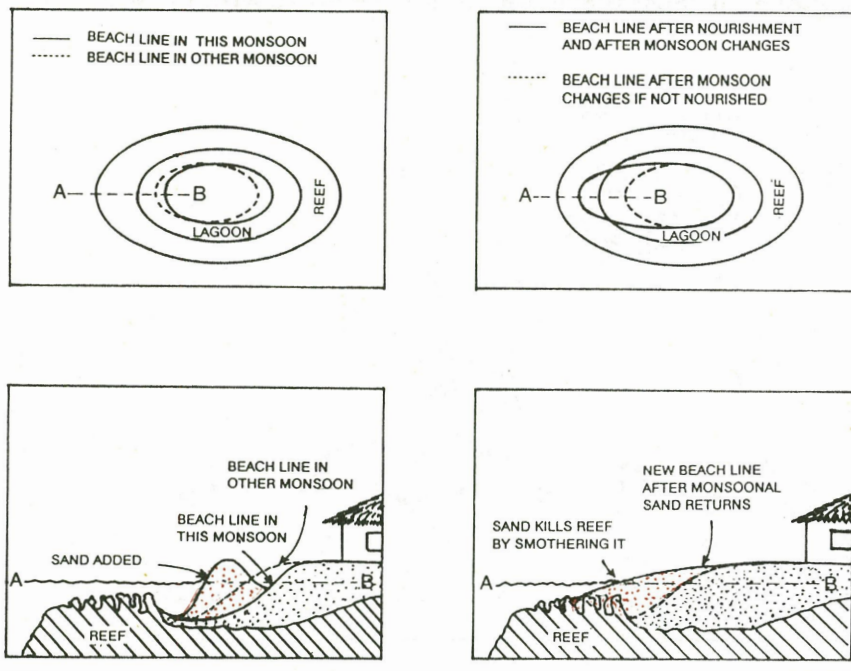


**FIG. 3 NEVER NOURISH A BEACH TO THE REEF.**



**STOP PRESS**

will start a beach nourishment program as soon as the equipment is cleared through Customs. Contact Hussain Rasheed on 343848. Klaus is trying out a beach nourishment programme using a slurry pump on Dhigufinolhu.

The British Science magazine, New Scientist, reports (9 June 1990) that Mexico last week announced a ban on all hunting of turtles, in response to a tourist boycott and pressure from environmentalists (*this could save 75,000 turtles from being butchered next year-ed*).

REG. No: 354

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**Please give a Copy to  
your Diving School!**

NO: 5  
DATE: JUN 1990

GREAT BARRIER REEF  
MARINE PARK AUTHORITY

10 JAN 1994

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**COT**  
NEWS LETTER



**MARINE RESEARCH SECTION  
MINISTRY OF FISHERIES AND AGRICULTURE  
The Republic of Maldives**

## EDITORIAL

### WORKING TOGETHER

Observations from a trip to 19 Resort Islands between the 23rd of May and the 02nd June suggest that beach erosion is a problem on all the islands. Local staff consider it to be a significant problem on at least 50% of these islands and yet this concern has not been voiced to Government. A number of reasons were given. The most disturbing one was that reporting a problem of beach erosion would be taken as a sign of Resort mismanagement and would be used by a competitor to justify a hostile bid for the Resort.

Since virtually all the Resorts have problems of beach erosion and many of the problems are due to inappropriate practices the mismanagement argument is not likely to be very effective. In the meantime the beaches continue to deteriorate which is bad news for individual Resort owners and the economy of the Country as a whole.

There is every hope that Resorts will cooperate with each other and with Government to sort out the problems of beach erosion. What is worrying is that concerns about other environmental issues are not being voiced. These may be even more important to the long-term development of the Maldives than beach erosion on Resort Islands.

Finally, and on a more pleasant note, we would like to thank all the Resorts we visited for their generous hospitality and co-operation. Clearly there is great concern about the environment amongst resort staff and if this can be catalysed and supported then Maldives can expect to be a leader in the newly developing market of 'ECO-TOURISM'.

### NEWS FROM RESORTS - REEFS

Table 2 gives the result of swims around 15 Resort Islands. These swims confirm the general results presented by the COT questionnaire although the situation on Fesdu is not as bad as was previously

suggested and the situation on Vabbin Faru is worse. It appears that COT are a serious problem in the northeast of North Male' Atoll and are a cause for concern in parts of Ari Atoll. The COT problem doesn't appear to be a problem elsewhere at this time. Despite this, continuous vigilance is necessary, since it can only take a few weeks for a COT plague to devastate a reef.

**Table 1 RESULTS FROM A SWIM AROUND 15 RESORT ISLANDS**

Atoll	Resort	Date 1990	House Reef	
			COT Seen/HR.	Condition
North Male'	Hembadu	24/5	0	Unhealthy
	Makunudu	24/5	106	Deteriorating
	Nakatchafushi	25/5	250	Deteriorating
South Male'	Vabbinfaru	23/5	8	Unhealthy
	Biyadoo	23/5	11	Deteriorating
	Bodufinolhu	26/5	0	Variable
	Embudhu Vill.	27/5	0	Healthy
Ari	Angaga	26/5	1	Healthy
	Bathala	30/5	4	Unhealthy
	Hurudhoo	02/6	0	Unhealthy
	Ari Beach Ins.	31/5	0	Healthy
	Fesdu Fun Is.	29/5	0	Healthy
	Maayaafushi	01/6	6	Healthy
	Mirihi	02/6	1	Unhealthy
Vaavu	Mirihi	30/5	0	Healthy
	Dhiggiri	28/5	0	Variable

It was depressing swimming around some of the Resorts, particularly in northeast Male' Atoll. At one time these must have been beautiful reefs. At Hembadu large numbers of dead table corals act as tombstones for once profuse coral gardens. If this wasn't bad enough there was little evidence of coral recovery. Few young corals were settling and growing meaning that it will take many years for the reefs to return to their former glory.

### COT QUESTIONNAIRE

6 more resorts have sent in completed COT Questionnaires since the May Newsletter was produced. We ask the remainder to reply as soon as is convenient - even if they don't have a problem with COT!

We haven't yet received a reply from the following resorts:-

**Table 2 COT STATUS MAY/JUNE 1990**

ATOLL	RESORT	HOUSE REEF	
		COT SEEN DAY	CONDITION
N. Male'	Vabbinfaru	100-999	Recovering
	Ihuru	10-99	Healthy
S. Male'	Bodufinolhu	0	Healthy
	Dhigufinolhu	0	Healthy
	Veligandu Hra	0	Healthy
Ari	Mirihi	3	Healthy

Alimatha, Ari Beach, Asdhu, Baros, Bathala, Boduhithi, Club. Med., Cocoa Island, Dhigiri, Ellaidoo, Embudhu Finolhu, Embudhu Village, Gangehi, Gasfinolhu, Giraavaru, Halaveli, Hudhuveli, Kadooma, Kudahithi, Kunfunadhoo, Kuredhdhu, Lankanfinolhu, Leisure Island, Little Hura, Madoogali, Makunudhoo, Meerufenfushi, Nika Hotel, Olhuveli, Rannalhi, Vaadhu, Velassaru, Velidhu, Ziyaaraafushi,

### MAKUNUDU

Staff at Makunudu were collecting huge numbers of COT off the house reef in late April and early May. 1244 COT were collected on the 25th April; 392 on the 2nd May; a staggering 2290 on the 3rd May; and 1107 on the 4th May. After a break due to the absence of the manager collections started again on the 6th June. It was evident that the reef had deteriorated quite significantly between our visit on the 12th February and 24th May and that the numbers of COT had increased. A count in the same area on the south side of the house reef produced 28/hr on 12th February versus 250/hr on the 25th May. As a crisis measure it was suggested that Makunudu try to keep a small area of a few hundred square meters of attractive reef about 100 meters from the bar clear of COT. Following this strategy 2490 COT were collected between the 06th June and the 11th June.

In view of the plague on Makunudu we decided to visit Eriyadhu which is 1-2km away. Luckily they have no problem with COT at this time despite their proximity to Makunudu.

### NAKATCHAFUSHI

Husain Rasheed stopped collections of COT in May due to bad weather. 170 COT were collected off the house reef between the 8th and the 11th of June.

### VABBINFARU

The reef was evidently deteriorating when we visited Vabbinfaru on the 23rd May. Up until quite recently the reef was showing good signs of recovery from a period of COT infestation between 1975 and 1980. We advised the Resort in early June to begin collecting COT off the house reef as a matter of urgency.

### NEWS FROM RESORTS - BEACH EROSION

All 19 Resorts visited in May/June had some degree of beach erosion (Table 3). Some seasonal movement of sand is natural. The sand goes and comes back with the change in monsoons. Such movement is only a problem if a resort has built a solid foundation building on the sand that is about to move away! It is a problem that could easily have been avoided but is not as easy to solve. More worrying is movement of sand that has been there for some time. If 30 year old palm trees are falling into the water or soil is being eroded away there is a long term problem.

### SEA-LEVEL RISE

There was a widely voiced concern that the problems of beach erosion were due to the first effects of sea-level rise. This is extremely unlikely. Sea-level has already been rising slowly for several thousand years since the last ice age ended and the present form of the islands is partly the result of this. There is no evidence that sea-level is rising faster than in the past. Indeed there is little evidence for a change in sea-level in Maldives over the last thirty years (Woodroffe, 1989; Maldives and sea-level rise: an environmental perspective. Ministry of Planning and Environment, Republic of Maldives). However, predictions are

that sea-level will rise faster than in the past so there is every reason to be vigilant and prepared for the worst but without panic!

**TABLE 3 BEACH EROSION ON 19 RESORT ISLANDS**

? = Possible cause

\* → \*\*\*\*\* Increasing seriousness of problem/cause

Resort	Seriousness * → *****	Monsoon sand Movement Blocked by Jetty or groyne	Strong Wind	Building on/Near Mobile Sand	Coral	Other
ANGAGA	**	*	**	*	?	
ARI BEACH	*	*	*	*	?	1
ATHURUGAU	***	***	?	?	?	2,3
BATHALA	*	*	?	*	?	2
BIYADHOO	****	****	?	**		2,3
BODUFINOLHU	**	**	*	**		2
DHIGGIRI	***	***	*	**		2
EMBUDHU	***	*	?	*	?	
ERTADHU	***	*	?	*		1
FESDU	***	***	***	*		2
HEMBADU	****	****	?	?		
KANIFINOLHU	***	***	*	*		
LHOHIFUSHI	*	*	*	**		
MAAYAFUSHI	***	*	***	**		
MAKUNUDU	***	**	***	***		3
MIRIHI	***	*	**	***		
NAKATCAFUSHI	***	*	***	?		2
VABBINFARU	***	*	*	*		
VILLIVARU	***	***	?	?		

- 1 DETACHED BREAKWATER
- 2 SEAWALL
- 3 SAND LOST OFF ISLAND

**MONSOONAL SAND MOVEMENT**

In most cases the problems of beach erosion are initiated by sand movement during monsoon changes, unusual storms or periods of strong winds. Nothing much can be done to prevent this from happening but recovery can either occur naturally over time or can be encouraged by nourishing the eroded beaches. Unfortunately the response to erosion is, all too often, a seawall or groyne which usually proceeds to magnify the problem rather than to rectify it.

The most significant cause of beach erosion is due to the obstruction of the natural monsoon driven movement of sand around the island by solid groynes and jetties. A new Tourism regulation requires that all solid jetties are opened-up (piled) by the end of June 1991. The effect should be beneficial in most cases though there may be erosion as the original beachline tries to reform. It may well be necessary to assist the recovery process by moving sand back by nourishing the beach. In some cases opening up jetties may prove deliterious.

**BUILDING IN THE WRONG PLACE**

Erosion is a particular worry in those cases where buildings have been constructed on mobile sand... sand that is moved by the monsoons. Huge spits of sand sometimes 100 meters or more long can build-up and disappear in the course of a few weeks. Build on these spits at your peril. The rule is quite simple. If your building doesn't have a thirty year old coconut between it and the sea build it on piles. If the sand goes the building will become an attractive feature rather than a worrying eyesore (fig. 1).

In several cases those resorts that build too close to the shore compound the erosion problem by trying to contain it with seawalls. Chasing the natural beach around an island with a seawall seems to be a popular pursuit on some resorts. Seawalls are bad for beaches, bad for butts, and bad for business. They should be tourism's last resort.

**BEACH NOURISHMENT**

In general the answer to most problems of beach erosion is beach nourishment in which sand is added artificially to a beach to speed-up the natural recovery process. The process is more readily appreciated if the processes by which coral sand is formed and transported are better understood.

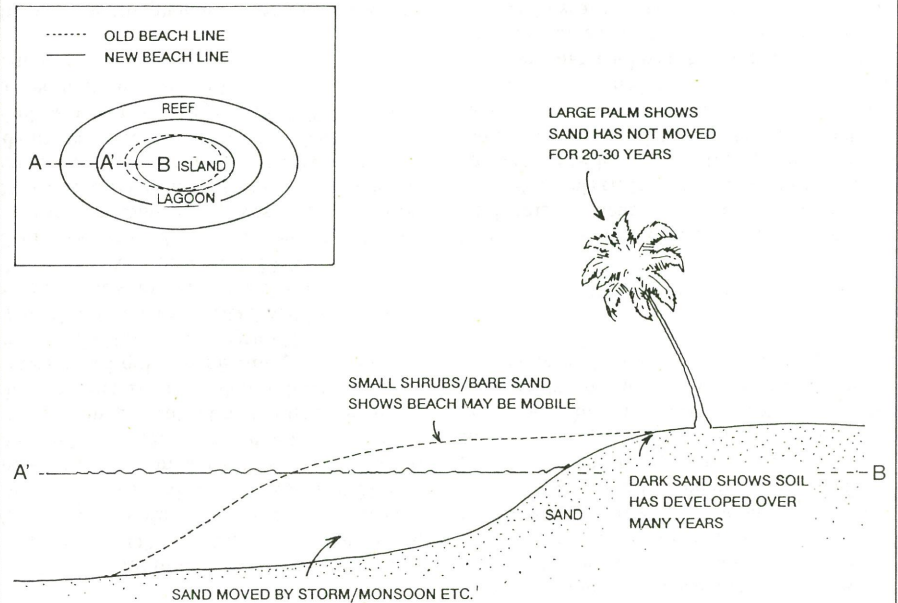
**CORAL SAND**

Coral sand is produced by coral reefs. Coral sand is the skeletal remains of once living corals, shells, sea-urchins, starfish, and various plants. The skeletons are all made out of a sort of hardened chalk and are broken down into smaller and smaller pieces by wave action and by feeding animals and growing plants.

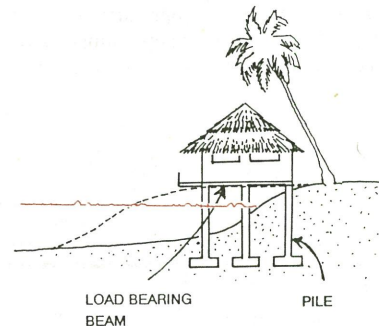
**CORAL RUBBLE**

Large pieces of reef material are only transported in occasional storms. These form the rubble ramparts that are eventually ce-

**FIG. 1 WHEN TO BUILD ON PILES.**



BUILDING ON PILES ALLOWS SAND TO MOVE AND BUILDING TO REMAIN STABLE



BUILDING WITH SOLID FOUNDATION UNDERCUT AS SAND MOVES AWAY



mented together by small algae to produce a living concrete rim to the atoll. This rim breaks the might of the Indian Ocean swell. First to thumb sized pieces of coral form shingle beaches where the wave energy is still high. Each size range of reef fragment settles where the wave or current energy is not sufficient to move it away.

### CORAL SAND BEACHES

The same goes for the sand which is deposited in more sheltered conditions. These conditions are created by the very reef that produced the sand in the first place. Slowly over a long period of time, perhaps of hundreds of years, more and more sand particles are moved into, and remain in, these areas. Eventually there is a sufficient quantity of sand so it can be shaped by winds, waves and currents, into a beach.

### BEACH SHAPE

The shape of a coral sand beach reflects a combination of occasional unusual events, such as storms, and the day to day action of wind, waves, and water currents, as the tide moves up and down.

On a day to day basis the shape of the beach is determined by wave action. When a wave breaks at the bottom of the beach and surges up the beach it carries sand grains with it. As it loses energy the sand grains that have been picked-up are deposited. When the next wave breaks and the water then flows back down the beach it may carry some of the sand grains with it but doesn't have the energy to take them all the way. Slowly there is a net movement of sand grains from the bottom of the beach to the top of the beach and the beach profile becomes steeper. As the beach becomes steeper more energy is needed to move each sand grain up the beach against the force of gravity and the sand doesn't move so far. Eventually an equilibrium is reached in which the sand stays in approximately the same place. What we see is a beach profile that is an equilibrium between the forces of breaking waves, which push sand up the beach, and of gravity, which pulls it down. A stable beach shape has formed.

Occasional storms or long periods of strong winds can create the wave conditions, and water currents, that move sand to form new beaches, erode old ones, and produce new beach profiles.

### BEACH NOURISHMENT

Even with this background knowledge predicting whether the sand will stay or not is extremely complex. Each island has a sand budget determined by various processes (fig. 2). The most important of these are:-

- (1) gains from the reef
- (2) movement between the beach and the lagoon
- (3) movement up and down the beach with the monsoons and/or longshore drift
- (4) losses off the reef edge

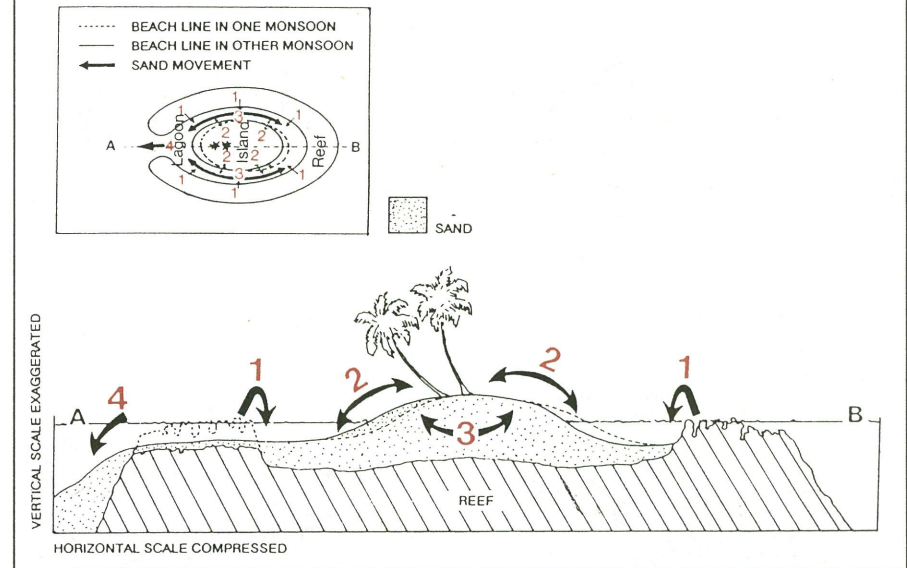
A detailed understanding of these processes is extremely complex. At a practical level it is possible to identify major processes such as loss of large quantities of sand off the reef edge after a storm and so determine how best to assist the beachlines to recover after a drastic change has taken place.

A rule of thumb is that sand will probably stay if it was there before and the conditions that moved it no longer operate. Sand moved by a freak storm or period of strong prevailing winds may take years to return naturally. If sand is artificially put on the beach that has eroded in this way it will probably remain because the normal conditions suitable to beach formation have returned. By adding sand you are merely speeding-up the recovery process.

A beach in which the prevailing conditions have not returned to normal will continue to erode until a new equilibrium is established. In this case nourishment will only be effective if you add sand at, or faster than, the rate at which it is eroding. In some cases the rate of erosion may be so slow that this is practical. In some cases it will not!

The only other way of effectively nourishing a

**FIG. 2 SAND BUDGET OF, AND PRINCIPAL SAND MOVEMENTS AROUND, A CORAL SAND ISLAND (SYSTEM MAY NOT APPLY TO ATOLL RIM ISLANDS).**



beach is to create the conditions in which a beach can form and then add sand. Nourishing a beach behind a detached breakwater is one example. This has its own risks. A detached breakwater may reduce wave energy on the beach but funnel water currents to particular parts of the shore and so cause erosion elsewhere.

Beach nourishment behind a detached breakwater can also develop into an excuse for a landfill exercise with the breakwater turning into a seawall....

### HOW TO NOURISH A BEACH

In simple terms you add sand to the beach. If the conditions are right for it to stay there it will stay and if not it will go. It solves the problem of beach erosion where sand has been moved by unusual winds, currents, or waves, and by sand mining. It may even be effective in reducing beach erosion if the beach is eroding due to other effects and if the sand is added

fast enough. The principal is one of 'try it and see'. The only constraints are the availability of sand; the amount of money, time, and effort you are prepared to invest in nourishing; and the amount of incidental damage you might do - for example to coral reefs by dumping sand all over them!

Never nourish a beach so much that there is any risk that the beach will extend to the house reef. This will kill the house reef and possibly make things much worse (fig. 3 over leaf).

### SORRY FOLKS!

No more space! More information in August.

### NOURISHMENT NEWS

Kanifinolhu is starting a beach nourishment programme as soon as they have opened up their jetty. Contact the Manager, Mohamed Ibrahim Didi, on 343152. Nakatchafushi