

Building Capacities from University to Society

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ABSTRACT

The purpose of this paper is to share experience in teaching rainwater harvesting systems as a mean of building capacities at two universities of Guadalajara, Mexico. Rainwater Harvesting is taking on a higher relevance at Mexico. Last semester we implemented some strategies in two universities: University of Guadalajara (public university) and ITESO (private university). At University of Guadalajara started an academic reform in hydraulic and sanitary programs of architecture carrier. This reform consists in teaching new approaches in the design of hydraulic and sanitary systems, transforming the traditional approaches that included the mixed drainages to sustainable approaches. Now the proposal consists in teaching the idea to separate the wastewater and rainwater because in Mexico it is very common mixing the both waters. At ITESO was implemented a new Rainwater Harvesting Course to Engineering and Architecture carriers. Finally, there was organized a Rainwater Harvesting Conference at University of Guadalajara last march, which they were, gathered several universities, governments, high schools, enterprises, and media. These experiences were very useful and let us know the best ways to teach rainwater harvesting systems and spread the knowledge initialing at universities and then to the rest of society.

KEYWORDS

Building Capacities; Teaching; Academic experience.

INTRODUCTION

Construction of rainwater catchment systems in Mexico exists many years ago; however, the implementation of new systems is still very nascent. One of the reasons for which this happens is lack of capacity due to a lack of knowledge. Nodaway in most university programs do not have rainwater catchment systems academic programs so many graduates do not have skills required to design systems that can function without affecting nature. University as an important institution of the society becomes a strategic place to build capacities in students for construction of rainwater catchment systems in buildings of the city.

BACKGROUND

Movement of Rainwater Harvesting at Guadalajara began on 2005 with the publication of the Manual of Rainwater Harvesting in Urban Centers. This book was also unveiled at the XII IRCSA Conference held in New Delhi India. This event provided a great motivation to undertake a major project which was promoting the theme as an important item at university. Since then Professor Gleason organized a student group and they requested to the Dean of that time, to design a Rainwater Catchment System for the campus. The work has done but it is not built yet. Later, the project was presented at a National Rainwater Catchment System Conference at Querétaro, México.

ACADEMIC EXPERIENCES

Experience at University of Guadalajara (Public University)

Professor Gleason started to teach the course Hydraulic, Sanitary Mechanical Systems at Architecture School. In this course the students learn the basic operation and main structure of hydraulic and sanitary systems. At the beginning the program had some general themes with a few references and it was not detailed. There was no any orientation to the implementation of techniques with sustainable approach. It realized a deep analysis about the current state of the course and it defined the needs of professional camp. From this work, it was detected that the content of the current academic program covers only the operation of the systems without additional studies and rainwater harvesting issues were not included in the program. Therefore, it proposed the following content for the course:

Theme 1: Sustainable Development Issues

Theme 2: Principles of Hydraulic

Theme 3: Operation of Hydraulic System

Theme 4: Operation of Sanitary System

Theme 5: Rainwater Catchment Systems

Course started in first term, with knowing sustainable development approaches, encompassing the coming up of this concept, its development and its direct relationship with normal human life and particularly with the professional daily execution. An analysis of the current state of the planet is realized, underscoring the serious environmental problems and the actions needed to stop and counter react them. Rainwater Harvesting concept is considerate as a resource to realised a sane development.

In second term, the students know the basic principles of Hydraulic, beginning from its definition, principles such as Archimedes, Pascal and others, as well as some basic magnitudes as such a flow and pressure with respective units. In third place, it teaches the seven levels of the Global Hydraulic Infrastructure in order to give to the student an abroad approach of its operation, and he can link to the hydraulic system of the building.

Hydraulic system of buildings theme, contents its basic structure observing its elements and basic principles of operation. It emphasizes the calculus of water demand and the design of the capacity of the cistern for water supply, this knowledge will be fundamental for the design of rainwater harvesting system. In the same way it teaches over sanitary system making the difference between traditional and sustainable system. Traditional sanitary system only discharges in safe way the wastewater from the building to main collector. It is important to point out that this approach is most applied almost Mexico and it contrast with sustainable approach which has the purpose to re-use the rainwater and wastewater in a safe way.

Rainwater Harvesting Systems is taught basically as an real alternative to increase the amount of water supply of the building and as a measure of floods mitigation in Guadalajara. Definition of Rainwater Catchment System encompasses: System that catches rainwater and conducts it to superficial or underground water tank, passing through purification system. Also it teaches basic concepts such as definition and types of precipitation, intensity, duration, frequency and magnitude in order to get a good understanding.

Once the students obtained these concepts, it organizes teams among students in order to design a sanitary and rainwater catchment system with the purpose to accomplish them at a workshop where the students show their different projects. During the last two years this activity has represented a point of meeting for reflection and creativity. From this activity we have learned following:

- Implementation of these kinds of systems is slight, it is necessary to promote these techniques with more emphasis.
- Potential of catchment is limited in ordinary Mexican houses, because its roofs are small and there is no enough space to storage.
- It is necessary to have an adequate acknowledge of rainwater systems before the realization of architectural design in order to leave the suitable spaces for the system.
- Purification system must be elected carefully in order to determine the rainwater usage.
- Challenge in design of these systems consists on the determination of optimal dimensions for the tank that it can allows an appropriate size to obtain a good volume of water for domestic consumption.

Workshop is consolidated as a clue activity for learning because it allows to students applying their creativity, doing research activities, debating and exchanging experiences and points of view. One of the results of this experience is that the students apply these systems in their architectural projects in high levels of their carriers. The application of these systems is very slowly but it is becoming in a normal activity allowing the students of architecture enrich their capacities in order to gain an architectural design integrated to environmental. This activity allows to the professor knowing the skills of his students as well as their analysis capacity and doubts, with the purpose to modify the academic program for responding to real needs. Finally, at the end of the course the students get a Hydraulic-Sanitary Systems Manual, that it can allow count with technical information for future projects. This Manual is complemented with “Rainwater Harvesting Systems in Urban Centres Manual” written by Professor Gleason.

Experience at ITESO University (Private University)

Last September Professor Gleason was invited to speak at Instituto Tecnológico de Estudios Superiores de Occidente, University (ITESO, spanish abbreviations). The name of his lecture was “Rainwater Catchment Potential of Guadalajara”, which was received with enthusiasm and some students invited to Professor Gleason to teach about rainwater harvesting issues at their university. It was not easy to realize it, because there was no academic program, so it was necessary to design a new one. With the experience obtained at University of Guadalajara, the professional experience and some local, international, local technical information it was designed an academic proposal with the following content:

General objective comprises knowing and applying diverse techniques of rainwater catchment systems at urban centers with integral approach in the sustainable development frame. As specific objectives comprise the following:

1. To obtain a global overview of the situation of water resources at the planet, standing out the rainwater potential as an important element of the solution of the water problem in the world.
2. To acquire the basic concepts of hydrology discipline in order to understand the water management in the surface of the Earth and gaining an appropriate intervention in the basin.
3. Accomplishment of the rainwater catchments techniques in specific cases.

About methodology, the professor realized about 20 lectures during 17 weeks. It counted with support through power point presentations, some videos, and articles of technical magazines. Also it was utilized the Moodle software in order to exchange opinions, to share documental and field investigations, all of these in internet.

Content of course was the following:

1. Concepts of Sustainability an Integral Water Resources Management.
2. Global Hydraulic System.
3. History of Rainwater Harvesting Systems and its
4. Hydrology I
5. Hydrology II
6. Introduction to main techniques of Rainwater Harvesting
7. Structure of Rainwater Harvesting System of House
8. Structure of Rainwater Harvesting System of Building
9. Structure of Rainwater Harvesting System at an Industry
10. Workshop 1. Rainwater Harvesting System of House
11. Water Sensitive Urban Design
12. Workshop 2. Application of Water Sensitive Urban Design

For this course, it was organized one workshop where the students participated through small teams in order to apply the knowledges in a real situation. The results were outstanding because the projects which were presented showed a exceptional creativity. Projects showed during the workshop were following

- 1) Rainwater Harvesting System of Popular House.
- 2) Rainwater Harvesting System of Residential House at Nuevo Vallarta.
- 3) Rainwater Harvesting System of Rest House

Course finished with great enthusiasm and with expectation to realize the second part. The capacities that students developed during the course were outstanding. Most of them at the beginning do not have the basic knowledges about rainwater harvesting systems, but now, their interest has encouraged them to design the project of their house even and a project for one building at their university. On next 2010, it is opened the possibility to realize the first part of the course to new students, and the second part to students who attended the first one.

Dialogue-Workshop for universities

After these both academic experiences, it was eminent the necessity to organize a point of meet among both and other institutions. On last march was held the First Rainwater Harvesting Dialogue-Workshop which slogan was “Toward a Sustainable Rainwater Management”, celebrated at Art, Architecture and Design Center of the University of Guadalajara. There attended many institutions from all the city even some high school and secondary schools, as well as some government agencies and media. It is very important to underline that the response overpass the expectations. Attendance was almost 500 persons per day during three days. There were seven lectures:

- Geopolitics of water and Rainwater Harvesting Systems by Professor Mario López Ramírez (ITESO).
- Integral Water Resources Management and Rainwater Harvesting at Metropolitan Zone of Guadalajara by Professor José Arturo Gleason Espíndola (CUAAD)
- Urban Projects and Rainwater Harvesting System by Ph. D. Juan Angel Demerutis Arenas (CUAAD).

- Rainwater Harvesting Proposal to Small House by Ph. D. Fernando Córdova Canela (CUAAD).
- Underground Water Management at Metropolitan Zone of Guadalajara by Professor Javier Clausen Silva (ITESO)
- Hydrology of Metropolitan Zone of Guadalajara by Professor Mireya Acosta Gurrola (Engineering Faculty of University of Guadalajara)
- Infiltration well by Engineer Pedro Márquez Parra (Rivera Construcciones Company)

In the figure 1 you can observe the beginning of the event with the participation of the academic authorities:



Figure 1. Inauguration of the event

In the figure 2 you can the attendance to the activity:



Figure 2. People at the event

After the lectures, it realized the workshop. This activity was divided in two parts: exposition of basic concepts in order to establish an equal basis in the participants in order to get a good understanding of these topics because in the second they were going to be apply them in a project. To this activity attended students and professors from many different carriers such as: architecture, urbanism, civil engineering, environmental engineering, biology, industrial design and other disciplines.

In the second part it was elected a special flood problematic located at Development Azucena. This area is located at El Salto municipality and the bottom of the basin just at the junction of El

Ahogado Stream and Santiago river, one of most important and contaminated rivers in the country. It was organized many teams integrated by students and professor from different carriers with the purpose to get an interdisciplinary approach in order to gain integral proposals. The process was very interesting because in a few time the participants realized that there were many different point of views than yours. In spite of short time, the participants did not discouraged and they were patient to dialogue and listen different opinions from theirs. The greatest achievement of this workshop was to obtain a complete solution to the problem as complex, but appreciate how important it is to work together with coordination. Figure 3 shows participants to workshop.



Figure 3. Participant of workshop

Thus, this activity was realized. It strengthened the knowledges about rainwater issues and it remark a great step towards the transformation of our understanding in order to achieve a sustainable development.

CONCLUSIONS

The process to ascertain the feasibility of rainwater harvesting systems in our area has started and promises to get great results in the future if it continues to strengthen the capacities of future professionals through courses on rainwater management. It will be necessary revise the current academic programs of carriers that are related with rainwater in order to make deep changes with approach based by sustainability. Activities like conferences, workshops, dialogues and others are points of meeting for exchange of experiences and point of view, they should be organized frequently and multi-disciplinary. It should always seek to achieve a multi-disciplinary approach to training and implementation of systems, since technically strengthen the proposal itself, and facilitate its execution. It is necessary to still researching in a new ways to communicate technical knowledges about rainwater harvesting systems in clear manner, not only for specialists but also for citizens. As most people know these systems, their construction and implementation may be more widespread in society. The university becomes a strategic point for developing the capacities of citizens today and in the future. Nowadays, university is a mean to awaken the interest in these systems and it becomes a valuable resource for get a deep change in the good usage of water and rainwater management.

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