Appendix for Chapter 7

Environmental Issues

A7-1 Transport Network of Madagascar

SPAT	SOMEAH	Etude d'impact environnemental des travaux de dragage du Port de Toamasina		Coordonnées en mètres Projection UTM 39S - WGS 84 Source : Google Earth 2007
		Figure n° 08 LOCALISATION DES STATIONS D'ÉCHANTILLONNAGE		0 250 500 m
	BP 519 Ankadivato 101 - Antananarivo	Affaire n° 20 040	Dessiné par SRa	
			Décembre 2008	

TABLEAU [23] - COMPOSITION GEOCHIMIQUE DES SEDIMENTS A DRAGUER

Paramètre	Unité	N1	N2	N3	1-6	1F-6F	2	2F	3	3F	4	4F	5-10	5F-10F	7	7F	8	8F	9	9F
Refus tamis 2mm	%				<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1
MS	%				78,7	80,6	80,8	80,7	81,3	78	84	84	85,7	80,4	81	78,5	82	80,6	78,8	79,5
Analyses sur la fraction < 2mm réduite à 150 µm																				
As	mg/kg	25	50		18,6	23	25,5	19,9	27,4	21,5	2,6	2,9	2,4	2,4	27	25,1	16,6	23	23	19,6
Cr	mg/kg	45	90		53,7	60	60,8	53,7	73,7	66,5	140	117	125	136	71,2	62,7	61,3	78,7	86,1	54,6
Cd	mg/kg	1,2	2,4		0,11	0,22	0,16	0,16	0,24	0,4	<0,05	<0,05	<0,05	0,05	0,19	0,21	0,12	0,18	0,21	0,17
Ni	mg/kg	37	74		23,9	27,5	31,3	31	32,7	30,2	13,4	12,4	13,5	13,6	31,9	28,5	22,1	31	27,8	23,3
Zn	mg/kg	276	552		278	440	362	315	505	420	119	90,5	114	102	434	317	248	399	393	347
Al	mg/kg				16800	18700	19600	16700	25500	21400	6860	6650	6200	5630	20800	20800	16500	20800	18400	17900
Hg	mg/kg	0,4	0,8		0,19	0,54	0,38	0,34	0,72	0,48	<0,05	<0,05	<0,05	<0,05	0,41	0,4	0,17	0,37	0,79	0,22
Polychlorobiphenyls																				
PCB 28	µg/kg	25	50		2,7	38,7	10	5,8	8,4	7,9	<2,0	<2,0	<2,0	<2,0	4,2	<2,0	3	5,9	10	10,8
PCB 52	µg/kg	25	50		12,7	373	34,2	35,6	23,8	26,3	<2,0	<2,0	<2,0	<2,0	17,8	14,5	25,8	34	40,3	68,3
PCB 101	µg/kg	50	100		26,1	651	76,5	63,8	35,9	43,3	<2,0	<2,0	<2,0	<2,0	28,9	27,8	34,4	50,8	77,1	154
PCB 118	µg/kg	25	50		21	696	57,6	55,3	30	36,9	<2,0	<2,0	<2,0	<2,0	29,9	29,9	33,8	60,9	69,9	150
PCB 138	µg/kg	50	100		33,8	473	97,9	73,5	39,1	53,5	<2,0	<2,0	<2,0	<2,0	26	31	37,7	63,6	76	154
PCB 153	µg/kg	50	100		40,6	431	122	96,6	41,9	68,6	<2,0	<2,0	<2,0	<2,0	31,1	36,3	33,2	71,3	84,2	170
PCB 180	µg/kg	25	50		28,8	119	69,4	61,2	26,5	43,4	<2,0	<2,0	<2,0	<2,0	13,3	17,2	21,9	31,1	33,7	83,6
HAP																				
Naphtalene	µg/kg				<5,0	<5,0	<5,0	<5,0	<5,0	17,5	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	14,5	<5,0
Methyl(2)naphtalene	µg/kg				<5,0	<5,0	<5,0	<5,0	<5,0	17,7	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0
Acenaphtylene	µg/kg				<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0
Acenaphtene	µg/kg				5,3	<5,0	<5,0	<5,0	14,9	41,6	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	22,3	<5,0
Fluorene	µg/kg				7,3	<5,0	<5,0	<5,0	10,4	49,8	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	<5,0	29,9	<5,0
Phenanthrene	µg/kg				89,6	42,5	31,5	19,8	59,8	344	<5,0	<5,0	<5,0	<5,0	12,8	35,9	84,1	40,3	246	16
Anthracene	µg/kg				26,6	6	5,6	<5,0	10,9	108	<5,0	<5,0	<5,0	<5,0	<5,0	8,3	6,4	11,2	73,9	<5,0
Fluoranthene	µg/kg	400	5000		173	121	147	80,6	139	437	<5,0	<5,0	<5,0	<5,0	119	140	166	138	371	44,8
Pyrene	µg/kg				144	116	151	79,7	124	345	<5,0	<5,0	<5,0	<5,0	129	127	133	127	302	46,3
Methyl(2)fluoranthene	µg/kg				18,1	17,8	22,7	9,2	11	35,9	<5,0	<5,0	<5,0	<5,0	13,6	10,5	6,4	13,7	23,1	<5,0
Benzo(A)anthracene	µg/kg				80,3	82	89	76,4	80,5	296	<5,0	<5,0	<5,0	<5,0	94,3	87,4	81	92,9	176	32,3
Chrysene	µg/kg				78	89,3	81,8	80,2	66,5	260	<5,0	<5,0	<5,0	<5,0	71,8	75,1	83,7	79,4	148	28,2
Benzo(B)fluoranthene	µg/kg	300	3000		88	96	164	86,9	70,7	181	<5,0	<5,0	<5,0	<5,0	118	114	120	70,6	150	43,9
Benzo(K)fluoranthene	µg/kg	200	2000		55,4	68,3	78,4	53,8	54,4	127	<5,0	<5,0	<5,0	<5,0	68	61,3	73	63,5	93,3	26,8
Benzo(A)pyrene	µg/kg	200	2000		67,2	98,9	110	95,6	103	196	<5,0	<5,0	<5,0	<5,0	110	104	123	117	157	50,6
Indenopyrene	µg/kg	200	1000		70,2	54	65,8	74,3	85,4	95,5	<5,0	<5,0	<5,0	<5,0	63,6	66,2	86,8	55	80,6	34,1
Dibenzo(AH)anthracene	µg/kg				13,6	20,5	20,7	16,1	16,9	32,2	<5,0	<5,0	<5,0	<5,0	24,8	23,4	25,7	24,8	25,3	7,6
Benzo(GHI)perylene	µg/kg	200	2000		59,2	78,1	80,4	65,1	78	76,9	<5,0	<5,0	<5,0	<5,0	65,8	73,2	84,9	61,9	76,7	37,6
HPA totaux (valeur arrondie)	µg/kg	*1500*	*15000*		974	890	1030	718	923	2660	<5,0	<5,0	<5,0	<5,0	891	926	1070	895	1990	368
Organoetains																				
Tributyletain	µg/kg	100000	400000	1E+06	95,6	589	117	122	416	780	<50	<50	<50	<50	286	176	65,7	278	125	277
Dibutyletain	µg/kg				51,2	162	63,9	61	175	318	<50	<50	<50	<50	92	67,2	39,6	100	<50	98,6
Monobutyletain	µg/kg				<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

A 7-2 Species Inventory

Species inventory of hard corals at Grand Reef and Point Hasti Reef

No.		Class	Order	Family	Genus/species	Lifeform	Site Status in IUCN Red List	1	2	3	4	5	6	7	8	9	10
1	CAC	Anthozoa	Scleractinia	Acroporidae	*Acropora clathrata*	Tabulate	Least concern	+	+				+				
2					*Acropora digitifera*	Submassive	Near threatened				+				+		
3					*Acropora elseyi*	Branching	Least concern	+				+					
4					*Acropora formosa*	Branching	Near threatened	+		+					+		
5					*Acropora hiacynthus*	Tabulate	Not listed		+								
6					*Acropora humilis*	Submassive	Near threatened									+	
7					*Acropora monticulosa*	Submassive	Near threatened				+						
8					*Acropora nasuta*	Branching	Near threatened			+					+	+	
9					*Acropora robusta*	Submassive	Least concern	+				+		+			
10					*Acropora tenuis*	Branching	Near threatened						+	+			
11					*Acropora* sp.	Branching	-										+
12	NAC	Anthozoa	Scleractinia	Pocilloporidae	*Pocillopora eydouxi*	Submassive	Near threatened		+								+
13					*Pocillopora damicornis*	Submassive	Least concern		+	+					+		
14					*Pocillopora verrucosa*	Submassive	Least concern	+	+		+			+		+	+
15					*Stylophora pistillata*	Submassive	Near threatened		+			+					
16				Acroporidae	*Astreopora ocellata*	Encrusting	Least concern									+	
17					*Astreopora myriophtalma*	Massive	Not listed	+			+	+					
18					*Astreopora cf.expansa*	Massive	Near threatened					+					+
19					*Astreopora* sp.	Massive	-		+								
20					*Montipora venosa*	Foliaceous	Near threatened					+	+				
21					*Montipora spumosa*	Encrusting	Least concern	+	+			+		+			+
22					*Montipora tuberculosa*	Foliaceous	Least concern	+									
23					*Montipora undata*	Foliaceous	Near threatened	+									+
24				Poritidae	*Goniopora minor*	Massive	Near threatened		+							+	+
25					*Goniopora somaliensis*	Massive	Least concern				+						
26					*Porites cylindrica*	Branching	Near threatened			+	+			+			+
27					*Porites lobata*	Massive	Near threatened		+		+					+	
28					*Porites nigrescens*	Branching	Vulnerable					+					
29					*Porites somaliensis*	Massive	Near threatened						+				
30				Siderastreidae	*Coscinarea monile*	Encrusting	Not listed	+	+			+					
31					*Psammocora explanulata*	Encrusting	Least concern					+		+			
32				Agariciidae	*Gardineroseris planulata*	Encrusting	Least concern						+				
33					*Leptoseris explanata*	Foliaceous	Least concern		+				+	+			
34					*Pachyseris speciosa*	Foliaceous	Least concern						+				
35					*Pavona minuta*	Encrusting	Near threatened					+					
36					*Pavona varians*	Encrusting	Least concern			+	+				+		
37					*Pavona decussata*	Submassive	Vulnerable								+		
38				Fungiidae	*Fungia fungites*	Free-living	Near threatened		+				+			+	
39				Oculinidae	*Galaxea astreata*	Encrusting	Vulnerable		+								
40					*Galaxea fascicularis*	Encrusting	Near threatened	+	+			+	+	+		+	+
41				Pectiniidae	*Oxypora lacera*	Encrusting	Least concern		+				+				+
42				Mussidae	*Lobophyllia corymbosa*	Massive	Least concern		+								
43					*Acanthastrea brevis*	Encrusting	Vulnerable					+					+
44					*Acanthastrea echinata*	Encrusting	Least concern	+	+			+	+	+		+	
45				Merulinidae	*Hydnophora microconos*	Encrusting	Near threatened		+			+		+		+	
46				Faviidae	*Echinopora lamellosa*	Foliaceous	Least concern									+	
47					*Echinopora gemmacea*	Encrusting	Least concern	+	+			+	+	+			+
48					*Diploastrea heliopora*	Massive	Near threatened						+				
49					*Favia favus*	Massive	Least concern					+					
50					*Favia pallida*	Massive	Least concern	+					+			+	+
51					*Favia speciosa*	Massive	Least concern					+					
52					*Favia stelligera*	Massive	Near threatened		+		+	+					
53					*Favites complanata*	Massive	Near threatened										+
54					*Favites flexuosa*	Massive	Near threatened		+		+						
55					*Leptoria phrygia*	Massive	Near threatened	+	+			+		+		+	+
56					*Oulophyllia crispa*	Massive	Near threatened		+				+				
57					*Platygyra daedalea*	Massive	Least concern	+	+								
58				Dendrophylliidae	*Turbinaria frondens*	Foliaceous	Least concern		+			+					
59		Hydrozoa	Hydrocorallina	Milleporidae	*Millepora platyphilla*	Fire coral	Not listed				+					+	

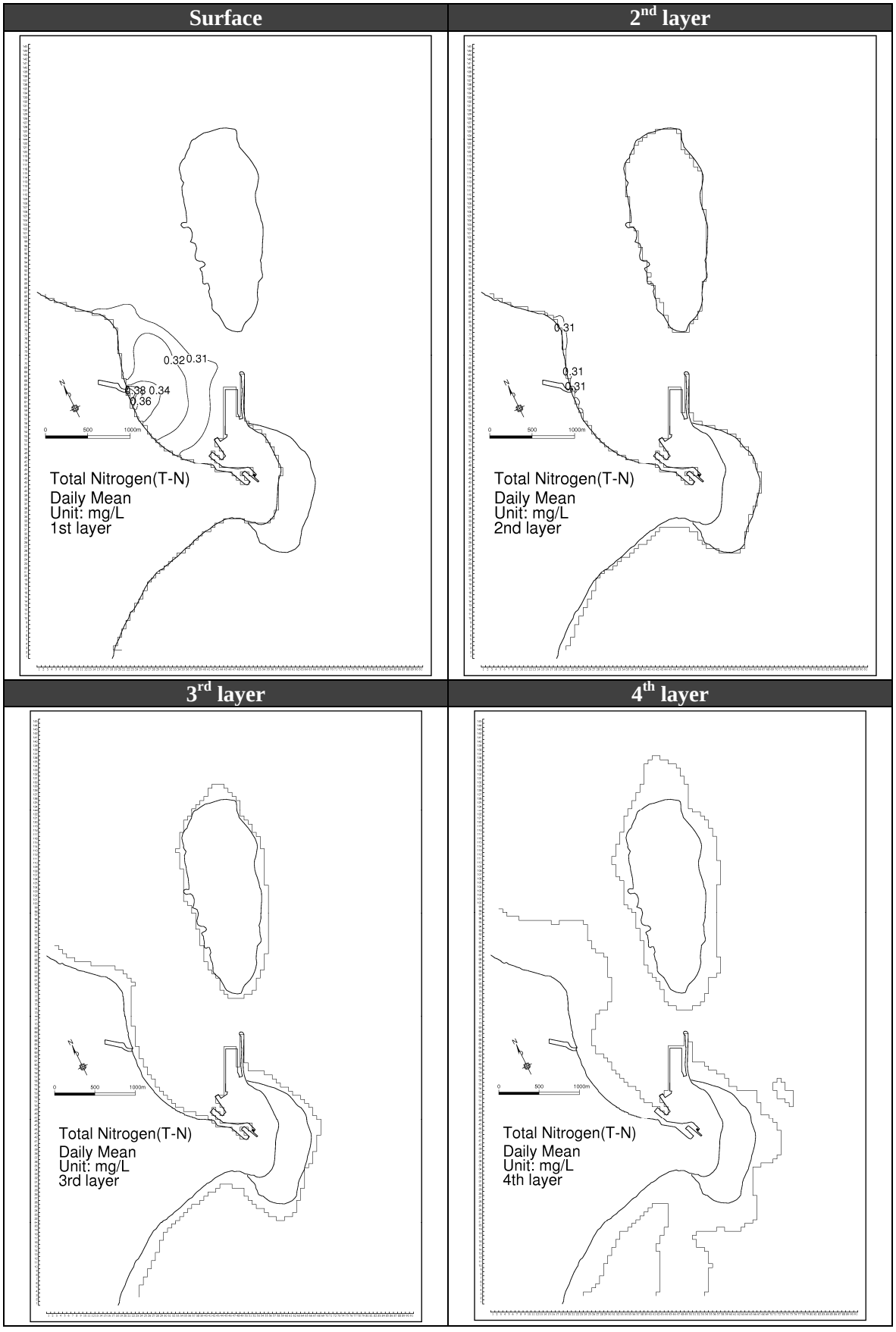
Species inventory of benthic fauna (other than hard corals) at Grand Reef and Point Hasti Reef

No.	Class	Order	Family	Genus/species	Common name	Site / Status in IUCN Red List	1	2	3	4	5	6	7	8	9	10
1	Rhodophyceae	Corallinales	Corallinaceae	*Amphiroa rigida*	Coralline algae (branching)	Not listed	+						+			
2				*Amphiroa tribulus*	Coralline algae (branching)	Not listed	+						+			
3				*Lithophyllum kotschyanum*	Coralline algae (encrusting)	Not listed	+				+	+				
4				*Lithophyllum frondosum*	Coralline algae (encrusting)	Not listed					+					
5				*Lithothamnion indicum*	Coralline algae (encrusting)	Not listed										+
6	Chlorophyeae	Bryopsidales	Halimedaceae	*Halimeda opuntia*	Green algae	Not listed	+	+		+	+					
7				*Halimeda macroloba*	Green algae	Not listed					+					
8	Phaeophyceae	Fucales	Sargassaceae	*Turbinaria ornata*	Brown algae	Not listed			+							
9	Demospongiae	Haplosclerida	Petrosiidae	*Xestospongia testudinaria*	Sponge	Not listed	+				+	+				+
10		Poecilosclerida	Microcionidae	*Clathria frondifera*	Sponge	Not listed	+									
11		Hadromerida	Clionidae	*Spheciospongia excentrica*	Sponge	Not listed					+					
12		Dendroceratida	Dysideidae	*Dysidea cf.herbacea*	Sponge	Not listed		+								
13	Anthozoa	Alcyonacea	Alcyoniidae	*Lobophytum venustum*	Soft coral	Not listed	+	+				+				
14				*Lobophytum* sp.	Soft coral	Not listed					+		+			+
15				*Sinularia* sp.	Soft coral	Not listed	+			+	+	+	+		+	
16				*Sarcophyton glaucum*	Soft coral	Not listed		+			+					+
17	Gastropoda	Archaeogastropoda	Trochidae	*Trochus virgatus*	Gastropod	Not listed				+						
18		Mesogastropoda	Strombidae	*Lambis chiragra arthritica*	Gastropod	Not listed			+	+						+
19	Bivalvia	Veneroida	Tridacnidae	*Tridacna squamosa*	Giant clam	Lower risk	+									
20	Asteroidea	Valvatida	Oreasteridae	*Culcita schmideliana*	Starfish	Not listed	+									
21	Echinoidea	Diadematoida	Diadematidae	*Diadema setosum*	Sea urchin	Not listed	+		+	+						
22				*Diadema savignyi*	Sea urchin	Not listed				+					+	
23				*Echinotrix diadema*	Sea urchin	Not listed			+	+					+	
24				*Echinotrix calamaris*	Sea urchin	Not listed									+	
25		Arbacioida	Stomecinidae	*Stomopneustes variolaris*	Sea urchin	Not listed	+									
26	Holothuroidea	Aspidochirotida	Holothuriidae	*Actinopiga mauritiana*	Sea cucumber	Not listed	+									

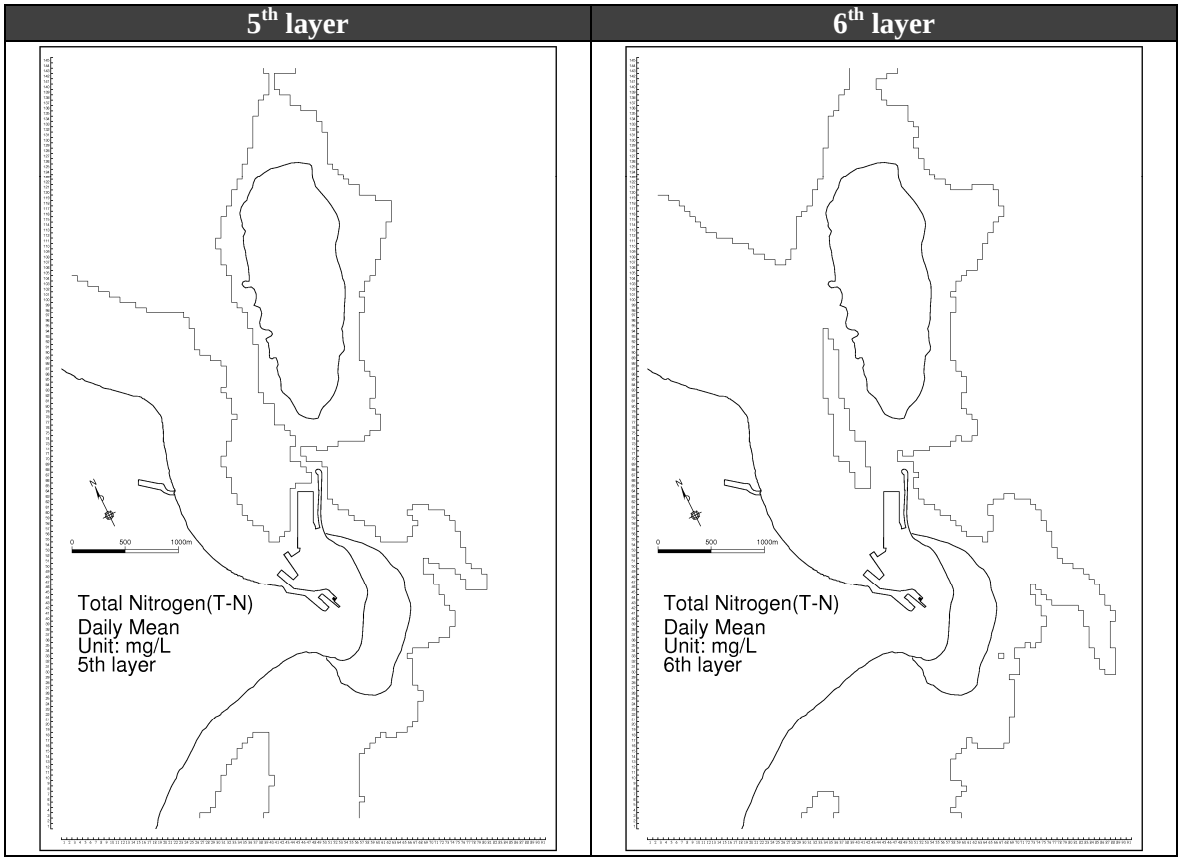
Species inventory of fish (other than hard corals) at Grand Reef and Point Hasti Reef

No.	Class	Order	Family	Species	Common name	Site / Status in IUCN Red List	1	2	3	4	5	6	7	8	9	10
1	Osteichthyes	Perciformes	Serranidae	*Epinephelus merra*	Honeycomb grouper	Least concern					+					
2			Mullidae	*Upeneus tragula*	Freckled goatfish	Not listed									+	
3				*Parupeneus cyclostomus*	Goldsaddle goatfish	Not listed									+	
4			Chaetodontidae	*Chaetodon trifasciatus*	Melon butterflyfish	Not listed				+	+					
5				*Chaetodon auriga*	Threadfin butterflyfish	Not listed					+					
6				*Chaetodon meyeri*	Scrawled butterflyfish	Not listed					+				+	
7				*Heniochus acuminatus*	Pennant coralfish	Not listed				+						
8			Pomacentidae	*Chromis leucura*	Whitetail chromis	Not listed					+			+	+	
9				*Chromis viridis*	Blue green damselfish	Not listed					+					
10				*Stegastes nigricans*	Dusky farmerfish	Not listed			+							
11				*Abudefduf sexfasciatus*	Scissortail sergeant	Not listed			+		+				+	
12			Scaridae	*Chlorurus cyanescens*	Blue humphead parrotfish	Not listed		+								
13				*Scarus rubroviolaceus*	Ember parrotfish	Not listed				+	+					
14			Zanclidae	*Zanclus cornutus*	Moorish idol	Not listed				+					+	
15			Acanthuridae	*Naso unicornis*	Bluespine unicornfish	Not listed			+							+
16				*Zebrasoma gemmatum*	Spotted tang	Not listed										+
17				*Ctenochaetus striatus*	Striated surgeonfish	Not listed					+					

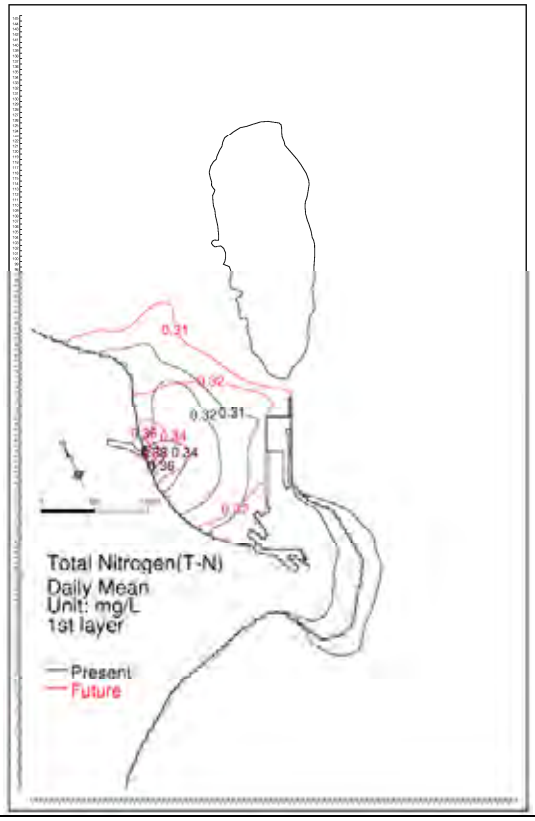
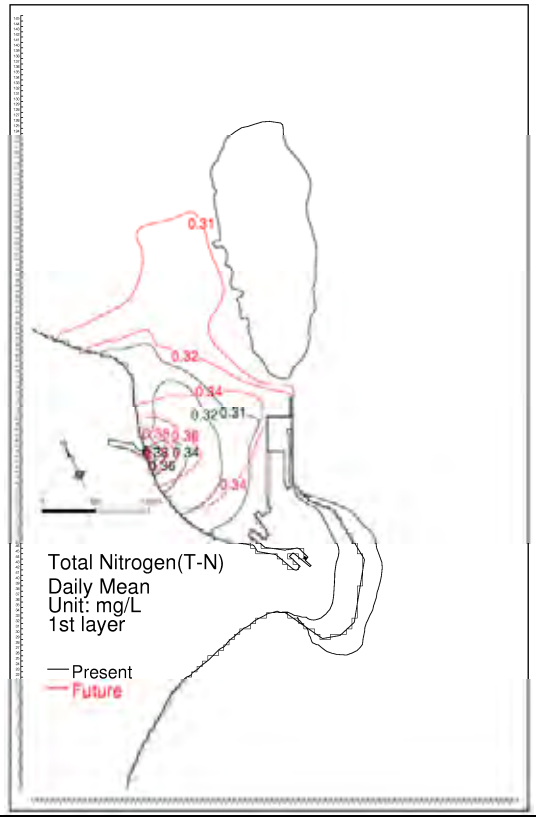
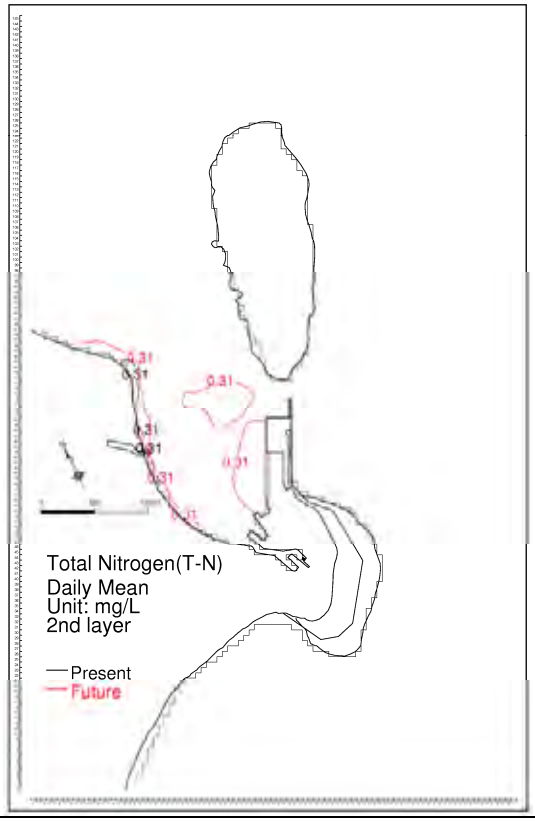
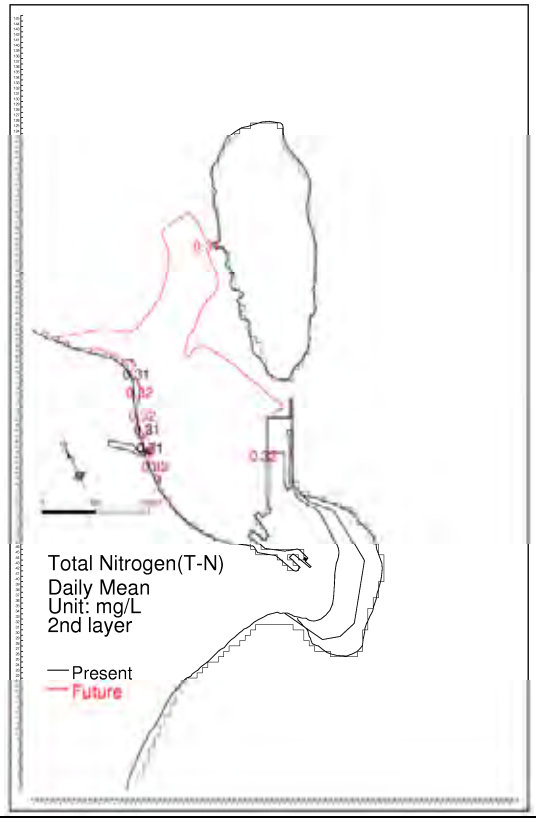
A7-3 Results of Water Quality Simulation



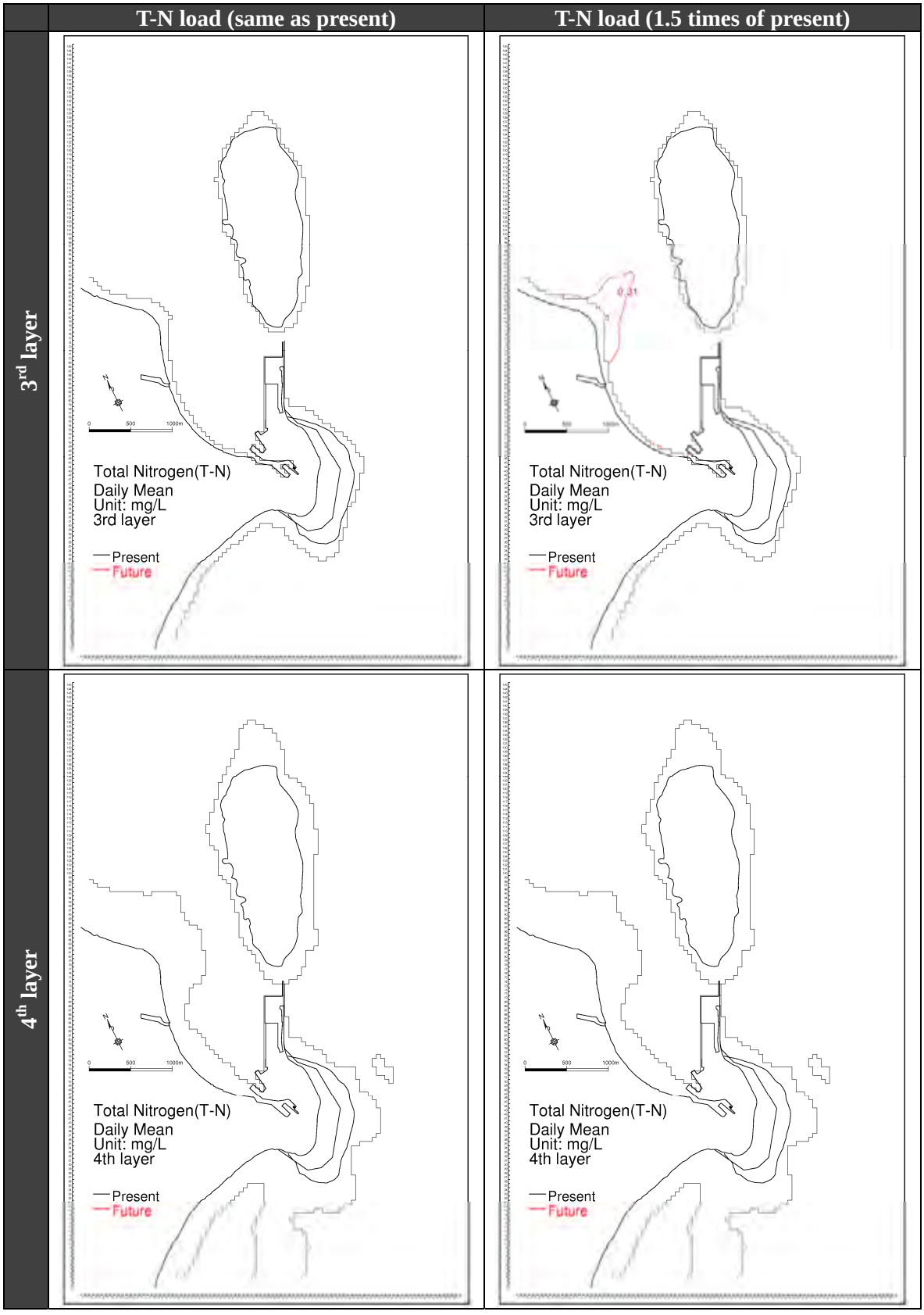
Results of water quality simulation (present case)



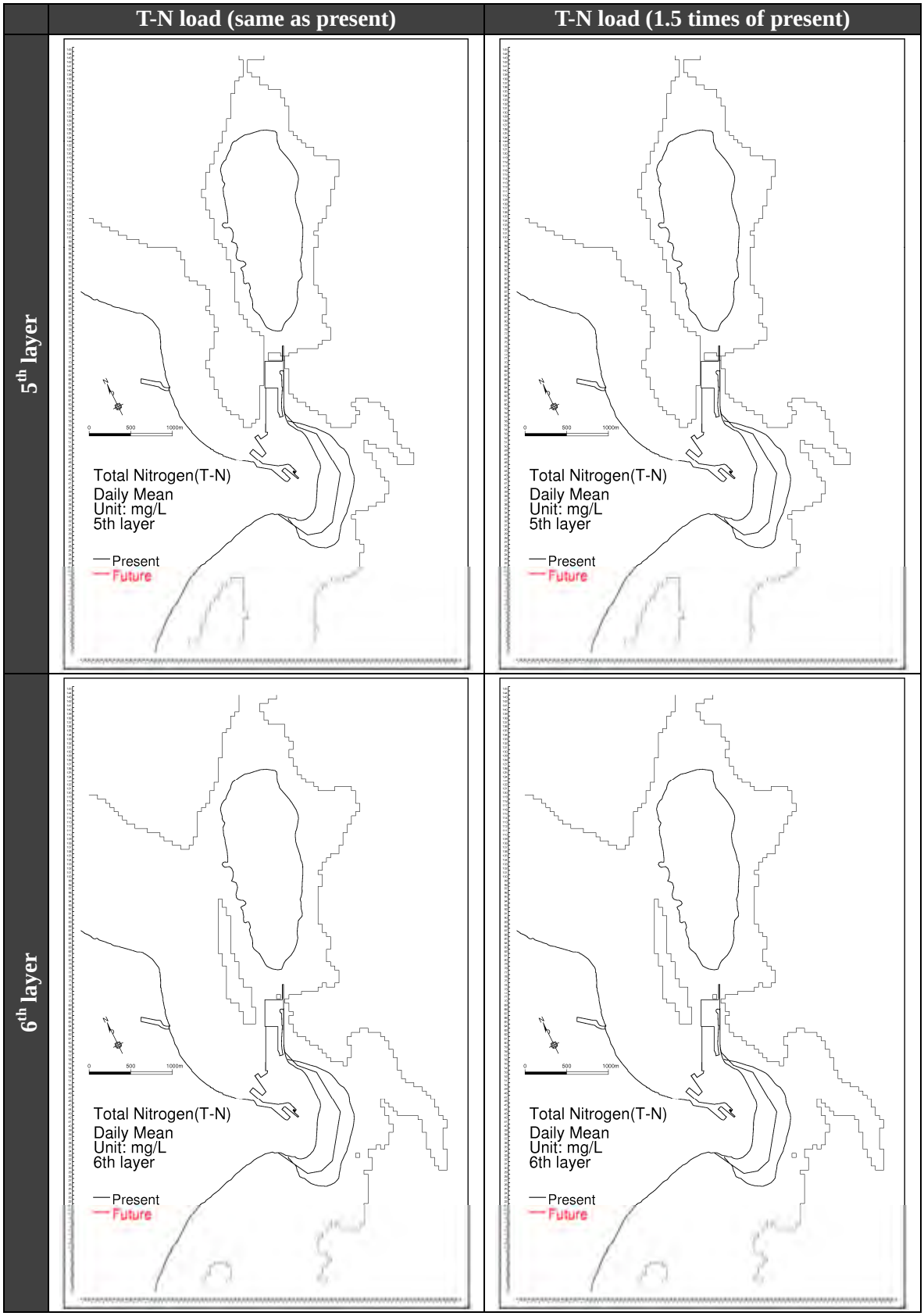
Results of water quality simulation (present case)

	T-N load (same as present)	T-N load (1.5 times of present)
Surface layer		
2nd layer		

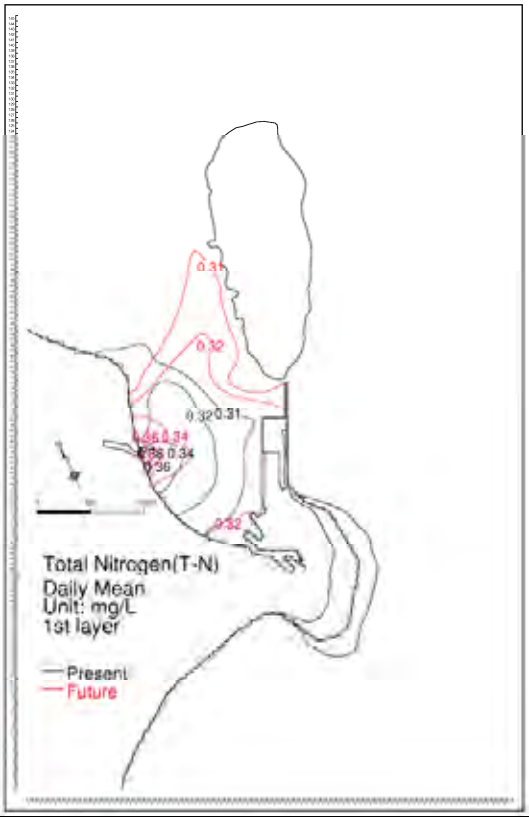
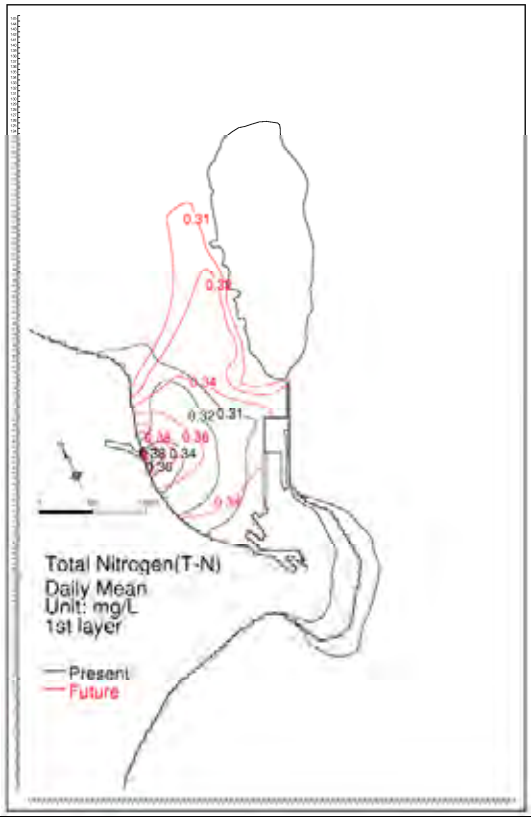
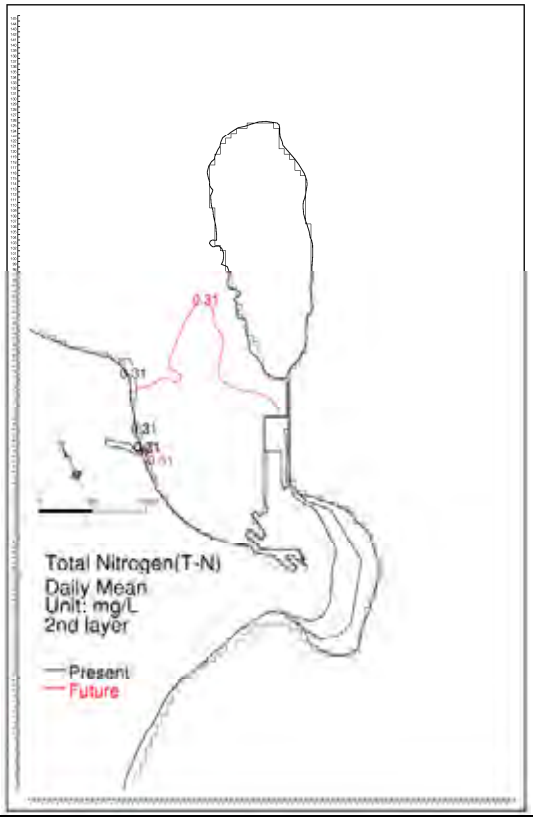
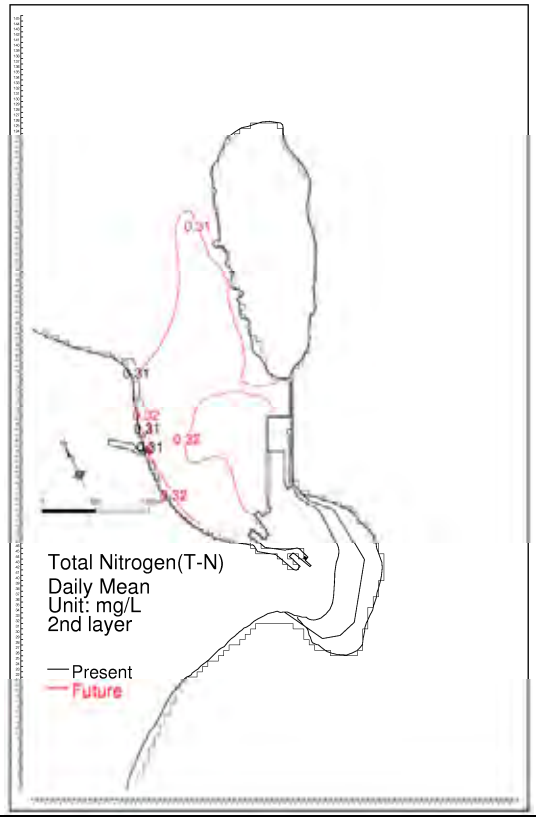
Results of water quality simulation (after breakwater extension of 345 m)



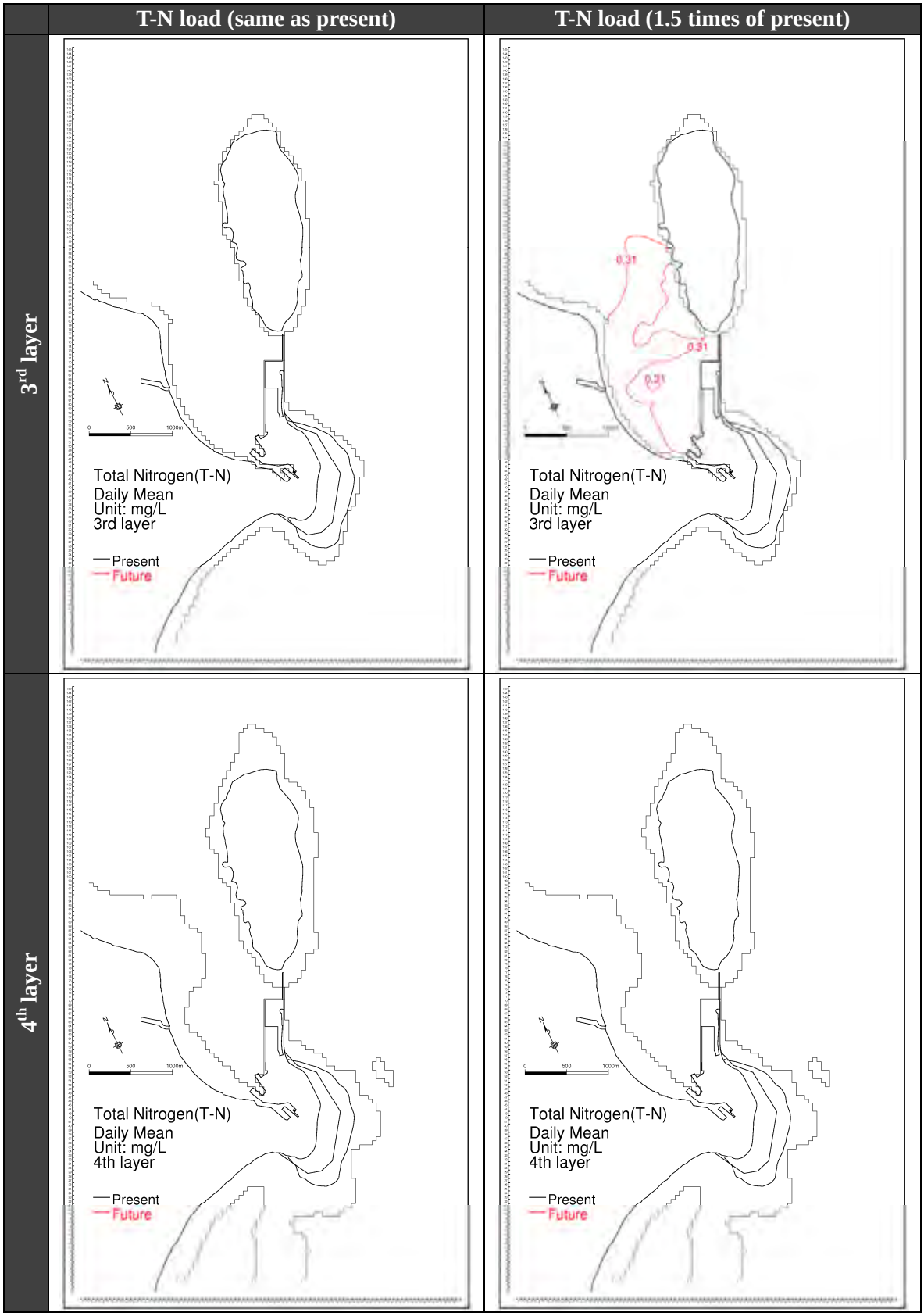
Results of water quality simulation (after breakwater extension of 345 m)



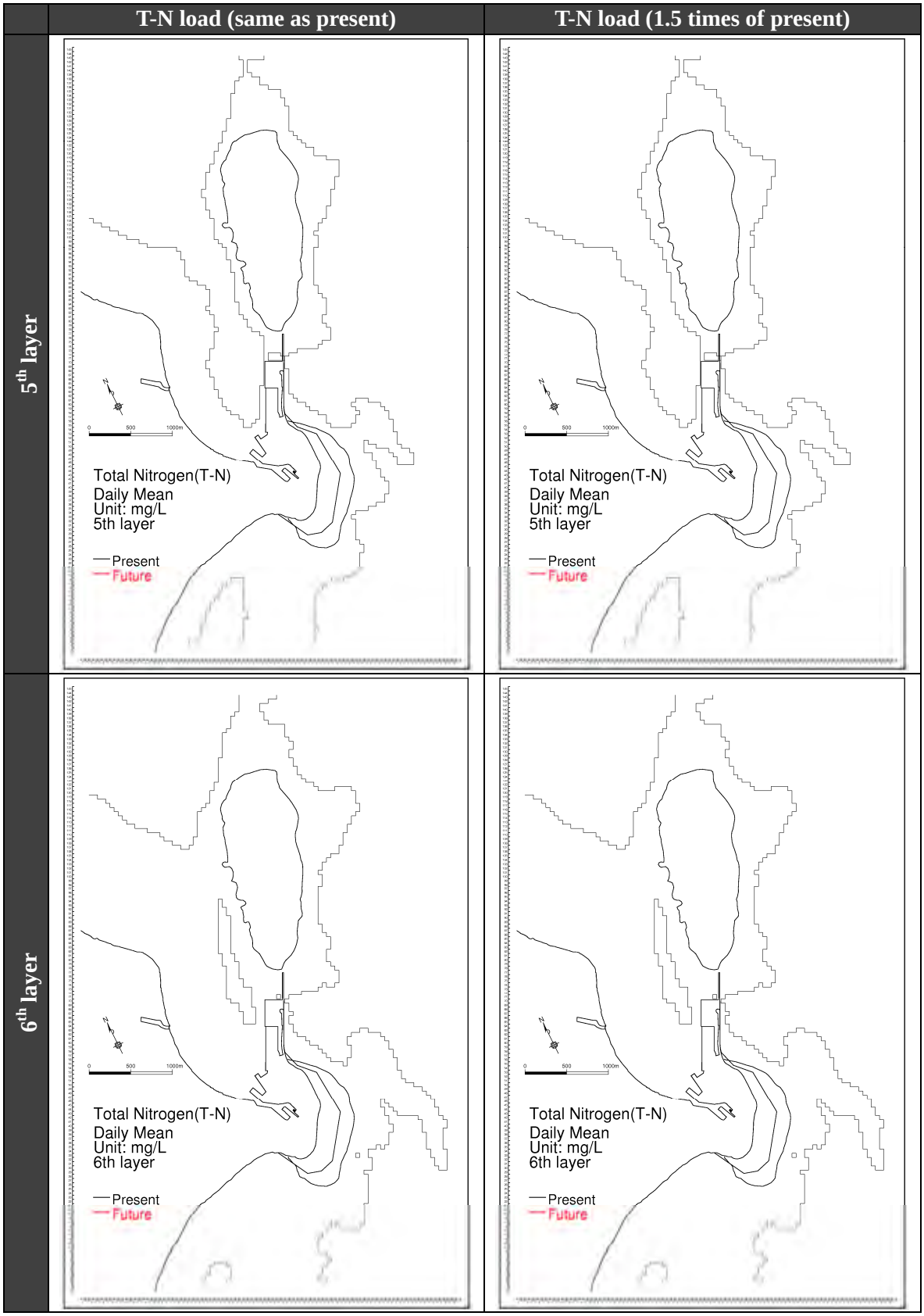
Results of water quality simulation (after breakwater extension of 345 m)

	T-N load (same as present)	T-N load (1.5 times of present)
Surface layer		
2nd layer		

Results of water quality simulation (after breakwater extension of 480 m)



Results of water quality simulation (after breakwater extension of 480 m)



Results of water quality simulation (after breakwater extension of 480 m)

A7-4 Record of Stakeholder Meetings

Minutes of the First Stakeholders Meeting on the Feasibility Study of Toamasina Port Development

Date: March 12, 2009
Place: Villa "Tsaravintana"
Start of meeting: 16:15
End of meeting: 18:00

I. Background

The stakeholders' consultation meeting is held in accordance with the guideline of the Environmental Impact Assessment for studied carried out under the Technical Cooperation scheme of the Japan International Cooperation Agency (JICA). In the course of the study, stakeholders' consultation meetings are schedule to be held three times. This meeting is the first one and is intended to explain the outline of the study and the discussion of the Terms of Reference for the Environmental Impact Assessment (EIA) study.

The meeting was called for by SPAT with the cooperation of JICA Study Team.

II. The Meeting

The meeting was held on March 12, 2009 at Villa "Tsaravintana." The meeting began by the opening remarks by Mr. Avellin Christian Eddy, Managing Director of SPAT. The participants of the meeting are listed in **Annex -1.**

Mr Avellin, in his remarks, thanked the guests for responding to the invitation of SPAT and to take part in this meeting. He emphasized the importance of the development of Toamasina Port to answer new needs as well as environmental aspects and the project financing.

He reiterated that the aim of the meeting to facilitate SPAT and the Study Team to take suggestions, proposals and opinions raised in the meeting into considerations in the course of their Feasibility Study.

III. Presentation of the Study Team

III-1 Introduction of the Study Team Members

Firstly, the six members of the JICA Study Team participated in the meeting were introduced to the audience.

Dr. KOBUNE Koji
Mr. SATO Takeshi
Mr. ITO Masafumi
Miss MISHIMA Kyoko
Mr. YOKOMOTO Hideki, and
Mr. RAJAOBELINA Jocelyn, the interpreter

III-2 Presentation

Dr. Koji KOBUNE, who is responsible for Port planning, explained those issues related to port facility planning, while Mr. Takeshi SATO made a presentation on the environmental aspects and issues concerned to the expansion of the port facilities.

1) Issues related to port planning:

- Scheme of the technical cooperation of Japanese Government.
- Schedule of study
  Phase 1: February-April (review of previous study and existing situations)
  Phase 2: May-August (Feasibility Study)
  Phase 3: September-December (Preparation of Report).
  The study will be completed by the end of 2009.
- Hierarchy of development policy:
- Different options for the urgent development of Toamasina Port:
  Option A: Extension of Mole C,
  Option B: New development along the shore, and
  Option C: New development behind Grand Reef.
- Brief explanation of the preliminary study completed in 2008 by OCDI
  The study proposed the extension of the mole C and the extension of storage area, was briefly explained.
- Problems encountered by the users
  - Insufficient spaces required in the harbour area;
  - Depth of the draft and insufficient length of quay;
  - Difficulty in finding spaces for the new users;
  - Insufficient and unsuited access roads within few years;
  - Need for a reorganization of railroad network.

2) Issues related to Environmental Impact Assessment (EIA)

- Objectives of the meeting:
  - To inform the public about the project;
  - To collect their opinions on the project of extension of the port of Toamasina;
  - To collect their opinion on the environmental impacts concerning the project;
- The environmental impacts assessment concerns:
  - Physical environment
  - Biological environment
  - Social environment

  These impacts can be negative or positive, which will be examined for the construction and operation phases. If there are significant negative impacts, mitigation measures must be implemented to minimize or eliminate the negative impacts.

  - The extension of the breakwater and the dredging of the mole C would involve a change of the water quality and would disturb the aquatic and marine life (fish, coral…)
  - The project could also have negative impacts on the air and noise quality.

IV. Questions and answers

(1) Representative of MICTSL
In the future the traffics along the access road will increase due to the increase in containers. Is the construction of new roads considered within the scope of this feasibility study?

Response by Study Team: The construction of roads does not enter within the scope of this study but if during the study the need for new access roads proves to be necessary the team will inform it in its report to the SPAT.

(2) University professor, maritime field
There are sensitive areas around the construction of new breakwater. What are you going to do to prevent a possible degradation of these sensitive areas?

What measures will be taken as for
- Iles aux prunes island
- Sainte-Marie
- Manompana

Response by Study Team: The construction of the port does not affect these areas which are far away from the site. Simulations will be made to evaluate the impact on the coral reefs and water quality.

Note: The University professor wishes to do a thorough discussion with the Japanese responsible for the environment.

(3) Representative of Oil Company GALANA
Will the best option take into account the positive environmental impacts? Is the option currently favoured? After the study, is an option retained or if not, will a new option be considered?

Response by Study Team: The options A, B, C are related to the closing of the pass (extension of the breakwater), if the study confirms negative impacts on the environment, option must be changed.

(4) Representative of HOLCIM
The closing of the pass (extension of the breakwater) surely will have impacts on the town of Toamasina, the Ambatovy project surely will cause problems of space for the circulations of the boats which will operate in the port. What do you think about it?

Response by Study Team: The team is neutral for the time being concerning the Ambatovy project (no opinion to give), but nevertheless it looks for other information concerning the Ambatovy project during the study.

(5) Representative of MICTSL
There is 1 truck/minute, or 150 trucks/hour in peak period, that enter or leave the port. Isn't it time to review the access roads and the current roads during the construction of the C4 quay and the dredging of the mole C?

Response by Study Team: The Study Tam recognizes that the access road and railway are as important as the port facilities and that that transport system should be improved together. However, the TOR of the study does not included the highways. The improvement of highways should be implemented as a separate project. Thus, the study team shall strongly recommend the highway improvement in our proposal and SPAT with coordination with the Ministry of Transport should take steps for the further development.

As explained in the presentation, the elaboration of long term and medium term development plans should be done in the policy guidelines of National transport plan. Since there is no concrete national transport development plan, the current study focuses the urgently needed project only.

(6) Comment by the representative of the Antsinanana Region
He wished to receive the documents a few days before the meeting to be able to study them. The team will honour this wish.

(7) A representative of the harbour user
Why not straightforwardly choose another Site other than the current one?

Response by Study Team: The study Team believes that for future development of the country, the development of other ports or a new port at other site would be necessary. However, once again, due to the scope of the study, we should first examine the feasibility of the plan proposed in the preliminary study: the extension of the mole C and the extension of the filling ground on the side Hastie reef.

V. Closing Remarks
To close the meeting, Mr.Christian Eddy, Managing Director of SPAT, delivered his closing remarks. He reiterated the appreciation to the guests for their active participation in the discussion. He, once again, requested the further contact with SPAT and the Study Team by any means and their participation in the next (the second) stakeholders' consultation meeting in June.

The Stakeholders' meeting adjourned at 18:00. All the participants were invited to a cocktail.

VI. Questionnaire
The Opinion sheet distributed to all the participants were collected at the end of the meeting. Annex-2 is the compilation of the comments and opinions.

Annex-1: List of Participants

	Name	Company/Occupation
	SPAT	
1	Avellin Christian Eddy	Director General, SPAT
2	Ranaivojaona Samuel	Dir. of Port Development & Management
3	RAONIZAFINIMANANA Rodolphe	SPAT Port strategic planning and management Department Chief
4	TABIHA LARSENE Nicolas	SPAT Economic Study Department Chief
5	RAKOTONDRAMAITSO James William	SPAT IRT Manager
6	MASY Lydie M.	SPAT-DGDP
7	JANI I.	SPAT Capitaine
8	ZANDRY Séraphin	SPAT
9	TAPIMIRINA Liliain	SPAT
10	RANDRIAMALALA Radotiana	SPAT
11	NJY Leon	SPAT
12	RAKOTOARIVONY Michael	SPAT Connexion Cibolin
13	RAKOTONIRINA Jhonson	SPAT
14	ZOELINE Rakotonirina-Miniminy	SPAT
15	PADON	SPAT
16	TOMBO Hilaire Alphonse	SMMC
17	JEAN BERTHIN	SMMC
	Port Industry	
18	RAMANAMPAMONJY James	M.S.C
19	RAVALOMANGA Hermann	AUXIMAD
20	RAZAKA RAFENOMANANA Dominique	MECI/DRDE Atsinanana Directeur
21	WAS Sandy	APTR
22	RAZAFIMAHARO Mamy	MICTSL
23	RATRIMO Michael	MICTSL
24	GONTHIER Michel	SEAL-DAL-PIL
25	RAZAFITSIALONINA Danny	CITM
26	ANDRIANIRINA Alain	HOLCIM
27	ANDRIAVOMISA B.	HOLCIM
28	RAKOTOMANIRAKA Mamitiana	MANA Madagascar
29	TERRA Olivier	SDV Madagascar
30	ANDRIANIVOSOA Daniel	SDV Madagascar
31	RAFANOHARANA Sus	DUMAS M/CAR
32	ETANCELIN Gaëtan	SAVONNERIE TROPICAL
33	LE TEXIER Tanguy	MAERSIC
34	AKA Aman	GALANA
35	BULKHORGGAU Yasvin	GALANA
36	DAVID Huet	MOCO
37	HYACINTHE	APMF Toamasina
38	LEBLANC Paul	AMBATOVY
39	CE BAMA	GENDARMERIE NATIONALE
40	RAKOTOMALALA G	1 Adjoint au Maire CUT
	University	
41	MLASA Eustache	GREEN Université Toamasina
42	SOLONIRINA Patrick	Journaliste

43	FRANCOIS Jean-Jeacques	Journaliste TVM Toamasina
44	SABOTSY José	Journaliste (La Vérité)
45	VOLAHANTA Francine	Journaliste FMA
46	RAKOTOMALALA Joël	Presse Ecrite Le QUOTIDIEN
47	STEVE Jean Claude	Journaliste
48	RAKOTONIRINA Jeannine	Journaliste (R.F.T)
49	RAJOELISOLO Gilbert	Journaliste M/car Tribune
50	ANDRISON Jean Claude	Photographe
	JICA Study Team	
51	Koji Kobune	Study Team
52	Masafumi Ito	Ditto
53	Hideki Yokokmoto	Ditto
54	Takahisa Aoyama	Ditto
55	Kyoko Mishima	Ditto
56	Takeshi Sato	Ditto
57	Jocelyn Rajaobelina	Ditto, Interpreter

Annex II: Opinion sheet

1. Nom: DAVID Huet
Nom de Compagnie: MOCO
Occupation: PLANT MANAGER
Contact (email, tel no., etc.): moco_dirusine@moov.mg

- Were the possibility to widen the reclamation area envisaged with the destruction of current breakwater and the construction of a new one really considered?
- Please pay attention to clutter. It would be necessary to provide parking spaces for trucks and to widen road axes.

2. Nom: RAKOTONIRINA Jhonson
Nom de Compagnie: SPAT
Occupation: International Marketing Manager
Contact (email, tel no., etc.): 033 23 159 82

- A very interesting Meeting especially for the users of the Port infrastructures. In my opinion, the extension and the modernization of the port of Toamasina must take account of the development of the TRAFFIC OF GOODS because the current trend is containerization. Thus:
    - Make the site for container storage, the reception and the storage of vehicles among PRIORITIES.
    - Do the facilities which we will undertake answer to the port user's needs?
- Before the starting of work, the users (armaments, chargers, etc…) must provide their opinions and their possible suggestions for the facilities of the port of Toamasina.

3. Nom: RAKOTONIRINA Miniminy Zoëline
Nom de Compagnie: SPAT
Occupation: Administration and communication manager
Contact (email, tel no., etc.): 53 329 94

- No major comments to give, except that I particularly appreciated the clearness of the presentation by the lecturers.
- It would be necessary however to provide a loudspeaker for the next times to ensure a level of optimal agreement, the external noises sometimes tending to cover the voice of the lecturers.
- Concerning the environmental impacts, will the extension of the breakwater and quays not intensify the silting of the immediate surroundings of the port level and the erosion of Pointe Tanio? For the SPAT, an increased silting is equivalent to a permanent need for dredging of mole A.

4. Nom: BAMA MARINA
Nom de Compagnie: GENDARMERIE NATIONALE
Occupation: Commandant de la Compagnie au Port de Toamasina
Contact (email, tel no., etc.): bamamarina@yahoo.fr

- I would like to ask you to include in your studies the safety and the security facing this project.
- To reduce the road traffics on Ivondro Boulevard, I would like to propose you the interior roads (to be rehabilitated), for example, the road facing the gate no. 3, continues along the place Bien Aimé beside SICAM.

5. Nom: BOUCHOREAU Yasvin
Nom de Compagnie: GALANA RAFFINERIE TERMINAL
Occupation: OPERATION MANAGER
Contact (email, tel no., etc.): yasvin.bouchoreau@galana.com

- A good initiative.
- Super and well-done Exposés
- Opened Consultations for full future info considerations. Very good.

6. Nom: LE TEXIER TANGUY
Nom de Compagnie: MAERSK LINE
Occupation: BRANCH MANAGER
Contact (email, tel no., etc.): 0330541772

- Is OCDI also involved in potential supplier selections
- Will the project have impact on existing agreement for terminal operator, tug boats?
- Will local employees be selected for the construction phase or will you bring foreign worker/specialists from abroad?

7. Nom: RAFANOHARANA
Nom de Compagnie: DELMAS M/CAR
Occupation: MANAGER
Contact (email, tel no., etc.): 0320785059 email r.jules@delmas.mg

- This development project of the port is very important for the economy of the country and must not suffer from any delay in its realization.
- For the various problems of possible negative impacts, we would always find solutions to minimize them, or if possible to eliminate them.
- For the next meeting the other options B and C should be developed more so that we can have a more precise idea of the project.

8. Nom: RAVATOMANGA Hermann
Nom de Compagnie: AUXIMAD
Occupation: Branch Manager
Contact (email, tel no., etc.): 0320704131 email auxito.dir@auximad.mg

- The objective is that the project is carried out to face the development of the maritime transport and international logistics.
- The purpose of the EIA will be thus to identify the negative consequences of the project and to minimize them/and even eliminating them. (Negative consequences fade the phase of construction until the time of the exploitation of the port). We suggest with the building owner (SPAT?) to make sure that all the concerned parties take part fully in this EIA phase in order to find compromises on the “Negative consequences” between the SPAT and the other concerned entities.
- We can add in the list to be evaluated: the effect of waste during the phase of constructions.
- In the EIA, will the “internalizing of these external consequences” be discussed/studied?
- We would wish to receive by e-mail under electronic format the talks of today. We remain at your disposal.

9. Nom: RAZAFIMAHARO Mamy
Nom de Compagnie: MICTSL
Occupation: Risk and Environment Manager
Contact (email, tel no., etc.): 0340282590 email mrazafimahazo@ictsi.mg

- I would like to emphasize the importance of the first question which was asked and which related to construction of new roads.
- I think it will already be necessary during the construction phase because we’ll have :
    - AMBATOVY Project’s trucks (around one truck every 2 mns)

- Trucks carrying containers (around 250 per day)
- Needed equipments for the construction (for carrying sand, stone and other materials)
- Normal citizen traffic

10. Nom: MIASA Eustache
Nom de Compagnie: UNIVERSITE GRENE
Occupation: Environnement teacher
Contact (email, tel no., etc.): 0320220287 Email miasaeustache@yahoo.fr

- Comments on the island Ilot Prunes.
- Coral reefs around and beyond the Port.
- Consequences of the installations on the littoral
    - Lycée Rabemananjara
    - Ivoloina river mouth
- Special consideration is not limited only to the Port
    - Salinity variation (Ivoloina river + Canal of Pangalanes)
    - Turbidity

11. Nom: RAZAKA RAFENOMANANA Dominique
Nom de Compagnie: Ministry of Economy, trade and Industry
Occupation: Regional director (DRDE) Atsinanana
Contact (email, tel no., etc.): razaka_raf@yahoo.fr tel 0331108574

- Very important Project.
- Contributing to regional and National development on economic, commercial and social aspects.
- Please forward us the files few days before the meeting for studies and opinions from our part.
- For this 1st meeting the possible remarks will be addressed to you according to cases.

Minutes of the Second Stakeholders Meeting on the Feasibility Study of Toamasina Port Development

Date: 3rd July 2009
Place: SPAT Conference Room, 2nd floor
Start of meeting: 10:15 hrs
End of meeting: 13:45 hrs

I. Introduction

The public consultation meeting is a requirement of the Japanese International Cooperation Agency's (JICA) Environmental Impact Study Directive.

The public consultation process for the Environmental Impact Study is divided into three stages. This meeting is the second, following from the first meeting in March 2009, which focuses on data from port development project and principal environmental issues linked to the Environmental Impact Assessment (EIA).

II. The Meeting

The meeting of 3rd July 2009 took place in the conference room of the Société de Port à Gestion Autonome de Toamasina (SPAT). The meeting commenced with a welcome introduction from the Manageing Director of SPAT Mr Avellin Christian Eddy. The list of participants at this meeting is found in the **Annex 1**.

During his speech, Mr Avellin thanked the audience for responding to SPAT's invitation. He also added that the presence of the participants is very important. He explained the objective of the meeting being part of the public participation process for the EIA and the feasibility study for the development of the port of Toamasina.

III. Presentation of the team

III.1 Introduction to the members of the team

The members of the study team and the technical/linguistic assistants were presented to the public at the meeting, as follows:
Dr KUNITA, Project Team Leader
Dr KOBUNE Koji, Port Planning Specialist
Mr SATO Takeshi, EIA Specialist
Mr Tim Healy EIA Reporting Assistance (technical language support)
Mr RASOANAIVO, EIA Reporting Assistance (interpreter)

III.2 Presentation

Dr Koji KOBUNE is responsible for Port Planning and explained how the project addresses the urgent extension of the port. He was followed by Mr SATO who would present environmental issues associated with the port's extension.

1) Planning for the port:

- Master Plan for the Technical Cooperation between the Government of Japan and SPAT
- Resume of the planning study: revision of study's work planning will be delayed due to the current diplomatic situation in Madagascar.
- Urgent Development Plan for Toamasina Port:
  - Existing problems were identified;
  - Anticipated problems were identified;
  - Initial Layout Plan for the project was presented.Brief explication of previsions for the circulation of containers: the study had selected Scenario 1 as a mid-term prevision, while storage space for the containers was briefly addressed.

- The problems:
  - problems encountered by existing users: depth of water, length of quays, and space storage space for containers;
  - cargo flow problems in the port area;
  - supplementary space for new port users: wood chips and bulk minerals

2) Port development and environmental issues

- The principal points mentioned during the presentation were as follows:
  - the pollution situation within the context of Toamasina Port's social and natural environment;
  - potential impacts upon the environment and mitigation measures;
- Several field studies concerning pollution and the environment were been done in March 2009 within the port area focusing on:
  - air , noise, water quality and sediment studies;
  - status of the physical, biological and social environment.
- The construction and operational phases can have positive and negative impacts. If there are significant negative impacts, these can be minimised or eliminated with mitigation measures:
  - Dredging and landfill works as well as the extension of the breakwater could have negative impacts on water and sediments.
  - The project could have impacts on air and noise qualities, fishing activities around the port and movement of vehicles during the construction and operational phases.

IV. Questions and answers

(1) Director of Holcim, Toamasina Port: Bernard Andrianoelison

Not hiring people with AIDS would be discriminatory; therefore this approach would not be acceptable. It is necessary to have a socially and politically acceptable approach.

Answers from study team: Effectively, we have changed the content of the slide to take into account the ethical and human rights issues associated with AIDS.

(2) Victor Razanandrakoto: General Secretary for Atsinanana Region

He stated that the study documents are directed to high level technical people; it is also necessary to formulate the study in a manner whereby the general public and attendees of the meeting can clearly understand. For example: The World Bank's terms and references should be more comprehensible for the majority.

Answers from study team: At the next meeting, we will try to prepare the documents in a manner which is more comprehensible for everybody.

(3) Christiane Riziky: Lecturer from the University of Toamasina

You touched on the subject of environmental impacts on the ecosystem (coral), have you examined the level of impacts on resources: fishing? For example at Foulepointe: it could provoke the loss of fish resources, then fishermen will have to travel further.

At the socio-economic level: do you think there will be benefits? Between a giant port and a small group of fishermen, I believe there is competition between port activities and fishing and that fishing activities are being sidelined in Tamatave.

Answers from study team: We think that smaller fishing groups are very important and the social study addresses their issues. We are going to take the fishermen into account, so they will not be ignored. I have interviewed fishermen; they explained where they fish and they explained that their principal fishing zones are not affected. I know that fishing activities will disappear if the coral is lost, so we are going to make a great effort to preserve the Grand Reef and local fishing activities.

(4) Amana Aka: Head of Galana Project - GRT

- Following from what you have said, as occurred with the Ambatovy and Galana projects, this project is obliged to do an EIA and submit it to the National Environmental Office (ONE); from this date, both technical and ad hoc committees will be formed. During this phase, a document in Malagasy will provide a better understanding of the project to concerned individuals.
- Concerning the impact of the foreseen project, I have seen the proposals for contact between the port and the containers. And I also understand that a dry port project exists for trucks. Has the port extension project taken into account these other projects or not?
- In relation to the parameters for air and water quality, I have not seen anything relating to n-hexane in the presentation;
- Can you define MPN and PM10?

Answers from study team:

- We have discussed with SPAT the proposal for a dry port and we have seen that the arrangements have not been made. This requires some solutions, as the dry port is largely used for port decongestion. Therefore we will have to analyse why this proposal has not been put into action.
- In our presentation, we have examined on line communication systems. The specific analysed points are:
    - Communication systems between parking and the port and the distance between parking and the port;
    - Organisational systems for trucks orientated to owner-drivers or truck companies
    - Customs' laws will have to be applied within these parking areas.
    - Following analysis of the situation, we will decide if the proposal is feasible or not, if not we will propose other measures.
- MPN is a measurement unit for coliform bacteria i.e. **M**ost **P**robable **N**umber; we use this unit as it is impossible to measure the bacteria.
- PM10 relates to particulate matter that are less than 10 micrometers. It is microscopic and invisible to the naked eye.

(5) Ravison Frederic: Jovenna

Is the over-pass road in the urgent development plan or just a recommendation?

Answers from study team:

- The over-pass road is located just after the main gate, where there is actually a speed ramp zone; we will try to include this over-pass road in our urgent development plan.
- We will examine its feasibility upon financial costs for the project, if it is too expensive, we will have to redefine the urgent development plan.

(6) Mirana Ranarivelo: Head of Sustainable Development Department - HOLCIM

- In the proposal for solutions and mitigation measures, certain measures will be the responsibility of SPAT and/or other bodies. Will there be specific conventions to assure and define who does what? If not the local community could suffer.
- If SPAT is responsible, is SPAT competent enough to address various technological solutions?
- It is necessary now to identify the capacity of SPAT and other parties.

Answers from study team:
- During the construction phase, the Contractor will be mainly responsible for implementing mitigation measures, especially for impacts generated from construction activities.
- During the operation phase, SPAT will mainly be responsible and could use consultants to do the studies, and if necessary JICA can assist with technical solutions. In addition, SPAT will develop an Environmental Department within its organisation.

(7) Rakotoniaina Jean Baptiste: Apostolat de la mer (NGO assisting local fishermen)

During the construction and operational phases: will there be any impacts on small scale fishing activities? Are there any mitigation measures?

Answers from study team:
- During the construction phase, construction vessels will be circulating around in the area, therefore, it may be dangerous for small scale fishermen for several months.
- During the operational phase of the breakwater, we are not sure if it will be too dangerous or not for fishermen to travel nearby.

Mr Avellin, MD of SPAT, added that it is illegal to enter the security perimeter of the port zone based upon «International Ship and Port Facility Security Code (ISPS Code)» of the International Maritime Organisation (IMO).

(8) Razafimaharo Mamy: MICTSL (Port Container Management Company)

What is the estimation of landfill material required during the 3 years?

Answers from study team:

At this stage we know that there will be many trucks moving around during the construction phase. Over the next few months we will precisely analyse the volumes and the need for temporary access for the construction phase.

(9) Sister Joséphine: Apostolat de la mer (NGO for local fishermen)
- The Apostalat de la mer senses that it is a victim of parked trucks and has made remarks upon the dysfunctional dry port. Is the project going to provoke again the environmental problems associated with parking?
- The Apostalat de la mer welcomes seamen from the port area; the problems is linked to the waste around the Apostolate, we believe that the project will provoke this problem and increase the noise from trucks.

Answers from study team:
- We are going to study in depth the problems as there are many issues associated with the parking of trucks:
    - Town Planning issues;
    - respect and application of the Highway Code;

- encouraging transport organisations into an Association and applying transport norms.

Note: SPAT is a key actor in negotiations with various parties.

(10) TIMBOU Alain : GPTE
What is the number of trucks moving around Tamatave in relation to the problems associated with the dysfunctional dry port?

Answers from study team: The problem is global and important. Our priority is the fluid movement of port activities. For this reason we need to have «Traffic Management System» studies.

(11) Ludie MASY: SPAT
Comments: Parallel problems related to the port will have to be discussed with the Tamatave Town Commune: cooperation between SPAT and the Commune, truck traffic, and times and zones for the circulation of trucks.

(12) Rakotoniaina Jean Baptiste: Apostolat de la mer
Comments: The fishermen are going to try to carry badges to identify individuals as well as provide security for fishermen.

V. Final remarks from the MD of SPAT
Mr Avellin Christian Eddy, MD of SPAT, closed the meeting and thanked the participation and comments from everybody. He said that SPAT and the Japanese experts will be available to receive all of your opinions and remarks. He invited the media to provide information to all of the partners. The next reunion will be confirmed. This meeting is terminated at 13.45 hrs and everyone is invited to a cocktail.

VI. Questionnaire
The question sheets for remarks and opinions had been distributed to participants and were collected at the end of the meeting. **Annex 2** is a compilation of the comments and opinions.

Annex 1: List of participants

	Name	Company/Occupation
1	AVELIN Christian	DG SPAT
2	RANDRIANTSALAMA Valerie	Formation GRENE
3	RAONIZAFINIMANANA Rodolphe	SPAT/ Responsable de planification portuaire
4	ANDRISON Jean Claude	SPAT/ Responsable de dispatching
5	Liliane ZAFIMIRANA	SPAT/ Service communication
6	RATRIMO Michael	MICTSL/ Terminal MGR
7	RAZAFIMAHARO Mamy	MICTSL/ Risque et environnement MGR
8	RANARIVELO Mirana	HOLCIM/ Développement Durable
9	RIRI	Association des pécheurs
10	Aman Aka	Galana Raffinerie Terminal GRT
11	Lena Leon Njy	SPAT/ Finance
12	AVELIN Christian	DG SPAT
13	TIMBOU Alain	GTPE
14	Jeanine RAKOTO	Journaliste RFT
15	RANDRIANARY Mario	MADARAIL
16	BELALAHY Jean Berchmans	Direction Régionale du Commerce - Chef de Service
17	INJIRASOA Julia	Commune Urbaine de Toamasina I
18	RAVISON Frederic	JOVENNA
19	TABIHA Larsene Nicolas	SPAT
20	RAZARALIMANANANA	SPAT
21	RAKOTONIAINA Zoeline	SPAT
22	NELSON	GN
23	MASY Lydie M	SPAT
24	ZANDRY F	SPAT
25	ANDRIAROENSON B.	HOLCIM
26	ANDRIANIRIANA Alain	HOLCIM
27	Dr RASOAZANAMADIO Joséphine	Apostolat de la Mer
28	Officier TEDDY	Commissariat SPAT
29	Mahefa RAKOTOMALALA	Journaliste
30	BALLOT Ganni	Apostolat de la Mer/ Stella Maris CLUB
31	FORESTIER	MOCO
32	ELISE	
33	Jean Claude STEVE	Journaliste MIDI MADAGASIKARA
34	FRANCOIS Jeean Jacques	Journaliste TVM/ RNM
35	NESTORE	FMA
36	FRANCINE	FMA
37	ETANCELIN	Savonnerie Tropicale
38	RAKOTONIRINA Jhonson	SPAT/ Marketing MANAGER
39	Capitaine JAM	SPAT
40	TSILANGONI Modeste	SPAT
41	RAKOTONIAINA Jean Batiste	Apostolat de la Mer/ Secteur Pêche
42	GALAIS Ricky	LA SEAL/ Marketing DEPT

43	SABOTY José	Journaliste/ La Vérité
44	RAZAFIMAHERY Bézime	Journaliste TVM/ RNM
45	RAHANTO	Journaliste Ino vaovao/ Toamasina
46	Gilbert RAJOELISOLO	Journaliste Ino vaovao/ Toamasina
47	RAZANADRAKOTO Victor Fidèle	Région ATSINANANA
48	TAMBY GERIDO	SPAT/ PFSO
49	RIZIKY Chirstiane	Université de TOAMASINA
50	RAFANOHARANA Jule	DUMAS/ CMA- CGM
51	Radotiana RANDRIAMALALA	SPAT
52	Purid Hvet	MOCO
53	Monique henriette	SPAT
54	Hyacinthe	APMF
55	RANOROARISOA	SPAT
56	RANDRIANJATOVO Roland	JICA/ Interprète
57	RAJAOBELINA Jocelin	JICA/ Interprète
58	RANDRIAMANANTOA Zoly	JICA/ Interprète

Annex 2: Opinions on the meeting of 3rd July 2009

1) Name: RAZANADRAKOTO Victor Fidèle
Organisation: Atsinanana Region
Occupation: General Secretary
Contact (email, tel., etc): regionatsinanana@moov.mg or razanadrakotov@yahoo.fr

- The themes were pertinent, moreover the following:
  - Fishing and fishermen;
  - Heavy trucks and parking at the port;
  - Pollution.
- Needs have been expressed, principally those from the Apostolat de la mer: Parking and waste in areas around the port.
- Ideas require integrated cooperation from all parties (local authorities, enterprises, local population…), for this reason, we hope that the ideas are communicated to the wider public, so that they are conscious of their respective responsibilities to share and to engage upon.

2) Name: RIZIKY Christiane
Organisation: University of Toamasina
Occupation: Social Development Teaching Director
Contact (email, tel., etc): rizikychristiane@yahoo.fr

- Well organised
- Translated slide presentations accompanied by an interpreter were appreciated.
- The meeting provided interesting information.
- Questions and answers provide an opportunity to exchange ideas and instructive suggestions.

3) Name: RAVISON Frederic
Organisation: JOVENNA MADAGASCAR
Occupation: Regional Director
Contact (email, tel., etc): drtoamasina@jovenna.mg / 034 07 203 08

- Timing of presentation: if possible start the presentation earlier or in the afternoon.
- The target audience needs to be widened because the project has social impacts. Therefore, incorporate specific economic actors

4) Name: RANARIVELO Mirana
Organisation: HOLCIM MADAGASCAR
Occupation: Head of the Sustainable Development Department
Contact (email, tel., etc): mirana.ranarivelo@holcim.com/ 0321165014

- The subjects discussed are very interesting from a technical point of view. The presentations were simple and good graphics.
- It would be good if the documents could be translated into Malagasy for the general public.
- It would be interesting to add the limits, European or OMS standards (which are used in Madagascar) as references for pollution, such as air, water and others.

Minutes of the Third Stakeholders Meeting on the Feasibility Study of Toamasina Port Development

Date: 30 October 2009
Place : Conference room «SPAT» 2nd floor
Start of meeting: 10:15
End of meeting: 13:30

I. Introduction

The public consultation meeting is a requirement of the Japanese International Cooperation Agency's (JICA) Environmental Impact Study Directive.

The public consultation process for the Environmental Impact Study is divided into three stages. This meeting is the third and last meeting during the study phase. The first meeting was held in March 2009 to present the project. The second meeting, held in July 2009, focuses on data from port development project and principal environmental issues linked to the Environmental Impact Assessment (EIA). This third meeting presented the proposed development plan for the port, at the feasibility stage, as well as the results from the EIA. Results from this meeting will be incorporated into the EIA to finalise the project documents.

II. The meeting

The meeting of 30 October 2009 took place in the conference room of the Société de Port à Gestion Autonome de Toamasina (SPAT). The list of participants at this meeting is found in the **Annex 1** of these minutes. The meeting commenced with a welcome introduction from the Managing Directors of SPAT, Mr Samuel RANAIVOJAONA and Mr Christian Eddy AVELLIN.

During his speech, Mr Ranaivojaona thanked the audience for responding to SPAT's invitation. He presented a brief review of previous consultation steps (see section I). He also added that this meeting was very important to finalise the EIA, which is a requirement to move forward to the next phase being project implementation. The final report will take into account all recommendations from this meeting, and will be submitted to ONE in December 2009 in order to obtain an environmental permit.

Mr Avellin Christian Eddy also thanked the audience for responding to SPAT's invitation, which outlines the public interest in the development project of Toamasina port. He invited all participants to formulate suggestions, which would be incorporated in the EIA report. He then declared open - the third stakeholder meeting.

Opening speeches were followed with a video-projector presentation of the proposed development plan and the EIA.

III. Presentation

III.1 Introduction of study team members

SPAT and JICA's study team worked together to prepare the development project for Toamasina Port. Members of the JICA's study team were introduced to the participants, as follow:
Dr KOBUNE Koji, Port Planning Specialist
Mr SATO Takeshi, EIA Specialist

III.2 Presentation

Dr Koji KOBUNE is responsible for Port Planning and presented the proposed development for the port. He was followed by Mr SATO who presented environmental issues associated with the port's extension.

1) Technical study

Dr Koji KOBUNE's presentation focussed on the following:

- Feasibility schedule (2009)
- Current operational scheme of Toamasina port
- Current traffic trends at the port
- Future traffic projections at the port
- Future needs in terms of space and traffic management for the port
- Proposed development plan for the port
- Project cost
- Implementation schedule

2) Environmental Impact Assessment:
Mr SATO's presentation focussed on the following:

- Impact on air quality: particulate matter concentration (PM10)
- Impact on water quality: total nitrogen concentration (T-N), as nutrient indicator
- Impact on coastal currents: directions and speed
- Impact on coastal topography: beach erosion / accretion
- Impact on marine fauna and fishery resources
- Impact of contaminated dredge spoil: disposal methods

IV. Questions and answers

(1) RANDRIAMAHAZO Nary: MADARAIL
- Regarding air quality, wouldn't it be possible to improve air quality by increasing railway traffic instead of road traffic?
- Would it be possible to increase the size of the container yard?

Answers from study team: Several inland depots have been built by shipping companies. Some major companies already plan to use the railway between the port and the inland depot. For example, the Ambatovy project plans to move 14,000 containers by rail.

(2) RAKOTONIAINA Jean Baptiste: Apostolat de la mer
The representative of *Apostolat de la mer* is pleased that SPAT is in contact with representatives of the fishermen regarding the port's extension. These fishermen request the following:
- open channel to allow for small boats to pass between the break-water and the reef
- port space for artisanal/traditional fishermen, as they will loose their current mooring site with the extension of Toamasina port
- motor boats based on previous discussions with SPAT and JICA.

Answers from study team:
- The proposed development plan is the result of a compromise between the port requirements, the cost of infrastructures and environmental issues. In the proposed plan, efforts have been made to limit the extension of the breakwater, to reduce both cost and environmental impacts. There will be an open channel between the breakwater and the reef.
- However, there is an issue associated with the regulation of traffic within this channel. This issue is SPAT's responsibility. During the second meeting, we already mentioned that the channel will be dangerous for navigation after the breakwater extension is completed.

(3) TIMBOU Alain: Professional road carriers association

Your EIA mentions that trucks are the main source of air pollution. The problem is that almost all trucks arriving in Madagascar are second hand. Would it be possible to assist the carriers in renewing their trucks and reducing pollution. For instance, MADARAIL, which is a private company, received public finance from donors such as The World Bank.

Answers from study team:

- This comment is very pertinent. However, there are different procedures for railway companies and road carriers. Trucks use public roads which are built and maintained by the State. Railway companies have to manage rail lines, but do not have the capacity to finance these infrastructures; this is why the state supports these costs.
- However, incentives could be implemented to support carriers in reducing their emissions. For example, Los Angeles port was highly polluted. One of the implemented measures included reduction of entrance fee for trucks with low emission rates.
- Improving the trucks' state is one of the measures we mentioned in the report. But the most important is to reduce traffic congestion on the access road. The inland depot will be an efficient mean to reduce this congestion. However infrastructure alone is not sufficient. This depot requires an adequate management and strict enforcement of regulations. Trucks will have to wait their turn at the depot, and not at the entrance gate. An example of regulation is that the port handling company gives the priority to trucks which observe the rules.

(4) Eustache RAMORAVELO: Toamasina Town Council

- Following what was said, I thank the study team for the great work which was done for the EIA. However, it is the first time that I participated in a consultation meeting for this project. I have a few questions. I noticed that you separated the port from the town. I believe a more thorough social and economical impact assessment is required, and more specifically:
  - What are the impacts on small fishermen who will disappear because of the port development?
  - If within 40 years from now, the sea rises and floods the city: is it necessary to invest so much money for these infrastructures which might be destroyed?
  - It is necessary to study social impacts, as Toamasina inhabitants are affected by impacts from port activities, such as air quality degradation and noise. Toamasina Town Council would be happy to assist with such a study.
  - What will be economical impacts, especially on tourism? Toamasina is a coastal town, and a lot of people go to the beach and some of them swim in the bay.

Answers from study team:

- We have taken into account these issues. However, the port has already reached its full capacity. Even with the proposed development, the port will not be able to handle increasing traffic in the future. This port is the principal gate for goods in Madagascar. Therefore, it has been required to prepare a long-term development master plan. Unfortunately, our TOR limits our work to the port extension for urgent purpose only, and we could not examine the outer zone, i.e. the town.
- To study urban issues, we recommend the preparation of a development plan integrating Toamasina town with the port, as well as taking into account truck traffic within the town. At present, development has been implemented piece by piece, and it is difficult to solve these issues without overall planning for both urban and port developments. Without such planning guidelines or master plan, Toamasina will be chaotic. Town zoning is necessary and needs to take into

account residential areas, business areas, logistics, etc. SPAT and the Toamasina Town Council are key actors who could request funding for such a study.

- Regarding small fishermen, one of the proposed mitigation measures in the EIA is an L type groyne at Point Tanio, to limit erosion. This infrastructure could also act as a small port for local fishermen.

(5) KALO Narcisse: Representative of Atsinanana Region

Toamasina has only one Secondary School, located north of Pointe Tanio. This school needs rehabilitation, but nobody wants to finance this rehabilitation, because they think it will be affected by coastal erosion. The proposed extension will accelerate erosion. Will this school disappear? If yes, should the construction of a new school be part of mitigation measures?

Answers from study team:

- After checking the location of the school on the map showing the coastal line evolution, the team stated that in accordance to the simulation, the school is unlikely to be affected by coastal erosion at least within the next few decades.
- Based on aerial photography, until the 60s, the breakwater was shorter. In the 70s, the present breakwater was built, and sand movement started. These sands come from north of Pointe Tanio, and move southward to the beach near the port, where there is deposition. The overall phenomenon needs to be studied and the erosion/deposition problem cannot be solved immediately. The study team recommend that, as soon as the breakwater is extended, SPAT carefully monitors erosion/deposition, to assess how this phenomenon evolves and what are the best countermeasures.

Additional remarks from KALO Narcisse

- I am very surprised by your results regarding the erosion of this area. Would it be possible to have a letter from you which certify that the school will not be affected; this would help us to convince potential funding donors to help the school?

Answers from study team:

- All results will be included in the EIA. This document combined with previous studies on the subject (study from the Ambatovy Project and the study on coastal protection at Pointe Tanio) could help you.

(6) KALO Narcisse: Representative of Antsinanana Region

- Regarding the overall size of the project, multiplying by 3 the container yard means also multiplying the number of custom officers and port staff. Therefore, Toamasina population will increase, as well as require public services and equipment. A social impact assessment is required to allow us to anticipate this increase.
- I ask SPAT to set up a local committee to integrate both the port and local authorities (Town, Region) to manage this project together.
- The project will require workers. It will be necessary to set up professional training, especially for young people, to help them to bridge these needs. It is important to study the social aspects of this project, not just the technical and environmental aspects.
- Did you include tourism in the project, as cruising ships call at Toamasina Port?

Answers from study team:

- Regarding the town development, we totally agree with you. We can suggest that you prepare a study proposal to integrate both the town and the port development. Unfortunately, this is not within our TORs for the urgent development of the port. JICA provides variety of programs as well as development studies. JICA's office in Madagascar will be pleased to make contact with local authorities. Before this project starts, we still have two and half year to prepare a study of town development plan and take into account all the issues that you have mentioned.
- Regarding tourism, during our stay, we observed the arrival of 2 cruising ships. Passengers have to walk along the container quay before reaching the gate to catch a rickshaw or a cab. The route is a long and unpleasant walk for them. Elsewhere in the world, there are souvenirs sellers where cruising ships arrive. Due to the significance of potential revenue from tourism, both the port authorities and the tourism sector should work together to organize the development of reception areas for these tourists.

(7) RAZAFIMAHARO Mamy: MICTSL

From your presentation, there will be a reorganization of the port facilities. However, oil tanks remain near the seaside. Will you displace these tanks?

Answers from study team: The relocation of these tanks has been one of the discussion topics since the beginning of the study. There are several concession contracts between the port and operators. It is necessary to take into account of the existence of these contracts. It was concluded that it is difficult to deal with these contracts within this urgent development phase. If SPAT reaches acceptable agreements with these operators before the end of this study, we could propose a better plan for their relocation.

Answers from SPAT: SPAT is also working with a consultancy from the Netherlands to prepare a long term development plan for the port.

(8) Paul LEBLANC: Ambatovy project

- In your presentation, you showed a simulation study. Could you make the report available to us as we are concerned by the impacts of the extension of Mole B.
- When the break-water is built, there will be some sedimentation in the bay. Did you assess the sedimentation rate? In addition, did you include periodic dredging in the project, and what would be the frequency of this dredging?
- There is sea current located where the break-water will be extended. This current will be blocked by this extension. There is also a sand beach in this area. Did you consider the removal of this sand, to allow for the current to be re-established in this area?

Answers from study team:

- SPAT is the one who will decide whether this study should be open to the public or not, and if it is possible to consult it. In December 2009, JICA will send the final report to SPAT. The study will then be available from SPAT.
- The consultants explained again what the results showed in their presentation.
- The simulation focuses on the impacts of the breakwater extension on the coastal line. There are no detailed results for the sedimentation inside the bay. However, this sedimentation should not reach the Mole B. On the east side of the quay, dredging should not be necessary.

- The simulation shows that the current will change in the reef channel area. While the inflow through the reef passage will remain the same after the breakwater extension, outflow will be blocked.

(9) David HUET: MOCCO

In the proposed plan presented today, our facilities will be enclosed within the containers area. However, during past discussions, this area was attributed to oil companies. I would like an explanation on this point.

Answers from SPAT:

- It is necessary to move all dangerous goods in a special area outside the town and far from other facilities, for environmental and safety reason. In addition, we need to take into account the specificity of liquids, which are transported by pipeline and tank trucks. Existing MOCCO facilities are allowed to remain there, but we decided not to allow new oil facilities in this area.
- On the proposed plan, MOCCO facilities appear to be enclosed, but access points are provided for this zone.

Answers from study team: All dangerous goods should be separated from other port activities. It is unfortunate that the new oil terminal and Sherrit's facilities were built in the middle of the port.

V. Final remarks

Mr Avellin Christian Eddy, MD of SPAT, closed the meeting and thanked the participation and comments from everybody. He mentioned that the meeting was closed, but the consultation will continue with SPAT, whose door will always remain open to receive additional suggestions. This meeting is terminated at 13.00 hrs.

Annex 1: List of participants

No.	Name	Company name	Phone number
1	RAMORAVELO Eustache	Commune Urbaine Toamasina	0325 988 422
2	ZAFINIRINA Liliane	SPAT	0320 260 800
3	ZAKAIZA Nestor	GEGN	0341 301 860
4	RAZAKALIMANANANDRO Mamy	SPAT	0320 252 980
5	RAMAROARISOA Vola	SPAT	0340 711 966
6	ANDRISON Jean Claude	SPAT	0320 416 000
7	HUET David	MOCCO	0320 533 638
8	ETANCELIN Gaetan	SAVONERIE TROPICALE	0320 705 360
9	KALO Narcisse	REGION ANTSINANANA	0330 650 000
10	RAMAROZATOVO Nina	S&E REGION ANTSINANANA	0341 567 619
11	JEAN BERTHIN	SMMC	
12	Marie CAPY	TMA	0324 010 523
13	RAKOTOMALALA Joelle	Journaliste	0340 102 529
14	SOLONIRINA Patrick	Journaliste	0320 266 997
15	TIMBOU Alain	GTPE	0331 135 427
16	RASAMIMANANA Lalasoa	GTRN	0331 146 204
17	RODIN Jean Claude	APMF	0321 125 707
18	RAVO	Ino Vaovao Toamasina	0321 100 115
19	FRACOIS Jean Jacque	TVM	0331 480 900
20	RAKOTONIAINA Jean Baptiste	APOSTOLAT DE LA MER	0324 060 273
21	RAMIARISON Deriazy	APOSTOLAT DE LA MER	0325 327 909
22	RAKONARAINIBE Jean Michel	MADARAIL	0340 050 059
23	RANDRIAMAHAZO Nary	MADARAIL	0340 050 035
24	RAKOTONIRINA Jeanine	Journaliste RFT	0320 214 608
25	RANDRIANARY Jean Mario	MADARAIL	0340 050 465
26	P.S Kazeh	APOSTOLAT DE LA MER	0324 260 546
27	RATRIMO Michael	MICTSL	0205 335 204
28	LEON Njay	SPAT	0332 315 954
29	BELALAHY Jean B.	Direction Commerce	0320 212 619
30	YASMIN B.	GALANA	0331 231 897
31	AVELLIN Christian	SPAT	0332 315 981
32	Cpt. JAMI Infona	SPAT	0332 315 985
33	SABOTSY Jose	Journaliste	0324 855 448
34	LEBLANC Paul	AMBATOVY	0330 527 108
35	RANDRIAMALALA R.	SPAT	0331 164 036
36	MIHA Antoine	SPAT	0332 315 947
37	KOJI Kobune	JICA STUDY TEAM	
38	TAKESHI Sato	JICA STUDY TEAM	
39	RAJAOBELINA Jocelin	JICA Interprete	
40	RASOANAIVO Aina	AQUATERRE Interprete	
41	Agnes JOIGNEREZ	AQUATERRE APPUI	

		Consultation	
42	RANDRIAMALALA Mireille	AQUATERRE	
43	RANDRIAJATOVO Rolland	JICA Coordinateur	
44	RANAIVOJAONA Samuel	SPAT	

Meeting with Toamasina Local Fishermen
June 23rd, 2009

Place: Apostolat de la Mer
Start of meeting: 09:10
End of meeting: 11:20
Number of attendance: expected 10 persons
Attended 23 persons including members of the OCDI team and SPAT representative

I. Opening Speech of Mr Jean Baptiste:
He thanked everybody for coming to the meeting and announced the topic of the discussion and the importance of the meeting. He also confirmed that the attendances are the chief and representative of all the 10 associations of traditional and artisan fishermen in Toamasina as well as members of the Apostleship of the Sea.

He then announced the schedule of the day which is the presentation of the summary of all the responses of the questionnaire sent in March; and secondly a recommendation followed by everybody's opinion.

The opening speech was followed by self-introduction of all participants of which the list is attached in annex.

II. Presentation by Mr SATO:
He thanked everybody for coming to the meeting.

By showing the map of the future development of the port, he explained what is planned to be done: construction of a new container berth mole C4 and its details, construction of new bulk berth and its detail, extension of breakwater and reclamation area as well as the dredging in front of the new construction area.

He explained that this is only a feasibility study which will be carried out this year 2009. The detail study will be done as soon as the political situation in Madagascar is fixed. Nonetheless the duration of this detailed study will take approximately 1.5 years, a construction phase will take at least 3 years and the operation phase depends on the preceding phases.

Mr Jean Baptiste then thanks the team for this brief presentation, which he remarked as quite hard, but very useful for all sea users. So he proposed to hear the summary of all the answers of the questionnaires.

The representative of the fishermen read the text in Malagasy, copies of which in French and English versions are attached in annex

They gave also a map showing their routes to fishing. As there are many people who lived upon fishing, the attendance asked if ever they can no more pass through the pass, they would prefer to be granted with bigger motor boat if possible.

The representatives assert that nobody fishes on Reef Hastie, but there are some who fishes around and inside Grand Reef where they catch many species of fishes, lobsters, and others…

The representatives then read a written request issued by their general meeting with the representative of Apostleship of the Sea, the ministry of fishery, Spat, and the Gendarmerie on May 28th 2009. The copy of which in French version and its translation in English is in the annex.

Mr KOBUNE answered that for the time being there are too many problems at the port. The study team take into account all the request and he explained that this is only a first step which is the urgent phase. Because it will take time as it is a continuous development until the operation phase by 2015. In the second phase they will include all request and opinion.

Mr Jean Baptiste acknowledged these words in the name of the Apostleship of the Sea, himself and the whole fishermen because their request had not been taken into account they themselves are in difficult position vis-à-vis the fishermen.

For the time being the fishermen use small boat (canoe) of 4 and half meter long with 60 centimetre wide for the traditional ones and medium sized boat about 8 to 9 meter long with 2 meter wide for the artisan ones.
They have around 100 boats.
The representative of the ministry of fishery gave his opinion that the construction of the small port for all fishermen is very beneficial especially for their office because the gathering in one place of all fishermen will certainly simplify their task as manager. They can control each boat to avoid the irregular fishermen in case they do something wrong in the red zone of the port. The traditional fishermen are more than 100 people so the service of fishery would identify them by giving them licence plate. And the place they need is far from the port.

Mr KUNITA asked what kind of port they really want. Do they pull the boat on the beach or mooring in the sea?

They answered that they need something for something for transporting their catch, cold storage, motor boat in order to go far away like Iles aux Sables.
For the time being they uses wooden boat and so they request for fibre made boat which they think are stronger, safe, motorized. So if possible each fisherman will have 1 boat. As they have not the same schedule.

Mr KUNITA then explained about the case of bad weather and the coastal stability, so the necessity for strong infrastructure which can not be destroyed easily.

The student from Toamasina University asked about the resources for the construction.

Mr KUNITA answered that Madagascar has not enough big machines, ships, vehicles for the transport of material so these things are to be imported but for the maintenance and labour force they are of course from Madagascar. And it also depends on the contractor who wins the bid.

As for the question of whether the sea will be opened or not during the construction, it is said that the pass will be temporarily closed for certain period of times.

Mr Jean Baptiste made final closing speech by thanking the study team and Spat for their time and having listen to their aspiration, and they have been honoured but not ignored. They hope that the project will be carried out and their request would be favoured.

The meeting ended up at 11.20.

After that the priest invites everybody for a visit of the centre of Apostleship of the Sea where you can find restaurant, exposition room, atelier, chapel, guest rooms, offices…

ANNEX I: List of participant for the fishermen meeting 23/06/09

Name	Associations
P. STANISLAW KAZEK Omi	Apostolat de la Mer
RASOLOFOMANANA Vincent	Service Régional de la Pêche et de Ressources Halieutiques
SOLO Jean-Pascal	F.P.V.M.A
TELOLAHY Félix	F.P.V.M.A
JEAN Florent	V.M.M. à Dépôt Analakininina
RAKOTONIAINA Jean Baptiste	Apostolat de la Mer
RIRI	V.M.M à Dépôt Analakininina
BOTOVAO Abraham	F3MA et FIMPANATOA
TOVOHERY Alexandre	FIMAM
RAVELOSON Emmanuel	FIMAM
MANUEL Michel	FIMAM
DELLARIS Huberto	Foyer STELLA MARIS
ELOI Zéphirin	Commandant de Vedette de Pêche
RAJOELINA	V.P.MI
Sœur Jeannette	Apostolat de la Mer
RAVOLOLONIRINA Angeline	Association Femme de Pêcheur
Sœur Joséphine	Foyer STELLA MARIS

JICA & SPAT

KUNITA Osamu	Study Team leader
KOBUNE Koji	Port Planning
SATO Takeshi	Environmental Expert
RANAIVOJAONA Sammuel	SPAT
RAONIZAFINIMANANA Rodolphe	SPAT
TABIHA LARSENE Nicolas	SPAT
RAJAOBELINA Jocelyn	Interpreter

ANNEX II: SUGGESTIONS

To the attention of the Japanese representatives who make the study of Toamasina Port Extension having request for the opinion of the fishermen on the aforesaid project;

We, fishermen who met at Apostolat de la Mer on May 28th, 2009, having answered to the questionnaire issued by the Study team of the project, do the following suggestions to the Japanese representative:

1. Construct a Traditional and artisan fishing port berth facing the Hopitaly Be (Big hospital)

2. Extend the breakwater in form of Extension Bridge in front of mole C3 in order for the pass to be always opened for traditional and artisan embarkations.

The representatives of Apostolat de la Mer, of Ministry of Fishery, Port and Gendarmerie were present at the meeting.

Copy of the presence sheet is annexed to this declaration

Signed by
P STANISLAW
RAKOTONIAINA Jean Baptiste
BOTOVAO Abraham
TOVOHERY Alexandre

RESPONSES TO THE QUESTIONNAIRES

1. What type of species do you catch?

-With gill net :
. Trois dents, pêche cavale, sole, barracuda, perroquet, fiampotsy,
. Shark, gogo, natamàna (ray);
.karapapaka, sabres, rarinkina, ambatsy, henalaza, fiatandroka

-With line: Cabot, captain, cardinal, carangue, rouget, thon, madame tombée, jegrette, tazara, bemolotra, vivano, fiamalandy, torovoka;

-With other means (diving…): shrimps, camaron, lobsters, squid, and calmar

2. Please show your fishing area on the attached map. Please also show on the map the route you take to the fishing area

Fishermen from Canada city and Dépôt Analakininina: Sea of Canada, depot continue southward up to Ivondro river.

Fishermen from Ambodisaina: southward to Ivondro.

Using motorboat: From Port or Club Nautique or Pangalana canal northward (Ile aux Prunes, Ambodiatafana, Foulpointe) ou southward (Ile aux Sables, Nosy Fogno)

3. What type of fishing method do you use? What type of boat do you use?

Method: gill net, line, trolling, diving
Boat: rowed monoxyle canoe used by 90%¨of fishermen, motorized canoe, small motorboat

4. Is fishing your only income source? If not what other income source do you have?

Yes, fishing is the only income source.

5. Do you conduct fishing all year? If not, when is your main fishing season?

Yes we go fishing all year long but not every day: except on bad weather. More than 200 days a year for traditional fishermen.

Main fishing season: October to January

6. How do you sell your fish catch?

The catches are sold by our wives in the market.
Or they are sold directly at the beach to dealers at the arrival of fishermen.

Approximately how much do you earn per year from fishing?

On the average 5 kg per day for 200 days…….1 ton

7. Is fish catch increasing or decreasing over the past years?

There is continual and considerable decrease of catches.

A7-5 Presentation Material

1st Stakeholder Meeting of Toamasina Port Development Project

Environmental Topics

SPAT

JICA Study Team

March 12th, 2009

Objective of this meeting

1. To inform and obtain opinions of the stakeholders of the Toamasina Port Development Project.
2. To inform and obtain opinions of the stakeholders on the potential environmental impacts of the Project.

Opinions of the stakeholders will be taken into account into the Project's basic development policy and Terms Of Reference of the EIA

What is Environmental Impact Assessment (EIA)?

- In accordance to Madagascar's law (MECIE: Decree No. 99-954), large-scale projects must obtain an environmental permit from National Office of Environment (ONE) by submitting an EIA report.
- EIA is conducted to assess the negative and positive environmental impacts of development projects.
- Impacts on physical (e.g. water quality), biological (e.g. coral reef) and social (e.g. local community) environment are assessed for the construction and operation phases.
- If any negative environmental impacts are identified, measures must be implemented to minimize or eliminate the negative impacts.
- If necessary, environmental monitoring must be conducted to check the environmental conditions.

Initial procedure of the EIA

- As an initial step of the EIA, the project proponent must submit a TOR of the EIA to ONE.
- The TOR describes the environmental impacts that will be assessed in the EIA.
- For this Project, in addition to the information collected so far, the TOR of the EIA will be developed by reflecting the opinions of the stakeholders.

So please provide your opinions of any environmental impacts that you think should be assessed in the EIA

Main components of the Project (Option A)

(1) Construction of C4 container berth (318 m x 14 m)
(2) Extension of breakwater (465 m)
(3) Construction of new stockyard (15 ha)
(4) Dredging for collecting filling material and deepening of Mole C

Potential environmental impacts of Option A (Physical environment)

- Deterioration of water quality through marine construction works (e.g. dredging and landfill)
- Deterioration of water quality through breakwater extension (i.e. alteration of coastal current pattern).
- Alteration of beach topography (erosion/accretion) through dredging and breakwater extension.
- Deterioration of air and noise quality through construction works and port operation.

Potential environmental impacts of Option A (Physical environment)

Potential environmental impacts of Option A (Biological environment)

- Reduction of marine life around Toamasina Bay (e.g. coral, fish, shellfish) through marine construction works.
- Disturbance to cetaceans (whales/dolphins) through marine construction works and increase in shipping traffic.

Potential environmental impacts of Option A (Biological environment)

Potential environmental impacts of Option A (Social environment)

- Disturbance to the fishing activities (e.g. industrial and local fisheries).
- Disturbance to the local community (e.g. recreation, introduction of diseases)
- Increase of risks of shipping and road accidents.

Potential environmental impacts of Option A (Social environment)

Potential environmental impacts of other development options

- Environmental impacts of other development options (Option B &C) will also be assessed in the EIA.
- The best development option will be determined by taking into account environmental, technical and economical aspects.

Once again, please provide your opinions of any environmental impacts that you think should be assessed in the EIA

2nd stakeholder meeting

- Next stakeholder meeting will be held in June 2009
- The following topics will be reported and discussed:
  - ✓ Informing of the draft layout plan
  - ✓ Interim results of the EIA study
  - ✓ Proposal of mitigation measures
- **Your active participation and opinion will be much appreciated in the next meeting as well!!**

Thank you for listening!

Any questions??

2nd Stakeholder Meeting of
Toamasina Port Development Project

Environmental Topics

SPAT
JICA Study Team

July 3rd, 2009

Main topics

1. Status of pollution, and natural and social environment around Toamasina Port
2. Potential environmental impacts of the Project and proposed countermeasures

1. Status of pollution, and natural and social environment around Toamasina Port

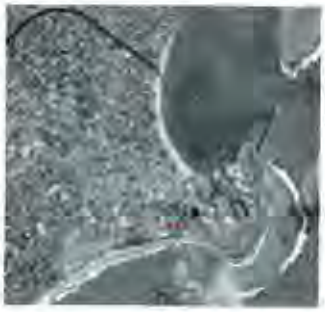
Status of pollution

The following field surveys were conducted in March 2009 to understand the pollution status around Toamasina Port:

- Air quality survey
- Noise survey
- Water quality survey
- Sediment quality survey

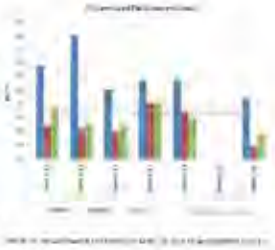
Method of the air quality survey

- Nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter (PM_{10}) were measured at the port access road (St. A), Boulevard Ratsimilaho (St. B) and city centre (St. C) during Mar. 10-16, 2009.
- NO_2, SO_2 and PM_{10} may cause health problems (e.g. asthma) when at high concentrations.
- Traffic volume of large and small vehicles were also measured.



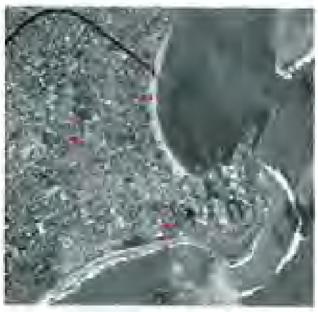
Results of the air quality survey

- Concentrations of NO_2 and SO_2 were low at all sites.
- PM_{10} concentration (24h-average) at St. A were significantly higher than St. B and C, exceeding World Bank guideline value (70 μg/m³) for all days.
- The main source of PM_{10} at St. A is probably exhaust gas from road vehicles, as a strong correlation was observed between traffic volume and PM_{10} concentration.
- PM_{10} at St. A was high also probably due to the significantly higher volume of large-vehicle traffic compared to the other sites.
- **Air quality improvement measures should be implemented in the future to minimize pollution, in particular around the access road.**



Method of the noise survey

- Noise level was measured at the same 3 sites (St. A, B and C) as the air quality survey from March 7-10, 2009.
- Noise level was measured for 24 hours (15 min./hr) at each site but at different dates.
- Traffic volume of large and small vehicles were also measured.



Results of the noise survey

Survey date		Equivalent noise level (dBA)	
		Daytime (07:00-22:00)	Nighttime (22:00-07:00)
St. A	[illegible]	71.2	54.8
St. B	[illegible]	[illegible]	[illegible]
St. C	[illegible]	[illegible]	[illegible]
World Bank guideline value (industrial area)		70.0	70.0
World Bank guideline value (residential area)		55.0	45.0

- During daytime, average noise level was highest at St. A (71.2 dBA); exceeding World Bank guideline value for industrial area (70.0 dBA).
- The main noise source at St. A is probably small and large vehicles, because noise levels at St. A corresponded well with traffic volume (i.e. low traffic volume = low noise level).
- Noise sources of St. B and C were more varied (e.g. small vehicles, port activities, city activities, beach festival)

Method of the water quality survey

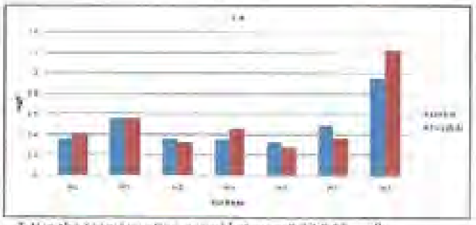
- Water quality survey was conducted at 7 sites (1 site at the mouth of Pangalanes canal) on March 15, 2009.
- The following parameters were measured as pollution indicators :

Parameter	Indication
Turbidity	General water quality
Total suspended solids (TSS)	General water quality
Total nitrogen (T-N)	Nutrient enrichment
Total phosphorus (T-P)	Nutrient enrichment
Coliform bacteria	Bathing safety
n-hexane extraction substances	Oil pollution

Results of the water quality survey

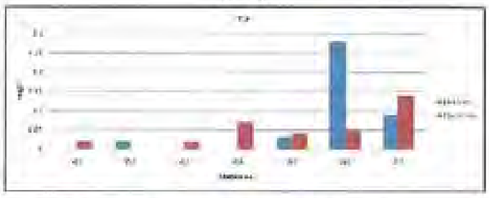
- Concentrations of the following parameters were high:
  - ✓ T-N and T-P
  - ✓ Coliform bacteria
  - ✓ n-hexane extraction substances

Results of the water quality survey (T-N)



- T-N in the Toamasina Bay ranged between 0.27-0.55 mg/l.
- Sea areas with healthy coral reefs usually have lower concentrations of T-N (e.g. <0.1 mg/l).
- The main source of T-N is probably the Pangalanes canal as indicated by the very high levels.

Results of the water quality survey (T-P)



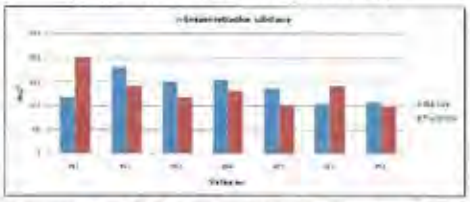
- T-P in the Toamasina Bay ranged between <0.02-0.07 mg/l.
- Sea areas with healthy coral reefs usually have much lower concentrations of T-P (e.g. <0.01 mg/l).
- The main source of T-N and T-P are probably the Pangalanes canal and port factories.

Results of the water quality survey (Coliform bacteria)

		W1	W2	W3	W4	W5	W6	W7
Ebb tide	MPN	<10	<10	1,067	10	<10	109	9,804
Flood tide	MPN	<10	1,592	258	428	703	209	10,111

- Levels of Coliform bacteria exceeded EU's standard for safe bathing water (>500 MPN) at St. W2, W3, W5 and W7.
- The main source of Coliform bacteria is probably the Pangalanes canal as indicated by the very high levels.

Results of the water quality survey (n-hexane extraction substance)



- Concentrations of n-hexane extraction substances (indicator of oil pollution) were high at all sites.
- The main sources of oil pollution are probably the Pangalanes canal, port factories, and leakages from port/shipping activities.

Results of the water quality survey

- In conclusion, the main water pollution sources of Toamasina Bay are probably the Pangalanes canal, port factories and port/shipping activities.
- The water quality of Toamasina Bay could further deteriorate through the extension of the breakwater.
- Therefore, water quality improvement measures should be implemented in the future by various entities to minimize further pollution of Toamasina Bay.

Method of the sediment quality survey

- Sediment quality was measured at 3 sites on March 15, 2009.
- The following parameters were measured as pollution indicators:

Parameter	Indication
Total nitrogen (T-N)	Nutrient enrichment
Total phosphorus (T-P)	Nutrient enrichment
Total sulphur (T-S)	Anaerobic environment
Heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn)	Contamination

Results of the sediment quality survey

Parameter	Unit	Screening level*	Max. level*	St. S1	St. S2	St. S3
Arsenic (As)	mg/kg	20	70	22.6	24.1	23
Cadmium (Cd)	mg/kg	1.5	10	<0.1	<0.1	<0.1
Chromium (Cr)	mg/kg	80	370	87	91	87
Copper (Cu)	mg/kg	65	270	20	24	15
Lead (Pb)	mg/kg	50	220	17	14	11
Nickel (Ni)	mg/kg	21	52	40	45	35
Zinc (Zn)	mg/kg	200	410	115	137	88

* Dredged material disposal, Code of Australia

- Concentrations of As, Cr and Ni were higher than the levels that are considered safe (i.e. screening level) for ocean disposal.
- Sediment quality survey by SOMEAH in 2007 also showed high levels of sediment contamination (e.g. heavy metals and PCBs) around the port.
- **To minimize the risk of contamination of marine organisms, the disposal method of dredged material must be carefully considered for this Project.**

Status of natural environment

The distribution of corals around Grand Reef and Point Hasti Reef were surveyed from March 15-19, 2009, mainly through diving surveys.

1. Status of pollution, and natural and social environment around Toamasina Port

Results of the coral survey

- High coral coverage on the reef flat and outer slope of Grand Reef.
- Coral coverage around Point Hasti Reef was generally lower compared to Grand Reef.
- Coral reef degradation (e.g. algae growth and coral damage/bleaching) was observed at some locations.
- **Further degradation of Grand Reef should be minimized, as the reef most likely plays an important role in the regional ecosystem (e.g. providing habitats for various marine organisms).**

1. Status of pollution, and natural and social environment around Toamasina Port

Results of the coral survey

1. Status of pollution, and natural and social environment around Toamasina Port

Status of social environment (Toamasina I)

- **Population**

2001	2002	2003	2004	2005	2020
179,424	185,358	191,406	197,722	205,267	214,736

Source: Institut National De la Statistique and PLAN D'URBANISME DIRECTEUR (2003)

- **Employment**

Unemployment rate of male and female in year 2000 was 7.1% and 10.1%, respectively (PUDi (2003)).

1. Status of pollution, and natural and social environment around Toamasina Port

Status of social environment (Toamasina I)

- **Economic activities**

Type of activity	No. of establishments
Primary sector	128
Industrial sector	1,126
Food industry	179
Textile & leather	132
Wood industry	156
Steel & metal	414
Other industries	225
Construction sector	895
Commercial sector	[illegible]
Wholesale trade	[illegible]
Retail trade	[illegible]
Service sector	[illegible]
Transport & telecommunication	[illegible]
Hotel & restaurant	[illegible]
Other services	[illegible]
Total	[illegible]

Source: Institut National De la Statistique

1. Status of pollution, and natural and social environment around Toamasina Port

Status of social environment (Toamasina I)

- **Fisheries**

Type	Entity	Fishing method	Boat type	Use of reef pass
Large scale commercial fisheries	Refrigepeche-est	Trawling (coastal area)	6 boats (25-28m)	No
		Handline (coastal area)	5 boats (12-14m)	Yes
		Longline (deep sea)	2 boats	No
Small scale commercial fisheries	Tazara ste.	Handline (coastal area)	Motorized and outboard type	Yes
Traditional fisheries	Local fishermen	Gill net, handline (inshore area)	Canoe	Yes

2. Potential environmental impacts of the Project and proposed countermeasures

Main environmental factors that will be affected from the Project

Construction phase	Operation phase
Water quality	Water quality
Air quality	Air quality
Noise	Noise
Waste	Beach topography
Ecosystem	Ecosystem
Fisheries	Fisheries
Public Health	Risk of accidents
Risk of accidents	

2. Potential environmental impacts and proposed countermeasures

Impact on water quality (construction phase)

Potential impact	Countermeasure
Degradation of water quality (e.g. increase in turbidity, dispersion of sediments, re-suspension of contaminated sediments) through dredging and landfill works of Mole C4.	• Landfill works will commence after most of the revetment works are completed. • Dredger will be equipped with silt screens. • Construction bidders will be required to propose countermeasures against sediment dispersion and will be one of the important criteria for Contractor selection. • Implementation of water quality reactive monitoring program (e.g. slowing/stopping of dredging when high turbidity levels are recorded)

2. Potential environmental impacts and proposed countermeasures

Impact on water quality (construction phase)

Dredger with silt screen

Example of landfill method to minimize sediment dispersion

2. Potential environmental impacts and proposed countermeasures

Impact on water quality (operation phase)

Potential impact	Countermeasure
Further degradation of the bay's water quality through extension of the breakwater (e.g. reduction of water exchange) and increase in port activities.	To minimize pollution from port activities, SPAT will consider/implement the following measures: • Prohibition of ship wastewater discharge (e.g. bilge water, sewage water, ballast water) inside and near the port. • Installation of oily wastewater treatment facility (oil/water separator) in the port. • Improvement of the port sewage system. • Installation of sedimentation ponds (e.g. Mole C4 and bulk storage areas). • Enforcement of port factories to comply with international wastewater discharge standards. • Regular environmental monitoring (e.g. water quality, coral). • Cooperation with the local authorities to improve the water quality of Pengalanes Canal.

2. Potential environmental impacts and proposed countermeasures

Impact on air quality (construction phase)

Potential impact	Countermeasure
Degradation of air quality outside the port area (e.g. access road) through movement of construction vehicles.	• Low-emission construction vehicles will be used as far as possible. • Dump trucks will be covered with a sheet cover. • Unnecessary engine idling will be prohibited. • Whenever possible, movement of construction vehicles will be scheduled to avoid periods of traffic congestion (e.g. during peak cargo vehicle movement).

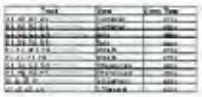
2. Potential environmental impacts and proposed countermeasures

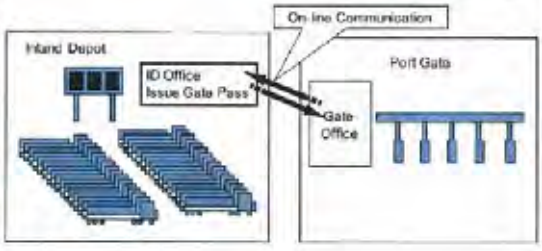
Impact on air quality (operation phase)

Potential impact	Countermeasure
Degradation of air quality outside the port area (e.g. access road) through increase in cargo vehicles and port activities.	To minimize air pollution from port activities, SPAT will consider/implement the following measures: • Prohibition of unnecessary engine idling. • Encouragement of truck owners (e.g. provision of subsidies) to renew or upgrade to low-emission vehicles. • Gradual upgrade of port vehicles (e.g. cargo handling vehicles) to low-emission vehicles. • Encouragement of bulk exporters (e.g. woodchip, chromite) to use railway transport. • Establishment of a traffic management system (e.g. control of cargo vehicle movement) to reduce traffic congestion along the access road.

2. Potential environmental impacts and proposed countermeasures

Concept diagram of traffic management system





2. Potential environmental impacts and proposed countermeasures

Impact on noise (construction phase)

Potential impact	Countermeasure
Increase in noise levels outside the port area (e.g. access road) through movement of construction vehicles and pile driving works.	• Low-noise construction vehicles will be used as far as possible. • Pile driving works will be conducted with low-noise pile driver (e.g. hydraulic pile driver)

2. Potential environmental impacts and proposed countermeasures

Impact on noise (operation phase)

Potential impact	Countermeasure
Increase in noise levels outside the port area (e.g. access road) through increase in cargo vehicles and port activities.	To minimize noise from port activities, SPAT will consider/implement the following measures: • Encouragement of truck owners (e.g. provision of subsidies) to use low-noise vehicles. • Gradual upgrade of port vehicles (e.g. cargo-handling vehicles) to low-noise vehicles.

2. Potential environmental impacts and proposed countermeasures

Impact on beach topography (operation phase)

Potential impact	Countermeasure
Possible enhancement of beach erosion/accumulation due to the extension of the breakwater. 	• SPAT will regularly monitor/study the erosion/accumulation process of the beaches north of the port. • If unacceptable levels of beach erosion/ accumulation are observed, SPAT will cooperate with the local authorities to develop and implement countermeasures.

2. Potential environmental impacts and proposed countermeasures

Waste disposal (construction phase)

Potential impact	Countermeasure
Degradation of environment (e.g. water quality, ecosystem) through ocean dumping of dredge spoil.	• To avoid ocean disposal, all dredge spoil will be used as landfill material for either Mole C4 or Point Hasti reclamation area. • If dredge spoil is contaminated, all of it will be disposed and contained at the Point Hasti reclamation area.

2. Potential environmental impacts and proposed countermeasures

Waste disposal (construction phase)

Conceptual diagram of disposal method of contaminated dredge spoil

2. Potential environmental impacts and proposed countermeasures

Impact on ecosystem (construction phase)

Potential impact	Countermeasure
Direct loss of corals and other benthic organisms through dredging, landfill and breakwater construction.	• Armour blocks that enhance coral attachment will be used. 
Possible reduction of corals of Grand Reef through increase in turbidity and sedimentation during landfill and dredging works.	• Implementation of measures to minimize sediment dispersion. • Dredging and landfill works will be stopped (e.g. 2-3 days) when mass coral spawning are observed. • Implementation of reactive coral monitoring (e.g. construction methods will be reevaluated if excess sedimentation or coral stress is observed).

2. Potential environmental impacts and proposed countermeasures

Impact on ecosystem (operation phase)

Potential impact	Countermeasure
Possible reduction of corals of Grand Reef through further degradation of the Bay's water quality.	• SPAT will minimize pollution from port activities as described in the 'Water quality' section.

2. Potential environmental impacts and proposed countermeasures

Impact on fisheries (construction phase)

Potential impact	Countermeasure
Possible distraction to local fishing activities through marine construction works (e.g. increase in travelling time to fishing ground due to temporary prohibition of reef passage use).	• SPAT will keep close contact with the local fishermen, and if necessary, negotiate with the affected fishermen.

2. Potential environmental impacts and proposed countermeasures

Impact on fisheries (operation phase)

Potential impact	Countermeasure
Possible distraction to local fishing activities through the extended breakwater (e.g. too dangerous to use the reef pass)	• SPAT will keep close contact with the local fishermen, and if necessary, negotiate with the affected fishermen.

2. Potential environmental impacts and proposed countermeasures

Impact on public health (construction phase)

Potential impact	Countermeasure
Introduction of communicable diseases (e.g. HIV/AIDS) through influx of construction workers.	• Pre-health checks will be implemented against all construction workers. Construction workers diagnosed with communicable diseases will not be employed.

2. Potential environmental impacts and proposed countermeasures

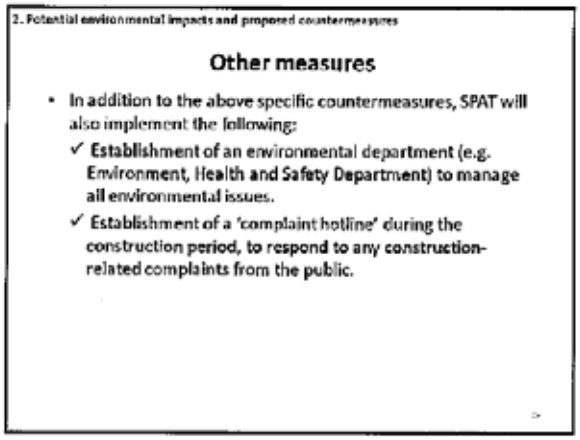
Risk of accidents (construction phase)

Potential impact	Countermeasure
Risk of collision between construction vessels and other vessels (e.g. container ships, tug boats, fishing boats)	• SPAT will prepare a 'Collision Prevention Plan', which may include: ✓Clear indication of construction zone. ✓Notification of ship captains and fishermen of danger zones; ✓ Evacuation of construction vessels before arrival/departure of shipping vessels. • SPAT will establish 'Contingency Plan' for all possible accident scenarios (e.g. oil spill response plan, human rescue plan)
Higher risks of road accidents through increase in construction vehicles.	• SPAT will set speed limits (e.g. 40 km/h) against the construction and cargo vehicles when travelling along the access road.

2. Potential environmental impacts and proposed countermeasures

Risk of accidents (operation phase)

Potential impact	Countermeasure
Higher risks of shipping accidents through increase in shipping vessels and port activities.	• SPAT will prepare 'Collision Prevention Plan'. • SPAT will establish 'Contingency Plan' for all possible accident scenarios (e.g. oil spill response plan, human rescue plan).
Higher risks of road accidents through increase in cargo vehicle traffic.	• SPAT will set speed limits (e.g. 40 km/h) against the cargo vehicles when travelling along the access road.


2. Potential environmental impacts and proposed countermeasures
Other measures
• In addition to the above specific countermeasures, SPAT will also implement the following:
✓ Establishment of an environmental department (e.g. Environment, Health and Safety Department) to manage all environmental issues.
✓ Establishment of a 'complaint hotline' during the construction period, to respond to any construction-related complaints from the public.

3rd Stakeholder Meeting of
Toamasina Port Development Project

Environmental Topics

SPAT
JICA Study Team

October 30th, 2009

Main topics

1. Main results of the environmental impact assessment, focusing in particular on:
   - Impact on air quality
   - Impact on coastal current
   - Impact on water quality
   - Impact on coastal topography
   - Impact on marine fauna/fishery resources
   - Disposal method of contaminated dredge spoil

Impact on air quality

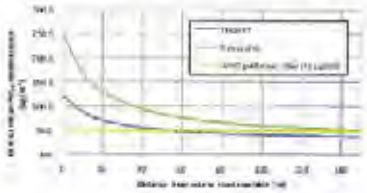
- The air quality around the access road could further deteriorate with the expected increase in cargo-vehicle traffic.

- Projected traffic volume in 2020.

Vehicle type		Traffic volume/day (2009)	Traffic volume/day (2020)
Cargo vehicle	Container trucks	387	1,290
	General cargo trucks	384	847
Cargo vehicle total		770	2,778
Small vehicle total		4,196	8,435
Cargo and small vehicle total		4,966	11,213

Impact on air quality

- The future air quality (PM_{10}) around the access road was predicted based on the projected traffic volume.



Impact on air quality

Results:

- PM_{10} concentration will almost double at the access road.
- However, PM_{10} concentration will rapidly decrease with distance.
- Impact will be negligible after around 100-150 m.
- Still, people that live near the access road could be affected.
- The main reason is probably because many of the trucks are old and not well maintained.

Impact on air quality

Countermeasures:

- Upgrade or renewal of trucks to low emission trucks should improve the situation dramatically.

- The establishment of the inland depot will also improve the situation by alleviating traffic congestion.

Impact on air quality

Countermeasures:

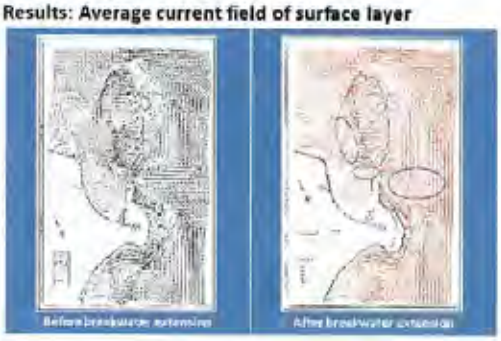
- Location of the inland depot

Impact on coastal current

- The breakwater extension could alter the current field around Toamasina Port.
- The present and future current field was predicted through hydrodynamic simulation model.

Impact on coastal current

Results: Average current field of surface layer



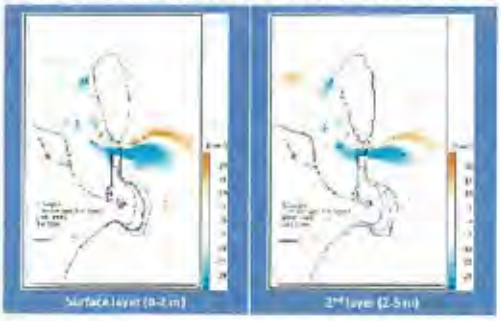
Impact on coastal current

Conclusion:

- The current direction inside the bay will change significantly; most of the surface water will no longer flow out to the open ocean through the reef passage. Hence, the eastward flow outside the reef passage will disappear.
- The direction of the surface current west of Grand Reef completely will reverse from a southward flow to a northward flow.

Impact on coastal current

Results: Change in current speed after breakwater extension



Impact on coastal current

Conclusion:

- Surface current speed will decrease significantly around the new Mole C4 (maximum decrease of -40 cm/s) and outside of the reef passage (maximum decrease of -50 cm/s).
- A moderate decrease in surface current speed (maximum decrease of -20 cm/s) will occur also along the west side of Grand Reef.
- More areas will experience water stagnation, which may have adverse impacts on water quality.

Impact on water quality

- The breakwater extension could have adverse impacts on water quality, as it will alter the present current field around Toamasina Port.
- The present and future water quality was predicted through water quality simulation model.

Impact on water quality

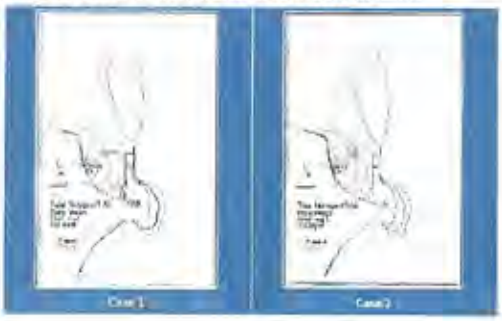
- The present and future water quality was predicted by using total nitrogen (T-N) as an indicator of pollution (nutrient enrichment).
- The source of T-N was assumed to be only from Panganales Canal.
- The simulation was conducted for 2 cases:

  Case 1 T-N load from Panganales Canal: same as present level

  Case 2 T-N load from Panganales Canal: 1.5 times from present level

Impact on water quality

Results: T-N concentration after breakwater extension



Impact on water quality

Results: Differences in T-N concentration before and after breakwater extension

Impact on water quality

Conclusion:

- The breakwater extension alone (Case 1) will result in only a very minor elevation in T-N concentration, and will be limited within the vicinity of the mouth of Panganales Canal and inner bay area.
- If T-N load from the Panganales Canal increases (Case 2), more areas will experience higher T-N concentration, but the degree of elevation will still be relatively small (in the order of 10^{-2} mg/l).
- Overall, nutrient elevation in the bay will remain within minor levels.
- However, as a precaution, water quality monitoring should be conducted regularly.

Impact on coastal topography

- The breakwater extension could enhance beach erosion/accretion around Toamasina Bay.
- The future shoreline was predicted through numerical simulation model with the following cases:

  Case 1 No breakwater extension

  Case 2 Breakwater extension: 345 m
- The effectiveness of countermeasures were also predicted with the following cases:

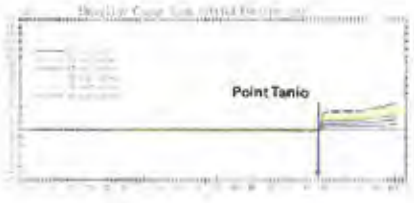
  Countermeasure 1 Construction of groyne at Point Tanio

  Countermeasure 2 Construction of L-type groyne at Point Tanio

  Countermeasure 3 Construction of L-type groyne at Point Tanio and 2 jetties inside the port beach

Impact on coastal topography

Results: Shoreline change with no breakwater extension (Case 1)

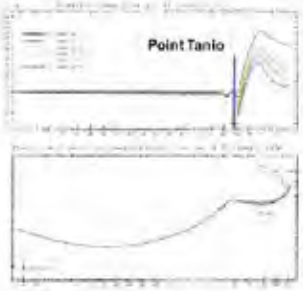


Impact on coastal topography

Results: Shoreline change with no breakwater extension (Case 1)

Impact on coastal topography

Results: Shoreline change with breakwater extension (Case 2)

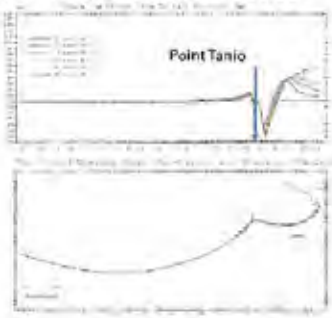


Impact on coastal topography

Results: Shoreline change with breakwater extension (Case 2)

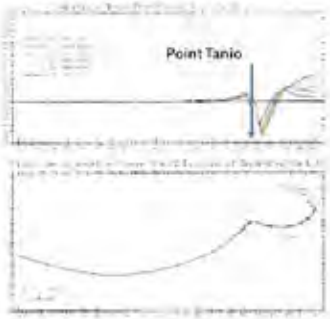
Impact on coastal topography

Results: Shoreline change with Countermeasure 1



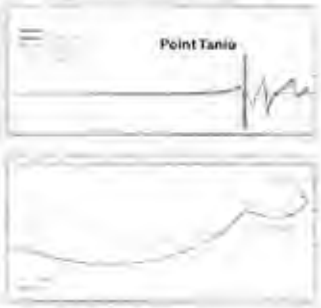
Impact on coastal topography

Results: Shoreline change with Countermeasure 2



Impact on coastal topography

Results: Shoreline change with Countermeasure 3



Impact on coastal topography

Conclusion:

- The breakwater extension will significantly enhance beach erosion/accretion.
- Erosion will occur immediately north and south of Point Tanio, especially significant in the south.
- Beach accretion will be most significant in the central part of the port beach, and to a lesser extent near the port.
- Countermeasure 1 and 2: beach accretion will be reduced but there will be an enhanced beach erosion south of Point Tanio. Beach north of Point Tanio will experience beach accretion.
- Countermeasure 3: there will still be beach erosion/accretion, but the degree of beach erosion/accretion will be relatively small. The beach will then stabilize after around 5 years.

Impact on marine fauna/fishery resources

- Marine construction works such as dredging and pile-driving works could have adverse impacts on marine fauna.
  Dredging impacts: Dispersion of sediments
  Pile-driving: Loud underwater noise

Impact on marine fauna/fishery resources

- According to desk-top studies and sediment dispersion simulation, impact on marine fauna will generally be limited within proximity of the construction sites, which will not overlap with any major fishing ground.
- However, there are many uncertainties, as tolerance to these impacts are species-specific and also depend on life stage.
- Therefore, SPAI will hold regular meetings with the local fishermen to monitor any impacts on fishing activities.

Impact of contaminated dredge spoil

- The dredging sites around Mole C may be contaminated by pollutants such as heavy metals and PCBs.
- Contaminated dredge spoil must be disposed in a manner to minimize impact on the environment.
- Therefore all contaminated dredge spoil will be contained inside a sealed concrete tank, which will be built at the new container yard.

Impact of contaminated dredge spoil (disposal method)