

POST-DISASTER SUSTAINABLE HOUSING SYSTEM IN TURKEY

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Abstract

Turkey experiences serious disasters due to its geological and topographical characteristics. The many damaged and collapsed buildings resulting from the disasters create a major housing problem needing urgent solutions. There are three stages in the current approach to post-disaster:

- Emergency Relief Stage
- Rehabilitation Stage
- Reconstruction Stage

However, there are no specific and decisive strategies for all these stages. This lack of strategies prevents Turkey from being prepared for the disasters. The present post-disaster housing approach cannot provide the needs of victims progressively, urgently, economically and ecologically. In the present approach, each of these is viewed as an isolated issue. Rather than a piecemeal approach, a view of the whole is needed. Therefore, this paper aims the following objectives:

- *To take the problem with the method of systems approach before the disasters* in order to keep all serving disciplines, related components under control and to be ready against the post-disaster housing.
- *To get a solution equipped with sustainability principles* in order to solve the housing problems healthfully, ecologically, progressively, urgently, and economically.

We are proposing a new approach to solving the post-disaster housing problems that exist in Turkey, which we refer to as “post-disaster sustainable housing system.”

Keywords: Disaster, post-disaster housing, emergency relief stage, rehabilitation stage, reconstruction stage, sustainability, system, systems approach, post-disaster sustainable housing system.

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INTRODUCTION

Turkey faces frequent disasters due to its geological and topographical characteristics. The most effective disasters in Turkey according to their severity rates are; earthquakes, landslides, floods, rocks fall, fires, avalanche, storm and rising of ground water, etc. The damaged building statistics in Turkey for the sixty years show that, 62% of the damaged buildings are caused by the earthquakes, 15 % by landslides, 12% by floods, 5% by rock falls, 4% by fires, 2% by storm, avalanches etc (Songür, 2000).

Natural disasters have extensive and violent effects, cause loss of life and property, substantial affect on the communal life. The huge number of damaged and collapsed buildings after the earthquakes creates a housing problem needing urgent attention. In Turkey, current approaches to post-disaster housing are taken in three stages:

- Emergency Relief Stage (Tents,)
- Rehabilitation Stage (Temporary housing,)
- Reconstruction Stage (Permanent housing,)

Emergency Relief Stage is the stage that provides emergency shelters to the homeless victims.

Rehabilitation Stage starts a few weeks after the disaster and continues until the permanent houses are completed. In this stage, the housing is solved by the temporary houses. The length of the rehabilitation stage is a consequence of providing the permanent housing and is never determined in advance. Due to the delay of the reconstruction stage, in some cases the rehabilitation stage may continue up to 30 years (Acerer, 1999). In such cases, the temporary houses undertake extemporary functions related with the usage style and period.

Reconstruction Stage develops after the rehabilitation stage and aims to provide proper permanent housing for the victims in a short period of time.

The problems related to each of the three levels are displayed in Table 1.

Table 1 Problems of the Present Post–Disaster Housing Approach

1	PROBLEMS OF THE PRESENT POST–DISASTER HOUSING APPROACH
ADMINISTRATIVE - LEGAL PROBLEMS	-The government is not ready against the disasters beforehand and has unsustainable policies in place. -Lack of organization / Not having sustainable organization structure
LAND QUALIFICATION AND LOCATION PROBLEMS	-Unscientific approaches are followed for the selection of the land and location decisions and the agricultural sustainability is not considered. -The local data is not taken into consideration during the settlement plans. -The present settlements are not analyzed. -Settlements are not designed to be added on the urban life and the social sustainability is not considered. -The ecological conditions are not taken into consideration during the location of the units.
UNITS' DESIGN-APPLICATION-USEMENT PROBLEMS	-The units are not suitable for the life style of the victims. -The units are not suitable for the regional and climatic conditions. -The emergency shelters and temporary houses are not sustainable, recyclable; therefore it is not sustainable in terms of users' health and comfort.
SUBSTRUCTURE PROBLEMS	Lighting, water, canalization, flood problems are caused by lack of basic substructure and the sustainability of the substructure is not considered.
SOCIA-PHYCHOLOGICAL PROBLEMS	-The victims are left alone at unhealthy conditions. -The social-cultural-economic life is not considered. -A model making the victims effective is not developed therefore it is seen that social sustainability is not considered.
ECONOMICAL PROBLEMS	-Applying international solutions -The cost of the transportation is high therefore it is seen that economical sustainability is not considered.
BEING UNSUSTAINABLE / NOT APPROPRIATE TO BE RECYCLED	-Not having sustainable politics -Not having sustainable organization structure -Not being sustainable in terms of users' health and comfort -Not having sustainable substructure plans. -Not having thought social sustainability. -Not having thought economical sustainability. -Effecting the agricultural sustainability negatively

The problems given in Table 1 shows that the present post disaster housing approach can not provide the needs of the victims progressively, urgently, economically and it is also inadequate in using country's resources efficiently. Furthermore, it is understood that there are not any set strategies regarding the subject, it is always decided after the disaster which prevents the society from being ready against the disasters.

In this sense, this paper aims;

- To develop a sustainable housing approach in order to solve the victims' housing problems in a more urgent, healthy and economical way which is ecologically correct and at the same time progressive.
- To take the post-disaster housing as a system with all related components in order to establish the decision steps before the disaster that the regions would

follow at the time of disaster by putting its local data on the system and be prepared and ready against the disasters.

This type of research and disaster preparedness is very important for Turkey, who faces disasters periodically and frequently and experiences housing problems after every disaster.

In short, post-disaster housing problem in Turkey can only be solved by taking the problem as a system, applying this system to every region according to its local data before disaster, determining the activity steps needed to be done before disaster, at the time of disaster and post-disaster and developing a sustainable housing approach. Only then will Turkey be able to house the victims in healthy and comfortable environments in a progressive way with the productive usage of the country resources and finally to be ready against the disasters.

POST- DISASTER SUSTAINABLE HOUSING SYSTEM

Why system approach is needed to solve the post-disaster housing?

The present post-disaster housing approach is not responding properly to the interrelated problems of speed, time, economy and no response or under-response. Whenever one type of the problem is taken in hand singularly, it's seen the other problems' severity increase (Ehrenkrantz, 1989). The many related components of post-disaster housing need to be analyzed as a whole. The development of systems approach has made it possible to take all the components of a system into consideration, understand their relationships, perceive alternative solution and foresee their impact and make adjustments when needed through constantly checking results.

Thus, each system is a coherent and indivisible whole that can be distinguished from its surroundings. Moreover this whole is organized since it reflects the dynamic and reciprocal interactions of its various components, and any change in one element will necessarily change others and consequently the entire system. A system cannot be reduced to the sum of its parts, since the latter do not have the same significance when studied in isolation as when seen as contributing to the whole. If we look at each component separately, therefore, we might miss the factors that constitute the system as such. As a result system approach is determined appropriate to be used as a tool to solve this problem.

Why post-disaster housing should have the sustainability criterions?

The need of energy and housing always increases in the world according to the speed of the population increase. Throughout the industrializing and technologically developing world, response to these needs exhausts limited resources. The contribution of the houses in this exhaustion is undeniably high. All the activities of the buildings like service, communication etc. exhaust the %75 of the energy

resources of the world (Ayaz, 2002). As the limited natural resources exhaust rapidly, the possibility of facing an environmental harm increases. Thus building construction acts an effective role on these facts; therefore the sustainability criterions should be taken into consideration during planning new post-disaster settlements.

The preservation and developing of the resources are at the base of the sustainability and sustainable development. The assessment of the resources by their continuous preservation, especially the defense of the renewable resources without going beyond their renewal limits to the development form the base of the development philosophy preserving the environment (Oktay, 2002).

Sustainability principles are as follows (Ayaz, 2002, Ministry of the Environment, 2002);

- Developing strategy and totaliter plan.
- Preservation of the basic ecological processes.
- Developing growth models that let the productivity spread to long terms and reach to the future generations.
- Establishing balance between economical growth and natural resources.
- Providing balance between international fair and possibility.

Besides, a set of properties are expected from the new post-disaster housing approach with the present properties. These are;

- To be ready against the disasters beforetime and to develop strategies.
- To be ecological and not give harm to the environment.
- To be sustainable and reusable.
- To be productive at time and speed.
- To provide the economical sustainability and preserve the natural resources.
- To provide the social sustainability.
- To provide the agricultural sustainability.
- To provide sustainability at the substructure.
- To respond to the needs and life style of the victims progressively, to be appropriate to the health and comfort conditions.

If the properties expected from the new approach are compared with the sustainability principles, the need of reflecting the sustainability principles to the new post-disaster housing approach emerges.

In this sense; it is suitable to name the new approach which is taken in hand with the method of systems approach through sustainability principles as a "post-disaster sustainable housing system".

Principles of the post-disaster sustainable housing system

Principles of the “post-disaster sustainable housing system” can be listed as below.

- To encourage the sustainable post-disaster human settlements.
 - To take the sustainable organization of the substructure into consideration.
 - To be suitable to the ecological conditions.
 - Respect to the nature, preservation of the environment, well-matched design with the nature.
 - Preservation of the energy and insufficient resources.
 - To give place to the use of the renewable resources like solar and wind.
- While planning the settlements, positioning and forming the buildings; well-matched designs with the nature and regional data, also designs that are preserving the ecological processes should be preferred. Slope, direction of the dominant wind and solar energy should be productively used.
- To design according to the productive usage of water, to select the building materials through this aim to evaluate rain water and other wasted waters.
 - To select building products with less environmental harm or harmless.
 - Preservation and augmentation of the green area for the rehabilitation of the micro-climax.
- To be suitable to the user’s health and comfort / to respond the needs and life style of the victims progressively.
 - To be suitable to the feasibility conditions / to provide economical sustainability.
- Selection of the suitable building product is an important criterion in sustainable buildings. In order to be economic, the building materials should have long effectiveness life and their maintenance and repair costs should be low. Besides, usage of local and regional building materials is also important in economic point of view.
- To provide productivity at time and speed
 - To provide administrative sustainability.
 - To provide agricultural sustainability. (To avoid causing harm to the prime agricultural lands. To prepare settlement master plans preserving the ecological processes, starting from the regional scale, depending on scientific criteria of land selection and thinking about regional population)
 - To provide social sustainability and develop social services.

CONCEPTUAL MODEL OF THE POST- DISASTER SUSTAINABLE HOUSING SYSTEM

Accepting sustainable post-disaster housing as a system and trying to solve the case with the systems approach; oblige the case to be handled through the system components given below.

- Facts directing the process in the system, “Objectives of the System”
- Facts feeding the system, “Resources of the System”
- The possible courses to reach the objectives, “Activities of the System”
- The results given by processes of the system, “Outputs of the System”

After determining the components of the system, the system should be described by a conceptual approach. Conceptual approach requires a presentation that perceives the system visually. This presentation materializes by “forming a model”. Figure1 shows the “System’s Conceptual Model” formed by the arrangement of the system’s components (Balanlı and Öztürk, 1997).

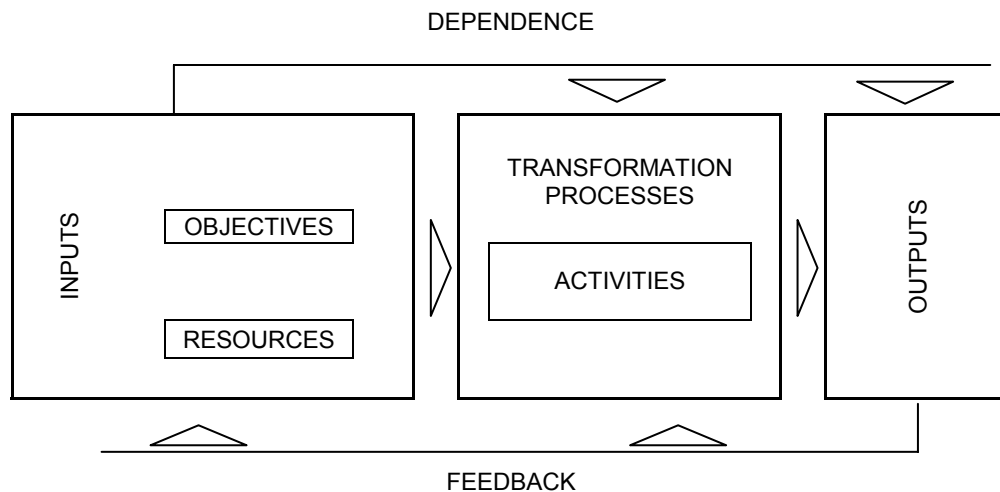


Figure 1 System’s Conceptual Model (Balanlı and Öztürk, 1997)

The components of the “post-disaster sustainable housing system” can be defined as below.

- Objectives of the “post-disaster sustainable housing system” determine the goals that are aimed to be achieved in return for the solution of the housing problem by providing the victims necessities economically, urgently, progressively with productive usage of the country’s resources,
- Resources of the “post-disaster sustainable housing system” include all the facts needed in order to develop the solutions regarding post-disaster housing,
- Activities of the “post-disaster sustainable housing system” include the activities and all the activity stages that took place while developing the aimed progressive post-disaster housing,
- Outputs of the “post-disaster sustainable housing system” show the reached situation according to the determined objectives with the help of the resources and activities.

Various facts, relations and processes take place in the components of the “post-disaster sustainable housing system”. Also these components form a new system by coming together and this give each component a property of being a system namely subsystem of the “post-disaster sustainable housing system”. According to the hierarchic structure of the system, whole post-disaster sustainable housing system have sub-systems, processes, sub-processes, programs and operation stages (Figure 2).

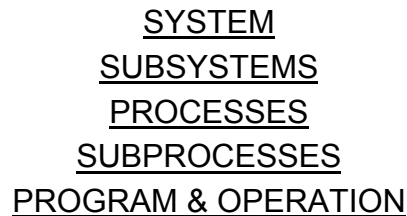


Figure 2 Hierarchic structure of the system (Hice, 1978)

Objectives Sub-Systems of the Post-Disaster Sustainable Housing System

To solve the victims’ housing needs in a systematic, practice, urgently, economic way with the progressive usage of the country’s resources form the whole objectives sub-systems.

So as to reach the objectives, determination of the mid-objectives according to the period is needed and to be successful in the mid-objectives the organization of the processes is needed. As an example, specific outputs at specific stages of post-disaster sustainable housing system should be examined rather responding the user’s needs or not and then the standards should be fixed according to the expectations and outputs should be manufactured through these standards.

Mid-objectives can be described as follows:

- To respond the necessary number of houses according to the stage
- To be suitable to the victims’ early needs and progressively to the activities according to their socio-cultural conditions
- To provide the allowable cost.

As the main objective, is to provide the victims’ progressive houses by using the country’s resources productively, it will be useful to determine the human groups acting a role in the formation of the house.

- Users (victims)
- Designers
- Constructors
- Manufacturers
- Supervisors

The objectives of the determined human groups regarding progressive housing units form the objectives sub-systems of the “post-disaster sustainable housing system”.

Objectives sub-systems of the “post-disaster sustainable housing system”

- Design Objectives
 - Architectural Design Objectives
 - Engineering Design Objectives
 - Design Objectives in Manufacturing Products
- Construction Objectives
- Objectives of Manufacturing Products
- Supervising Objectives
- Usage Objectives

Resources Sub-Systems of the Post-Disaster Sustainable Housing System

The objects, facts, knowledge that are transformed according to the production laws and used in order to provide housing units and settlements progressively according to the system form the resources sub-systems of the system.

- Natural Resources
 - Land
 - Natural building products
 - Water
 - Solar energy
- Manufactured Resources
 - Materials
 - Tools
 - Energy
- Work power
 - Designer
 - Constructors
 - Manufacturers
 - Supervisors
 - Users
- Financial Resources
 - Disaster Funds
- Information Resources
 - Science
 - Consents
 - Experience
 - Evaluation
- Housing

Activities Sub-Systems of the Post-Disaster Sustainable Housing System

The activity steps that are needed to solve the housing problem progressively, to provide the health and comfort conditions of the victims that the stage assures and besides use of the country's resources productively to provide sustainability are determined below,

- Stage of Sustainable Emergency Relief
- Stage of Sustainable Rehabilitation
- Stage of Transforming of the Units into Permanent Houses

Outputs Sub-Systems of the Post-Disaster Sustainable Housing System

The output of the "post-disaster sustainable housing system" is the situation reached at the end of the activities determined through the objectives and formed with the help of the resources. The conceptual model of the "post-disaster sustainable housing system" is given in Table 2.

CONCLUSION

As a result of having the advantage of being aware of the successful and unsuccessful sides of the present approach, the new approach established and named as “post-disaster sustainable housing system” should be seen as a guide that can be followed by all the regions of Turkey. The system should be applied on all the regions by the government according to their local data and the decision steps regarding before-disaster, at the time of disaster and post-disaster should be determined.

The decision steps needed; to solve the post-disaster housing, to be prepared against the disaster beforehand, to develop an urgent, economic, sustainable approach can be summarized orderly as given below.

- To take the problem/subject as a system.
- As a result of the comparison between problems / needed qualifications of the present approach and sustainability principles determined by the commission of World Environment and Development; to comprehend that the system should include or to be established on the sustainability principles.
- Afterwards, to name the new system as “post-disaster sustainable housing system”, to develop comprehensively, to form the components of the system; objectives, resources, activities, outputs.
- As the objectives of the system, is to give the victims progressively developed houses, to determine the activity stages of the system as follows:

Stage of Sustainable Emergency Relief

Stage of Sustainable Rehabilitation

Stage of Transforming of the Units into Permanent Houses

The three stages under the activities sub-systems of the “post-disaster sustainable housing system” should be also taken as a system and solved by the method of system approach comprehensively. The objectives, resources, activities and outputs sub-systems of each stage should be developed and formed.

As the post-disaster sustainable housing system is an inter-discipliner subject, the organization structure that will work on this system should include the professionals of all related disciplines like architecture, city planning, geophysics, sociology, environmental psychology, civil engineering, ecology, economy-management and law.

In short; by taking this type of approach in hand at the base of all the regions, it seems; the post-disaster housing will be solved through the environmental and climatic conditions of the region, urgently, economically, progressively within the productive use of the country’s resources.

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