



Report on Nexus activities in Naga City/Philippines on affordable housing and waste water management concept



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Integrated Resource Management in Asian Cities: the Urban Nexus

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List of abbreviations:

BISCAST	BICOL State College of Applied Sciences and Technology
BMZ	German Federal Ministry for Economic Cooperation and Development
ESCAP	Economic and Social Commission for Asia and the Pacific
GIZ	Deutsche Gesellschaft fuer Internationale Zusammenarbeit
ICLEI SEA	International Council for Local Environmental Initiatives/South East Asia
LCH	Low cost housing
MoU	Memorandum of Understanding
NTF	Nexus Task Force

Contents:

0. Executive summary	p. 4
1. The Rationale	p. 5
2. The Nexus Project	p. 7
3. Wastewater concept for Del Rosario in Naga City	p. 8
3.1.Wastewater sources and composition	p. 8
3.2.Concept for wastewater treatment	p. 8
4. Methodological approach	p. 9
5. BISCAS	p. 10
6. Results achieved	p. 14
7. Lessons learnt	p. 15

0. Executive summary

Naga City, being one of the partner cities of the regional „Integrated Urban Development Project (NEXUS”) financed by BMZ and implemented by GIZ was given advisory service for a low cost housing project in Del Rosario, a district of Naga City. The area comprises 5200 m² provided by the City Government of Naga. It is an in-fill area where 48 housing units are to be built by Habitat for Humanity, financed by the Home Development Mutual Mortgage Fund for low income dwellers on the basis of a tripartite agreement between Naga City, the Home Development Mutual Mortgage Fund and Habitat for Humanity. Naga City is providing the basic infrastructure (site development) encompassing the construction of roads, surface drainage, water and energy.

Naga City had asked the GIZ Nexus Project to support this project by ensuring better housing quality in accordance with the National Building Code and improved sanitation hence reaching more resilient sustainable houses.

GIZ Nexus Project has responded to this request by sending two short term experts (building engineers) from Germany and Ethiopia to the construction site. From midst January 2014 to midst April 2014 three “quarto complex”, e.g. 12 housing units have been completed. The remaining 36 housing units are to be completed within this year.

The housing units have a size of 21 m² with a cost of 150.000 pesos each. Additionally, 400 hours of the future home owners have to be contributed adding another 104.000 pesos to the costs of the housing unit.

Amendments have been introduced making the foundations more earthquake resistant, economizing on septic tanks by building one central septic tank instead of 48 single septic tanks and reducing unnecessary structural elements (columns), protecting the roof against uplifting during heavy winds or taiphoons

Apart from implementing on-job-training on the construction site for the Habitat for Humanity staff and the semi-and skilled construction laborers the GIZ building engineers implemented practical training at BICOL State College of Applied Sciences and Technology (BISCAST) for the teachers and the students. This training consisted of practical engineering skills such as construction site management, detailed cost estimation and cost calculation for better monitoring and evaluation, modular construction system and improved hollow bock production, improved roofing, cross ventilation and climatically adjusted designing and construction. The training was conducted at BISCAST as well as on the construction site.

The training skills mentioned above have become part of the training courses implemented by BISCAST in their courses for architects. BISCAST has the ambition of becoming the leading training center on innovative resilient low cost housing technology and innovative Nexus technologies not only for BICOL Region but for the whole of the Philippines.

The changes in the housing designs have been drawn by the students and the teachers of BISCAST and later approved by the Chief Engineer of Naga City.

Moreover, a pilot wastewater treatment system is intended to be installed on the Del Rosario development site. The wastewater from a slaughterhouse, a prison, a new housing estate and a planned high school shall be purified here. At the moment, septic tanks and a constructed wetland are used to treat the effluent of the slaughterhouse. This concept is not functional, causes smell and pollutes the environment. The prison’s effluent runs off directly into a nearby creek. In this report a potential wastewater management concept for Del Rosario is presented and discussed. This concept has the aim to demonstrate on site the

technical feasibility of the production of energy from wastewater in form of biogas and the reuse of the treated wastewater in agriculture.

1. The Rationale

Affordable & energy efficient urban housing is part of the NEXUS approach because:

- Planning and implementation of cost efficient housing schemes requires a cross sectoral approach (roads, energy, water, waste water, storm water drainage, solid waste),
- Integrated urban planning considers inclusion policies (integration of urban poor),
- The neighbourhood designs should consider land as scarce commodity and the provision of basic infrastructure as relevant cost factor,
- Neighborhood designs should consider urban planning considerations such as “mixed functions” (business/shops/schools/kindergartens/green areas etc.) and socio-economically “mixed settlement schemes”,
- The neighbourhood design has to emphasise densification, small plot sizes and vertical growth (compact city, no urban sprawl),
- The costs for basic infrastructure can be economized if inbound infill areas are used,
- Settlements on the fringe or outside of urban centres are financially not viable - high costs for the provision of minimum basic infrastructure,
- Housing designs should be elaborated according to the country Building Code & Standards,
- Architectural housing designs should correspond to the climate conditions and climate change as well as socio cultural aspects,
- Housing schemes should consider investment costs as well as life cycle costs,
- Housing schemes should be resilient to natural disasters (flooding, storms, earthquakes),
- Detailed cost calculation, monitoring and evaluation is required.

Low cost housing is a system approach:

- Houses have to be free of major maintenance and repair work for at least 10 years
- The life span is considered to be at least 50 years, reducing the negative impact on the environment and the national economy that would otherwise arise from the need of rebuilding houses.
- Waste water collection and treatment planned and implemented on the level of the whole settlement reduces costs and pollution of the environment caused by poor maintenance of individual septic tanks and soak-away pits.

On-job-training as part of system approach:

- On-site training, skills improvement (hands-on approach) in collaboration with training institutes.
- Training-on-the-job in the real world of work, i.e. on construction sites, is the most efficient training.

The construction sector as motor of economic development

- Job creation, income generation, increased purchasing power.
- Housing schemes should not be built by beneficiaries unless they are (semi-) skilled construction workers.
- The diversification of the construction sector as key factor for sustainable dissemination of cost and energy-efficient building technologies.

Cost considerations:

- Cost-efficiency is one of the most crucial points of low-cost housing not compromising the construction quality and the safety/structural stability of the buildings.
- The shorter the construction period the lower the overhead costs.
- A construction site is economical if work is completed without interruption.

Managing the 4 M

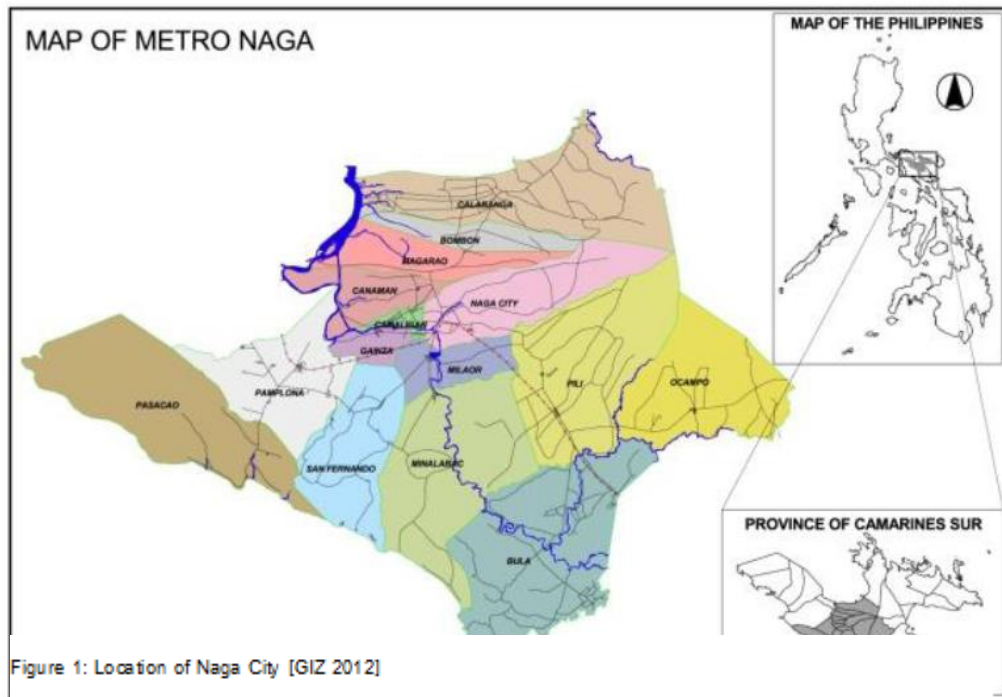
It is all about managing the 4 M:

- Machines, Material, Money, Manpower in an efficient manner.



2. The Nexus project

Naga City, situated in the south-eastern part of the island Luzon in Bicol region in the province Camarines Sur (figure 1), has a population of over 175,000 inhabitants, which is growing fast. There is no sewer network operating yet, most houses have septic tanks for the wastewater. The water overflows into the rainwater drainage system and into the rivers, the septage is emptied roughly every 5 years. A septage treatment plant is currently being constructed.



In the search on planned and financed Nexus projects the Local Government of Naga City proposed the Low cost housing project in Del Rosario to be considered within the framework of the Nexus activities in Naga City.

The Del Rosario LCH comprises all features of an integrate Nexus project. It is an integrated approach to be implemented by the City in collaboration with different departments such as engineering, pro poor, roads, Metro Naga Water District and the electricity utility.

Basic infrastructure provision is always a combined task of various departments of a city to reach a joint objective. This becomes very clear once the waste water concept described below is studied.

It is supposed to be realized in a later phase of the project.

The project represents a multilevel approach (national level¹, local level²) and a cooperation between the governmental, the private and the civil sector.

Community participation is included in the project as the beneficiaries were supposed to contribute 400 hours per household for construction activities.

¹ Home Development Mutual Mortgage Fund and Habitat for Humanity

² Local government, utilities

The target group consists of employees of the city in need of housing. They are low income groups who have been selected beforehand paying back their credit through part of their income for up to 30 years.

3. Wastewater concept for Del Rosario in Naga City

3.1 Wastewater sources and composition

Moreover, a pilot wastewater treatment system is intended to be installed on the Del Rosario development site. The wastewater from a slaughterhouse, a prison, a new housing estate and a planned high school shall be purified here. At the moment, septic tanks and a constructed wetland are used to treat the effluent of the slaughterhouse. This concept is not functional, causes smell and pollutes the environment. The prison's effluent runs off directly into a nearby creek. In this report a potential wastewater management concept for Del Rosario is presented and discussed. This concept has the aim to demonstrate on that site the technical feasibility of the production of energy from wastewater in form of biogas and the reuse of the treated wastewater in agriculture.

The wastewater from the prison, the new housing estate and from the school can be classified as municipal wastewater with a slightly increased concentration due to the absence of showers in school and the little number of showers in the prison. The total amount of municipal wastewater on a daily average is estimated to about 130 m³/d, in which 40 m³/d are derived from the prison, 60 m³/d from the housing estate and 40 m³/d for five days a week from the school.

Wastewater deriving from a slaughterhouse typically has high concentrations of organic components, mainly proteins and fat, as well as nitrogen, depending on the individual production steps. For the design of the wastewater treatment plant, wastewater from washing, slaughtering and disemboweling is considered. Five working days per week and the processing of 200 pork per day were assumed. Accordingly the total amount of wastewater from the slaughterhouse is about 70 m³/d.

3.2 Concept for wastewater treatment

The results for the wastewater treatment plant have to be apprehended as roughly calculated and heavily depend on the actual amount of the wastewater and its concentration. A large part of the organic carbon can be degraded anaerobically, consuming no energy for aeration, but rather producing energy in form of biogas.

Due to the high concentrations of fat, the wastewater from the slaughterhouse is pre-treated prior to mixing it with the other wastewater in a buffer tank. This buffer tank should be designed to equalize the amount of wastewater running towards the anaerobic treatment: fluctuations between a) day and night and b) over the weekend, when the slaughterhouse and the high school do not generate wastewater. Depending on the actual fluctuations that should be measured before designing the plant in detail, the buffer tank will have a volume between 100 and 200 m³.

The water from the buffer tank then flows through a pre-sedimentation unit in order to separate most solids from the water. These settled solids can be digested together with the fat from the slaughterhouse in a fully mixed digestion tank with a residence time between 15 and 20 days. The necessary volume of the digestion tank is between 20 and 30 m³. Between

150 and 250 m³ biogas can be produced daily from the solids. The remaining sludge (1-2 m³/d) is largely stabilized and contains high concentrations of nutrients. It can be applied as fertilizer in agriculture, if it is managed in a way to prevent contamination of agricultural products and over-fertilization of the soil.

The water can be treated in an anaerobic process, e.g. a UASB (Upflow Anaerobic Sludge Blanket reactor) or a fixed-bed process with immobilized biomass. This way, 60 to 80 % of the organic load (COD) can be transformed into biogas. The bio-reactor should be operated with retention times between 15 and 24 hours, resulting in a necessary volume of 130 to 200 m³. This way, 60 to 100 m³ biogas can be produced from the water each day. The effluent has a substantially reduced organic pollution, but still contains most of its initial load of nutrients. As for this small scale a treatment process for the removal of the nutrients is economically not feasible under the current conditions in Naga City, the effluent should be used for irrigation and fertilization in agriculture as much as possible to reduce the eutrophication of the rivers caused by these nutrients. To reduce risks for staff and consumers, the treated effluent should be disinfected prior to utilization, e.g. by sand filtration and UV-radiation. An area of 0.6 to 1.2 ha can be irrigated and fertilized with the treated water.

The biogas generated in the two processes amounts to 200 to 350 m³ per day. With an energy-content between 1200 and 2100 kWh per day, the amount is too low for the economical operation of a combined heat and power plant for the generation of electricity. It should be used to heat up water for the slaughterhouse or for the prison. Between 23 and 40 m³ of water can be heated from 20°C to 60°C per day with the produced biogas. If additional sources for organic carbon like kitchen waste from the prison or the school are put into the digester, the biogas production will increase considerably.

The space requirements for the treatment processes are about 300 m² if the tanks are 3 m deep. The treatment facilities should be located below the wastewater sources, so the wastewater can flow there by gravity. On the other hand, the treatment facilities should be flood-proof, because flooding would cause huge damages to the facilities and the plant would have to be started up from the beginning.

4. Methodological approach

The Nexus Task Force (NTF) composed cross sectorally on the basis of an “Executive Order” of the Mayor based on an Memorandum of Understanding (MoU) signed by the Mayor and GIZ was and is the basis for all Nexus related activities implemented in Naga City.

Moreover, a MoU is signed between GIZ, BISCAS and Naga City structuring the cooperation between GIZ, BISCAS and Naga City Government.

In order to concretize the problems and needs of Naga City, several Workshops have been conducted with the Nexus Task Force members. ICLEI SEAS mainly implemented the Workshops.

Affordable, resilient housing, innovative and environmentally friendly solid waste treatment and waste water management with the link to energy production and agriculture have been identified as the main problems in urgent need of solutions in the framework of Nexus.

However, in order to make the knowledge transfer sustainable, capacity building on micro and meso level are moreover essential.

It was therefore decided to include BISCASST as meso level training institution into the Nexus advisory services mentioned above.

The actualization of the Comprehensive Land Use Plan also incorporating the cross-sectorial Nexus approach is another area of cooperation with Naga City as well as with BISCASST.

BISCASST is giving advisory service to smaller local governments in elaborating their Land Use Plans and actualizing them with regard to disaster risk management, climate mitigation and adaptation.

5. BISCASST

The Bicol State College of Applied Sciences and Technology (BISCASST) is a governmental institution of higher learning, a public State College, Nonsectarian in the Philippines. It was created by Act No. 10231 and is located along Peñafrancia Avenue in Naga City. The current president is Dr. Richard H. Cordial.

It is the premier applied sciences and technology institution in the country.

History

Its history traces its humble beginnings in 1911, when it started as the **Camarines Sur Trade School (CSTS)**. Mr. Pedro Hidalgo organized trade courses in the intermediate level, offering carpentry, drawing and trade arts. Classes were first held at the library hall of the Camarines Sur High School.

In 1924, it started offering Vocational courses in the Secondary level under Mr. Doroteo Federis. In November 1925, the first permanent school building was constructed, the Gabaldon building, on its 25,699 sq. m. school site donated by the provincial government. This building still exists and is considered as the school's historical landmark. Woodworking courses were also introduced during the term of Mr. Cornelio Casaclang, as Principal. At the outbreak of World War II, the school principal was Mr. Romulo Y. Mendoza.

In 1945, the school was re- opened under Mrs. Primitiva Obias as Officer- in- Charge until the reassignment of Mr. Cornelio Casaclang, Auto- mechanics, Building Construction and Furniture and Cabinet Making were offered. In 1948, during the administration of Oligario Lenon, girls trades courses in Dressmaking, Cosmetology and Food Trades were offered and with it the construction of buildings and shops By virtue of House Bill no. 2919 (R.A. 825) , sponsored by Congressman Emilio Tibble, and approved in August 15, 1952, the school was nationalized and renamed **Camarines Sur National School of Arts and Trades (CSNSAT)**. Mr. Manuel T. Espinosa became its first Superintendent. In 1954, the two- year post- secondary trade- technical education was offered. Upon its conversion to a full pledged college by virtue of R.A. No. 5056 sponsored by Cong. Ramon H. Felipe, Jr. in June 17, 1967, the CSNSAT was converted into a College and renamed as **Bicol College of Arts and Trades (BCAT)** and was authorized to offer courses like Bachelor of Science in Industrial Education (BSIE). This was during the term of Mr. Carlos Borjal, But before it formally assumed its name as BCAT, it was known as **Camarines Sur National College of Arts and Trades (CSNCAT)** until in the mid 1980's when it adapted its name BCAT. Tertiary level was immensely expanded to cover other fields of trade- technical education, thus the

Bachelor of Science in Industrial Technology (BSIT) was opened in 1977. Under the Technical– Vocational Education Project (TVEP), it was selected as one of the pilot Technician Education Institutes (TEI) for Region V, by the Ministry of Education, Culture and Sports (MECS). The education component of the project was operationalized in school year 1984-1985, by the offering of the two- year Diploma in Industrial Technician (DIT) curriculum, with four major fields of specialization namely Automotive, Mechanical, Electrical , and Refrigeration and Air conditioning technologies. In 1984, Dr. Pacita S. Yorobe temporarily headed the school. Five months later, in April 1, 1985, Superintendent Augusto R. Nieves took over—the second alumnus to achieve such status. In 1988, by virtue of DECS Order no. 39, s. 1988, the Teacher-Education component was expanded through the offering of the Bachelor of Secondary Education (BSEd), major in Technology and Home Economics (THE), Mathematics, English and Physics; and Bachelor of Science in Elementary Education (BEEd) with the area of specialization in Home Economics and Livelihood Education (HELE). Under the administration of Mr. Honesto T. Aguilar, the 5th School Superintendent, BCAT started its offering of engineering courses namely: Electrical Engineering (BSEE) Electronics and Communications Engineering (BSECE), Mechanical Engineering (BSME) and Bachelor of Science in Architecture (BSA). The institution had first Engineering and Architecture graduates last March, 2001 and until now had steadily produced board passers and board topnotchers. BCAT continued its bid for excellence in technology and teacher education under Mr. Pedro F. Moreno, the 6th Superintendent of the College. It remained undefeated during the annual Skills Olympic among TECHVOC schools in the Region. Its students maintained its dominance in the FFP-FAHP contests for high school students. In December 2000, pursuant to Republic Act 8760, on the integration of CHED Supervised Institution (CSI's) to State Universities and College (SUC's), the Bicol College of Arts and Trades was integrated to the **Camarines Sur Polytechnic Colleges (CSPC)** in Nabua, Camarines Sur with Dr. Lourdes B. Laniog as its President and Dr. Amparo A. Nieves as the Campus Director. In the Naga Campus.

On July 1, 2002, Dr. Monsito G. Ilarde, was appointed College President. Within the first month of his Presidency, he effected the integration of BCAT to **Camarines Sur Polytechnic College (CSPC)**, with Dr. Alejandro R. Cortez as the new Campus Director until October, 2003, when the position was reverted back to Dr. Nieves, until her retirement in 2006. To date, pursuant to CSPC Board of Trustees Resolution No. 00-044, the former BCAT became CSPC Naga Campus. On October 19, 2012, President Benigno S. Aquino III signed Republic Act No. 1110231 separating CSPC Naga Campus and converting it into **Bicol State College of Applied Sciences and Technology (BISCAST)**. The CSNCAT, the BCAT, CSPC- Naga Campus, and now BISCAST, has survived 102 years as an institution of learning and served generations of Bikolanos. It remains to this day, a premier source of Vocational Technology and Teacher Education. With the spirit and dynamism of its present leaders and staff, it will continue to grow, serve and pursue its goals and commitment to the people of Bicol.

BISCAST Color

The BISCAST colors are MAROON, GOLDEN YELLOW and GREEN. Maroon and golden yellow are the official school colors, depicting the journey of the institution from a Trades school to an institution for applied sciences and technology. While green symbolizes the advocacy of the school to care for mother earth

BISCAST SEAL

The institution, aiming to leave a mark in the educational arena, bears its identity in its seal, which consists of six (6) elements; gear, torch, golden laurel leaves, atom, map of the Bicol region, and the year 1911. The BISCAST seal consists of the following elements:

The GEAR symbolizes TECHNOLOGY. The teeth of the gear embody the illustrious history of the school. The (7) teeth represent the different names by which the school was known since 1911: to Camarines Sur Trade School (CSTS) to Camarines Sur School of Arts and Trades (CSSAT) to Camarines Sur National School of Arts and Trades (CSNSAT) to Camarines Sur National College of Arts and Trades (CSNCAT) to Bicol College of Arts and Trades (BCAT) to Camarines Sur Polytechnic Colleges-Naga Campus (CSPC-Naga) to Bicol State College of Applied Sciences and Technology (BISCAST).

The TORCH symbolizes LIGHT which the school provides through the knowledge, skills and wisdom the graduates acquire within its portals.

The (2) GOLDEN LAUREL LEAVES represent VICTORY and STRENGTH for the school in sustaining quality education and technological skills for over 100 years. It also symbolizes the continuing growth and development towards the pursuit of excellence in the fields of applied sciences and technology.

The ATOM represents the field of SCIENCE. In the structure of the atom, the three (3) orbiting electrons indicate the three (3) mandates of the College: INSTRUCTION, RESEARCH and EXTENSION. These mandates are effectively carried out by the orbits, representing the stakeholders of the school: ADMINISTRATION & FACULTY, PARENTS & ALUMNI and STUDENTS, all indispensable components of the institution.

The MAP of the BICOL REGION represents the primary service area of the school-Bicolandia. It is colored GREEN because the school believes that though it aims to contribute significantly to the development of the region in Applied Sciences and Technology, it upholds the principle of caring for the natural conditions of the land through environment-friendly programs.

The year 1911 denotes the founding year of the school as a learning institution.

Academics

Undergraduate Programs:

- College of Engineering and Architecture
- Bachelor of Science in Architecture
- Bachelor of Science in Electronics and Communication Engineering
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Mechanical Engineering

College of Education

- Bachelor of Elementary Education
- BSED in Home Economics and Livelihood Education
- BSED in Mathematics
- BSED in Physics
- BSED in Technology and Home Economics

College of Trades and Technology

- BS in Industrial Education major in Automotive
- BS in Industrial Education major in Drafting Technology
- BS in Industrial Education major in Electrical Technology
- BS in Industrial Education major in Food Technology
- BS in Industrial Education major in Garment Technology
- BS in Industrial Education major in Industrial Arts
- BS in Industrial Education major in Mechanical Technology

High School

Laboratory High School

BISCAST balances the college experiences of its students, faculty and staff through various recreation and wellness programs. These programs, like the annual intramural activities, are made with the aim of developing the total well-being of its members, catering to their other skills/abilities and offer an avenue for its members to socially interact with each other while improving their physique and/or just enjoying their interests. The institution is home for different sports clubs which cater to the varied interests of the students, faculty and staff. They can also participate in the dance fitness program called Zumba. Facilities such as the student pavilion are also always open to cater for these purposes.

Athletics

The College recognizes athletic abilities/skills of its members and provide them avenue to hone it farther through different physical education programs and activities under recreation and wellness. The institution also pushes social boundaries by allowing and supporting deserving student-athlete to participate in athletic competitions outside the school premises.

Career Services

Choosing a career is a task that defines one's journey/life in the academe that is why the institution offers services in planning one's career path. Students can seek consultation on their career choices and plans to help them align it in their interests and goals.

Counselling Center

The institution is aware that ensuring holistic wellbeing of its students, faculty and staff extends far beyond the services offered by the health center. Concerns regarding stress management, anxiety, social and cognitive pressures, career change and transitional issues and the like are handled by the counseling center. The center offers counsel to those who seek it and to those who are advised to seek it. These matters are treated with utmost confidentiality by the counseling center.

6. Results achieved

The following results have been achieved:

Amendments have been introduced making the foundations more earthquake resistant, economizing on septic tanks by building one central septic tank instead of 48 single septic tanks and reducing unnecessary structural elements (columns), and protecting the roof against uplifting during heavy winds or taiphoons.

Detailed cost calculations on the “quarto complex” housing units have been elaborated and presented to the Naga City Municipality.

Apart from implementing on-job-training on the construction site for the Habitat for Humanity staff and the semi-and skilled construction laborers the GIZ building engineers implemented practical training at BICOL State College of Applied Sciences and Technology (BISCAST) for the teachers and the students. This training consisted of practical engineering skills such as construction site management, detailed cost estimation and cost calculation for better monitoring and evaluation, modular construction system and improved hollow block production, improved roofing, cross ventilation and climatically adjusted designing and construction. The training was conducted at BISCAST as well as on the construction site.

The training skills mentioned above have become part of the training courses implemented by BISCAST in their courses for architects. BISCAST has the ambition of becoming the leading training center on innovative resilient low cost housing technology and innovative Nexus technologies not only for BICOL Region but for the whole of the Philippines.

The changes in the housing designs have been drawn by the students and the teachers of BISCAST and later approved by the Chief Engineer of Naga City.

Naga City Government has decided to end the contract with Habitat for Humanity after the construction of 12 housing units because of substandard quality and performance by Habitat for Humanity. A private contractor will take over in order to complete the Del Rosario construction scheme.

Moreover, preliminary ideas for a pilot wastewater treatment system to be installed on the Del Rosario development site have been elaborated and discussed with the Municipality of Naga City. The wastewater from a slaughterhouse, a prison, a new housing estate and a planned high school shall be purified here.

7. Lessons learnt

Housing and in particular affordable housing is a comprehensive topic with many diverging interests involved.

The implementation of housing construction schemes has to be well organized. The roles of the different players, their responsibilities, duties, obligations and mandates should be clearly defined beforehand in order to avoid misunderstandings and wrong expectations.

Transparent contracts should be concluded, the required financial resources and procedures should be established in a structured manner before construction starts. Good will is not enough to guarantee a smooth implementation of construction activities.

The designs should be completed in a comprehensive manner beforehand considering the existing building code³ and should be approved by the corresponding local authority (local government).

The competences of the organization to be contracted should be studied before entering into a contract.

A timeframe to finish the construction is a required instrument (construction schedule) and should be part and parcel of the commission/contract.

The contracting partner should implement a regular, systematic and continuous supervision on site.

The contribution of labor on the construction site by the beneficiaries is not recommended as they are not skilled construction laborers. Moreover, their schedule does often not coincide with efficient construction site management.

³ "Revised Implementing Rules and Regulations for BP 220". Amended in 2001.

BP220 (according to Annex 6 of the Booklet):

"Batas Pambansa BLG. 220

AN ACT AUTHORIZING THE MINISTRY OF HUMAN SETTLEMENTS TO ESTABLISH AND PROMULGATE DIFFERENT LEVELS OF STANDARDS AND TECHNICAL REQUIREMENTS FOR ECONOMIC AND SOCIALIZED HOUSING PROJECTS IN URBAN AND RURAL AREAS FROM THOSE PROVIDED UNDER PRESIDENTIAL DECREES NUMBERED NINE HUNDRED FIFTY SEVEN, TWELVE HUNDRED SIXTEEN, TEN HUNDRED NINETY-SIX AND ELEVEN HUNDRED EIGHTY-FIVE"

<https://drive.google.com/file/d/0B1SgtZTR4hnkZ1p0RkJheXVPbVE/edit?usp=sharing>