

TABLE 1. Daily and three hourly wind-speed in knots (average all directions) and dominant wind direction for October 29th to November 06th 1990 for Hulule supplied by the Maldives Meteorology Office (VRB=VARIABLE).

DAY	DAILY AVERAGE	WIND DIRECTION AND SPEED DAILY AND 3 HOURLY AVERAGE (UTC)											
		0000	0300	0600	0900	1200	1500	1800	2100				
29th	WSW 07	SW 09	WSW 09	VRB 08	W 09	WSW 09	WSW 10	WSW 10	W 10				
30th	W 09	WSW 12	W 14	WSW 08	VRB 06	W 07	WSW 08	WSW 13	VRB 05				
31st	WSW 18	WSW 10	WSW 12	WSW 15	WSW 23	WSW 20	WSW 20	WSW 20	WSW 25				
01st	WSW 20	WSW 20	WSW 18	WSW 20	WSW 20	WSW 21	WSW 18	WSW 22	WSW 21				
02nd	WSW 19	WSW 23	WSW 18	WSW 17	WSW 20	WSW 19	SW 18	SW 22	WSW 20				
03rd	W 24	W 30	WSW 25	W 28	WSW 27	WSW 20	W 18	W 28	WSW 15				
04th	W 18	WSW 16	WNW 23	WNW 24	WNW 19	WNW 17	W 18	W 13	WSW 15				
05th	W 10	W 13	W 13	W 10	W 10	W 10	WNW 14	W 05	WSW 08				
06th	SW 07	WSW 07	SW 06	W 05	SSW 07	WSW 07	SW 09	SW 08	S 08				

undercut by the sea! At Ihuru Resort in North Male' the beach on the east side has widened by 6-10m (and narrowed on the west side) since June. In June some of the palm trees on the east of the island side had to be tied-up to stop them falling into the water.

At Kuredhdhoo Resort in Lhaviyani Atoll the open jetty was blocked by sand up to 20th of

October for a distance of over 10 metres. Twenty days later it is completely clear.

These major movements need to be researched and monitored so that we can distinguish between natural events, where the beach will recover without the need for artificial protection, and those changes that need to be actively managed.

REG. No: 354

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

NO: 10
 DATE: NOV. 1990

WORKSHOP ISSUE

COT NEWS LETTER



GREAT BARRIER REEF
 MARINE PARK AUTHORITY

- 2 AUG 1991

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MINISTRY OF FISHERIES AND AGRICULTURE
 The Republic of Maldives

EDITORIAL

ENVIRONMENTAL HEALTH AND DIVER SAFETY

There are those who would suggest that Dive based Tourism in the Maldives is not sustainable and that the answer is to make as much money as possible and then invest it elsewhere before the market collapses. There are those who would not approve of this suggestion in principle but would accept it in practice because they see the business, and the reefs that sustain that business, as unmanageable. They argue that even if they did try to look after the reef properly they would be fighting a losing battle against those who would continue to abuse the reef. They would also argue that we know too little about the reef to do anything but stand back and let human destruction and natural catastrophe take their own course.

The Government of Maldives is not in the business of accepting either line of argument. The reefs of Maldives must be given the best possible chance of surviving in the long term. If Resorts and Dive Schools are unable to manage their marine resources on a voluntary basis then they will have to be instructed to do so.

Fortunately many Resorts and Dive Schools are keen to assist voluntarily and to support regulations aimed at sustaining their business in the long term. Some of these Resorts and dive schools attended a workshop on environmental health and diver safety held in Male' on October 18th 1990. We hope that many more resorts and dive schools will participate in the process of developing practical regulations.

The reefs and islands of the Maldives are an increasing source of national pride. As this pride develops the loan of reefs and islands to the tourism sector will become conditional on how well they are cared for. The time will come when the level of short-term revenue is no longer the prime criterion of success. The Tourism sector should bear this in mind if they have any interest in the long-term future of this industry in Maldives.

A range of possible recommendations aimed at assisting the tourism sector in long-term

protection of the marine environment was presented and discussed at the Workshop. Only minor modifications were suggested by those who were present. If you wish to comment on any of the recommendations then please write to us at Marine Research Section. A draft document will be prepared by the end of June 1991 and will be presented for agreement at the workshop next October. Please remember this in your diaries. It is important that you attend so that we can reach some sort of a consensus amongst all those in the Tourism sector that use the marine environment. The document produced as a result of that meeting will be sent to Government for consideration.

JUSTIFICATION FOR RECOMMENDATIONS

- 1 **Recognising** that the reefs and popular dive sites need to be protected for the maintenance of the living marine resources, and conserved for future generations, and that the marine environment should be maintained in a way that ensures biological and ecosystem diversity;
- 2 **Considering** that the degree of deterioration to house reefs and popular dive sites will continue unless active management is implemented;
- 3 **Requesting** that the responsibility for management be designated and administrative resources allocated;
- 4 **Urging** that the ratio of divers/snorkellers to qualified instructors be set to allow for the increase in administration needed to provide this management.
- 5 **Believing** that acceptance of a license to operate a Resort should include responsibility for managing (amongst other things) the house reef and dive operation according to various environmental health and safety criteria;

RECOMMENDATIONS PRESENTED AT THE WORKSHOP

- 1 Recommends that all interested parties (under the direction of MATI and MPE/ERU with expert advice from MRS/MOFA) be involved in developing environmental health and safety management requirements for the house reef and dive school operations.
- 2 Recommends that a discussion document be prepared and circulated by June 1991. The draft be brought before the workshop in October 1991 prior to transmission to Government for consideration.
- 3 Recommends that the document should contain among other things the following:
 - Dive school leaflets should carry some environmental advice/messages about the environmental health and safety regulations.
 - The expected standards for environmental health and safety met by Government should be prominently displayed with an address provided for more information.
 - Dive schools should certify divers (according to criteria to be selected but including their 'reef-sense' and ability to control buoyancy).
 - Dive sites should be designated according to these criteria and checks made that divers/snorkellers visiting these sites have the appropriate level of certification.
 - There should be a maximum (to be identified) diver/snorkeller capacity per qualified member of staff and per boat.
 - A 'no anchoring' policy should be employed by dive boats.
 - Resorts should install mooring buoys on their house reef and selected dive sites to protect the reef from damage.
 - The Resorts should be required to arrange for active clearance of rubbish from the house reef.
 - Dive schools should be given an operating license by tendering. The tenders should be evaluated according to their attention to environmental health and safety.
 - Resorts and their licensed dive schools should be subject to an environmental health and safety inspection and certified annually.
- 4 Recommends that all commercial diving organisations and individuals (both local and foreign) be required to fulfil the expected standards for environmental health and safety set by the Government.

SEAWALLS

More often than not a Resort builds a seawall to stop beach erosion. It has already been suggested that seawalls are the 'last resort' for any island that wishes to retain a natural beachline. There are three reasons for this.

- (1) the wall is ugly,
- (2) the wall may prevent the natural beach from reforming,
- (3) the wall may destabilise, and erode, adjacent natural sections of beachline.

On a natural beach (see fig. 1) much of the energy contained in each wave is released over a wide area (I) by friction with the sand and by pushing the wave up the beach against the force of gravity. Relatively little energy is available to carry sand away as the wave recedes down the beach.

This is not the case in front of a seawall (see fig. 2). In front of a seawall the energy contained within the wave has to be dealt with over a much smaller area (II) The wave also takes the line of least resistance to its progress. This is not vertically upwards against the full force of gravity but back in the direction from which it came. The wave that is reflected off the seawall contains a higher proportion of its original energy than a receding wave on a gently sloping sand beach.

This higher energy will keep larger sand particles in suspension near the base of the seawall and even undercut the seawall. This limits the opportunity for natural beach formation and especially so if the waves hit the beach at an angle.

LONGSHORE DRIFT

More often than not waves hit the beach at an angle. This gives rise to longshore drift (see

Fig 1. COMPARISON OF THE ENERGY CONTENT (WAVE HEIGHT) OF AN INCOMING WAVE (A) AND A REFLECTED/RECEDING WAVE (B) WHEN THE SHORELINE IS PROTECTED BY A SEAWALL

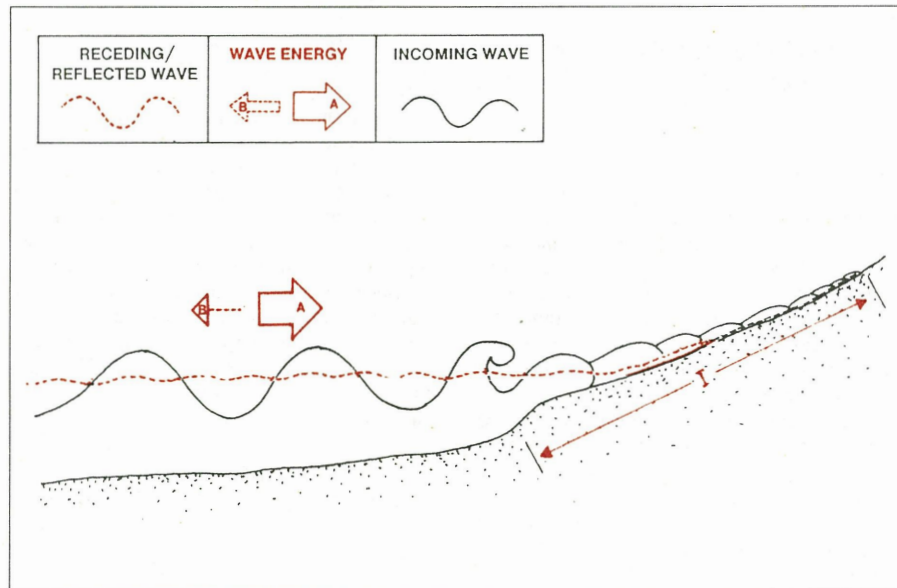
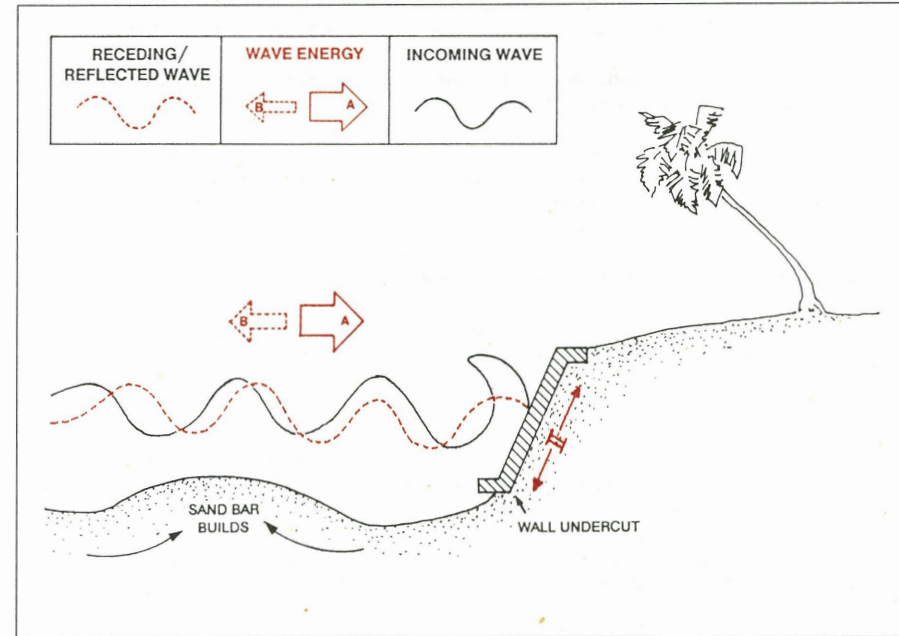


Fig 2. COMPARISON OF THE ENERGY CONTENT (WAVE HEIGHT) OF AN INCOMING WAVE (A) AND A REFLECTED/RECEDING WAVE (B) WHEN THE SHORELINE IS PROTECTED BY A SEAWALL.



the September Newsletter - Ed). A reflected wave contains a higher proportion of the original wave energy than a receding wave and will increase longshore drift (fig. 3). Sand will be moved-out from the seawall, and the junction between the seawall and natural beach by the increased longshore drift.

EXTENDING THE SEAWALL

The Resort may try to solve this localised erosion at the junction between the natural beach and the seawall by extending the seawall. This is the first step in the popular Resort pursuit of chasing the natural beachline around an island with a seawall.

Sand carried away by the enhanced longshore drift in front of a seawall may collect on the nearby natural beach where there is no seawall and longshore drift is reduced (fig.3 - 'A') and also be moved offshore to form a sand bar (fig.3 - 'B') where the wave energy of the reflected wave dies.

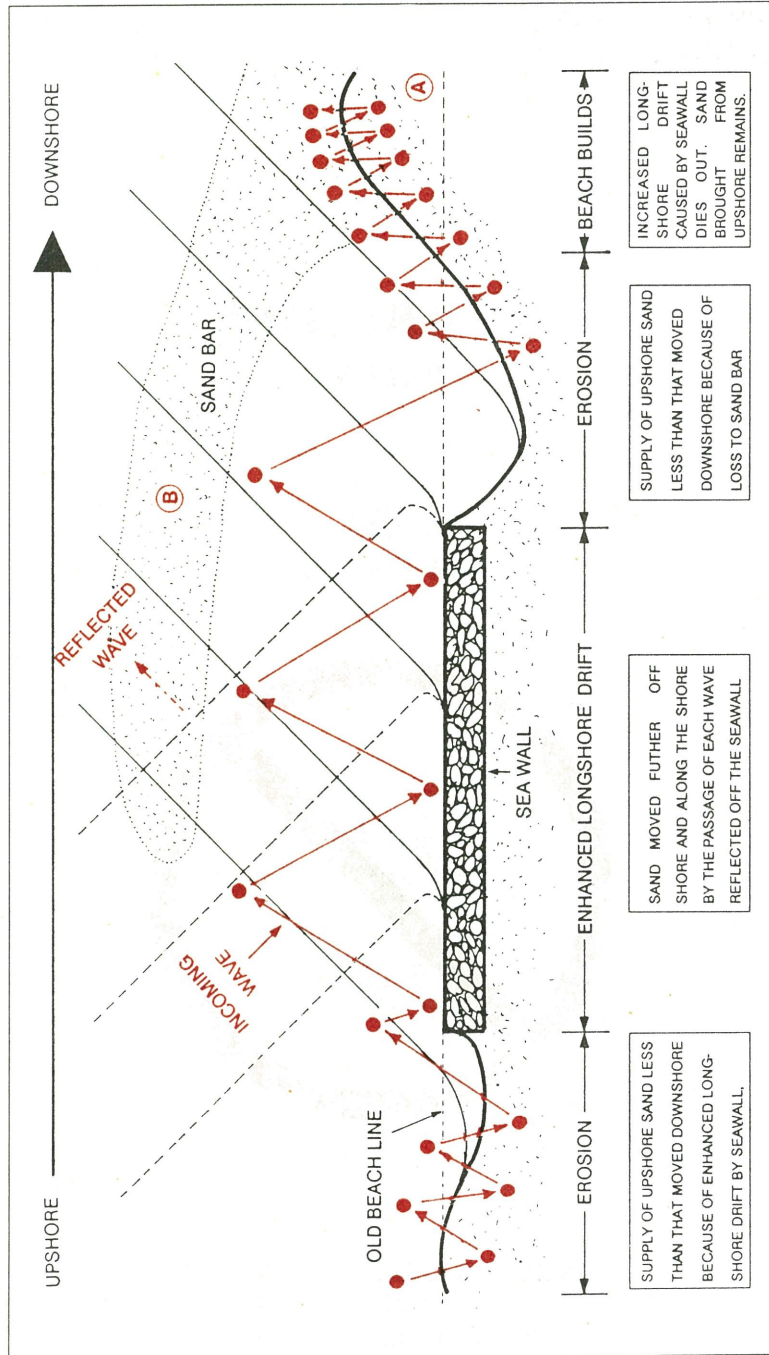
PROBLEM SOLVING

There are ways of getting around these problems. The wall can be designed to look more natural and it can be shaped so that it absorbs energy and allows sand to settle. Both options can be very expensive. More likely than not the ideal structure will end-up looking like a natural beach! A seawall that is incorrectly designed will be more trouble than it is worth.

- (1) if the energy of each wave is concentrated over a small area any weakness in the wall will be subject to great stress (see fig. 4). Constant maintenance is necessary.
- (2) if the seawall is not seated on bedrock and sits on sand it will be undercut because the energy of the reflected wave will carry the sand away. As the wall is undercut it will crack and sink. The situation may end-up worse than if the wall had never been built.

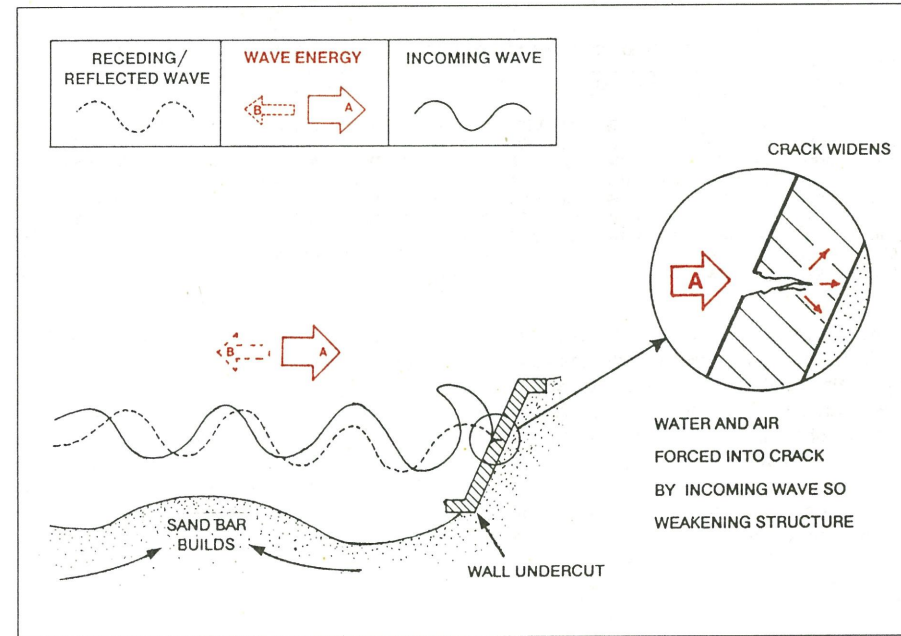
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Fig 3. EFFECT OF SEAWALL* ON LONGSHORE DRIFT AND SAND MOVEMENT (● → ●) WHEN WAVES HIT THE WALL AT AN ANGLE.



* Modified after fig.30 in: Miles O. Hayes (1985), *Case Study Two. Beach Erosion*. In: John R. Clark (Ed) *Coastal Resources Management: Development Case Studies*, pages 67-200. Research Planning Institute, Inc., 925 Gervais St., Columbia, SC, U.S.A. 29201.

Fig 4. A SEAWALL CAN CONCENTRATE THE ENERGY OF AN INCOMING WAVE AND SO WEAKEN ITS OWN STRUCTURE.



Contd. from page 4.....

- (3) There may be erosion of the beach at either end of the seawall caused by the presence of the seawall. Extending the seawall to prevent this is the first stage of the popular resort pursuit of chasing the natural beach around the island with a seawall.

Seawalls are bad for butts, bad for bucks, and bad for business. They should be Tourisms last Resort. If in doubt:-

**FIRST
CONSIDER
BEACH
NOURISHMENT**

....and don't do anything without seeking advice from the Ministry of Tourism. The reason for the erosion that you may wish to prevent using a seawall could be due to any number of

factors and the type of the solution needs to take all of these factors into account. The sand around each resort behaves differently and each case needs to be considered separately. Copying a method that has been used on another Resort may prove disastrous if the factors causing erosion are different. It is likely that they will be.

STOP PRESS

There was a period of strong westerley winds between the 31st of October and the 04th of November 1990 (see table 1 on page 7). Some of the beaches that caused concern earlier this year are now recovered from the strong northeasterly winds of last December. Rannalhi Resort in South Male' is now holding barbecues on the 50m wide sand spit in front of the Restaurant. In June the Management were expecting the Restaurant wall to be

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