DRR Mission Report
SÉNÉGAL Coastal Breach Saint Louis
« Brèche de Barbarie »

12 December 2014
Final Report DRR Mission
Version 2

DRR TEAM
ST. LOUIS - SÉNÉGAL

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1 SUMMARY

1.1 Introduction

Senegal is facing serious coastal erosion, aggravated by the digging in 2002 of an artificial discharge of the river Senegal just south of the city of Saint-Louis. This initial discharge canal of some 5 m wide has now grown end 2014 into an opening of some 4,5 km wide and has thus led to a large Coastal Breach leading to erosion processes having a large impact on the environment. A long and growing strip of former river bank is now threatened directly by the heavy surf of the ocean, houses and cemeteries being destroyed. Senegal has requested the Dutch Risk Reduction Team (DRR-Team) to advise on this situation.

An official request from the Ministère de l'Environnement et du Développement Durable of the Republic of Senegal was sent to the Dutch Government on 28 of February 2014, to advise on managing the critical situation of the coastal zone close to the city of Saint-Louis. The Senegalese government ordered a stand-still of all measures to cope with the impacts of the Coastal Breach, pending the DRR mission. The DRR field mission to Senegal took place from 8/11/2014 to 14/11/2014.

1.2 Approach during the mission

The DRR mission visited various stakeholders such as the Ministère de l'Environnement et du Développement Durable, the Municipality of Saint-Louis, the University of Saint-Louis (Department of Geography) etc. Together with World Bank team members possibilities are explored to coordinate a joint study related to the coastal projects and the connection with the coastal problems around Saint-Louis, which the World Bank and the Government of Senegal (through the GEF funding) are financing.
The embassy assisted in planning of the total agenda, assisted and joined the total mission.

1.3 Main results

The DRR field mission led to the experts formulation short, medium and long term actions related to the Coastal Breach of Saint Louis, Senegal.

The short term actions are related to procurement of equipment are related to: reducing the risks of the fisherman using the breach, monitoring of high risk locations and collecting of data (see chapter 5.2)

The medium and long term actions are related to starting an Integral study of the coastal breach with numerical modelling, evaluations of options and recommendations. This integral study will lead to the best actions / measures for the fisherman and the coastal protection.

1.4 Financing

The various short, medium and long term actions and the need to Technical Assistance require funds. These funds and the financing approach was discussed with the International Financing Agencies. Possibly World Bank and EU financing could be used.

1.5 Way forward

A second mission is strongly advised to follow-up on the following elements:

- Help World Bank and EU to structure and focus their efforts in programs resolving the issues at hand for the Coastal Breach of Saint Louis
- Interact with the EU as to the best approach to spend the 1 ME before 1 September 2015 on useful element for the coastal breach.
- The Embassy should follow-up their interactions with the Senegalese government as to the organization required
- Interact with the Senegalese Government, WB and EU as to the "Technical Assistance Approach" throughout the total project of the Coastal Breach of Saint Louis in Senegal.

In order for the actions to be effective this second mission should start as soon as possible.

2 INTRODUCTION

2.1 Introduction

Senegal is facing serious coastal erosion, aggravated by the digging in 2002 of an artificial outlet of the river Senegal just south of the city of Saint-Louis. This initial discharge canal of some 5 m wide has now grown end 2014 into an opening of some 4,5 km wide and has thus led to a large coastal erosion by the sea having a large impact on the environment. A long and growing strip of former river bank is now threatened directly by the heavy surf of the ocean, houses and cemeteries being destroyed. Senegal has requested the Dutch Risk Reduction Team (DRR-Team) to advise on this situation.
An official request from the Ministère de l'Environnement et du Développement Durable of the Republic of Senegal was sent to the Dutch Government on 28 of February 2014, to advise on managing the critical situation of the coastal zone close to the city of Saint-Louis. The DRR field mission to Senegal took place from 8/11/2014 to 14/11/2014.

2.2 Scope of Work

The scoping mission will advise the government of Senegal about sustainable coastal defense measures and/or approaches, specifically around Saint Louis. Main topics are:

- Protect the town of Saint-Louis and the villages downstream from flooding;
- Avoid further degradation of the Langue de Barbarie and the river banks;
- Restore the livelihoods of the riverine people.

2.3 Approach

The DRR mission visited various stakeholders such as the Ministère de l'Environnement et du Développement Durable, the Municipality of Saint-Louis, the University of Saint-Louis (Department of Geography) and the inhabitants of the directly threatened villages. Together with World Bank team members possibilities are explored to coordinate a joint study related to the coastal projects and the connection with the coastal problems around Saint-Louis, which the World Bank and the Government of Senegal (through the GEF funding) are financing.
The embassy assisted in planning of the total agenda, assisted and joined the total mission.

2.4 Objectives

The objectives of the scoping mission are:

- Investigate with the government what the possibilities are to take urgent measures to mitigate the coastal problems around Saint-Louis taking into consideration already existing documents and approaches including results from the " Economic and spatial study of the vulnerability and adaptation to Climate change of coastal areas in Senegal" jointly led by the Senegalese Environment Directorate and the World Bank (July 2013);
- Suggest sustainable strategies towards coastal management solutions. Explore which other relevant Ministries, Municipalities and Academics should be involved in long term planning options for a possible coastal management plan and possible infrastructural measures;
- Assess all previous studies and action plans related to the Senegal estuary and to coastal erosion along Senegalese coasts;
- Provide advice on the finance options on the solutions for the Senegalese government.

3 BACKGROUND

3.1 Background Brèche de Saint-Louis

The river Senegal ends in an estuary near the city of Saint-Louis. Saint-Louis is the capital of the region Saint-Louis, located in the north of Senegal near the border with Mauritania. In 2003 exceptional rains have been registered in the Sahel zone and in Guinea leading to considerably high water levels in the river Senegal. To prevent the Diama dam, just upstream form Saint-Louis, from collapsing, it was opened widely, provoking inundation of the lower, recently build, areas of Saint-Louis.

This made the Senegal Government to decide to dig an artificial outlet through the narrow (200 - 400 m) strip of dunes that separates the river from the ocean over a distance of nearly 20 km before its estuary. The small opening quickly eroded and became a large opening (now in November 2014 about 4.5 km) which is moving gradually to the south. This had large impact on the environment, through salt intrusion in an area where before fresh river water was used for vegetable gardening. A long and growing strip of former river bank is now threatened directly by the heavy surf of the ocean, houses and cemeteries being destroyed.

Context Saint-Louis
Three characteristics give Saint-Louis its distinctive geographic appearance: the Sahel, the marshes and the Langue de Barbarie. The heart of the old colonial city is located on a narrow island (just over 2 km long and about 400 m wide) in the Senegal River, 25 km from its mouth. At this point the river is separated from the Atlantic Ocean to the west by a narrow sand spit, the Langue de Barbarie (300 m wide), which has also been urbanized (the seaside neighborhoods of Ndar Tout and Guet Ndar). A third part of the city, Sor, lies on the eastern mainland and is nearly surrounded by tidal marshes.
The Langue de Barbarie is a 40 km long stretch of sand with a width varying from 200 to 400 meter that separates the lower Senegal River from the Atlantic Ocean. Its vegetation mainly consists of Filao trees, propagated to prevent soil erosion in sandy and salty soils. However, nowadays dunes and vegetation are disappearing due to erosion and salinisation (especially in the southern area). The area is a very important nature reserve with the Parc national des Oiseaux du Djoudj, parc national de la langue de Barbarie, special fauna reserve Gueumbeul and the main area protecting Saint-louis.
Rising sea levels, as well as water levels flowing out of the Senegal River now threaten the low lying islands which make up the city. In June 2008, Alioune Badiane of the United Nations' UN-Habitat agency designated Saint-Louis as "the city most threatened by rising sea levels in the whole of Africa", citing climate change and a failed 2004 river and tidal canal project as the cause.
The River Senegal is managed by the OMVS (Organisation pour la mise en Valeur de fleuve Sénégal), created in 1972 by Mali, Mauritania, and Senegal. Guinea joined the OMVS in 2006. The OMVS also manages the dams in the river (Manantali, Félou, Diama). Electricity is provided to Mali, Mauritania and Senegal.

3.2 Arial pictures of evolvement Brèche de Saint-Louis

An impression of the evolvement of the Brèche de Saint-Louis from 2003 to end 2014 is given in the pictures below. The some 5 m cut in 2003 now grew to some 4,5 km in November 2014.

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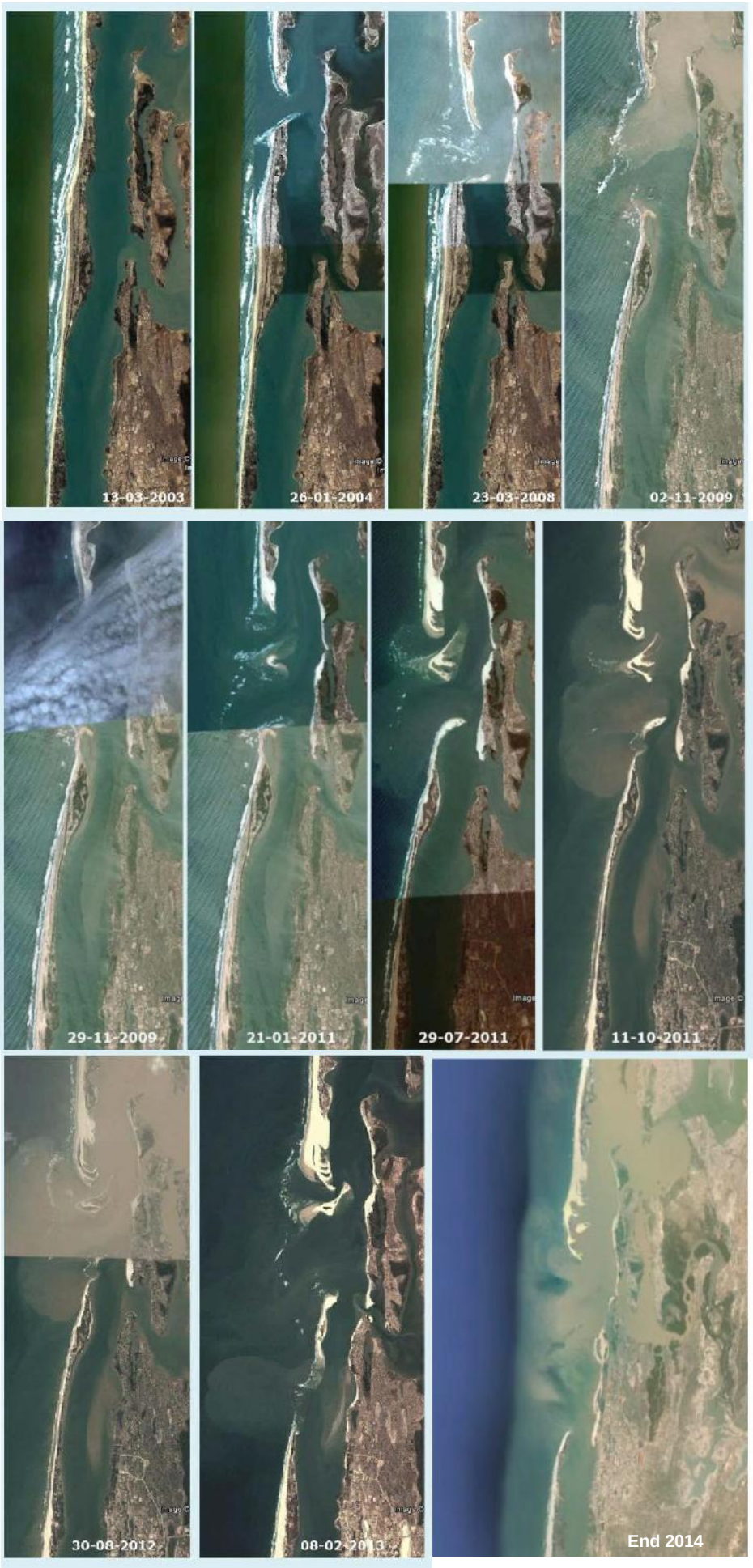

13-03-2003
26-01-2004
23-03-2008
02-11-2009
29-11-2009
21-01-2011
29-07-2011
11-10-2011
30-08-2012
08-02-2013
End 2014

4 FIELD TRIP DRR MISSION

4.1 Introduction

Senegal is facing serious coastal erosion, aggravated by the digging in 2002 of an artificial discharge of the river Senegal just south of the city of Saint-Louis. This initial discharge canal of some 5 m wide has now grown end 2014 into an opening of some 4,5 km wide and has thus led to a large coastal erosion by the sea having a large impact on the environment (see the arial picture of chapter 3.2). A long and growing strip of former river bank is now threatened directly by the heavy surf of the ocean, houses and cemeteries being destroyed. Senegal has requested the Dutch Risk Reduction Team (DRR-Team) to advise on this situation.

An official request from the Ministère de l'Environnement et du Développement Durable of the Republic of Senegal was sent to the Dutch Government on 28 of February 2014, to advise on managing the critical situation of the coastal zone close to the city of Saint-Louis. The DRR field mission to Senegal took place from 8/11/2014 to 14/11/2014.

4.2 DRR mission experts

For the DRR mission of 8/11/2014 to 14/11/2014 the following experts went to Senegal:

Ben Reeskamp: Team leader and expert in integrated coastal and marine projects
Job Dronkers: Expert in coastal erosion, having a broad network in the Dutch water sector and experience in delta countries

4.3 Documents

A large number of documents were provided to and collected by the experts as a preparation in the weeks before the field trip of the mission. The documents provided and collected are:

1. EGIS report November 2012: « Etude économique et spatiale de la vulnérabilité et de l'adaptation des zones côtières aux changements climatiques au Sénégal »
2. Arcadis Report 2010: « Quelques Considérations sur les Conséquences de l'Eau et du Changement Climatique – St. Louis, Sénégal »
3. Study report of necessary actions after a flooding catastrophy – WB/UNDP/EU Report July 2014 :French Title « Le Relèvement et la Reconstruction à partir de 2009 - Etude de case pour le Cadre de relèvement post catastrophe »
4. Presentation Wetlands 25/09/2014: Urban Resilience and Green Infrastructure – Planning for a Sustainable City in St Louis.
5. Bathymetric map St Louis area 1977 (« Carte sédimento fonds marins Saint-Louis »)

4.4 Approach and agenda

4.4.1 Approach

The DRR mission visited various stakeholders such as the Ministère de l'Environnement et du Développement Durable, the Municipality of Saint-Louis, the University of Saint-Louis (Department of Geography) etc. Together with World Bank team members possibilities are explored to coordinate a joint study related to the coastal projects and the connection with

the coastal problems around Saint-Louis, which the World Bank and the Government of Senegal (through the GEF funding) are financing.

The embassy assisted in planning of the total agenda and joined the mission which took place from 8 November to 14 November 2014.

4.4.2 Agenda DRR mission

The agenda of the DRR mission is given in the table below.

Date	Heure	Évènement	Lieux	Contact
9 nov.		Arrivée des experts		
	10.30 – 11.30	Accueil des consultants à la résidence de l'ambassadeur	Résidence des Pays-Bas	
10 nov.				
	8.30 – 9.30	Rencontre avec équipe de développement rural de l'Union européenne	Délégation UE	Anne Simon
	10.00 – 11.00	Rencontre avec BEI et Ambassade de France	BEI	Isabelle Vangrunderbeeck
	11.30 – 12.30	AFD	AFD	Simon Gomis
	12.30 – 14.00	Lunch avec l'ANAM	Toukouleur	
	14.30 – 16.00	Réunion avec DEEC, CESE, Bachir Diouff et Alioune Kane (de l'université)	Ministère de l'environnement	Mariline Diara
	16.00	Réunion avec Ministre de l'Environnement	Ministère de l'environnement	Mariline Diara
11 nov.				
	9.00 – 10.00	Audience avec Ministre de l'hydraulique et de l'Assainissement qui est également le maire de Saint Louis	Ministère de l'hydraulique et de l'Assainissement	DC Ministre de l'Hydraulique et de l'assainissement
	10.00 – 11.00	Rencontre avec Wetlands	Ambassade des Pays-Bas	Ibrahima Thiam Yakhya Gueye
	11.30 – 12.30	Rencontre avec Banque Mondiale	Bureaux de la Banque	Isabelle Kane
	13.00 – 14.00	Lunch avec Oxfam	Terrou - bi	
	14.00	Départ pour Saint Louis		
	19.00	Visite au gouverneur de Saint Louis		Gouverneur
	20.00	Installation à l'hôtel		
12 nov.				
	9.00 – 11.00	Rencontre avec services	Université Gaston Berger	Recteur de l'UGB , Pr

		compétents de l'Université Gaston Berger	à Saint Louis	Boubou Aldiouma SY du Laboratoire Leïdi, Dr Da DIENG
	11.00 Pour toute la journée	-Départ sur le terrain -Visite en voiture d'un quartier de St-Louis (à déterminer) affecté par l'érosion sur la Langue de Barbarie -Visite en pirogue de :	-Village de Pilote-Barre -Village de Doun Baba Dièye (selon la pertinence et le temps) -brèche	Gouverneur, Préfet, Sous Préfet de Rao, maire de Ndièbène Gandiole, Parc National de la Langue de Barbarie, AMP de Saint-Louis, DREEC, ANAM, Hydraulique, Pêche…
13 nov.				
	9.00 – 13.00	Rencontre avec la société civile et les structures étatiques concernées		Gouverneur, Préfet, Sous Préfet de Rao, maire de la commune de Saint-Louis, maire de Ndièbène Gandiole, Bureau d'information des Parcs, PNLB, DREEC, ANAM, Hydraulique, Pêche, ASAN,IREF, AMP de Saint-Louis, GREEN, A.N.E.,CONGAD, ARD, Service régional de l'Aménagement du Territoire, Service régional de la Planification, Service régional d'Appui au Développement Local,
	13.00–14.00	Lunch (équipe restreinte)		
	14.30	Départ pour Dakar		
14 nov.				
	10 :00-12.00	Restitution mission	Résidence des Pays-Bas	
	12 : 00	lunch	Résidence des Pays-Bas	
14 - 15 nov.		Départ des experts		

4.5 Impressions DRR field trip

11/11/2014 Arrival in St Louis, Senegal

12/11/2014 Interactions at the University Gaston Berger

12/11/2014 Visit of coastal area threatened by the sea to the south of Saint Louis and interactions with the Press

12/11/2014 Damages at the town of Pilote-Bar and Mayor of Pilote-Bar

12/11/2014 Coastal area north of St Louis

13/11/2014 Interactions with Governor, Head Commissioner and civil servants of St Louis

14/11/2014 Presentation by experts of their findings and required actions
at the residency of the Ambassador in Dakar

5 FINDINGS, MEASURES AND RECOMMENDATIONS

5.1 Introduction

The mission resulted in the experts presenting their findings, measures and recommendations on 14/11/2014 at the residence of the ambassador of the Netherlands in Dakar.

The measures were split up in:

- Short term measures
- Medium term measures
- Long term measures

These measures are presented below.

For the total presentation of the findings, measures and recommendations reference is made to Annex A.

5.2 Sort Term Actions

The short term actions concern:

1. Actions related to the fisherman:
   Procurement of equipment – Survey and monitoring of the opening and aligning of buoys on channel that can be used by the fisherman – SMS of weather, tide info to the fisherman
2. Actions related to the high risk locations
   Continuous monitoring of the critical coastal locations. The installation of geo-tubes could be evaluated. Including the contracting time they would probably only be able to be installed at the earliest in May 2015 (start of the good weather period)
3. Actions related to the area of “Brèche de Barbarie”:
   Collection of data, definition of surveys. execution of activities and support. This will be the basis for the computer modeling and detailed integral study.

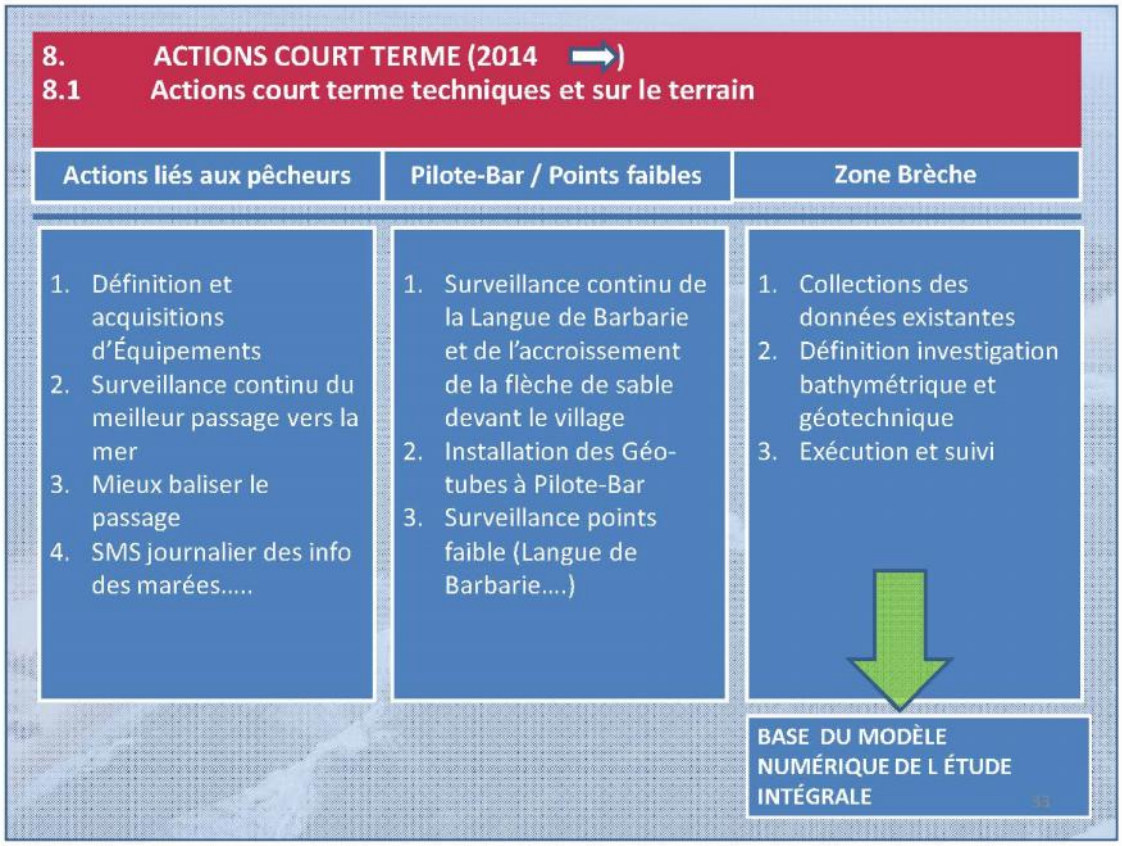


Figure 5.1: Short term actions in the field

Short term action related to the organization deal with the need to have one responsible project director who has been mandated by the president for this project. There is a lot of expertise in Senegal however for a number of subjects we see the need of special “technical assistance” throughout the project.
The view as to the organization is presented below.

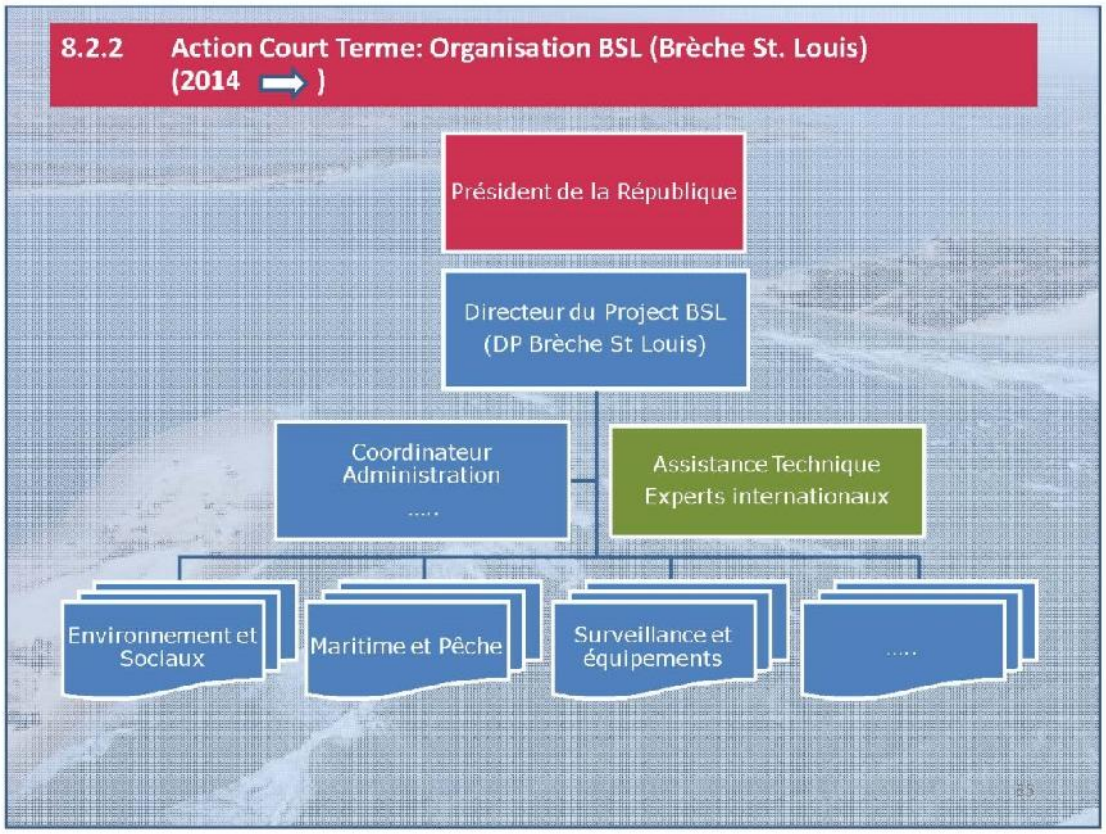


Figure 5.2: Short term actions related to organisation

5.3 Medium and Long Term Actions

The medium and long term actions concern:

1. The integral study of the “Brèche de Barbarie”:
   This part will contain a project definition phase – modeling of the coastal area – validation of the modeling – Integral study of alternatives- Evaluation and recommendations.
2. The integral study will lead to decisions as to the best options/way forward for the fisherman and as to the protection and measure to be taken

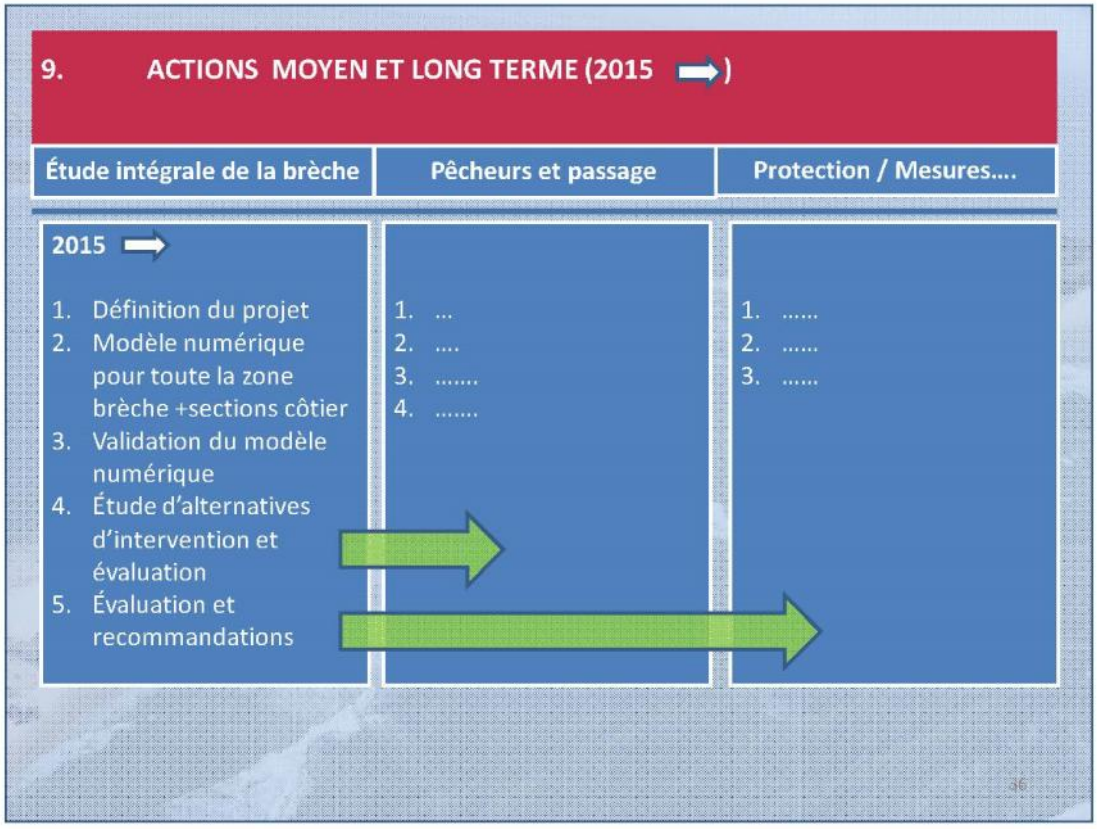


Figure 5.3: Medium and long term actions

5.4 Financing

The various short, medium and long term actions and the need to Technical Assistance require funds. These funds / the financing approach was discussed with the International Financing Agencies. Possibly World Bank and EU financing could be used.

We propose that this will also be subject of discussion in a next step of assistance of the government of Senegal.

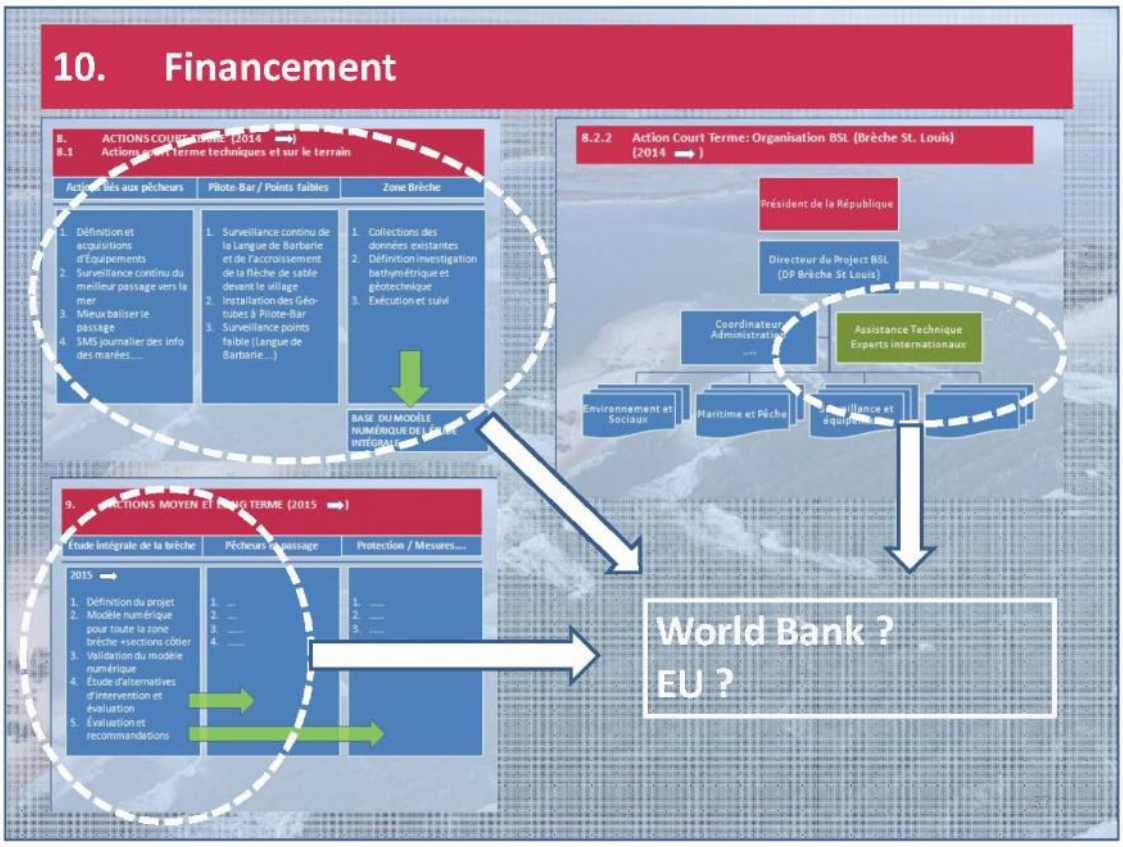


Figure 5.4: Financing

6 PROPOSED FOLLOW-UP ACTIVITIES

After the presentation of the experts on 14/11/2014 (see Annex A) the following actions were taken by the Senegalese government:

- The advisor of the President mentioned that a Guiding Comity will be created supported by the Prime Minister (Comité de Pilotage)
- The Word Bank mentioned they want to enclose a number of the actions into one of their coastal erosion projects
- The EU mentioned that until September 2015 they have 1 million Euro available that they want to spend on the Coastal Breach of Saint Louis.

Follow-up activities are strongly recommended and are related to the following elements:

- Help World Bank and EU to structure and focus their efforts in programs resolving the issues at hand for the Coastal Breach of Saint Louis
- Interact with the EU as to the best approach to spend the 1 ME before 1 September 2015 on useful element for the coastal breach.
- The Embassy should follow-up their interactions with the Senegalese government as to the organization required
- Interact with the Senegalese Government, WB and EU as to the “Technical Assistance Approach” throughout the total project of the Coastal Breach of Saint Louis

In order for the actions to be effective the second mission should start as soon as possible.

7 POTENTIAL PROSPECTS FOR THE DUTCH WATER SECTOR

The prospects for the Dutch Water Sector are related to:

1 The coastal erosion problems and thus the coastal protections measures
2 The flood protection works
3 Port design and construction works in the port of Dakar

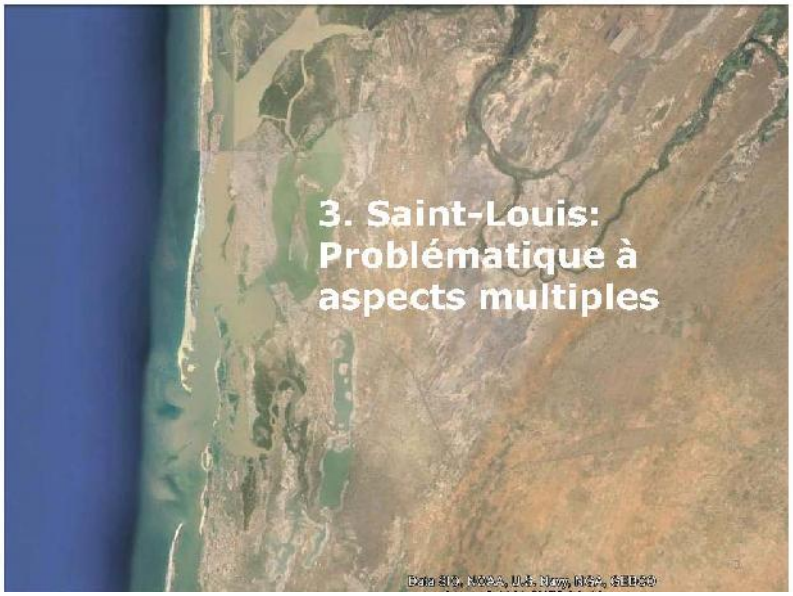
Some of the specific opportunities for the coastal Breach of Saint Louis are:

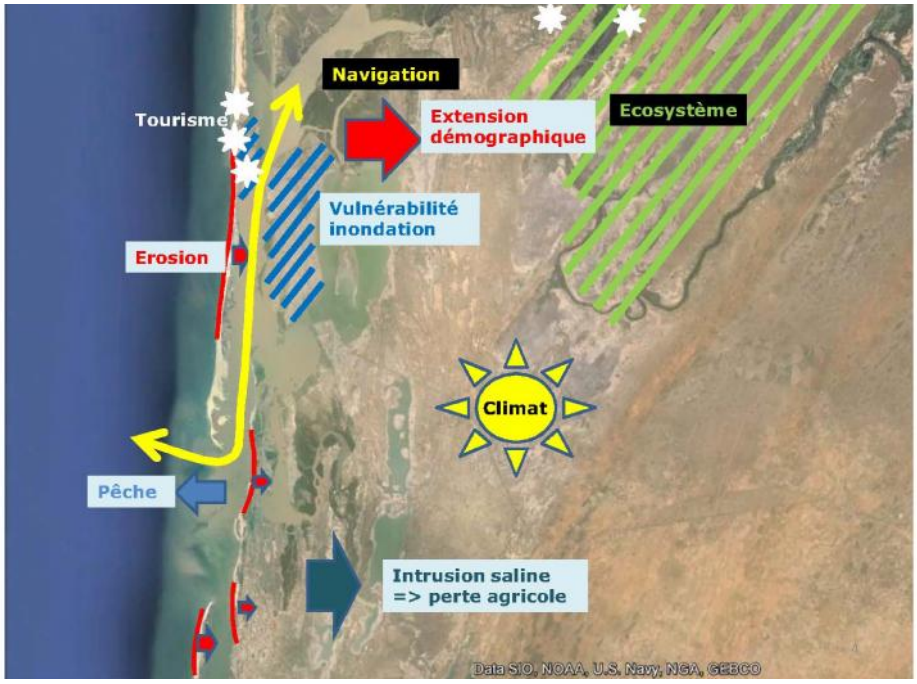
1.1 The investigations related to the coastal breach: bathymetry, topography and soil investigations
1.2 The Integral Study of the total projects (modelling, options, evaluations and recommendations)
1.3 Provide people for the “Technical Assistance” group in the various maritime, coastal and contracting fields required
1.4 Dredging Contractors and Maritime Contractors in the implementation phase of the works for the chosen solution for the Breach of Saint Louis.

For coastal erosion:

2.1 Assistance of the government in coastal erosion programs, studies etc throughout the country
2.2 Dredging Contractors and Maritime Contractors in the implementation phase of coastal protection works and or maintenance works.

ANNEX A: Presentation of findings, measures and recommendations

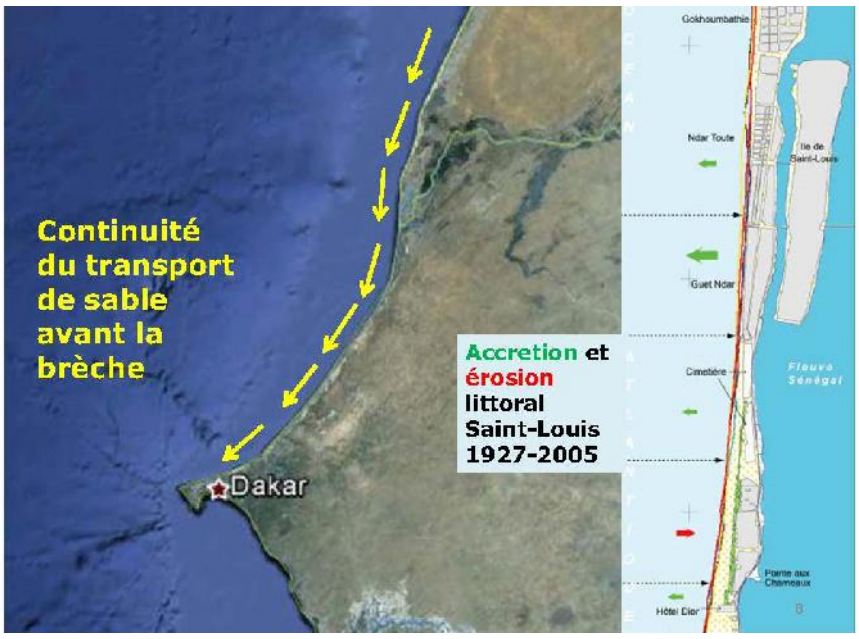



Navigation
Tourisme
Extension démographique
Ecosystème
Vulnérabilité inondation
Erosion
Climat
Pêche
Intrusion saline => perte agricole
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

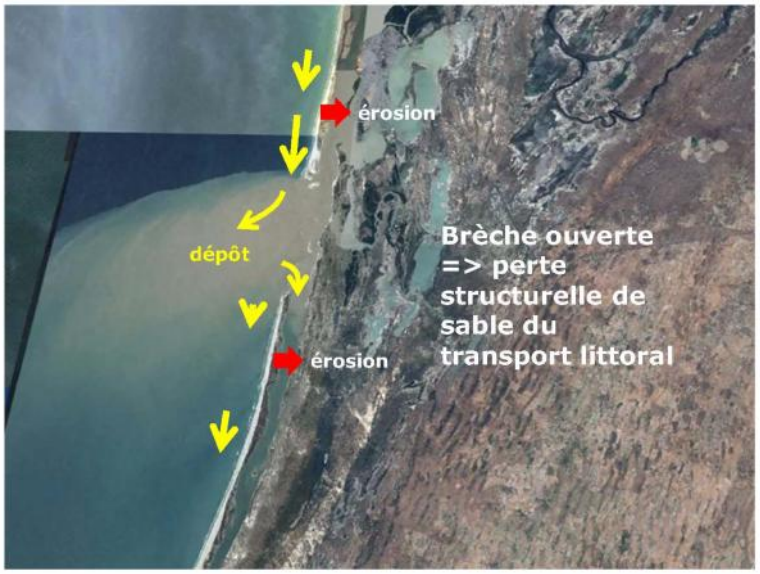

4. Impact de la brèche sur l'érosion côtière
5. Perspective long-terme
6. Actions effet à moyenne terme
7. Actions d'urgence


PRÉALABLES
Les recommandations sont basées en grande partie sur l'expérience de situations comparables ailleurs; l'expérience locale n'est pas encore pleinement intégrée.
Nous présentons des alternatives; le choix incombe aux responsables Sénégalais.
Une bonne compréhension de la dynamique du système est indispensable pour définir des solutions fiables
L'association étroite des experts et des acteurs Sénégalais au développement des solutions est essentiel pour garantir leur durabilité

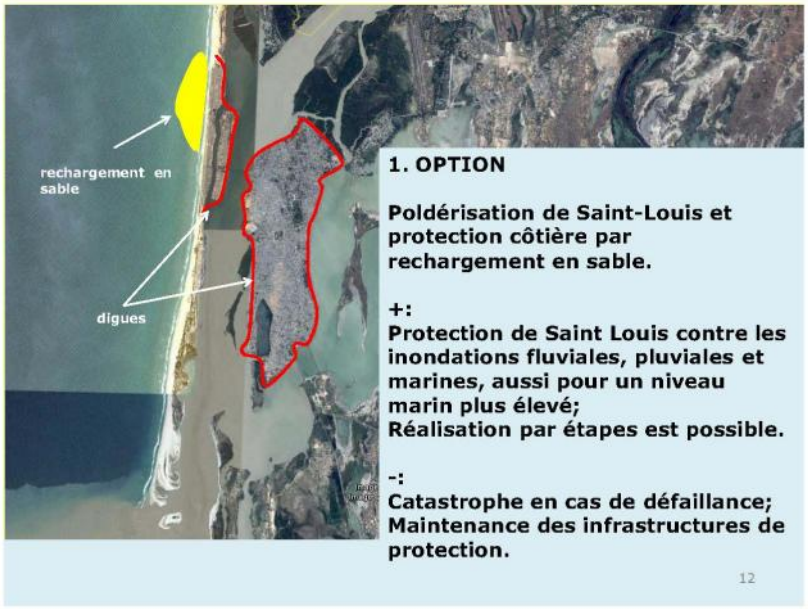

IMPACT DE LA BRÈCHE SUR
L'ÉROSION CÔTIÈRE

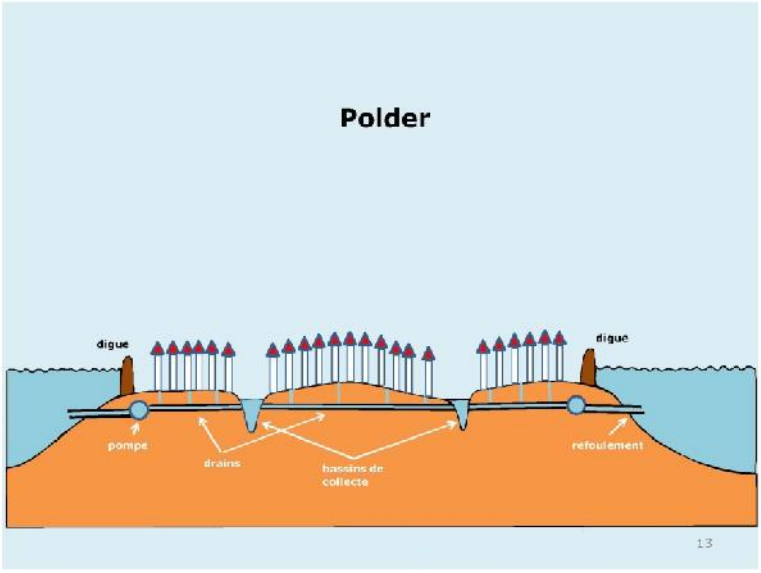

Continuité
du transport
de sable
avant la
brèche
Dakar
Accretion et
érosion
littoral
Saint-Louis
1927-2005
Gokhoumbathie
Ndar Toute
Ile de
Saint-Louis
Guet Ndar
Cimetière
Fleuve
Sénégal
Pointe aux
Chameaux
Hôtel Eior

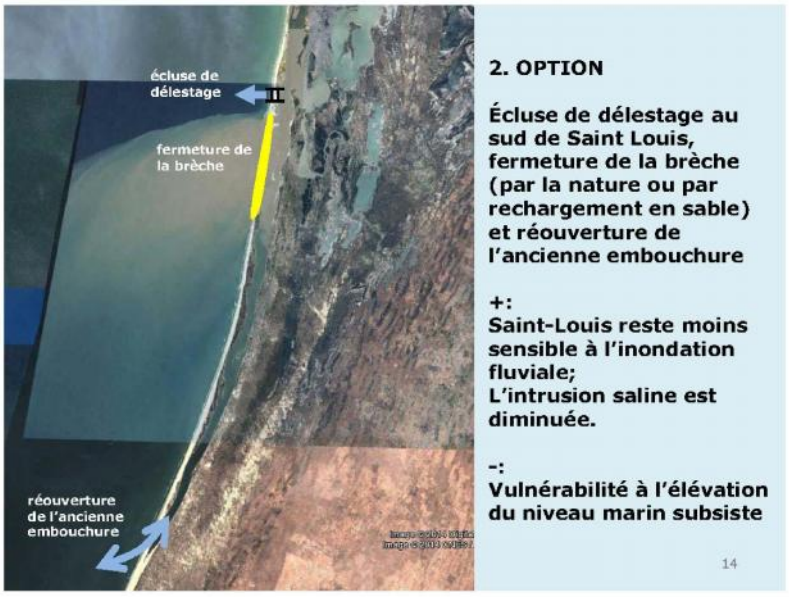

flot
érosion
jusant
flot
érosion
Les courants de marée dans la brèche causent l'érosion de
la langue de Barbarie

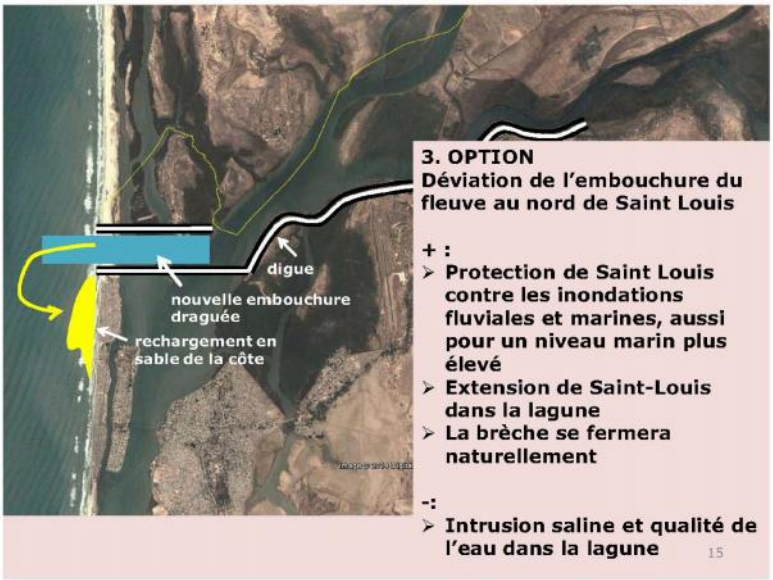

érosion
dépôt
érosion
Brèche ouverte
=> perte
structurelle de
sable du
transport littoral

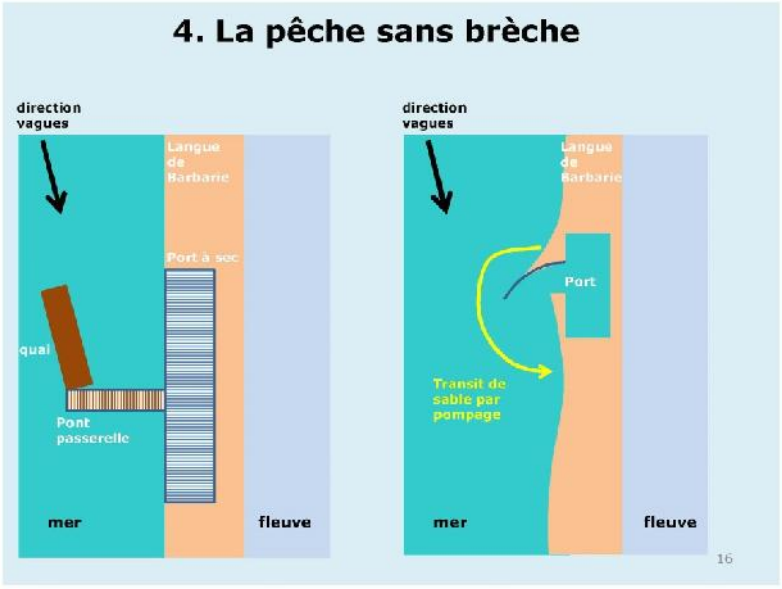

PERSPECTIVE LONG TERME (> 50 ans)
Exemples d'adaptation au changement climatique
Anticiper = ne pas entraver les options d'adaptation futures => dès maintenant explorer les options
Action: gouvernement du Senegal, commune de Saint-Louis
11


rechargement en sable
digues
1. OPTION
Poldérisation de Saint-Louis et protection côtière par rechargement en sable.
+:
Protection de Saint Louis contre les inondations fluviales, pluviales et marines, aussi pour un niveau marin plus élevé;
Réalisation par étapes est possible.
-:
Catastrophe en cas de défaillance;
Maintenance des infrastructures de protection.
12


Polder
digue
digue
pompe
drains
bassins de collecte
refoulement
13


écluse de délestage
fermeture de la brèche
réouverture de l'ancienne embouchure
2. OPTION
Écluse de délestage au sud de Saint Louis, fermeture de la brèche (par la nature ou par rechargement en sable) et réouverture de l'ancienne embouchure
+:
Saint-Louis reste moins sensible à l'inondation fluviale;
L'intrusion saline est diminuée.
-:
Vulnérabilité à l'élévation du niveau marin subsiste
14


digue
nouvelle embouchure draguée
rechargement en sable de la côte
3. OPTION
Déviation de l'embouchure du fleuve au nord de Saint Louis
+ :
➢ Protection de Saint Louis contre les inondations fluviales et marines, aussi pour un niveau marin plus élevé
➢ Extension de Saint-Louis dans la lagune
➢ La brèche se fermera naturellement
-:
➢ Intrusion saline et qualité de l'eau dans la lagune
15


4. La pêche sans brèche
direction vagues
Langue de Barbarie
Port à sec
quai
Pont passerelle
mer
fleuve
direction vagues
Langue de Barbarie
Port
Transit de sable par pompage
mer
fleuve
16

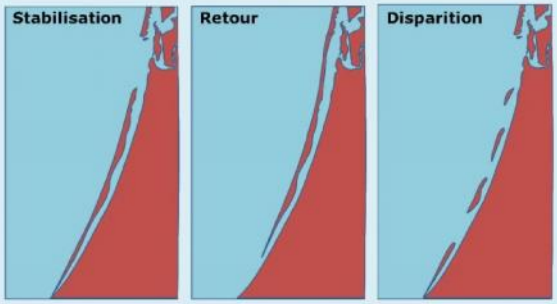

ACTIONS EFFET A MOYEN TERME (>5 ans)
Réalisation: Ministère de l'Environnement, experts Univ. Gaston Berger en consultation avec acteurs locaux.
Assistance technique par experts NL


1. Modèle mathématique
Pronostic de l'évolution de la brèche
Instrument de gestion opérationelle: sécuriser le passage des bateaux de pêche, anticiper les phénomènes d'érosion
18

La brèche ne s'est pas encore stabilisée

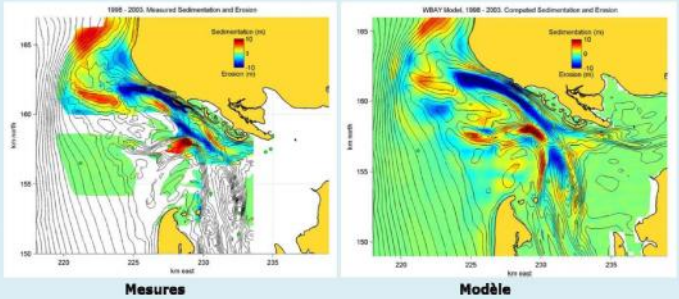
19

Evolution de la langue de Barbarie ?



L'expérience de l'évolution des brèches d'autrefois n'est plus applicable.
Depuis, la réflexion de l'onde de marée sur le barrage de Diama a amplifié les courants de marée dans la brèche.
Il est nécessaire de recourir à des modèles.

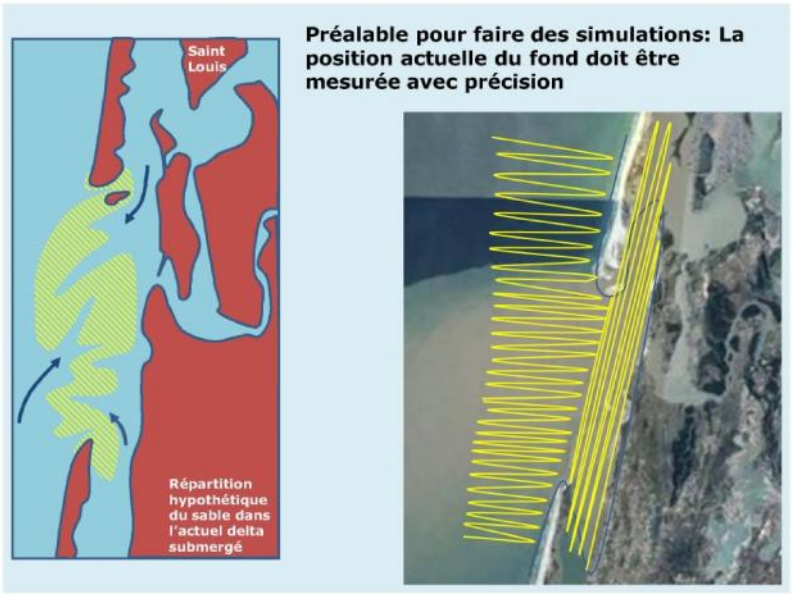
20 /45

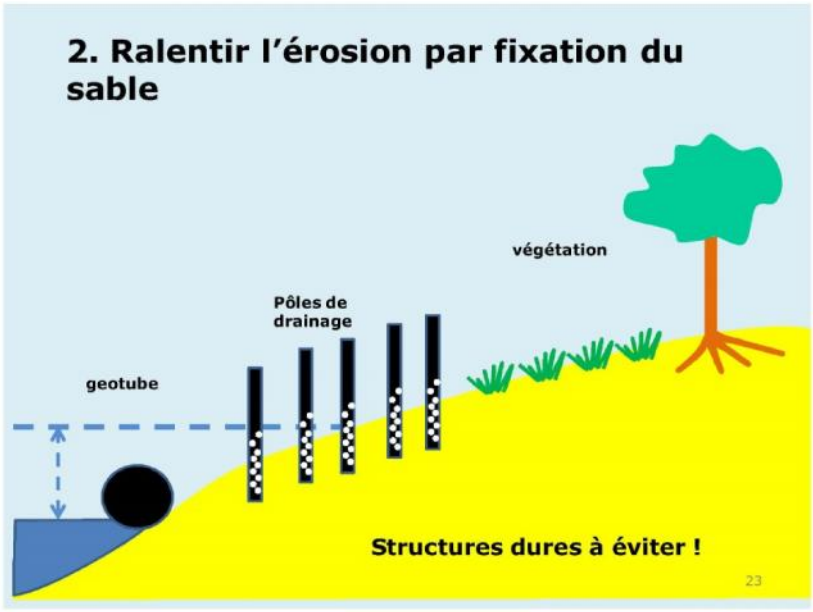


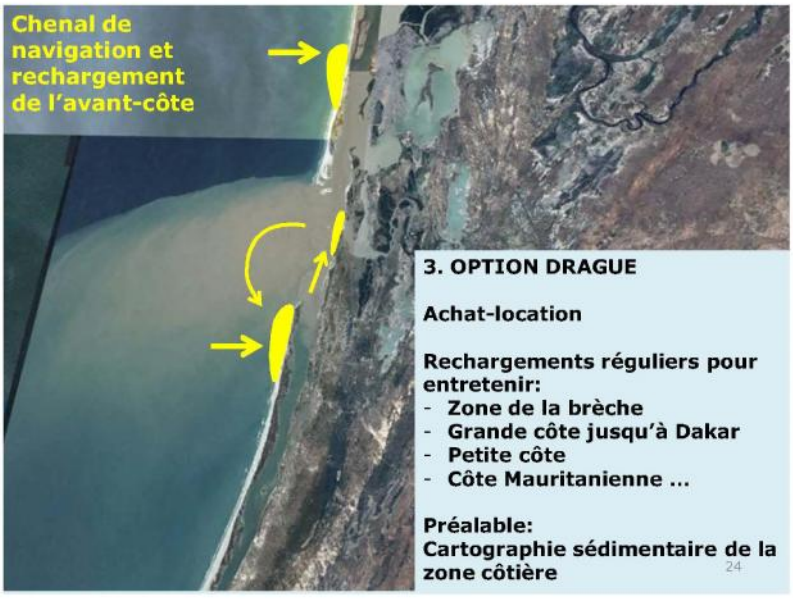
Mesures **Modèle**

Potentiel du modèle numérique Delft3D: exemple d'une simulation de l'évolution de l'embouchure de Willapa Bay (US)

21


Saint Louis
Répartition hypothétique du sable dans l'actuel delta submergé
Préalable pour faire des simulations: La position actuelle du fond doit être mesurée avec précision


2. Ralentir l'érosion par fixation du sable
végétation
Pôles de drainage
geotube
Structures dures à éviter !
23


Chenal de navigation et rechargement de l'avant-côte
3. OPTION DRAGUE
Achat-location
Rechargements réguliers pour entretenir:
- Zone de la brèche
- Grande côte jusqu'à Dakar
- Petite côte
- Côte Mauritanienne ...
Préalable:
Cartographie sédimentaire de la zone côtière
24

Entretien de la maison

Entretien du littoral

4. OPTION LAGUNE DOUCE

Transformation du bras mort du fleuve en une lagune d'eau douce et stabilisation de la langue de Barbarie

+:
Renforcement du potentiel agricole de l'arrière pays;
Moins de perte de sable et d'érosion côtière

-:
Saint Louis reste vulnérable à la montée du niveau marin;
Pêche en mer difficile;
L'écosystème de la lagune est modifié

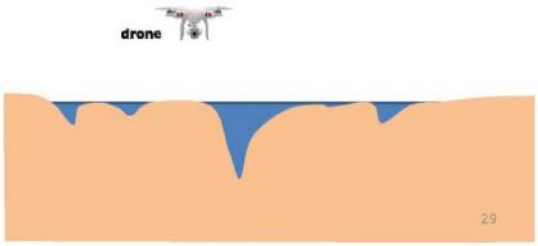
26

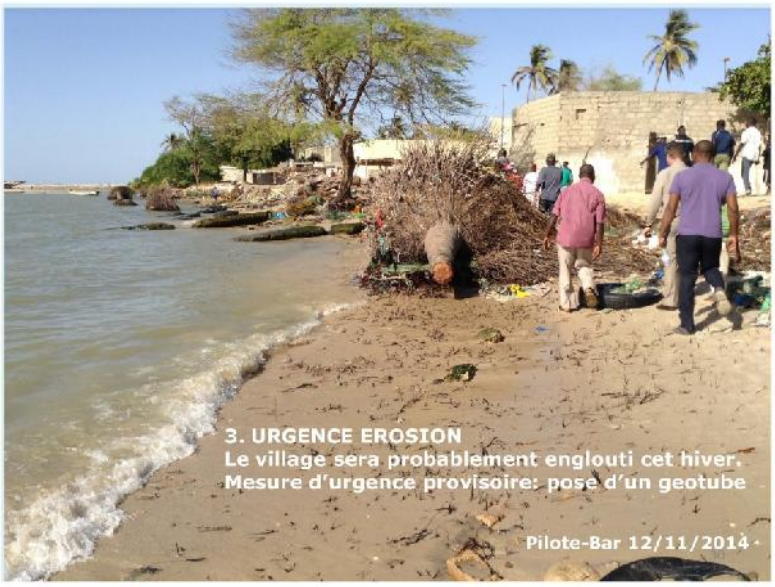
2. SÉCURISER LA PÊCHE

- Monitoring profil de la brèche
- Entretien chenal navigation
- Balisage adéquat
- Modèle opérationnel =>
- Prévision courants +vagues, avertissement périodes risquées pour passer la brèche

Surveillance de la zone de brèche:

- Évolution des chenaux et bancs
- Info temps réel des périodes et zones de risque
- Intervention en cas d'accident



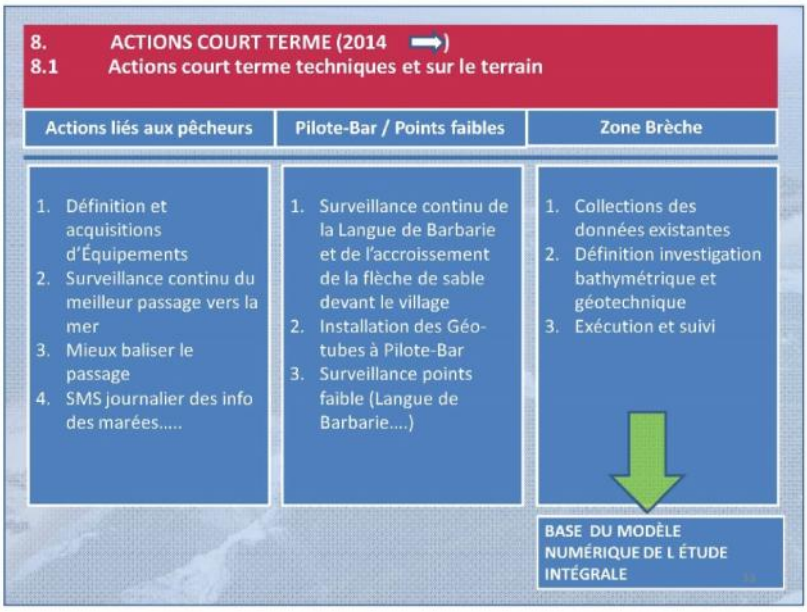


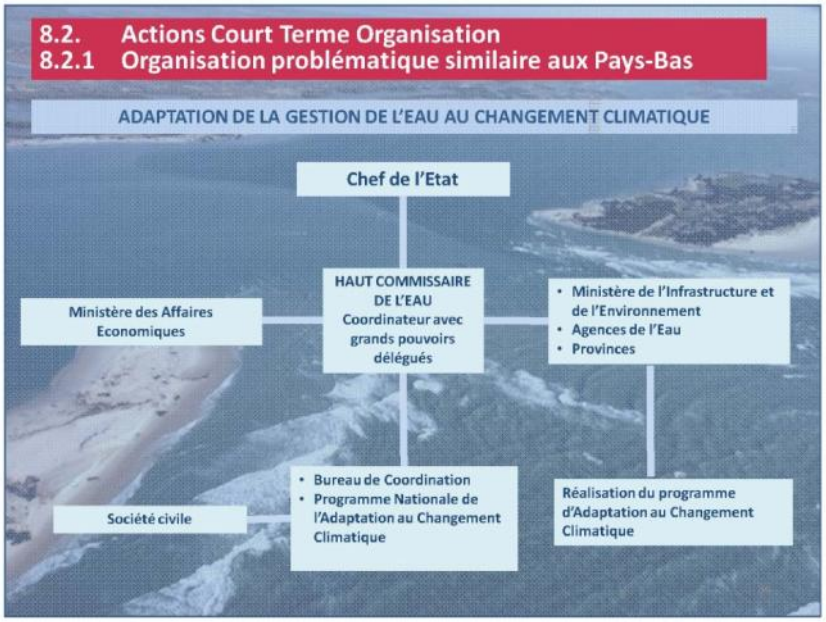
4. ACTION EXTRACTION SABLE: Empêcher les extractions de sable de la plage et des dunes

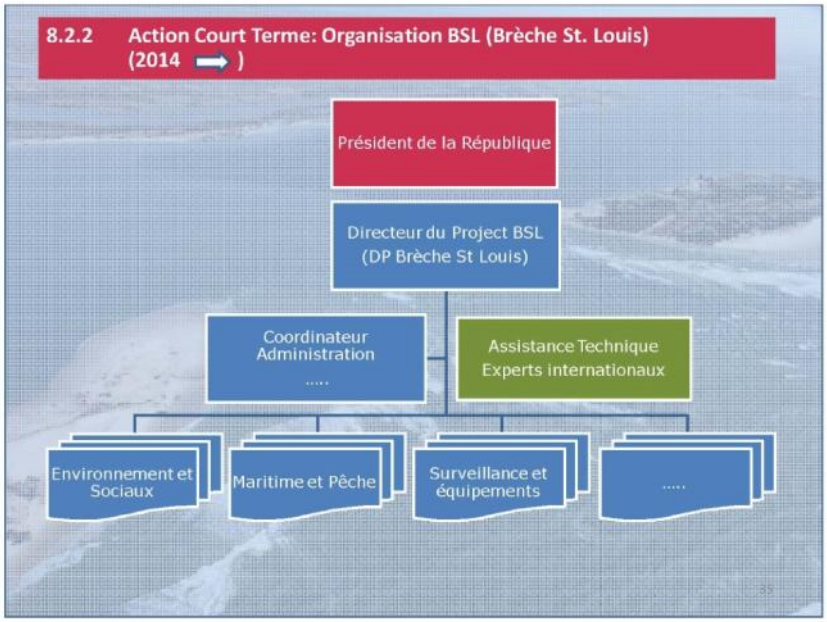
31

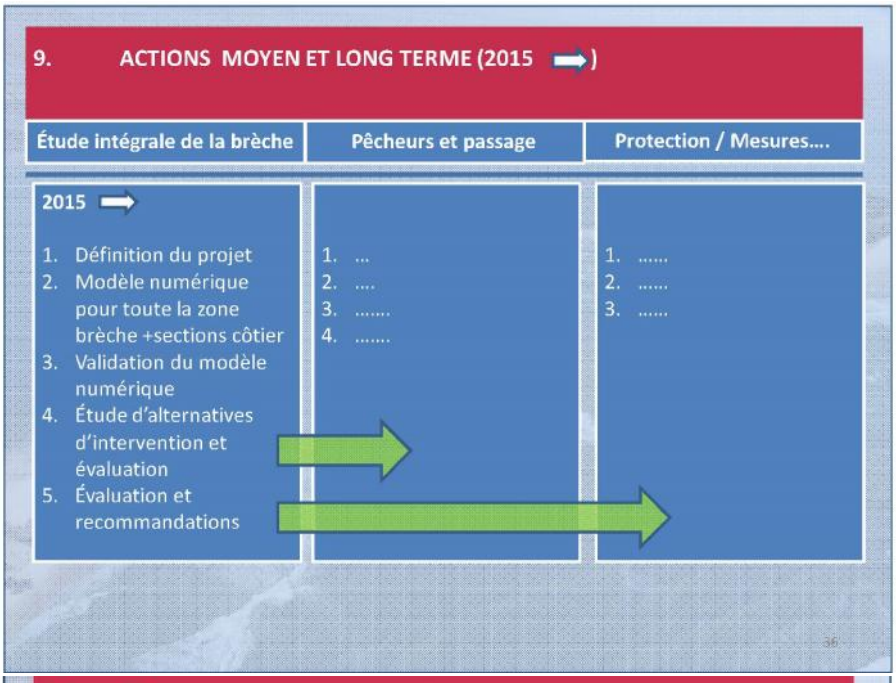
5. ACTION Planification urbaine – Délimitation domaine maritime

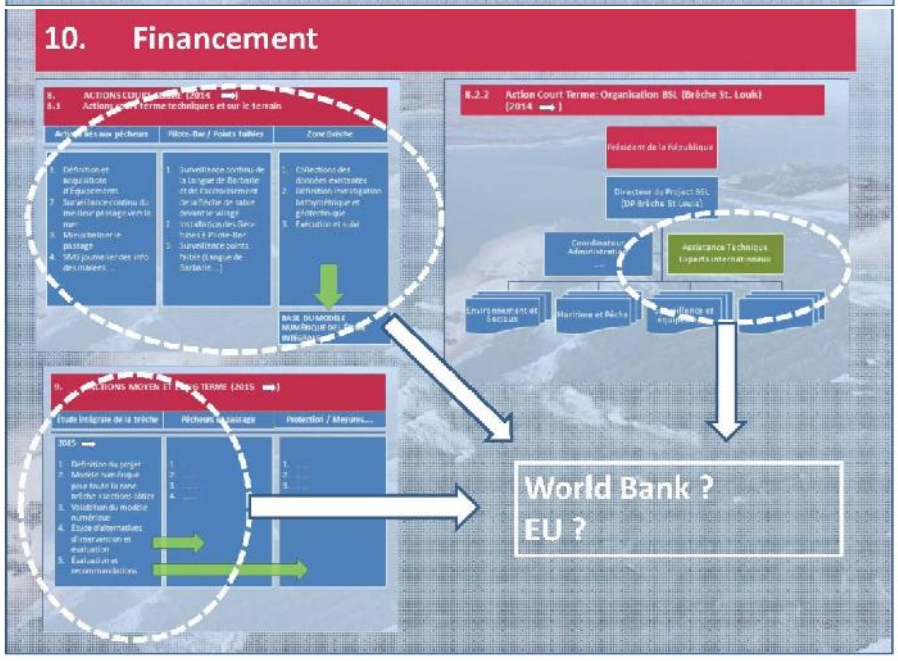
32


8. ACTIONS COURT TERME (2014 ➡)
8.1 Actions court terme techniques et sur le terrain
Actions liés aux pêcheurs
Pilote-Bar / Points faibles
Zone Brèche
1. Définition et acquisitions d'Équipements
2. Surveillance continu du meilleur passage vers la mer
3. Mieux baliser le passage
4. SMS journalier des info des marées.....
1. Surveillance continu de la Langue de Barbarie et de l'accroissement de la flèche de sable devant le village
2. Installation des Géo-tubes à Pilote-Bar
3. Surveillance points faible (Langue de Barbarie....)
1. Collections des données existantes
2. Définition investigation bathymétrique et géotechnique
3. Exécution et suivi
BASE DU MODÈLE NUMÉRIQUE DE L ÉTUDE INTÉGRALE


8.2. Actions Court Terme Organisation
8.2.1 Organisation problématique similaire aux Pays-Bas
ADAPTATION DE LA GESTION DE L'EAU AU CHANGEMENT CLIMATIQUE
Chef de l'Etat
HAUT COMMISSAIRE DE L'EAU Coordinateur avec grands pouvoirs délégués
Ministère des Affaires Economiques
• Ministère de l'Infrastructure et de l'Environnement
• Agences de l'Eau
• Provinces
• Bureau de Coordination
• Programme Nationale de l'Adaptation au Changement Climatique
Société civile
Réalisation du programme d'Adaptation au Changement Climatique


8.2.2 Action Court Terme: Organisation BSL (Brèche St. Louis) (2014 ➡)
Président de la République
Directeur du Project BSL (DP Brèche St Louis)
Coordinateur Administration .....
Assistance Technique Experts internationaux
Environnement et Sociaux
Maritime et Pêche
Surveillance et équipements
.....


9. ACTIONS MOYEN ET LONG TERME (2015)
Étude intégrale de la brèche
Pêcheurs et passage
Protection / Mesures....
2015
1. Définition du projet
2. Modèle numérique pour toute la zone brèche +sections côtier
3. Validation du modèle numérique
4. Étude d'alternatives d'intervention et évaluation
5. Évaluation et recommandations
1. ...
2. ....
3. .....
4. .....
1. .....
2. .....
3. .....


10. Financement
8.2.2 Action Court Terme: Organisation BSL (Brèche St. Louis)
(2014)
World Bank ?
EU ?


MERCI

ANNEX B: DRR Facility of the Netherlands

The Netherlands government established in 2013 a Facility to enhance water related disaster management in other countries around the world. The objective of this facility is to assist countries in their efforts for recovery from or prevention against water related hazards with quality advice from the water sector in The Netherlands. The name of this facility is Disaster Risk Reduction (DRR) Facility.

The following key messages of the DRR facility were presented during the scoping mission.

What is the DRR Facility?
The DRR Facility is a cooperation between the Netherlands Government and the Netherlands Water Sector at large. The government in cooperation with the private sector have recently established a funding mechanism to support quality advice of Netherlands expertise to other countries that are coping with water related natural and manmade disasters. Floods, droughts and environmental accidents are in the core of the DRR Facility. A recent hazard will in usually be the trigger for starting a DRR Team activity. The Ministry of Foreign Affairs and the Ministry of Infrastructure and Environment are jointly financing and managing the Facility. The private sector finances roughly one sixth of the resources available. The DRR Team Facility has been approved for a period of two years.

What are the DRR facility objectives?
The aim of DRR Team is to contribute with quality advice to institutions in other countries responsible for disaster prevention and/or the recovery and reconstruction after a hazard. Emergency assistance is not a part of the DRR Team Facility because there are other international organisations and mechanisms in place. The aim is to bring the best water expertise of the Netherlands water sector tailor made to a specific case. The DRR Facility is also establishing contact between the Netherlands water sector and the authorities. These contacts may, after the DRR Team activity expires, help the water sector to develop further business, amongst others deliverables for water and flood risk management in a broad sense.

What is the scope of the DRR facility?
A DRR Team works with the authorities and institutions on a specific case. The DRR Team works with the authorities and institutions to make proper assessments, to develop policies and to define management responses. The objective is to reduce risk with effective policies and adequate management measures. The DRR Facility brings adequate expertise from the Netherlands to work with the experts of a specific country. Joint products as assessments, policy advice and management measures are based on tools, models and information that is made available by the authorities of a specific country. DRR Team assistance can be positioned in the context of a generic Framework for Flood Risk Governance as presented in Annex 3. Emphasis may be on assessment the risk, on policy development for risk reduction or on flood risk management for service delivery to protect people and the economy. Flood risk management services cover the development and management of flood risk infrastructure, the management of the land use of the flood plain and retention areas and the operational management of disaster emergency relief.

What is the size and how is the phasing of a DRR Team effort?
A DRR Team support may consist of the flowing phases: identification phase, scoping phase, inception phase and master planning phase. Identification is a short contact to understand the rationale of a specific case. The identification phase is an effort of one or two days. Scoping is an effort to understand the issues and problems of a specific case. Scoping may also include an advice to the authorities on the direction of recovery and preventive action. The scoping phase is an effort of one or two weeks. Inception is an effort to analyse the range of possible solutions and counter measures that may be undertaken by the authorities. It includes options for strengthening policies and management measures, based on proper assessments. Identification may also include an advice to the authorities on policy options and specific management measures. The inception phase is an effort of several weeks working together. Finally, on the basis of the inception analyses, assistance can be delivered through DRR Facility for developing a master plan. A master plan builds on the risk reducing policies that are set in place and assembles management action for a certain area as a river basin, a coastal plain or the country as a whole. The master planning phase may include several month of cooperation. Each phase is completed with an end product with advice to the authorities involved. The DRR Team assistance can be stopped after each phase, if further elaboration and analyses do not have added value. A follow up with an additional phase is to be decided separately. Agreed terms of reference are the basis for a follow up next phase including the desired competences of the DRR Team.