



Recurring hurricanes – the Cuban experience

Guatemala earthquake – a quarter century later

Hurricane Mitch 1998 - Nicaragua

Hurricane Mitch 1998 - Honduras

Hurricane George 1998 – Dominican Republic

Hurricane Gilbert 1989 - Jamaica

Disaster Prevention

It is a long hard road until construction projects integrate disaster prevention into their project planning. It is the dream of EcoSouth to influence development projects in this direction, prior to the onslaught of catastrophes.

To build dwellings that withstand local climatic conditions has been a guiding principle in the housing projects of EcoSouth partners over the past three decades. From Columbia, to the Dominican Republic, to Nicaragua, Jamaica, Cuba, houses have withstood recurring hurricanes or earth tremors. This has given EcoSouth the confidence to continue this path.

The hurricane laden Caribbean has demonstrated the resistance of Micro Concrete Roofing tiles (MCR), as well as other technologies including vaulted brick roofs. In a sense it is a laboratory for hurricane resistant construction!

Over the years EcoSouth has been able to observe the behavior of EcoMaterials in these extreme situations. The accompanying summaries highlight experiences using technologies and materials that have withstood recurring disasters.



Disaster Prevention

It is a long hard road until construction projects integrate disaster prevention into their project planning. It is the dream of EcoSouth to influence development projects in this direction, prior to the onslaught of catastrophes.

To build dwellings that withstand local climatic conditions has been a guiding principle in the housing projects of EcoSouth partners over the past three decades. From Columbia, to the Dominican Republic, to Nicaragua, Jamaica, Cuba, houses have withstood recurring hurricanes or earth tremors. This has given EcoSouth the confidence to continue this path.

The hurricane laden Caribbean has demonstrated the resistance of Micro Concrete Roofing tiles (MCR), as well as other technologies including vaulted brick roofs. In a sense it is a laboratory for hurricane resistant construction!

Over the years EcoSouth has been able to observe the behaviour of EcoMaterials in these extreme situations. The accompanying summaries highlight experiences using technologies and materials that have withstood recurring disasters.



Hurricane Gilbert 1989 - Jamaica

Gilbert is the strongest hurricane in Jamaican recorded history (wind speeds to 320 km/h).

Many roofs suffered serious damage, but the Golden Age Home in Kingston's Trench Town became a refuge for neighbors whose tin roofs had flown away. Its Micro Concrete Roof resisted well and only five tiles on the open overhang were lifted. It must be stressed that these tiles were not properly fixed as recommended, even worse, the wire loops were not nailed down!

In the Dominican Republic MCR roofs did not suffer while zinc roofs were severely damaged and the vaulted brick roofs were not affected.



In the early days of Micro Concrete Roofing (MCR) the recurring hurricanes were an important test. In Jamaica and the Dominican Republic all tiles were manufactured by local producers and sometimes placed on rudimentary support structures.

Hurricane George 1998 – Dominican Republic

Three weeks after Hurricane George ravaged the Dominican Republic in September 1998, EcoSouth colleagues from Ecuador and Honduras visited houses built with EcoMaterials and encountered the great majority in good condition.

The housing projects were built after Hurricane David ravaged the Dominican Republic in 1979 and used technologies and materials that could resist the recurring natural calamities. Since 1980 Grupo Sofonias had built around 300 houses and reconstructed some 600 with local participation and labor, and has educated many masons and rural builders.



The houses had no major problems and, according to some inhabitants, they did not feel anything during the hurricane. The few tiles which did fly away was because they had not been fastened to the wooden understructure.

It is interesting to note that the same hurricane and floods that destroyed thousands of homes and took hundreds of lives in the Dominican Republic, caused little damage and no loss of life in the neighboring island of Cuba.

The technologies were determined by the availability of raw materials: foundations of rocks and low grade concrete (cyclop concrete), walls of cyclop concrete, adobe or fired bricks, and roofs with Micro Concrete Roofing tiles (MCR) or brick vaults. All technologies were new to the villagers; traditional construction used palm boards for walls and thatch or zinc sheets for roofing. An intensive education program for future masons was always the base for action.

Hurricane Mitch 1998 - Honduras

After Hurricane Mitch devastated much of Central America, EcoSouth colleagues Grupo Sofonias Nicaragua, EcoVide Honduras and CIDEM Cuba became involved in post-disaster reconstruction.

La Betania, just another barrio in a satellite city ?

When Hurricane Mitch hit Honduras in October 1998, the inhabitants of “La Betania”, a neighborhood in Tegucigalpa, had to abandon their houses and sacrifice them to the swelling river. Four years later they moved into their new houses in a satellite town 30km outside of Tegucigalpa, the new neighborhood is also called “La Betania”.

When EcoViDe was entrusted with the reconstruction of “La Betania”, it first had to search for a suitable piece of land, an almost impossible task as land prices kept rising. Together with a planning consultant from Grupo Sofonias and active consultation with the social organization of “La Betania”, they decided it would be wrong to follow other NGO’s that simply started building houses in the mountains surrounding Tegucigalpa.

EcoSouth partner CIDEM dispatched a town planner to Honduras and, together with the national planning board and the committee of the future house owners, he conceived an innovative settlement design, limiting earth movements to a minimum and creating interesting areas for the 317 projected houses.



The only materials available on site were clay, sand and rocks. Due to the massiveness of the project and the small plots clay was not a viable choice for walls. Thus, EcoVide produced hollow concrete blocks and MCR tiles on site at costs below commercial materials, although market salaries were paid and all sand, gravel and cement had to be transported to the site.



Hurricane Mitch 1998 - Nicaragua

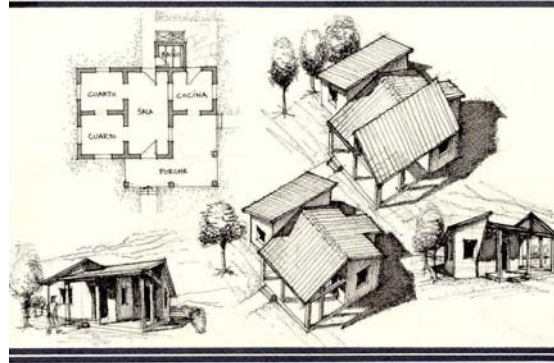
After Hurricane Mitch devastated much of Central America, EcoSouth colleagues Grupo Sofonias Nicaragua, EcoVide Honduras and CIDEM Cuba became involved in post-disaster reconstruction.

Malacatoya is a living example of architectural design and human settlement planning that demonstrates to all nations threatened by hurricanes and floods the wisdom of an integrated and participatory approach that draws upon experiences.

The Malacatoya resettlement project brought villagers from flood risk zones to a safer haven. Not only is the new settlement located in a higher zone where an inundation has never occurred, its design incorporates many principles to avoid future disasters, and involved the people themselves in the planning.

The primordial challenge was to ensure that water from the torrential rains would be evacuated naturally. Thus, the project drew upon the wealth of experience from EcoSouth colleagues at CIDEM in its response to the recurring hurricanes and floods that thrash through the Caribbean.

Their overall design included plans for roads and paths, electrical and sanitary installations, as well as community buildings such as a health center, pavilions for women and for children.



For the houses, the challenge was to achieve a basic design that allowed the houses to look different. This was accomplished through various ways of treating the roofs. A participatory approach allowed beneficiaries to express how they would like their future homes, and designs emerged that became reality in the houses the people built under the guidance of Grupo Sofonias.



Rocks, fine sand and clay are the raw materials available locally; everything else must be transported from afar, crossing a river on a ferry. The technology chosen was foundations and walls of cyclop concrete with partial substitution of Portland cement by puzzolana. Clay was no option as a certain risk of inundation could not be totally excluded. Micro Concrete Roofing tiles (MCR) were produced on site.

Guatemala earthquake – a quarter century later

Guatemala earthquake 1976

(based upon 2001 evaluation of adobe houses by University of San Carlos team)

In a nutshell, it was reconstruction in a sustainable manner, concentrating on setting examples of earthquake resistant adobe houses affordable to the general public.

This project concentrated on the Department of Baja Verapaz, a hard hit area somewhat off the beaten track in the center of the country....A team of adobe-builders was trained and a total of 150 houses were built in guided self-help in dozens of outlying villages and in the neighborhoods of the small towns..... The condition of the 24 year old houses generally is good.....The differences between them are due to different degrees of maintenance and differences in their location....The evaluation team came to the conclusion that it is possible to build houses with traditional clay technologies in seismic zones, if the necessary improvements are made.

The evaluation team recommends this type of project where local materials are used and a harmony with the identity of the communities is created. Many years later new houses were built in the same manner.



The technical evaluation compared the results to the instructions in the technical manual produced by Caritas Guatemala in 1976. This manual has been widely used as a reference document in many adobe projects throughout Latin America, and was based on a UN-sponsored investigation after the 1970 Peruvian earthquake. Learning from experiences cannot be underestimated.



The evaluated project was a 2001 finalist for the World Habitat Award.

The first months after the earthquake construction with adobe was not popular as people were afraid. However, the project area has few other raw materials, notably almost no sand and gravel. Cement was extremely expensive at the time. Through a program of practical education of masons and attractive model houses with improved features (foundation of cyclop concrete, thick adobe walls, careful masonry work, buttresses, tie beam at the wall top, safe roof structure) people started to regain confidence in their tradition. Roofs were mostly of metal sheets at the beginning, but step by step fired clay tiles made their way back

Recurring hurricanes – the Cuban experience

.....George, Lilly, Mitch, Lilli, Michelle, Ivan, Charly.....

After Hurricane Michelle passed through the Caribbean and Central America in November of 2005, an article in the Guardian drew attention to the great differences in damage between Cuba and its neighbors, not only in this hurricane but others throughout the past decades: “Whatever the reasons, Cuba has lessons for the rest of us.”

Dr. Gilberto Quevedo, director of the research center CIDEM at Santa Clara said there exists a policy of organized prevention from the national level through to the neighborhoods. It is composed of community organizations, as well as professional sectors and is centered in a Civil Defense program, which prepares plans throughout the year that are activated when there is danger of cyclones. Analysis of causes also is important in order to take the necessary infrastructure steps. Early analysis of the causes of floods resulted in a program of dam construction. New highways and roads are analyzed to ensure that the inclinations were made stable to cope with the heavy rains connected with hurricanes. Sewer systems and bridges were built to permit water to circulate without producing great inundations. Another focus was to improve housing. Urban development plans seek to diminish risks by not using zones that are easily inundated and avoiding areas that could have landslides.

“To withstand Michelle was a real life test. The MCR tiles and the blocks fabricated with EcoMaterials gained credibility,” according to the director of the national housing institute.



People in the town of Isabela remember when Hurricane Michelle whipped through with winds up to 280km/hour, and destroyed many buildings. However, 21 families already had Micro Concrete Roofing through and one inhabitant said that in the past each time a hurricane passed she lost her roof. Now, with her new roof, no tiles broke or moved during Hurricane Michelle and she feels secure.



After Hurricane Lilli passed through the island in 1996, CIDEM began to implement projects in the affected area using EcoMaterials. Hurricane Michelle whipped through the area in 2001.

In Cuba the limits to construction are not primarily the finances, but the availability of materials on the free market. For over two years in two provinces, the production of alternative cement and its use as a partial substitute for Portland cement allowed near duplication of production of hollow concrete blocks. Micro Concrete Roofing tiles (MCR) combined with innovative support structures became the most used light weight roofing material over the past decade. Use of local raw materials and waste products from the sugar industry are the basis of this development, which was nominated as best practice in the Dubai Habitat Award 2004.