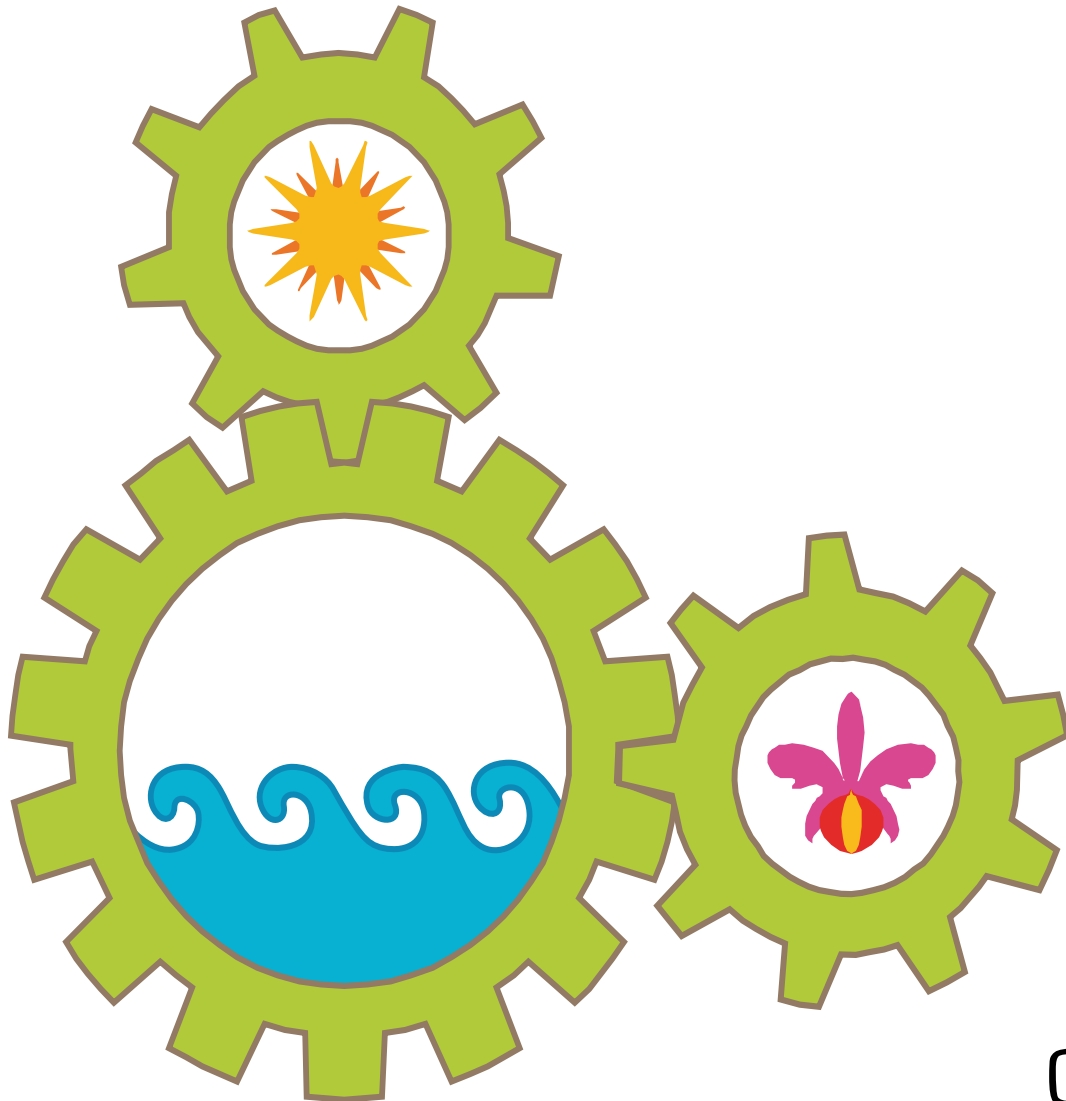


ENVIRONMENT AND SUSTAINABILITY WORKSHOP

WATERSHED MANAGEMENT IN THE RIVIERA MAYA

Report July - August 2009 - 2010

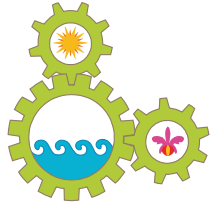


Centro Ecológico Akumal

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Summary



The management and economic development of the watershed in the Riviera Maya does not currently take into account the karst elements of the Yucatan Peninsula; the underground rivers, and the interaction between ecosystems, thus provoking environmental issues that are seldom identified and or resolved. To address this situation, Centro Ecológico Akumal organized three workshops in July and August of 2009, about the watershed, its ecology and sustainable management. The workshops were geared to the public and private sector; mainly for hotel operators (where large amounts of freshwater are used for the tourism industry).

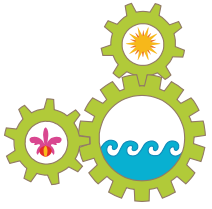
Two workshops were offered in Spanish and one in English, and the different sectors participated in the following percentages: Hotel 39%, Civil Society 24%, Services sector 14%, Public sector 10% and Real estate sector 2%.

Within the workshop we formed work groups in which the participants, building on the base of their learning, could discuss activities through which their jobs could contribute to the protection of the environment, obstacles to such efforts, and possible incentives which might help bring such efforts to fruition.

These work groups concluded that internal training in the hotel industry needs to be better, that civil society needs to readopt the concept of belonging to the earth that responsibilities and accountability need to be apportioned, and those economic rules need to be changed to prevent destructive and exploitative industrial practices.

Another conclusion of the workshops was that the current model of development is not sustainable in an environmental, economic, or social sense; nor is coastal management, now that the burden of tourism and population growth exceeds the environment's capacity to provide ecosystem services for humans and biodiversity.

Later, in March 2010, another workshop was carried out, for feedback from the participants of the previous workshops. Of the thirteen participants in this workshop, only five had participated in previous workshops and belonged to the non-profit, hotel and government sectors. The remaining eight participants had expressed interest in the workshop, after having learned about the previous events. This final workshop ended the capacity building about the environment and sustainability, watershed management in the Riviera Maya.



2009 Training workshops

Personal and professional experiences on sustainability of the aquifer from the participants in this and previous workshops, as well as their sense of belonging, were shared and discussed. The round table discussions centered on the advantages and disadvantages of the training in this type of workshop and the long term impact promoting the improved use of the aquifer. It was concluded that it is necessary to educate people in an ongoing way, through talks and workshops in work and job centers, as well as in places where the acquired knowledge needs to be applied in day-to-day life.

These workshops were financed by National Oceanic and Atmospheric Administration (NOAA) through a project submitted by Centro Ecológico Akumal (CEA). They were carried out with the support of the following partners: the Association of Hotels of the Riviera Maya, Hotel Club Akumal Caribe, and the Gran Bahía Príncipe Complex.

The specific objective of the workshops was:

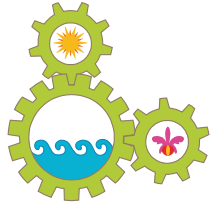
Assemble, train, and motivate the tourism sector and the public to increase knowledge about proper management of regional watersheds.

The goal at the end of the workshop was that the participants would be able to identify ecological and economic threats to the watershed of the Riviera Maya, the effects of their own activities, and also possible solutions they could implement to preclude those threats.

The workshop was designed to be three sessions: July 30 and 31 (in Spanish) and August 20 (in English). They all took place in the facilities of the Hotel Bahía Príncipe.

Because the workshops were divided into three sessions, different speakers participated in each one:

- Juan Ramón Díaz Calderón and Guadalupe Leal Uc, of the National Water Commission (CONAGUA): "Social Participation in the Watershed Councils and their subsidiaries"
- Dr. Mario Rebolledo Vieyra, of the Center for the Study of Water (CICY Q. Roo): "Underground System of the Yucatan Peninsula".
- Dr. Patricia Beddows of Northwestern University: "Yucatán Karst Aquifer".



- Dr. Laura Hernández Terrones, of the Center for the Study of Water (CICY Q. Roo): “Water Quality of the Aquifer of Quintana Roo”.
- Miguel Ángel Maldonado and David Placencia of Centro Ecológico Akumal (CEA): “The Importance of the Mesoamerican Barrier Reef and the Sustainable Management of Coastal Areas”.
- Marisol Venegas: “Economic implications of the use of resources: on the economic value of ecosystems and the sustainability of tourist destinations”.
- Dr. Gabriela Mantilla Morales: “Alternative technologies for wastewater treatment”.
- Ana García and Francisco Pérez of the company Maremex: “Solid Waste Treatment in Quintana Roo”.

A total of 71 people responded to the announcement of the workshop. A total of 15 people participated in the workshop on July 30, 33 people on July 31, and 23 people on August 20. Out of these participants, 45.5% were between 25 and 35 years old, 34.5% were older than 45, 12% were between 35 and 45, and only 8% were between 18 and 25 years old.

Of the 15 total participants in the July 30th workshop, two were from non-governmental organizations (NGOs) or foundations, one was from real estate, one was from the public sector, five were from the service industry, and six were from the hotel and tourism sector of the Riviera Maya.

Of the 33 participants in the July 31st workshop, 15 worked in the hotel and tourism sector, seven in NGOs or foundations, seven in the public sector, two in universities, and two in the service industry.

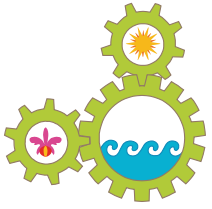
Of the 23 participants in the August 20th workshop, eight worked in NGOs or foundations; seven in the hotel sector; five in academia; and three in the service industry.

The majority of participants, 69%, had resided in the region for 1 to 5 years, 24% for 5-10 years; 5% for less than a year; and only 2% of the participants were actually native to the state.

Profile of Participants



Author: CEA



Expectations of the participants

A) To get to know my environment and how the system works, to participate in:

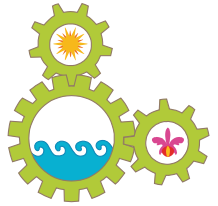
- Understand the hydrological system, the water underground, and the environment; to be able to spread and share that information with more people.
- Implement more practices of sustainability in businesses.
- Raise awareness among the local population.

B) Responsibility and co-responsibility:

- Recognize the real problem regarding water in the region.
- As a property or business owner, rely on infrastructure backed by scientific investigation.
- Understand the impact of mass tourism on the environment of Tulum and the daily life of its inhabitants.
- Have information for projects or studies in the zone.
- Know what is going on around me and in the community in which I live.
- Have the knowledge to take care of the environment.
- Get to know better the management of the watershed, have a wider vision and be able to transmit that to hotel operators of the zone in order to raise consciousness.
- Have the knowledge about the management of water and alternative treatments for wastewater and the ability to put them in practice in my hotel.

C) Interchange information and get to know the organizations, projects, and programs concerning sustainability in the Riviera Maya:

- Get up to date, make connections with local organizations, have ideas to implement in my hotel.
- Introduce myself and my organization to be included in research.

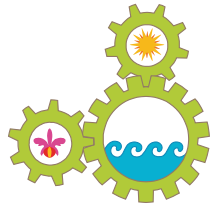


The training process was designed as the following phases:

- **Announcement.** With the objectives of the workshop and preliminary program (appendix 1).
- **Preliminary Registration.** Allowed us to identify interest and integrate a register of participants (appendix 2).
- **Preliminary survey.** Allowed us to identify the level of knowledge about the theme of sustainability and watershed management, the regional and local problems, as well as the expectations and interest of the participants in involving themselves in the promotion of an alternative model of sustainability in the region (appendix 3).
- **Presentations.** Presentation of the subject content was geared to provide the fundamental components of sustainable development, identifying the general problems for each one of those components and presenting alternative technologies and mechanisms of participation to achieve sustainable development.
- **Question and answer.** At the end of each presentation, the participants could direct questions to the speakers to clarify and complement the talks.
- **Work groups.** These presentations were followed by analysis and discussion to integrate the participants into work groups, in which they could interchange information and ideas about the 3 axes of analysis:
 - What activities do you do in your job that contribute to the protection of the environment?
 - Why do people who work in your industry not take more actions to conserve the environment?
 - What do you think is the way to encourage people in your industry to take actions at their workplace that help conserve the environment?

At the end, the conclusions of each work group were shared.

- **Presentation of certificates.** To each of the participants and speakers in the workshop.



Development of the workshops (July 30, 31 & August 20)

The presentations had three modules:

1. Basic understanding of the regional and local hydrological system, watershed, and coastal area; identification of the risks and threats due to urban development and current tourism practices.
2. Legal framework - regulatory and participatory mechanisms.
3. Search for new parameters of sustainable development and alternative management of solid waste and wastewater.

Module 1. Basic understanding of the regional and local hydrological system, watershed, and coastal area; identification of the risks and threats due to urban development and current tourism.

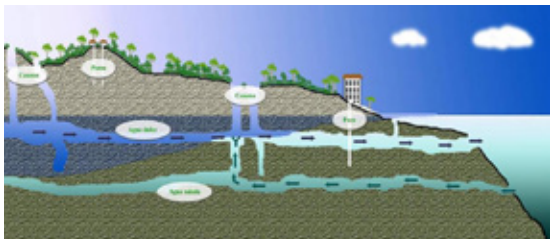
The presentations “Underground System of the Yucatan Peninsula” by Dr. Mario Rebolledo Vieyra, “Water Quality of the Aquifer of Quintana Roo” by Dr. Laura Hernández Terrones, “Yucatán Karst Aquifer” by Dr. Patricia Beddows, and “The Importance of the Mesoamerican Barrier Reef and the Sustainable Management of Coastal Areas” by Miguel Ángel Maldonado and David Placencia provided information about the progress of research into the characteristics and function of the underground water system and the different components of the system; indicating weaknesses as well as the principal risks and threats facing them, and above all else the unsustainable urban planning and tourism behind the development of the zone.

Yucatan Peninsula Underground System.

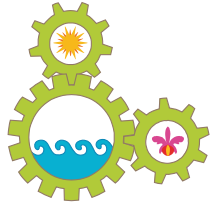
To understand the hydrology of the Yucatan Peninsula, it is necessary to address the following questions:

- How much water exists?
- What is the quality of the existing water?
- What are the directions of regional flow?
- What is the flow pattern?
- What is the spatial distribution of the saline intrusion?

To consider **hydrological balance**, a little understood concept based on the hydrological or water cycle and allows the measurement of how much water enters and leaves a region, one must consider not only the rainfall pattern, which in Quintana Roo is 1200 mm on



Author: CEA



average per year, but also the phenomenon of evapotranspiration. This process as in all tropical regions with heavy vegetation cover is very important. In fact, hydrological balance is little understood.

In the Yucatan Peninsula (YP) watershed, or Hydrological Region 12, the available water is completely underground with the infiltration of water to the subsoil feeding the aquifer. Because it reaches the sea, the aquifer is subject to its pressure. In a simplified model, it is formed by a lens of freshwater over one of saltwater. The freshwater and saltwater do not mix as the saltwater is denser, which forms two layers of water: the freshwater over the saltwater. For every meter of freshwater, one can estimate approximately 20 meters of salt water underneath.

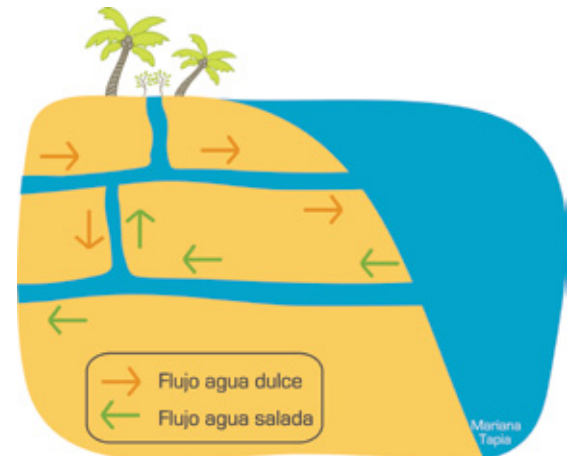
Aquifers are not static as the mixing zone depends on variations in sea level; thus, the quantity and quality of an aquifer changes all the time.

Karst. The term karst soil is incorrect. Karst is a phenomenon that occurs in the rocks, not the soil. In the YP, the soil is only several centimeters deep. The soil layer serves as a filter in other zones, but in this zone it cannot because it is too thin.

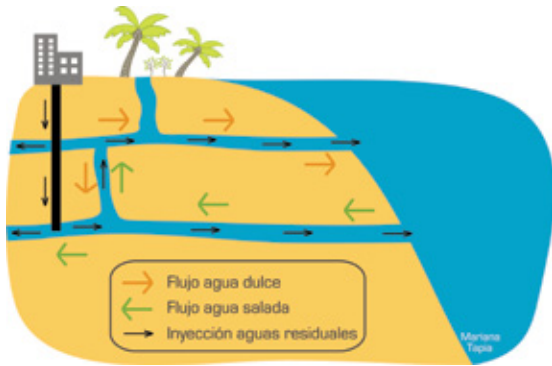
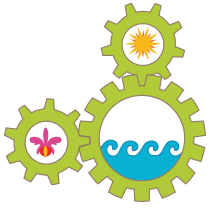
Dissolution phenomenon. The rain reacts with carbon dioxide and produces carbonic acid, which, with time, begins to dissolve the rock, increasing the effect with saltwater. This dissolution has facilitated the creation of complex systems of caverns and submerged caves that are very vulnerable to pollution. Cenotes are a cavern of dissolution in which the ceiling has collapsed. The Yucatan is not exceptional in this respect; there are many other karst sites in the world.

Water flow. Recent studies in the Yucatan and the coast of Quintana Roo demonstrate that:

- The flow of underground water does not radiate from the center of the Peninsula. Rather, in the state of Yucatan, it arrives at a ring of cenotes and discharges into the sea. Meanwhile, in the state of Quintana Roo, the water from the center of the peninsula enters the system fractures parallel to the coast towards the north.
- The discharges of underground water occur in the coast by means of numerous waterholes and springs.
- The saline water under the mixing zone changes direction. In certain times of year,



Water flow
Author: Mariana Tapia



Author: Mariana Tapia

it flows towards the interior of the peninsula at speeds of hundreds of meters per day. The direction of the flow of saltwater inward is controlled by the changes of low frequency (weekly, monthly) in sea level.

- The subterranean drainage happens through organized networks of channels formed by dissolution. It is estimated that 96-99% of the water is stored in the matrix and that 94.99% flows in these conduits.
- There is a high density of conduits and interconnectivity within the systems. In the area of Ox Bel Ha, the density of conduits is 4.3 km/km²; 8.9 km from the coast, the density is 1.8 km/km². The influence of the tides is at 39% amplitude 5 km from the sea and hydrological flow is 0.5 to 2.5 km per day.



Author: CEA

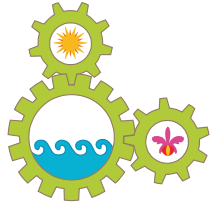
Water use problems.

Pollution by saline intrusion: Excessive extraction of freshwater in the coastal aquifer for human consumption can cause levels of freshwater to lower dramatically, to such an extent that the saltwater rises, filling the spaces previously occupied by freshwater.

Pollution by nutrient dumping: Regulations allow the injection of waste water into the subsoil at a depth between 50 and 80m. Unfortunately, due to the difference in density, the wastewater rises and can contaminate the aquifer. The sewage can thus rise and mix with the rapid flow of saltwater below the mixing zone. At high tide the sewage can be transported to drinking water wells located a few kilometers from the coast. Meanwhile, at low tide, the sewage is rapidly discharged all along the coast by means of the conduits.

The wastewater, even after treatment, contains a load of nutrients that pose a risk to both the water quality and the ecological balance of both the aquifer and the barrier reefs, for which the nutrient dumping is the real problem.

Changes to the environment and natural drainage patterns, such as excavations or the creation of canals, have proven catastrophic in similar regions, such as Florida. However, in this region, we cannot yet quantify effects because of the lack of historical data. Nevertheless, indicators such as landslides, loss of wetlands, and declines in biodiversity, show the importance of preserving water quality and quantity.



Water quality in the Quintana Roo aquifer. The objective of the research is to better understand the quality and quantity of available water, to study the relationships between the water and the nutrients, and to know the quality in terms of bacteria for the purposes of storage and recreation as well as identifying potential health risks.

The samples and analyses are based on both international and official Mexican standards (NOMs). Different techniques are used, like multiparametric probe or sampling and laboratory analysis, depending on the monitoring system. Radioisotope studies are used to define the direction of water flow.

Monitoring of Puerto Morelos. Since 2006, periodic monitoring has been done and one of the findings is the distribution of salinity along Puerto Morelos. The distribution of nitrates: there is a source and it diminishes along the coast.

Monitoring Akumal. There are freshwater inputs to the springs of Yal Ku. This type of map allows us to evaluate the seasonal variation and the activities that are occurring, like the leak of a treatment plant. In the bays the monitoring is done in the freshwater water holes and the marine water.

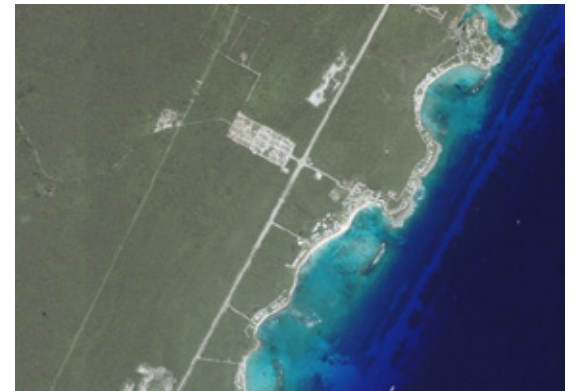
Monitoring the wells from Mahahual to Xcalak. It was of heavy metals, but there were no significant concentrations. Calcium is a principal component of the rock of the YP. The microalgae are also monitored as an indicator of water quality; the chlorophyll in oligotrophic media, the diatoms in mesotrophic media, and cyanobacteria in eutrophic media with poor oxygen. An integrated study may be made from all of this data.

The seasonal analysis has allowed the analysis of the impacts of pollution and how long the system takes to recover. It assesses the relationship of tourist activity to variations in water quality.

What can be done from home is to review septic tanks for leaks; see if they need maintenance and that the waste from the tanks is adequately treated. Treatment plants must follow the operation for which they were designed; do not improvise their management. Treated wastewater may pass through a refining system such as wetlands or canals, so that it may subsequently be used for irrigation and not necessarily injected into the ground.



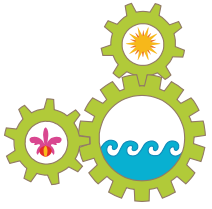
Quality of the water. 2007
Author: CICY, Unidad Quintana Roo



Akumal
Author: CEA



Treatment plant
Author: CEA



Importance of the Mesoamerican Reef within sustainable management

The Mesoamerican Reef System (MRS) is a complex and extensive ecosystem with high biodiversity that spans approximately 1000 km alongside Mexico, Belize, Guatemala, and Honduras.



Author: Yibrán Aragón

Reef is an underwater calcareous structure made of living organisms, in which coexist a large number of animals and terrestrial plants that adapted to marine life over the past 120 million years.

Corals are colony-dwelling animals associated with symbiotic algae. Together they generate a calcareous exoskeleton that grows toward the surface of the water.

There are different species of coral that are distributed according to depth and the pattern of energy in the system (waves): border, barrier, atoll (as in Banco Chinchorro reef), and the patch reefs of the reef lagoon.

To live they require:

- Light: depth < 50 m
- Temperature: 25 - 29 °C
- Salinity: 25 – 35 ‰
- Hydrodynamics: food and oxygen
- Nutrients: in low concentration
- Hard substrate: to affix

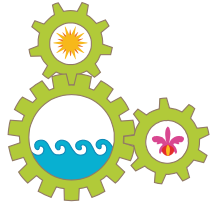
Any change in any one of these parameters affects them and explains the vulnerability of this ecosystem.

Disturbances and deterioration, resulting from the combination of natural factors and human factors.

Within the natural factors there are incidences of disease, predation, competition, and the effects of hurricanes. Bleaching provokes mass mortalities and 10 relatively new diseases exist that are affecting different species and are associated with climate change and water pollution, such as: white band, yellow band, black band, white plague, white pox, dark spots, black line, and cotton disease, among others. Human factors include: eutrophication, tourism, construction, overfishing, collection, and pollution.



Author: Yibrán Aragón



Various monitoring studies carried out through the MRS project have demonstrated the decrease in coral coverage. In Akumal in 1990, coral coverage was estimated at 40 to 45%. In 1998 the bleaching phenomenon and white band disease dropped coverage to 22%. Today, the rate is only 3.5%.

The pressure of tourism and aquatic activities exceeds bearing capacity: in 1999 the Riviera Maya had 667,000 visitors. In 2008 it came to compete with Cancun with 3 million visitors.

The ecological importance of the reef system is that it forms sand (by means of its calcareous exoskeletons), produces food for other species, provides reproductive niches, manufactures oxygen, and forms a natural barrier to stabilize sediments and protect the coast against the impact of hurricanes. It also has great medicinal potential, and, above all else, 80% of the economic activity occurs around the reefs: diving, fisheries, fishing, etc.

The decrease in the coverage of the corals is due not only to increase in the temperature of the water but also, above all else, to the excess of nutrients as a result of tourism development and associated works, such as aquatic activities, which are constantly increasing and poorly managed.

Also the decrease in the number of herbivores contributes to the increase of algae that compete for space with the coral.

The cost of the devastation of the reef is very high; perhaps much more is being lost than is being gained.



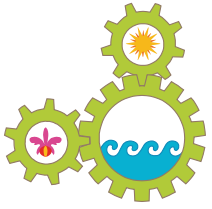
Author: Yibrán Aragón



Author: Yibrán Aragón

Questions and answers:

1. Why is the YP zone not seismic?
 - » Historically, it has not had seismic activity. There is a large fault coming from the Cayman Islands that passes between Mexico and Guatemala.
2. The whole tourist sector is polluted. What can be done about it?
 - » The work crosses sectors; the research institutions take on the responsibility of giving the technical information. There are alternative technologies, like artificial



wetlands, composting toilets; all depends on each operator, a review of the regulations, and the participation of the three levels of government and organized civil society. depende de cada operador y revisar la normatividad, la participación de los tres niveles de Gobierno y la sociedad civil organizada.

3. Are there examples of flooding that have affected the subterranean waters? If there is pollution on the coast, how much can it penetrate to the interior with the flow of the tides?

» The studies that are being made monitoring water quality are generally done at the extraction sites indicated by current protocols and regulations. This is inadequate for the reality of the YP environment: they should do them in remote sites away from the wells to be able to measure the impacts considering natural drainage patterns.

4. Do you know about the artificial canals of Mayakoba in Playa del Carmen? How much damage have they caused? And can it be remedied?

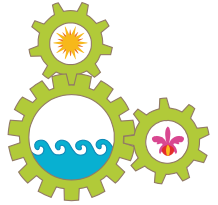
» For a lack of studies and for the little time elapsed since these modifications (as opposed to what happened in Florida with the management of the canals) the damages have not been measured and the impacts are still unknown. However, considering the fragility of the ground and caliche below, the risk is very high.

5. Regarding the slide of figures of Escherichia coli (E. coli) do you know if the figures there are alarming, and, if so, what repercussions does that have on the environment?

» All warm-blooded animals have Escherichia coli (E. coli) present. On the beaches, the maximum limit is 100; as the most probable number in 100ml (mpn/100ml). In recreational activities, the standard is 200 mpn/100m. Discharges are a daily average of 1000, with 2000 as a monthly average. There is a fluctuation related to the high tourist season that recurs on a regular basis, although on average we are at 150mpn/100ml depending on the moment or the month.

6. Is there an area of the Riviera Maya that is the most polluted?

» I cannot answer that because monitoring is not done apart from Akumal, Sian Ka'an, Xcalak, and Mahahual. You can access the webpage COFEPRIS, where you can view an analysis of water quality in 35 public beaches in the state. The strategy that has been adopted is to close beaches when 500 enterococci mnp is exceeded, but so far this has not been detected except after the impact of a hurricane. The idea is to have water quality forecasts for the beaches so that people can choose whether or not to get into the water. **www.cofepris.gob.mx**.



7. What would be the impact on one's personal health if the beach was polluted – what symptoms would present?
 - » Diarrhea, sinusitis, dermatitis, depending on the time of the exposure and the individual's propensity to get sick.
8. What causes the coral disease – virus, bacteria, or pollution?
 - » The bacteria present in fecal matter has been documented to cause disease in coral. White pox and yellow band have been found to be related to viruses. While there is a correlation, it is very difficult to demonstrate causality. However it has been demonstrated that E. coli has a half life of a few days in the water but other bacteria can indeed adapt to marine life.
9. The data for the decrease of coral growth is linked to the increase in the number of rooms in the tourism sector; it is not difficult to determine that urban development affects the reefs. Is anything being done to control it? There are laws that regulate this, but is anyone enforcing them?
 - » Some of the reefs are located within natural protected areas (NPA). The reefs are not taken into account in planning; what happens on the land is not actively linked to the marine natural protected areas, even though everything is actually connected. They should be linking the problems of the reef to the development plans of the coastal zone. In the past few years, the Committee on Water Supply and Sewage (CAPA) has come to accept this relationship and is beginning new actions to attack the problem.

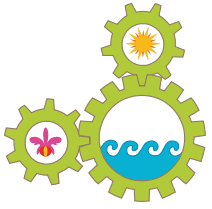
Module 2. Legal framework - regulatory and participatory mechanisms.

The presentations, "Participation in the watershed and sub-basins" by Juan Ramon Diaz Calderon and Guadalupe Leal Uc, presented the elements for understanding what a watershed is, and, within the legal framework of national water law, which mechanisms of water management allow the participation of the consumers of the water

Water is a national asset; it is administered by National Water Commission (CONAGUA), but it belongs to all Mexicans. Within the framework of national water law, the integrated management of water is promoted through the organization of consumers and civil society for the management of the watersheds. Different mechanisms exist for the management of water that allow for the participation of the consumers of the water, such as the watershed councils.



Author: Mariana Tapia



Author: CEA

In the whole country there are 37 hydrological regions. Regions 31, 32, and 33 are located in the Yucatan Peninsula. 26 watershed councils have been formed. The YP is council 25. The YP has enough water; there is no water above ground except for the Hondo and Escondido rivers.

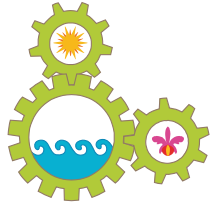
Participation is part of the solution to the problem. The watershed councils are examples of consultation and coordination between consumers and authorities. Consumers are individuals or corporations that are registered in the public registry of water rights (REPDA) for having requested a certificate of concession for use of the aquifer. There are 1939 registered users; 41% of the water concession goes to the services sector (1000 liters per room per day (including swimming pools). They are the board for dialogue and cooperation to implement policies and work plans. They preside over the five uses of water (industrial, service, etc.). Currently, Xel-Ha Park represents the tourism sector.

The Watershed Council is in an improvement phase. Consumers and NGOs should constitute 50% of the participation and 50% should be the government. A new president of the Watershed Council will be elected.

Water is an asset that belongs to everyone. The aquifer does not recognize borders. Water is available, but the ecosystems may be affected by the change in water quality. We should all participate in the care of the water. One of the requirements for sustainable development is the positive and active participation of the consumers.

Questions and answers:

1. What are the fundamental problems of the watershed council; why do we have this level of crisis in the state?
 - » The problem in the watershed is the vulnerability of the aquifer to pollution. If development is not planned and actions put in place for treatment, the aquifer will be contaminated. We should all work to improve the health of the watershed. Lack of social participation; there is no appropriate legal framework; poor management of solid waste.
2. Is the problem the influence CONAGUA has on public policy?
 - » In reference to the watershed, there is sufficient water. CONAGUA cannot deny anyone the resource if there is water available. The hotels should request their permits. It is necessary to have an influence in the treatment of sewage. The problem is that the utility cannot go hand-in-hand with the necessary infrastructure. Regarding supervision, lack of resources and personnel.



3. Do the watershed councils discuss the guidelines and regulations? Should we be drilling to 50m?
 - » People have to participate, to make changes that positively impact as CONAGUA can influence to ensure compliance. Quintana Roo lives off of tourism and we are polluting the resource. Everyone must be convinced to participate in the watershed councils and take this responsibility.
4. When is the next meeting of the watershed council?
 - » The participation part is going to be discussed in the work table. The administration of all the problems of the watershed does not only have to do with water, but involves all sectors. The next session of the council is in the month of October, and you will gladly be sent invitations.
5. Social participation – have they developed a strategy to ensure that all can participate in these councils?
 - » There is a process of election of consumers; which involves the NGO’s, the hotel industry, and the association of hotels in the Riviera Maya to form part of the council. The idea is that through them, information will be dispersed. Anyone can participate as they are open forums and the problem is discussed by everyone. The invitation is open for the committees for clean beaches and those who wish to participate need only to send a letter to CONAGUA to be included.

Module 3. Alternative solutions - technological, social, and economic.

Economic implications on the sustainability of a tourist destination,” by Marisol Vanegas Perez, “Solid Waste Management in Quintana Roo” by Ana Garcia, and With “Alternative Technologies for Wastewater Treatment”, Dr. Gabriela Mantilla Morales of the Mexican Institute of Water Technology (IMTA) gave information about the legal and regulatory framework within which the current urban tourism model is developed, who applies and supervises it, as well as difficulties and possible conflicts in its application; also what water treatment is and the need for it to avoid public health problems and enable environmental sustainability; as well as the principal water treatments currently used in the country within the legal framework and alternative water treatment technologies.

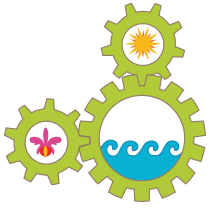
Economic implications on the sustainability of a tourist destination.

There are a number of myths about the tourism sector:

- The tourism development model we have followed since 1960 is successful..



Internet Source 1 in Annex 5



Internet Source 2 in Annex 5

- In terms of tourism, Mexico is competitive.
- Tourism activity has a high profitability.
- The results of the sector - revenue and tourists - are positive and increasing.
- The creation of jobs from tourism is essential to boosting investment.
- Tourism generates regional development.
- If we adopt good practices in hotel operation and tourism together; we will achieve sustainability.

Data from 1995 to date:

- In Mexico, inbound tourism grows 5% on average annually, below the growth of its competitive set, the Caribbean and destinations worldwide.
- The average expenditure per inbound tourist grows 3.3% per year.
- Tourism jobs grow by less than 1% per year.
- The employment rate compared to the national rate decreases.
- The total annual investment in promotion plus public spending produces on average 250 thousand additional tourists.
- The central policy is not reflected in the states or municipalities. There are 32 different ways of doing things.
- International tourism generates 20% of revenues and 15% of passenger flow. The remaining 80% and 85% respectively are provided by domestic tourism.

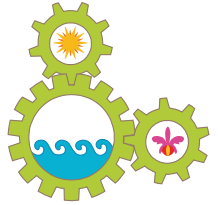


Internet Source 3 in Annex 5

Private initiative forms part, due to absence or omission, of the regulatory and decision-making superstructure. On the part of public policy, there is a general tourism law as well as other instruments, agencies; and resources (DNI, 2% tax); to put in place sustainable actions, but Article 115 of the Constitution gives the municipal president the power to change zoning and room density.

There is a provision in the new law regarding tourism such that when you want to make a change, it is proposed and revised at the state and federal level as well. However, it lacks coordination. The tourism sector's agenda must be lowered, the regulations of general tourism law; mechanisms for implementation or local political will to accomplish the necessary changes.

Thus the paradox that arises is that it creates an absence of regulation, since it only guarantees to serve the interests of a few actors, increasing the inequality of the sector.



On a more critical level, the above results in a loss in the public image of the government and gives privileges to special interests over the collective interest; that cannot be recovered later.

The costs incurred in the countermeasures to stop the deterioration of resources, especially environmental resources, increase costs. The paradox is that such costs are not reflected in bringing to a halt the conditions that cause the deterioration of resources, so the problem persists. The cost to repair the environmental disaster is not considered in the costs.

Short-term investments encourage a cheaper market, reduced costs, and scant attention to environmental and social issues. This discourages long-term investments willing to invest in high quality criteria which are unable to compete at that price level.

We have developed an unsustainable model. The model of tourism development is not successful; Mexico is not competitive – we rank 126th among 133 countries in terms of safety, education, health, etc. It does not have a high profitability; 72% is handled by international wholesalers. Many investments are recovered in less than 5 years; resulting in the costs being what they are.

The Mayan area is not integrated within the system. 3% of what guests eat is from this state. Last year, 20 thousand tons of oranges were produced and none were consumed directly in the area. The Ritz Carlton purchases 96% of its food locally.

The rate of migration due to attraction of labor and generation of jobs causes backlogs in municipal services and worsened living conditions. This means marginalization for the typical employee.

The systems of supply and distribution of inputs and outputs neither recognize boundaries, nor pursue local interests. Regional developments, and development of other productive sectors thought to be associated with tourism, are not actually furthered; and on the contrary, inequalities increase.

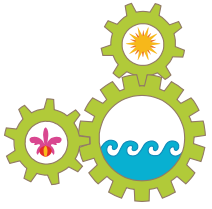
The social impact associated with destinations in a mature stage leads to annoying behaviors and antagonism due to inequality, marginalization, and unmet expectations. This affects the services and adds costs for re-awareness campaigns and the re-creation of “tourist culture”.



Internet Source 4 in Annex 5



Internet Source 5 in Annex 5



Author: Yibran Aragón



Internet Source 6 in Annex 5

The urban and tourism development policies which have been adopted have caused problems of regional and local imbalance, impoverishment, marginalization in urban centers, and environmental and health problems due to the inadequate disposal of trash and sewage.

Water is an asset that belongs to everyone. The aquifer does not recognize borders. Water is available, but the ecosystems may be affected by the change in water quality. We should all participate in the care of the water. One of the requirements for sustainable development is the positive and active participation of the consumers.

The Watershed Council is in an improvement phase. Consumers and NGOs should constitute 50% of the participation and 50% should be the government. A new president of the Watershed Council will be elected.

Tourism may represent a unique option for the future of Mexico. It is possible to imagine a just, inclusive tourism that meets the objectives required by the nation, but the usual practices will have to be abandoned. Otherwise we will continue to reap the same results.

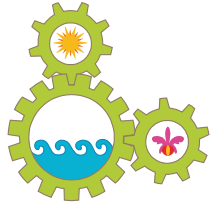
Solid Waste Management in Quintana Roo.

The Ecological Footprint indicator stems from the human need to live well, within ecological limits. Not living within these limits leads to destruction. Unfortunately, what is not measured is not taken into account. Therefore, to ensure sustainability, we need to become aware of people's lifestyles and how much nature they use.

Like any individual or organization, we need to have records that show how much we are growing and how much we are using of our assets. The most essential goods depend on nature. However, we need to maintain a way of knowing how much nature we have and how much we use. Only in this way can we monitor whether or not we are living outside of our ecological limits and by how much.

With the growth of the population and urban centers, one of the most important problems is the mismanagement of solid waste in Quintana Roo. For this reason, there is an urgent need to solve the problem of dumping trash outside indiscriminately.

Having final disposal sites without management causes air pollution (dioxin); which is classified as highly carcinogenic to the human population. Lagoon leachate, which



seeps into the ground, contaminating groundwater and degrading the landscape, leads to deterioration of ecological integrity in the area and risk (point of infection).

Research is needed to have local solutions. MAREMEX Group is a company dedicated to collecting recyclable materials for industrialization. They have agreements with several companies that industrialize waste from other parts of the country, but it is very expensive. The closest plant is in Orizaba; it pays 21.000 but the freight is 15000, leaving a gain of 6000 pesos.

They work with state and federal entities, and locally with Dreams, Calica, El Dorado, El Dorado Royal, Paladium, h10, and Flora and Fauna.

Alternative Technologies for Wastewater Treatment.

A comparative analysis of different systems in terms of efficiency in removing nutrients and pathogens was made, presenting artificial wetlands as an example, and biofiltration with organic filler as an easy and inexpensive option.

Another system presented is a combination of this biofiltration combined with a wetland, which considerably reduces the space needed for that purpose. This often represents an impediment in the construction of wetlands.

Another model identified as a treatment for a middle-class condominium that can cover 20 houses is the biostar-1.

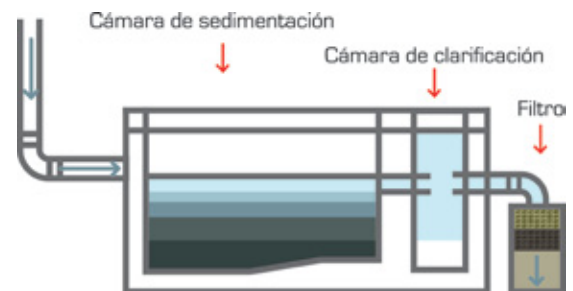
Technology and Sustainability. For the design of both conventional and unconventional systems, the following must be considered:

- The disposition of land occupied by these systems
- The economic aspect for the payment of energy (electricity)
- The quality of water that you want to obtain.
- If you are going to be able to pay for the operation of the treatment, not ensuring maintenance of the operation is the main cause of loss of the investment required to build a system.
- Each system must be adapted to the community or final recipients.

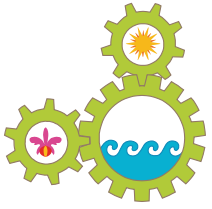
Regional issues. As in the rest of the country, most of the raw sewage will go to deposits that will eventually become a supply source. In the Yucatan Peninsula, there is drainage system coverage of 75% in the Riviera Maya - Cancun and Playa del Carmen. In the rest,



Author: CEA



Author: Mariana Tapia



Author: Mariana Tapia

there is no system of sewage collection. Septic tanks are not cleaned, nor are the manufacturers' instructions followed.

The protection of aquatic life and the reef is imperative, as well as the reducing the eutrophication of bodies of water. In the hotel zone, disinfectants, insecticides, and chemicals are thrown into the drainage system to remove odors, and in communities, battery acids, acetones, nutrients, all the waste from the agricultural industry, misapplied pesticides, the leakage of hydrocarbons (gasoline stations), etc.

The cost of not treating waste water results in red tide and a loss of mangroves, coral, and quality of life. In the YP there is a lot of water in the aquifer and not all the water is fit for human consumption, especially on the coast. Desalination is very expensive and it is cheaper to treat and reuse water than to continue to exploit the aquifer. It is necessary to protect the supply sources.

All treatment systems need maintenance. They should operate properly.

Questions and answers:

1. Where does one find a local company licensed and qualified to design household treatment plants?

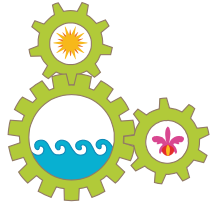
- » There are no licensed companies. You can go to institutions like CONAGUA, operating agencies, and ANEAS, for consultation. You should request that service providers provide references from previously completed jobs, find out if their technology has been evaluated by an institution, as well as inquire about the efficiency of the treatment and the costs of the operation and maintenance.

2. In this area that depends on few nutrients (the reef) and a permeable aquifer, do you think it is right to inject treated waters with a high amount of nitrogen and phosphorous into the aquifer?

- » Personally, I do not think it is right and it also depends on what is considered a high content of nitrogen and phosphorus (one should specify values and point of injection). What would have to be revised are the limits of current regulations (NOM-001-SEMARNAT-1996) for the different receptive bodies.

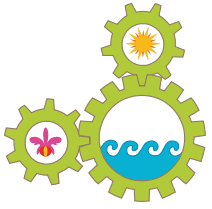
3. If biofiltration processes or Biostar are used to remove pollution from sewage, what is done with the waste from the plants? Are the animals contaminated?

- » Do not forget that the byproducts of treatment are based on the origin of the wastewater to be treated. In the case of municipal wastewater, it is not considered



to have hazardous byproducts. However, both residual sludge and biofilter filler need to be stabilized (compost, vermicopost, etc.)

4. What are the soil depth requirements for a biofiltration system? For example, if the soil here in Quintana Roo is very shallow, can you install such a system without perforating down to a level that would contaminate the aquifer?
 - » You can design the system with beds built on top of the ground, as if they were flowerbeds. They do not necessarily have to be buried. This is part of the design, the goal is that the system is impermeable, precisely to prevent leaching or pollution of the aquifer.
5. What is the average wastewater produced per hotel room?
 - » That depends on the region in which this hotel is located and what services are provided. If the hotel room has a Jacuzzi tub (pool, sauna, etc.), obviously it is going to consume much more water than a hotel with water-saving showerheads.
6. Are these alternative systems regulated or who promotes their use?
 - » Treatment systems are not “legislated”. They must result in a certain type of discharge of treated water (quality). Alternative systems have lower energy consumption (electricity) than conventional ones, which makes them attractive to small communities that may have enough land for their installation.
7. What is the percentage of treated water and treatment through alternative systems?
 - » In 2007 according to information from CONAGUA, wastewater treatment by artificial wetlands accounted for 7.5%. This information is updated every year. (www.conagua.gob.mx).
8. Are there economic incentives for using them?
 - » No, only that their operation and maintenance is more economical.
9. Do IMTA / CONAGUA have programs to promote the use of alternative technologies for urban areas at the municipal level credit program?
 - » IMTA promotes these technologies, presenting them to interested people, but we do not have credit programs. This information will have to be solicited from CONAGUA.
10. What would be your recommendation to reduce the nutrient loads discharged by existent treatment plants?
 - » You can work two angles: at the household level and the processing level, do not throw organic waste in sinks or toilets and do not use them as trashcans. At the



level of processing, if you are talking about centralized plants, you can include a phase in which you try to remove the nitrogen and phosphorous from the treated water. Although this will increase the cost of treatment, it will also improve the quality of the final effluent.

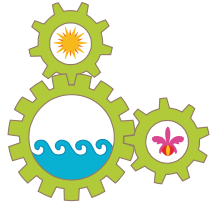
11. How many places or areas in the Riviera Maya currently use alternative treatment systems?

- » To my knowledge, they are using wetlands for wastewater treatment in the area. Specifically, an example of that would be CEA Akumal and some hotels. Composting toilets are also used in some parks.

Conclusions of the working groups

To help in decision-making we must:

- Advance knowledge of the hydrological system and continue with the inventory of surface karst phenomena.
- Continue or propose interdisciplinary projects involving multidisciplinary focus on environmental, educational, and economic issues.
- Make a formal compilation of data that is publicly accessible. It must be a consensual compilation so as to not affect interests, integrity, and lifestyles.
- Make alliances among workshop participants for the exchange of information and to organize the group for this purpose.
- Participate in the Watershed Council and other groups to promote actions aimed at protecting the aquifer and protecting replenishment areas.
- Update regulations for the protection of the environment. Make a mandatory standard for the tourism sector. Ensure that the hotel sector becomes healthier and apply pressure so that they follow the laws.
- Unify the criteria for green certifications.
- Modify building criteria, because currently there is nothing that regulates construction regarding water use.
- Pressure the authorities based on the information. Ensure that those who govern are working for the people and are not servants to the private sector.
- Create an environmental culture and spread the concept of sustainability so that the people appropriate it.
- Continue with education and training with the multiplier effect on all levels.



- Act as multipliers and take responsibility. See how to educate governors, legislators, municipal presidents, demanding compliance with the regulations.
- We need to raise issues beyond the hotel sector to the level of the municipality; thus disseminating environmental issues to the level of the interlocutors.

Improve internal training:

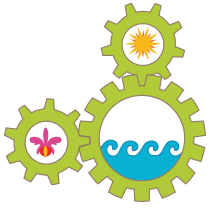
- The hotel experience is that it is hard work to meet environmental standards because the training is given at the managerial level and then trickles down. However, often there is no follow-through, or the training was not well learned. When there is staff turnover, new staff members do not know the policies for environmental protection, so training must be continuous. It must permeate all levels in the hotel and be monitored all the time to ensure compliance with the standards..

Empowerment of the ecological environment:

- Recover the concept of land ownership by the general population.
- Social responsibility and supporting local communities for the production of local products that can meet the standards and quantity requested by the suppliers.
- Internalize the problem so that every hotel proposes an action plan above and beyond the legislation or current standards.
- Analyze new forms of supply of primary resources, such as capturing rainwater, even in tourist complexes. Are the hotels willing to implement these systems to reduce the extraction of water from wells? If this proves to be viable, it may be feasible.

Economic policies:

- Find balance and create alternative markets that are fair and supportive. Reduce costs with local markets.
- Household food production and capturing rainwater for human consumption.
- Avoid “predatory” industries. Focus on the feasibility of the industry itself.



General Conclusions 2009

The current model of environmental, economic, and social development is not sustainable. Also, coastal management is not sustainable, as the growth of the population and urban and tourist centers is much greater than the capacity of the environment to bear it.

For lack of long-term studies and historical records of the different parameters, one cannot precisely quantify the damage done to the environment. However, there are indicators, thanks to the measurement of certain polluting agents in the subterranean water, which is the only source of supply for development and the life of the inhabitants, as well as the pollution in the sea.

Changes have been noted in the ecosystems, such as loss and impact of coastal resources, the phenomenon of erosion, and shoreline changes, as well as a reduction in biodiversity of the different ecosystems in the Mesoamerican Barrier Reef.

This model leads to regional inequality and the marginalization of the majority of the social sector, particularly in the Mayan zone.

Despite the existence of a legal and regulatory framework, policies and regulations are not enough. Some policies are not specific to the karst geology of the Yucatan Peninsula, such as the rule that allows the injection of treated water to relatively shallow depths. Above all other reason, regulations often fail to function as desired because they are not implemented due to a lack of surveillance and monitoring by all the responsible government agents (CONAGUA, CAPA, PROFEPA, municipalities). Policies are not respected by the owners and private sector actors, who, in their individual practices, contribute to the increase in water and soil pollution.

Dominant today are economic policies and individual practices in the tourism sector geared toward the short-term and ignorance at the management level. In this case, managers often confine themselves to their area of expertise and are not aware of environmental and sustainability concepts.

The technologies exist; but the problem is both social and political, concerning the use and management of the technologies by consumers. Alternatives are sought, but within the given budgets policy changes are not considered for resource conservation.

The **specific objective** of the workshop was to gather, train, and motivate the tourism and public sectors and increase their knowledge about the good management of the region's aquifer.

The **goal** was to identify which of the elements from prior workshops were useful to avoid or diminish the ecological and economical risks that are the consequences of the activities of the participants in their jobs and lives for the Riviera Maya Aquifer.

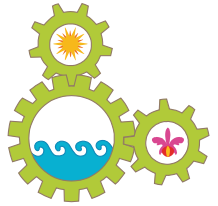
The workshop was done in one session, on March 5, in Spanish, at the Hotel Bahia Principe. Three specialists from different institutions participated:

- Alejandra Serrano, lawyer from the Mexican Center for Environmental Law (CEMDA, acronym in Spanish) with the presentation "Importance of Environmental Law for Tourism."
- Biologist Katia Cordourier, Ecological Foundation Bahia Principe, with the presentation "Environmental Management System: Tool for Aquifer protection."
- M. C. Edith Sosa, Centro Ecológico Akumal (CEA) with the Review of the 2009 workshops.

There were 13 participants, five of whom attended prior workshops and came from NGO's, hotel and government sectors, were interested in the workshops, and asked to participate in them.

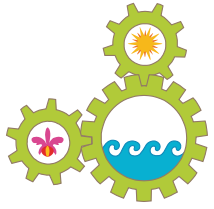
- 46% of the assistants were 25-35 years old, 39% 35-45 and 15% over 45.
- 47% of them work in the hotel industry, 15% in NGOs, 8% in government, 15% were consultants, and 15% in other sectors.
- 23% were born in Quintana Roo, 31% have been living here for less than 5 years, 15% have been here for less than 5 years, 15% from 5-10 years, 8% from 10-15 years, 8% from 15-30 years and 15% did not answer

Feedback Workshops 2010



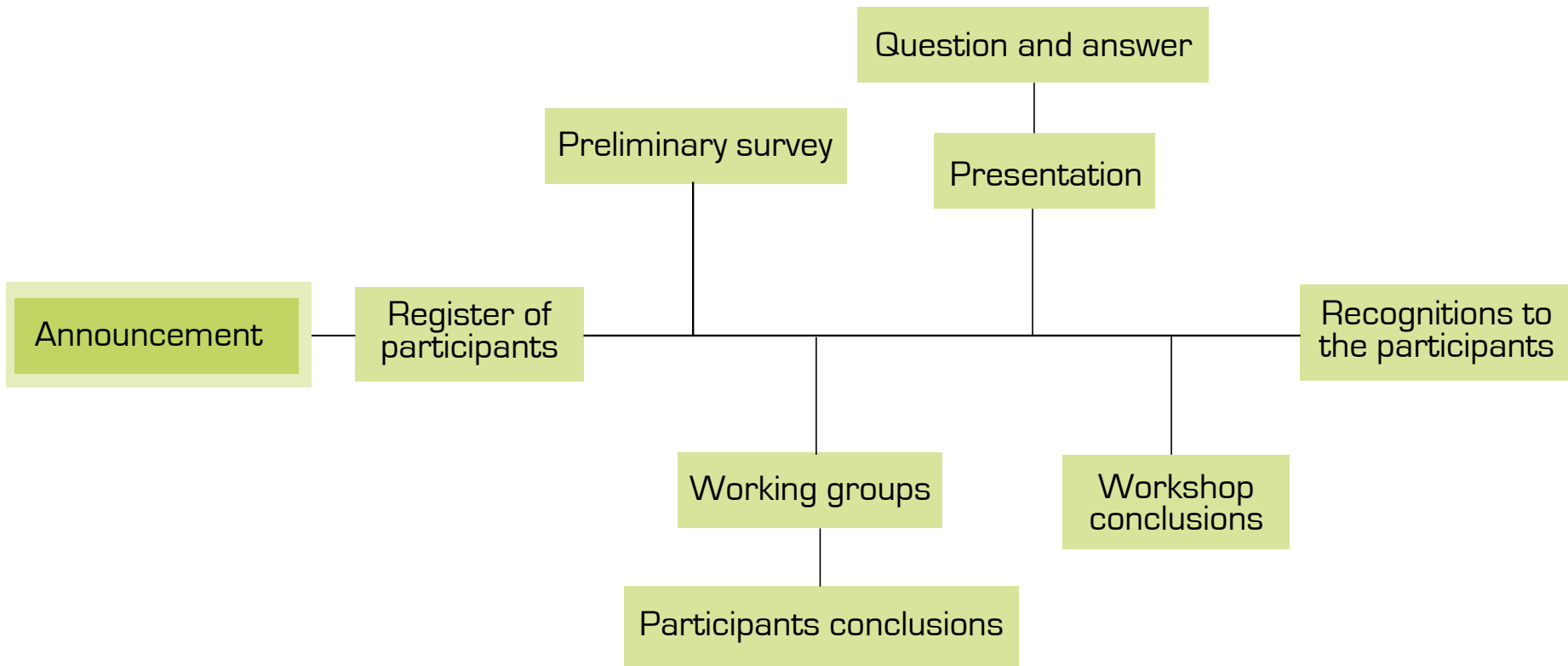
Author: CEA

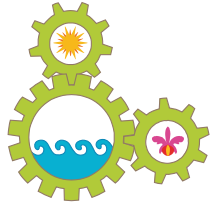
Participants profile



Training process

This was developed with the same phases as prior workshops:





All the presentations were done in a single module. The first subject was presented using an audiovisual presentation, going over the most important points of the subjects as well as their results and conclusions presented in prior workshops to allow the participants to have the same reference point, thus preparing them for later subjects.

The second presentation showed the development of the Ecological Foundation Bahia Principe Tulum, A.C. since the moment of its inception in 1999, for the development and implementation of a Natural Resource Conservation and Protection Program in the Gran Bahia Principe Hotel Complex, with the objective of reducing the impact of the complex's operation may generate on the environment.

The General Characteristics of the complex are:

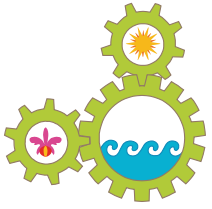
- All inclusive Service
- 2,500 rooms
- 90% occupation
- 2500 employees
- 1.5 km of beachfront
- The second most important nesting beach for two sea turtle species *Caretta Caretta* (Loggerhead) and *Chelonia Mydas* (Green turtle).
- Important portion of Barrier Reef
- Water treatment System Management

The current programs developed by the Foundation in the complex are the following:

1. Sea turtle Protection Program
2. Solid Waste Separation Program: SEDUMA Management Plan
3. Coral Reef Protection Program
4. Native Jungle Protection and Conservation Program
5. Social and Environmental Education Program
6. Operational Criteria Revision and Updates
7. Beach Certification

All the efforts and corrections made in the operational procedures in the solid waste management, environmental educational work in the zone, flora and fauna management, and the actions to improve water quality and beach management were presented.

Once the operation procedures were standardized in different manuals, the hotel complex could start the Beach Certification procedures from the Secretariat of the Environment



and Natural Resources (SEMARNAT, acronym in Spanish) using the criteria from the NMX-AA-120_SFCI 2006 Norm. After an evaluation process by an auditor from the Mexican Institute for the Normalization and Certification, they obtained the clean beach certification for the hotel complex on August 2009. It is noteworthy that it is the first beach in Quintana Roo to be certified.

With the actions done and the results obtained, they concluded:

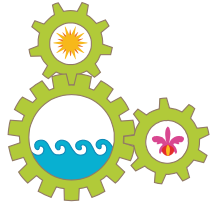
- The Beach Certification Process allows us to identify and control environmental risks and impacts, as well as improves the competitiveness of the tourist destination and indirectly helps us protect the areas environment.
- Beaches represent one of the most important natural resources for Mexico because of their beauty and the wealth of animal and plant species. Beaches are also one of the main places also one of the main places for recreation for Mexicans and visitors to the country.
- The protection and conservation of our natural resources would not be possible without the collaboration of all the people involved in beach management; this includes the private sector as well as municipal and state authorities.

The third and last subject was on the importance of Environmental law for tourism. The different environmental policy and management instruments in Mexico were introduced and explained. The organizations and authorities in charge of them, as well as participation mechanisms for society to contribute to the supervision and correct application were identified as specified in the General Law for Ecological Balance and Environmental Protection (LGEEPA, acronym in Spanish):



Author: CEA

- Environmental Planning and Ecological ordering for the territory
- Economic instruments
- Ecological Regulation of human settlements
- Environmental Impact Manifest (MIA, in Spanish Acronym)
- Environmental Impact Evaluation (EIA, in Spanish Acronym)
- Mexican Official Norms (NOMs, Spanish Acronym) in environmental matter
- Environmental Self Regulation and audits
- Ecological Education and Research
- Instruments provided in this law such as Declaration and management plan of the Natural Protected Areas (ANP, Spanish Acronym), which can consist of authorizations, licenses and concessions.



- Citizen's Report
- Revision Process
- Sanctions

Other laws that help sustainable development in the watershed are: National Water Law, Forest Law, Fishing Law, General Law for Wildlife, General Health Law, and Federal Rights Law.

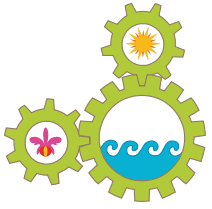
Because of requests to strengthen their participation, special emphasis was put on Citizen's Report as it is in the LGEEPA, article 189. This law states that any person can press charges or present a complaint or report and the Secretariat for the Environment and Natural Resources (SEMARNAT, acronym in Spanish) through the Department for the Federal Protection of the Environment (PROFEPA, Spanish acronym) or any other federal, state, or municipal authority, for any act or omission that causes or can cause ecological imbalance or environmental damage, or opposes any of the current legal dispositions or any other regulations on matter related to environmental protection, preservation, or restoration.

An exercise was done on how to press charges and; the procedure must have:

1. Legal name, address, and phone number of the person pressing charges, and his/her legal representative if available.
2. The acts or omissions being reported.
3. The necessary information that allows identifying the accused lawbreaker or locating the source of the polluter.
4. Any proof that the accuser can gather.

PROFEPA must give a receipt at the reception of the complaint and assign a file number which should be registered. Within 10 days, the person that pressed charges will be notified on how the complaint has been graded and classified, and a report on what is being done will be issued.

The Citizen's Report can be presented personally, by mail, telegraph, or phone. It is the obligation of the civil servant that receives it to do a circumstantial certificate. PROFEPA will take the necessary steps to determine the existence of acts or omissions in the pressed charges.



Workgroup results in 2010

In the cases foreseen by this law, it can start the inspection and vigilance procedures that are relevant, in which case the relevant dispositions on these procedures will be observed.

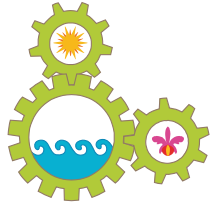
The person pressing charges can aid PROFEPA, providing proof, documents, and information that he/she considers pertinent.

Generally the participants agree that people should be educated through workshops and talks, but regrettably there is no practical access to this knowledge. All the people that receive this information should contribute to increasing and spreading it through:

- Leaders that teach people, talk about the problems that exist and help understand and start in their own homes ideas of environmental consciousness.
- Videos, which are great tools to motivate and teach people.
- Finding solutions for existing problems

Proposed actions:

- Not everyone can follow the process continually, due to work or other reasons, so a revision should be done every one or two months.
- The last course was too simple, so it would be better if courses and workshops are more specialized.
- Keep creating awareness in all employees, trying to explain that what we do not only affects the place where we work, but also the environment that surrounds us.
- Do not allow the treatment plants to stop working; teamwork is needed, so awareness must be fostered in all the people that work in the plants in order to improve its performance.
- In all these workshops it is necessary to share experiences, looking for the best results with specialists.
- Find the way how to reach everyone so that they have the most optimal job and awareness to go with it.
- Reaching everyone through children (schools).
- Education at all levels, ages, and social sectors, because what is ecological is 99.99% ethical.



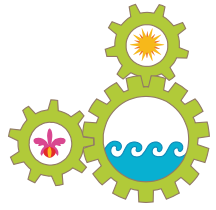
- Circulate the available information on the problems and how to solve them in any circumstance because most people do not know, nor understand, why it is important to have good water treatment control.
- Create educational material according to their education and social interests in particular.
- Training is necessary, as well as also follow up and feedback.
- Environmental practices in different sectors are possible but first a shift in awareness is necessary. For this shift to be permanent, it should be done through environmental education at all levels, but specifically in children. We have to start today so that results are not too far into the future. It is necessary take individual actions that include sectors in all political and social levels.

This workshop helped complete both the Ecological Foundation Bahia Principe Tulum's experience, and the legal framework theme of the Government and Society's responsibility to execute the needed actions together for the preservation and conservation of the environment and ecological balance.

It was recognized that greater social participation in the environmental problem solution dynamic is necessary, because it is clear that authorities themselves cannot solve all the problems. It is society, with its ideas and proposals that should participate responsibly, with trustworthy information and according to the law. The solutions and spaces are there, it is just a matter of knowing how to take advantage of them.

There is still a long road ahead to be able to strengthen social participation in environmental matters. As such, public's participation spaces have to be improved, and constitutional reform in which a healthy environmental law is incorporated must be established. That would help create a stronger legal framework in which people and organizations interested in environmental matter may take action.

General conclusions in 2010



Appendix 1: Announcement and programs

**CENTRO ECOLÓGICO AKUMAL,
HOTEL GRAN BAHÍA PRÍNCIPE,
HOTEL AKUMAL CARIBE
ASOCIACIÓN DE HOTELEROS DE LA RIVIERA MAYA**

Invite you to join us for a workshop on
SUSTAINABILITY AND THE ENVIRONMENT:
Managing the Watershed of the Riviera Maya

PLACE: Hotel Bahía Príncipe Coba, Akumal, Q. Roo

DATE: August 20 (English)

GOAL:

Convene, train, and motivate the tourism industry and the public to improve watershed management in the region.

OUTCOME:

Following the workshop, participants will identify the ecological and economic threats to the Riviera Maya watershed, the effects of the activities in which they themselves operate, and possible solutions.

TARGET AUDIENCE:

Hotel managers, real estate agents, tourist development, civil engineers, architects, public sector, and individuals who are interested in the subject.

MAXIMUM CLASS SIZE:

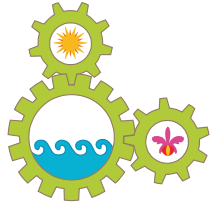
30 people

Registration and further information:

With Edith Sosa Bravo

Tel/Fax: + 5201 (984) 875-9095

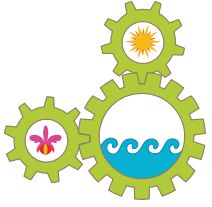
e-mail: agua@ceakumal.org



SUSTAINABILITY AND THE ENVIRONMENT:
 Managing the Watershed of the Riviera Maya

Hour	Activities	Speaker
8:30 - 9:00	Registration of Participants	
9:00 – 9:10	Welcome and rationale of the workshop	Edith Sosa y Alma Boada
9:10 – 9:30	Underground water system of the Yucatan Peninsula	Dra. Patricia Beddows
9:35 – 10:10	Social participation in the Watershed Council and subcouncils	Ing. Juan Ramón Díaz Calderón Traducción
10:15– 10:30	Water quality of the aquifer in Quintana Roo	Dra. Laura Hernández
10:35 – 10:55	Importance of the Mesoamerican Reef and sustainable management of coastal areas	Biol. David Placencia
11:00 – 11: 10	R e c e s s	
11:10 - 11:20	Solid waste management in Quintana Roo	Lic. Ana García
11:25 – 11:50	Alternative technologies for wastewater treatment	Dr. Gabriela Mantilla Morales
11:55 – 12:30	Economic implications of the use of resources relating to the economic value of ecosystems and the sustainability of a tourist destination	Lic. Marisol Venegas
12:35 – 12:40	R e c e s s	
12:40 – 12:50	Roundtables: Environment, Sustainability	Biol. David Placencia
12:50 – 14:00	Conclusions of the working groups and workshop	Roundtable secretaries
14:00 – 14:10	Presentation of certificates to participants	Manager of Bahía Principe
14:10 – 15:30	L u n c h	

THE EXPERT TEAM OF SPEAKERS IS COM-
 PRISED OF RESEARCHERS, CONSULTANTS,
 LAWYERS, AND PUBLIC SERVANTS.



SUSTAINABILITY AND THE ENVIRONMENT:
 Managing the Watershed of the Riviera Maya
PRE-REGISTRATION FORM
 PARTICIPANT INFORMATION

Last Name(s) First name(s)

Nationality: _____ Age: _____

Address: _____

Personal telephone: _____ email: _____

Academic degree: _____ Profession: _____

Company or Organization: _____

Job Title: _____

Occupational Sector:

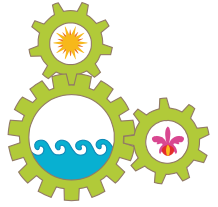
Hospitality:___ Real Estate:___ Public service:___ Tourism Services:___

Other:___

Work address: _____

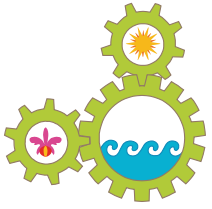
Brief description of your interest in this workshop:

Appendix 2: Register of participants



Speakers registration list

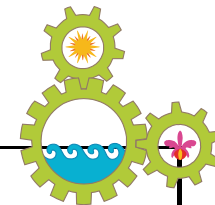
#	Name of Speakers	Home town	Organization	Profession	Telephone	Email
1	Ing. Juan Ramon Diaz Calderon	Quintana Roo	Comision Nacional de Agua Direccion local Quintana Roo, (CONAGUA)	Subdirector de Consejos de Cuenca, Gestion Social y Atencion a Emergencias	01 998 8876404 y 76505 Ext. 1730	juan.diazc@conagua.gob.mx
2	Dr. Mario Rebolledo Vieyra	Quintana Roo	Centro de Investigacion Cientifica de Yucatan, Unidad Q. Roo	Director de la Unidad	01(998)2113008	marior@cicy.mx
3	Dra. Laura Hernández Terrones	Quintana Roo	Centro de Investigacion Cientifica de Yucatan, Unidad Q. Roo	Investigadora	01(998)2113008 ext. 106	laurah@cicy.mx
4	M.C. Miguel Angel Maldonado	Quintana Roo	Centro Ecologico Akumal (CEA)	Coordinador del Programa Marina y Costera	01(984)8759350	marina@ceakumal.org
5	M.C. Marisol Venegas	Quintana Roo	Consultoria Desarrollo y Turismo	Directora de la Consultoria	01(998) 874222	mvanegas@redesturismo.com
6	Dra. Gabriela Mantilla Morales	Morelia	Instituto Mexicano de Tecnologia del Agua	Investigadora	01(777)3293600 ext. 430 o 432	mantilla@tlaloc.imta.mx
7	Lic. Ana Garcia	Quintana Roo	Grupo Maremex	Consultora	9847456807	contacto@maremex.com
8	Lic. Alejandra Serrano	Quintana Roo	Centro Mexicano de Derecho Ambiental	Directora del CEMDA	01(998)852840	aserranop@cemda.org.mx
9	Lic. María Guadalupe Leal Uc	Quintana Roo	Comision Nacional de Agua Direccion local Quintana Roo, (CONAGUA)	Coordinación de las Acciones de Consejos de Cuenca	01 998 8876404 y 76505 Ext. 1730	mariag.leal@conagua.gob.mx
10	Lic. Fransisco Perez Ponce	Quintana Roo	Grupo Maremex	Consultora	9847456807	contacto@maremex.com
11	Dra. Patricia Beddows	Estados Unidos	Northwestern University	Assistant Chair, Lecturer, Department of Earth and Planetary Sciences		patricia@earth.northwestern.edu



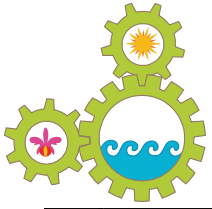
Participant registration list: July 30th

#	Name of participant			Organization	Profession	Telephone	Email
1	Peel		Rebeca Joanne	Parque Xel-há	Biologo	3313 082100	jrpeel@gmx.de
2	Salas	Tah	Carlos Gabriel	Excellence Riviera Cancún	Hotelería	2523692	csalas@excellence-resorts.com
3	Sáenz	Morales	José Ricardo	Parque Xel-há	Biologo	9841164055	rsaenz@xelhá.com.mx
4	Santillan	Rodriguez	Marco Tulio	Capa, Tulum	Ing. Electromecanico	9847456784	eecaventuras@yahoo.com.mx
5	Courdourier	Real	Katia	Fundación eco-Bahía	Biologo	9848755039	direccionfundacioncompMex@bahia-principe.com
6	Bautista	Vega	Mauricio	Fundación eco-Bahía	Ing. Pesquerías opc. Acuicultura	9841209635	proyectossocialesfuneco@gmail.com
7	Del valle	Castillejos	Luis Fernando	Asociación de Hoteles de la Riviera Maya	Ingeniero	9981523892	risk_breaker19@hotmail.com
8	Gonzales	Too	Casimiro	Fundacion Ecologica Bahia Principe		9848755039	
9	Ramos		Ricardo	Hotel Excellence Playa Mujeres	Chef Stuard	9988728600 ext 3705	stuard@excellenceresorts.com
10	Oliveira		Juan	Bahia Principe	Lic. en Adm de Empresas Turisticas	9841200767 875000 ext 28805	portu8@hotmail.com
11	Montiel		Jose Alfredo	Bahia Principe	Ing. Electromecanico, Gte Mantenimiento	9848755000 ext. 28831	josh4_you@hotmail.com
12	Torres	Talamante	Olmo	Razonatura A.C.			olmo@razonatura.org
13	Villafuerte	Arreola	Fidel de Jesús	Islander Propierties S.A.	Ingeniero	987872 9300 ext. 5061	fva63@hotmail.com
14	Medina	Robles	Gabriel				
15	Carrera	Gongora	Ricardo				

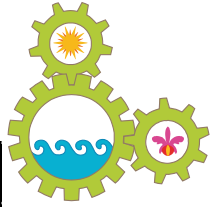
Participant registration list: July 31st



#	Name of participant			Organization	Profession	Telephone	Email
1	Gordillo	Relles	Lindsay	Iniciativa MARTI	Ing. Ambiental	984 13 69091	Lindsay_gr@yahoo.com.mx
2	Pereira	Inclan	Jesus	Grupo Vista S.A de C.V.	Ing. Ambiental	8711338850	jesuspereyra_2085@hotmail.com
3	Martinez	Manzanero	Jorge Humberto	H.Ayuntamiento de Solidaridad	Biologo	9841056702	arwen_504@hotmail.com
4	Cabrera	Rincon	Jimmy Manuel	Hotel Grand Velas	Administracion de Empresas	9982253490	reclutamiento1@grandvelas.com
5	Alvarez	Bravo	Jorge	Bahia Principe	Hoteleria	9848755000 ext. 28836	subdircoba@coba.bahia-principe.com
6	Freites		Melitza	Bahia Principe	Abogado	9848755000 ext 28849	subgerentepremierbbpcob@bahia-principe.com
7	Osuna		Mercedes	Hacienda de la Tortuga	Economista	18676780603	oshalcon@gmail.com
8	Osuna		Virginia	Hacienda de la Tortuga	Biologo	6783698	virginiaozuna@hotmail.com
9	Rivera	Gonzales	Luis Enrique	H.Ayuntamiento de Tulum	Ing. En Sistemas Computacionales	9841305188	enriquerivera80@hotmail.com
10	Ayim	Sauste	Leobardo	Hotel Temptation	contador	848 7912	gestoria@originalresorts.com
11	Alvarez	Ramirez	Adriana	Iberostar Playa Paraiso	contador	9848772800 ext. 8721	alvarez@iberostar.com
12	Escobar	Martinez	Veronica	Asociacion de Hoteles de la Riviera Maya	LCS	8592234	rp@rivieramaya.org.mx
13	Magaña	Marroquin	Luis Manuel	SAGARPA-CONAPESCA	Ing. en Construccion	S/N	imaganam@conapesca.sagarpa.gob.mx
14	Ceballos	Canche	Carlos Humberto	ASIOHMEX A.C.	Ing.Industrial	9981564211	caceambiental@yahoo.com.mx
15	Martinez	Medina	Angelica	SAGARPA-CONAPESCA	Hidrobiologa	998 (8988148) cel trab 9831083089	maga2k5@gmail.com
16	Espinosa	Flores	Norma Vanessa	Exellence Riviera Cancun	LAE	2523692	vane_espinosa@hotmail.com

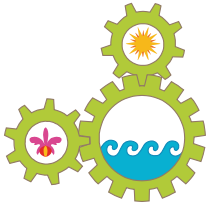


17	Guiet		Jean-Claude	Independiente	Distribuidor calentador solar y desincrustador de sarro	9841056241	sayabmaya@hotmail.com
18	Buenfil	Y cusi	Manuel Alfredo	Universidad La Salle Cancun	Arquitecto	9981331414	manuelybuenfil@hotmail.com
19	Balderas	Santos	Julio Cesar	Hotels Secrets Maroma Beach	Ing.Ambiental	9841512978	recojbs20@hotmail.com
20	Oviedo	Mendoza	Gerardo	Ocean Maya by H10 Hotels	Diseñador escénico	9848078836	oviedoduchanne@hotmail.com
21	Buenfil	Ceballos	Victor	Comisión Nacional del Agua, Dirección Local Quintana Roo	Coordinación de Cultura del Agua y LFTYAIPG	9838320024 ext. 1350	victor.buenfil@conagua.gob.mx
22	Ceron	Dorantes	Ma. Teresa	Comisión Nacional del Agua, Dirección Local Quintana Roo	Comunicación y Atención Social e Institucional	9838320024	maria.ceron@conagua.gob.mx
23	Gomez	Fernandez	Carlos	Centro Ecológico Akumal	Contador	9848759095	admin@ceakumal.org
24	Morales		Judith	The Nature Conservancy			jmorales@tnc.org
25	Heredia	Quijano	Ariel Antonio	Independiente	Ing.Civil	9841164267	ariel_ahq@hotmail.com
26	Collado	Alfaro	Sheila Larissa	Hojas Verdes A.C. y Latitud 21	Pedagogía y Ciencias de la Educación	984 806 5724	<u>sheilanatural@hotmail.com</u>
27	Perez	Castillo	Fernando	CEA	Oceanologo	9841314258	xcacel@gmail.com
28	Vazquez	Martinez	Shivani	GPPA		9841289982	svelazquez@gppa.com.mx
29	Ortiz	Mejia	Luis Manuel	Matakoba - OHL		9848734900 ext152	lortiz@gppa.com.mx
30	Vasquez	Mendoza	Alheli	Bahia Principe	Secretaria	9841256266	alheli-vam@hotmail.com
31	Alvarez	Garcia	Rosa	Exellence	Lic.en Turismo	9848728500	rosalva-rivas@yahoo.com
32	Alvarez	Reyes	Carlos	Bahia Principe	Dr A y B	8755000 ext. 28884	<u>directordeaybbpcob@bahia-principe.com</u>
33	Alvarado	Bastos	Lourdes	Bahia Principe	Coor. De Formacion Recreacion	8755000	<u>capacitacionrrhcompemex@bahia-principe.com</u>



Participant registration list: August 20th

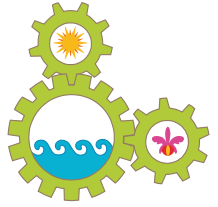
#	Name of participant			Organization	Profession	Telephone	Email
1	Maffiodo	Hernandez	Nancy	Amigos de Sian Kaan	Ing. Química	9981524409	nmaffiodo@amigosdesiankaan.org
2	Melo	Zurita	Maria de Lourdes	King's college London	Estudiante	9841051339	marilumelo@gmail.com
3	Carrasco	Arreola	Karla Marcela	BBVA Bancomer	Lic. En Admon.	9841300875	k_marce@hotmail.com
4	Fregoso	Dominguez	Alejandra	Amigos de Sian Kaan	Bióloga	9841357949	afregoso@amigosdesiankaan.org
5	Hernández	Reyes	Edith	Hotel El Dorado Royale a SPA Resort Karisma	Gerente de Calidad	9848790232	quality@eldorado-resort.com.mx
6	Muñoz	Jiménez	Ramiro	Hotel Dorado Seaside Suites	Medio ambiente y desarrollo	9841124691	iuvenis03@hotmail.com
7	Geddes	Gonzales	Henry	Universidad de Massachusetts	Comunicación	9841430005	geddes@comm.umass.edu
8	Thomas		Brooke	Universidad de Massachusetts	Antropologo	9841197574	rbthomas@anthro.umass.edu
9	Salazar	Chavez	Luz Gabriella	Hotel the Tides Riviera	Gift shop manager/Green team	9847453295	luz.salazar@thetidesresorts.com
10	Gutiérrez	Badillo	Karina Celia	Hotel el Dorado Seaside Suites	Gerente de Calidad	9848751910	calidad@eldorado-resort.com.mx
11	Santos	Rodriguez	Lyn Ohala	Hotel Fairmont Mayakoba	M.C. Biologist	9841154500	lyn.santos@fairmont.com
12	Venegas	González	Cynthia Yocelin	Hotel Fairmont Mayakoba	Student	9841154500	lyn.santos@fairmont.com
13	Margolis		Ruth	Margolis Services	Manager	9841283872	margolisruth@gmail.com
14	Ponce	Taylor	Daniel	E.V.I.	Director	9841164208	dan@gviworld.mac.com
15	Orvañamos	Ruiz	Damian	Fundación Selva Maya	Propietario	9848064364	damiananda@mac.com
16	Klotz		Bob	Fundación Eco-Bahia	Asesor	9848759510	bklotz@mac.com
17	Kenny	Tei	Santiago	Hotel Nueva Vida De Ramiro	Manager	9841143796	santiagokenny@yahoo.com
18	Orvañamos	Urrutia	Manuel	Fundación Selva Maya	EMP	9841519451	manuelorvanamos@mac.com
19	Tello de M.	Teyfer	Liliana	Fundación Selva Maya	Jardines y terapia floral	9848790478	shojolian@mac.com
20	Ibarra	Barrios	Mariana	MARTI	Ing. Química	9841299337	marti1@rivieramaya.org.mx
21	Gonzalez		Christopher	CEMDA	Biologist	9988852840	cgonzalez@cemda.org.mx
22	Redclift		Michael	King's college London		-	michael.r.redclift@kcl.ac.uk
23	Redclift		Nanneke	University College Of London	Antropologa	-	n.redclift@ucl.ac.uk



Participant registration list: March 5th

#	Name of participant	Organization	Profession	Telephone	Email
1	Miguel Angel Sereno Espinosa	Tides	Electric Engineer	8773000	alinenancy.ceron@thetidesresort.com
2	Katia Cordourier Real	Fundación eco-Bahía	Biologist	9848755039	direccionfundacioncompmex@bahia-principe.com
3	Marco Tulio Santillan Rodriguz		Electromechanic Engineer	9847456784	eecaventuras@yahoo.com.mx
4	Luis Fernando Del valle Castillejo	Asociación de Hoteles de la Riviera Maya	Engineer	9981523892	marti@rivieramaya.com
5	Casimiro Gonzales Too	Fundacion Ecologica Bahia Principe		9848755039	
6	Ricardo Ramos	Hotel Excellence Playa Mujeres	Chief Steward	9988728600 ext 3705	stuard@excellenceresorts.com
7	Juan Oliveira	Bahia Principe	Tourism Business Administration	9841200767 875000 ext 28805	portu8@hotmail.com
8	Jose Alfredo Montiel	Bahia Principe	Electromechanic Engineer, Maintenance Manager	9848755000 ext. 28831	josh4_you@hotmail.com
9	Leobardo Ayim Sauste	Hotel Temptation	Accountant	848 7912	gestoria@originalresorts.com
10	Carlos Humberto Ceballos Canche	ASIOHMEX A.C.	Industrial Engineer	9981564211	caceambiental@yahoo.com.mx
11	Angelica Martinez Medina	SAGARPA-CONAPESCA	Hydrobiologist	998 (8988148) cel trab 9831083089	maga2k5@gmail.com
12	Ruth Margolis	Margolis Services	Manager	9841283872	margolisruth@gmail.com
13	Carlos Gomez Fernandez	Centro Ecológico Akumal	Accountant	9848759095	admin@ceakumal.org
14	Jesús Guerrero Baeza	Hotel Catalonia Royal Tulum	Electrical Engineer	9841062267	querreo_baeza@hotmail.com
15	Cirino Martinez Bornios	Hotel Catalonia Royal Tulum	Industrial Maintenance Tech	9841526096	
16	Shivani Vazquez Martínez	GPPA		9841289982	svelazquez@gppa.com.mx
17	Luis Manuel Ortiz Mejia	Matakoba - OHL		9848734900 ext152	lortiz@gppa.com.mx
18	Julio Cesar Balderas Santos	Hotels Secrets Maroma Beach	Environmental Engineer	9841512978	recojbs20@hotmail.com
19	Bob Klotz	Fundación Eco-Bahia	Asesor	9848759510	bklotz@mac.com
20	Santiago Kenny Tei	Hotel Nueva Vida De Ramiro	Manager	9841143796	santiagokenny@yahoo.com

Appendix 3: Preliminary survey



QUESTIONNAIRE

To determine the training needs of various sectors, in relation to the management of the watershed, sewage, and its impact on the reef

Name of Participant: _____

Date _____

Telephone: _____

Email: _____

Sector represented

Construction Consultant Environmentalist Public Service Hotel

Property owner Resident

1. Among the following attractive characteristics of the Riviera Maya region, choose the 4 most important, in order from most to least (4 being most and 1 being least).

Beaches

Forests

The coral reef

Sea turtles

Cenotes and caves

Indigenous villages

Archeological zones

The nightlife

Tourist services (hotels, bars and restaurants)

Tourist activities (tours, diving, snorkeling, fishing, aquatic sports, golf, etc.)

Why? _____

2. In financial terms, choose from the following attractive characteristics of the Riviera Maya region the 4 most important, in order from most to least (4 to 1).

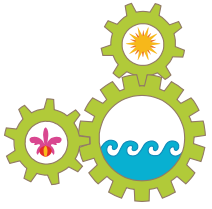
Beaches

Forests

The coral reef

Sea turtles

Cenotes and caves



- Indigenous villages
- Archeological zones
- The nightlife
- Tourist services (hotels, bars and restaurants)
- Tourist activities (tours, diving, snorkeling, fishing, aquatic sports, golf, etc.)

Why? _____

3. Of the following characteristics, how do you think your clients* would order them, in order from most to least (10 to 1).

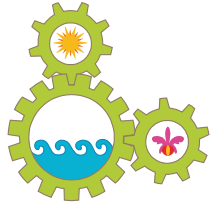
- Beaches
- Forests
- The coral reef
- Sea turtles
- Cenotes and caves
- Indigenous villages
- Archeological zones
- The nightlife
- Tourist services (hotels, bars and restaurants)
- Tourist activities (tours, diving, snorkeling, fishing, aquatic sports, golf, etc.)

Why? _____

*"A client" may be: the populace (public sector); hotels/ tourism businesses (consultants); patrons (environmentalists); clients (hotels / tourist businesses); developers and builders (construction)

4. From the following list of threats to the region, choose the 4 that you consider will have a long-term impact on the environment, in order of greatest to least (4 to 1).

- Fishing
- Hurricanes
- Current urban development
- Pollution of the water
- Tourist behavior



- Extraction of earth and sascab
- Accelerated population growth
- Recreational activities for tourists
- Construction of tourism complexes
- Destruction of the forests and mangroves
- Solid waste disposal
- The sale of species in danger of extinction
- Sewage treatment and disposal
- The generation of solid waste by the urban population
- Increased extraction of fresh water from the aquifer in the replenishment zones

5. From the previous list, write the three threats that you think will directly affect the reef and the three threats that will affect it most indirectly.

Direct: _____

Indirect: _____

6. Which do you think is the principal function of the aquifer?

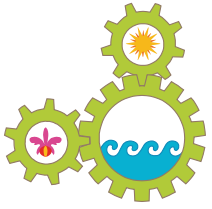
- Ecological balance among the ecosystems
- Economic worth
- The services it offers the population (consumption)

7. In terms of importance, prioritize from greatest to least the following uses of the aquifer:

- Development of tourist activities
- Final disposal of sewage
- Final disposal of treated water
- Provide water to the populace

8. Put in order from most to least the following list of social actors, in relation to their responsibility in the protection of natural resources and care of the environment.

- Tourists
- The populace
- Consultants
- Legislators
- Developers and builders
- Private property owners



- Administrative entities of municipal government
- State government entities (SEDUMA)
- Civil society organizations dedicated to the environment
- Tourist service businesses (hotels, bars and restaurants)
- Tourist activity businesses (tours, diving, snorkeling, fishing, aquatic sports, adventure activities)
- Government entities for the protection of the environment (PROFEPA, CONAGUA, SEMARNAT, etc.)

9. Do you know why there are no above ground rivers in Quintana Roo?

Yes No, Why? _____

10. What are the indications that a treatment plant is not functioning correctly?

11. From the following options, select the ones that you think pollute the underground rivers the most.

- Sewage
- Chemical agents used domestically (oil, cleansers, bleach, etc.)
- Organic waste
- Non-organic waste

12. From the perspective of your profession/business, what duration of time do you give to "short", "medium", and "long" term?

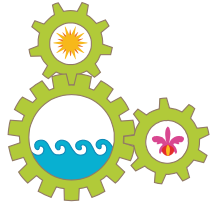
short: _____
medium: _____
long: _____

13. In your profession/business, do you currently have a strategic plan?

No Yes, within how many years will it be realized? _____

14. In your profession/business, do you budget funds allocated to the research and development of projects and/or new procedures?

No Yes



15. Supposing that the coral reef disappears within ten (10) years, how would this affect your sector/business? _____

16. Put in order the following list with respect to social actors that you think should participate more to prevent the destruction of the reef:

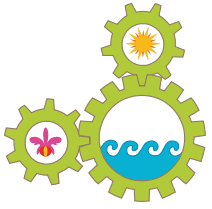
- ___ Tourists
- ___ The populace
- ___ Consultants
- ___ Legislators
- ___ Developers and builders
- ___ Private property owners
- ___ Administrative entities of municipal government
- ___ State government entities (SEDUMA)
- ___ Civil society organizations dedicated to the environment
- ___ Tourist service businesses (hotels, bars and restaurants)
- ___ Tourist activity businesses (tours, diving, snorkeling, fishing, aquatic sports, adventure activities)
- ___ Government entities for environmental protection (PROFEPA, CONAGUA, SEMARNAT, etc.)

17. What is the role that your sector/business would play in the prevention of the destruction of the reef? _____

18. What topics would you like training in, in order to promote the good management of the watershed, sewage, and its impact on the reef? _____

19. What topics do you think your clients should be trained in to promote good management of the watershed, sewage, and its impact on the reef? _____

20. Of the topics you selected, whom would you consider the right person in Mexico to address that topic in a workshop? _____



INITIAL SURVEY

Environment and Sustainability Workshop: Managing the Watershed of the Riviera Maya
Centro Ecológico Akumal
August 20, 2009

Name _____

Age: __ (18 – 25) __ (25 – 35) __ (35 – 45) __ (45 – 99)

Occupation:

- Hotel
- Tourism Services (tours, etc.)
- Government (municipality_ state_ federal_)
- Consulting
- Investor (national_ foreign _)
- Private Owners
- Constructor
- Environmental Organization
- Other, ¿Which one? _____

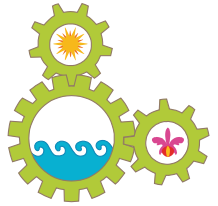
Years in Quintana Roo or Yucatan Peninsula:

- 1-5
- 5-10
- 10-15
- 15-30
- Born in the state

1. Why are you interested in participating in this workshop?

2. How would you rank the following features of the Riviera Maya in terms of their attractiveness to tourists? (From 1 to 13)

- Cenotes
- Archaeological sites
- Coral reef



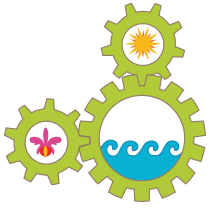
- Sea turtles
- Beaches
- The sea
- Forests
- Indigenous communities
- Tourism services (hotels, bars and restaurants)
- Tourism activities (tours, diving, snorkeling, fishing, water sports, adventure activities)
- Golf
- Shopping
- Nightly entertainment

3. How would you rank the following in terms of economic value?

- Cenotes
- Archaeological sites
- Coral reef
- Sea turtles
- Beaches
- The sea
- Forests
- Indigenous communities
- Tourism services (hotels, bars and restaurants)
- Tourism activities (tours, diving, snorkeling, fishing, water sports, adventure activities)
- Golf
- Shopping
- Nightly entertainment

4. What are the three most important threats to the environment of the Riviera Maya?

- Hurricanes
- Water pollution
- Inadequate solid waste management
- Tourists' behavior
- Tourism activities
- Construction
- Wastewater treatment
- Destruction of forests
- Destruction of mangroves



- _ Sascab extraction
- _ Coral extraction
- _ Fishing and capture of seafood

5. Name two environmental services and two economic services provided by the Coral Reef System in Quintana Roo (either directly or indirectly):

Environmental _____

Economic _____

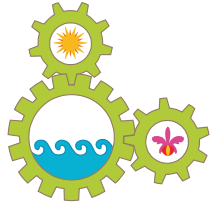
6. To prevent alteration of the watershed, how would you put in order the importance of the involvement of the persons listed below:

- _ Local population
- _ Owners of private properties
- _ Tourists
- _ Businesses in the tourism industry
- _ Developers and builders
- _ Environmental organizations
- _ Legislators
- _ Federal authorities
- _ State authorities
- _ Municipal authorities

7. Name three pollutants associated with sewage:

8. Suppose that the coral reefs will disappear within ten (10) years. How would this affect your industry / company / business?

9. What things do you do you in the course of your job that help to protect the environment?



10. Mention 3 problems that prevent people in your industry from implementing practices that help conserve the environment:

11. What do you think is the way to encourage people in your industry to implement practices that help conserve the environment?

**C. DELEGADO DE LA PROCURADORÍA
FEDERAL DE PROTECCION AL AMBIENTE
P R E S E N T E**

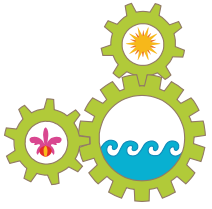
Asunto: Se presenta denuncia Popular

Appendix 4:
Public
Claim / Suit

La suscrita por mi propio derecho, y en calidad de miembro de la comunidad afectada del Municipio de Solidaridad, Quintana Roo, señalando como domicilio para recibir y oír toda clase de escritos y notificaciones, el ubicado en Condominios Villas Marlin, Blvd.. Kukulkan km. 13.5 Local 4 Zona Hotelera, C. P. y autorizando para los mismos efectos a las siguientes personas: „..... ante ustedes acudo para exponer:

“Que con fundamento en el artículo 189 y demás relativos del Capítulo VII de la Ley General del Equilibrio Ecológico y la Protección al Ambiente vengo a presentar **DENUNCIA POPULAR** para hacer del conocimiento de esta Autoridad hechos, actos y omisiones que producen desequilibrio ecológico y daños a los recursos naturales, además de contravenir las disposiciones de la misma Ley y de diversos ordenamientos que regulan materias relacionadas con la protección del ambiente y la preservación y restauración del equilibrio ecológico.

Motivan la presente denuncia los siguientes:



HECHOS

- I.-El demandado, se ubica en Municipio de Q. Roo, México.
- II.- Actualmente se llevan a cabo obras dentro del Parque la Zona Federal Marítimo Terrestre sin autorización de impacto ambiental.
- III.- Las obras se llevan a cabo sin la Autorización de Impacto Ambiental correspondiente.

CONSIDERACIONES DE DERECHO

1.- Las obras y actividades que pretenden llevarse a cabo para la recuperación de playa contravienen diversas disposiciones que deben regirlas, toda vez que se presume que las obras de recuperación de playa se llevan a cabo por el demandado sin la debida Autorización de Impacto Ambiental.

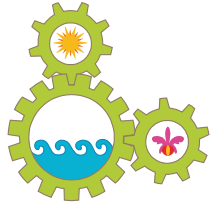
- I. **La Ley General del Equilibrio Ecológico y Protección al Ambiente (“LGEEPA”) es el principal ordenamiento jurídico vigente en materia de protección del ambiente en su conjunto. La LGEEPA, en su artículo 28, fracción I, establece la obligación de llevar a cabo un a Evaluación de Impacto Ambiental para llevar a cabo obras y actividades en humedales, manglares, lagunas, ríos, lagos y esteros conectados con el mar, así como en sus litorales o zonas federales.**

2.- Inspección ocular de la autoridad, consistente en el apersonamiento de la misma en la zona del Megaproyecto, a fin de verificar su exacta ubicación y el inicio de los trabajos preliminares para su construcción.

Por lo antes expuesto y fundado a esta Autoridad atentamente pido se sirva:

PRIMERO.- Tener por presentada formalmente la presente denuncia popular e integrar el expediente relativo a la misma.

SEGUNDO.- Notificarme dentro del término de Ley del trámite que se le de a la presente, así como realizar las diligencias necesarias a fin de determinar la existencia de los hechos denunciados.



TERCERO.- Con fundamento en el artículo 195 de la LGEEPA, se emita a la(s) autoridad(es) competentes a nivel estatal o municipal a las que haya lugar, las recomendaciones necesarias a fin de promover a éstas la ejecución de las acciones procedentes.

CUARTO.- Se me informe del resultado de la visita de inspección y de las sanciones y medidas de mitigación que procedan de acuerdo a la Ley, en contra del responsable.

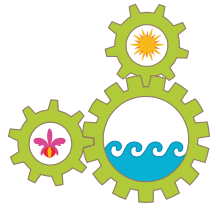
SEXTO.- De acuerdo con lo dispuesto por el artículo 202 de la LGEEPA denunciar ante el Ministerio Público Federal los actos, omisiones o hechos que impliquen la comisión de un delito, a efecto de proteger y defender el medio ambiente, los recursos naturales y la pesca.

Cancún, Quintana Roo a de 2010

PROTESTO LO NECESARIO

NOMBRE DE DENUNCIANTE

I. Las disposiciones de la LGEEPA son complementarias a las disposiciones del Libro Cuarto Código Administrativo del Estado de México. Esta complementariedad está fundamentada en el artículo 4.3 y 4.50 de dicho Código.



Appendix 5: Internet image Sources

1. <http://fuegosol.files.wordpress.com/2009/05/cancun1.jpg>
2. <http://thundafunda.com/33/World-tour/download/Cancun%20Shoreline,%20Mexico%20pictures.jpg>
3. <http://aclarando.files.wordpress.com/2009/12/cancun-comparativo-playa-gaviota-azul-091212.jpg>
4. <http://plantamedicinales.net/wp-content/jas.jpg>
5. <http://www.esmas.com/galeria/fotos/2006/12/200681410181165608618.jpg>
6. http://www.noticaribe.com.mx/cancun/images/03_06cancun1.jpg

