BA Feature Article

Biorocks: a Coral Revolution

By Ima Deville

A Technology to Reverse the Trend

At the end of the 1970s, the Professor and architect Wolf Hilbertz and the marine biologist Dr Thomas Goreau had a genius idea to introduce large metal structures into the sea and electrify them with low voltage current to stimulate coral production. This new Biorock technology brought hope to restore bleached damaged coral reefs and prevent erosion of the sand in many fragile environments. Today, Pemuteran on the northern coast of Bali and Gili Trawangan in Lombok are leading two major projects that have had amazing results. This in a way comes to no surprise when we know that Indonesia has the widest variety of coral species in the world, with 450 species.

The Damage Done

The coral reefs around Bali and the Gili Islands have suffered tremendously in the last few years. It is estimated that today, only 6 percent of these reefs are in healthy condition (www.globalcoral.org). Destruction has come from human activities, such as dynamite and cyanide fishing, pollution, global warming, increased turbidity, over-exploitation and environmentally unfriendly tourism. Several causes can be identified, some of them brought by changes in the environment and others directly caused by men. The serious damage is often a combination of coral heatstroke, disease, land-based sewage, global sea level rise, over-fishing and direct physical damage from destructive fishing practices, boats, anchors, tourists and reef harvesting. The immediate impact on society and local economy is a threat to food supplies, a decrease in tourism income and the erosion of beaches in the area. If nothing is done rapidly, we can only imagine a bleak future, affecting all of us. Large-scale restoration of reefs and coastal habitats can only be possible if it becomes a priority for local businesses. This is why for example, the Gili Eco Trust has partnered with 10 dive shops and over 18 villas and hotels.

A Simple but Effective Technology

The technology is simple: metal structures of varying sizes and shapes are installed on the ocean floor and harmless low voltage electrical current passes through them to produce electrolysis. This process makes limestone or calcareous matter grow and cover the metal. At the same time, pieces of broken coral are attached to the Biorocks where they will grow faster and are more resistant to environmental changes such as higher temperatures and have a higher chance of survival. Fish and other marine organisms are attracted to these structures and sea life can thrive again. Biorocks are classified according to their function and depth. Biorocks in deep waters (between 5 and 20 meters) are installed to restore coral reefs. The ones found at 2 or 3 meters deep also restore reefs but help protect the beaches. Coral develops the fastest and many young fish shelter on the shallow water Biorocks. Finally, to fight erosion Biorocks are installed at less than one meter deep and their role is slow down the waves and diminish their force. When this happens, waves can then bring sand on the beach and enlarge them.

Amazing Results

Because Biorock technology is a catalysist for a natural reaction and not just a simple reproduction, the coral grows from 2 to 6 times faster than in usual conditions and their resistance rate has been estimated to be 20 to 50 times higher than in natural environment. Hard corals are perhaps the most visible parts covering Biorocks but soft corals, sponges, bivalves and tunicates also develop and become part of a healthy ecosystem. New marine life can be seen around the Biorock in a perimeter of about ten meters. On a large scale, Biorocks help restore damaged coral reefs and put a stop to the erosion of beaches in many fragile and endangered places in the world. The Gili Eco Trust is currently working on a new project of Biorock structures with an autonomous and eco-friendly turbine providing electricity from marine currents.

Pemuteran, Bali

The Karang Lestari project in Pemuteran is a large reef restoration project started in 2000. Mr Chris Brown and Mr Agung Prana were pioneers in the field and came with a strong will to protect the area. They created ecotourism income for the local community. The Karang Lestari project or Pemuteran Coral Conservation Project was initiated by Dr. Thomas Goreau, Professor Wolf Hilbertz, Yos Amerta and divers from Yos Dive Shop who built the first coral nursery using Biorock technology in front of Pondok Sari Hotel in 2000. In October 2002, an international workshop on design and construction of coral nursery took place and many new Biorocks have since been created and installed in what is considered one of the largest coral rehabilitation projects of its kind in the world. The success of the Pemuteran project is partly due to the community involvement whereby village leaders, dive shop owners, fishermen and tourism professionals all worked toward a better underwater world and the rehabilitation of coral reefs. Villagers also understand that they too can benefit from the expansion of the coral nurseries as they generate direct and alternative income. The Reef Gardeners of Pemuteran are a group of 12 trained local workers funded by the Pemuteran Foundation who work full-time protecting the reefs, the fish stocks and educating local residents and tourists about reef preservation. The Karang Lestari project continues to grow under the leadership of Rani E. Morrow-Wuigk and several other areas of Bali are interested to set up similar environmental initiatives. In May 2011 The Coral Goddess sculpture, designed by artist Celia Gregory and the Marine Foundation was added to the project and it is the first structure to be powered by a green energy source with two solar panels and a marine breeze wind turbine installed on a tower 30-meters in front of the resorts' Bio-Rock Centre. The Coral Goddess was blessed during a traditional Balinese ceremony, with holy water collected from several local Balinese temples. Ms. Rani Morrow-Wuigk now has a dream that one day the project will be entirely powered by alternative energy. The Pemuteran project has been documented in November 2011 in a short film and shown internationally ("Corals of Trawangan", link on www.biorock-workshop.org).

The Gili Islands, Lombok

In 2004 the Gili Eco Trust launched its Biorock program around the Gili islands. Today 65 Biorock structures are successfully helping to restore coral reefs in order to preserve the depths of the sea. This initiative, led by the Gili Eco Trust, is particularly important in this area because the coral reefs have suffered greatly over the last few years in the beautiful but fragile environment of the Gilis. This is all the more alarming that the economy of these islands relies on tourism oriented towards the sea and the underwater world.

The erosion of the sand is also getting worse. Like many small islands in the world, the Gilis could one day disappear because of the destruction of their reefs and sea water rising. Beaches are threatened to disappear because of erosion. Inspired by a project on the island of Ihuru in the Maldives, the Gili Eco Trust and some of their sponsors decided to fund a project of Biorock necklace technology in the north of Gili Trawangan. They connected long Biorock structures in the middle of the platter and used recycled rubble to create a wave breaker. We know sea walls cannot stop erosion on their own because they reflect the waves, which in turn take sand away with them. Biorocks, on the other hand, slow down the waves and allow them to bring sand onto the beach. The regeneration of a natural coral barrier is necessary to protect the beach and the coral reef. The Biorock technology on Gili Trawangan has been amazingly successful. Whilst many storms have hit the island in 2010 in particular, the beach has not receded and has even gained a few meters. The Gili Eco Trust has been the catalyst for the success of the Biorock programme in the Gilis. From one first biorock structure installed in 2004, in front of Villa Ombak, Gili Trawangan now has 65 Biorock structures around the island. Biorocks workshops are now organized annually in collaboration with the Kerang Lestari project from Pemuteran, PADI, the Global Coral Reef Alliance, the government of Lombok, Mataram University and businesses on the island. Participants come from all over the world to learn and share good practices and workshops are always an opportunity to install new Biorock structures around the island. Businesses contribute and sponsor Biorocks in front of their resort or dive shops.

Ecotourism Opportunities

Snorkelling and diving on these spectacular Biorock structures attract many visitors. It is diving based ecotourism and, apart from admiring these human creations, visitors also learn about the marine eco-system and its fragility. Tourism goes hand in hand with education for a better planet in the future. Tourists learn to interact with the environment, not standing or touching the corals, not grabbing the turtles. Many dive shops encourage participation in Clean-up days and there is now a PADI certification for completing the Biorock® Specialty Course.

Where Art Meets Science

Artists have felt inspired by this new dimension and new media for 3 dimentional structures. The free designs of Biorocks allow almost total freedom and gives endless opportunities. The beauty of these structures is that in time they will become living art, habitat for marine creatures. Seascapes and artistic dive sites have been created to transform the oceans and contribute to their better future. In Gili Trawangan, we can find domes, tunnels, a dolphin, a manta ray, a cone chimney, a turtle, baskets, waves, a starfish, a heart and more. Celia Gregory, artist, Biorock designer and President of The Marine Foundation has contributed several of these structures. This foundation is behind the international Living Coral Art Project, a program of stunning underwater installations or Biorocks regenerating marine habitat. Interactive eco art that sustain communities and the marine ecosystems on which they depend. Designs and nature converge in these art forms. It is a perfect way to pass on important information about the environment and encourage curiosity and enquiry.

Here in Bali, Deus Ex Machina, leader of fashion and trends has jumped on the bandwagon and created its own Biorock with the help of the Marine Foundation. A Deus motorbike, fixed to a metal rebar road and sunk 5 meters deep now lies on the ocean floor in front of Café Gili on Gili Trawangan. This excellent and fun project has been filmed and can be viewed on Youtube. Deus, known for their inspiring visuals, will draw new followers to the issues of the ocean environment.

Current Developments

Registration is now open for the 8th Indonesian Biorock Training Workshop on the Gili Islands, 12th-18th November 2012. This is an opportunity to learn and work with professional coral restoration experts and lecturers. The content of the workshop include design, construction, installation, monitoring, maintenance and repair of Biorock sites. It is of interest to dive shop operators, hotel and resort managers, conservation groups, coastal zone managers, fishing communities, marine scientists, mariculturists, tourism agencies, seascape and landscape architects, engineers, artists, government fisheries, environmental, and tourism policy makers, and to anyone who intends to design, construct and operate their own Biorock structures. For more info: www.biorock-workshop.org

Why not sponsor a Biorock initiative now?

- Gili Eco Trust welcomes donations to be able to maintain and create more Biorocks: www.giliecotrust.com/en/get-involved.html
- Sponsor a baby coral from Biorock Bali: http://biorockbali.webs.com
- Donate to the Marine Foundation to re-build the reefs around the planet: www.themarinefoundation.org
- Help a Biorock art piece to be sunk at sea. Living Sea Sculpture on Facebook and Kickstarter campaign: http://kck.st/vZ4GIk

Bibliography and Credits:

www.giliecotrust.com; www.globalcoral.org; www.biorock-workshop.org; www.themarinefoundation.org. Videos: Colleen Flanigan - TEDxWoodsHole - Living Sea Sculpture, www.youtube.com; "Corals of Trawangan", link on www.biorock-workshop.org; Deus Biorock by The Marine Foundation on Youtube; Karang Lestari documentary on Youtube; 2011 Pemuteran Project Documentary: http://vimeo.com/32615744; Coral Goddess films on Youtube.

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