
K	sleep	2.7+ 2.4	5.1
L	pray	1X1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5X4	2
P	watch	1.8X1.5	2.7
Q	relax	2x1.2	2.4
R	play		
S	enter	1.8X1.5	2.7
T	store-4	0.5X3	1.5
U	celebra		
V	organiz		
W	religion		

PENJARINGAN 1-12: C-302, 4 people, no business

A	wash		
B	dry	0.6X1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X1. 2	0.6
F	cook	2x1	2
G	eat	1.5x2	3
H	d-wash		
I	store-2	0.5X3	1.5
J	bath		
K	sleep	2x2.8	5.6
L	pray	1X1.5	1.5
M	study	1X1.4	2.8
N	ch-care		
O	store-3	0.5X3	1.5
P	watch	1.5X2	3
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5X3	1.5
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9

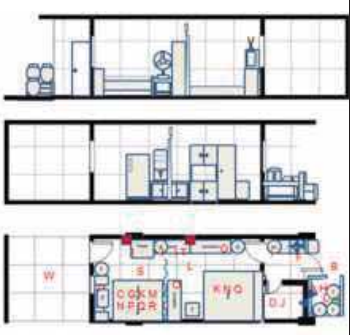
PENJARINGAN 1-15: C-416, 4 people, cookies maker

A	wash		
B	dry	0.6X2	1.2
C	iron	1.5x1.2	1.8
D	store-1	0.3X2.5	0.8
F	cook	1X1.5	1.5
G	eat	1.5x1.2	1.8
H	d-wash	1X1	1
I	store-2	0.5X4+0.5	2.5
J	bath		
K	sleep	1.5+3.6	5.1
L	pray	1X1.5	1.5
M	study	1X1.5	1.5
N	ch-care	2X1.8	3.6
O	store-3	0.5X4	2
P	watch	1.5x1.4	2.1
Q	relax	2x1.8	3.6
R	play	1.5x1.5	2.3
S	enter	1.5x1.5	2.3
T	store-4	0.5X4	2
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9
X1	Material	0.5x1.5	0.7
X2	Product	0.5x1.5	0.7
Y	Equip		
Z	work	1x1.5	1.5



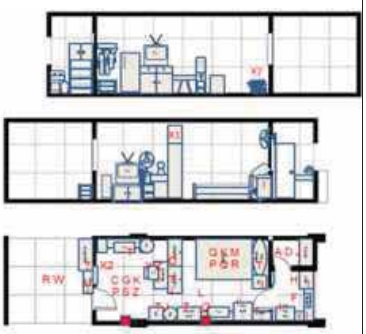
PENJARINGAN 1-16: C-314, 4 people, no business

A	wash		
B	dry		
C	iron	1.5x1.5	2.3
D	store-1	0.3x0.5	0.2
F	cook	0.6X2	1.2
G	eat	2X1.2	2.4
H	d-wash		
I	store-2	0.5X3+0.5	2
J	bath		
K	sleep	2(1.2+1.5	5.4
L	pray	0.8X1.5	1.2
M	study	2X1.2	2.4
N	ch-care		
O	store-3	0.5X 3	1.5
P	watch	2X2	4
Q	relax	2x1.5	3
R	play		
S	enter	2X1.2	2.4
T	store-4	0.5X5.5	2.7
U	celebra	3X3	9
V	organiz		
W	religion	3X3	9



PENJARINGAN 1-19: C-106, 4 people, no busness

A	wash	1X1	1
B	dry	1X1.5	1.5
C	iron	1.5X1.5	2.3
D	store-1	0.3X2.5	0.8
F	cook	1X1.5	1.5
G	eat	2X1.5	3
H	d-wash	1X1	1
I	store-2	0.5X3+ 0.5	2
J	bath	1.5X1.5	2.2
K	sleep	2X3.3	6.6
L	pray	0.8X1.5	1.2
M	study	2X1.5	3
N	ch-care	2X1.8	3.6
O	store-3	0.5X3	1.5
P	watch	2X1.5	3
Q	relax	2X1.8	3.6
R	play	2X1.5	3
S	enter	2X1	2
T	store-4	0.5X2.5	1.2
U	celebra		
V	organiz		
W	religion	33X3	9

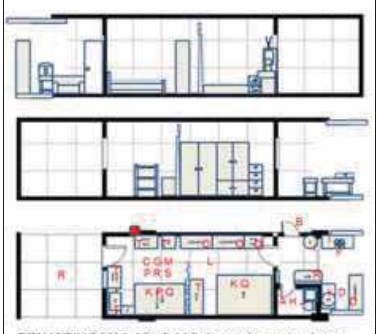


PENJARINGAN 1-17: C-203, 3 people, tailor

A	wash	1x1	1
B	dry		
C	iron	1.5X1.5	2.3
D	store-1	0.3X1.5	0.5
F	cook	1X1.5	1.5
G	eat	1.5X2	3
H	d-wash	1X1	1
I	store-2	0.5X4+0.5	2.5
J	bath	1X1.5	1.5
K	sleep	2X2.5	5
L	pray	0.5X1.5	0.8
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5X2	1
P	watch	2X1.5	3
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5X6	3
U	celebra		
V	organiz		
W	religion	3X3	9
X1	Material	0.5x2	1
X2	Product	0.5x1	0.5
Y	Equip	0.5x1.5	0.7
Z	Work	2x1.5	3

PENJARINGAN 1-20: C-110, 4 people, no business

A	wash	1X0.8	0.8
B	dry	0.6x1.5	1
C	iron	1.5X1.5	2.3
D	store-1	0.3X1.5	0.5
F	cook	1X1.5	1.5
G	eat	2X1.5	3
H	d-wash	1X1	1
I	store-2	0.5X2+ 0.5	1.5
J	bath	1.5X1.5	2.2
K	sleep	2x3	6
L	pray	1x1.5	1.5
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	2x2	4
S	enter	c. space	
T	store-4	0.5x2.5	1.2
U	celebra		
V	organiz	3X3	9
W	religion	3X3	9



PENJARINGAN 1-18: C-112, 4 people, no business

A	wash	1x1	1
B	dry	0.6x1.5	0.9
C	iron	1.5X1.5	2.3
D	store-1	0.5X1.5	0.7
F	cook	1X1.5	1.5
G	eat	2X1.5	3
H	d-wash	1X1	1
I	store-2	0.5X2.5	1.2
J	bath	1X1.5	1.5
K	sleep	2X2.7	5.4
L	pray	0.6X1.5	0.9
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5X 3	1.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x4.5	2.2
U	celebra	1.5x2	3
V	organiz		
W	religion		

PENJARINGAN 1-21: C-103, 5 people, no business

A	wash	1X1	1
B	dry	1.6x0.6	1
C	iron	1.5X1.5	2.3
D	store-1	0.3X3	1
F	cook	1.2X1.5	1.8
G	eat	2X2	4
H	d-wash	1X1	1
I	store-2	0.5X2	1
J	bath	1.5X1.5	2.2
K	sleep	2(1.5+1.8)	6.6
L	pray	1X2	2
M	study	2x2	4
N	ch-care	2x1.5	3
O	store-3	0.5X3	1.5
P	watch		
Q	relax	2x1.5	3
R	play	2x2	4
S	enter	2X2	4
T	store-4	0.5X2.5	1.2
U	celebra		
V	organiz		
W	religion		

5. PENJARINGAN-2

PENJARINGAN 2-1: DA-121, 4 people, no business

A	wash	1X1.4	1.4
B	dry	1.2X1	1.2
C	iron	1X2	2
D	store-1	0.3X3	0.6
F	cook	2X1.2	2.4
G	eat	1X2	2
H	d-wash	1x1.2	1.2
I	store-2	0.75+0.5	1.3
J	bath	2X1.4	2.8
K	sleep	2X1.6+1.4	6
L	pray	1X2	2
M	study	2X1.4	2.8
N	ch-care	2X1.4	2.8
O	store-3	0.5X5	2.5
P	watch	2.5X1.5	3.7
Q	relax	2X1.4	2.8
R	play	2X1.4	2.8
S	enter	1X2	2
T	store-4	0.5X4.8	2.4
U	celebra	3X3	9
V	organiz	ground	
W	religion	ground	

PENJARINGAN 2-4: DA-204, 1 people, no business

A	wash	1X1.4	1.4
B	dry	1.2X1	1.2
C	iron		
D	store-1	0.3X1.2	0.4
F	cook	1.5X1.2	1.8
G	eat	1X1.5	1.5
H	d-wash	0.5X1.2	0.6
I	store-2	0.5X2	1
J	bath	2X1.4	2.8
K	sleep	2X1.5	3
L	pray	Ground	
M	study		
N	ch-care		
O	store-3	0.5x4	2
P	watch	2x2	4
Q	relax	1x1.5	1.5
R	play		
S	enter	1.5X2.5	3.8
T	store-4	0.5X3.8	1.9
U	celebra	3X3	9
V	organiz	3X3	9
W	religion	3X3	9

PENJARINGAN 2-2: DA-203, 3 people, no business

A	wash	1X1.4	1.4
B	dry	1.2X1	1.2
C	iron	0.7X2	1.4
D	store-1	0.3X3.5	1
F	cook	2X1.2	2.4
G	eat	1X1	1
H	d-wash	1X1.2	1.2
I	store-2	0.5X2	1
J	bath	2X1.4	2.8
K	sleep	2(2x1.4)	5.6
L	pray	Ground	
M	study		
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	2.5x2	5
Q	relax	2x1.4	2.8
R	play		
S	enter	1x1.8	1.8
T	store-4	0.5X2	1
U	celebra	3X3	9
V	organiz	ground	
W	religion	ground	

PENJARINGAN 2-5: DA-215, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.3x1	0.3
F	cook	2x1.2	2.4
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x3	1.5
J	bath	2x1.4	2.8
K	sleep	2x1.6	3.2
L	pray	1x1.5	1.5
M	study	1.8x2	3.6
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x1.8	3.6
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.8	3.6
T	store-4	0.5x4	2
U	celebra	2x1.8	3.6
V	organiz		
W	religion		

PENJARINGAN 2-3: DB-304, 3 people, no business

A	wash	2x0.7	1.4
B	dry	1.2X1	1.2
C	iron	1x1.2	1.2
D	store-1	0.3x1	0.3
F	cook	2x1	2
G	eat	1X2	2
H	d-wash	1X1	1
I	store-2	0.5+0.5	1
J	bath	2X1.4	2.8
K	sleep	2X1.6	3.2
L	pray	0.8X2	1.6
M	study	1.5x1.5	2.3
N	ch-care		
O	store-3	0.5X4	2
P	watch	2X2	4
Q	relax	2X1.5	3
R	play	1X2	2
S	enter	2X1.5	3
T	store-4	0.5X2	1
U	celebra		
V	organiz	ground	
W	religion	ground	

PENJARINGAN 2-6: DB-311, 2 people, snacks retailer

A	wash		
B	dry		
C	iron		
D	store-1		
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5+1.5 +0.5	1.3
J	bath	2x1.4	2.8
K	sleep	2x1.8	3.6
L	pray	0.8x1.5	1.2
M	study		
N	ch-care		
O	store-3	0.5x4.5	2.2
P	watch	1.5x1.5	2.2
Q	relax	1.5x1.5	2.2
R	play		
S	enter	1.5x1.5	2.2
T	store-4	0.5x2.2	1.1
U	celebra		
V	organiz		
W	religion		
X1	Material		
X2	Product	0.5x1.8	0.9
Y	Equip		
Z	Work	1.5x1.5	2.2

PENJARINGAN 2-7: FB-216, 4 people, tailor

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x2	2
D	store-1	0.5x1.3	0.6
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	2x1.4	2.8
K	sleep	2x1.2	2.4
L	pray	1x2	2
M	study	0.6x1	0.6
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	1x2.5	2.5
Q	relax	2x1.2	2.4
R	play	2x2	4
S	enter	2x1.5	3
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		
X1	Material	0.5x1	0.5
X2	Product	0.5x2	1
Y	Equip	0.6x6	3.6
Z	Work	0.6x6	3.6

PENJARINGAN 2-10: DB-405, 3 people, cigarette retailer

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x1.6	0.8
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	0.8x1.2	1
I	store-2	0.5x2.5 +0.5	1.8
J	bath	2x1.4	2.8
K	sleep	2x1.6	3.2
L	pray	1x1.5	1.5
M	study	1.4x1.5	2.1
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play		
S	enter	1.6x1.5	2.4
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9
X1	Material		
X2	Product	0.5x1	0.5
Y	Equip		
Z	Work	1x1.5	1.5

PENJARINGAN 2-8: DA-403, 2 people, no business

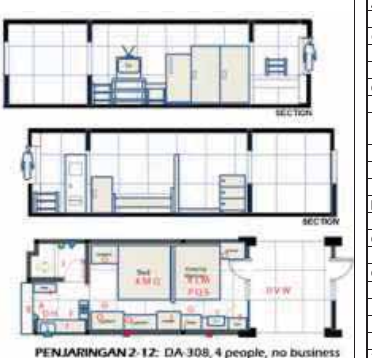
A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x2	2
D	store-1	0.3x0.9	0.3
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.2 +0.5	1.1
J	bath	2x1.4	2.8
K	sleep	2x1.8	3.6
L	pray	1x1.5	1.5
M	study	1x2	2
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.5x1.8	2.7
Q	relax	2x1.8	3.6
R	play		
S	enter	1.8x1.5	2.7
T	store-4	0.5x0.8	0.4
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

PENJARINGAN 2-11: FB-215, 4 people, phone credit retaile

A	wash	1x1.4	1.4
B	dry	1.2x1	1.2
C	iron	1x1.2	2.4
D	store-1	0.5x0.5	0.3
F	cook	2x1.2	2.4
G	eat	2x1.4	2.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x4	2
J	bath	2x1.4	2.8
K	sleep	2(1.6+1.4	6
L	pray	1.5x1	1.5
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x4	2
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	2x1.4	2.8
S	enter	2x1.4	2.8
T	store-4	0.5x4.4	2.2
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9
X1	Material		
X2	Product		
Y	Equip		
Z	Work		

PENJARINGAN 2-9: DA-405, 2 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1.5x1	1.5
D	store-1	1x0.7	0.7
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	0.8x1.2	1
I	store-2	0.5x1.5 +0.5	1.3
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1x1.5	1.5
M	study	1x1.5	1.5
N	ch-care		
O	store-3	0.5x4.6	2.3
P	watch	2.5x2	5
Q	relax		
R	play	2x1.5	3
S	enter	1.4x1.5	2.1
T	store-4	0.5x6	3
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9



PENJARINGAN 2-12: DA-308, 4 people, no business

A	wash	0.8x1	0.8
B	dry	1.2X1	1.2
C	iron		
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0. 5	1.5
J	bath	2x1.4	2.8
K	sleep	2x1.8	3.6
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x4.6	2.3
P	watch	2.5x1.4	3.5
Q	relax	2x1.8	3.6
R	play		
S	enter	1.5x2	3
T	store-4	0.5x1.6	0.8
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9

PENJARINGAN 2-13: EB-214, 2 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2x1	2
H	d-wash	0.8x1.2	1
I	store-2	0.5x1.2	0.6
J	bath	2x1.4	2.8
K	sleep	2(2x1.5)	6
L	pray	1x1.5	1.5
M	study	1x1.2	1.2
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	1.5x2	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x1.6	0.8
U	celebra		
V	organiz		
W	religion		

PENJARINGAN 2-16: EB-209, 5 people, batagor producer

A	wash	1x1.4	1.4
B	dry		
C	iron	1x1.5	1.5
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x2 +0.5	1.5
J	bath	2x1.4	2.8
K	sleep	2(1.5+1.2	5.4
L	pray	0.8x1.5	1.2
M	study	1x2	2
N	ch-care		
O	store-3	0.5x1.6	0.8
P	watch	2x2.5	5
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9
X1	Material	0.5x2.4	1.2
X2	Product	0.5x3	1.5
Y	Equip	0.5x1.6	0.8
Z	Work	1.2x2	2.4

PENJARINGAN 2-14: D-207, 2 people, no business

A	wash	1x1.4	1.4
B	dry	2x0.6	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x06	0.3
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	1x1	1
I	store-2	0.5x2+0.5	1.5
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1.2x2	2.4
M	study	1x2	2
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2.5	5
Q	relax	1x2	2
R	play		
S	enter	2x2.5	5
T	store-4	0.5x2.2	1.1
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

PENJARINGAN 2-17: DA-213, 1 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron		
D	store-1	0.5x0.8	0.4
F	cook	2x1.2	2.4
G	eat	0.6x1.5	0.9
H	d-wash	1x1.2	1.2
I	store-2	0.5+0.5	1
J	bath	2x1.4	2.8
K	sleep	2x1.8	3.6
L	pray	1x1.8	1.8
M	study		
N	ch-care		
O	store-3	0.5x4.4	2.2
P	watch	2x1.4	2.8
Q	relax	2x1.4	2.8
R	play		
S	enter	2x1.8	3.6
T	store-4	0.5x4	2
U	celebra	3x3	9
V	organiz		
W	religion		

PENJARINGAN 2-15: EB-205, 4 people, retailer

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1.2x1.5	1.8
D	store-1	0.5x2.2	1.1
F	cook	2x1.2	2.4
G	eat	0.6x3	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	2x1.4	2.8
K	sleep	2x1.6	3.2
L	pray	0.8x1.5	1.2
M	study	2x1	2
N	ch-care		
O	store-3	0.5x4.8	2.4
P	watch	2x2	4
Q	relax	2x1.6	3.2
R	play	1x1.5	1.5
S	enter	1.5x1.8	2.7
T	store-4	0.5x2.8	1.4
U	celebra		
V	organiz		
W	religion		
X1	Material		
X2	Product	0.5x4	2
Y	Equip		
Z	Work		

PENJARINGAN 2-18: DA-201, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x1.5	1.5
D	store-1		
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	2x1.4	2.8
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study		
N	ch-care	1.2x2.5	3
O	store-3	0.5x3.4	1.7
P	watch	2x2	4
Q	relax		
R	play	1.2x2.5	3
S	enter	2x1.5	3
T	store-4	0.5x2.8	1.4
U	celebra		
V	organiz		
W	religion		

6. WONOREJO

PENJARINGAN 2-19: DA-208, 5 people, no business

A	wash	1x1.4	1.4
B	dry	1.2X1	1.2
C	iron	1x2	2
D	store-1	0.5x2.6	1.3
F	cook	2x1.2	2.4
G	eat	2x1.6	3.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.2	0.6
J	bath	2x1.4	2.8
K	sleep	2x1.5+1.6	6.2
L	pray	1.2x1.5	1.8
M	study	1x2	2
N	ch-care		
O	store-3	0.5x2	1
P	watch	2x2	4
Q	relax	2x1.6	3.2
R	play		
S	enter	1x1.2	1.2
T	store-4	0.5x2.6	1.3
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

WONOREJO-1: WC-203, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.4x1.5	2.1
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	1.4x1.5	2.1
H	d-wash	1x1.2	1.2
I	store-2	1.5+0.5	2
J	bath	2x1.4	2.8
K	sleep	2(2x1.4)	5.6
L	pray	1.4x1.5	2.1
M	study	1.4x1.5	2.1
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x1.4	2.8
Q	relax	2x1.4	2.8
R	play	2x1	2
S	enter	2x1.4	2.8
T	store-4	0.5x2.2	1.1
U	celebra	3x3	9
V	organiz		
W	religion		

PENJARINGAN 2-20: DB-209, 4 people, no business

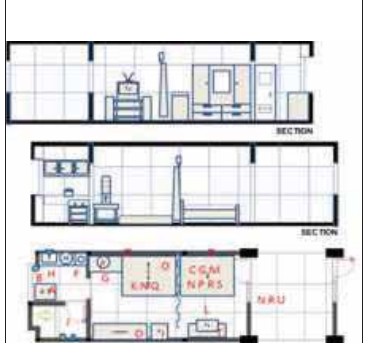
A	wash	1x1.4	1.4
B	dry	2x0.6	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1	1
I	store-2	0.5x2+0.5	1.5
J	bath	2x1.4	2.8
K	sleep	2x1.6	3.2
L	pray	1x1.5	1.5
M	study	1x2.5	2.5
N	ch-care		
O	store-3	0.5x4	2
P	watch		
Q	relax		
R	play	2x1.6	3.2
S	enter	2x2	4
T	store-4	0.5x3.6	1.8
U	celebra		
V	organiz	3x3	9
W	religion		

WONOREJO-2: WC-308, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.8	0.9
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5+0.5	1
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1.2x2	2.4
M	study	1.5X2	3
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	1.5X2	3
Q	relax	2x1.5	3
R	play	2x1.4	2.8
S	enter	1.5X2	3
T	store-4	0.5x1	0.5
U	celebra	3x3	9
V	organiz		
W	religion		

PENJARINGAN 2-21: DB-211, 3 people, no business

A	wash		
B	dry	1.2X1	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5+0.5	1
J	bath	2x1.4	2.8
K	sleep	2(1+1.2)	4.4
L	pray		
M	study	1x0.8	0.8
N	ch-care		
O	store-3	0.5x3.2	1.6
P	watch	2x1.5	3
Q	relax	1x2	2
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2.8	1.4
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9



WONOREJO-3: WC-316, 5 people, no business

A	wash	0.7x1.5	1.1
B	dry	1x1.2	1.2
C	iron	2x1.4	2.8
D	store-1		
F	cook	2x1.2	2.4
G	eat	2x1.4	2.8
H	d-wash	1x1	1
I	store-2	0.5x1.5	0.8
J	bath	2x1.4	2.8
K	sleep	2(2x1.4)	5.6
L	pray	1x1.5	1.5
M	study	2x1.4	2.8
N	ch-care	2x1.4	2.8
O	store-3	0.5x3.4	1.7
P	watch	2x1.5	3
Q	relax	2x1.4	2.8
R	play	2x1.4	2.8
S	enter	2x1.4	2.8
T	store-4	0.5x1.2	0.6
U	celebra	3x3	9
V	organiz		
W	religion		

WONOREJO-4: WC-311, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	1x1.2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5+0.5	1
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1.5x0.8	1.2
M	study		
N	ch-care	2x1.5	3
O	store-3	0.5x4.8	2.4
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.2	2.4
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion		

WONOREJO-7: WC-307, 2 people, painting seller

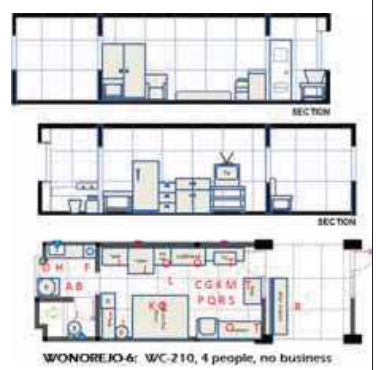
A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1x2	2
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1x2	2
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x3.8	1.9
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	1.5x1.2	1.8
S	enter	1.5x1.2	1.8
T	store-4	0.5x 2.8	1.4
U	celebra	3x3	9
V	organiz		
W	religion		
X1	Material	0.5x2	1
X2	Product	0.5x3.2	1.6
Y	Equip	0.5x1	0.5
Z	Work	1.5x1.2	1.8

WONOREJO-5: WC-315, 5 people, no business

A	wash	1.5x0.6	0.9
B	dry	1x1.2	1.2
C	iron	1x1.5	1,5
D	store-1	0.5x0.6	0.3
F	cook	2x1	2
G	eat	1.5x1.5	2.3
H	d-wash	1x1	1
I	store-2	0.5x1	0.5
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1x1.5	1.5
M	study	1.5x2	3
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	2x1.5	3
Q	relax	2x1.5	5
R	play		
S	enter	1.5x2	3
T	store-4	0.5x2.8	1.4
U	celebra		
V	organiz		
W	religion		

WONOREJO-8: WE-204, 4 people, small shop

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.6	2.4
D	store-1	0.5x 0.6	0.3
F	cook	2x1.6	3.2
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.75 +0.5	1.3
J	bath	2x1.4	2.8
K	sleep	2(1.5+1)	5
L	pray	2x0.8	1.6
M	study	1.5x1.2	1.8
N	ch-care		
O	store-3	0.5x2.3	1.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x2.6	1.3
U	celebra	3x3	9
V	organiz		
W	religion		
X1	Material		
X2	Product	0.5x2	1
Y	Equip		
Z	Work	2x1.8	3.6



WONOREJO-6: WC-210, 4 people, no business

A	wash	0.7x1.5	1.1
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2x1	2
G	eat	1.8X1.5	2.7
H	d-wash	1x1	1
I	store-2	0.5x3+0.5	2
J	bath	2x1.4	2.8
K	sleep	2(1.5+1)	5
L	pray	0.8x1.5	1.2
M	study	1.8X1.5	2.7
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.8X1.5	2.7
Q	relax	2x1.5	3
R	play	1.8X1.5	2.7
S	enter	1.8X1.5	2.7
T	store-4	0.5x3.5	1.8
U	celebra		
V	organiz		
W	religion		

WONOREJO-9: WE-216, 2 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5X1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2x1.6	3.2
G	eat	1.5x1	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.6	0.8
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x4.8	2.4
P	watch		
Q	relax	2x1.5	3
R	play		
S	enter	2x2	4
T	store-4	0.5x2.3	1.2
U	celebra		
V	organiz		
W	religion		

WONOREJO-10: WC-309, 4 people, lamp seller

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.2x2	2.4
D	store-1	0.5x2	1
F	cook	1.5x1.2	1.8
G	eat	1.2x2	2.4
H	d-wash	0.8x1.2	1
I	store-2	0.5x2+0.5	1.5
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	1x1.2	1.2
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9
X1	Material	0.5x0.9	0.5
X2	Product	0.5x0.9	0.5
Y	Equip	1x0.8	0.8
Z	Work	2x1.5	3

WONOREJO-13: WC-413, 6 people, no business

A	wash	0.7x1.5	1.1
B	dry	1x1.2	1.2
C	iron	1x1.8	1.8
D	store-1	0.5x1.4	0.7
F	cook	2x1	2
G	eat	1.5x1.6	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5 +0.5	1.3
J	bath	2x1.4	2.8
K	sleep	3x1.6+1.8	6.6
L	pray		
M	study	2x1.6	3.2
N	ch-care	2x1.6	3.2
O	store-3	0.5x4	2
P	watch	1.5x1.6	2.4
Q	relax	2x1.6	3.2
R	play	1.5X1.6	2.4
S	enter	1.5x1.6	2.4
T	store-4	0.5x2.4	1.2
U	celebra		
V	organiz		
W	religion		

WONOREJO-11: WC-306, 4 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x1	2
D	store-1	0.5x0.6	0.3
F	cook	2x1.2	2.4
G	eat	2x1	2
H	d-wash	1x1.2	1.2
I	store-2		0
J	bath	2x1.4	2.8
K	sleep	2x2x1.6	6.4
L	pray	2x1	2
M	study	2x1	2
N	ch-care	2x1.6	3.2
O	store-3	0.5x4	2
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	2x1	2
S	enter	2x1	2
T	store-4	0.5x2.2	1.1
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

WONOREJO-14: WC-310, 4 people, retailer

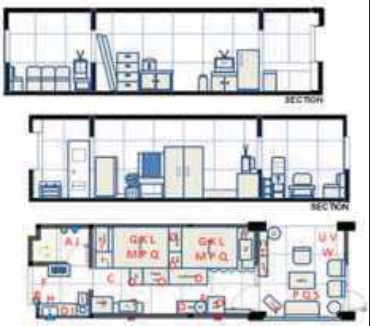
A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x1	2
D	store-1	0.5x1.6	0.8
F	cook	2x1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	2x1.4	2.8
K	sleep	2(1.6+1.2	5.6
L	pray	2x1	2
M	study	2x1.6	3.2
N	ch-care	2x1.6	3.2
O	store-3	0.5x2.6	1.3
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	1x2	2
S	enter	2x1.2	2.4
T	store-4	0.5x1.4	0.7
W	religion	3x3	9
X1	Material	0.8x1.2	1
X2	Product	0.8x3.5	2.8
Y	Equip		
Z	Work	2x1.2	2.4

WONOREJO-12: WC-401, 7 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	1.5x1.2	1.8
G	eat	1.5x1.8	2.7
H	d-wash	0.8x1.2	1
I	store-2	0.5	0.5
J	bath	2x1.4	2.8
K	sleep	3.2+2.7	5.9
L	pray	0.8x2	1.6
M	study	2x1.6	3.2
N	ch-care	2x1.6	3.2
O	store-3	0.5x6	3
P	watch	1.5x1.8	2.7
Q	relax	2x1.6	3.2
R	play		
S	enter	1.5x1.8	2.7
T	store-4	0.5x1.2	0.6
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

WONOREJO-15: WC-302, 4 people, salon & tailor

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.6	0.8
F	Cook	2x1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2		0
J	bath	2x1.4	2.8
K	sleep	2(1.9+1)	5.8
L	pray	1x2	2
M	study	2x1.2	2.4
N	ch-care	2x1.9	3.8
O	store-3	0.5x2	1
P	watch	2x21.9	3.8
Q	relax	2x1.9	3.8
R	play	1x2	2
S	enter	1x2	2
T	store-4	0.5x2.4	1.2
U	celebra	3x3	9
W	religion	3x3	9
X1	Material	0.5x2.4	1.2
X2	Product	0.5x2.4	1.2
Y	Equip	0.6x3.5	2.1
Z	Work	2x2	4



WONOREJO-16: W/E-208, 4 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.2	1.8
D	store-1	0.5x0.8	0.4
F	cook	2x1.6	3.2
G	eat	1.8x1.5	2.7
H	d-wash	1x1.2	1.2
I	store-2	0.5x 3+0.5	2
J	bath	2x1.4	2.8
K	sleep	2(1.5x1.8)	5.4
L	pray	2x1x1.5	3
M	study	1.8x1.5	2.7
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	1.8X1.5	2.7
Q	relax	2X2	4
R	play		
S	enter	2x2	4
T	store-4	0.5x5.2	2.6
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9

WONOREJO-19: W/E-203, 2 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x1.2	2.4
D	store-1	0.5x0.8	0.4
F	cook	2x1.2	2.4
G	eat	2x1	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	2x1.4	2.8
K	sleep	2x1.5	3
L	pray	2x1	2
M	study		
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1	2
T	store-4	0.5x2	1
U	celebra		
V	organiz	3x3	9
W	religion		

WONOREJO-17: W/E-309, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.6	2.4
D	store-1	0.5x1.6	0.8
F	cook	1.5x1	1.5
G	eat	1.5X1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	2x1.4	2.8
K	sleep	(2+1.5)1.6	5.6
L	pray	2x0.9	1.8
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x1.6	0.8
P	watch	2X1.6	3.2
Q	relax	1.5X1.6	2.4
R	play		
S	enter	1.5x1.6	2.4
T	store-4	0.5x4	2
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9
X1	Material	2x0.6	1.2
X2	Product	2x0.6	1.2
Z	work	1.5x1.6	2.4

WONOREJO-20: W/E-203, 2 people, peyek maker

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.2	0.6
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5 +0.5	1.3
J	bath	2x1.4	2.8
K	sleep	2(1.4+1.2	5.2
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x4	2
P	watch	2X1.4	2.8
Q	relax	2x1.4	2.8
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2.6	1.3
U	celebra		
V	organiz	3x3	9
W	religion		
X1	Material	0.8x0.8	0.6
X2	Product	0.5x2.6	1.3
Y	Equip	0.5x1.2	0.6
Z	Work	2x1.5	3

WONOREJO-18: W/C-415, 4 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	2X1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	2x1.4	2.8
K	sleep	2(1.6+1.2)	5.6
L	pray	2x1	2
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x4.2	2.1
P	watch	2x1.5	3
Q	relax	2x1.6	3.2
R	play	1X2	2
S	enter	2x1.5	3
T	store-4	0.5x2.4	1.2
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

WONOREJO-21: W/E-413, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.6x1.6	0.8
F	cook	2x1.6	3.2
G	eat	2X1.2	2.4
H	d-wash	0.8x1.2	1
I	store-2	0.5x4	2
J	bath	2x1.4	2.8
K	sleep	2(1.2+1.4)	5.2
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x1.2	2.4
Q	relax	2x1.4	2.8
R	play		
S	enter	1.5x1.5	2.3
T	store-4	0.5x 0.8	0.4
U	celebra	2x1.5	3
V	organiz		
W	religion	3x3	9

WONOREJO-22: WC-205, 5 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.4x1.5	2.1
D	store-1	0.5x1.6	0.8
F	cook	1.2x2	2.4
G	eat	2x1.5	3
H	d-wash	0.8x1.2	1
I	store-2	0.5x1+0.5	1
J	bath	2x1.4	2.8
K	sleep	2(1.5+1.4	5.8
L	pray	1x1.4	1.4
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	1x1.2	1.2
T	store-4	0.5x2.2	1.1
U	celebra		
V	organiz		
W	religion	3x3	9

WONOREJO-25: WC-414, 5 people, retailer

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x0.8	1.6
D	store-1	0.5x1.6	0.8
F	cook	2x1.2	2.4
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	2x1.4	2.8
K	sleep	2(1.5+1)	5
L	pray	2x0.8	1.6
M	study	2x1.5	3
N	ch-care	1x1.8	1.8
O	store-3	0.5x3	1.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	1x2	2
S	enter	1x2	2
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion		
X1	Material	0.6x1.6	1
X2	Product	0.6x1.6	1
Y	Equip		
Z	Work	1x2	2

WONOREJO-23: WC-408, 4 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x1.2	2.4
D	store-1	0.5x 1.6	0.8
F	cook	2x1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	2x1.4	2.8
K	sleep	2(2x1.5)	6
L	pray	0.8x1.5	1.2
M	study	2x1.2	2.4
N	ch-care	2x1.5	3
O	store-3	0.5x1.6	0.8
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	1x2	2
S	enter	2x1.2	2.4
T	store-4	0.5x 2.4	1.2
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9

WONOREJO-26: WC-215, 4 people, batok maker

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2X1	2
D	store-1	0.5x1.6	0.8
F	cook	2x1.2	2.4
G	eat	2X1	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	2x1.4	2.8
K	sleep	21.6+1.4	6
L	pray	2X1	2
M	study	2X1.4	2.8
N	ch-care		
O	store-3	0.5x4.5	2.3
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	1x2	2
S	enter	2X1.4	2.8
T	store-4	0.5x3	1.5
U	celebra	3x3	9
V	organiz	3x3	9
W	religion		
X1	Material		
X2	Product	0.6x1	0.6
Y	Equip		
Z	Work	2x1.4	2.8

WONOREJO-24: WC-206, 3 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.6	0.8
F	cook	2x1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	2x1.4	2.8
K	sleep	1.8(1.5+1	4.5
L	pray	1x1.5	1.5
M	study	2x1	2
N	ch-care	1x1.8	1.8
O	store-3	0.5x3	1.5
P	watch	2x1.5	3
Q	relax	1.5x1.8	2.7
R	play	1.5X2	3
S	enter	1.5x2	3
T	store-4	0.5x1.2	0.6
U	celebra	3x3	9
V	organiz		
W	religion		

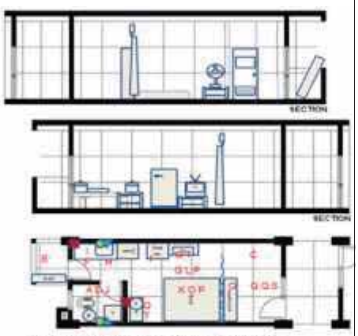
WONOREJO-27: WC-212, 5 people, no business

A	wash	1x1.4	1.4
B	dry	1x1.2	1.2
C	iron	2x1.2	2.4
D	store-1	0.5x1.6	0.8
F	cook	2x1.2	2.4
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+ 0.5	1
J	bath	2x1.4	2.8
K	sleep	2(1.6+1.2	5.6
L	pray	2x1	2
M	study	2x1.5	3
N	ch-care	1x2	2
O	store-3	0.5x4.2	2.1
P	watch	2x2	4
Q	relax	2x2	4
R	play	2x2	4
S	enter	1x2	2
T	store-4	0.5x2	1
U	celebra		
V	organiz	3x3	9
W	religion		

7. RANDU

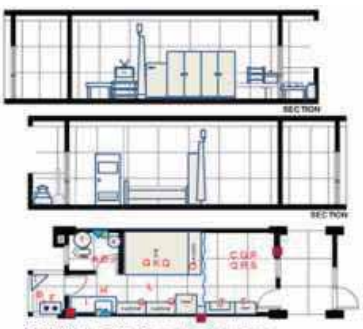
RANDU-1: F-206; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1.8	0.9
F	cook	1.2x1	1.2
G	eat	2x1.5	3
H	d-wash	1.2x1	1.2
I	store-2	0.5x1.5 +0.5	1.3
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1.2)	5.4
L	pray	1x2	2
M	study	1.4x1.5	2.1
N	ch-care		
O	store-3	0.5x3.8	1.9
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		



RANDU-4: F-404; 2 people; no business

A	wash	0.7x1	0.7
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x 1.8	0.9
F	cook	1x1.2	1.2
G	eat	2X1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.8	2.7
K	sleep	2x1.6	3.2
L	pray	0.8x1.5	1.2
M	study		
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play		
S	enter	1.5x1.5	2.3
T	store-4	0.5x2	1
U	celebra	C-space	
V	organiz	c.space	
W	religion	c.space	



RANDU-2: F-405; 3 people; no business

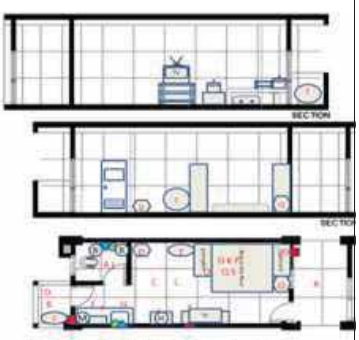
A	wash	0.8x1.5	1.2
B	dry	0.8x1.2	1
C	iron	1x2	2
D	store-1	0.5x1.8	0.9
F	cook	2x1.2	2.4
G	eat	0.6x2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.8	2.7
K	sleep	2x1.6	3.2
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x4	2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

RANDU-5: F-411; 6 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x1.5	1.5
D	store-1	0.5x 1.5	0.8
F	cook	1x1.2	1.2
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1.5)	6
L	pray	0.8x1.5	1.2
M	study		
N	ch-care	3x1	3
O	store-3	0.5x4	2
P	watch	2x2	4
Q	relax	2x1.5	3
R	play	3x1	3
S	enter	2x1.5	3
T	store-4	0.5x2.6	1.3
U	celebra		
V	organiz		
W	religion		

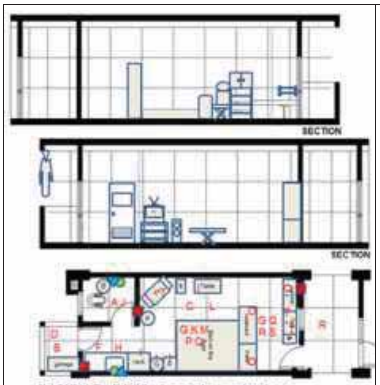
RANDU-3: F-412; 5 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x1.6	1.6
D	store-1	0.5x2.7	1.4
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1.2)	5.4
L	pray	0.8x1.5	1.2
M	study	2x2	4
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch		
Q	relax	2x1.5	3
R	play	2x2	4
S	enter	2x2	4
T	store-4	0.5x1.2	0.6
U	celebra		
V	organiz		
W	religion		



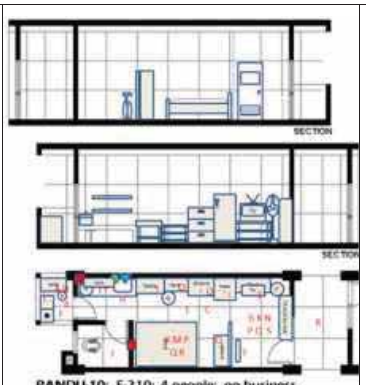
RANDU-6: F-403; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.2	0.6
J	bath	1.5x1.8	2.7
K	sleep	2x1.8	3.6
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2	4
Q	relax	2x1.8	3.6
R	play	3x1	3
S	enter	1x1.5	1.5
T	store-4	0.5x3.5	1.8
U	celebra		
V	organiz		
W	religion		



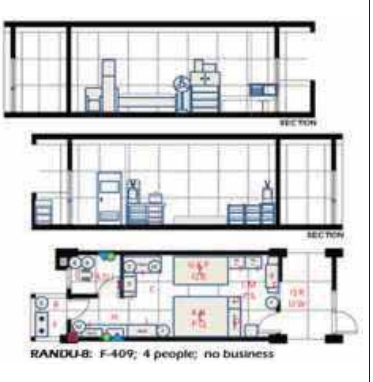
RANDU-7: F-509; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1X2	2
D	store-1	0.5x 1	0.5
F	cook	1x1.2	1.2
G	eat	1.5X1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2.5	1.3
J	bath	1.5x1.8	2.7
K	sleep	2x1.6	3.2
L	pray	1x2	2
M	study	2x1.6	3.2
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2	4
Q	relax	2x1.6	3.2
R	play	3x1	3
S	enter	2x1	2
T	store-4	0.5x2	1
U	celebra	C-space	
V	organiz	C-space	
W	religion	C-space	



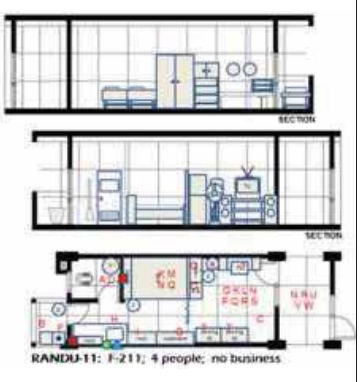
RANDU-10: F-210; 4 people; no business

A	wash	0.8x1.2	1
B	dry	0.6x1.5	0.9
C	iron	0.8x1.5	1.2
D	store-1	0.5x 0.8	0.4
F	cook	2.7x1	2.7
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1)	5
L	pray	0.8x1.5	1.2
M	study	1x1.5	1.5
N	ch-care	1.5x1.5	2.3
O	store-3	0.5x3	1.5
P	watch	1.5x1.5	2.3
Q	relax	1.5x1.5	2.3
R	play	1x1.5	1.5
S	enter	1.5x1.5	2.3
T	store-4	0.5x2.2	1.1
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9



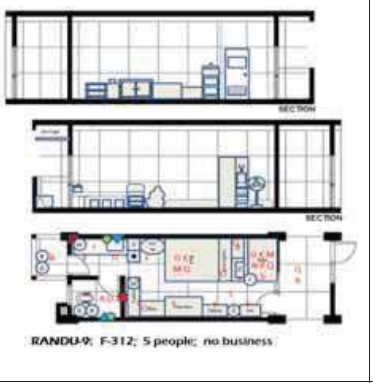
RANDU-8: F-409; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x1.5	0.9
C	iron	1.2x1.5	1.8
D	store-1	0.5x 1.8	0.9
F	cook	2.7x1	2.7
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x2.2	1.1
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1.2	5.4
L	pray	1x1.5	1.5
M	study	1x1.5	1.5
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	2x2	4
Q	relax	2x1.2	2.4
R	play	1.2X1.5	1.8
S	enter	1x1.5	1.5
T	store-4	0.5x3..6	1.8
U	celebra	C-space	
V	organiz	c-space	
W	religion	C-space	



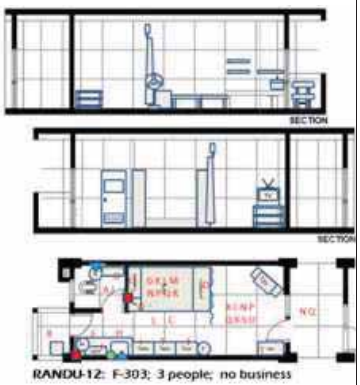
RANDU-11: F-211; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x1.5	0.9
C	iron	1x2	2
D	store-1	0.5x 1.5	0.8
F	cook	2x1.2	2.4
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.8	2.7
K	sleep	2x1.5	3
L	pray	1x2	2
M	study	1x2	2
N	ch-care		
O	store-3	0.5x2.7	1.4
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2X1.5	3
S	enter	2x1.5	3
T	store-4	0.5x3.2	1.6
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9



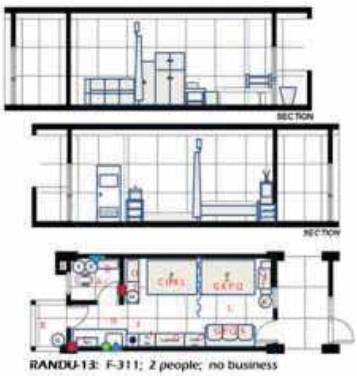
RANDU-9: F-312; 5 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1. 5	0.8
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.8	2.7
K	sleep	1.6(2+1)	4.8
L	pray	1x1.5	1.5
M	study	1x1.6	1.6
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	0.8x1.5	1.2
Q	relax	2x1.6	3.2
R	play	3X1	3
S	enter	1x1.5	1.5
T	store-4	0.5x3.2	1.6
U	celebra		
V	organiz		
W	religion		



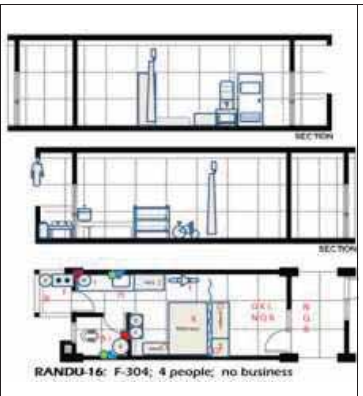
RANDU-12: F-303; 3 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x 0.9	0.5
F	cook	1x1.2	1.2
G	eat	0.6x2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.2	0.6
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1)	5
L	pray	1x1.5	1.5
M	study	1x2	2
N	ch-care	2x1.5	3
O	store-3	0.5x3	1.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x3.6	1.8
U	celebra	3x2.5	7.5
V	organiz		
W	religion		



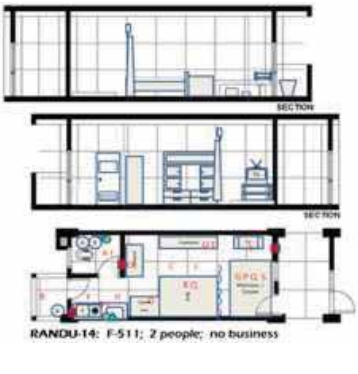
RANDU-13: F-311; 2 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	2x1.2	2.4
D	store-1	0.5x 0.9	0.5
F	cook	2x1.2	2.4
G	eat	1.2x2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.8	2.7
K	sleep	2x2x1.2	4.8
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3.4	1.7
P	watch	2x1.5	3
Q	relax	2x1.2	2.4
R	play		
S	enter	2x1.2	2.4
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		



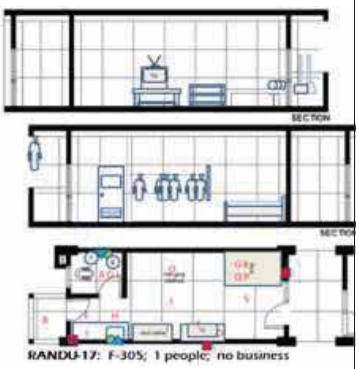
RANDU-16: F-304; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.8x1.5	1
C	iron		
D	store-1	0.5x 3	1.5
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.8	2.7
K	sleep	2(1.5+1)	5
L	pray	1x2	2
M	study		
N	ch-care	1x3	3
O	store-3	0.5x2.8	1.4
P	watch		
Q	relax	1x3	3
R	play	1x3	3
S	enter		
T	store-4	0.5x1	0.5
U	celebra		
V	organiz		
W	religion		



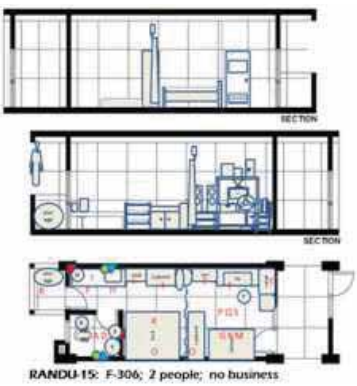
RANDU-14: F-511; 2 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x 1	0.5
F	cook	1x1.2	1.2
G	eat	1.2x1.5	1.8
H	d-wash	1x1.2	1.2
I	store-2		0
J	bath	1.5x1.8	2.7
K	sleep	2x1.5	3
L	pray	2x1	2
M	study		
N	ch-care		
O	store-3	0.5x4	2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		



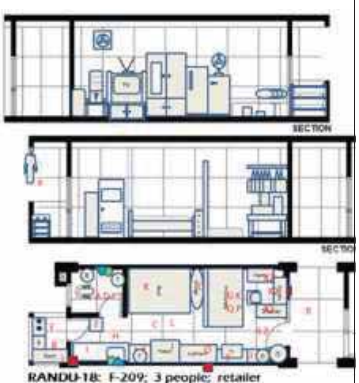
RANDU-17: F-305; 1 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x 0.9	0.5
F	cook	1x1.2	1.2
G	eat	1x1.2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.8	2.7
K	sleep	2x1.2	2.4
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1x1.2	1.2
Q	relax	1x1.2	1.2
R	play		
S	enter	2x2	4
T	store-4	0.5x1.5	0.8
U	celebra	3x3	9
V	organiz	3x3	9
W	religion	3x3	9



RANDU-15: F-306; 2 people; no business

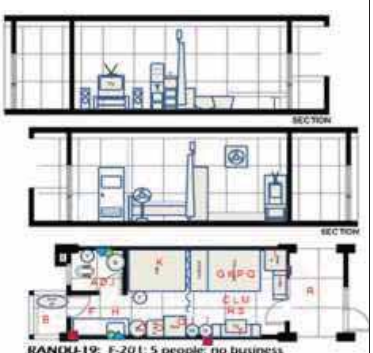
A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x0.9	0.5
F	cook	1x1.2	1.2
G	eat	1x1.6	1.6
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.8	0.9
J	bath	1.5x1.8	2.7
K	sleep	2x1.6	3.2
L	pray	Outside	
M	study	1x1.6	1.6
N	ch-care		
O	store-3	0.5x2	1
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x3.2	1.6
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9



RANDU-18: F-209; 3 people; retailer

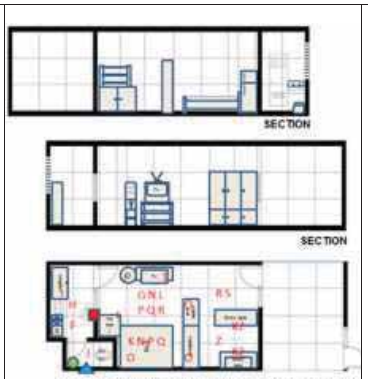
A	wash	0.8x1.5	1.2
B	dry	0.6x1.5	0.9
C	iron	0.8x2	1.6
D	store-1	0.5x0.9	0.5
F	cook	2.x1.2	2.4
G	eat	1x1.2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.8	2.7
K	sleep	2(1.2x1.4)	5.2
L	pray	0.8x1.5	1.2
M	study		
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	2x2	4
Q	relax	2x1.2	2.4
R	play	3x1	3
S	enter	1x1.5	1.5
T	store-4	0.5x1.4	0.7
U	celebra	3x3	9
V	organiz		
W	religion	3x3	9
X1	Material		
X2	Product	0.6x3	1.8
Y	Equip		
Z	Work	1x1.5	1.5

8. GUNUNGSARI



RANDU-19: F-201; 5 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x0.9	0.5
F	cook	1x1.2	1.2
G	eat	2x1.8	3.6
H	d-wash	1x1.2	1.2
I	store-2	0.5x 1+0.5	1
J	bath	1.5x1.8	2.7
K	sleep	1.5(2+1.8)	5.7
L	pray	1x2	2
M	study	1x2	2
N	ch-care		
O	store-3	0.5x1.6	2.4
P	watch	2x1.8	3.6
Q	relax	2x1.8	3.6
R	play	1x3	3
S	enter	1x2	2
T	store-4	0.5x3.6	1.8
U	celebra	3x3	9
V	organiz	3x3	9
W	religion		

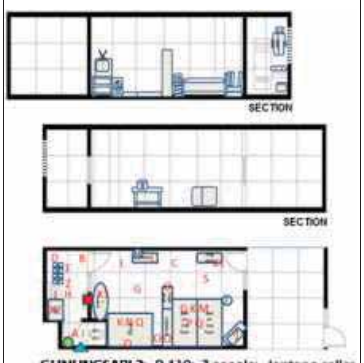


GUNUNGSARI-1: A-308; 3 people; retailer

A	wash		
B	dry		
C	iron		
D	store-1		
F	cook	1x1.5	1.5
G	eat	1.5x2	3
H	d-wash	0.8x1.5	1.2
I	store-2	1.5x1.5+0.5	1.3
J	bath	1x2	2
K	sleep	2x1.5	3
L	pray	1x2	2
M	study		
N	ch-care	2x1.5	3
O	store-3	0.5x3	1.5
P	watch	3x2.2	6.6
Q	relax	2x1.5	3
R	play	1.5x2.2	3.3
S	enter	1.5x2.2	3.3
T	store-4	0.5x1.6	0.8
U	celebra		
V	organiz		
W	religion		
X1	Material		
X2	Product	0.5x3.4	1.7
Y	Equip		
Z	Work	1x2.2	2.2

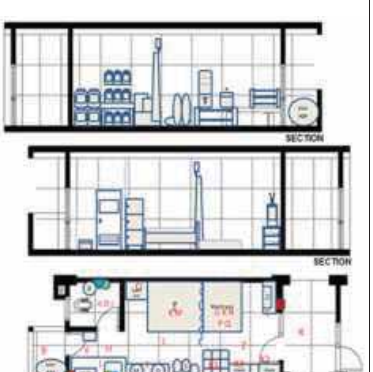
RANDU-20: F-308; 3 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.8x1.5	1
C	iron	1x2	2
D	store-1	0.5x1.8	0.9
F	cook	2x1.2	2.4
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.8	2.7
K	sleep	2x(1+1)	4
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x3.2	1.6
P	watch	2x2	4
Q	relax	1x2	2
R	play	1x3	3
S	enter	1x2	2
T	store-4	0.5x4.2	2.1
U	celebra	3x3	9
V	organiz		
W	religion		



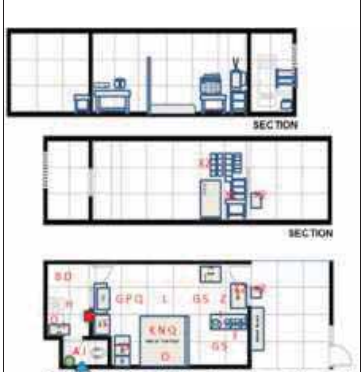
GUNUNGSARI-2: B-419; 7 people; lontong seller

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x 1	0.5
F	cook	1.2x1.5	1.8
G	eat	2x1.5	3
H	d-wash	0.8x1.5	1.2
I	store-2	0.5x1.5	0.8
J	bath	1x2	2
K	sleep	2(1.5+2)	7
L	pray	1x1.5	1.5
M	study	2x2	4
N	ch-care	2x1.5	3
O	store-3	0.5x4	2
P	watch	2x2.5	5
Q	relax	2x1.5	3
R	play		
S	enter	3x1	3
T	store-4	0.5x1.2	0.6
U	celebra		
V	organiz		
W	religion		
X1	Material	0.5x2.5	1.3
X2	Product	0.5x1	0.5
Y	Equip		
Z	Work	1x2	2



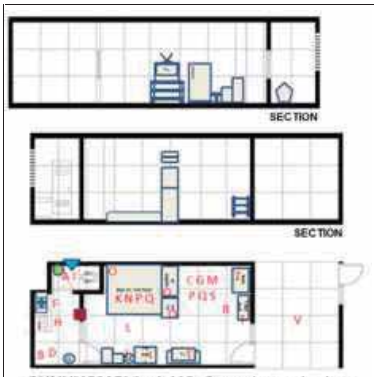
RANDU-21: F-503; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1.8	0.9
F	cook	1x1.2	1.2
G	eat	1.2x1.5	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.8	2.7
K	sleep	1.5(2+1.2)	4.8
L	pray	1x1.5	1.5
M	study	0.6x2	1.2
N	ch-care		
O	store-3	0.5x 1	0.5
P	watch	2x1.5	3
Q	relax	1.2x1.5	1.8
R	play	1.2x1.5	1.8
S	enter		
T	store-4	0.5x2	1
U	celebra	3x3	9
V	organiz		
W	religion		
X1	Material		
X2	Product	0.6x2.5	1.5
Y	Equip		
Z	Work	1x2.5	2.5



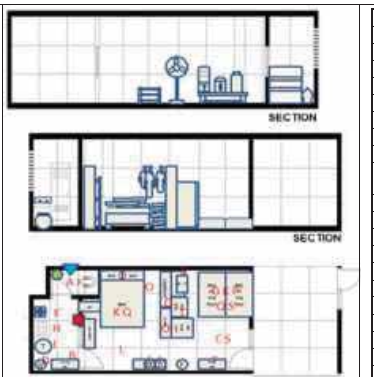
GUNUNGSARI-3: B-417; 4 people; snacks retaile

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x1.8	3.6
L	pray	1x1.5	1.5
M	study		
N	ch-care	2x1.8	3.6
O	store-3	0.5x3.4	1.7
P	watch	3x2.	6
Q	relax	2x1.8	3.6
R	play		
S	enter	1x1.5	1.5
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		
X1	Material		
X2	Product	0.5x1.5	0.8
Y	Equip		
Z	Work	1x1.5	1.5



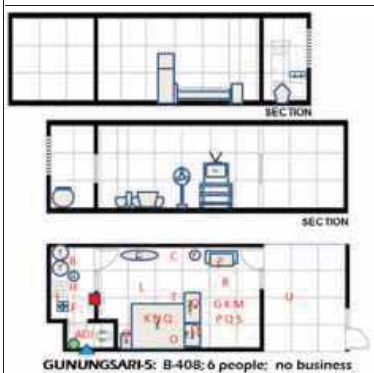
GUNUNGSARI-4: A-419; 3 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x2	4
L	pray	1x2	2
M	study	2x2	4
N	ch-care		
O	store-3	0.5x2.5	1.3
P	watch	2x2+1.5 x2	7
Q	relax	2x2	4
R	play	1x1.5	1.5
S	enter	2x2	4
T	store-4	0.5x3.2	1.6
U	celebra		
V	organiz	3x4	12
W	religion		



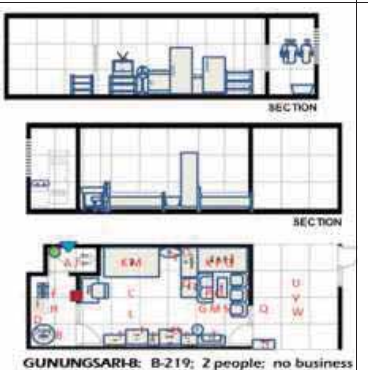
GUNUNGSARI-7: B-306; 5 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x0.6	0.3
F	cook	1x1.2	1.2
G	eat	2x1.8	3.6
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2(1.8+1.5)	6.6
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	2x2	4
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x2.8	1.4
U	celebra		
V	organiz		
W	religion		



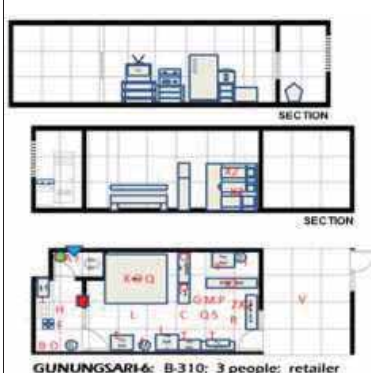
GUNUNGSARI-5: B-408; 6 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x2.4	4.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1x2	2
K	sleep	2x1.8	3.6
L	pray	1x2	2
M	study	2x2.4	4.8
N	ch-care	2x1.8	3.6
O	store-3	0.5x3.5	1.8
P	watch	2.5x2.4	6
Q	relax	2x1.8	3.6
R	play	1x2.4	2.4
S	enter	2x2.4	4.8
T	store-4	0.5x2	1
U	celebra	3x4	12
V	organiz		
W	religion		



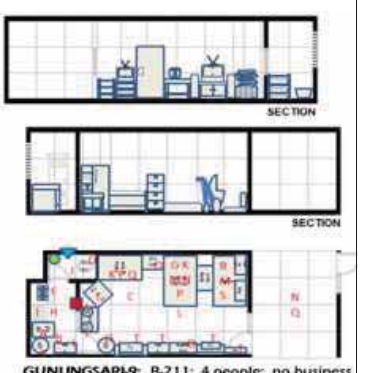
GUNUNGSARI-8: B-219; 2 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x0.6	0.3
F	cook	1x1.2	1.2
G	eat	2x2	4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2(1.2+1)	4.4
L	pray	1x2	2
M	study	2x2	4
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x3	6
Q	relax	1x2	2
R	play		
S	enter	2x2	4
T	store-4	0.5x3	1.5
U	celebra	3x4	12
V	organiz	3x4	12
W	religion	3x4	12



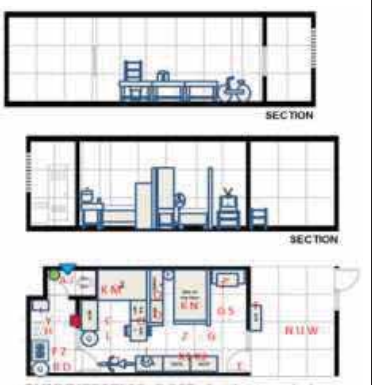
GUNUNGSARI-6: B-310; 3 people; retailer

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+ 0.5	1
J	bath	1x2	2
K	sleep	2x2	4
L	pray	1x2	2
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.5x2.5	3.8
Q	relax	2x2	4
R	play	1x1.5	1.5
S	enter	2x1.5	3
T	store-4	0.5x3.5	1.8
U	celebra		
V	organiz	3x4	12
W	religion		
X1	Material		
X2	Product	3.5	1.8
Y	Equip		
Z	Work	2x1.5	3



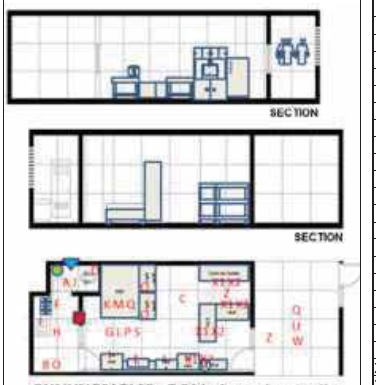
GUNUNGSARI-9: B-211; 4 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1x1.8	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2(1.5+1.2)	5.4
L	pray	1x2	2
M	study	1.2x2	2.4
N	ch-care	1.2x2	2.4
O	store-3	0.5x2.6	1.3
P	watch	2x3	6
Q	relax	2x1.2	2.4
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x4.2	2.1
U	celebra	Ground	
V	organiz	public	
W	religion	ground	



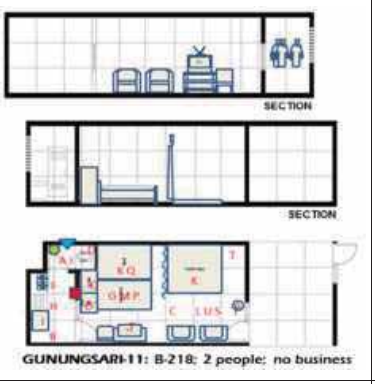
GUNUNGSARI-10: B-207; 4p; lontong balap

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2x2x1.2	4.8
L	pray	1x2	2
M	study	2x1.2	2.4
N	ch-care	2x1.2	2.4
O	store-3	0.5x3.8	1.9
P	watch	2x1.6	3
Q	relax	2x1.2	2.4
R	play		
S	enter	1.4x1.5	2.1
T	store-4	0.5x3	1.5
U	celebra	3x4	12
V	organiz		
W	religion	3x4	12
X1	Material	0.6x2	1.2
X2	Product	0.6x2	1.2
Y	Equip		
Z	Work	1x3	3



GUNUNGSARI-13: B-214; 1 people; retailer

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1.5x2	3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x1 +0.5	1
J	bath	1x2	2
K	sleep	1x1.4	1.4
L	pray	1x2	2
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1x2.5	2.5
Q	relax	2x1.4	2.8
R	play		
S	enter	1x2.5	2.5
T	store-4	0.5x1	0.5
U	celebra	3x4	12
V	organiz		
W	religion	3x4	12
X1	Material	0.6x6.5	3.9
X2	Product	0.6x6.5	3.9
Y	Equip		
Z	Work	1x2	2



GUNUNGSARI-11: B-218; 2 people; no business

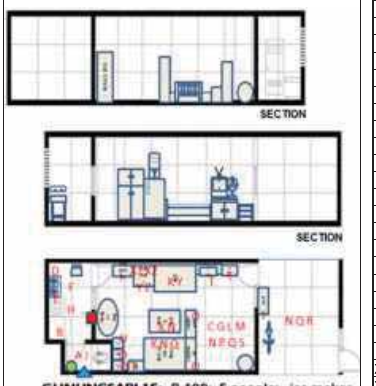
A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1x2	2
K	sleep	2(1.5+2)	7
L	pray	1x2	2
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	2x1.2	2.4
Q	relax	2x1.5	3
R	play		
S	enter	2x3	6
T	store-4	0.5x2	1
U	celebra	2x3	6
V	organiz		
W	religion		

GUNUNGSARI-14: B-219; 7 people; no business

A	wash	0.7x1.5	1.1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x0.8	0.4
F	cook	1x1.2	1.2
G	eat	2x2	4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2(1.4+1.8)	6.4
L	pray	1x2	2
M	study	2x1.4	2.8
N	ch-care	1.5x4	6
O	store-3	0.5x4	2
P	watch	2x2.5	5
Q	relax	2x1.4	2.8
R	play	C-space	
S	enter	2.5x2	5
T	store-4	0.5x1.2	0.6
U	celebra	3.5x2.4	8.4
V	organiz		
W	religion	C-pace	

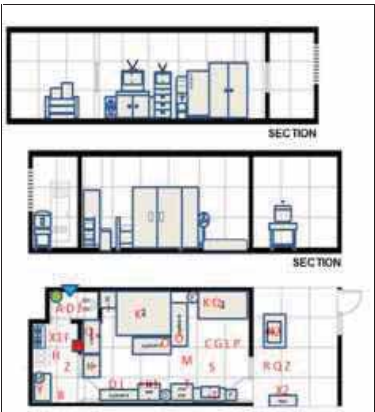
GUNUNGSARI-12: B-201; 1 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x 1	0.5
F	cook	1x1.2	1.2
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2x1.2	2.4
L	pray	0.8x2	1.6
M	study		
N	ch-care		
O	store-3	0.5x4.4	2.2
P	watch	2.5x2	5
Q	relax	1x2	2
R	play		
S	enter	2.5x2	5
T	store-4	0.5x2.2	1.1
U	celebra	2.5x3	7.5
V	organiz	2.5x3	7.5
W	religion	3x4	12



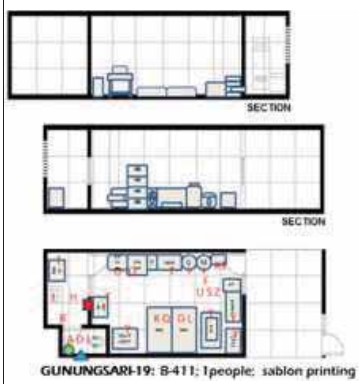
GUNUNGSARI-15: B-408; 5 people; ice maker

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x2.2	3.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2(1.4+1.2)	5.2
L	pray	1x2	2
M	study	2x2	4
N	ch-care	2x1.4	2.8
O	store-3	0.5x3.5	1.8
P	watch	2.2x2.5	5.5
Q	relax	2x1.4	2.8
R	play	1.5x4	6
S	enter	2x2.5	5
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		
X1	Material	0.8x1	0.8
X2	Product	0.8x1	0.8
Y	Equip	2x1.2	2.4
Z	Work		



GUNUNGSARI-16: A-411; 3 people; bakso seller

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x2	4
H	d-wash	1x1.2	1.2
I	store-2	0.5x3+0.5	2
J	bath	1x2	2
K	sleep	2(1.6+1)	5.2
L	pray	1x2	2
M	study	1x1.5	1.5
N	ch-care		
O	store-3	0.5x4.2	2.1
P	watch	2x2.2	4.4
Q	relax	2x1	2
R	play	1.5x1.5	2.3
S	enter	2x2	4
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		
X1	Material	0.6x1+0.6	1.2
X2	Product	0.8x2	1.6
Y	Equip	0.8x1	0.8
Z	Work	1x3	3



GUNUNGSARI-19: B-411; 1people; sablon printing

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron		
D	store-1	0.5x1	0.5
F	cook		
G	eat	0.6x1	0.6
H	d-wash	1.5x1.2	1.8
I	store-2	0.5x1	0.5
J	bath	1x2	2
K	sleep	1x2	2
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x1.6	0.8
P	watch		
Q	relax	1x2	2
R	play		
S	enter	1.2x3	3.6
T	store-4	0.5x2.5	1.3
U	celebra	1.2x3	3.6
V	organiz		
W	religion		
X1	Material	0.5x0.6	0.3
X2	Product		
Y	Equip	0.8x4.5	3.6
Z	Work	2x3	6

GUNUNGSARI-17: B-412; 2 people; no business

A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron	1x2	2
D	store-1	1.5(1+0.5)	0.8
F	cook	1x1.2	1.2
G	eat	0.6x1.6	1
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1x2	2
K	sleep	2(1.6+1.4)	6
L	pray	1x1.4	1.4
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x1.2	0.6
P	watch		
Q	relax	2x1.4	2.8
R	play		
S	enter	2x2	4
T	store-4	0.5x1	0.5
U	celebra		
V	organiz		
W	religion		

GUNUNGSARI-20: B-402; 5 people; no business

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.2x1.5	1.8
G	eat	2x1.4	2.8
H	d-wash	1.5x1.2	1.8
I	store-2	0.5x1	0.5
J	bath	1x2	2
K	sleep	2x3	6
L	pray	1x2	2
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.5x3	4.5
Q	relax	2x1.4	2.8
R	play		
S	enter	2x1.4	2.8
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

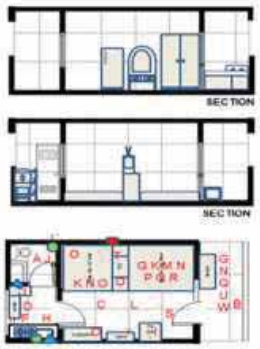
GUNUNGSARI-18: B-409; 2 people; retailer

A	wash	1x1	1
B	dry	0.6x2	1.2
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	1x2	2
K	sleep	2x1.6	3.2
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2.5	5
Q	relax	2x1.6	3.2
R	play		
S	enter		
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		
X1	Material	0.6x2	1.2
X2	Product	0.6x4	2.4
Y	Equip		
Z	Work	2x1x1.5	3

GUNUNGSARI-21: B-414; 1 people; no business

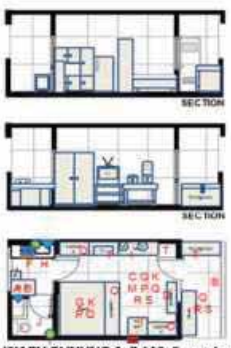
A	wash	1x1	1
B	dry	1.2x1.5	1.8
C	iron		
D	store-1	0.5x1	0.5
F	cook		
G	eat	outside	
H	d-wash	1.5x1.2	1.8
I	store-2	0.5x1	0.5
J	bath	1x2	2
K	sleep	2x1.5	3
L	pray	1x1.5	1.5
M	study	1x1.5	1.5
N	ch-care		
O	store-3	05x2.6	1.3
P	watch		
Q	relax	2x1.5	3
R	play		
S	enter		
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

9. WARU GUNUNG



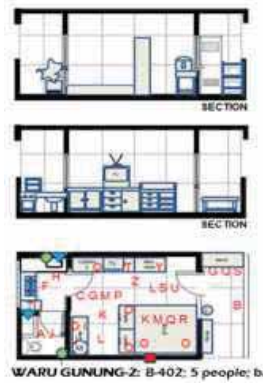
WARU GUNUNG-1: A-310; 4 people; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	2x1.2	2.4
D	store-1	1x0.3	0.3
F	cook	1x1.2	1.2
G	eat	2X1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	1.8(2+1.5)	6.3
L	pray	1.5X1	1.5
M	study	1.8x2	3.6
N	ch-care	1.8x2	3.6
O	store-3	0.5x4	2
P	watch	1.5X1.8	2.7
Q	relax	1.8x2	3.6
R	play	1.8x2	3.6
S	enter	2X1.2	2.4
T	store-4	0.5x1.6	0.8
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion	3.6x1.5	5.4



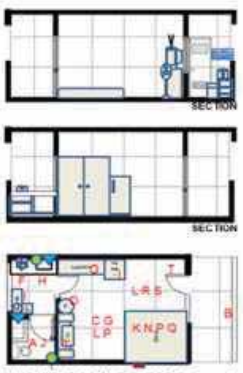
WARU GUNUNG-4: B-112; 5 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x2	1
F	cook	1x1.2	1.2
G	eat	1.5x2	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(2x1.5)	6
L	pray	ground	
M	study	1.5x2	3
N	ch-care		
O	store-3	0.5x4.6	2.3
P	watch	3x1.5	4.5
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5x3	1.5
U	celebra		
V	organiz	ground	
W	religion	outside	



WARU GUNUNG-2: B-402; 5 people; baby-sitting

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	2X1.2	2.4
D	store-1	0.5x1.2	0.6
F	cook	1x1.2	1.2
G	eat	1.5X1.6	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	1.6x1.5	2.4
K	sleep	1.8(1+2)	5.4
L	pray	1x1.5	1.5
M	study	1.5X1.6	2.4
N	ch-care		
O	store-3	0.5x2.8	1.4
P	watch	1.5X1.6	2.4
Q	relax	1.8x2	3.6
R	play	1.8x2	3.6
S	enter	2X1.2	2.4
T	store-4	0.5x1	0.5
U	celebra	3X1.2	3.6
V	organiz		
W	religion		
X1	Material		
X2	Product		
Y	Equip	0.5x1	0.5
Z	Work	2X1.2	2.4

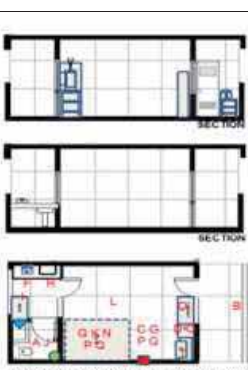


WARU GUNUNG-5: B-104; 3 people; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.5	0.3
F	cook	1x1.2	1.2
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.6x1.5	2.4
K	sleep	2x1.8	3.6
L	pray	1x2	2
M	study		
N	ch-care	2x1.8	3.6
O	store-3	0.5x2	1
P	watch	2x1.8	3.6
Q	relax	2X1.8	3.6
R	play	2x2	4
S	enter	2x2	4
T	store-4	0.5x3	1.5
U	celebra		
V	organiz	ground	
W	religion	ground	

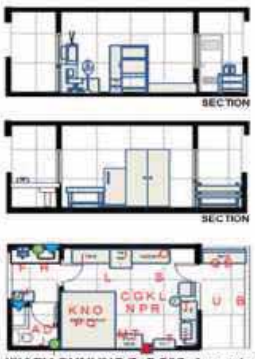
WARU GUNUNG-3: A-204; 4 people; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.5	0.3
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(2x1.5)	6
L	pray	1x1.5	1.5
M	study	1.5X2	3
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5x3	1.5
U	celebra	3.6x1.5	5.4
V	organiz	ground	
W	religion		



WARU GUNUNG-6: B-404; 3 people; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	1x1.2	1.2
G	eat	1X1.6	1.6
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.6x1.5	2.4
K	sleep	2X1.6	3.2
L	pray	1x1.5	1.5
M	study		
N	ch-care	2X1.6	3.2
O	store-3	0.5x1.6	0.8
P	watch	2X1.6	3.2
Q	relax	2X1.6	3.2
R	play		
S	enter		
T	store-4	0.5x0.8	0.4
U	celebra		
V	organiz		
W	religion		

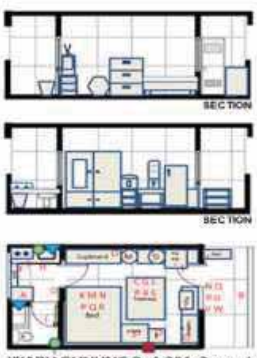


WARU GUNUNG-7: B-502; 4 people; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2 +0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(1.5+1.2)	5.4
L	pray	1X2	2
M	study	1X1.2	1.2
N	ch-care	1.5X2	3
O	store-3	0.5x1.8	0.9
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5X2	3
S	enter	1.5x1.5	2.3
T	store-4	0.5x3	1.5
U	celebra	3.6x1.5	5.4
V	organiz	ground	
W	religion		

WARU GUNUNG-10: B-509; 3p; convection tailor

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.6x1.5	2.4
K	sleep	1.6X2	3.2
L	pray	1x1.5	1.5
M	study	1.6x1	1.6
N	ch-care	1.6X2	3.2
O	store-3	0.5x3.4	1.7
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	3.6x1.5	5.4
S	enter	1.5x1.8	2.7
T	store-4	0.5x2	1
U	celebra	3.6x1.5	5.4
V	organiz	c-space	
W	religion	C-space	
X1	Material	0.5x1.4	0.7
X2	Product		
Y	Equip	0.5x1.2	0.6
Z	Work	0.6x1.5	0.9

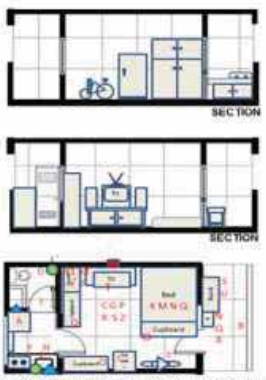


WARU GUNUNG-8: A-201; 3 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1.2x1.5	1.8
D	store-1	0.5x0.6	0.3
F	cook	1x1.2	1.2
G	eat	1.5x1.2	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2x1.6	3.2
L	pray	1.5x1	1.5
M	study	1.5x1.2	1.8
N	ch-care	2x1.6	3.2
O	store-3	0.5x4	2
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play	2x1.6	3.2
S	enter	1.5x1.2	1.8
T	store-4	0.5x1	0.5
U	celebra	3x1.5	4.5
V	organiz	3x1.5	4.5
W	religion	3x1.5	4.5

WARU GUNUNG-11: A-206; 2p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.2	1.8
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x0.6	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x3+0.5	2
J	bath	1.6x1.5	2.4
K	sleep	2x1.8	3.6
L	pray	0.8x1.5	1.2
M	study	2x1	2
N	ch-care		
O	store-3	0.5x3.2	4.8
P	watch	2x1.2	2.4
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.2	2.4
T	store-4	0.5x1.6	2.4
U	celebra	1.2x3	3.6
V	organiz		
W	religion	public	

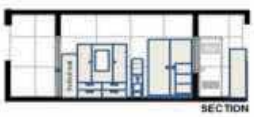


WARU GUNUNG-9: B-405; 3 people; factory order

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.6x1.5	2.4
K	sleep	1.8X2	3.6
L	pray	outside	
M	study	1x1.8	1.8
N	ch-care	1.8X2	3.6
O	store-3	0.5x4.2	2.1
P	watch	1.5X2	3
Q	relax	1.8X2	3.6
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5x3.5	1.8
U	celebra		
V	organiz	c-space	
W	religion	outside	
X1	Material	0.5x1	0.5
X2	Product	0.5x1	0.5
Y	Equip	0.5x1	0.5
Z	Work	2.4x1.5	3.6

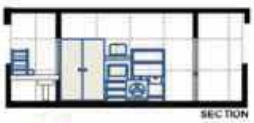
WARU GN-12: A-207; 5p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	0.8x1	0.8
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.6x1.5	2.4
K	sleep	2(1.5+1.5)	6
L	pray	1.5x1	1.5
M	study	2X1.5	3
N	ch-care	2X1.5	3
O	store-3	0.5x3.4	1.7
P	watch	2X1.8	3.6
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.2	2.4
T	store-4	0.5x2.8	1.4
U	celebra	C-space	
V	organiz	c-space	
W	religion	ground	



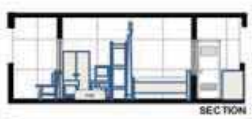
WARU GUNUNG-13: B-306; 5p; no business

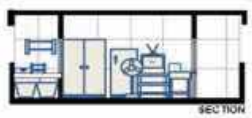
A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5X1.8	2.7
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(2X1.5)	6
L	pray	1x1.5	1.5
M	study	1.5x1.8	2.7
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5x1.6	2.4
U	celebra	C-space	
V	organiz	c-space	
W	religion	C-space	



WARU GUNUNG-16: B-216; 4p; no business

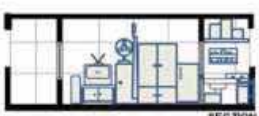
A	wash	1x1.6	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.6x1.5	2.4
K	sleep	2(1.5X1.8	5.4
L	pray	1x1.5	1.5
M	study	2x1	2
N	ch-care		
O	store-3	0.5x2.8	1.4
P	watch	1.5X2	3
Q	relax	1.5X2	3
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5x1.8	0.9
U	celebra	3x2	6
V	organiz	ground	
W	religion	ground	

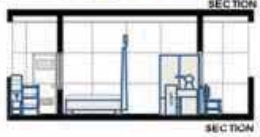




WARU GUNUNG-14: B-310; 3p; no business

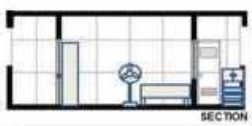
A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.6x1.5	2.4
K	sleep	1.5(2+1)	4.5
L	pray	1x1.5	1.5
M	study	2x0.6	1.2
N	ch-care	1x1.5	1.5
O	store-3	0.5x2	1
P	watch	2.5x1	2.5
Q	relax	2x1.5	3
R	play	1.5x1.5	2.3
S	enter	2x1	2
T	store-4	0.5x3.2	1.6
U	celebra	C-space	
V	organiz	c-space	
W	religion	C-space	

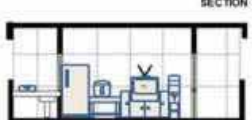




WARU GUNUNG-17: A-218; 4p; no business

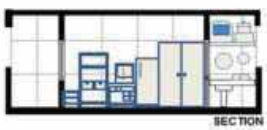
A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(1.8+1.2)	6
L	pray	1x1.5	1.5
M	study	1.5x1.5	2.3
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	1.5X2	3
Q	relax	1.8X2	3.6
R	play	1.5X1.5	2.3
S	enter	1.6x1.5	2.4
T	store-4	0.5x3	1.5
U	celebra	Ground	
V	organiz	c-space	
W	religion		

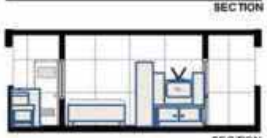




WARU GUNUNG-15: A-209; 3p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1.5X1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5X1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(1.6+1)	5.2
L	pray	1x1.5	1.5
M	study	1.5X1.5	2.3
N	ch-care	1.5X2	3
O	store-3	0.5x2	1
P	watch	1.5X2	3
Q	relax	1.6X2	3.2
R	play	1.5X2	3
S	enter	1.5X2	3
T	store-4	0.5x1.6	0.8
U	celebra		
V	organiz	ground	
W	religion		





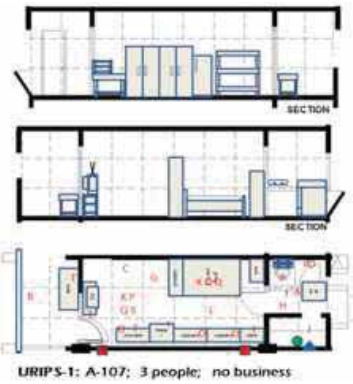
WARU GUNUNG-18: B-213; 4p; cookies maker

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1.2x1.5	1.8
D	store-1	0.5x 1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.2	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.6x1.5	2.4
K	sleep	2(1.8+1.2)	6
L	pray	1x1.5	1.5
M	study	1x2	2
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.2X2	2.4
Q	relax	1.8x2	3.6
R	play	1.5x1.2	1.8
S	enter	1.2x1.5	1.8
T	store-4	0.5x3.4	1.7
U	celebra		
V	organiz	ground	
W	religion		
X1	Material		
X2	Product	0.5x0.8	0.4
Y	Equip	0.5x1.5	0.8
Z	Work	0.6x1.2	0.7

10. URIP-S

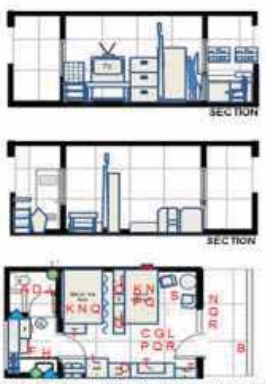
WARU GUNUNG-19: B-219; 3p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	2X1.2	2.4
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.5x1.2	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x2 +0.5	1.5
J	bath	1.6x1.5	2.4
K	sleep	2(1.4+1)	4.8
L	pray	1x1.5	1.5
M	study	1x1	1
N	ch-care		
O	store-3	0.5x4	2
P	watch	2X1.5	3
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5x2	1
U	celebra		
V	organiz	ground	
W	religion	outside	



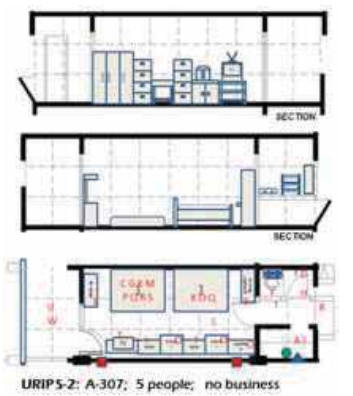
URIPS-1: A-107; 3 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x 1	0.5
F	cook	1.2x1.2	1.4
G	eat	1x1.5	1.5
H	d-wash	1x1	1
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2(1.4+1)	4.8
L	pray	1x2	2
M	study	outside	
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2x2.5	5
Q	relax	2x1.4	2.8
R	play	ground	
S	enter	2x2.	4
4T	store-4	0.5x3.5	1.8
U	celebra	2x3	6
V	organiz	ground	
W	religion	2x3	6



WARU GUNUNG-20: A-510; 3p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	2x1.2	2.4
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.6x1.5	2.4
K	sleep	1.8(1.2+1)	4
L	pray	1x1.5	1.5
M	study		
N	ch-care	1.2x2	2.4
O	store-3	0.5x2.6	1.3
P	watch	2x1.2	2.4
Q	relax	2x1.2	2.4
R	play	2x1.2	2.4
S	enter	1.2x1	1.2
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

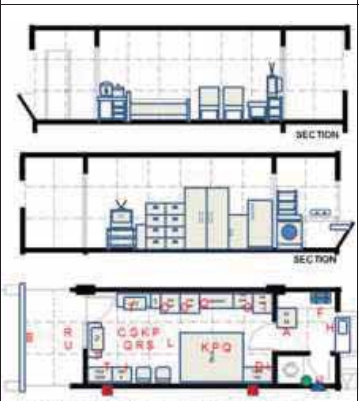


URIPS-2: A-307; 5 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1x2	2
K	sleep	2(2x1.5)	6
L	pray	1x2	2
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	2x2.5	5
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x4.2	2.1
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6

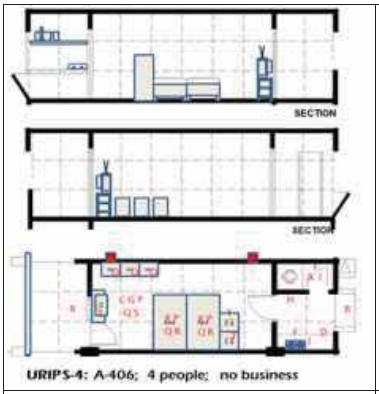
WARU GUNUNG-21: B-217; 5p; no business

A	wash	1.6x1	1.6
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.2	1.2
G	eat	1.8x1	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x2.5	1.3
J	bath	1.6x1.5	2.4
K	sleep	2(1.2+1.6)	5.6
L	pray	1x1.5	1.5
M	study	1.6x1.5	2.4
N	ch-care	1.6x1.5	2.4
O	store-3	0.5x2.4	1.2
P	watch	2x2	4
Q	relax	1.6x1.5	2.4
R	play	2x2	4
S	enter	1.5x2	3
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		



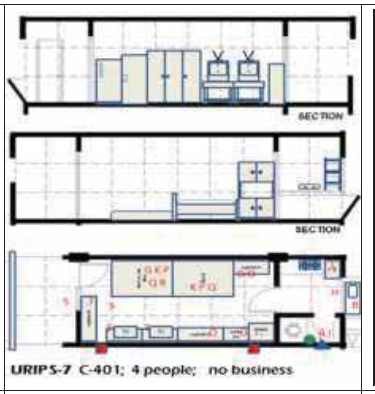
URIPS-3: A-109; 4 people; no business

A	wash	0.8x1.5	1.2
B	dry	0.6x3	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2(1.6+1.4)	6
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	2.5x1.5	3.8
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x2.8	1.4
U	celebra	2x3	6
V	organiz		
W	religion		



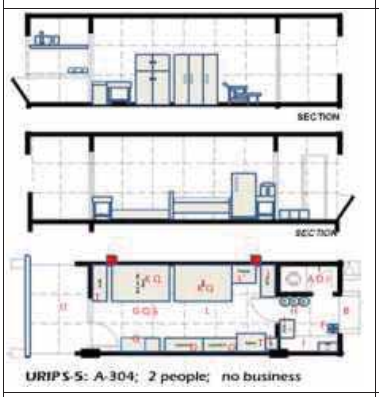
URIPS-4: A-406; 4 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2		0
J	bath	1x2	2
K	sleep	2x2x1.1	4.4
L	pray	c.space	
M	study	outside	
N	ch-care		
O	store-3	0.5x2	1
P	watch	2x2	4
Q	relax	2x1	2
R	play	3x1	3
S	enter	2x1.5	3
T	store-4	0.5x2.4	1.2
U	celebra		
V	organiz	ground	
W	religion	outside	



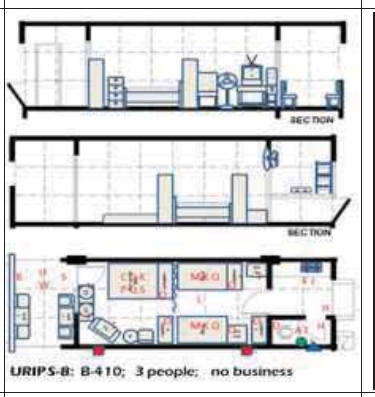
URIPS-7 C-401; 4 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron		
D	store-1	0.5x1	0.5
F	cook		
G	eat	1.5x2	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2x2x1.5	6
L	pray	C-space	
M	study	Outside	
N	ch-care		
O	store-3	0.5x3.2	1.6
P	watch	2.5x2	5
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter		
T	store-4	0.5x3.6	1.8
U	celebra		
V	organiz	ground	
W	religion		



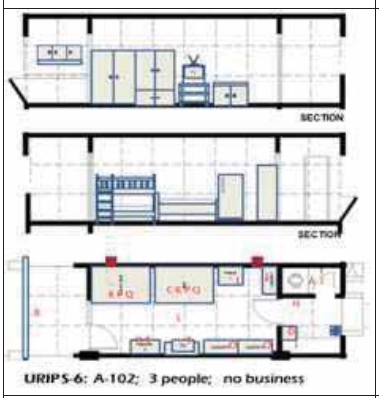
URIPS-5: A-304; 2 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron		
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	1x1.2	1.2
I	store-2	0.5x3+0.5	2
J	bath	1x2	2
K	sleep	2x2x1.1	4.4
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch		
Q	relax	2x1.2	2.4
R	play		
S	enter	1.5x1.5	2.3
T	store-4	0.5x2.2	1.1
U	celebra	2x3	6
V	organiz		
W	religion		



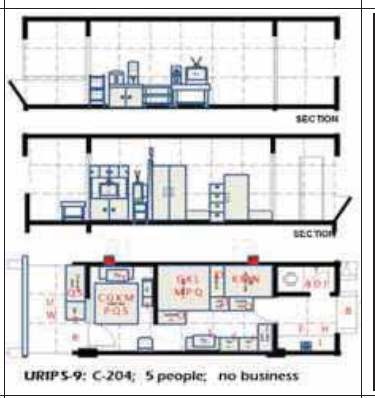
URIPS-8: B-410; 3 people; no business

A	wash	1x1	1
B	dry	1.2x1	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	1.5x1.4	2.1
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1x2	2
K	sleep	3.6+2.1	5.7
L	pray	1x2	2
M	study	1x1.8	1.8
N	ch-care		
O	store-3	0.5x4	2
P	watch	1.5x1.8	2.7
Q	relax	1.5x1.4	2.1
R	play		
S	enter	1.5x1.4	2.1
T	store-4	0.5x2	1
U	celebra	2x3	6
V	organiz	c-space	
W	religion	2x3	6



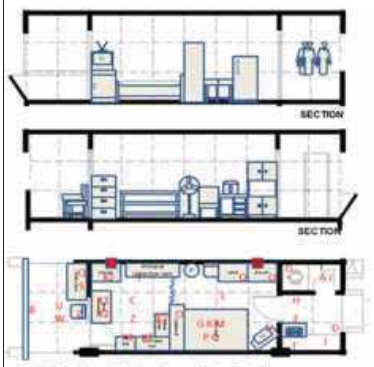
URIPS-6: A-102; 3 people; no business

A	wash	1x1	1
B	dry	0.6x3	1.8
C	iron	2x1.2	2.4
D	store-1	0.5x0.5	0.3
F	cook		
G	eat		
H	d-wash	1x1.2	1.2
I	store-2	0.5x3+0.5	2
J	bath	1x2	2
K	sleep	2x2x1.2	4.8
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.5x2	3
Q	relax	2x1.2	2.4
R	play		
S	enter		
T	store-4	0.5x2	1
U	celebra		
V	organiz	ground	
W	religion		



URIPS-9: C-204; 5 people; no business

A	wash	1x1	1
B	dry	1.2x1	1.2
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	1.5x1.4	2.1
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.2x1	1.2
K	sleep	1x1.5	1.5
L	pray	0.5x1	0.5
M	study	2x1.2	2.4
N	ch-care	1.5x1.4	2.1
O	store-3	1x1.2	1.2
P	watch	0.5x1	0.5
Q	relax	1.2x1	1.2
R	play	1x1	1
S	enter	1.5x1.5	2.3
T	store-4	0.5x4	2
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6



URIPS-10: C-104; 2 people; Retailer

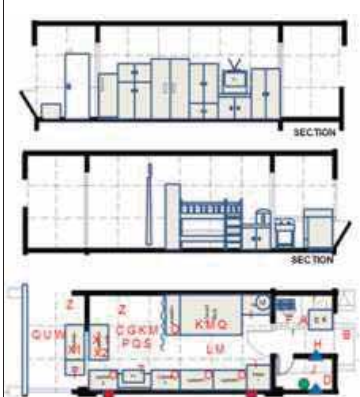
A	wash	1x1	1
B	dry	0.6x3	1.8
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	0.6x2	1.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	2x1.5	3
Q	relax	2x1.4	2.8
R	play		
S	enter	1x1.5	1.5
T	store-4	0.5x1	0.5
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6
X1	Material	0.6x1.5	0.9
X2	Product	0.6x3	1.5
Z	Work	1x1.5	1.5

URIPS-13: A-402; 1 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5(1+1)	1
F	cook		
G	eat	1.5x1	1.5
H	d-wash	1x1	1
I	store-2	0.5x3+0.5	2
J	bath	1x2	2
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study	1x1.2	1.2
N	ch-care		
O	store-3	0.5x2.8	1.4
P	watch	2x1.4	2.8
Q	relax	2x1.4	2.8
R	play		
S	enter	1x1.5	1.5
T	store-4	0.5x5.6	2.8
U	celebra	C-space	
V	organiz	c-space	
W	religion	c-space	

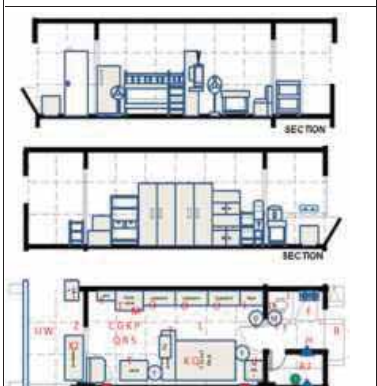
URIPS-11: A-105; 2 people; Retailer

A	wash	0.8x1.5	1.2
B	dry	1.5x0.7	1.1
C	iron		
D	store-1	0.5x1+0.5	0.8
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	1x1	1
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study	1.2x1.5	1.8
N	ch-care		
O	store-3	0.5x2.5	1.3
P	watch	2x1.5	3
Q	relax	2x1.4	2.8
R	play		
S	enter	2X1.5	3
T	store-4	0.5x2	1
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6
X1	Material	0.6x2.5	1.5
X2	Product	0.6x2.5	1.5
Y	Equip		
Z	Work	1x2	2



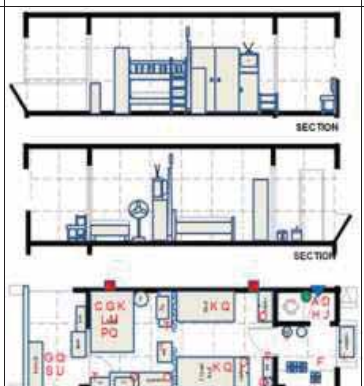
URIPS-14: C-404; 5 people; Retailor

A	wash	0.8x1.5	1.2
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2X1.5	3
H	d-wash	0.8x1.2	1
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2(1.4+1)	4.8
L	pray	1x2	2
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5x5.4	2.7
P	watch	2x2	4
Q	relax	2X1.5	3
R	play		
S	enter	2X1.5	3
T	store-4	0.5x1.6	0.8
U	celebra	2x3	6
V	organiz	c-space	
W	religion	2x3	6
X1	Material	0.6x2.5	1.5
X2	Product	0.6x2.5	1.5
Y	Equip		
Z	Work	1x3	3



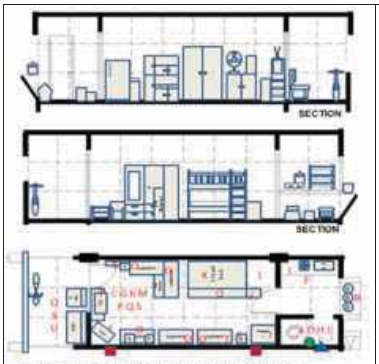
URIPS-12: C-403; 4 people; Retailer

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1.5x2	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1x2	2
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study	0.8x1.5	1.2
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play	1.5x2	3
S	enter	1.5x2	3
T	store-4	0.5x4.2	2.1
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6
X1	Material		
X2	Product	0.8x1.5	1.2
Z	Work	1x1	1



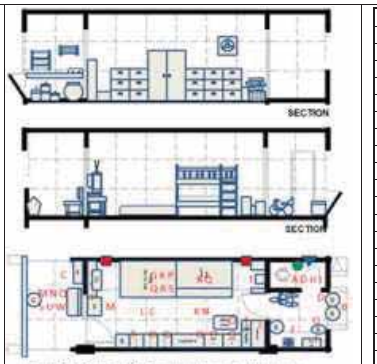
URIPS-15: C-408; 6 people; no business

A	wash	1x1	1
B	dry	C-space	
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	2x1.5	3
G	eat	1x2	2
H	d-wash	0.6x1	0.6
I	store-2	0.5x3.6	1.8
J	bath	1x2	2
K	sleep	1.8x4	7.2
L	pray	1x2	2
M	study	1x2	2
N	ch-care		
O	store-3	0.5x4.4	2.2
P	watch	1.5x2	3
Q	relax	1x1.8	1.8
R	play	ground	
S	enter	1x1.5	1.5
T	store-4	0.5x2.6	1.3
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6



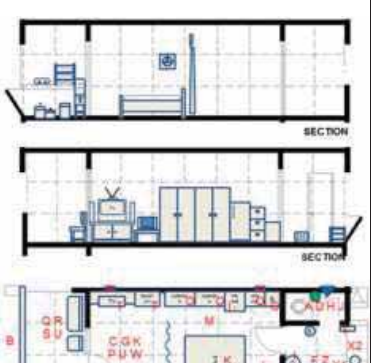
URIPS-16: B-208; 4 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	2x1.2	2.4
G	eat	1.5x1.5	2.3
H	d-wash	1x1	1
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x1.4	2.8
L	pray	1x1	1
M	study	1.5x1.5	2.3
N	ch-care		
O	store-3	0.5x5.4	2.7
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x3	1.5
U	celebra	2x3	6
V	organiz	c-space	
W	religion	c-space	



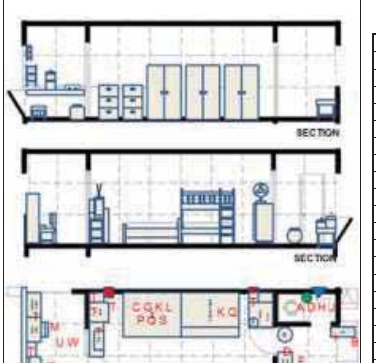
URIPS-19: B-203; 5 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2x1.4	2.8
H	d-wash	1x1	1
I	store-2	0.5x2.5	1.3
J	bath	1x2	2
K	sleep	2(2x1.4)	5.6
L	pray	1x2	2
M	study	1x1	1
N	ch-care	2x1	2
O	store-3	0.5x4	2
P	watch	2x2	4
Q	relax	2x1.4	2.8
R	play		
S	enter	2x1.4	2.8
T	store-4	0.5x4.6	2.3
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6



URIPS-17: B-309; 4 people; fried rice seller

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1x2	2
H	d-wash	1x1	1
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2x1.6	3.2
L	pray	1x1.5	1.5
M	study	1x2	2
N	ch-care		
O	store-3	0.5x3.2	1.6
P	watch	2x1.5	3
Q	relax	1x1.4	1.4
R	play	1.5x1	1.5
S	enter	1x2	2
T	store-4	0.5x2.2	1.1
U	celebra	2.5x2.5	6.3
V	organiz	c-space	
W	religion	2.5x2.5	6.3
X1	Material	0.6x1	0.6
X2	Product	0.6x1	0.6
Y	Equip		
Z	Work	2x1.5	3

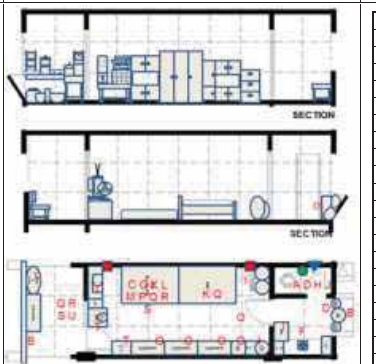


URIPS-20: B-209; 5 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1.5	0.8
F	cook	1.5x1.2	1.8
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1+0.5	1
J	bath	1x2	2
K	sleep	2(2x1.5)	6
L	pray	1x5	1.5
M	study	1.5x2	3
N	ch-care		
O	store-3	0.5x4	2
P	watch	2X2	4
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x5	2.5
U	celebra	2x3	6
V	organiz		
W	religion	2x3	6

URIPS-18: B-207; 4 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1x1.5	1.5
H	d-wash	1x1	1
I	store-2	0.5x2	1
J	bath	1x2	2
K	sleep	(1.5x1.8)+(1x1.4)	4.1
L	pray	1x1.4	1.4
M	study	1x2	2
N	ch-care		
O	store-3	0.5x5	2.5
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x2	4
T	store-4	0.5x1.2	0.6
U	celebra	2.5x1.5	3.8
V	organiz	c-space	
W	religion	2.5x1.5	3.8



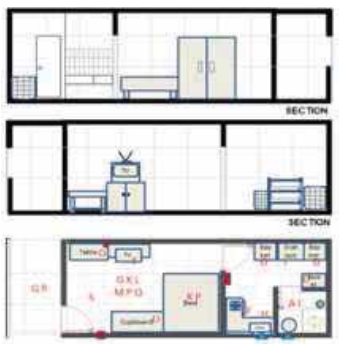
URIPS-21: A-104; 4 people; no business

A	wash	1x1	1
B	dry	1.5x0.7	1.1
C	iron	1.4x1.5	2.1
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	2X1.4	2.8
H	d-wash	1x1	1
I	store-2	0.5x2	1
J	bath	1x2	2
K	sleep	2x2x1.4	5.6
L	pray	1x2	2
M	study	2X1.4	2.8
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	2x2	4
Q	relax	2X1.4	2.8
R	play	1x3	3
S	enter	2X1.4	2.8
T	store-4	0.5x4.5	2.3
U	celebra	2x3	6
V	organiz	c-space	
W	religion	c-space	

11. TANAH MERAH

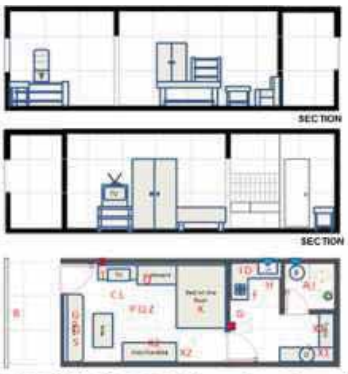
TANAH MERAH-1: C-205; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron		
D	store-1	0.5x0.5	0.3
F	cook	1x1.5	1.5
G	eat	1x1.5	1.5
H	d-wash	1.2x1	1.2
I	store-2	0.5x2	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.5+1.2)	5.4
L	pray	1x2	2
M	study		
N	ch-care	3x1.5	4.5
O	store-3	0.5x3.5	1.8
P	watch		
Q	relax	1.5x2	3
R	play	3x1.5	4.5
S	enter	2.4x1.5	3.6
T	store-4	0.5x1	0.5
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	



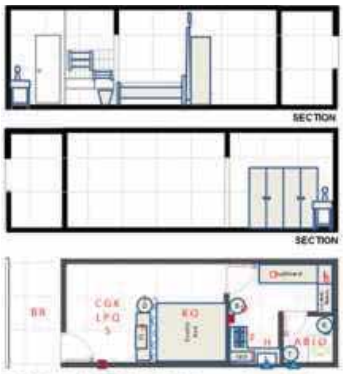
TANAH MERAH-4: C-309; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry		
C	iron		
D	store-1	0.5x1.5	0.8
F	cook	1x1.5	1.5
G	eat	1.2x2.5	3
H	d-wash	1.2x1	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.5	2.3
K	sleep	2(1.8+1.2)	6
L	pray	1x2	2
M	study	1.2x2.5	3
N	ch-care		
O	store-3	0.5x2.8	1.4
P	watch	3x1.5	4.5
Q	relax	1x2.5	2.5
R	play	3x1.5	4.5
S	enter	1x2.5	2.5
T	store-4	0.5x1.2	0.6
U	celebra	Ground	
V	organiz	ground	
W	religion	ground	



TANAH MERAH-2: D-504; 1 people; snacks retailer

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1.5	0.8
F	cook	1x1.5	1.5
G	eat	0.8x0.8	0.6
H	d-wash	1.2x1	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.5	2.3
K	sleep	2x1.5	3
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5x1.2	0.6
P	watch	1.5x1.7	2.6
Q	relax	2x1	2
R	play		
S	enter	2x1	2
T	store-4	0.5x1	0.5
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	
X1	Material	0.5x2.5	1.3
X2	Product	0.6x2	1.2
Y	Equip		
Z	Work	1.8x1.5	2.7

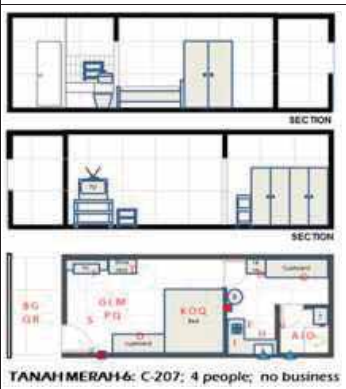


TANAH MERAH-5: D-407; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x05	0.3
F	cook	1.2x1.5	1.8
G	eat	2x1.5	3
H	d-wash	1.2x1	1.2
I	store-2	0.5x2	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.6+1)	5.2
L	pray	1x2	2
M	study		
N	ch-care		
O	store-3	0.5(1.6+1.8+1)	2.2
P	watch	3x1.5	4.5
Q	relax	3x1.5	4.5
R	play	3x1.5	4.5
S	enter	2x1.5	3
T	store-4	0.5x2.5	1.3
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	

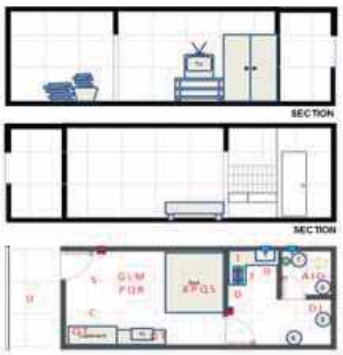
TANAH MERAH-3: D-501; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	1.5x1.5	2.3
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.6+1.2)	5.6
L	pray	1x2	2
M	study	1x1	1
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	2x1.6	3.2
Q	relax	2x1.6	3.2
R	play		
S	enter	1x1	1
T	store-4	0.5x2.8	1.4
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	



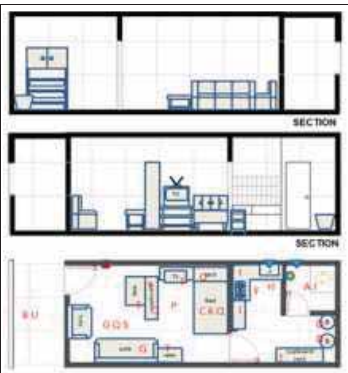
TANAH MERAH-6: C-207; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron		
D	store-1	0.5x0.5	0.3
F	cook	1.2x1.5	1.8
G	eat	1.2x2.5	3
H	d-wash	1.2x1	1.2
I	store-2	0.5x2.5	1.3
J	bath	1.5x1.5	2.3
K	sleep	2(1.8+1)	5.6
L	pray	1x2	2
M	study	1.2x2.5	3
N	ch-care		
O	store-3	0.5(1.6+1.8+0.6+1)	2.5
P	watch	1.2x2.5	3
Q	relax	3x1.5	4.5
R	play	3x1.5	4.5
S	enter	2x1	2
T	store-4	0.5x2	1
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	



TANAH MERAH-7: C-406; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	cspace	
C	iron	1x2	2
D	store-1	0.5(0.8+1	0.9
F	cook	1x1.5	1.5
G	eat	2x2.2	4.4
H	d-wash	1.2x1	1.2
I	store-2	0.5X1.5	0.8
J	bath	1.5x1.5	2.3
K	sleep	2(1.8+1)	5.6
L	pray	1x2	2
M	study	2x2.2	4.4
N	ch-care		
O	store-3	0.5(2.8+1	1.9
P	watch	2x3	6
Q	relax	2x1.8	3.6
R	play	2x2.7	5.4
S	enter	2x1.5	3
T	store-4	0.5x2.8	1.4
U	celebra	3x1.5	4.5
V	organiz	ground	
W	religion	ground	

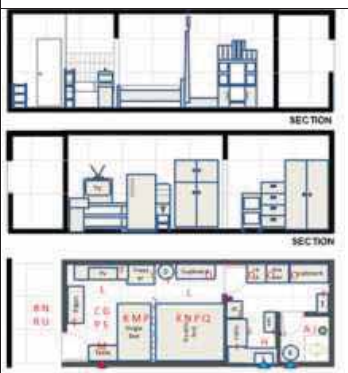


TANAH MERAH-10: D-208; 1 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x1.8	1.8
D	store-1	0.5x0.6	0.3
F	cook	1.5x1.5	2.3
G	eat	1x0.9	0.9
H	d-wash	1.2x1	1.2
I	store-2	0.5X1.5	0.8
J	bath	1.5x1.5	2.3
K	sleep	1.8x1	1.8
L	pray	outside	
M	study		
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	1.5x1	1.5
Q	relax	1.8x1	1.8
R	play		
S	enter	1.8x2.5	4.5
T	store-4	0.5x2.6	1.3
U	celebra	3x1.5	4.5
V	organiz		
W	religion	outside	

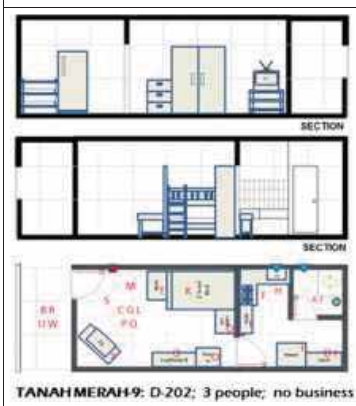
TANAH MERAH-8: D-207; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.5	0.3
F	cook	1.5x1.5	2.3
G	eat	1.5x1.5	2.3
H	d-wash	1.2x1	1.2
I	store-2	0.5X1	0.5
J	bath	1.5x1.5	2.3
K	sleep	2(1.6+1.2	5.6
L	pray	1x2	2
M	study	2x1.6	3.2
N	ch-care	3x1.5	4.5
O	store-3	0.5x2.8	1.4
P	watch	2x2	4
Q	relax	3x1.6	3.2
R	play	3x1.5	4.5
S	enter	2x2	4
T	store-4	0.5x2	1
U	celebra	3x1.5	4.5
V	organiz	3x1.5	4.5
W	religion	3x1.5	4.5



TANAH MERAH-11: D-203; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.6	0.3
F	cook	1.5x1.5	2.3
G	eat	1.5x1	1.5
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	1.8(1+2)	5.4
L	pray	1x2	2
M	study	1x1	1
N	ch-care	3x1.5	4.5
O	store-3	0.5x3	1.5
P	watch	2x3	6
Q	relax	1.8x2	3.6
R	play	3x1.5	4.5
S	enter	1.5x1	1.5
T	store-4	0.5x3.2	1.6
U	celebra	3x1.5	4.5
V	organiz		
W	religion	ground	



TANAH MERAH-9: D-202; 3 people; no business

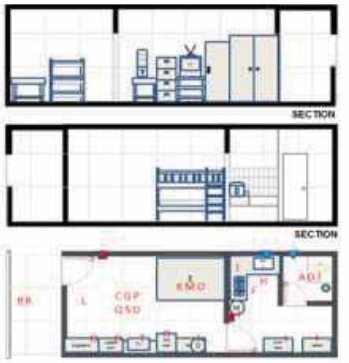
A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.5	2.3
G	eat	1x2	2
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2x1.4	2.8
L	pray	1x2	2
M	study	1x1	1
N	ch-care		
O	store-3	0.5x2.8	1.4
P	watch	2+1.5	3.5
Q	relax	1x2	2
R	play	3x1.5	4.5
S	enter	2x1.5	3
T	store-4	0.5x2.2	1.1
U	celebra	3x1.5	4.5
V	organiz		
W	religion	3x1.5	4.5

TANAH MERAH-12: C-213; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x1.8	1.8
D	store-1	0.5x1.8	0.9
F	cook	1.5x1.5	2.3
G	eat	1.8x1.5	2.7
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	1.8(1.5+1.5	5.4
L	pray	1x2	2
M	study	1.5x1.8	2.7
N	ch-care	1.5x1.8	2.7
O	store-3	0.5x3x1.4	2.1
P	watch	2x1.5	3
Q	relax	1.8x1.5	2.7
R	play	3x1.5	4.5
S	enter	1.8x1.5	2.7
T	store-4	0.5x3.4	1.7
U	celebra	Ground	
V	organiz	ground	
W	religion	ground	

TANAH MERAH-13: C-212; 7 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.6	0.3
F	cook	1x1.5	1.5
G	eat	1.8x2.5	4.5
H	d-wash	1.2x1	1.2
I	store-2	0.5X1	0.5
J	bath	1.5x1.5	2.3
K	sleep	1.8x2.5) + (1.5x1.5)	6.8
L	pray	1x2	2
M	study	1.8x2.5	4.5
N	ch-care	1.8x1.25	2.3
O	store-3	0.5(1.6+ 1.4+1.5)	2.3
P	watch	2x3	6
Q	relax	1.8x1.25	2.3
R	play	3x1.5	4.5
S	enter	1x2	2
T	store-4	0.5x2.5	1.3
U	celebra	3x1.5	4.5
V	organiz		
W	religion	3x1.5	4.5

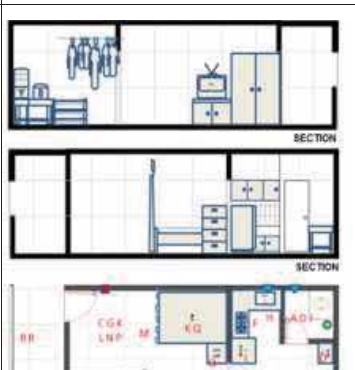


TANAH MERAH-16: C-203; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.5	2.3
G	eat	1x2.5	2.5
H	d-wash	1.2x1	1.2
I	store-2	0.5x3	1.5
J	bath	1.5x1.5	2.3
K	sleep	2x2x1.4	5.6
L	pray	1x1.5	1.5
M	study	2x1.4	2.8
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	2x2.5	5
Q	relax	1x2	2
R	play	3x1.5	4.5
S	enter	2x2	4
T	store-4	0.5x1	0.5
U	celebra	2.5x2.5	6.3
V	organiz		
W	religion		

TANAH MERAH-14: D-201; 4 people; tailor

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	0.6x2	1.2
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.8+1)	5.6
L	pray	1x.5	1.5
M	study	1.2x2	2.4
N	ch-care	1.8x2	3.6
O	store-3	0.5x2	1
P	watch	1.8x1.5	2.7
Q	relax	1.8x2	3.6
R	play	3x1.5	4.5
S	enter	1.5x1.5	2.3
T	store-4	0.5x1.2	0.6
U	celebra	3x1.5	4.5
V	organiz		
W	religion	3x1.5	4.5
X1	Material	0.5x2.6	1.3
X2	Product	0.5x2.6	1.3
Y	Equip	0.5x2.7	1.4
Z	Work	0.5x2.7	1.4

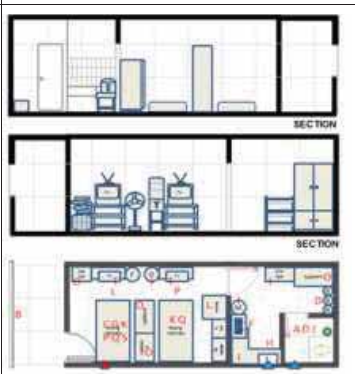


TANAH MERAH-17: D-510; 5 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1.4	0.7
F	cook	1.5x1.5	2.3
G	eat	1x2.5	2.5
H	d-wash	1.2x1	1.2
I	store-2	0.5x2	1
J	bath	1.5x1.5	2.3
K	sleep	2(1.6+1.2)	5.6
L	pray	1x2	2
M	study	1.5x1	1.5
N	ch-care	2x1.5	3
O	store-3	0.5x2.8	1.4
P	watch	2x2.5	5
Q	relax	1.6x2	3.2
R	play	3x1.5	4.5
S	enter		
T	store-4	0.5x1.2	0.6
U	celebra		
V	organiz		
W	religion		

TANAH MERAH-15: D-304; 4 people; no business

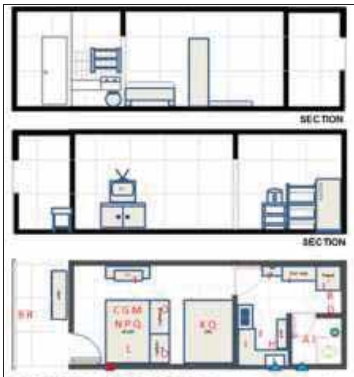
A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.5	2.3
G	eat	1x2	2
H	d-wash	1.2x1	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.5	2.3
K	sleep	2(1.5+1)	5
L	pray	1x2	2
M	study	2x0.8	1.6
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	2x2	4
Q	relax	2x1.5	3
R	play	3x1.5	4.5
S	enter	2x1.2	2.4
T	store-4	0.5x3.8	1.9
U	celebra	C-space	
V	organiz	ground	
W	religion	ground	



TANAH MERAH-18: D-309; 3 people; no business

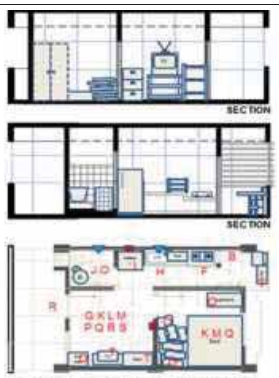
A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1.6	0.8
F	cook	1.5x1.5	2.3
G	eat	2x1	2
H	d-wash	1.2x1	1.2
I	store-2	0.5x2+0.5	1.5
J	bath	1.5x1.5	2.3
K	sleep	2x2x1	4
L	pray	0.6x2	1.2
M	study		
N	ch-care		
O	store-3	0.5x3.6	1.8
P	watch	2x2	4
Q	relax	2x1	2
R	play		
S	enter	2x1	2
T	store-4	0.5x2	1
U	celebra	Public	
V	organiz	ground	
W	religion	ground	

12. PENJARINGAN 3



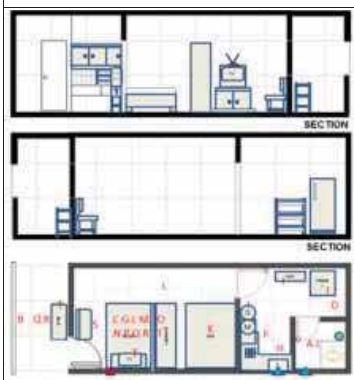
TANAH MERAH-19: D-509; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.5	2.3
G	eat	2x11.2	2.4
H	d-wash	1.2x0.8	1
I	store-2	0.5x2+0.5	1.5
J	bath	1.5x1.5	2.3
K	sleep	2(1.2+1.4)	5.2
L	pray	1x1.5	1.5
M	study		
N	ch-care	2x1.2	2.4
O	store-3	0.5x2	1
P	watch	2x2.5	5
Q	relax	2x1.2	2.4
R	play	3x1.5	4.5
S	enter		
T	store-4	0.5x1.6	0.8
U	celebra		
V	organiz		
W	religion		



PENJAR 3-1: 501; 5p; no business

A	wash		
B	dry		
C	iron		
D	store-1		
F	cook	1.5x1.2	1.8
G	eat	2X2	4
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.8+1.5	6.6
L	pray	1x1.5	1.5
M	study	2X1.5	3
N	ch-care		
O	store-3	0.5x4.2	2.1
P	watch	2.5X2	5
Q	relax	1.8X2	3.6
R	play	2X2	4
S	enter	2x1.5	3
T	store-4	0.5x2.6	1.3
U	celebra		
V	organiz		
W	religion		



TANAH MERAH-20: D-305; 4 people; no business

A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x1.5	1.5
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.5	2.3
G	eat	1x1.2	1.2
H	d-wash	1.2x1	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2x1.4	2.8
L	pray	1x1.5	2
M	study	1x1.2	1.2
N	ch-care	1.5x1.2	1.8
O	store-3	0.5x2	1
P	watch	2x2	4
Q	relax	1.5x1.5	2.3
R	play	3x1	3
S	enter		
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		

PENJAR 3-2: 502; 3p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x15	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.7	2.6
K	sleep	2x1.8	3.6
L	pray	1x1.5	1.5
M	study		
N	ch-care	1.8X2	3.6
O	store-3	0.5x0.9	0.5
P	watch		
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.6	3
T	store-4	2x2	4
U	celebra		
V	organiz		
W	religion		

TANAH MERAH-21: D-307; 3 people; no business

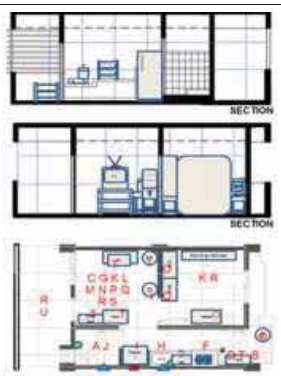
A	wash	1.5x0.8	1.2
B	dry	0.6x3	1.8
C	iron	1x2	2
D	store-1	0.5x1.2	0.6
F	cook	1x1.5	1.5
G	eat	1.5x1.5	2.3
H	d-wash	1.2x1	1.2
I	store-2	1.5x1 + 0.5	1
J	bath	1.5x1.5	2.3
K	sleep	2x1.5	3
L	pray	1x2	2
M	study	2x1.5	3
N	ch-care	2x1.5	3
O	store-3	0.5x2.6	1.3
P	watch	2x2	4
Q	relax	2x2.5	3
R	play	3x1.5	4.5
S	enter	2x2	4
T	store-4	0.5x3	1.5
U	celebra	3x1.5	4.5
V	organiz	ground	
W	religion	ground	

PENJAR 3-3: 304; 3p; no business

A	wash		
B	dry		
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.4	0.2
F	cook	1.5x1.2	1.8
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.5+1)	5
L	pray	1x1.5	1.5
M	study		
N	ch-care	public	
O	store-3	0.5x3	1.5
P	watch	2x2	4
Q	relax	2x1.5	3
R	play		
S	enter	2x2	4
T	store-4	0.5x3	1.5
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion		

PENJAR 3-4: 503; 7p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5X1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	2X1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(2+1.6)	7.2
L	pray	1x2	2
M	study	2X1.5	3
N	ch-care	2X1.6	3.2
O	store-3	0.5x4	2
P	watch	1.5X2	3
Q	relax	2X1.6	3.2
R	play		
S	enter	2X1.5	3
T	store-4	0.5x1.6	0.8
U	celebra		
V	organiz		
W	religion		



PENJAR 3-7 524; 5p; no business

A	wash	1.5x0.8	1.2
B	dry	6	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x 0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	2X1.5	3
H	d-wash	1x1.2	1.2
I	store-2	1.5x1+0.5	1
J	bath	1.5x1.7	2.6
K	sleep	(1.4+1.8	6.4
L	pray	1x1.5	1.5
M	study	2X1.5	3
N	ch-care	2X1.5	3
O	store-3	0.5x2.8	1.4
P	watch	2.5X1.5	3.8
Q	relax	2X1.5	3
R	play	2X1.5	3
S	enter	2X1.5	3
T	store-4	0.5x3.4	1.7
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion		

PENJAR 3-5: 222; 3p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5X1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	2x1	2
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.5+1)	5
L	pray	1x1.5	1.5
M	study		
N	ch-care	2x2	4
O	store-3	0.5x2.4	1.2
P	watch	2X2	4
Q	relax	2x2	4
R	play	2X2	4
S	enter	2x2	4
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

PENJAR 3-8: 517; 3p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.2x15	1.8
D	store-1	0.5x 0.6	0.3
F	cook	1.5x1.2	1.8
G	eat	1.2x1.8	2.2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.7	2.6
K	sleep	L.8(1.2+2	5.8
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care	2x1.8	3.6
O	store-3	0.5x2	1
P	watch	2x2	4
Q	relax	2x1.8	3.6
R	play	2x1.8	3.6
S	enter	1.2x1.8	2.2
T	store-4	0.5x1.8	0.9
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion	3.6x1.5	5.4

PENJAR 3-6: 302; 4p; no business

A	wash	0.8x1.5	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.6x0.3	0.2
F	cook	1.5x1.2	1.8
G	eat	2x1.5	3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5+ 0.5	1.3
J	bath	1.5x1.7	2.6
K	sleep	2(1.4+1.8	6.4
L	pray	1x2	2
M	study	2X1.2	2.4
N	ch-care	2x1.8	3.6
O	store-3	0.5x3.2	1.6
P	watch	2x2	4
Q	relax	2x1.8	3.6
R	play	2x2	4
S	enter	2x2	4
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		

PENJAR 3-9: 521; 4p; no business

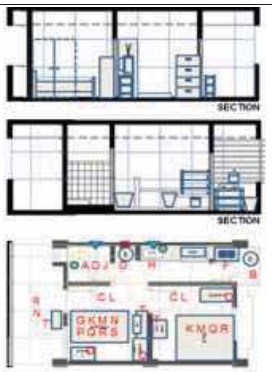
A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1.5x1.2	1.8
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5 +0.5	1.3
J	bath	1.5x1.7	2.6
K	sleep	2(2X1.5)	6
L	pray	1x1.5	1.5
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	2x1.5	3
S	enter	2x1.5	3
T	store-4	0.5x2.4	1.2
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion	3.6x1.5	5.4

PENJAR 3-10: 311; 1p; no business

A	wash		
B	dry		
C	iron		
D	store-1	0.5x0.4	0.2
F	cook	1.5x1.2	1.8
G	eat	1.2x1.2	1.4
H	d-wash	1x1.2	1.2
I	store-2	05x1.5	0.8
J	bath	1.5x1.7	2.6
K	sleep	2x1.5	3
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	2x1.2	2.4
Q	relax	1.5x2	3
R	play		
S	enter	1.2x2	2.4
T	store-4	0.5x1.8	0.9
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion	3.6x1.5	5.4

PENJAR 3-13: 520; 3p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x15	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	2X1	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5 +0.5	1.3
J	bath	1.5x1.7	2.6
K	sleep	2(1.2+1.6)	5.6
L	pray	1x1.5	1.5
M	study	1.5x1.5	2.3
N	ch-care	2X1.6	3.2
O	store-3	0.5x2	1
P	watch	2.5x2	5
Q	relax	1.6x2	3.2
R	play		
S	enter	2x2	4
T	store-4	0.5x1	0.5
U	celebra	Ground	
V	organiz		
W	religion	ground	



PENJAR 3-11: 529; 4p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.2	1.8
D	store-1	0.5x0.4	0.2
F	cook	2.5x1.2	3
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2		0
J	bath	1.5x1.7	2.6
K	sleep	2(1.2+1.8)	6
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care	2x1.2	2.4
O	store-3	0.5x3.5	1.8
P	watch	1.5x3	4.5
Q	relax	2x1.8	3.6
R	play	2x1.2	2.4
S	enter	2x1.2	2.4
T	store-4	0.5x2.6	1.3
U	celebra	Ground	
V	organiz	ground	
W	religion	ground	

PENJAR 3-14: 218; 3p; no business

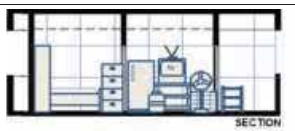
A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x15	2.3
D	store-1	0.5x0.6	0.3
F	cook	1.5x1.2	1.8
G	eat	1.5X1.2	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.7	2.6
K	sleep	2(1.2+1.6)	5.6
L	pray	1x1.5	1.5
M	study		
N	ch-care		
O	store-3	0.5x4.6	2.3
P	watch	2x2	4
Q	relax	2X1.6	3.2
R	play		
S	enter	2X1.2	2.4
T	store-4	0.5x2.4	1.2
U	celebra		
V	organiz		
W	religion		

PENJAR 3-12: 312; 4p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron		
D	store-1	0.5x1	0.5
F	cook	2.5x1.2	3
G	eat	2x1.2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.2+1.6)	5.6
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	1.5x2.5	3.8
Q	relax	1.2x2	2.4
R	play		
S	enter	1.2x2	2.4
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

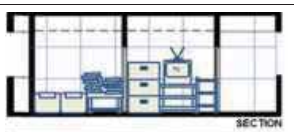
PENJAR 3-15: 201; 5p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	1.2x1.5	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.4+1.8)	6.4
L	pray	0.8x1.5	1.2
M	study		
N	ch-care	2x1.8	3.6
O	store-3	0.5x3.6	1.8
P	watch	1.8x2.5	4.5
Q	relax	2x1.8	3.6
R	play	2x1.4	2.8
S	enter	2x1.4	2.8
T	store-4	0.5x2.5	1.3
U	celebra	ground	
V	organiz		
W	religion		



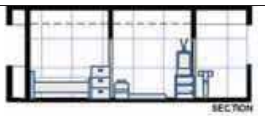
PENJAR 3-16: 305; 4p; kopyor ice seller

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	1x2	2
H	d-wash	1x1.2	1.2
I	store-2	0.5x1+0.5	1
J	bath	1.5x1.7	2.6
K	sleep	2(2X1.6)	6.4
L	pray	1x1.5	1.5
M	study	1.5x1.6	2.4
N	ch-care		
O	store-3	0.5x3.3	1.7
P	watch	2.5X1,8	4.5
Q	relax	2X1.6	3.2
R	play		
S	enter	2x2	4
T	store-4	0.5x2.8	1.4
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion		
X1	Material	0.8x0.8	0.6
X2	Product	0.8x0.8	0.6
Y	Equip		
Z	Work	0.9x2	1.8



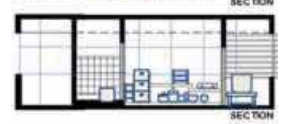
PENJAR 3-19: 409; 1p; no business

A	wash		
B	dry		
C	iron		
D	store-1	0.5x0.8	0.4
F	cook		
G	eat	outside	
H	d-wash	1x1.2	1.2
I	store-2	0.5x2	1
J	bath	1.5x1.7	2.6
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	1.2x1.5	1.8
N	ch-care		
O	store-3	0.5x4.5	2.3
P	watch	2x1.5	3
Q	relax	1.2x1.5	1.8
R	play		
S	enter	1.2x1.5	1.8
T	store-4	0.5x4.2	2.1
U	celebra		
V	organiz		
W	religion		



PENJAR 3-17: 415; 3p; no business

A	wash		
B	dry		
C	iron		
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	1.2X2	2.4
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.2+1.6	5.6
L	pray	0.8x2	1.6
M	study		
N	ch-care	2x1.6	3.2
O	store-3	0.5x2.8	1.4
P	watch	2.5x1.5	3.8
Q	relax	2x1.2	2.4
R	play	2x1.2	2.4
S	enter	2x1.2	2.4
T	store-4	0.5x4.2	2.1
U	celebra		
V	organiz		
W	religion		

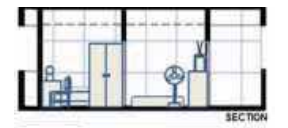


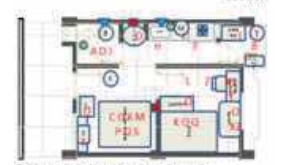
PENJAR 3-20: 407; 4p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.4	2.1
D	store-1	0.5x1.8	0.9
F	cook	1.5x1.2	1.8
G	eat	1.5x1.4	2.1
H	d-wash	1x1.2	1.2
I	store-2	0.5x1.5	0.8
J	bath	1.5x1.7	2.6
K	sleep	2(2x1.4)	5.6
L	pray	1x1.5	1.5
M	study	2x1.4	2.8
N	ch-care	2x1.4	2.8
O	store-3	0.5x4.3	2.2
P	watch	2.5x1.8	4.5
Q	relax	2x1.4	2.8
R	play	ground	
S	enter	2x1.4	2.8
T	store-4	0.5x2.4	1.2
U	celebra	public	
V	organiz		
W	religion		

PENJAR 3-18: 410; 3p; no business

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	1.5x1.2	1.8
H	d-wash	1x1.2	1.2
I	store-2	0.5	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(1.2x1.6	5.6
L	pray	1x1.5	1.5
M	study	2x1.2	2.4
N	ch-care	2x1.6	3.2
O	store-3	0.5x3	1.5
P	watch	1.5x2.5	3.8
Q	relax	2x1.6	3.2
R	play	2x1.2	2.4
S	enter	2x1.2	2.4
T	store-4	0.5x5.5	2.8
U	celebra	3.6x1.5	5.4
V	organiz		
W	religion		





PENJAR 3-21: 513; 4p; tailor

A	wash	1.5x0.8	1.2
B	dry	1.5X1.2	1.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1.5x1.2	1.8
G	eat	1.5x1.5	2.3
H	d-wash	1x1.2	1.2
I	store-2	0.5x1	0.5
J	bath	1.5x1.7	2.6
K	sleep	2(2x1.5)	6
L	pray	1x1.5	1.5
M	study	2x1.5	3
N	ch-care		
O	store-3	0.5x4.4	2.2
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play	outside	
S	enter	2x1.5	3
T	store-4	0.5x1.8	0.9
U	celebra		
V	organiz		
W	religion		
X1	Material	0.6x1.2	0.7
X2	Product	0.6x1.5	0.9
Y	Equip	0.6x1.2	0.7
Z	Work	1.2x1	1.2

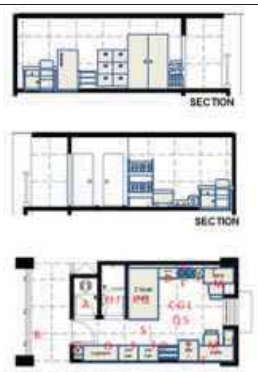
13. ITS

ITS-1 : H-209; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x0.8	0.4
F	cook	1x0.8	0.8
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.6	0.8
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1.2x2	2.4
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x3	1.5
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

ITS-4: H-222; 2p; no business

A	wash	1x1	1
B	dry		
C	iron		
D	store-1		
F	cook		
G	eat		
H	d-wash	1x1	1
I	store-2	0.5x2.4	1.2
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2	1
P	watch		
Q	relax	2x2	4
R	play		
S	enter	2x2	4
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		



ITS-2: H-237; 2p; no business

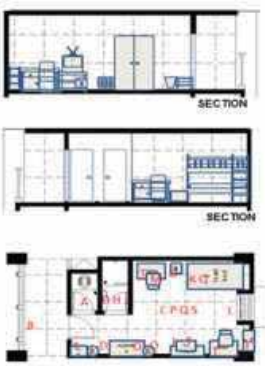
A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x0.8	0.4
F	cook	0.8x1	0.8
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1+0.6	1.1
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2.7	1.4
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.6	1.8
U	celebra		
V	organiz		
W	religion		

ITS-5: H-319; 2p; no business

A	wash		
B	dry		
C	iron		
D	store-1		
F	cook		
G	eat		
H	d-wash	1x1	1
I	store-2	0.5x1.2	0.6
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2.6	1.3
P	watch	2.5x1.5	3.8
Q	relax	2x1.8	3.6
R	play		
S	enter	2x1.8	3.6
T	store-4	0.5x3.6	1.8
U	celebra		
V	organiz		
W	religion		

ITS-3: H-308; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x1.2	0.6
F	cook		
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.6	0.8
J	bath	2x1	2
K	sleep	1.5x2	3
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x4	2
P	watch	C-space	
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x4.3	2.2
U	celebra		
V	organiz		
W	religion		



ITS-6: H-221; 1p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x1	0.5
F	cook		
G	eat		
H	d-wash	1x1	1
I	store-2	0.5x1.2	0.6
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	1.5x2.4	3.6
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x4.6	2.3
U	celebra		
V	organiz		
W	religion		

ITS-7: H-303; 2p; no business

A	wash		
B	dry		
C	iron		
D	store-1	0.5x1.5	0.8
F	cook	0.8x1.5	1.2
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x2.5	1.3
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x2.3	1.2
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.8	1.9
U	celebra		
V	organiz		
W	religion		

ITS-10: H-307; 2p; no business

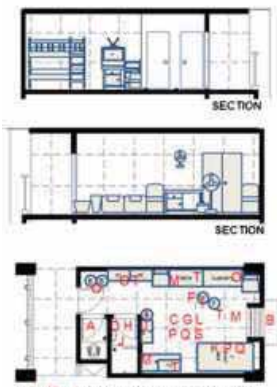
A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x1	0.5
F	cook	1x1	1
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x0.8 +0.6	1.2
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x2.5	1.3
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x4.5	2.3
U	celebra		
V	organiz		
W	religion		

ITS-8: H-326; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	1x0.4	0.4
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.4	0.7
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x3.5	1.8
P	watch	C-space	
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x2	1
U	celebra		
V	organiz		
W	religion		

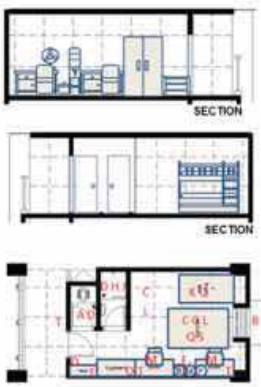
ITS-11: H-315; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x2	1
F	cook		
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.2	0.6
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x6.4	3.2
U	celebra		
V	organiz		
W	religion		



ITS-9: H-309; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x1	0.5
F	cook	1x1	1
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.8	0.9
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x3.3	1.7
P	watch	1.5x2	3
Q	relax	1.5X2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.2	1.6
U	celebra		
V	organiz		
W	religion		



ITS-12: H-321; 2p; no business

6	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5X2	3
D	store-1	0.5x2	1
F	cook	1x0.8	0.8
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x0.8	0.4
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.4	1.7
U	celebra		
V	organiz		
W	religion		

ITS-13: H-325; 2p; no business

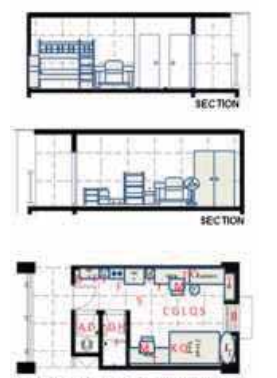
A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x0.6	0.3
F	cook	1x1.5	1.5
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x2.5	1.3
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x1.6	0.8
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.4	1.7
U	celebra		
V	organiz		
W	religion		

ITS-16: H-227; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	2x1.5	3
D	store-1	0.5x1	0.5
F	cook	0.5x0.8	0.4
G	eat	2x1.5	3
H	d-wash	1x1	1
I	store-2	0.5x0.4	0.2
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x3.4	1.7
P	watch	2x1.5	3
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x6	3
U	celebra		
V	organiz		
W	religion		

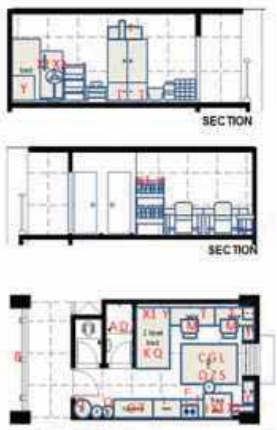
ITS-14: H-225; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x2	1
F	cook		
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.6	0.8
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2	1
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x5.5	2.8
U	celebra		
V	organiz		
W	religion		



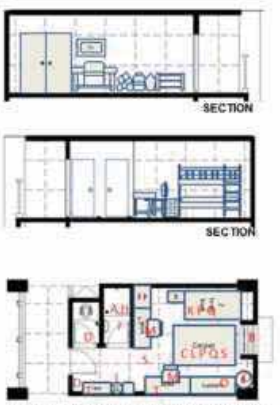
ITS-17: H-313; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.2x2.5	3
D	store-1	0.5x2	1
F	cook	1x2	2
G	eat	1.2x2.5	3
H	d-wash	1x1	1
I	store-2	0.5x2.4	1.2
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	C-space	
Q	relax	1.2x2.5	3
R	play		
S	enter	1.2x2.5	3
T	store-4	0.5x4.8	2.4
U	celebra		
V	organiz		
W	religion		



ITS-15: H-212; 2p; ice cream producer

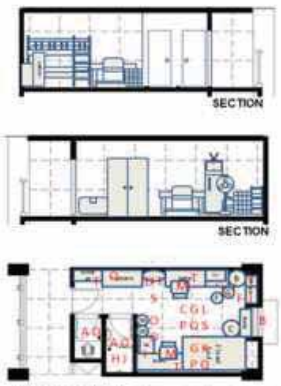
A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	2x1.5	3
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.5 +0.6	1.4
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2.5	1.3
P	watch	C-space	
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3.8	1.9
U	celebra		
V	organiz		
W	religion		
X1	Material	0.5x1.2+ 0.6	1.2
X2	Product	0.8x0.8	0.6
Y	Equip	.5(1.2+0.1	1
Z	Work	1.5x2	3



ITS-18: H-304; 1p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	2
D	store-1	0.5x1	0.5
F	cook		
G	eat	outside	
H	d-wash	1x1	1
I	store-2	0.5x1.2	0.6
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2	3.6
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.5x2	3
Q	relax	1.5x2	3
R	play		
S	enter	1.5X2	3
T	store-4	0.5x3.4	1.7
U	celebra		
V	organiz		
W	religion		

14. UNESA



ITS-19: H-301; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x2	1
F	cook	0.8x1	0.8
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.5 +0.6	1.4
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x1.5	0.8
P	watch	2x2	4
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x5	1.5
U	celebra		
V	organiz		
W	religion		

UNESA-1: 220; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5(1+1)	1
F	cook	0.6x1	0.6
G	eat	2x1	2
H	d-wash	C-space	
I	store-2	0.5x1.2	0.6
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x9	4.5
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.2	2.4
T	store-4	0.5x6	3
U	celebra		
V	organiz		
W	religion		

ITS-20: H-202; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x2	1
F	cook	1x1	1
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x1.8 +0.6	1.5
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x3	1.5
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter		
T	store-4	0.5x4.2	2.1
U	celebra		
V	organiz		
W	religion		

UNESA-2: 217; 3p; no business

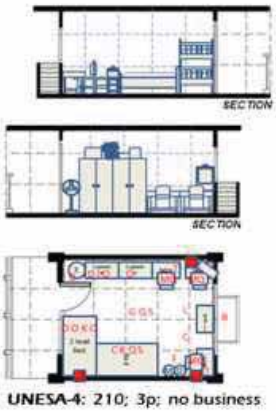
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x2	1
F	cook	1x1	1
G	eat	2x1	2
H	d-wash	C-space	
I	store-2	0.5x1.6	0.8
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x4.6	2.3
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		

ITS-21: H-312; 2p; no business

A	wash	1x1	1
B	dry	0.5x1.6	0.8
C	iron	1.5x2	3
D	store-1	0.5x1	0.5
F	cook	1x1.5	1.5
G	eat	1.5x2	3
H	d-wash	1x1	1
I	store-2	0.5x3.4	1.7
J	bath	2x1	2
K	sleep	1.2x2	2.4
L	pray	1x1.5	1.5
M	study	2(1.5x1.2)	3.6
N	ch-care		
O	store-3	0.5x2.3	1.2
P	watch		
Q	relax	1.5x2	3
R	play		
S	enter	1.5x2	3
T	store-4	1x1	1
U	celebra		
V	organiz		
W	religion		

UNESA-3: 203; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook		
G	eat	2x1.5	3
H	d-wash	C-space	
I	store-2	0.5x2.2	1.1
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x5.8	2.9
U	celebra		
V	organiz		
W	religion		



UNESA-4: 210; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	1x2.8	1.4
F	cook	1x0.8	0.8
G	Eat	1.5x2	3
H	d-wash	C-space	
I	store-2	0.5x1.6	0.8
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	1.5x2	3
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		

UNESA-7: 224; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x1	1
G	eat	1.5x1.5	2.3
H	d-wash	C-space	
I	store-2	0.5x2	1
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

UNESA-5: 201; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x2	1
F	cook	1x0.8	0.8
G	eat	1.5x1.5	2.3
H	d-wash	C-space	
I	store-2	0.5x1.8	0.9
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x3	1.5
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x5	2.5
U	celebra		
V	organiz		
W	religion		

UNESA-8: 308; 4p; no business

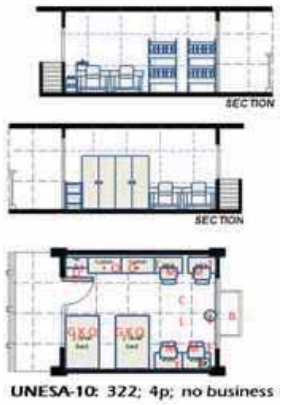
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1x1.5	1.5
D	store-1	0.5x1	0.5
F	cook	C-space	
G	eat	2x1.2	2.4
H	d-wash	C-space	
I	store-2	0.5x1	0.5
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	2x1.2	2.4
Q	relax	2x1.2	2.4
R	play		
S	enter	2x1.2	2.4
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

UNESA-6: 208; 3p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1x1.8	1.8
D	store-1	0.5x1.6	0.8
F	cook	0.6x1	0.6
G	eat	2x1.5	3
H	d-wash	C-space	
I	store-2	0.5x1	0.5
J	bath	C-space	
K	sleep	3(2x1)	4
L	pray	1x1.5	1.5
M	study	3(1x1.5)	4.5
N	ch-care		
O	store-3	0.5x4	2
P	watch	C-space	
Q	relax	2x1.5	3
R	play		
S	enter	2x1.5	3
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

UNESA-9: 305; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x 0.8	0.4
F	cook	1x1	1
G	eat	1.5x1.5	2.3
H	d-wash	C-space	
I	store-2	0.5x3.6	1.8
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2x2	4
R	play		
S	enter	1.5x1.5	2.3
T	store-4	0.5x6	3
U	celebra		
V	organiz		
W	religion		



UNESA-10: 322; 4p; no business

A	wash	C-space	
B	dry	C-space	
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1x0.6	0.6
G	eat	2x1	2
H	d-wash	C-space	
I	store-2	0.5x1.2	0.6
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2(1x2)	4
R	play		
S	enter	C-space	
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

UNESA-13: 320; 4p; no business

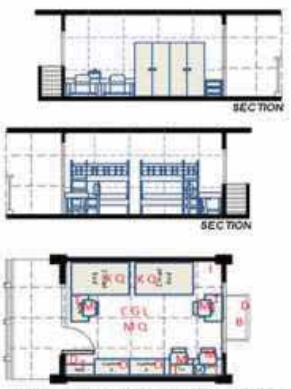
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook	C-space	
G	eat	2x2	4
H	d-wash	C-space	
I	store-2	0.5x0.4	0.2
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.5X2	3
Q	relax	2X2	4
R	play		
S	enter	2X2	4
T	store-4	0.5x4.6	2.3
U	celebra		
V	organiz		
W	religion		

UNESA-11: 324; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron		
D	store-1	0.5x0.6	0.3
F	cook	C-space	
G	eat	2x1.5	3
H	d-wash	C-space	
I	store-2	0.5x0.8	0.4
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2(1x2)	4
R	play		
S	enter	2x1.5	3
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

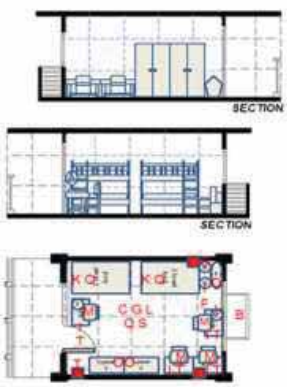
UNESA-14: 302; 4p; no business

A	wash	C-space	
B	dry	C-space	
C	iron	1.5X1.4	2.1
D	store-1	0.5x0.6	0.3
F	cook		
G	eat	2x1.4	2.8
H	d-wash	C-space	
I	store-2	0.5x1.2	0.6
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2(1x2)	4
R	play		
S	enter	ground	
T	store-4	0.5x5	2.5
U	celebra		
V	organiz		
W	religion		



UNESA-12: 309; 3p; no business

A	wash	C-space	
B	dry	C-space	
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	C-space	
G	eat	2x2	4
H	d-wash	C-space	
I	store-2	0.5x0.8	0.4
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2x2	4
R	play		
S	enter	ground	
T	store-4	0.5x3	1.5
U	celebra		
V	organiz		
W	religion		



UNESA-15: 416; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook	1x0.8	0.8
G	eat	2X2	4
H	d-wash	C-space	
I	store-2	0.5x2.6	1.3
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2.4	1.2
P	watch	C-space	
Q	relax	2x2	4
R	play		
S	enter	2X2	4
T	store-4	0.5x4.6	2.3
U	celebra		
V	organiz		
W	religion		

UNESA-16: 421; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1	0.5
F	cook		
G	eat	2x2	4
H	d-wash	C-space	
I	store-2	0.5x3.2	1.6
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2.5	1.3
P	watch	C-space	
Q	relax	2X2	4
R	play		
S	enter	ground	
T	store-4	0.5x5	2.5
U	celebra		
V	organiz		
W	religion		

UNESA-19: 422; 4p; no business

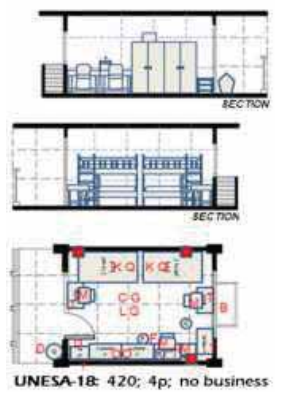
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1x1.5	1.5
G	eat	2x2	4
H	d-wash	C-space	
I	store-2	0.5x0.4	0.2
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2x2	4
R	play		
S	enter	ground	
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

UNESA-17: 418; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.8	0.4
F	cook	1x1	1
G	eat	2X2	4
H	d-wash	C-space	
I	store-2	0.5x1.5	0.8
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2X2	4
R	play		
S	enter	1.5x2	3
3T	store-4	C-space	
U	celebra		
V	organiz		
W	religion		

UNESA-20: 424; 4p; no business

A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5X1.5	2.3
D	store-1	0.5x1	0.5
F	cook	0.5x0.4	0.2
G	eat	1.8x1.5	2.7
H	d-wash	C-space	
I	store-2	0.5x1.6	0.8
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	1.8x1.5	2.7
Q	relax	2X2	4
R	play		
S	enter		
T	store-4	0.5x6	3
U	celebra		
V	organiz		
W	religion		



UNESA-18: 420; 4p; no business

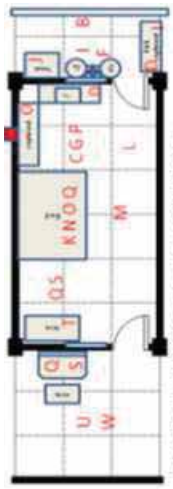
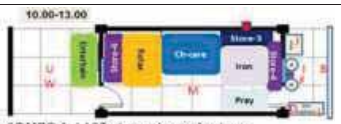
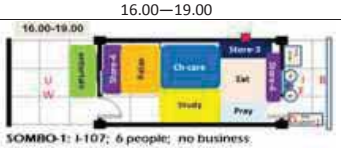
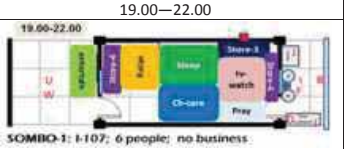
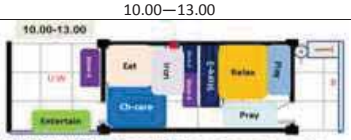
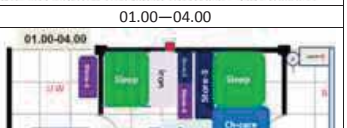
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x1.2	0.6
F	cook	0.5x0.6	0.3
G	eat	2X2	4
H	d-wash	C-space	
I	store-2	0.5x1.4	0.7
J	bath	C-space	
K	sleep	2(2x1)	4
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2X2	4
R	play		
S	enter	ground	
T	store-4	0.5x4.6	2.3
U	celebra		
V	organiz		
W	religion		

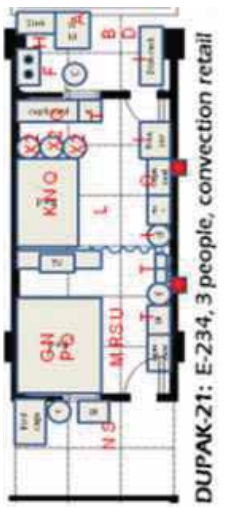
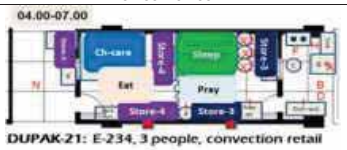
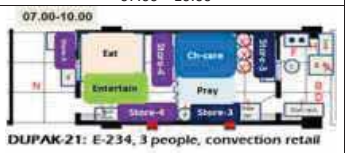
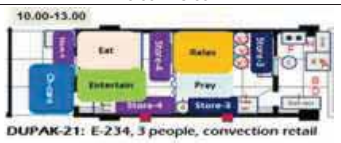
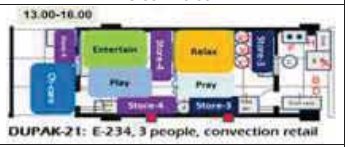
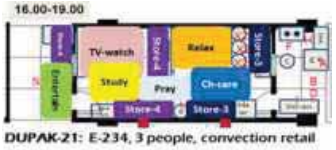
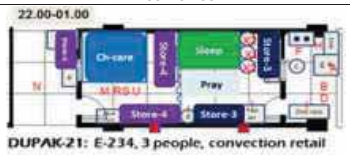
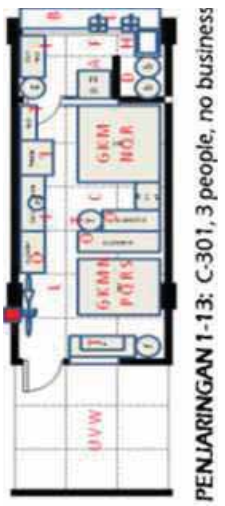
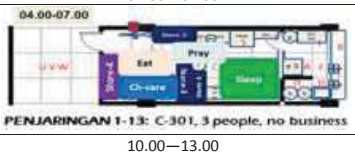
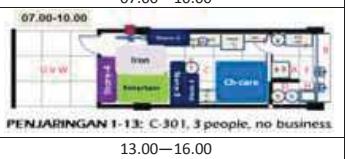
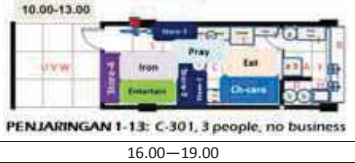
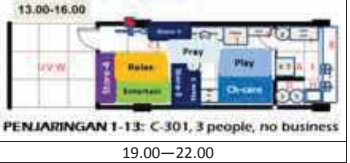
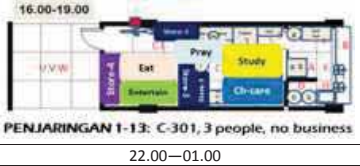
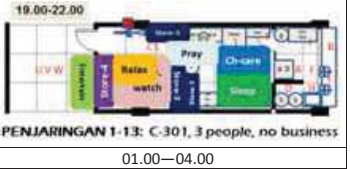
UNESA-21: 423; 4p; no business

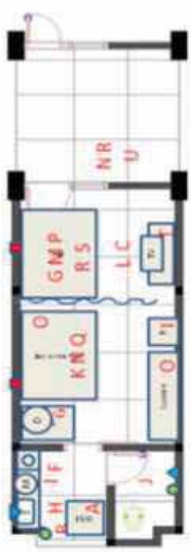
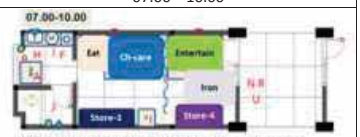
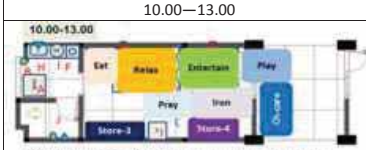
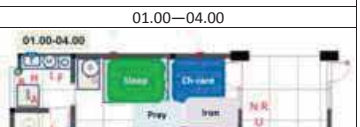
A	wash	C-space	
B	dry	0.5x1.6	0.8
C	iron	1.5x1.5	2.3
D	store-1	0.5x0.6	0.3
F	cook		
G	eat	2X1.2	2.4
H	d-wash	C-space	
I	store-2	0.5x0.4	0.2
J	bath	C-space	
K	sleep	3(2x1)	6
L	pray	1x1.5	1.5
M	study	4(1x1.5)	6
N	ch-care		
O	store-3	0.5x2	1
P	watch	C-space	
Q	relax	2(1x2)	4
R	play		
S	enter	ground	
T	store-4	0.5x4	2
U	celebra		
V	organiz		
W	religion		

APPENDIX - 4

Three Hourly Use of Space (Functional Adaptation)

1. SOMBO  SOMBO-1: I-107; 6 people; no business	MORNING	04.00—07.00  SOMBO-1: I-107; 6 people; no business	07.00—10.00  SOMBO-1: I-107; 6 people; no business
	DAYTIME	10.00—13.00  SOMBO-1: I-107; 6 people; no business	13.00—16.00  SOMBO-1: I-107; 6 people; no business
	EVENING	16.00—19.00  SOMBO-1: I-107; 6 people; no business	19.00—22.00  SOMBO-1: I-107; 6 people; no business
	NIGHT	22.00—01.00  SOMBO-1: I-107; 6 people; no business	01.00—04.00  SOMBO-1: I-107; 6 people; no business
2. SIMO  SIMOLAWANG-13: A-215; 5 people; no business	MORNING	04.00—07.00  SIMOLAWANG-13: A-215; 5 people; no business	07.00—10.00  SIMOLAWANG-13: A-215; 5 people; no business
	DAYTIME	10.00—13.00  SIMOLAWANG-13: A-215; 5 people; no business	13.00—16.00  SIMOLAWANG-13: A-215; 5 people; no business
	EVENING	16.00—19.00  SIMOLAWANG-13: A-215; 5 people; no business	19.00—22.00  SIMOLAWANG-13: A-215; 5 people; no business
	NIGHT	22.00—01.00  SIMOLAWANG-13: A-215; 5 people; no business	01.00—04.00  SIMOLAWANG-13: A-215; 5 people; no business

3. DUPAK 	MORNING	04.00—07.00 	07.00—10.00 
	DAYTIME	10.00—13.00 	13.00—16.00 
	EVENING	16.00—19.00 	19.00—22.00 
	NIGHT	22.00—01.00 	01.00—04.00 
4. PENJAR-1 	MORNING	04.00—07.00 	07.00—10.00 
	DAYTIME	10.00—13.00 	13.00—16.00 
	EVENING	16.00—19.00 	19.00—22.00 
	NIGHT	22.00—01.00 	01.00—04.00 

<table>
<tr><td rowspan="8">5. PENJAR-2
 
PENJARINGAN 2-1: DA-121, 4 people, no business</td><td rowspan="2">MORNING</td><td>04.00—07.00</td><td>07.00—10.00</td></tr>
<tr><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td></tr>
<tr><td rowspan="2">DAYTIME</td><td>10.00—13.00</td><td>13.00—16.00</td></tr>
<tr><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td></tr>
<tr><td rowspan="2">EVENING</td><td>16.00—19.00</td><td>19.00—22.00</td></tr>
<tr><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td></tr>
<tr><td rowspan="2">NIGHT</td><td>22.00—01.00</td><td>01.00—04.00</td></tr>
<tr><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td><td> 
PENJARINGAN 2-1: DA-121, 4 people, no business</td></tr>
<tr><td rowspan="8">6. WONOREJO
 
WONOREJO-3: WC-316, 5 people, no business</td><td rowspan="2">MORNING</td><td>04.00—07.00</td><td>07.00—10.00</td></tr>
<tr><td> 
WONOREJO-3: WC-316, 5 people, no business</td><td> 
WONOREJO-3: WC-316, 5 people, no business</td></tr>
<tr><td rowspan="2">DAYTIME</td><td>10.00—13.00</td><td>13.00—16.00</td></tr>
<tr><td> 
WONOREJO-3: WC-316, 5 people, no business</td><td> 
WONOREJO-3: WC-316, 5 people, no business</td></tr>
<tr><td rowspan="2">EVENING</td><td>16.00—19.00</td><td>19.00—22.00</td></tr>
<tr><td> 
WONOREJO-3: WC-316, 5 people, no business</td><td> 
WONOREJO-3: WC-316, 5 people, no business</td></tr>
<tr><td rowspan="2">NIGHT</td><td>22.00—01.00</td><td>01.00—04.00</td></tr>
<tr><td> 
WONOREJO-3: WC-316, 5 people, no business</td><td> 
WONOREJO-3: WC-316, 5 people, no business</td></tr>
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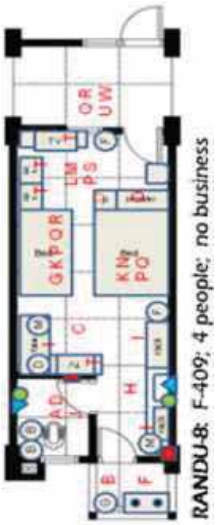
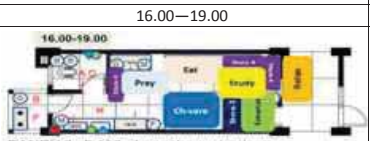
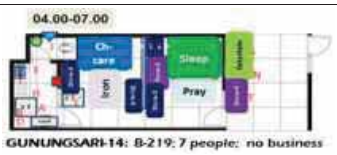
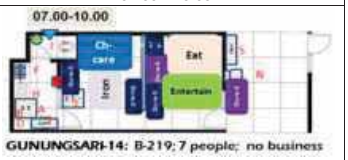
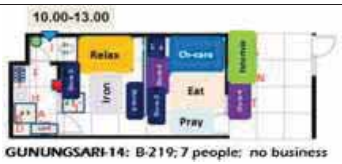
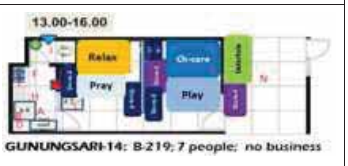
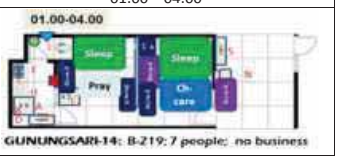
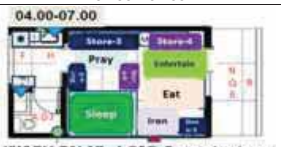
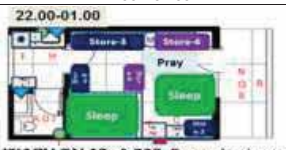
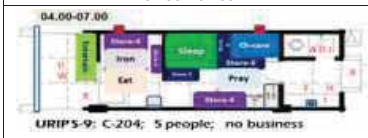
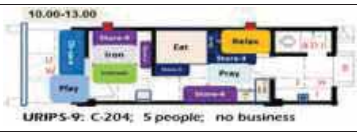
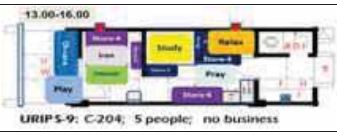
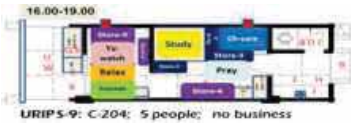
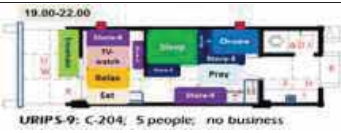
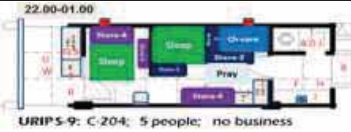
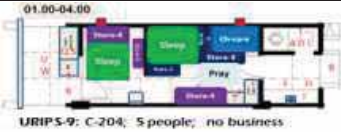
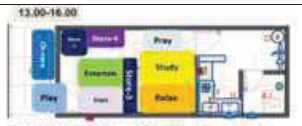
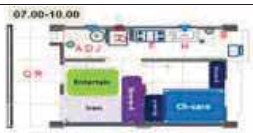
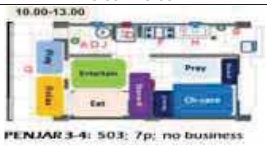
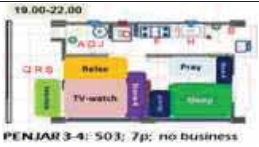
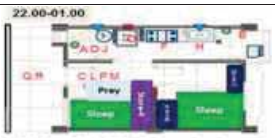
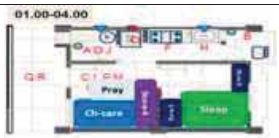
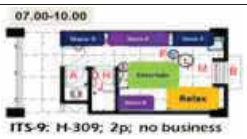
7. RANDU 	MORNING	04.00—07.00 	07.00—10.00 
	DAYTIME	10.00—13.00 	13.00—16.00 
	EVENING	16.00—19.00 	19.00—22.00 
	NIGHT	22.00—01.00 	01.00—04.00 
8. GUNUNGSARI 	MORNING	04.00—07.00 	07.00—10.00 
	DAYTIME	10.00—13.00 	13.00—16.00 
	EVENING	16.00—19.00 	19.00—22.00 
	NIGHT	22.00—01.00 	01.00—04.00 

9. WARU-GUNUNG 	MORNING	04.00—07.00	07.00—10.00
		 WARU GN-12: A-207; 5p; no business	 WARU GN-12: A-207; 5p; no business
	DAYTIME	10.00—13.00	13.00—16.00
		 WARU GN-12: A-207; 5p; no business	 WARU GN-12: A-207; 5p; no business
	EVENING	16.00—19.00	19.00—22.00
		 WARU GN-12: A-207; 5p; no business	 WARU GN-12: A-207; 5p; no business
	NIGHT	22.00—01.00	01.00—04.00
		 WARU GN-12: A-207; 5p; no business	 WARU GN-12: A-207; 5p; no business
10. URIP-S 	MORNING	04.00—07.00	07.00—10.00
		 URIP S-9: C-204; 5 people; no business	 URIP S-9: C-204; 5 people; no business
	DAYTIME	10.00—13.00	13.00—16.00
		 URIP S-9: C-204; 5 people; no business	 URIP S-9: C-204; 5 people; no business
	EVENING	16.00—19.00	19.00—22.00
		 URIP S-9: C-204; 5 people; no business	 URIP S-9: C-204; 5 people; no business
	NIGHT	22.00—01.00	01.00—04.00
		 URIP S-9: C-204; 5 people; no business	 URIP S-9: C-204; 5 people; no business

11. TANAH-MERAH 	MORNING	04.00—07.00  TANAH MERAH-8: D-207; 5 people; no business	07.00—10.00  TANAH MERAH-8: D-207; 5 people; no business
	DAYTIME	10.00—13.00  TANAH MERAH-8: D-207; 5 people; no business	13.00—16.00  TANAH MERAH-8: D-207; 5 people; no business
	EVENING	16.00—19.00  TANAH MERAH-8: D-207; 5 people; no business	19.00—22.00  TANAH MERAH-8: D-207; 5 people; no business
	NIGHT	22.00—01.00  TANAH MERAH-8: D-207; 5 people; no business	01.00—04.00  TANAH MERAH-8: D-207; 5 people; no business
12. PENJAR-3 	MORNING	04.00—07.00  PENJAR 3-4: 503; 7p; no business	07.00—10.00  PENJAR 3-4: 503; 7p; no business
	DAYTIME	10.00—13.00  PENJAR 3-4: 503; 7p; no business	13.00—16.00  PENJAR 3-4: 503; 7p; no business
	EVENING	16.00—19.00  PENJAR 3-4: 503; 7p; no business	19.00—22.00  PENJAR 3-4: 503; 7p; no business
	NIGHT	22.00—01.00  PENJAR 3-4: 503; 7p; no business	01.00—04.00  PENJAR 3-4: 503; 7p; no business

13. ITS  ITS-9: H-309; 2p; no business	MORNING	04.00—07.00	07.00—10.00
		 ITS-9: H-309; 2p; no business	 ITS-9: H-309; 2p; no business
	DAYTIME	10.00—13.00	13.00—16.00
		 ITS-9: H-309; 2p; no business	 ITS-9: H-309; 2p; no business
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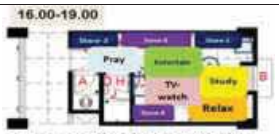
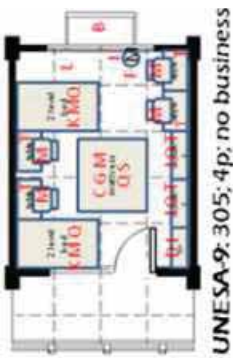
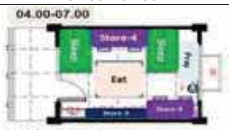
		 ITS-9: H-309; 2p; no business	 ITS-9: H-309; 2p; no business
	NIGHT	22.00—01.00	01.00—04.00
		 ITS-9: H-309; 2p; no business	 ITS-9: H-309; 2p; no business
14. UNESA  UNESA-9: 305; 4p; no business	MORNING	04.00—07.00	07.00—10.00
		 UNESA-9: 305; 4p; no business	 UNESA-9: 305; 4p; no business
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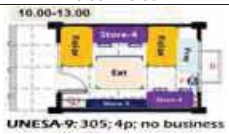
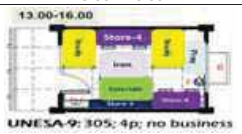
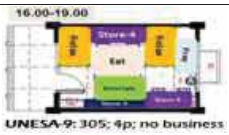
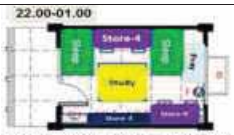
		 UNESA-9: 305; 4p; no business	 UNESA-9: 305; 4p; no business
	EVENING	16.00—19.00	19.00—22.00
		 UNESA-9: 305; 4p; no business	 UNESA-9: 305; 4p; no business
	NIGHT	22.00—01.00	01.00—04.00
		 UNESA-9: 305; 4p; no business	 UNESA-9: 305; 4p; no business

FIGURES

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5

CHAPTER 6

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TABLES

CHAPTER 7

CHAPTER 8

CHAPTER 9

GLOSSARY

ADB	Asian Development Bank
APBD	Anggaran Pendapatan & Belanja Daerah = Regional Expenditure & Budget Revenue (provincial or local)
APBN	Anggaran Pendapatan & Belanja Negara = State Expenditure & Budget Revenue (the country of Indonesia)
BAPPENAS	Badan Perencanaan Pembangunan Nasional = National Development Planning Board / Agency
BI	Bank Indonesia = Indonesian (State/Central) Bank
BPS	Badan Pusat Statistik = Central Bureau of Statistics (Indonesia)
BPN	Badan Pertanahan Nasional = National Land Agency
CIPTAKARYA	Directorate General of Public Works Ministry
DKI	Daerah Khusus Ibukota = Special Capital City Region (of Jakarta)
IDR	Indonesian Rupiah
IPM	Indeks Pembangunan Manusia = Human Development Index
ITS	Institute of Technology Sepuluh Nopember = Governmental Institute of Technology in Surabaya
JPN	Jabatan Perumahan Negara = National Housing Department of Malaysia
KASIBA	Kawasan Siap Bangun = Ready Built Region (consists of number of LISIBAs)
Kementrian PU	Public Works Ministry
KDB	Koefisien Dasar Bangunan = Coefficient of building base – land area ratio
KLB	Koefisien Lahan Bangunan = Coefficient of total floor – land area ratio
LCA	Low Cost Apartment
LCRA	Low Cost Rental Apartment
LIH	Low Income Household
LISIBA	Lingkungan Siap Bangun = Ready Built Environment
OECD	Organization for Economic Cooperation and Development
PDRB	Produk Domestik Regional Bruto = Gross Regional Domestic Product
PPR	Program Perumahan Rakyat = People's Housing Project (low cost high rise flats by JPN (Malaysia)
PERUMNAS	Perusahaan Umum Perumahan Nasional = National Housing / Urban Development Corporation
Renstra	Rencana Strategis = Strategic Plan
RPJMD	Rencana Pembangunan Jangka Menengah Daerah = Regional Medium Term Development Plan
RQ	Research Question
Rusunawa	Rumah Susun Sederhana Sewa = Simple Rental Storey House
SUSENAS	Survai Sosial Ekonomi Nasional = National Social-Economic Survey
UFC	United Facilities Criteria
UN	United Nations
UNDP	United Nations Development Program
UN HABITAT	United Nations - Habitat (for housing concerns)
UNWCED	United Nations World Commission on Environment and Development
WBDG	Whole Building Design Guidelines
WCED	World Commission on Environment and Development