

DESTRUCTIONS OF THE CORAL REEFS IN CHUUK

XAVIER TOWN STUDY PROJECT 1992

Group Members:

Tim Terno  
Thaxton Panuel  
Fredrick Aitab  
Roderick Capelle  
Chris Houmarek

Moderator: Michael Lee

## Introduction

Coral is a marine animal that is made up of tiny organisms called polyps which stick together in groups or colonies. They have dome-shaped bodies with mouths that are surrounded by tentacles. Most polyps are usually between 1 to 30 millimeters in diameter but can grow as large as 25 centimeters in diameter.<sup>1</sup>

Coral polyps feed mostly at night by shooting poison from their tentacles, containing stinging cells called nematocysts, into floating micro-organisms called zooplankton. They can also obtain their food from small plant cells called zooxanthellae, which live in the coral's tissue. These plant cells use sunlight to produce their food by means of photosynthesis, which then is shared with the polyps. In a sense, then, coral can be thought of as a flower or any other plant living underwater. Therefore, coral cannot live or survive in gloomy and muddy water because coral needs sunlight and clear water in order to live and survive.<sup>2</sup>

Coral polyps are continuously reproduced both sexually and asexually. Sexually, eggs are produced and become larvae when they hatch. As larvae, they swim about, settle down on rocks or dead coral and begin to grow. Asexually, they are reproduced through the act of budding--the buds break away from the mother polyp and become separate. In other cases, however, the buds remain attached to the original polyp and a colony is formed through the addition of new buds.<sup>3</sup>

Millions of coral polyps make up limestone formations called

coral reefs. As old polyps die, new polyps grow on top of the remaining skeleton. The living polyps, which are on the thin outer layer of a coral reef, grow outward and upwards every generation. The growth rate of coral reefs depends on its age, food supply, water temperatures and species. Basically, however, a coral reef grows at an average rate of about 0.5 to 2.8 centimeters per year.<sup>4</sup>

There are three main types of coral reefs: fringing, barrier and atoll reefs. Fringing reefs are the most common type and grow along the edges of shores and islands. Barrier reefs are similar to fringing reefs but are separated from the shore line by deep water. Finally, there are atolls, which are coral reefs that are almost the same as barrier reef but without any islands in the middle. The islands, however, grow on the reef instead of in the middle such as that of the barrier reefs.<sup>5</sup>

The reef structure of Chuuk, in general, includes all three types of coral reefs. Immediately surrounding the lagoon islands is limestone consisting mostly of dead corals. As the water gets deeper, there is live coral that make up fringing reefs and serves to shelter large varieties of seafood such as reef fish, clams, lobsters and shrimps. Furthermore, all the lagoon islands are surrounded by a large barrier reef which is 40 miles in diameter and serves as an important habitat for marine life while also protecting the lagoon islands from battering ocean waves. Finally, the outer islands of Chuuk are mostly atolls consisting of large, circular barrier reefs with no islands inside.

Coral reefs play a significant role in the lives of marine and land inhabitants in and around the coral or volcanic islands of the Pacific region. For man, one of the most important roles or functions of coral reefs is the fact that they act as land-builders or land providers. Early in Earth's history, when the volcanic islands were formed, some reefs did not quite make it up to the surface. Fortunately for man, coral continued (and still continues) to grow upward towards the surface until small coral islands or atolls were formed. Also, coral grows around volcanic islands that are already on the surface and, in turn, creates more land or small islands.

One other valuable service done by coral, particularly barrier reefs, is that it protects islands from big waves during storms and typhoons. It prevents land erosion by waves and tides and produces white sand, which replaces any natural erosion that has taken place along the shoreline.

Underwater, coral reefs play a vital role in the marine ecosystem. They provide food and shelter for many marine animals such as fish, clams, lobsters, crabs, octopi, etc..., which all serve as an important food sources for the people of the Pacific islands. In other words, the people depend on the fish for living and the fish depend on the coral.

Economically, the coral reef is one of the main sources of earning money in Chuuk. For example, fishing is now a commercial practice today among the local people as a means of earning money; however, this is only due to the coral reefs that shelter



the fish. Moreover, now-a-days, tourists are attracted to coastal reefs, which happen to be one of the most attractive natural resources that Chuuk has. Therefore, even in a modern world economy, coral reefs serve as a benefit for developing tropical islands like Chuuk.

At present, the coral reefs here in Micronesia, especially in Chuuk, are threatened both by natural and man-made factors. Man-made factors are the ones that are increasingly doing the greatest harm. The problem is that these factors are sometimes seen as "necessary" or inevitable with regard to modern dilemmas facing Chuuk such as feeding an increasing population or developing and industrializing the infrastructure of the state. In this way, the Chuuk state government is aware of the deteriorating condition of the reef, yet it seems to be doing little to prevent or lessen the destruction which, if allowed to continue, will alter the lifestyle and ecosystem of Chuuk for hundreds of years to come.

### CAUSES OF DESTRUCTION

#### Natural Causes

Natural causes of destruction to the coral reefs in Chuuk used to serve as having the greatest negative impact on the reefs. One such cause are animal predators like parrot fish, trigger fish, crown of thorns, and starfish. These predators feed off the polyps that build up the coral, which, in turn, build up the reef. Even though these predators damage the coral reefs in this way, they are also helpful in the beautification of the

islands. For instance, the parrot fish breaks down the coral when it eats the polyps, however, the result is that the coral fragments produce pleasant sandy beaches.

Other natural causes of destruction to the coral reefs are caused by various forces of the nature. Two examples of these are typhoons and temperature. Typhoons damage the reefs by creating big waves that strike down the delicate branches of the coral or wash large pieces of floating debris onto the coral on the reefs. Moreover, changes in temperature affect the lives of the coral reefs due to the fact that coral needs to live in a temperature range between 23 to 28 degrees Celsius (72 to 82 degrees Fahrenheit). A drastic change then in the temperature, therefore, can kill the coral.<sup>6</sup>

#### Man-made Causes

The man-made causes of destruction of the coral reefs are relatively recent but are now having the most damaging impact on the reefs. For the most part, these man-made causes are the results or by-products of development strategies and the technologies now being introduced into Chuuk State. Before, the effect of development was not very strong on the environment; however, because of the compact-step-down, the government and the people are trying to develop more in order to be able to stand on their own. Such development includes the building of factories, roads, and other things that will supposedly help the State become less dependent on the United States and the FSM National Government. Nevertheless, these developments can be damaging and

harmful for the environment, especially the reefs.

## SILTATION

Siltation, the accumulation of silt or dirt in the water by erosion or developmental activities, is one of the man-made causes of destruction to the coral reefs. A great deal of siltation occurs in Chuuk because the lagoon islands are mountainous and have very limited areas of flat land to build on. Furthermore, this flat land is found primarily along the shore, and, because of this, most of the "developmental" activities cause or allow the silt to go right out into the water and onto the reefs. Three examples of "developmental" activities that we identify as causing siltation here in Chuuk are dredging, construction, and mangrove removal.

Dredging, or the mining of sand, is one activity that is damaging the coral in the name of development. We say this because sand is a key ingredient in the making of concrete or cement and also plays an important part in levelling roads before they are paved. Because sand fulfills these and other developmental needs, it is mined or dredged everyday.

The locations of these dredge sites, not surprisingly, are right next to the shore or just a few yards out into the water. At these sites, heavy machinery is used to bulldoze or scoop huge quantities of sand for later use. However, when the sand is mined, the fine grains of sand escape the scooping machines, cloud the water, and block out the sunlight, which is important for the coral's photosynthesis. Besides clouding the water and

blocking out the sunlight, the fine grains of sand also create siltation problems when they accumulate and become silt.

In Weno, in particular where the development boom is greatest--the impact that dredging has had on the surrounding coral is sever. As of 1982, existing dredging sites were located in Wichap, Aepukos, Iras, Mechitiw, Tunnuk, and Nemwan, Sapuk.<sup>7</sup> All of these sites, except the one at Mechitiw, still exist today and continue to "disturb the coral.

Mangroves play an important role in the protection of the coral reefs. They function as a filter for the silt and the dirt naturally washed off the land before they affect the marine environment. Dr. Nora DeVoa from the U.S Forestry Department who is currently studying the mangrove situation in Micronesia stated, "Mangroves are very important resources; they provide shelter for small marine lives and for the fish when they spawn. They also function as filter for the trash and dirt from the land when they are washed out from the land during heavy rains."<sup>8</sup>

These natural filters, however, are now being removed and at a faster rate today than in years past. One reason for this is for the use of firewood. Another is simply to get easier access to the lagoon. A good example for this is the Netutu Bay in Tol where many of the mangroves have been removed to make an easy access to the water.

Reclamation is another reason why the mangroves are being removed. For instance, at some places, the mangroves are removed and then dirt, trash or concrete is put in its place to

accommodate for new sites for houses and so forth. Lastly, other reason why the mangroves are removed is because of road construction. This is seen at Penia and Wichap where the road construction has expanded into mangrove areas. As a result of all of these factors, the natural filter provided by mangroves is becoming less and less effective which means more siltation and damage to the reefs.

#### POLLUTION AND SEWAGE DISPOSAL

The dumping or releasing of raw sewage is also a contributing factor to the present destruction of the reefs. Such sewage is or has been released by scattered, over-water benjos, large ships, and even the sewage treatment plant on Moen. The problem with dumping untreated sewage is that it produces green algae, which is dangerous to the coral and other marine life. The green algae produced by raw sewage is dangerous in the sense that it depletes oxygen from the water leaving the marine life to suffocate.

The Continental Hotel and ships in the lagoon have been known to dump concentrated sewage into the water. Furthermore, in the past, the sewer plant knowingly dumped untreated sewage into the lagoon because of a lack of treatment chemicals. It is possible that such activities will happen again, especially with the sewer system on Moen being extended to bring more concentration of sewage through the plant. As a result, the problem could potentially worsen.

The careless disposal of fuel also creates a big problem to

the lives of the coral. Many developing areas in the world today are increasingly using and relying on fuels, but their disposal is not carefully taken care of by the government or the people themselves. Take for example the oil that has flowed up until recently from the Power Plant directly out into the water. This, plus oil and gas discharge from snips and outboards, impacts on the lives of the coral reefs by blocking out oxygen from the water in a way similar to that of sewage.

When Public Works Deputy Director, Larry Gouland, was asked if his department was aware of oil flowing from the Power Plant into ditches and out into the water, he said, "Yes, we are aware of that, and we try our best to clean it up or else the EPA will come after us. But, you know, there is nothing much we can do if the rain overflows the tank that containing (sic) the oil because we don't have the means. Besides, it's not really big."

Besides oil and sewage, the littering or disposal of growing amounts of trash is also harming the reefs. This is especially true because the current dump site is located near the water, separated by just a few mangroves. The dump site contains many chemicals that are hazardous to the coral reefs. Such chemicals include the acid from old car batteries, the residue from pesticides containers, and also oil from the aging automobiles dumped there.

All of these chemicals freely flow out into the lagoon after steady periods of rain. Furthermore, the dirt that the public workers use to cover up the trash is also another problem that

the dump site creates because it causes siltation near the place. Because of the condition that these two problems create, the condition of the coral nearby the place is also affected. This was actually justified when Mark Mailo, Director of Marine Resources, said, "I went to do some inspection on the water near the dump site and all the corals are dead." 11 This, as he said, are maybe from the things dumped in the area.

Along with this problem from the chemicals, there is also the problem with the people's bad habit of littering both in the water and on land. One explanation for this is that people are used to using and throwing aside decomposable garbage such as coconuts or banana leaves. Now, however, the people out here rely more on imported goods, which are mostly packaged in plastics or other non-degradable materials but are being thrown around everywhere in the same manner. For example, people just throw around cans, plastics, and other things that are not decomposable. Often times outboard operators throw empty oil cans into the water and create an unhealthy environment for the coral reefs and the fish.

#### DYNAMITING AND CLOROXING

Dynamiting fish is a particularly damaging activity and illegal way of fishing here in Chuuk State. The presence of the sunken fleet in the Chuuk Lagoon contributes to the on-going use of dynamite because it supplies the dynamiters with the necessary gunpowder. The dynamite charges are made from the gunpowder from the ships, put into bottles with a wick, lit and thrown



overboard to explode! The explosion itself immediately kills nearby fish by bringing about a rapid change in water pressure. Furthermore, other fish are stunned and immobilized by the blast, so fishermen can easily grab them.

Dynamiting happens everyday because it is an easier and faster way of catching fish. It is the fastest way to accommodate other activities for the day without spending too much time on fishing. In this way it is clear to see how dynamiting is such a popular way to fish. It is quick and easy and allows for one to catch many fish at one time.

The problem with dynamiting is that it indiscriminantly kills the fish, small and big alike. Its shock also breaks down the delicate coral and leaves them in an unhealthy condition for the fish that the people depend on. Furthermore, the reefs are the place where the fish live, and, therefore, dynamited the most. Sadly, the dynamiters do not seem to care whether they drop their dynamite on the reefs or in the deep water as long as they get an abundant catch.

Equally disappointing, dynamiting activities in Chuuk do not seem to be decreasing. When Chief of Police Heratio William was asked if dynamiting in Chuuk is decreasing, he said, "I don't know. So far the rate of dynamiters that we get is getting smaller these years. but maybe because they are smarter in avoiding the law enforcers."10 A good example of how the dynamiters avoid the law enforcers is that they go dynamiting on Sundays when there are no law enforcers on patrol.



A Xavier student was actually involved in this type of fishing expedition one Sunday when he was told that he would be going trolling but instead went dynamiting. This is a good example of what Mark Mailo means when he said that he thinks dynamiting is not getting smaller. He said, "It is an on-going activity that cannot be monitored, so we can never tell how bad it is. In fact, I think the dynamiters are getting smarter; that's why we cannot catch them."11

Another illegal way of fishing that destroys the coral reefs is "cloroxing" or using bleach to kill fish. The way it is done, like dynamiting, is also relatively simple. When it is poured out on the reef where fish are, the fish and the coral get poisoned and die. Like dynamiting, clorox is used because it is a much faster and easier way of fishing; however, "cloroxing" of fish might be considered worse in the sense that it affects a more widespread part of the reef each time it is done.

The result of both dynamiting and cloroxing can be seen near the Northeast Pass where a certain part of the reef is nothing but a huge white piece of rock. Some fishermen, who have witnessed this, said that the place used to be a very good fishing spot, but, when they went back out, all they see now is rubble from the destroyed and bleached coral.

#### GROUNDED VESSELS AND ANCHOR DAMAGE

Two other man-made causes of destruction for the coral reefs that are not as closely linked to the issue of development are grounded vessels and anchor damage. The damages that are caused

by these two can quickly and permanently damage large portions of the reefs. For example, especially during typhoons and storms, big waves can pull ships free from their moorings and ground them on reefs, destroying large sections of the coral which took many years to grow and will take many more to grow back. Furthermore, once these vessels are grounded, they seem to stay grounded until another storm comes and washes them onto another section of the reef. The problem with some grounded vessels on the reefs in Chuuk is that they are impounded foreign vessels, whose occupants have left the ships to rot in the lagoon. Gas and oil, whose damages we already explained, also often seep from these vessels directly onto the reefs.

Even everyday boats can damage the coral when operators are not careful. For instance, sometimes the operators of the outboards carelessly throw their anchors overboard and damage the branches of the delicate coral. Also when the current and waves move them around, the anchors, which are dropped into the water, damage the coral as they move along with the boats.

#### EXISTING CONDITIONS AND POLICIES

With all of the above-mentioned factors that are destroying the coral reefs, it is not surprising that the existing condition of the coral reef in Chuuk is damaged and not as full of marine life as it used to be. In the past ten to thirty years, the condition was much more healthy than what it is today, primarily because of all of the development that has taken place during that time period.

When we asked some fishermen about the condition, causes of damage, as well as their reaction to these issues, Aliwis Nukuto, a prominent fisherman from Tol said, "Before, the reefs were very abundant with fish. When I used to go fishing, I would just spend four hours and I'll be loaded with catch; however, today I could spend eight hours and my catch would not even amount up to half of the amount I used to get before, mainly because of the use of dynamiting."<sup>12</sup> Another fisherman, Caspar Berry, also said, "The reef is not as good as it used to be before. You can see that especially near the Northeast Pass where it has been repeatedly dynamited everyday."<sup>13</sup>

Joseph Ekis, a fisherman from the outer-islands, was also interviewed and he pointed out several differences between the coral reefs here in the lagoon area and those around the outer-islands. "Anyone who has been fishing here and in the outer-islands, where people never use dynamite, can tell the difference that I see."<sup>14</sup> Ekis continued on to describe how there are many fish in the outer-islands because of the healthy reefs, unlike here in the lagoon area where both fish and coral reefs are destroyed because of dynamiting. "In the outer-islands the coral reefs are growing and are abundant with marine lives, but in the lagoon the reefs are damaged." Again, one cannot help but point out that the majority of development, along with dynamiting, takes place inside the lagoon rather than around the outer-islands.

What all of this leads us to ask, then, is what are the

people and the government doing to prevent the reef from deteriorating? What are the policies that the government has implemented, to prevent the destruction of the reef from continuing?

An answer to some of these questions is that there are some policies that exist. For example, in the Marine Species Preservation Act, there are laws to prevent dynamiting and chloroxing. However, most of these policies or laws were made during the Trust Territory time and later adopted into the laws of the four States, Yap, Chuuk, Pohnpei, and Kosrae when they formed the FSM. Some examples of these laws are the ones under Chapter one of the Marine Species Preservation:

Sections:

101. Use of explosives, poisons, chemicals, etc., prohibited.

(1) Except as provided in section 102 (Exceptions to prohibition--Permit.) of this chapter, no person shall knowingly catch any fish or other marine life by means of explosives, poisons, chemicals, or other substances which kill fish or marine life...

104. Use of explosives, poisons, chemicals, etc.--Penalty.

--Any person who violates any of the provisions of section 101 of this chapter shall, upon conviction thereof, be fined not

less than \$100 or more than \$2,000. or  
imprisoned for not less than six months, or  
more than two years, or both. (Code 1966  
Section 780; Code 1970 43 TTC 1: PL 4C-35  
Section 4; Code 1980 45 TTC 1(4)) 15

These two specific sections under the Marine Species Preservation  
are the two existing laws that concern the coral reefs in Chuuk.

### Government Concern

In general, the agencies or departments of the Chuuk state government involved in overseeing local development and/or its effects on the coral reefs have been aware of the on-going destruction of the coral reefs, yet there has been no action or passing of state laws to more strictly preserve and protect the coral reefs. Such departments or agencies that we feel are but should be more involved and concerned are: Planning and Statistics, Chuuk Visitors Bureau, Public Works, Marine Resources, Public Safety, the State Legislature, the Executive branch and the Environmental Protection Agency.

The department of Planning and Statistics is aware of the problem. For instance, Henry Kelliam, the deputy director, said, "we are being critical with the reefs in our planning in terms of development. In our work, we put great concern in the preservation of the marine resources so that the people will benefit from it in the long run." 16 In reality, however, we find that there has not been any specific actions this department

has taken in order to stop or prevent this problem. Perhaps this is mainly to the fact that its present responsibility is to put all planning information on projects together, develop the strategies and present them to the legislative branch. The approval and recommendation is then done by the legislative branch.

Concerning a plan to develop five outer-island airstrips, the Planning and Statistics did study the sites in order to find out if they would be beneficial both to the people and the environment. What this meant is that during their study, they tried to examine or balance the potential costs and benefits of the projects. From their observation, they designated Ta island as one of the outer-island to build an airfield on. One benefit that was brought up about this project was that it would provide a quicker way of transportation of both people and goods to the lagoon. A cost, however, would be that it could possibly damage the coral and marine life. When the department had finished its study, all the information and strategies were given to the legislative branch for recommendation and approval.

Just recently, the Ta airfield was completed. In other words, the plan of developing an airfield on Ta was approved by legislature, meaning priority was given to economic development rather than on maintaining the local environment. Further supporting this conclusion is the recent proposal for building a Pa-Satawan causeway. At this point, it is understood that the government is most concerned with developing instead of

preserving. It does not seem to carefully consider the negative effects of development on the future of the reefs but rather on short-term, economic benefits for life today.

In all, Henry Kellam said, "Planning and Statistics department puts great consideration upon the importance of the reefs and the balance on the marine ecosystem as well as in the development of the state of Chuuk. For example, the department understands that the coral reefs are very fragile and a break-off of one connection in the ecosystem will harm its balance." 17 Nevertheless, though the department claimed to be aware of how development affects the reefs and the marine organisms, it continuously plans more projects, or, in a sense, more destruction.

Also, since the destruction of the coral reefs would affect the flow of tourism into Chuuk, the Chuuk Visitors Bureau, which was created by law in order to promote tourism is indirectly involved with local environmental matters and preserving the natural resources of Chuuk. It takes care of the shipwrecks and some specific sites for tourists to see with the help of the EPA agency and Marine Resources. For example, it has policies concerning the shipwrecks and some interesting sites for tourists to view.

The Chuuk Visitors Bureau has taken special efforts or initiatives in minimizing the problem. For example, it sponsored a program for recycling aluminum cans to deal with the littering problem, funded a special group to help the clean up of

particular areas on Weno and has also requested Public Works to clean up and relocate the dump in Neno to a real dumping site. "But they are waiting for a real expert from the U.S to do the designation of a real dumping site", according to Joe Kono from the EPA.<sup>18</sup> They need the expert to examine some sites around Weno in order to find a particular place for an official dump, where the surroundings would be appropriate for a dump site.

As for the sewer system, the waste or raw sewage is treated with chlorine in the sewage treatment plant and then dumped into the ocean. However, occasionally it has been dumped into the lagoon without treatment due to a lack of chemicals. Occurrences such as this reportedly take place about once every two years. When they occur, Public Works has to make public notice and consult the EPA for permission before they bypass or discharge of raw sewage without treatment.

Concerning this problem, one worker at the plant optimistically declared that, "the longest time they did the bypass of raw sewage was about a month sometime during the year 1991. However, now-a-days it could be fixed in a short period of time, since there is a new sewage treatment plant technician, who tries to maintain the plant in a better condition."<sup>19</sup> Furthermore, the same worker, dismissed any possibilities of future problems by saying that, "The site, where the treated liquid sewage is released, was studied by real experts from the U.S. They put in consideration the course of the current in the lagoon. They knew that the treated liquid sewage will not stay in



the same place but rather move along with the current. As a result, it will not be concentrated in a particular place. Therefore, I think it's not a big problem." 20 However, we, the Environmental TSP group, predict that as time goes on, it will eventually become a big problem considering the fact that the amount of raw sewage from the public is rapidly increasing due to the dramatic growth of the Chuuk population.

In terms of the power plant, there is a new generator that can recycle the used up oil and reuse it itself. Only the waste is being separated and put into a tank. However, when it rains, the waste oil spills out of the tank and flows into the ditch and stays there. Then, the public workers use plants to soak it up and get dried up. Afterward, they dump the plants that they used at the dumping site. Thus, it does not contribute any danger or threat to the reefs and the marine life.

The department of Fisheries or Marine Resources is in charge of the preservation of the marine resources including the coral reefs and marine organisms. Although there are rules against pollution in the sea, they are under the jurisdiction of the EPA agency, which is operating on the national basis. But there are state laws that prohibit the act of dynamiting and use of poison and chlorine for killing fish. (All of the laws and policies concerning the preservation of the marine life are stated under the section on Existing Conditions and under the responsibility of the Environmental Protection Agency.)

Furthermore, it does surveys or studies on the coral reef

and at the same time, enforces its laws, especially on the act of dynamiting. Specifically, it has a special program, which is called the Public Conservation Program. This program has patrol men who patrol the lagoon six times a week and eight hours a day for dynamiters. However, they are having a hard time controlling it due to the lack of personnel and equipments. For example, when we, the Environmental TSP group, went on a patrol with the conservation police, there was only one boat and few workers while there is a vast, open lagoon and ocean to patrol. In a way, there is not much money provided by the government for the sake of preventing the illegal act of dynamiting. As a result, the patrol program is a waste of time, since they only have few boats and equipments considering the fact that dynamiters played smart now-a-days. For example, when we, the Environmental TSP group, went patrolling with the conservation police, we were only able to see a particular area at a time. Also, we did not even find any dynamiters that day.

Public Safety is responsible for the investigation of dynamite and illegal taking of artifacts and munitions from the shipwrecks. However, no arrests have been made, though they were reported. Moreover, Americans were mostly the ones who made the reports instead of the Chuukese. Generally, the police are only involved with EPA, Marine Resources and Sanitation, particularly during an investigation and to make an arrest.

Additionally, littering is against the law. At first, the police arrested people who littered illegally. However, the

Public Safety department claimed that it could not enforce the law anymore without making any public awareness and improvements such as providing public trash cans in the first place. According to us, the Environmental TSP group, the situation might encourage even more people to litter although they know that it is against the law.

The executive branch, mainly the governor, knows about these problems. Yet, during our interview, the governor said, "We have no specific policies concerning the reefs but there is on dynamiting." 21 In fact, he seemed to blame the law-makers, the legislative branch, for the present situation. For example, he said, "I'm waiting for the Legislature to establish a state EPA." 22 If a state EPA is established, then the continuous destructions of the coral will be under control. In addition, he also said, policies were more strict during the Trust Territory time. As a result, they somehow prevented development. For example, dredging was strictly forbidden back then." 23

This last statement seems to hint at our belief that the state is more concerned about the development rather than the preservation of its natural resources. He understands the consequences of the problem, but he is waiting for the legislature to either approve or reject the laws and proposals concerning the preservation of the marine resources.

Additionally, the law-makers in the legislature do very little about the prevention of destructions of the coral reefs. For instance, Elliot Cholyamay, the former director of Fisheries,

said. "I wrote a proposal to the legislature but, up to now, there is no effect or result. So, it means that the legislators are not doing their job." 24 Also, Kowas Santa, Chief of Pollution Control, from EPA said that "The EPA department proposed a legislation to be introduced in the legislature and so far there are no results as of today. We follow up on it, but they told us that it is still with the Health and Welfare Committee in the house of Senate." 25

Anyway, since we, the Environmental TSP group, know that all of the proposals are stuck in the Legislative branch, we tried to contact them but they never had time. We set up many appointments with different senators and representatives but our appointments were always cancelled or postponed.

Apparently, we can conclude that the law-makers or senators are more concerned about the development of the state without considering the effect of its consequences or environmental impacts on the coral reefs. To be more specific, they fund money to improve the tourist industry, including the establishment of new hotels and road construction. As a result, we can say that they forget that such development would affect the reefs. Regarding this approach, Clark Graham, director of Chuuk Micronesia Aquatics and Scuba instructor, said, "Guam has many fancy hotels; however, the sea close to the hotels is polluted. People cannot swim and fish in the sea because it is polluted. This is happening in Chuuk where the Continental hotel is located." 26 In all the law-makers seemed to be more concerned

about the development of the state of Chuuk without considering its effects on the coral reefs.

The Environmental Protection Agency, which is operating under FSM national laws, is ideally an agency that is responsible for the enforcement of such laws and regulations concerning the protection and preservation of the environment. Mainly, there is a public law that regulates all earthmoving constructions or activities, including land reclamation, dredging, ocean disposal and land development. And a person should obtain a permit from the EPA agency before he starts any earthmoving activities here in Chuuk.27

In general, the EPA is working with all the departments that have to do with the environment. For example, Public Works has to get a permit from EPA in order to dispose the raw sewage into the ocean or to start a dredging. Joe Kono, director of EPA, said, "The agency is not trying to stop economic development but to see how much can they take out of the environment without creating a major impact on it"28. Unfortunately, it is really hard to exercise its control within the state, since it is operating on a national basis. However, since the FSM Constitution, article XL, section 1, says, "The Legislature shall provide by law for the development and enforcement of standards of environmental quality, and for the establishment of an independent state agency vested with responsibility for environmental matters", there is a legislation that tries to establish a Chuuk state EPA, which is still in working process in

the third legislative branch.

### Experts View

In our research, we also sought out and talked with experts, or people that know much about the reefs and the effects that development has had on them. People whom we consider as experts are: Clark Graham, Joe Kono, and Marx Nallo.

In general, these experts believe that the reasons for the man-made causes of destruction are related to the people's social attitudes and habits as well as a lack of education and knowledge on the issue. All of them believe that the best possible solution to this problem is an intensive education of the people. Education will enable the people to understand and know the importance of the coral reefs to their daily lives. It will also make the people aware of the problems that are occurring to the coral reefs today, and how it will affect the future generation.

This, as they view it, should be done through several programs like public hearings, radio programs and an extra course in all the schools curriculum on the importance of the reefs. To do the public hearing, the government workers, especially the workers from EPA and the Fisheries, should go from village to village and explain to the people the problems and the current condition of the coral reefs. Along with the explanations, they should also tell the people how to avoid creating the problems that the reef faces. The program should consist of many kind of

activities, such as letting the people picture the future and how it will be without the coral reefs. They should also explain that the best way to prevent the destruction of the reefs is to stop dynamiting.

To do the radio programs, the government should interview people with knowledge on the reefs and ask questions that would bring out the reefs importance and the problems it is facing. Doing such interviews should make the people become more aware of the damage they do to the reef and perhaps marks the beginning of the people's awareness on the issue of coral reefs.

The "experts" also strongly believe that it were even better if a class about the issue should be put into the curriculum of all the schools, private and public alike. This is very important because it will enable the future leaders of Chuuk to know that the coral reefs are very important to their lives both physically and economically.

We, ourselves, conducted surveys of the general public, and our findings also support the need for greater education on this issue. For example, when fifty-seven of the Chuuk High School students were given some questions on the issue, ninety-two percent of them could not comment on the present condition of the reef. A majority of them did know, however, that dynamiting is one of the causes of destruction of the reef. Apparently we can see that students are aware of some problems, but they do not know much about the condition of the coral reefs and the importance of the coral reefs to their lives. If they learn the

important of the coral reefs and the condition of the coral reef. then they will stop creating problems to the reefs.

From Saramen Chuuk Academy, eighty-three percent of the fifty-seven students were given the same questions but could list only two or three actions or activities that damage the reefs. This means that the students are not fully aware of all the problems that are damaging the coral reefs.

By viewing these results, it is obvious that the "experts" are right about the need of education. This is because the people as well as the students who are going to be the future leaders of this country do not know much about the coral reefs. It is a shame because they do not know about the importance of the coral reefs to their lives. They also are not aware of the fact that the coral reefs are in a stage of deterioration. Therefore, education is needed for people to be aware of the important role that the coral reefs play in their lives and how to prevent such damages preventing its growth.

The experts also agreed that to go about educating the people would require a lot of effort and resources, which they believe is worth it. But what about the government? What is the government doing about any education programs? Alton Higashi, director of Chuuk Education Curriculum, believe that the education process is not an easy process that only takes a short time to be perfected--the whole process would take twenty to thirty years to become successful. The government needs to develop a curriculum concerning reefs and provide even resources



such as teachers and books to the class rooms, so the process can start from the elementary up to high school. By introducing the issue of coral reefs in the school, it will enable the children to understand the importance of the coral reefs to them.

### CONCLUSION

In this paper, we mentioned how coral reefs grow, reproduce, and what kind of environment they live in. Furthermore, we have tried to show how and why coral reefs are important to the land and marine environments. They function as wave-breakers, shelter the fish, provide the coral fragments that make up the beaches, and hold the islands together from eroding.

In tropical areas like Chuuk, the people depend on the coral reefs as a provider of food. For many years, the reefs of Chuuk have played a major role in supplying the people with adequate seafood and marine resources. However, this vital source of food and resources is now facing serious environmental damages due to the developmental activities taking place in Chuuk. It can be stopped if the people want it to, but it is hard because of the people's attitudes.

The government's and the people's concern and understanding about the reef are shocking and disappointing. We feel that such attitudes are the underlying reason for the deterioration of the reef. As mentioned earlier, ninety-two percent (92%) of the people involved in the survey do not know about the condition of the coral reefs or what activities damage them. With this number of people not knowing what is happening to the reef around them,

it can be concluded that damaging activities will most likely continue. On the other hand, the government, as a whole, know about the condition of the reef but does not take serious action on it. For example, most (not all) of the department heads that we interviewed said that they are aware of the problems with the reef and they try to do something about it, but they were not able to give concrete examples of what that "something" they are doing actually was. There were some departments that showed examples of what they are doing, but even those are still lame.

Looking at how the people and the government view the coral reef in Chuuk, we offer some practical recommendations on how to go about saving the reefs in Chuuk before it is too late. One is to educate the people on how to take care of the reef and how to go about their activities in a way which will not adversely affect the reef.<sup>29</sup> This, as mentioned under Expert View section, is not a short process that can only run for one or two years, but it is the best to make the people fully understand the condition of the reef and its importance to them. Second, and perhaps even more important, recommendation is for the government to execute more of its power and energies in the prevention of the destruction of the coral reef. For example, it should first undertake a very thorough study of all the sites where its projects are and find a way of preventing all kinds of environmental damages. If these recommendations are not followed, the reef will not last. These recommendations then must be followed if the people do not want to lose the major source of

their food.

1.Sources:1.Encyclopedia Britannica, volume III,"Coral"(139-140)  
2.Compton's Encyclopedia, volume 6, "Coral"(571-572)  
3.New Knowledge Library, volume 7, "Coral"(650-651)  
4.Coral Reefs in the South Pacific

2.See #1.

3.See #1.

4.See #1.

5.See #1.

6.Encyclopedia Britannica Vol.5  
page 162: "Coral Islands, Coral Reefs, and Atolls"

7.Taken from INVENTORY OF THE COASTAL RESOURCES AND REEFS OF MOEN ISLAND, IRUA ATOLL.

Look under "Moen Coastal Atlas Legend" maps 2,8,12.

8.Quote taken from Dr.Nora during a tour in the mangroves on February 19,1992.

9.Taken from the March 26, 1992 interview with Larry Gouland at the Public Works Department.

10.Quote taken from an interview with the Chief of Police on March 19, 1992.

11.Taken from interview on March 26,1992.

12.An interview with randomly picked fishermen on March 24, 1992.

13.Result of an interview with the fishermen on March 20, 1992.

14.Taken from interview on same day as note #1.

15.Taken from the National Law for the environment

16.Henry Kellam, deputy director of Planning and Statistics(March 17, 1992.

17.Look at #16.

18. Joe Kono, director of EPA, (March 16, 1992).
19. George, deputy director of Sewage Treatment Plant, (March 23, 1992).
20. George, deputy director of Sewer Treatment Plant (March 23, 1992).
21. Governor Sasao Gouland, governor of Chuuk State, March 19, 1992.
22. Look at #21.
23. Look at #21.
24. Eliot Cholyamay, former director of Marine Resources, March 16, 1992.
25. Kowas Santa, EPA chief of Pollution Control, April 06, 1992.
26. Clark Graham, owner of Chuuk Micronesia Aquatics and SCUBA dive instructor, March 16, 1992.
27. 25 F.S.M Constitution 610, as amended by Public Law No. 5-21.
28. Quote taken from Joe Kono during an interview on March 16, 1992.
29. Look under Expert View section for thorough explanation.

## ACKNOWLEDGEMENT

Our F.S.P. group would like to extend our most sincere gratitude to the people that will be listed below for making our project successful. Most especially, we would like to thank Clark Graham whom with his great generosity, has given up most of his time to help our group. We would also like to thank Michael Lee, our Moderator, who has gone through a lot of trouble to help us accomplish this project. The sponsors and parents should be also thanked for bearing with us during our research. Lastly, we would like to thank the principals and students from Saramen Chuuk and Chuuk High School who cooperated with us during our surveys. The following are names that we would like to acknowledge for their performances that they have contributed to the benefit of this report.

Joe Kono.....	Director of EPA
Marion Henry.....	Director of Industry and Commerce
Mark Mallo.....	Director of Marine Resources
Clark Graham.....	Diving Instructor
Gov. Sasao Goulard.....	Head Executive of Chuuk State
Dr. Nora DeVoa.....	U.S Forestry Department
Camy Akapito.....	Deputy Director of Truk Visitors Bureau
Heratic William.....	Public Safety Chief Police
Larry Goulard.....	Deputy Director of Public Works
Alton Higashi.....	CIRET Chief, Chuuk Department of Education
Krescio R. Billy.....	Director of Planning & Statistics
Henry Kellam.....	Deputy Director of Planning & Statistics
Kowas Santa.....	Pollution Control Chief, EPA
Elliot Cholyamay.....	Teacher and former Director of Fisheries
Caspar Berry.....	Teacher and Fisherman
Joseph Ekis.....	Fisherman
Aliwis Aukuto.....	Fisherman
Thomas Shirai.....	Teacher and fisherman
.....	TRANSPORTATION PROVIDERS.....
Tino Ponny & Ezekiel Kannys	