



GLOBAL ENVIRONMENT FACILITY  
INVESTING IN OUR PLANET

**Naoko Ishii**  
CEO and Chairperson

November 29, 2016

Dear LDCF/SCCF Council Member:

AfDB as the Implementing Agency for the project entitled: *Togo: Strengthening Climate Resilience of Infrastructure in Coastal Areas in Togo*, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with AfDB procedures.

The Secretariat has reviewed the project document. It is consistent with the proposal approved by LDCF/SCCF Council in September 2013 and the proposed project remains consistent with the Instrument and LDCF/SCCF policies and procedures. The attached explanation prepared by AfDB satisfactorily details how Council's comments have been addressed. I am, therefore, endorsing the project document.

We have today posted the proposed project document on the GEF website at [www.TheGEF.org](http://www.TheGEF.org). If you do not have access to the Web, you may request the local field office of UNDP or the World Bank to download the document for you. Alternatively, you may request a copy of the document from the Secretariat. If you make such a request, please confirm for us your current mailing address.

Sincerely,

Naoko Ishii  
Chief Executive Officer and Chairperson

Attachment: GEFSEC Project Review Document  
Copy to: Country Operational Focal Point, GEF Agencies, STAP, Trustee



# REQUEST FOR CEO ENDORSEMENT

**PROJECT TYPE: Full-sized Project**

**TYPE OF TRUST FUND: LDCF**

For more information about GEF, visit [TheGEF.org](http://TheGEF.org)

## PART I: PROJECT INFORMATION

Project Title: Strengthening climate resilience of infrastructure in coastal areas in Togo			
Country(ies):	Togo	GEF Project ID: <sup>1</sup>	5279
GEF Agency(ies):	AfDB (select) (select)	GEF Agency Project ID:	
Other Executing Partner(s):	Ministry of Environment and forest resources, Ministry of Public works	Submission Date:	05/23/2016
GEF Focal Area (s):	Climate Change	Project Duration(Months)	36
Name of Parent Program (if applicable):		Project Agency Fee (\$):	848,580
➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> ➤ For PPP <input type="checkbox"/>			

### A. FOCAL AREA STRATEGY FRAMEWORK<sup>2</sup>

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCA-1 (select)	Reduce the vulnerability of people, livelihoods, physical assets and natural systems to the adverse effects of climate change	Vulnerable physical and natural assets strengthened in response to level sea rise due to climate change and erosion	LDCF	8,450,000	85,500,000
CCA-2 (select)	Strengthen adaptive capacity to reduce risks to climate-induced economic losses	Targeted population groups (concerning equally men and women; in absence of census, we assume 50% men and 50% women) covered by adequate risk reduction measures	LDCF	482,420	4,500,000
<b>Total project costs</b>				8,932,420	90,000,000

### B. PROJECT FRAMEWORK

Project Objective: Building resilience of coastal areas and related infrastructures in Togo						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
Component 1 : Making infrastructure	Inv	Transport infrastructure in coastal zone in the	- Baguida sector is protected thanks to 19 new groynes, the	LDCF	7,300,000	82,000,000

<sup>1</sup> Project ID number will be assigned by GEFSEC.

<sup>2</sup> Refer to the [Focal Area Results Framework and LDCF/SCCF Framework](#) when completing Table A.

climate resilient		area of Baguida Plage and Kossi Agbavi is climate resilient	<p>extension of an existing one and beach nourishment of 800,000 m3 : looking ahead 2035 this protection system will prevent a coastal line recession of 80m.</p> <p>- Kossi Agbavi Sector is protected thanks to 7 new groynes, the extension of an existing one and beach nourishment of 120,000 m3: looking ahead 2035 this protection system will prevent a coastal line recession of 120m.</p> <p>- looking ahead 2035 about 100 ha currently jeopardized by erosion will be safeguarded.</p> <p>- The national road currently threatened by erosion will be protected.</p> <p>- About 700 houses/buildings that are currently threatened are protected by groynes and sand supply.</p> <p>-About 22 ha of cultivated land are preserved.</p>			
Component 2 : Capacity building for coastal management	TA	enabling environment for coastal management is reinforced	<p>- The coastal integrated management scheme and plan of Lome SDAU_GL is strengthened and completed in the project area</p> <p>- Communities are supported in their</p>	LDCF	850,000	2,500,000

		Increased adaptive capacity of communities in the coastal zone	<p>conversion through:  6 existing IGAs (fishing, agro and fish processing, market gardening, small-scale trade, taxi-moto facility, traditional handcraft);  5 new IGAs (trade of gravels from inland quarries, extensive farming, trade of corn and red oil, trade of liquid soap, beadwork).</p> <p>About 400 (64% of women, 36% of men) inhabitants benefit from technical training and financial support.</p> <p>This diversification of activities induces reduction of illegal harvest of aggregate and gravel in coastal zones.</p> <p>- The existing Early Warning System (EWS) is strengthened in the coastal zone of Togo</p> <p>- 40 inhabitants and stakeholders benefit from general training dealing with sandy coast evolution so as to be able to train in turn the rest of the local population. An equal implication between men and women is expected.</p> <p>- 40 inhabitants (6750 people indirectly trained) and stakeholders benefit from training on adaptation to climate</p>			
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			change so as to be able to to train in turn the rest of the local population. An equal implication of men and women is expected.			
Component 3 : Knowledge Management and Monitoring & Evaluation	TA	Knowledge Management based on results based management and lessons learnt are captured and appropriately disseminated	<ul style="list-style-type: none"> <li>- Knowledge products on adaptation in coastal zones are produced and disseminated</li> <li>- Training support and materials produced (listed under component # below)</li> <li>- Aggregation of data are done by dedicated staff trained to collection techniques and data analysis</li> <li>- Reporting of the results is done and communicated.</li> <li>- Participation of stakeholders in adaptation practitioners' events (40 inhabitants per year. An equal implication of men and women is expected.)</li> <li>- Monitoring and Evaluation of the project</li> </ul>	LDCF	367,420	1,000,000
Subtotal					8,517,420	85,500,000
Project management Cost (PMC) <sup>3</sup>				LDCF	415,000	4,500,000
<b>Total project costs</b>					8,932,420	90,000,000

### C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
GEF Agency	African Development Bank	Soft Loan	90,000,000
<b>Total Co-financing</b>			90,000,000

<sup>3</sup> PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

**D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>1</sup>**

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) <sup>2</sup>	Total c=a+b
AfDB	LDCF	Climate Change	Togo	8,932,420	848,580	9,781,000
<b>Total Grant Resources</b>				8,432,420	848,580	9,781,000

<sup>1</sup> In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

<sup>2</sup> Indicate fees related to this project.

**F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:**

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	920,000	1,200,000	2,120,000
National/Local Consultants	450,000	850,000	1,300,000

**G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT? No**

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

**PART II: PROJECT JUSTIFICATION****A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF<sup>4</sup>**

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc .

The project is in line with Togo's NAPA which includes protecting and securing infrastructure, that is exposed to environmental and climatic hazards as well as implementing early warning systems. The NAPA acknowledges that coastal erosion, which resulted from the construction of hydroelectric and port infrastructure has increased in conjunction with sea level rise partly due to global warming. Recent data on coastal erosion indicates that the coastline is receding by 5m/year on average and is expected to reach 10 m/year. The NAPA recommends that protective infrastructure should be installed in coastal zones as well as building up vulnerable communities' capacity in their daily extraction of sand. Coastal erosion is also prominently mentioned in the country's first national communication as well as in its Poverty Reduction Strategy Paper (PRSP). Other environmental concerns raised are linked to water pollution, land degradation and the deterioration of natural habitats. The project is also in line with the “regional shoreline and monitoring study and management scheme for the West Africa n Coastal area” commissioned by the West African Economic and Monetary Union (UEMOA). The UEMOA report recommends that coastal management should encompass i) increasing the resistance and resilience of littoral areas occupied by people and human facilities and reducing people's vulnerability in the littoral zone; ii) identify and detect with anticipation the situations that engender risks; and iii) increase the combined individual, collective and institutional capacities to face coastal risks.

The project responds to the needs identified by the country in the framework of its national development strategy called "Stratégie de Croissance Accélérée et de Promotion de l'Emploi (SCAPE)", which has dedicated the fourth sector of its fifth pillar to an efficient management of hazards, including coastal erosion.

The National Investment Program for Environment and Natural Resources, which is the framework of

<sup>4</sup> For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter “NA” after the respective question.

investments in the sector has dedicated its third component to the "mitigation of climate change effects, disaster management and risk awareness", which includes coastal erosion as a priority target.

This project is therefore compatible with the climate change adaptation options adopted by the Republic of Togo, including programs and strategies such as i) the strategic implementation of UNFCCC's recommendations in Togo, ii) the national strategy for conservation, restoration and sustainable management of mangroves, iii) the national strategy for risk reduction and natural disaster management, and iv) the national strategy for the management and sustainable use of biodiversity.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

NA

A.3 The GEF Agency's comparative advantage:

NA

A.4. The baseline project and the problem that it seeks to address:

NA

A. 5. Incremental /Additional cost reasoning: describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

No component level or outcome-level changes were made since the PIF's approval. By building on the updated baseline assessment carried out during PPG work, some complementary outputs were added while some of the outputs presented in the PIF were reworded and added to the project design. These changes are reflected in the Project Results Framework (Table B) presented in the this document. The changes from the PIF are as follows:

The GEF funding will contribute to the baseline project by focusing specifically on:

1) Making infrastructure climate resilient and therefore reduce the risk of seeing transport infrastructure damaged or destroyed by coastal erosion. This will reinforce the country's resilience and enhance the sustainability of transport infrastructure in the face of climate change. The baseline activities contribute to the development of the road sector but do not systematically factor in climate change effects, which is why the GEF project is a necessary complement to ensure the long-term sustainability of these investments.

2) Supporting local coastal communities who exploit the coastal sand and marine gravel as part of their livelihoods. Climate change is partly responsible for sea level rise and subsequent coastal erosion. Regrettably, this phenomenon is further exacerbated by the unsustainable collection of sand and gravel by communities in the region. Under these circumstances, the receding coastline both diminishes the quantity of exploitable sand and increases the vulnerability of coastal infrastructure. To address these challenges, the project will promote strategies and activities to diversify and strengthen communities' livelihoods. This will increase communities' adaptive capacity in the face of climate change's after effects.

The project is composed of three components:

Component 1: This component will finance the civil works related to the installation of coastal protection infrastructure from Katanga to Gbodjomé. These civil works include the installation of 28 groynes coupled with beach nourishment (global volume of 920,000 m3) within some of critical shelves framed by groynes. Groynes and beach nourishment will be distributed as following:

- Baguida sector:

- from Katanga to Gbétsogbé, 1 groyne will be built, coupled with beach nourishment on both sides (sand supply = 120,000 m3 + 40,000 m3);

- from Gbétsoygbé to Avépozo (including Baguida Plage), 10 groynes will be built, coupled with beach nourishment in shelves between groynes (sand supply = 370,000 m<sup>3</sup>);
- in front of Avépozo, 1 groyne will be built and the existing one will be extended;
- from Avépozo to Kpogan, 7 groynes will be built, coupled with beach nourishment in shelves between groynes (sand supply = 270,000 m<sup>3</sup>);
- Kossi Agbavi sector
  - from Kpogan to Kossi Agbavi, 7 groynes will be built, coupled with beach nourishment in shelves between groynes (120,000 m<sup>3</sup>);
  - from Kossi Agbavi to Gbodjomé, the existing groyne will be extended.

These civil works will protect the national coastal road section Avepozo-Aneho, which is jeopardized by coastal erosion as described earlier in section A.1. The sites mentioned above have been selected based on i) the level of erosion registered along the coast, and ii) the proximity of the road to the coast.

On the eastern side of the port financed by the Japan International Cooperation Agency (JICA), Unless action is taken, shoreline recession is expected to carry on at the same high rates as in the recent past. For instance, the shoreline between Baguida-Plage and Kpogan will recede by an annual mean rate varying from 4 to 6 m/year. By 2035, the sea will have flooded at least 86 m wide of coastal strip due to the cumulative effect of littoral drift variations, marine aggregate extractions and sea level rise. Moreover, up to 126 m wide of the coastal strip of Fraternity beach is expected to be flooded inland. Consequently, the national road will be greatly jeopardized in the reference situation, as can be seen on the following figure. Against this dramatic backdrop, studies undertaken as part of the preparation phase of the project have found that the benefits to be reaped from the protection system include significant land loss reduction and prevention.

Figure 1 : Expected shoreline retreat in 20 years (UNIBEST C+ simulation for reference situation)

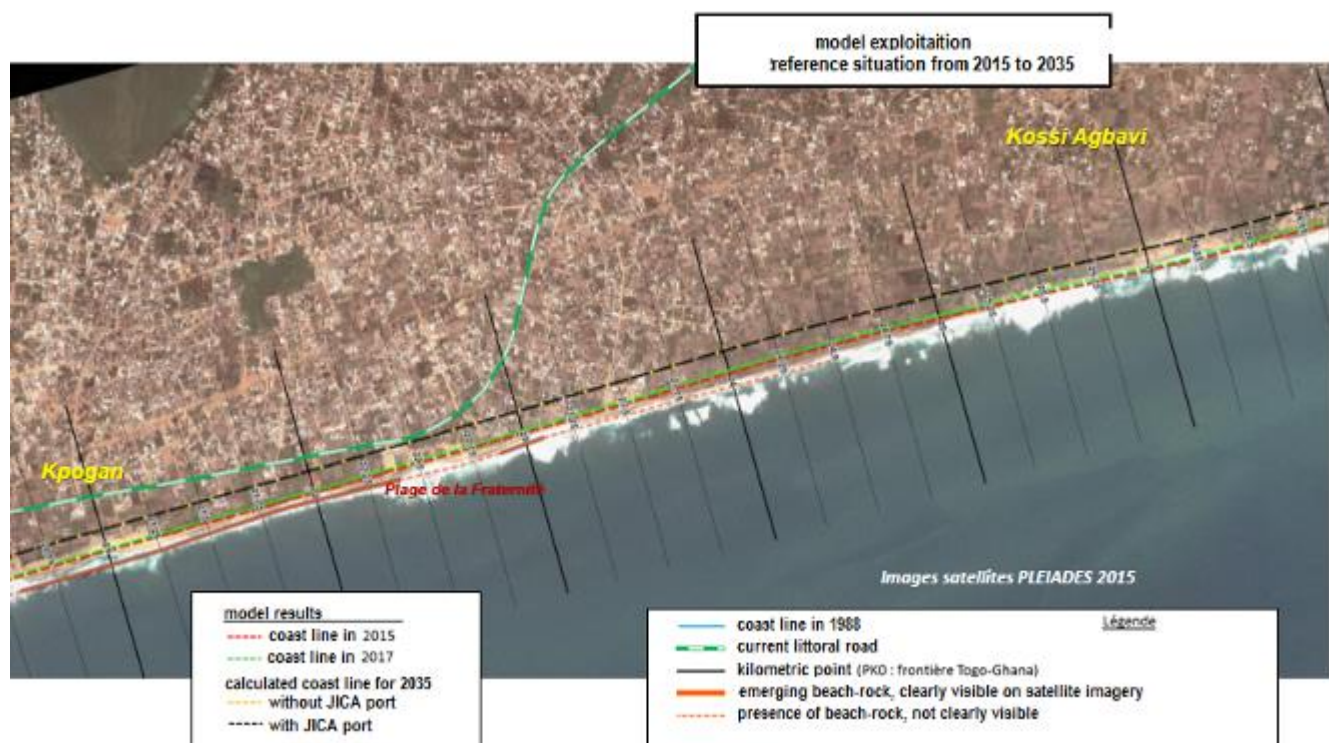
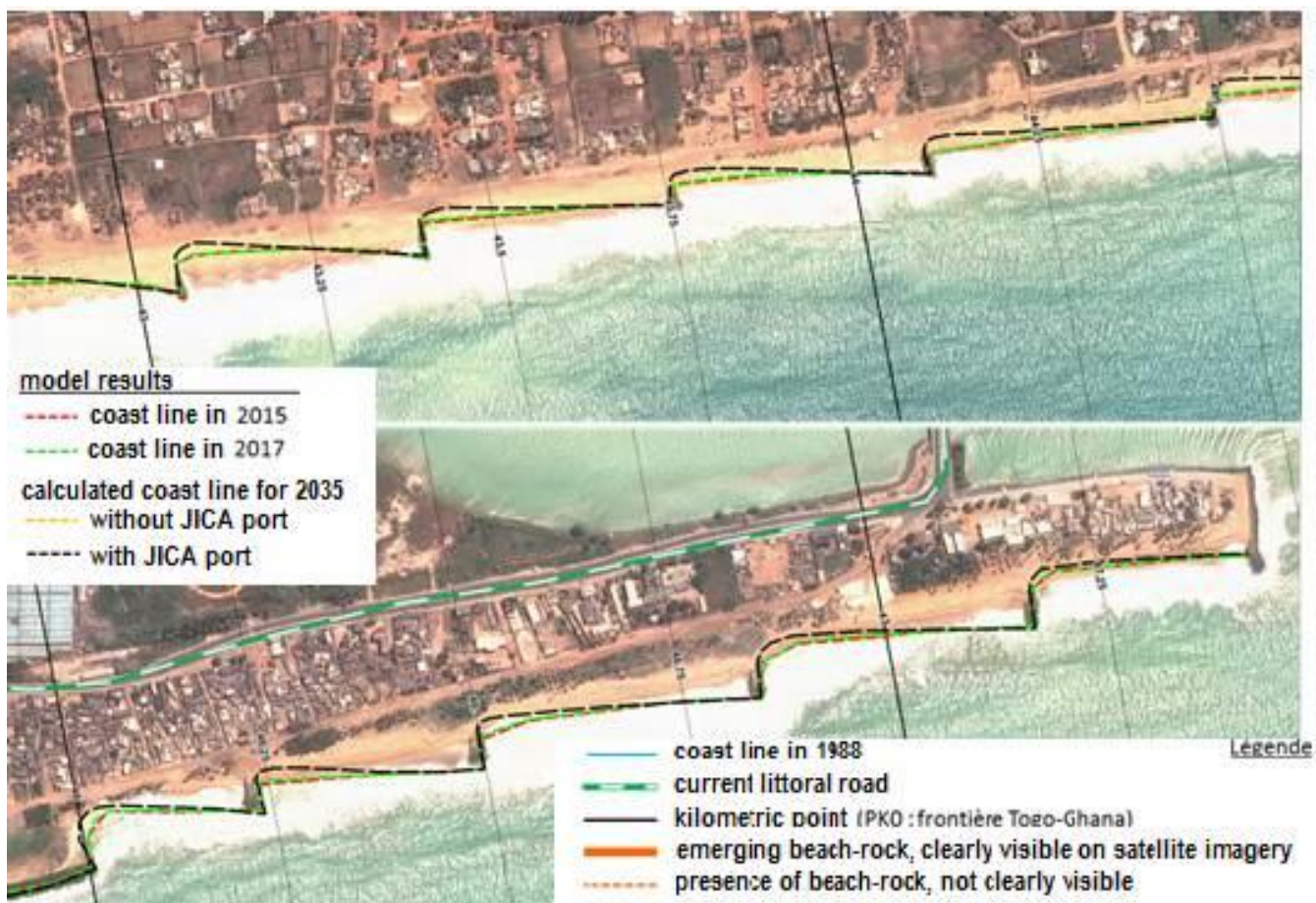


Figure 2 : Expected shoreline retreat in 20 years - zoom on UEMOA and Aného groynes Sector (UNIBEST C+ simulation for reference situation)





Benefits from the proposed protection system are presented in further detail in Section B2

Risks due to the construction of infrastructure are presented in further detail in Section A6

The realization of civil works such as groynes and beach nourishment will be made according to up-to-date best practices with proven technologies for marine works in the context of an extremely aggressive environment. Riprap groynes will be dimensioned by considering their ability to resist projected wave heights (the height of a projected wave considered for dimensioning is 3.2 m at +2.2 m IGN), their stability, the top level, and floor covering.

#### Component 2 : Capacity building for coastal management

This component includes three outcomes: (i) strengthening the enabling environment for coastal management; (ii) increasing communities' adaptive capacity in the coastal zone; and (iii) strengthening the existing EWS in the coastal zone of Togo.

(i) strengthening the enabling environment for coastal management : Not applicable since there has not been any change since the PIF was written and submitted for approval in 2013.

(ii) diversification of Income Generating Activities

Although marine aggregate extractions are officially forbidden in Togolese coastal areas since 2011, this activity is still carried out because it represents the most profitable source of income for a number of people, mainly for women and young people. To prevent future coastal erosion, the project must target local communities because their exploitation of marine sands and gravels affects the coastal line's stability. This component comprises technical support and dedicated budget to build communities' capacity to diversify their economic activities and move away from illegal sand collection.

Strategies were developed to implement a range of Income Generating Activities (IGAs) in Katanga, Gbetsogbé, Baguida Plage, Avepozo, Kpogan and Kossi Agbavi. These strategies aim at helping 400 people change their

current illegal economic activity into a legal and sustainable one. Numerous IGAs have been identified based on market studies and several scenarios for a deployment plan are proposed.

Technical solutions retained are based on existing options for improving the climate-resiliency of coastal infrastructure and income generating sources that are known and implemented within the country. A list of technical solutions, primary alternatives explored, and the reasons behind their rejection of those alternatives are as follows:

### **Component 1: Making infrastructure climate resilient**

**Technical solution retained:** ARTELIA's protection system V2 (28 groynes + 1,000,000 m3 of sand supply)

- **Alternative explored:** Inros Lackner's protection system (33 groynes + 2 new sea walls + extension of an existing one)
- **Reasons for rejection**
  - This approach requires additional infrastructures which are not approved by communities
  - Not cost effective
  - Protection beyond 2035 is not secured
  - Minimum protection compare to Arteria V1 and V2 options (see figure 8)
- **Alternative explored :** ARTELIA's protection system V1 (28 groynes)
- **Reasons for rejection**
  - The model simulation shows that this approach protect only critical area currently affected by erosion (coastal road) and not the exposed areas (including schools, houses, agriculture land), see figure 6.
  - Do not stop illegal gravel extractions
  - Do not constitute a full protection compare to V2 (see figure 8)
  - The V1 alternative was rejected in favor of the V2 solution which also offers ecological, social and economic benefits

### **Component 2: Capacity building for coastal management**

**2.1 Technical solution retained:** Six (6) existing IGA (Fishing, agro processing, small scale trade, market gardening, traditional handcraft, and local transportation - taxi-moto) and five (5) new IGAs (trade of gravel from inland quarries, extensive farming, corn and red oil trade, manufacturing of liquid soap, beadwork)

- **Alternative explored:** Craft (pottery, wood processing, etc.) Fruit & vegetable processing, production of cassava flour (gari) and palm oil, aquaculture, seaweed production, renewable energy production
- **Reasons for rejection:**
  - Activities not currently undertaken by local communities and require extensive trainings
  - Not environmentally sustainable (crafts, seaweed production)
  - Requires significant investments not available (aquaculture, renewable energy production, etc.)

**2.2. Technical solution retained:** Upgrade the existing national wide early warning system (EWS)

- **Alternative explored:** Setup a new Early Warning System to monitor the Coastal erosion
- **Reasons for rejection:**
  - The existing national Early Warning System (EWS) is already operative in the country as a result of the project "*Projet de Gestion Intégrée des Catastrophes et des Terres (PGICT)*". The coastal zone is included in this EWS. In order to ensure EWS efficiency, a technical desk has been created, in charge of data collection, analysis and dissemination of information by means of an Early Warning Bulletins.
  - Although not fully functional, keeping the existing EWS is considered cost effective. There is no reliable real-time information relative to coastal areas that would permit efficient information to be

provided to the local people on risks in a timely manner. For this reason, the solution to strengthen the existing EWS is the ideal option.

### **2.3. Technical solution retained:** Training of trainees for local communities awareness and capacity building

- **Alternative explored:** Instead of proposing a training of trainees program, the alternative could have been to train a large number of persons directly
- **Reasons for rejection:**
  - Not easy to find a large number of persons with education background to attend training
  - There is a high risk to maintain the training program beyond the one shoot session
  - Sustainability reasons: Training of trainees allow to cover a large group beyond the project timeline.

Based on these studies, the recommended strategy is to rely on a combination of 11 IGAs. This will consist in: strengthening 6 existing IGAs (fishing, agro and fish processing, market gardening, small-scale trade, taxi-moto facility, traditional handcraft); creating 5 new IGAs (trade of gravels from inland quarries, extensive farming, corn and red oil, trade of liquid soap, beadwork). This strategy includes plans for technical training and financial support, and new partnership development to ensure long-term success. The 11 proposed IGAs will objectively contribute (directly or indirectly) to decreased pressure on land (market gardening, extensive farming, and trade of palm oil), need of water (market gardening), GES emissions (taxi-moto, agro and fish processing, potential deforestation due to palm oil and corn crops).

However, among the 11 IGAs proposed in the reconversion strategy, efforts in terms of investment and training are focused on the most sustainable ones (extensive farming, market gardening, artisanal fishing) for promoting environment-friendly technologies through training programs. Trainings and practices are in line with the strategy promoted by the NAPA (2009) that aims at strengthening the capabilities of rural operators and producers exposed to climate change by supporting livelihood diversification and contributing to sustainable development.

As fish smoking is concerned, new bio technics exist that can be promoted to reduce pressure on forestry. For the other IGAs, one have to keep in mind that they concern a tiny number of people (< 100 people). The strongest argument behind the sustainability aspect is the proposed livelihood diversification process which will reduce the resulting potential environmental impact in few minor impacts.

About 400 residents (64% women, 36% men) will benefit from technical training and financial support. In order to guaranty sustainability of community support and involvement into this program of conversion, inhabitants were surveyed and interviewed on their willingness. The promotion of gender-responsive climate adaptation is also planned. Besides, the ONG in charged with execution of the reconversion program (4 full-time people during 36 months) will report the successes and fails so as to readjust actions during the project.

This diversification of economic activities will help reduce the illegal harvest of sand and gravel in coastal zones.

Risks due to the conversion of economic activities are presented in further detail in Section A6.

(iii) The existing EWS is strengthened in the coastal zone of Togo. (NA - no change since 2012 PIF version).

### **Component 3: Project monitoring and evaluation**

The project has to ensure its proper monitoring and evaluation by proposing a M&E system that will track the project outcomes on two levels. The system will monitor coastal erosion rate in the future, as well as project outcomes at the communities' level, ensuring that people's behavior and economic activities are changing for an improved sustainable management of the coastal line within the project area. In order to achieve these objectives, four critical tasks have been defined as following : (i) identification of education, information and communication needs in matters of climate change and possible impacts on coastal zone, (ii) identification of activities and operations in order to strengthen integration of climate change issue, (iii) realization of monitoring and evaluation (M&E) of coastal erosion and adaptive behavior and knowledge capitalization among local communities coping with climate change impacts, and (iv) accurate identification of required investment for such M&E implementation. In order to strengthen the integration of climate change issues, recommendations are provided in terms of communication strategy that has to be developed. This strategy depends on: (i) an ambitious training program,

including technical training of qualified people as well as awareness activities for the community; (ii) project monitoring and evaluation implementation, (iii) creation of an efficient knowledge management system, including data base, code of practice, planning of activities within coastal area; and (iv) the definition of a chart that officially points out each roles and responsibility. A dedicated budget envelope has also been defined.

Concretely, 40 inhabitants and stakeholders will benefit from general training dealing with sandy beach barrier evolution, 40 inhabitants and stakeholders will benefit from training on adaptation to climate change, and 30 inhabitants will take part to visits/workshops/feedback presentations. The number of 40 people is the result of the following assumption considering 5 trained people per localities (6 localities) + 10 people belonging to administrations/stakeholders. This results from a compromise between investment costs / expected results in terms of local communities' education/ knowledge. The detailed/advanced trainings aim at teaching a smaller group of people the coastal evolution or the adaptation to climate change so as the trainees would be able in turn to train a larger number of local people. This second circle of trained people is expected to reach 95% of the local population (see in Tracking tools – indicator 8). An external specialist in System Information Management and M & E will teach the method of the construction / implementation and operation of the database. thanks to purchased computer equipment, office machines and vehicles, the trained staff responsible for the aggregation of data will consequently be efficient in the collection techniques and data analysis and will report frequently the results. Knowledge products on adaptation in coastal zones will be produced and disseminated (manuals, guides): training supports in addition to reference knowledge supports such as the manual called « Analyse de la Vulnérabilité et de la Capacité d'adaptation au Changement Climatique » edited by CARE (2010), the manual called « trousse à outils de planification et suivi-évaluation des capacités d'adaptation au changement climatique (TOP-SECAC), Manuel et guide d'utilisation », CILSS/Centre Régional AGRHYMET, 2011, the guide called « Guide d'intégration des changements climatiques dans les plans de développement communaux - Modèle pour servir d'exemple dans la commune d'Atakpamé au Togo », the manual called « Le Programme Pilote pour la Résilience Climatique (PPCR - Niger) - AIDE MEMOIRE MISSION CONJOINTE ». International Finance Corporation, BAD, 2010, .... Stakeholders will take part in adaptation practitioners events (organisation of exchange visits between the project partners and counterparts in the country and in the West African sub-region) . 2 public meetings/year (6 meetings during the 3 year project) are planned to ensure a feedback of the trainings/workshops that representative people attended to the rest of the communities.

Concerning Monitoring and Evaluation System, technical staff responsible for data collect/data aggregation will be designed, and local partners and community representatives will be supported for collecting data and updating the database. Follow-up reports will be published, annual audits will permit to assess the effectiveness of the project regarding erosion issues. If needed, meetings/trainings / information sessions will be gendered in order to facilitate access and to insure open expression to women that are eager to take part in the project. Considering population behavior during the field visits and surveys, the women appear to be at least equally motivated and implied in the project than men. During the field campaign carried out in October 2015 in Baguida, men and women were equally represented (15 men/12 women); in Katanga, only women expressed themselves (4 women in individual pools). All over the studied area, the individual pools carried out concerned 60 % of women. Given this field data, the project targets an equal access to knowledge/training between male and female (50% of males, 50% of females, see in Tracking tool - indicator 9).

The following table sums up the main differences between PIF document and CEO endorsement form.

PIF stage	CEO endorsement stage
Planned civil works were: <ul style="list-style-type: none"> <li>- 1 waterwall and 2 riprap walls installed in Baguida Plage</li> <li>- 1 waterwall and 2 riprap walls installed in the sector of Kossi Agbavi</li> </ul>	Recommended civil works are: <ul style="list-style-type: none"> <li>- 19 new groynes, the extension of an existing one and beach nourishment of 800,000 m3 in Baguida sector;.</li> <li>- 7 new groynes, the extension of an existing one and beach nourishment of 120,000 m3 of Kossi Agbavi sector.</li> </ul>
New EWS were planned	Existing EWS is strengthened

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

In addition to the risks mentioned in the previous PIF, other risks have been highlighted by the ARTELIA study, as follow:

RISKS	RANKING	MITIGATION MEASURES
People failure/reluctance to use correctly the technologies, despite of an increased knowledge/awareness of the advantages/benefits of such a program.  people do not feed the database	Medium	<ul style="list-style-type: none"> <li>•Continuous training/educative program in order to increase coastal communities' awareness of coastal erosion risk and potential damage.</li> </ul>
Changes inconsideration/priority from government/politicians/ policymakers that will lead in the future (before the end of the program) to a decrease or a lack of support for the project and the abandon of the project.  credits for trainings are cut	Medium	<ul style="list-style-type: none"> <li>•Ensuring the good implementation of the training program, the activities, events, and follow-up reporting, annual audits that prove the effectiveness of the project.</li> <li>•the project has to identify and hire a consultant gifted with technical expertise, interest, availability and willingness to work with communities and the government in an participative monitoring</li> </ul>
Reluctance of communities to adopt new IGA, to cooperate with the program.	Low	<ul style="list-style-type: none"> <li>•Continuous training/educative program in order to increase coastal communities' awareness of negative effect /consequence of marine sand or gravels extractions</li> </ul>
Once coastal area would be protected, the costs of land would rise. This possible speculation would prevent poor local population from land acquisition	High	<ul style="list-style-type: none"> <li>•Policies to prevent local communities from expropriation</li> </ul>

Risks due to making infrastructure climate resilient are the following :

RISKS	RANKING	MITIGATION MEASURES
Accident risk due to expansion of gas under high pressure during rock-breaking	Medium	<ul style="list-style-type: none"> <li>• Safety perimeter, shelters, protection screen</li> </ul>
Fire risk due to fuel storage in the yard	Medium	<ul style="list-style-type: none"> <li>• emergency response procedures;</li> <li>• Protection and fight equipment</li> <li>• procedures for fuel distribution</li> </ul>
Accident risk due to residual instability	Medium	<ul style="list-style-type: none"> <li>• Geological analysis ...</li> </ul>
Contamination and spread of venereal diseases	Medium	<ul style="list-style-type: none"> <li>• Increasing worker and population awareness, distribution of condoms;</li> <li>• Free voluntary testing</li> </ul>
Accident risk due to falls and drowning	Medium	<ul style="list-style-type: none"> <li>• Protecting extraction sites</li> <li>• warning signs</li> </ul>



burial risks due to temporary sand deposit	Medium	<ul style="list-style-type: none"> <li>warning signs</li> </ul>
Risk of road accidents	Medium	<ul style="list-style-type: none"> <li>Insurance policies</li> <li>Lane markings and traffic signs</li> <li>Increasing staff &amp; population awareness to road prevention</li> <li>Marking working areas</li> <li>Traffic restriction measures</li> <li>Daily check of vehicles and construction equipment</li> <li>Weekly meetings dealing with worksite safety</li> <li>Insisting on the importance of driver awareness</li> <li>Vehicles must be driven with their lights on at all times, day and night</li> <li>Banning performance incentives and promoting good behavior incentives (no accident)</li> </ul>
Risk of work accidents for yard staff	High	<ul style="list-style-type: none"> <li>Vehicles must be driven with their lights on at all times, day and night</li> <li>Power supply: warning signs,; ground connection</li> <li>Eye protections</li> <li>Vehicle driving : training and habilitation; medical checks; Traffic restriction measures in the yard</li> <li>Technical check</li> </ul>

Except road accident risks which are quite strong during building stage, all these risks are moderate and null after building stage.

Risks due to diversification of Income Generating Activities are the following:

RISKS		MITIGATION MEASURES
<u>Fishing:</u> <ul style="list-style-type: none"> <li>New Legislation ongoing to prevent abusive fishing activities</li> <li>More pressure on the fishery resource</li> <li>competition with aquaculture</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification by: <ul style="list-style-type: none"> <li>Concerned people frequent interviews,</li> <li>follow-up reporting,</li> <li>Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Agro and fish processing</u> <ul style="list-style-type: none"> <li>more pressure on the fishery resource</li> <li>competition with the imported products</li> </ul>	High	<ul style="list-style-type: none"> <li>During the project, ensuring the good implementation of IGAs diversification: Concerned people frequent interviews, follow-up reporting,</li> <li>Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Market gardening</u> <ul style="list-style-type: none"> <li>land pressure</li> <li>competition with the imported products</li> </ul>	High	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>Concerned people frequent interviews,</li> </ul>

		<ul style="list-style-type: none"> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Small-scale trade</u> <ul style="list-style-type: none"> <li>• risk of failure to sell in case of too much competition within the area</li> </ul>	High	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Taxi-moto</u> <ul style="list-style-type: none"> <li>• high rates of road accidents</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Traditional handcraft (production, art et services)</u> <ul style="list-style-type: none"> <li>• risk of failure to sell or stock accumulation</li> </ul>	High	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Trade of gravels from inland quarries</u> <ul style="list-style-type: none"> <li>• risk of failure to sell</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Extensive farming</u> <ul style="list-style-type: none"> <li>• land pressure</li> <li>• competition with the imported products</li> <li>• parasites pressure and inherent infectious disease risks</li> <li>• competition</li> </ul>	High	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Trade of corn and palm oil, etc.</u> <ul style="list-style-type: none"> <li>• risk of failure to sell in case of too much competition within the area</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> <li>• Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Production and trade of liquid soap</u> <ul style="list-style-type: none"> <li>• risk of failure to sell or stock accumulation</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>• Concerned people frequent interviews,</li> <li>• follow-up reporting,</li> </ul>

		<ul style="list-style-type: none"> <li>Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>
<u>Beadwork</u> <ul style="list-style-type: none"> <li>risk of failure to sell or stock accumulation</li> </ul>	Medium	During the project, ensuring the good implementation of IGAs diversification: <ul style="list-style-type: none"> <li>Concerned people frequent interviews,</li> <li>follow-up reporting,</li> <li>Annual audits that prove the effectiveness and viability of the project in terms of environment and local economy.</li> </ul>

The Table below indicates how the proposed IGA are climate change sensitive and contribute to the community resilience:

IGA	Risks/challenges	Mitigation measures
Fishing	climate change (CC) impact on marine ecosystems with decrease stock of fisheries : ocean acidification, rising sea level, etc.	The project includes a number of trainings for sustainable fishing
Agro and fish processing	Low fisheries production	The project includes a value chain training program for communities to group their production for efficient product processing
Market gardening	Land pressure due to coastal erosion	Training on irrigation scheme in new mainland areas
Small-scale trade	No significant CC risk	NA
Taxi-moto facility	No significant CC risk	NA
Traditional handicraft	No significant CC risk	NA
Trade of gravels from inland quarries	High demand due to prohibited coastal aggregate trade	Additional persons will be trained in gravel extraction from inland quarries
Extensive farming	Land pressure due to high demand	The project will support community shared access to land for efficient production
Corn and red oil	No significant CC risk	NA
Trade of liquid soap	No significant CC risk	NA
Beadwork	No significant CC risk	NA

Mitigation measures consist in ensuring a continuous training/educative program to increase coastal communities' awareness of coastal erosion risk and potential damage from gravel extraction. Financial support, mutual help, public assistance for material needs have to be encouraged.

A.7. Coordination with other relevant GEF financed initiatives:

NA



## **B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:**

B.1 Describe how the stakeholders will be engaged in project implementation.

The preparation of this project was guided by a comprehensive and extensive participatory process involving all stakeholders, including local communities, a multidisciplinary approach (professionals from different sectors participated); and a complementary approach, building upon existing plans and programs, including national action plans and national sectoral policies.

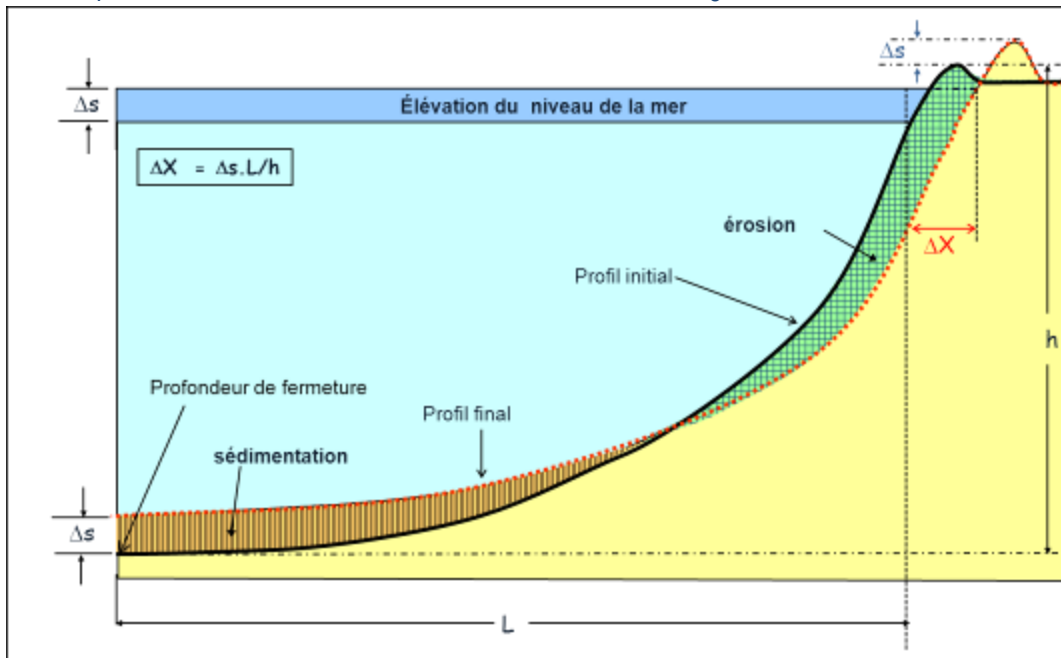
**Climate vulnerability and capacity assessment:** Through use of climate vulnerability and capacity assessment methodology, the analysis provided the understanding of the implications of climate change for the lives and livelihoods of households at risk living close to the project area (coastal road).

In addition to marine aggregate extractions and significant littoral drift variations along the coast that generate locally strong erosion, Togolese coastal line is subjected to sea level rise due to climate changes. This third phenomenon leads also to a consecutive coastal line recession that can be assessed by the mean of the Brün rule (in « Sea level rise as a cause of shore erosion » Journal of Water. Harb. Vol 88 pp 117-130).

This rule is based on the assertion that sea level rise is slow, which will permit a progressive adaptation of beach profile as sea level rises.

Concretely :

- The sea will gain ground, and at the same time the top of the beach will rise in adaptive way.
- Beach profile will translate further inland as shown on the next Figure 3 : **Brün rule**.



**Figure 3 : Brün rule**

On this graph :

- $\Delta s$  (m) is the mean sea level rise due to climate change,
- $h$  (m) is the height between top of the beach and closure depth,
- $L$  (m) is the distance between upper part of the beach and closure depth.

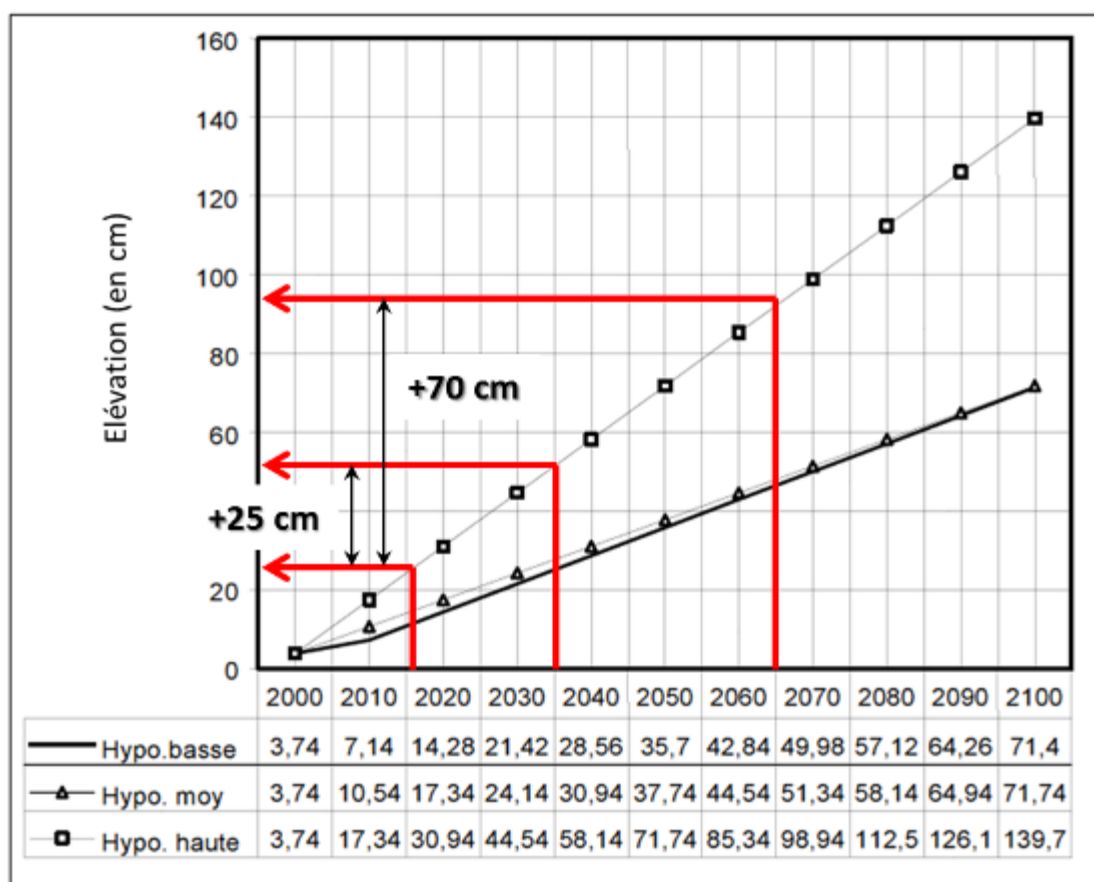
- $\Delta X$  (m) is the encroachment of the sea onto land, due to sea level rise  $\Delta s$ .

As Togolese littoral is concerned, closure depth is about -7,0 m IGN et the top of the beach reaches +1,0 m to +4 m IGN. Distance between upper beach and closure depth varies from 180 m to 320 m (in front of Kpémé and Aného groynes).

Following IPCC recommendations (Intergovernmental Panel on Climate Change), three scenarios of climate change (basic, mean and high assumptions) have been considered for mean sea level rise forecast in Togo, from reference year 2000 [HYD\_06]. Under these three assumptions, sea level rise forecasts to 2100 are plotted on Figure 4 : **Forecast of mean sea level rise in Togo (in FEM-PNUD, 2010)**

. For the needs of the present project, the following figures will be considered (mean assumption):

- Looking ahead to 2030: +0,20 m,
- Looking ahead to 2050: +0,35 m,
- Looking ahead to 2100: +0,70 m.



**Figure 4 : Forecast of mean sea level rise in Togo (in FEM-PNUD, 2010)**

Thus, considering these forecasts (+0,25 m from 2015 to 2035 and +0,70 m from 2015 to 2065), retreat of the coastal line due to sea level rise, looking ahead 2035, would reach from 4,0 to 10,0 m.

If nothing is done to protect the littoral, the mean value for expected recession of Togolese coast line, due to sea level rise only, is about of 6 m looking ahead 2035. This encroachment will be increased by 10 m to 15 m from 2035 to 2065.

Yet, climate change will not have significant impact on wave climate; consequently, the main hydro-sedimentary dynamic agent, which is wave energy, will stay unchanged within the active zone located from the upper beach to the closure depth. Consequent littoral drift will stay roughly the same; however its cross-shore distribution along beach profile will be adapted so as to reach an equilibrium profile.

As far as storm set-up/surcote climate is concerned, it will stay unchanged. As long as the upper beach is rising with the sea level, marine flooding will not occur more frequently. However, water levels and height of submersion will be higher. Consequently, water amounts crossing over the beach will be larger than nowadays, which implies longer flooding events in the future.

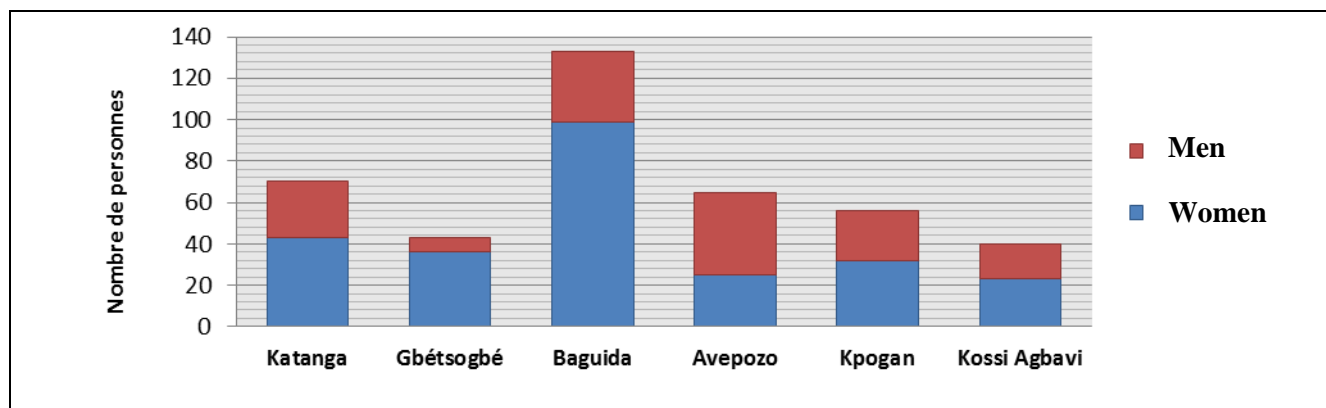
Local knowledge and scientific data was combined to provide an in-depth socio-economic analysis as well as capture people's understanding about climate risks and possible adaptation strategies.

Besides, expected coastal line recession will cause further direct destruction of infrastructure such as school, homes, and international coastal road, industrial. Tourism will also be impacted by destruction of dedicated infrastructures, and by the loss of beaches and boat landing sites in addition to potential direct destruction of hotels.

**Gender analysis:** To ensure that alternative adaptation options meet equality and equity criteria, with special attention given to women and youth, a gender impact assessment methodology was used to complement the climate vulnerability and capacity assessment. The applied method was the following. During the start-up mission of climate vulnerability and capacity assessment study carried out from 12 to 21 October 2015, women and youth were interviewed (in groups or individually) on their knowledge of erosion risk ( its origins, how to face the risk, their own feeling concerning how their situation is taken into account by authorities...). They were asked about their income generating activities too. The following table inventories the number and gender of surveyed people.

	Survey in group	individual interview
<b>Katanga</b>	-	4 women
<b>Gbétso</b>	13 people (11 hommes et 2 femmes)	-
<b>Baguida</b>	27 people (15 hommes et 12 femmes)	1 man
<b>Avepozo</b>	11 people (11 hommes)	1 man
<b>Kpogan</b>	10 people (8 hommes et 2 femmes)	1 man
<b>Kossi Agbavi</b>	23 people (21 hommes et 2 femmes)	2 women et 1 man

During a second mission, from March to April 2016, more specific interviews concerning the 400 people involved in illegal marine aggregate extractions within the study area were carried out. The goal of this consultation was to survey this population on their aspirations in terms of professional reconversion, their willingness to change their illegal activity into one out of the 11 IGAs proposed by surveyors. Women who represent 64% of the concerned population could express their own wishes that were taken into account in the development of diversification strategy.



**Figure 5: Assessment of number of people involved in marine aggregate extraction, by community and gender**

For instance, 211 women expressed their wish to change their current activity to fish processing, 48 women expressed their wish to change their current activity to trade of corn and palm oil, 42 women considered the production and trade of liquid soap as a possible alternative activity.

This assessment reviewed the impact of alternative adaptation options (see section C below) on women and men as well as on gender relations in the project area.

**Stakeholder analysis:** The stakeholder analysis was conducted as part of vulnerability and adaptation opportunities analysis. The analysis provided insights into and understanding of the interactions between the project and its stakeholders and identified and prioritized stakeholders who have an impact on project success so as to assure their support as well as manage their expectations.

Stakeholders will be engaged in project implementation in a variety of ways. At the national level, the project takes place as a part of the broader National Early Warning System and Infrastructures resilience program in Togo. National-level stakeholders will be engaged via the following coordination mechanisms:

- Togo's donor coordination mechanism is composed at the high level by the Local Development Partner Group, which brings on board all heads of development agencies and all donors/development partners involved in the infrastructure sector.
- Project Steering Committee involving all stakeholders during project implementation period. The Project steering Committee meets at least 2 times a year and is supported by the project implementation unit.

In addition to the African Development Bank (ADB), stakeholders have been identified who will take part in project meetings and workshops:

- Institutions / government delegate dedicated to project coordination :
  - ☐ Environment Direction – Department of Environment and Forest Resources (ED-DEFR),
  - ☐ General Direction of Civil Works - Department of Transports (GDCW-DT),
  - ☐ Department of Fisheries and Aquatic Resources - Department of Agriculture, Husbandry and Fisheries (DFAR-DAHf),
- Lome University, especially the Integrated Coastal Zone and Environment Management Center (CGILE) and Pr. Blivi, whose research team studies coastal line evolution and could share important data,
- Local associations, governmental or non-governmental (Red Cross, ...),
- Tourism professionals,
- Local populations directly implied and/or affected by erosion issue:
  - ☐ Village heads, leading citizens, heads of village development committees, Committees of Wise Men,
  - ☐ Representatives of community of marine aggregate exploitations.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

In order to assess the projected benefits of the beach protection systems (for 2022), in terms of infrastructure development and preserved land, an analysis relying on pictures "Pléiades" from 2015 and calculated shoreline positions under reference situation with current protection system will first be carried out.

A projection is provided for coastal line position in 2022, deduced from the coastal line evolution calculated between 2015 and 2017 under the cumulative pressures of variations of littoral drift, illegal extraction of marine aggregates and sea level rise due to climate change. A 12m-wide land ridge is added to take into account the 12m shoreline recession that a severe storm (as observed in 2011-2013) could cause if occurring at the end of 2022. Then a comparison between coastal line positions in 2017 and in 2022 (if no protection system is built) shows damages caused by erosion that could occur in the 5 next years (project term) if nothing is undertaken. This study made the assumption that JICA port is constructed in 2017.

Applying the same method to protected situation with ARTELIA V2 system, comparison between calculated coastal line positions in 2017 and in 2022 if protection system is built gives damages caused by erosion that could occur in the 5 next years (project term) if ARTELIA V2 system is undertaken.

The following table summarizes possible losses of land and infrastructures in the next 5 years if nothing is undertaken (second column), and if ARTELIA V2 system is built (third column).

Looking ahead to 2022, the project would preserve 37.4 ha on the threatened 67 ha, 85 houses out of the threatened 315 that are currently threatened.

TOTAL OF LOSS OCCURRING FROM 2017 to 2022	IF NOTHING IS UNDERTAKEN		IF THE SYSTEM ARTELIA V2 IS UNDERTAKEN	
Land loss	67 ha		29.6 ha	
including land occupied by hotel resort	6.5 ha		<1.5 ha	
loss of houses/buildings	273 to 315	houses/buildings	205 to 230	houses/buildings
including finest properties /villas	10	houses/buildings	6	houses/buildings
Including buildings dedicated to tourist use	17	houses/buildings	9	houses/buildings
loss of areas cultivated in 2015	4.65 ha		<1.1 ha	

In order to assess the benefits from protection system in terms of preserved infrastructures and land looking ahead to 2035, an analysis relying on pictures "Pléiades" from 2015 and calculated shoreline positions under reference situation with current protection system is first carried out.

The coastal line evolution is calculated between 2015 and 2035 under the cumulative pressures of variations of littoral drift, illegal extraction of marine aggregates and sea level rise due to climate change (8m-recession due to climate change only). Besides, a 12m-wide land ridge is added to take into account the 12m shoreline recession that a severe storm (as observed in 2011-2013) could cause if occurring at the end of 2022. Then a comparison between coastal line positions in 2017 and in 2035 (if no protection system is built) highlights damage caused by erosion that could occur in the 18 next years (project term) if nothing is undertaken.

Applying the same method to protected situation with ARTELIA V2 system, comparison between calculated coastal line positions in 2017 and in 2035 if protection system is built gives damages caused by erosion that could occur in the 18 next years if ARTELIA V2 system is undertaken.

The following table summarizes possible losses of land and infrastructures in the next 20 years if nothing is undertaken (second column), and if ARTELIA V2 system is built (third column).



Looking ahead to 2035, the project would preserve 100 ha on the threatened 172 ha, and 710 houses out of the 1185 that are currently threatened.

TOTAL OF LOSS OCCURING FROM 2017 to 2035	IF NOTHING IS UNDERTAKEN		IF THE SYSTEM ARTELIA V2 IS	
Land loss	172.25 ha		72.1 ha	
including land occupied by hotel resort	11.5 ha		<2.9 ha	
loss of houses/buildings	1105 to 1185	houses/buildings	425 to 475	houses/buildings
including finest properties /villas	43	houses/buildings	11	houses/buildings
Including buildings dedicated to tourist use	159	houses/buildings	60	houses/buildings
loss of areas cultivated in 2015	25.7 ha		<4.6 ha	

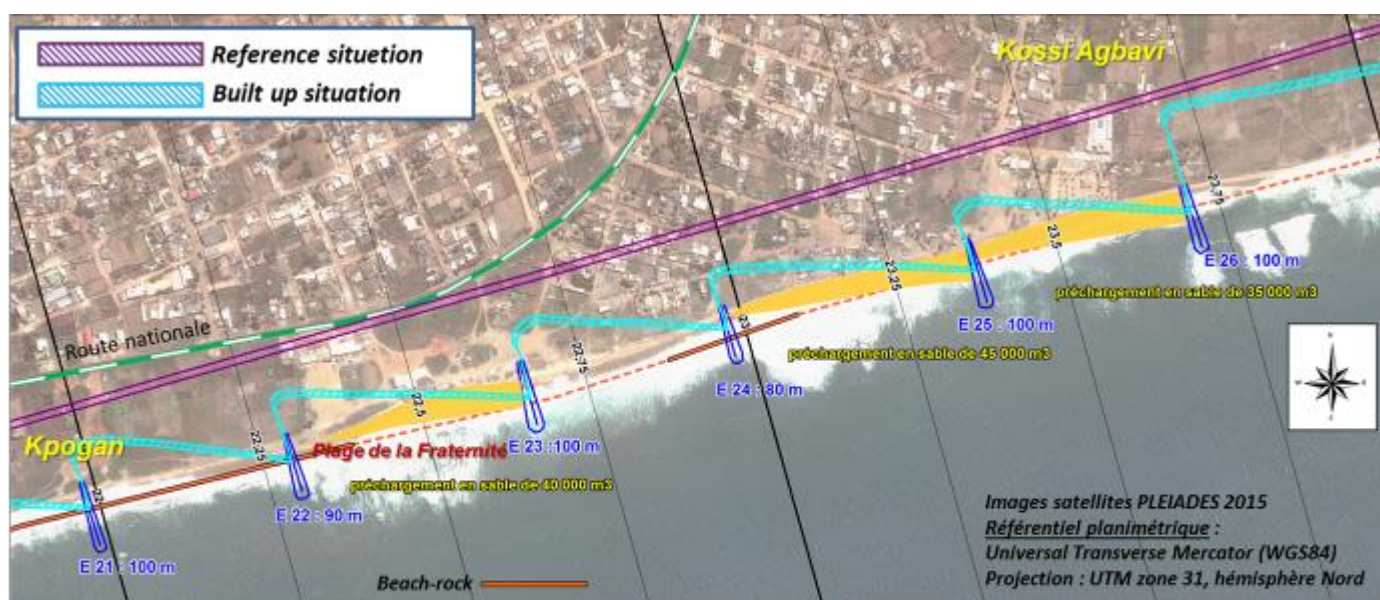
As Baguida Plage sector is concerned, the following picture (**Figure** ) shows that looking ahead to 2035, the school is threatened in reference situation. The proposed ARTELIA V2 protection system succeeds in preserving the school.



**Figure 6:** Expected shoreline position in 20 years, in reference situation (in purple) and in built up situation (in blue). Position of shoreline integrating climate change effect (looking ahead 2035 for example) Baguida - Plage Land ridge added to take into account shoreline recession due to a severe storm (mean recession of 12 m)

As Kossi Agbavi sector is concerned, the next picture

( Figure ) shows that looking ahead 2035, the national road is threatened in reference situation. The proposed ARTELIA V2 protection system succeeds in preserving the national road.



**Figure 7: Expected shoreline position in 20 years, in reference situation (in purple) and in built up situation (in blue) - zoom on Kossi Agbavi**  
 Position of shoreline integrating climate change effect (looking ahead 2035 for example)  
 Land ridge added to take into account shoreline recession due to a severe storm (mean recession of 12 m)

From a socio-economical point of view, benefits are great for coastal communities too:

- Protection of the national road,
- Protection of hundreds of houses, cultivated lands...
- Identification of high risk zone;
- Forecasting of endangered people migration;
- Increasing awareness of erosion risks ;
- Increasing awareness of the consequences of bad usages like illegal gravel extractions.
- Ensuring material and financial support for beginning a new IGA.

A gender analysis was conducted during the project preparation consultations. Women who are currently living in the affected coastal area that the project won't be able to support, will be equally informed of the risk they are facing, in order to relocate in time.

Plus, the professional reconversion of women involved in marine aggregate extraction is planned by the project: 256 women will be supported in their new alternative activity. Youth involved in marine aggregate extraction will also be supported in their reconversion.

Numerous indicators will be evaluated in a gender-disaggregated manner as outlined in the project results framework.

### B.3. Explain how cost-effectiveness is reflected in the project design:

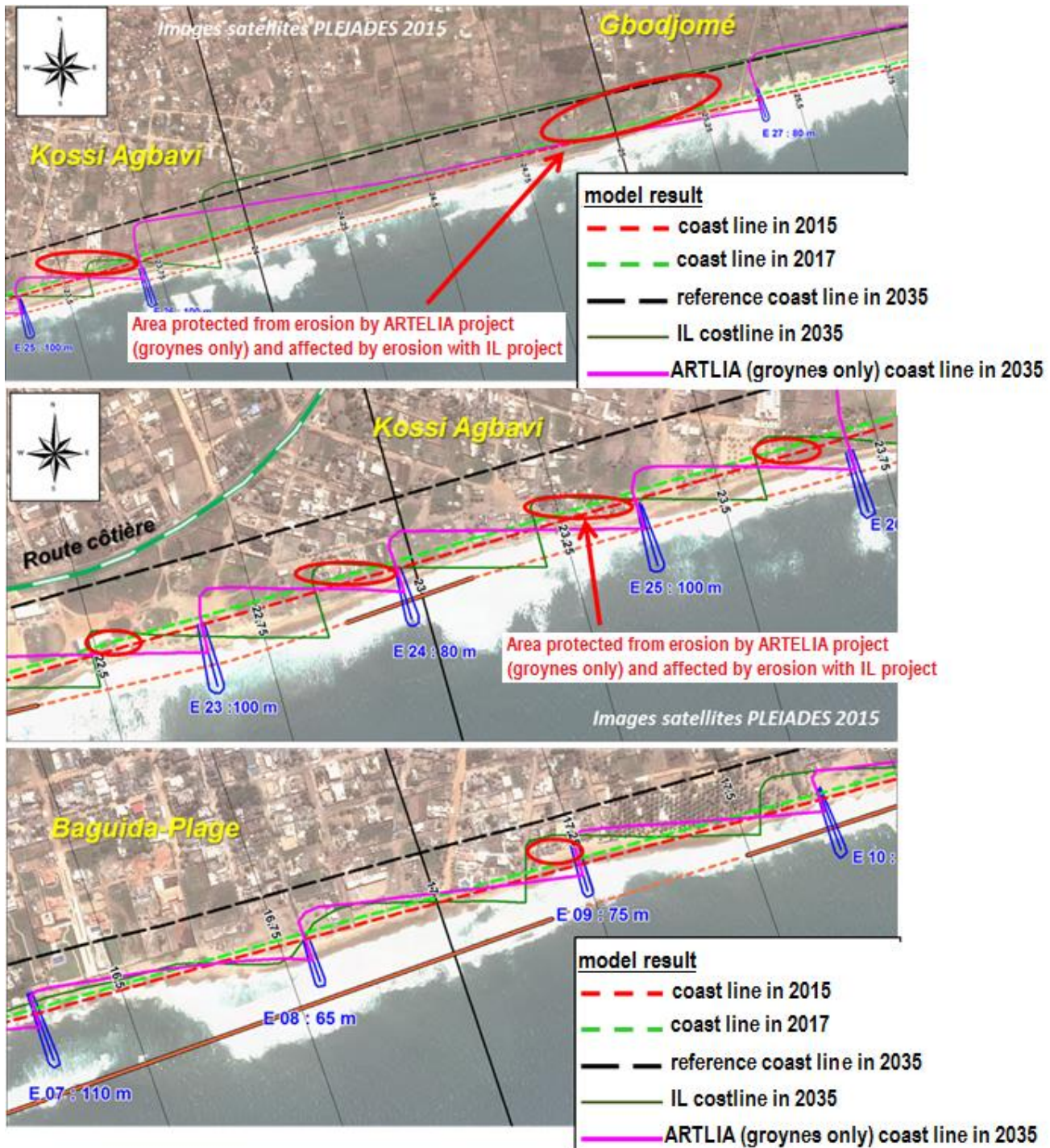
In order to assess the cost/effectiveness of the recommended protection system, four planning scenarios for coastal area have been tested and compared in terms of costs and ability to reduce shoreline recession.:

- Scenario 1 : no new protection system (reference situation)
- Scenario 2 : Inros Lackner's protection system
- Scenario 3 : ARTELIA's protection system V1 (groynes only)
- Scenario 4 : ARTELIA's protection system V2 (groynes + sand supply)

The ARTELIA hydro-sedimentary study showed that the realization of groynes and sand supply will greatly succeed in reducing coastal line recession and protecting assets.

First, Inros Lackner's solution is compared with ARTELIA protection system including groynes only (ARTELIA V1). Following figures show that looking ahead 2035, ARTELIA V1 proposal succeeds in protecting critical areas better than Inros Lackner's one does.

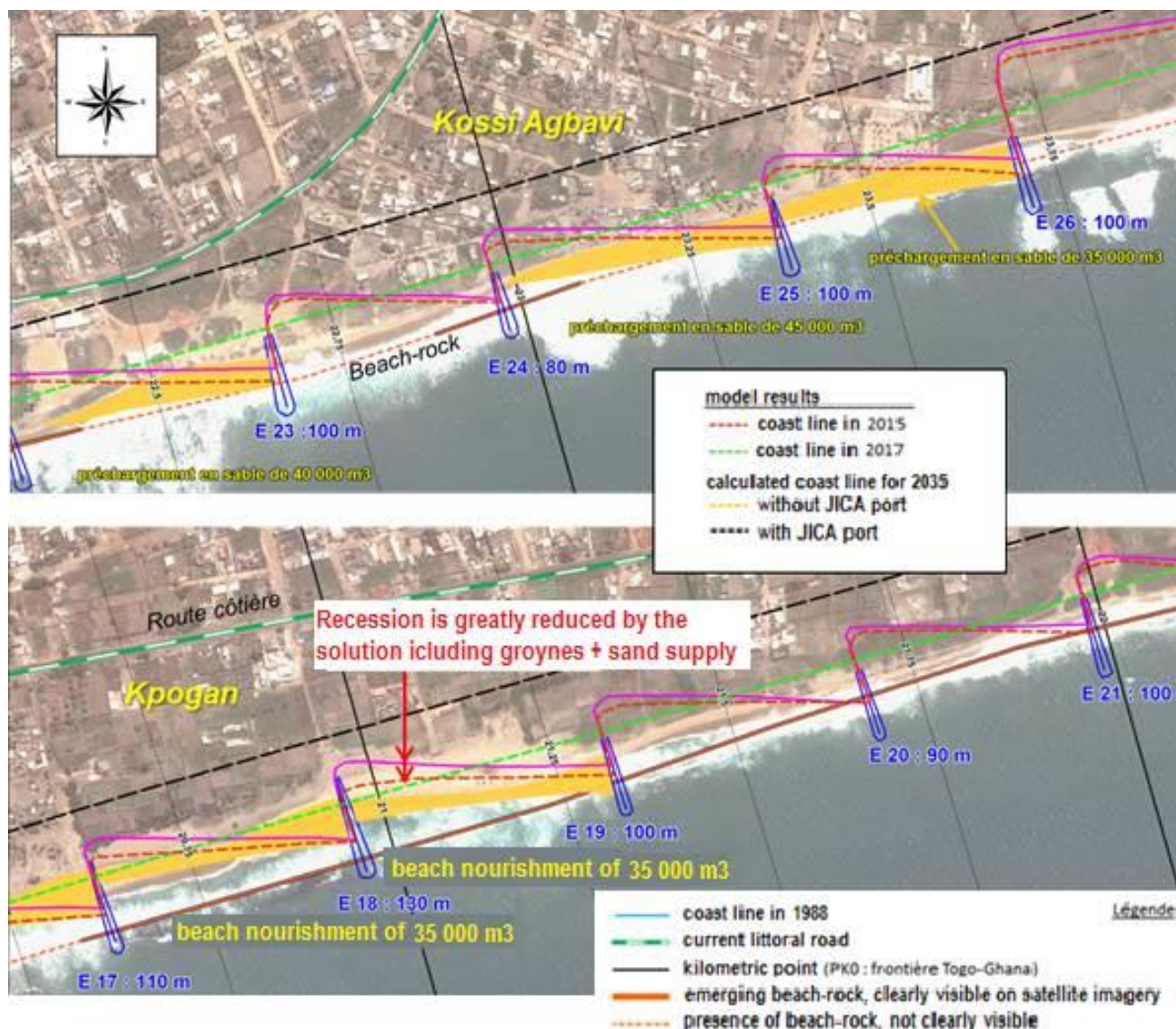




**Figure 8 : Comparison between expected shoreline position in 2015 for reference situation (black dashed line), considering Inros Lackner protection system (dark green line) and considering Artelia V1 protection system (pink line)**

Then a comparison between ARTELIA protection system effectiveness with and without sand supply is carried out. The following figure shows comparison between coastal line locations in 2035: if nothing is done (black dashed line), if groynes only are built (pink dashed line), if groynes are completed with beach nourishment (red dashed line). This result leads to the conclusion that recession is greatly reduced by the solution including groynes plus beach nourishment.





**Figure 9 : Comparison between expected shoreline position in 2015 considering Artelia V1 protection system (pink line) and considering Artelia V2 protection system (red dashed line)**

The following table compares the cost of each protection solution. The recommended one is the ARTELIA V2 system, for its best ratio cost/ effectiveness.

PROTECTION SOLUTION	DESCRIPTION	COSTS in FCFA	COSTS IN US \$
iNROS LACKNER (Stage 1)	33 groynes + 2 new sea walls + extension of an existing one	26,580,640,000	45,187,100
ARTELIA V1	28 groynes	15,709,600,000	26,706,000
ARTELIA V2	28 groynes + 1,000,000 m3 of sand supply	27,669,600,000	47,038,000

### **C. DESCRIBE THE BUDGETED M & E PLAN:**

Component 3 of the project is focused on supporting Knowledge Management (KM) and Monitoring and Evaluation (M&E) of the project. The following approach for KM and M&E will be used to build awareness of technologies, measures and practices to increase resilience to climate change in coastal area. The mechanisms described below will

enable empirical analysis of experiences and lessons learned in building resilience in the coastal infrastructure (road). In accordance with Stakeholder discussions, LDCF funds for M&E will be channeled through project implementation Unit. The following M&E process is being implemented.

The project will support the country system to monitor coastal erosion rate in the future, as well as project outcomes at the communities' level, ensuring that people behavior and economic activities are changing for an improved sustainable management of coastal line within the project area.

In order to achieve these objectives, four critical tasks have been defined:

- ☐ Identification of education, information and communication needs in matters of climate change and possible impacts on coastal zone,
- ☐ Identification of activities and operations in order to strengthen integration of climate change issue,
- ☐ Realization of monitoring and evaluation (M&E) of Coastal erosion,
- ☐ Adaptive behavior and knowledge capitalization among local communities coping with climate change impacts,
- ☐ Accurate identification of required investment for such M&E implementation.

In order to strengthen integration of climate change issue, recommendations are provided in terms of communication strategy that has to be developed. This strategy depends on:

- ☐ Ambitious training program, including technical training of qualified people as well as awareness activities for the local communities,
- ☐ Project monitoring and evaluation implementation,
- ☐ Creation of an efficient knowledge management system, including data base, code of practice, planning of activities within coastal area...
- ☐ Definition each roles and responsibility in the M&E within the project.
- ☐ Dedicated budget envelope has also been defined.

## **PROJECT START:**

A Project Inception Mission will be held within the first 2 months of project start with those with assigned roles in the project organization & structure, AfDB country office in Togo and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Mission is crucial to building ownership for the project results and to plan the first year annual work plan. An Inception Workshop will then be held, that should address a number of key issues including:

- Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of AfDB staff vis-à-vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
- Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
- Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- Plan and schedule Project Board meetings. Roles and responsibilities of all project organization structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

An Inception Mission report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

**QUARTERLY:**

- Based on the initial risk analysis submitted, the risk log shall be regularly updated in AfDB information system. Risks become critical when the impact and probability are high. Note that for GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of value chain actors are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in AfDB information system, a Project Progress Report can be generated in the Executive Snapshot.

**ANNUALLY:**

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (1 July to 30 June). The APR/PIR combines both AfDB and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes — each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- AfDB information system
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

**PERIODIC MONITORING THROUGH SITE VISITS:**

AfDB will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report will be prepared by the AfDB and will be circulated no less than one month after the visit to the project team and Project Board members.

**MID-TERM OF PROJECT CYCLE:**

The project will undergo an independent Mid-Term Review at the mid-point of project implementation. The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-Term Review will be prepared by the AfDB based on guidance from the GEF. The management response and the evaluation will be uploaded to AfDB corporate systems. The relevant GEF Focal Area Tracking Tools will also be completed during the Mid-Term Review cycle.

**END OF PROJECT:**

An independent Final Evaluation will take place three months after the final Project Board meeting and will be undertaken in accordance with AfDB and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Review, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the AfDB based on guidance from the GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded. The relevant GEF Focal Area Tracking Tools will also be completed at project completion stage.

During the last two months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

#### **LEARNING AND KNOWLEDGE SHARING:**

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

As shown in Table 2, the KM products will be implemented along the project life through various type of features including training of trainees, public awareness campaigns, focused groups (IGAs trainings), and toolkit/manual distribution.

**Table 2: Knowledge management implementation plan**

Type of training	Delivered supports	Implementation arrangements	Timeline
<ul style="list-style-type: none"> <li>- IGAs trainings</li> <li>- Sandy littoral management strategy</li> <li>- Adaptation strategy to deal with Climate Change (CC)</li> </ul>	- Toolkit for each IGA implementation	- IGA trainings be conducted throughout timeline for communities	5 years
	- Booklet on adaptation to coastal erosion		
	- Publication of the Vulnerability assessment report and capacity building (CARE, 2010)	- Toolkits and publications be disseminated through awareness campaigns by Trainees	5 years
	- Publication of the toolkit « trousse à outils de planification et suivi-évaluation des capacités d'adaptation au changement climatique (TOP-SECAC), Manuel et guide d'utilisation », CILSS/Centre Régional AGRHYMET, 2011	- Trainees program will include extensive sessions on Toolkit and manuals dissemination	During training of trainees
	- Dissemination of the toolkit called « <i>Guide d'intégration des changements climatiques dans les plans de développement communaux - Modèle pour servir d'exemple dans la commune d'Atakpamé au Togo</i> »	- Awareness campaigns periodically at selected villages by Trainees	During and after project period
	- Awareness campaign on coastal erosion techniques	- Focus groups by trainees to disseminate toolkits and manuals	During and after project period
		- Creation of local communities exchange group for IGAs best practices exchanges	During and after project period


**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

- A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):** (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this form. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Yao Djiwonu Folly	Directeur de l'inspection forestière et environnementale, Point focal opérationnel du FEM	MINISTRY OF ENVIRONMENT AND FOREST RESOURCES	03/08/2013

**B. GEF AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Mahamat ASSOUYOUTI		05/23/2016	Lydie EHOUMAN	+220 20 26 4215	l.ehouman@afdb.org

## ANNEX A: PROJECT RESULTS FRAMEWORK

Results Chain	Performance Indicators			Means of verification	Risks/Mitigation Measures
	Indicator	Baseline	Target		
	(Including CSI)				
Outcome 1: Transport infrastructure in coastal zone in the area of Baguida (KP 11to 20) and Kossi Agbavi (KP 20 to 26) is climate change resilient	<p>The national road currently threatened by erosion will be protected.</p> <p>Due to the protection system, <b>looking ahead 2035:</b></p> <ul style="list-style-type: none"><li>- Reduction of the coastal line recession of 80m in Baguida-Plage and of 120m in the sector of Kossi Agbavi;</li><li>- About 120 ha currently jeopardized by erosion will be safeguarded;</li><li>- About 620 houses / buildings / tourist facilities that are currently threatened are protected by groynes and sand supply;</li><li>- About 22 ha of cultivated land currently jeopardized by erosion will be safeguarded.</li></ul>	<p>Between KP 11 to 20 and 20 to 26</p> <ul style="list-style-type: none"><li>- Mean erosion of 3.5m and 5.7m respectively</li><li>- loss of 142ha of land</li><li>- Destruction of about 1010 constructions</li><li>- loss of 26 ha of crops</li></ul>	<p>Between KP 11 to 20 and 20 to 26</p> <ul style="list-style-type: none"><li>- Mean erosion of 0.8m and 1.5m respectively</li><li>- loss of 42ha of land</li><li>- Destruction of about 390 constructions</li><li>- loss of 4ha of crops</li></ul>	<p>Project monitoring systems, Reporting by monitoring teams, mid and end of project reviews</p>	<p><b>Risk:</b> People may fail to use correctly the technologies, despite of an increased awareness of the advantages/benefits of such a program.</p> <p>Once coastal area would be protected, the costs of land would rise. This possible speculation would prevent poor local population from land acquisition</p> <p><b>Mitigation Measures:</b> Continuous training/educative program in order to increase coastal communities’ awareness of coastal erosion risk.</p> <p>Policies to prevent local communities from expropriation. Financial compensations</p>
Outcome 2: <ul style="list-style-type: none"><li>- Reinforced enabling environment for coastal management</li><li>- Increased adaptive capacity of communities in the coastal zone</li></ul>	<p>The coastal integrated management scheme and plan of Lome SDAU_GL is strengthened and completed in the project area (extension to the sector from Kopgan to Kossi Agbavi), after integration of the coastal integrated management scheme and plan (including regulatory framework, training and equipment of personnel in charge of coastal control)</p>	<p>Existing coastal integrated management scheme and plan to extend to the Kpogan/Kossi Agbavi sector</p>		<p>Project monitoring systems, reports</p> <p>Knowledge Attitude Practice (KAP) survey Report</p>	<p><b>Risk:</b> Changes inconsideration/priority from government/politicians/ policymakers that will lead in the future (before the end of the program) to a decrease or a lack of support for the project and the abandon of the project.</p> <p><b>Mitigation Measures:</b> Ensuring the good implementation of the training program, the activities, events, and follow-up reporting, annual audits that prove the effectiveness of the project.</p>

Results Chain	Performance Indicators			Means of verification	Risks/Mitigation Measures
	Indicator	Baseline	Target		
	(Including CSI)				
	Communities involved in illegal sand collection are supported in their conversion through: - 6 existing IGAs (fishing, agro and fish processing, market gardening, small-scale trade, taxi-moto facility, traditional handcraft); - 5 new IGAs (trade of gravels from inland quarries, extensive farming, corn and red oil, trade of liquid soap, beadwork); - Technical training and financial support.		The diversification of activities will induce reduction of illegal harvest of aggregate and gravel in coastal zones : 80% of the community  About 400 (64% of women, 36% of men) inhabitants benefit from technical training and financial support.	Project monitoring systems, reports  Community action plans	<b>Risk:</b> Reluctance of communities to adopt new IGA, to cooperate with the program.  <b>Mitigation Measures:</b> Continuous training/educative program in order to increase coastal communities’ awareness of negative effect /consequence of marine sand or gravels extractions
	The existing Early Warning System (EWS) is strengthened in the coastal zone of Togo.	Existing EWS, weak in coastal zone	At least 50% of engineers trained and utilising guidelines	Project monitoring systems, reports	
Outcome 3: M&E management and lessons learnt are captured and appropriately disseminated	- General training dealing with sandy coastal evolution and training on adaptation to climate change  - Visits/workshops /feedback presentations  - Knowledge products (KP) on adaptation in coastal zones are produced and disseminated (manuals, guides)  - Participation of stakeholders in adaptation practitioners events (organisation of exchange visits between the project partners and counterparts in the country and in the West African sub-region)		80 persons (inhabitants and stakeholder representatives) benefit from these trainings  30 persons take part to visits or workshops  Providing at least 6 main KP acceptable for A ranked international journals, and information that can be used in training,  Participation of 20 stakeholder representatives in	Attendance sheet  Training reports  Project monitoring reports  Publications	<b>Risk:</b> Changes that could occur in consideration/priority of government/politicians/ policymakers. This could lead in the future (before the end of the program) to a decrease or a lack of financial support for the project and the abandon of the project.  people do not feed the database  credits for trainings are cut  <b>Mitigation Measures:</b> the project has to identify and hire a consultant gifted with technical expertise, interest, availability and willingness to work with communities and the government in an participative monitoring



Results Chain	Performance Indicators			Means of verification	Risks/Mitigation Measures
	Indicator	Baseline	Target		
	(Including CSI)				
	- Monitoring and evaluation of the project is effective: technical staff responsible for data collect/data aggregation is designed, local partners and community representatives are supported for collecting data and updating the database, follow-up reports are published, annual audits permit to assess of the effectiveness of the project regarding to erosion issue.		events dealing with practice adaptation Local partners and community representatives are supported for data collecting and database updating: at least 5 persons		

### Output-level indicators

Results Chain	Performance Indicators			Means of verification
	Indicator	Baseline	Target	
	(including CSI)			
Component 1: Making infrastructure climate resilient				
Output 1.1.1 – The national road currently threatened by erosion will be protected	Minimum distance between the road and the shoreline in the “Plage de la Fraternité” sector	130m	130m +/-20m	Annual survey / Campaign reports
Output 1.1.2: Due to the protection system, looking ahead 2035, the coastal line recession will be reduced of 80m in the sector of Baguida-Plage and of 120m in the sector of Kossi Agbavi	Shoreline position relative to a reference line (measurements every 500 m between KP 11 and 26)			
Output 1.1.3: Due to the protection system, looking ahead 2035, about 100ha of land currently jeopardized by erosion will be safeguarded	Surface (in ha) of land lost per year (between KP 11 and 26)	7.1	2.1	
Output 1.1.4: Due to the protection system, looking ahead 2035, about 620 houses / buildings / tourist facilities that are currently threatened are protected by groynes and sand supply	No. of houses / buildings / tourist facilities destroyed per year (between KP 11 and 27)	50	20	
Output 1.1.5: Due to the protection system, looking ahead 2035, about 22 ha of cultivated land currently jeopardized by erosion will be safeguarded.	Surface (in ha) of cultivated land lost per year (between KP 11 and 27)	1.2	0.2	
Component 2: Capacity building for coastal management				

Output 2.1.1: The coastal integrated management scheme and plan of Lome SDAU-GL will be strengthened and completed in the sector from Kopgan to Kossi Agbavi, after integration of the coastal integrated management scheme and plan (including regulatory framework, training and equipment of personnel in charge of coastal control)	% of communities with knowledge and understanding of social dimensions of vulnerability and resilience to climate change	0%	80%	Baseline Report, Knowledge Attitude Practice (KAP) report
Output 2.1.2: Communities involved in illegal sand collection are supported in their conversion through:  <ul style="list-style-type: none"> <li>- 6 existing IGAs and 5 new IGAs</li> <li>- technical training and financial support</li> <li>- awareness campaigns on climate change impacts (erosion) and promotion of gender-responsive climate adaptation conducted.</li> </ul>	No. of jobs created (by gender)	0	400 (64% of women, 36% of men)	Campaign reports  Database of NGO  Individual interviews  Socio-economic survey
	% change in income before and after the implementation of reconversion activities			
	No. of technical training and financial support	0	8	Training reports
	No. of awareness campaigns on climate change impacts and promotion of gender-responsive climate adaptation conducted	0	8	Campaign reports
Output 2.1.3: The existing EWS is strengthened in the coastal zone of Togo	No. of community based planning, implementation and monitoring adaptation programmes implemented	0	6	Community based programmes
	No. of people with access to information on the CC and EWS	0	20%	
<b>Component 3: Knowledge Management and Monitoring &amp; Evaluation</b>				
Output 3.1.1: General training dealing with sandy coast evolution and training on adaptation to climate change	No of training	0	80	Attendance sheet
Output 3.1.2: Visits/workshops /feedback presentations	No of visits/workshops	0	30	Attendance sheet
Output 3.1.3: Knowledge products on adaptation in coastal zones are produced and disseminated (manuals, guides)	No. of knowledge adaptation products developed documented and disseminated	0	5	Knowledge products

Output 3.1.4: Participation of stakeholders in adaptation practitioners events (organisation of exchange visits between the project partners and counterparts in the country and in the West African sub-region)	No. of adaptation practitioners' events attended and evidence of incorporating lessons into the project	0	6	Event Reports
Output 3.1.5: Monitoring and evaluation of the project is effective: technical staff responsible for data collect/data aggregation is designed, local partners and community representatives are supported for collecting data and updating the database, follow-up reports are published, annual audits permit to assess of the effectiveness of the project regarding to erosion issue	No. Number of people (local partners and community representatives) trained to fill and update the database	0	5	Training reports
	No. of follow-up reports	0	12	Reports
	No. of audits	0	3	Audit reports

**ANNEX B: RESPONSES TO PROJECT REVIEWS** (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Comments	Responses	Document reference
<b><i>GEFSEC pending comments at Project Identification Form (PIF) review</i></b>		
Question 10 : By CEO Endorsement, please clarify how public participation will be ensured during implementation, beyond the consultations contributing to project design	As described in the section B.1, stakeholders will be fully involved during project implementation through steering committee, project supervision and M&E activities	GEFSEC Review sheet at PIF stage
<b><i>Comments from the United States (2013)- US GEF Council email on 09/17/2013</i></b> <b><i>The United States welcomes this project concept. We recognize the importance of reducing climate change impacts on coastal infrastructure and appreciate the project's focus on improving coastal management. We would like to request that AfDB, as it prepares the draft final project document for CEO endorsement:</i></b>		
<ul style="list-style-type: none"> <li>Clarify how it plans to promote policy development or enact legislation to limit harmful land use practices that increase vulnerability to the impacts of climate change;</li> </ul>	<ul style="list-style-type: none"> <li>Law n°2008-005 of the 30th of May 2008 provides framework for creation by State of Togo of an environmental police department whose missions are to enforce legal instruments dedicated to littoral area and marine environment. Besides, prefectural direction of environment and forest resources department from Golf and Lakes sectors sends trained brigades to control and enforce inter-ministerial instructions N° 002/MME/MERF/2013 of 15th of January 2013 et n°031/MME/MERF/2011 of 05th of May 2011 dealing with marine aggregate extraction banning all over the Togolese littoral.</li> <li>Besides, the current project will ensure its monitoring and evaluation by proposing M&amp;E system that will track the project outcomes according two levels. The system will monitor coastal erosion rate in the future, as well as project outcomes at the communities' level, ensuring that people behavior and economic activities are changing for an improved sustainable management of coastal line within the project area.</li> </ul> <p>In order to achieve these objectives, four critical tasks have been defined as following :</p> <p>(i) identification of education, information and communication needs in matters of climate change and possible impacts on coastal zone, (ii) identification of activities and operations in order to strengthen integration of climate change issue, (iii) realization of monitoring and evaluation (M&amp;E) of coastal erosion and adaptive behavior and knowledge capitalization among local communities coping with climate change impacts, (iv) accurate identification of required investment for such</p>	US GEF Council email

Comments	Responses	Document reference
	<p>M&amp;E implementation. In order to strengthen integration of climate change issue, recommendations are provided in terms of communication strategy that has to be developed. This strategy depends on: (i) ambitious training program, including technical training of qualified people as well as awareness activities for the community; (ii) project monitoring and evaluation implementation, (iii) creation of an efficient knowledge management system, including data base, code of practice, planning of activities within coastal area...; (iv) definition of a chart that officially points out each roles and responsibility. Dedicated budget envelope has also been defined.</p>	
<ul style="list-style-type: none"> <li>Provide more information on the benefits of waterwalls and riprap walls (or breakwater infrastructure and gabion walls) relative to other coastal erosion protective measures and the process leading up to the selection of this type of infrastructure. Will complementary policy and enforcement measures aimed at reducing gravel- and sand-mining practices be promoted (in addition to identification of alternative livelihood activities) in order to increase the sustainability of erosion infrastructure?</li> </ul>	<ul style="list-style-type: none"> <li>The project recommends groynes + beach nourishment instead. See in B2 the benefits such installation will provide. Looking ahead 2035, the project would preserve 100 ha on the threatened 172 ha, and 710 houses on the threatened 1185 ones.</li> <li>No complementary law is promoted. Instead, recommendation / informative meetings are planned to increase public awareness on the great role that sandy beach and sand supply play in assets protection and how important it is for the whole community to respect the law that bans sand extraction.</li> </ul>	US GEF Council email
<ul style="list-style-type: none"> <li>Clarify whether the project proposes to build an entirely new Early Warning System (EWS) or to expand on an existing EWS;</li> </ul>	<ul style="list-style-type: none"> <li>The government of Togo has funded a national EWS including for coastal area. Therefore, this project activity is revised to avoid duplication. The project will support the existing EWS which will be strengthened within the coastal area. Indeed, EWS is currently weak in the area.</li> </ul>	US GEF Council email
<ul style="list-style-type: none"> <li>Clarify how the proposed EWS will be developed, including what exactly it will be measuring, how this information will be organized, archived, and used, if personnel will be specifically trained to operate and maintain the equipment, and if there is current capacity within relevant government ministries to analyse the information produced by the EWS;</li> </ul>	<p>The contractor in charge with the next study will have to precise:</p> <ul style="list-style-type: none"> <li>Expected indicators and method of measurement for assessment of factors predicting strong waves and assessment of sea level rise evolution leading to erosion;</li> <li>Specific trainings to provide to ministry staff and local stakeholders (CGILE, national marine, Lome port) in order to monitor phenomena evolutions and to carry out data analysis, prediction update, information diffusion.</li> </ul>	US GEF Council email
<ul style="list-style-type: none"> <li>Clarify how users will be involved both in</li> </ul>	A specific study has to be launch that will permit	US GEF Council

Comments	Responses	Document reference
<p>the design of the EWS and in deciding what information is produced from the EWS as well as how information will be disseminated. Better results can be achieved by ensuring that climate information and early warning system products are user-driven and communicated to users through various innovative channels; and,</p>	<p>to precise this point</p>	<p>email</p>
<ul style="list-style-type: none"> <li>• Provide more information on how the alternative livelihood activities were identified and if consideration was given to environmental and social impacts of the proposed activities.</li> </ul>	<p>The choice of the 11 IGAs is based on:</p> <ul style="list-style-type: none"> <li>• Previous proposal provided in 2014 study (<i>'Options de reconversion des acteurs de la filière d'extraction de granulats marins sur le littoral togolais'</i>) dealing with economic reconversion of people involved in illegal sand collection and living from Baguida to Kossi Agbavi. This study was financed by FAO and identified 12 alternative IGAs;</li> <li>• Stakeholder consultations that were carried out from March to April 2016 by a team made of a coordinator and 3 Togolese surveyors. Groups and local people expressed themselves freely about their concerns, expectations, willingness and questions.</li> </ul> <p>The main criteria that will ensure successful reconversion is the willingness of people to change their illegal activity into a legal one. A socio-economic study shows that the 11 proposed IGAs are viable. Thus, the strategy consisting in proposing a large range of activities (11 IGAs) aims at reducing economic and environmental pressure of each one.</p>	<p>US GEF Council email</p>
<ul style="list-style-type: none"> <li>• Clarify how it will communicate results, lessons learned and best practices identified throughout the project to the various stakeholders both during and after the project;</li> </ul>	<p>This will be done through the followings:</p> <ul style="list-style-type: none"> <li>• Training program / Workshop / public meetings with attendance sheets</li> <li>• Follow-up report</li> <li>• Awareness campaigns as part of the Knowledge activities</li> </ul>	<p>US GEF Council email</p>
<ul style="list-style-type: none"> <li>• Expand on how it will ensure the sustainability of climate change adaptation education for personnel as part of the integrated coastal management scheme; and</li> </ul>	<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Training</li> <li>• Consultation</li> </ul>	<p>US GEF Council email</p>

Comments	Responses	Document reference
	<ul style="list-style-type: none"> <li>information on project realizations, results, lesson learned</li> <li>information on planned projects</li> </ul>	
<ul style="list-style-type: none"> <li>Provide more information on how beneficiaries, including women and indigenous groups, have been involved in the development of the project proposal and will benefit from this project.</li> </ul>	<p>Concerning IGAs, 400 people will benefit from assistance in order to leave their illegal activity consisting in marine aggregate extractions. 64% of this group are females.</p> <p>Concerning M&amp;E and knowledge management, 40 inhabitants and stakeholders (assuming 50% of females) will benefit from general training dealing with sandy coast evolution, 40 inhabitants and stakeholders (assuming 50% of females) will benefit from training on adaptation to climate change, 30 inhabitants (assuming 50% of females) will take part to visits/workshops /feedback presentations. Knowledge products on adaptation in coastal zones will be produced and disseminated (manuals, guides). Stakeholders will take part in adaptation practitioner's events (organization of exchange visits between the project partners and counterparts in the country and in the West African sub-region). Concerning Monitoring and Evaluation System, technical staff responsible for data collect/data aggregation will be designed, and local partners and community representatives will be supported for collecting data and updating the database. Follow-up reports will be published, annual audits will permit to assess the effectiveness of the project regarding to erosion issue.</p>	US GEF Council email



**ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS<sup>5</sup>**

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: \$200,000			
<i><b>Project Preparation Activities Implemented</b></i>	<i><b>GEF/LDCF/SCCF/NPIF Amount (\$)</b></i>		<b>\$200,000</b>
	<i><b>Budgeted Amount</b></i>	<i><b>Amount Spent To date</b></i>	<i><b>Amount Committed</b></i>
Preparation Consultancy fee	150,000	150,000	150,000
Consultancy reimbursables	50,000	20,000	50,000
<b>Total</b>	<b>200,000</b>	<b>170,000</b>	<b>200,000</b>

<sup>5</sup> If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

**ANNEX D: CALENDAR OF EXPECTED REFLOWS** (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

N/A

## ANNEX F: MONITORING & EVALUATION BUDGET

Type of M&E activity	Responsible Parties	Budget USD Excluding project team staff time	Time frame
Year 1: Inception Workshop and Report	Project Manager PMT (Project Management Team ) AfDB, GEF	Indicative cost: USD 20,000	Within first two months of project start up with the full team on board
Year 1, 2, 3: Measurement of Means of Verification of project results.	AfDB GEF/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. PMT, esp. M&E expert	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
End of year 1, 2, 3: Measurement of Means of Verification for Project Progress on output and implementation	Oversight by Project Manager PMT, esp. M&E expert Implementation teams	To be determined as part of the Annual Work Plan's preparation. Indicative cost is USD 50,000	Annually prior to ARR/PIR and to the definition of annual work plans
End of year 1, 2, 3: Annual review	Project manager; PMT; AfDB and GEF	None	Annually
Every quarter for 3 years: Periodic status/ progress reports	Project manager and team	None	Quarterly
After 18 months after project start: Mid-term Review	Project Manager PMT (Project Management Team) AfDB, GEF External Consultants (i.e. evaluation team)	Indicative cost: USD 45,000	At the mid-point of project implementation.
At the end of Y3: Terminal Evaluation	Project Manager PMT (Project Management Team) AfDB, GEF External Consultants (i.e. evaluation team)	Indicative cost: USD 45,000	At least three months before the end of project implementation
Years 1, 2, 3: Audit	AfDB Project manager PMT	Indicative cost per year: USD 3,000 (USD 15,000 total)	Yearly
Years 1, 2, 3: Visits to field sites	AfDB GEF Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly
Total indicative cost Excluding project team staff time and AfDB staff and travel expenses		USD 320,000 USD 250,000	



# **STRENGTHENING CLIMATE RESILIENCE OF INFRASTRUCTURE IN COASTAL AREAS IN TOGO**

## **CLIMATE RISK ASSESSMENT REPORT**

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N° 871 4397 R9 - V1 - STRENGTHENING CLIMATE RESILIENCE OF INFRASTRUCTURE IN COASTAL AREAS IN TOGO - CLIMATE RISK ASSESSMENT REPORT					
V1	Rapport provisoire	ALZ	ELC	ELC	27/04/2016
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## ACRONYM LIST

AfDB	: African Development Bank
AG	: Auditor General
AMAT	: Adaptation Monitoring and Assessment Tool
APR	: Annual Progress Review
CCAP	: Climate Change Action Plan
CCKD	: Centre for Climate Knowledge
CEO	: Chief Executive Officer
CSI	: Core Sector Indicators
DCC	: Department of Climate Change
DP	: Development Partner
ESMP	: Environment and Social Management Plan
EU	: European Union
FAO	: Food and Agriculture Organization of the United Nations
FONERWA	: National Fund for Climate and Environment
GCMs	: General Circulation Models
GEF	: Global Environment Facility
GFS	: Gravity Flow Scheme
GHG	: Green House Gas
IDP	: Integrated Development Project
IWRMD	: Integrated Water Resources Management Development
IPCC	: Intergovernmental Panel on Climate Change
IPRC	: Integrated Polytechnic and Research College
IPRR	: Implementation Progress and Results Report
JPF	: Joint Partnership Fund
KM	: Knowledge Management
LDCF	: Least Developed Countries Fund
LGFS	: Large Gravity Flow Schemes
NGO	: Non-Governmental Organisation
M&E	: Monitoring and Evaluation
MFA	: Multi-focal area projects
MTF	: Multi-Trust Fund project
NAPA	: Nation Adaptation Programme of Action
NCB	: National Competitive Bidding
NDP	: National Development Plan
NEMA	: National Environmental Management Authority
NGO	: Non-Governmental Organization
NP	: National Park
PCR	: Project Completion Report
PIF	: Project Identification Form
PMC	: Project Management Cost
PPG	: Project Preparation Grant
RBCSP	: Bank's Results Based Country Strategy Paper
RCMs	: Regional Climate Models Advance Climate Change Adaptation
RWSS	: Rural Water Supply and Sanitation
RWSSI	: Rural Water Supply and Sanitation Initiative
SCCF	: Special Climate Change Fund
SPS	: Sector Programme Support
SREX	: (IPCC) Special Report on Managing the Risks of Extreme Events and Disasters to
SWAp	: Sector Wide Approach to Planning
TA	: Tracking Adaptation
TAMD	: Tracking Adaptation and Measuring Development
TSU	: Technical Support Unit
UNDP	: United Nations Development
UNFCCC	: United Nations Framework Convention on Climate Change
USAID	: United States Agency for International Development
VFM	: Value for Money



# 1. INTRODUCTION

## 1.1. BACKGROUND OF THE PROJECT

The Gulf of Benin area is highly vulnerable to climate change, which is the direct cause of sea level rise. This affects in particular the coastal zones of Ghana, Togo and Bénin. Scenarios predict substantial loss of land in the coastal zone as well as increased flooding. Another consequence of sea level rise in this area is the salinization of phreatic napes with substantial repercussion on drinking water availability in the zone and substantial potential economic losses in this zone that is highly dependent on natural resources (water, land, vegetation, fauna and flora products). The consequences of sea level rise as a direct effect of climate change are expected to have a substantial impact on livelihoods but also on key infrastructure in coastal areas. In summary, the phenomenon of coastal erosion entails the following consequences:

- beach erosion increase,
- destruction of coastal line and its habitats (including villages and infrastructure),
- Socio-economic mutations.

These consequences are mainly due to the lack of appropriate coastal management and infrastructure. **In Togo, the erosion level due to sea level rise has been estimated between 5 to 10 meters per year during the period 1955-1985 and 18 to 29 meters per year during the period 1985-2009.** During this period, the coastal road linking Lomé to Aného has been moved twice. This puts at direct risk the coastal line and its related infrastructure. For example, it is here important to acknowledge that two roads situated on the coastal zone have been destroyed because of coastal erosion. Given this phenomenon, the Government of Togo has installed during the period 1985-1988 specific coastal protection installation between Lomé Port and Aného. However, these infrastructures do not have significant protection effect anymore given the magnitude of sea level rise and tides that are more and more violent because of climate change. This confirms the emergency and the need to intervene in a timely manner in order to safeguard coastal infrastructure, roads in particular.

The Government of Togo is developing its transport infrastructure with the support of the African Development Bank. In that framework, several road construction projects have been financed and implemented while some others are currently being designed. The development of the transport network in Togo is essential to support the country's economic development. This will contribute in linking regions within the country but also enhancing regional integration by enhancing the country's liaison with Ghana and Benin.

One of the main transport corridors for linking Togo to its neighbors is situated on the coastal area. This road goes across the entire 50 Km of Togo coast line linking Grand-Popo in Bénin and Aflao in Ghana. With its deep-water harbor, Togo is one of the key transit points for overseas trade for countries in the sub-region, particularly land locked countries such as Burkina-Faso, Niger, Mali, and Chad. Consequently, an improvement in the level of service of inter-state roads and adequate management of the urban sections of these roads are part of the priorities of the Togolese Government.

Under the African Development Fund 13th cycle, which will start in 2014 for a period of three years, the Bank will be pursuing this effort of strengthening regional integration through the financing of transport infrastructure.

In particular, it will finance in 2015 the “rehabilitation of the corridor Lomé-Cotonou and transport facilitation project” under which the section Avepozo-Aného, linking Lomé Port to the Bénin frontier along the coastal line, is considered. This section, which will represent the co-financing (estimated to USD 90 million) element of the LDCF project, is the direct continuity of the section that has just been rehabilitated by the Bank on the section in between the Port of Lomé and Avezopo (10.2 Km in 2x2 ways for a total cost of USD 39 million). The Avepozo-Aného section is directly at risk from natural coastal erosion, which has been increased with climate change and sea level rise as its direct consequence.

In the face of climate change and the threat that is represented by sea level rise as described above, this project main objective is to finance the related infrastructure and capacity building that will make coastal infrastructure, roads in particular, climate resilient.

In addition to protecting the Avepozo-Aného, the project will also enable to protect existing infrastructure that are at direct risk due to climate change, sea level rise in particular. These are the West Africa Gazoduc, manufacturing industries and high standing hotels.

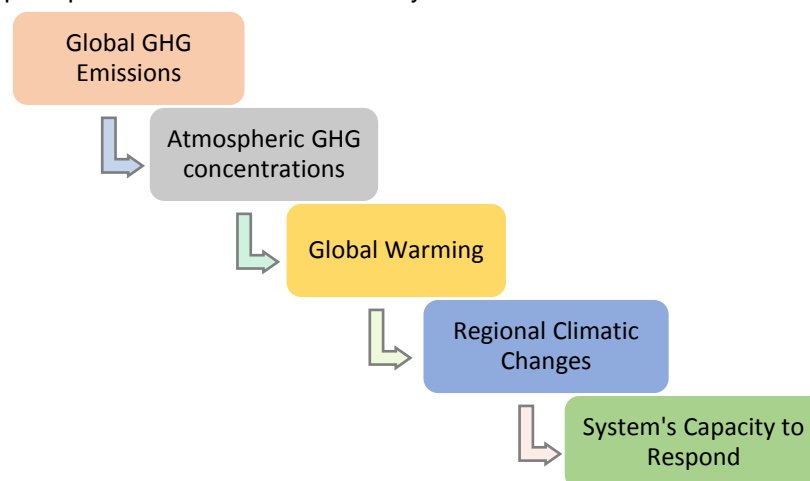
This project will focus specifically on:

- Making infrastructure climate resilient and therefore mitigate the risk of seeing transport infrastructure harmed or destroyed by coastal erosion. This will reinforce the country's resilience in front of climate change and enhance transport infrastructures sustainability while the baseline activities is contributing to the development of the road sector but does not systematically factor in climate change effects.
- Supporting local coastal communities, who exploit the coastal sand and marine gravel. While the effects of climate change involving sea level rise and subsequent coastal erosion, the phenomenon is enhanced by the collection of sand and unsustainable activities of communities in the region. Because of climate change and sea level rise, the sand is scarcer and its collection increases the vulnerability of coastal infrastructure. Therefore, the project will promote strategies and activities to diversify and strengthen communities' livelihood. This will increase the adaptive capacity of communities in the area in front of the effect of climate change on the coastal lien described above (sea level rise and sand scarcity).

## 1.2. THE CONCEPT OF CLIMATE RISK AND VULNERABILITY

Climate is the long-term average weather conditions of a region including typical weather patterns such as frequency and intensity of storms, cold spells and heat waves, taken over a period of 30 years as defined by the World Meteorological Organization. Lavell et al. (2012) define climate risk as the probability of occurrence of a climate related hazard that triggers a series of events with undesirable outcomes. This essentially means that risk is a function of the probability of a hazard and the magnitude of its consequence. Vulnerability on the other hand is defined by the IPCC as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change including climate variability and extreme events. Climate risk is thus an external factor while vulnerability is the (internal) inability to manage risk without compromising a system's well-being. Quantifying both risk and vulnerability is limited by layers of uncertainty. While there is a general consensus among scientists on the relationship between anthropogenic greenhouse gases

and global warming it remains unclear how the impacts of climate change will manifest across the globe (IPCC, 2007). Uncertainties on the rate and magnitude of the impacts cascades down to characterising the climate risk and vulnerability levels (see [figure 1](#)). Thus, we must be prepared for an uncertain amount of future deviations, which implies that decision-makers must develop and implement adaptive policies that allow for flexibility as the future unfolds and uncertainty is reduced.



**Figure 1. Cascading Effect of Uncertainty (Adapted from World Resources Institute, 2011)**

Risk and vulnerability overlap on several levels as the second dimension of risk, which is the magnitude of the consequence, is to a great extent determined by the vulnerability of the system. The terms vulnerability, risk, sensitivity, adaptive capacity, resilience, hazards and coping range are therefore often used interchangeably within the climate change discourse. Researchers focusing on biophysical aspects of climate change often use the concept of “risk” while those in the social sciences prefer to discuss “vulnerability”. Exposure and sensitivity are properties of the system that define the interaction of the system with the climate risk and include physical, social, cultural, political and environmental factors. While exposure and sensitivity illustrates the systems positioning relative to the risk, the adaptive capacity is a system’s ability to adjust to climate change to moderate potential damages, take advantage of the opportunities or cope with the consequences (Smit & Wandel, 2006). This includes factors such as the managerial ability, access to financial resources, institutional environment, access to technology and information. Resilience is the system’s ability to withstand the impact without altering its original functions and characteristics. All these concepts form part of the building blocks that define or influence the vulnerability of a system. The state of vulnerability is dynamic as societies and ecosystems are constantly evolving. Based on the definition of Lavell et al. (2012), risk and vulnerability may be represented mathematically as:

$$\text{Risk} = f(\text{probability of impact} \times \text{magnitude of consequences})$$

$$\text{Vulnerability} = f(\text{Exposure, Sensitivity}) - (\text{Adaptive Capacity})$$

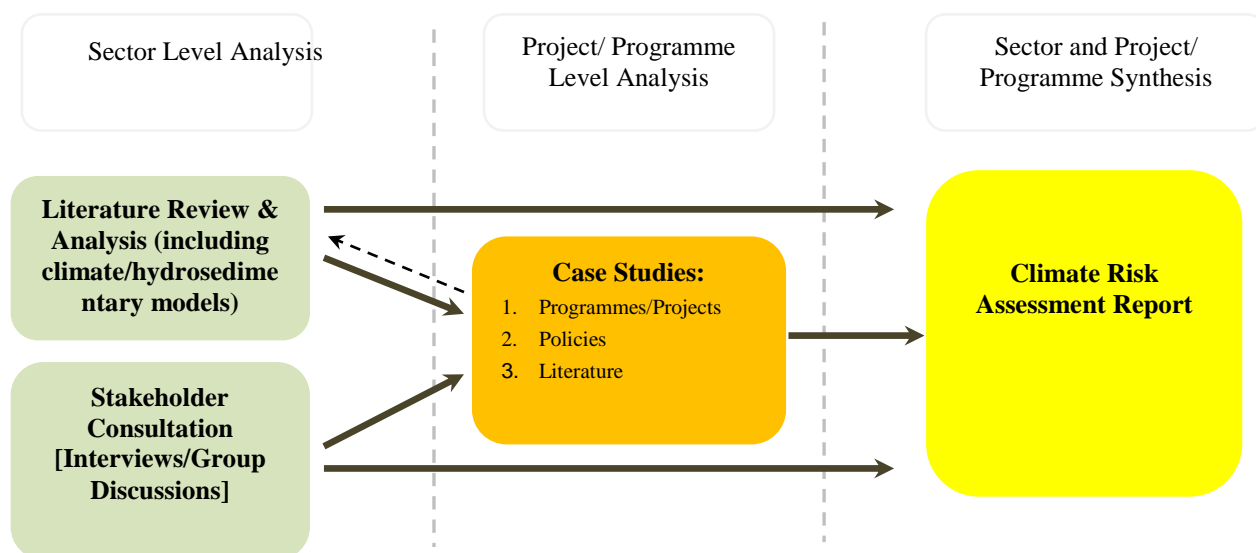
Climate change impacts will unfold over time and most assessments of climate change are tied within a time-frame. Most General Circulation Models (GCM), also referred to as Global Climate

Models, relevant to Togo have an 80-year time horizon (2020-2100). GCMs are complex computer models that simulate interactions between different climate components including land surface, atmosphere and the oceans. The degree of certainty, however, of any forecast typically decreases further into the future. Projections of future climate vary in the way they model the climate system, and so produce different results in some instances. For example some models may show a region getting wetter, and some would show it getting drier. Due their resolution, GCMs cannot make projections below the size of one grid cell (typically 200-300km<sup>2</sup>) and perform best at wider scales. Regional Climate Models (RCMs) allow projections to be made at a finer scale, but still deliver results with much uncertainty.

Understanding uncertainty is crucial in designing adaptation strategies guided by GCM and RCMs. The four main sources of uncertainty are natural variability (non-climate forcings), future emissions, methodological considerations and impacts of downscaling. All climate projections are presented in probabilities. In spite of these uncertainties, the projections provide a bounded area of possibilities which then creates a platform for designing knowledge based interventions.

### 1.3. METHODS AND TOOLS

Assessing the nature and extent of climate risk and vulnerability in coastal areas of Togo involved applied research that incorporates both qualitative and quantitative methods. A mixed methods integrated approach including (a) literature review and analysis, including an abridged presentation of the outcomes of climate and coastal line evolution models (b) case studies assessments, and (c) stakeholder consultation was applied. Outputs from the different methods, techniques and tools influenced and built on each other (See Figure 2 below).



**Figure 2: Methods, tools and approaches**

- (a) **Literature Review and Analysis:** This involved an assessment of peer-reviewed published papers and grey literature (donor reports, government development plans and reports, online databases). Under this component, mapping of on-going related activities and a stakeholder analysis was done. The purpose of the first was to share resources, exchange experiences and reduce the risk of duplication while the second was to guide the stakeholder engagement process. An overview of the outcome of climate models pertaining to Togo's sea level rise was

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also undertaken. Important reference literature for this assignment included the IPCC Fourth Assessment Report, NAPA and documentation from the Government of Togo...

- (b) **Case Studies:** Case studies are used to provide contextual analyses to the possible impacts of climate change. Well known cases that are vulnerable to projected climate change impacts have been discussed. For instance, feedback about recent past coastal evolution since UEMOA groyne construction provides precious information on studied area.
- (c) **Stakeholders Consultation:** Stakeholder engagement was achieved using two main methods:
- **Consultation Workshops:** One Stakeholders' Consultation Workshop was held on october 2015 to obtain a general understanding of the climate change issues with respect to key sectors and their impacts on key stakeholders. Discussions were also initiated on the possible interventions in order to identify the key areas of interest to pursue in later development of the project.
  - **Interviews:** Complementing literature review, interviews with key policy makers, sector leaders and experts were done. These were guided by a semi-structured interview to gain current and in-depth understanding of the working of various sectors or to fill anticipated information gaps. Representatives of government (ministries, regulatory bodies), research and academic institutions (public and private), development institutions (multi-lateral development banks, bilateral development agencies and NGOs) and sector experts participated.

## 2. TOGOLESE COASTAL ENVIRONMENT PROFILE - CURRENT SITUATION

Togolese coast stretches over about 50 km, and comprises the three main following zones:

- Coastal zone located in the western side of Lomé Port ( $\approx 10$  km), where sand that is transported from the West by littoral drift des sables is stopped by port infrastructures and is accumulated in front of Lomé (due to the effect of dikes and groynes),
- Coastal zone located at the immediate eastern side of Lomé Port. This area is not protected against erosion yet ( $\approx 25$  km) and it is consequently dramatically affected by coastal erosion. It experiences high annual erosion rates, leading to significant shoreline recession (from 5 to 10 m/year, locally up to 20 m/year),
- Coastal zone located between Kpémé and Aného ( $\approx 15$  km), which is already protected against coastal erosion by groynes mainly, since late eighties. This protection system has been reinforced lately by construction of new groynes : this allowed to slow down the erosion spread.

The coastal area located between Lomé port and Kossi Agbavi is characterized by the presence of beach-rock, which ensures a protection effect by breaking waves before the shoreline just like a natural seawall.

Its emergence is due to the strong erosion observed over the last decades, and it can also possibly disturb coastal activities, like fishing particularly (preventing « beachage » i.e. berthing of fishing boat, destroying fish nets and fishing tackle, ...).

Numerous signs of damages caused by erosion have been noticed when visiting the different localities (Katanga, GbétsoGbé, Baguida, Avepozo, Kpogan, Kossi Agbavi), such as:

- Weakness of the beach width and a micro-cliff more or less affecting the top of the beach,
- Ruins of buildings lying on the beach and at the edge of micro-cliff (habitats, pits, cemeteries, roads...),
- Villages in the immediate vicinity of the shoreline (several houses already destroyed),
- Dead tree trunks laying on the beach (coconut trees especially),
- Disturbance of coastal activities (fishing, market gardening, tourism,...),
- Damages on coastal ecosystems (ground loss / local marine flooding).

Another origin of the strong coastal erosion is revealed when visiting the seafront: gravel piles can be locally observed. These piles are the evidence of marine aggregate extractions by local populations despite of the official banning of this activity. Indeed, it represents a main income generating activity, one of the most profitable actually.

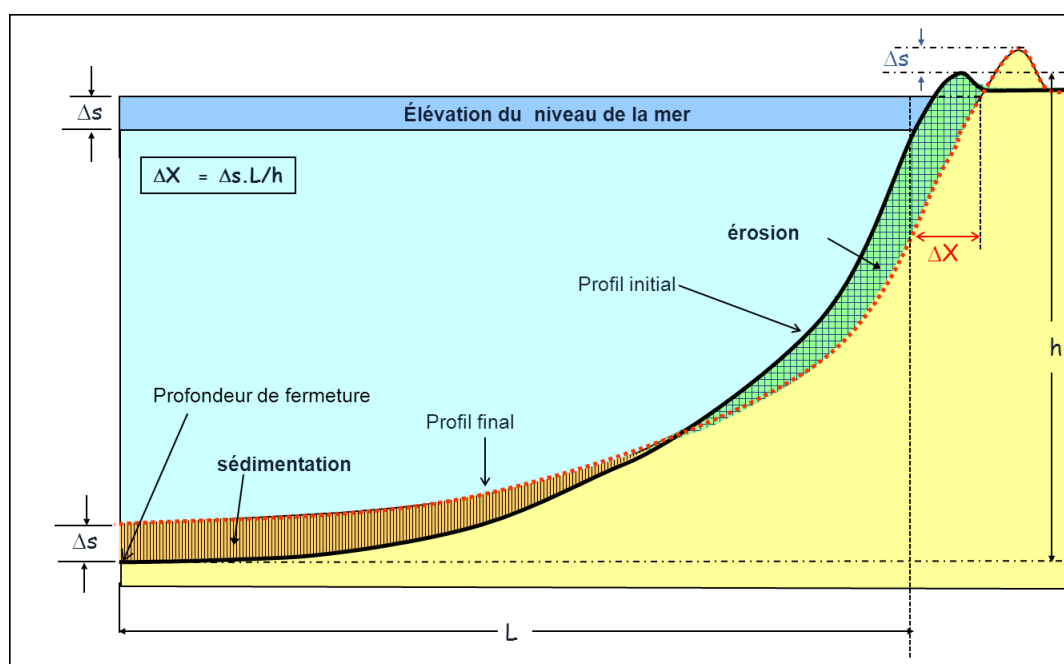
### 3. SEA LEVEL RISE DUE TO CLIMATE CHANGE IN TOGO

In addition to marine aggregate extractions and significant littoral drift variations along the coast that generate locally strong erosion, Togolese coastal line is subjected to sea level rise due to climate changes. This third phenomenon leads also to a consecutive coastal line recession that can be assessed by the mean of the Brunn rule (in « Sea level rise as a cause of shore erosion » Journal of Water. Harb. Vol 88 pp 117-130).

This rule is based on the assertion that sea level rise is slow, which will permit a progressive adaptation of beach profile as sea level rises.

Concretely:

- The sea will gain ground, and at the same time the top of the beach will rise in adaptive way.
- Beach profile will translate further inland as shown on the next **Figure 3**.



**Figure 3. Brunn rule**

On this graph :

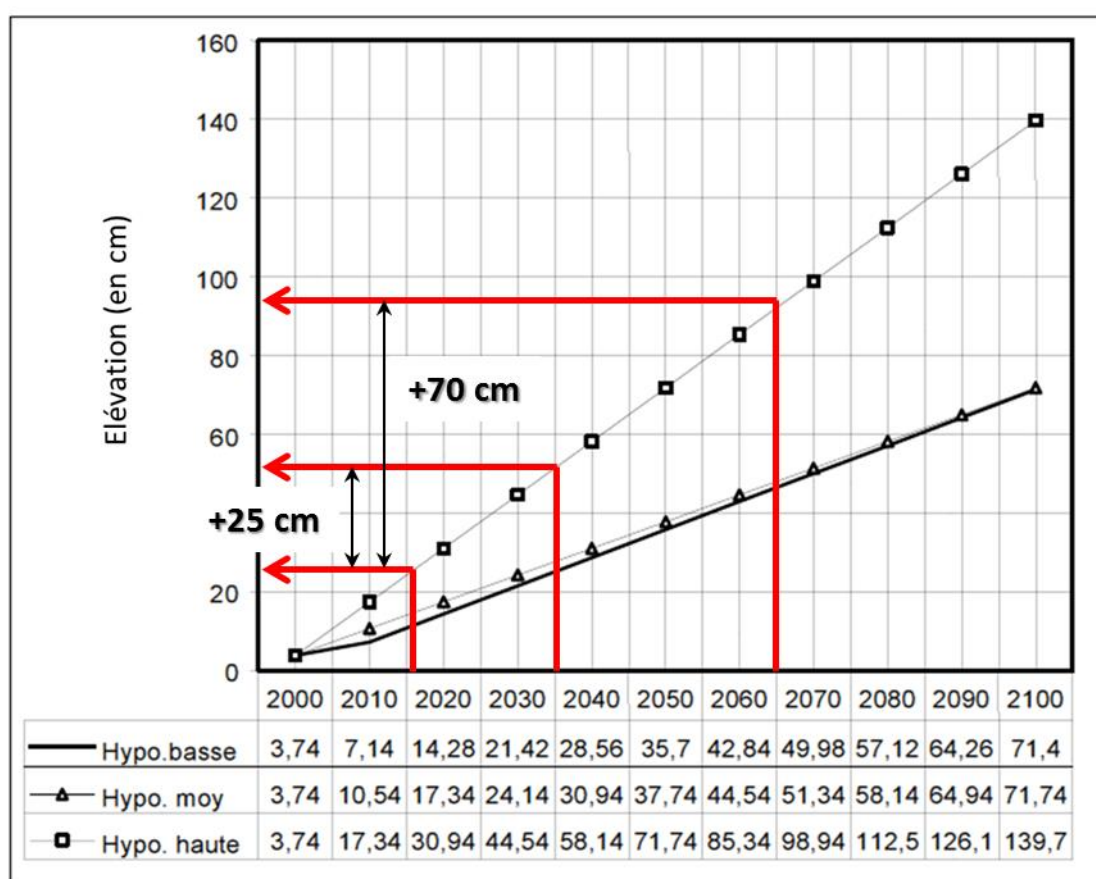
- $\Delta s$  (m) is the mean sea level rise due to climate change,
- $h$  (m) is the height between top of the beach and closure depth,
- $L$  (m) is the distance between upper part of the beach and closure depth.
- $\Delta X$  (m) is the encroachment of the sea onto land, due to sea level rise  $\Delta s$ .



As Togolese littoral is concerned, closure depth is about -7.0 m IGN and the top of the beach reaches +1.0 m to +4.0 m IGN. Distance between upper beach and closure depth varies from 180 to 320 m (in front of Kpémé and Aného groynes).

Following IPCC recommendations (Intergovernmental Panel on Climate Change), three scenarios of climate change (basic, mean and high assumptions) have been considered for mean sea level rise forecast in Togo, from reference year 2000 [HYD\_06]. Under these three assumptions, sea level rise forecasts to 2100 are plotted on Figure 4. For the needs of the present project, the following figures will be considered (mean assumption):

- Looking ahead to 2030: +0.20 m,
- Looking ahead to 2050: +0.35 m,
- Looking ahead to 2100: +0.70 m.



**Figure 4. Forecast of mean sea level rise in Togo (in FEM-PNUD, 2010)**

Thus, considering these forecasts (+0.25 m from 2015 to 2035 and +0.70 m from 2015 to 2065), retreat of the coastal line due to sea level rise, looking ahead 2035, would reach from 4.0 to 10.0 m.

**If nothing is done to protect the littoral, the mean value for expected recession of Togolese coast line, due to sea level rise only, is about of 6 m looking ahead 2035.** This encroachment will be increased by 10 m to 15 m from 2035 to 2065.

Yet, climate change will not have significant impact on wave climate; consequently, the main hydro-sedimentary dynamic agent, which is wave energy, will stay unchanged within the active zone located from the upper beach to the closure depth. Consequent littoral drift will stay roughly the

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same; however its cross-shore distribution along beach profile will be adapted so as to reach an equilibrium profile.

As far as storm set-up/surcote climate is concerned, it will stay unchanged. As long as the upper beach is rising with the sea level, marine flooding will not occur more frequently. However, water levels and height of submersion will be higher. Consequently, water amounts crossing over the beach will be larger than nowadays, which implies longer flooding events in the future.

## 4. COASTAL AREA'S SENSITIVITY TO CLIMATE CHANGE

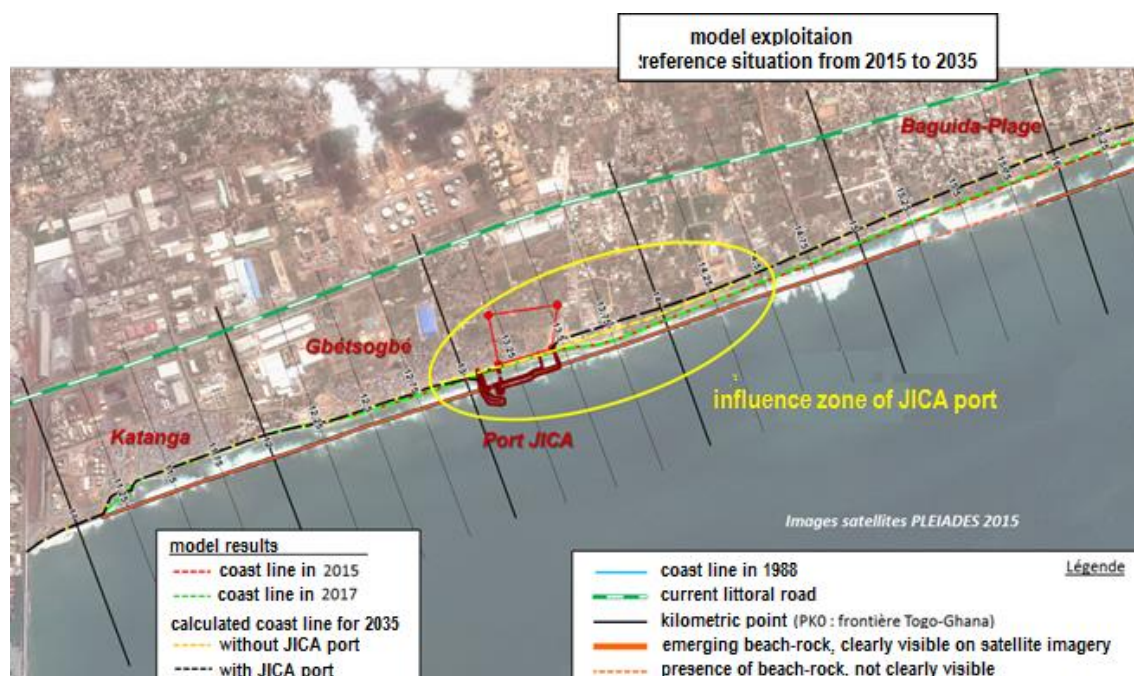
### 4.1. COASTAL LINE VULNERABILITY ASSESSMENT

As reminded previously, Togolese coastal line is subjected to erosion due to littoral drift variation, marine aggregate extractions and sea level rise. In order to assess the extent of expected damages on coastal zone in a near future (2035) in case no coastal protection is built between Lomé and Kossi Agbavi, two UNIBEST C+ simulations of coast line evolution were carried out from 2015 to 2035: the first one did not include JICA port construction planned for 2017, the second one did.

As these simulations do not take sea level rise into account, an additional 6m-retreat of the coast line has to be applied to the calculated future shoreline position, in order to consider the cumulative damage due to littoral drift variations, marine aggregate extractions and sea level rise.

Simulations and results are presented in [REF R3a]. Here is a brief summary of the main conclusions to be drawn regarding coastal line vulnerability for the next 20 years.

Figure 5, Figure 7 and Figure 7 present calculated coast line position/location within 20 years (looking ahead to 2035), taking or not into account JICA port effect and considering that no extra coastal protection will be built from today: **this future situation is considered as the reference situation for the project, which means the one to be improved.** Yellow dashed line plots the coast expected in in 2035 without JICA port, and black dashed line plots the coast line expected in in 2035 taking JICA port effect into account.

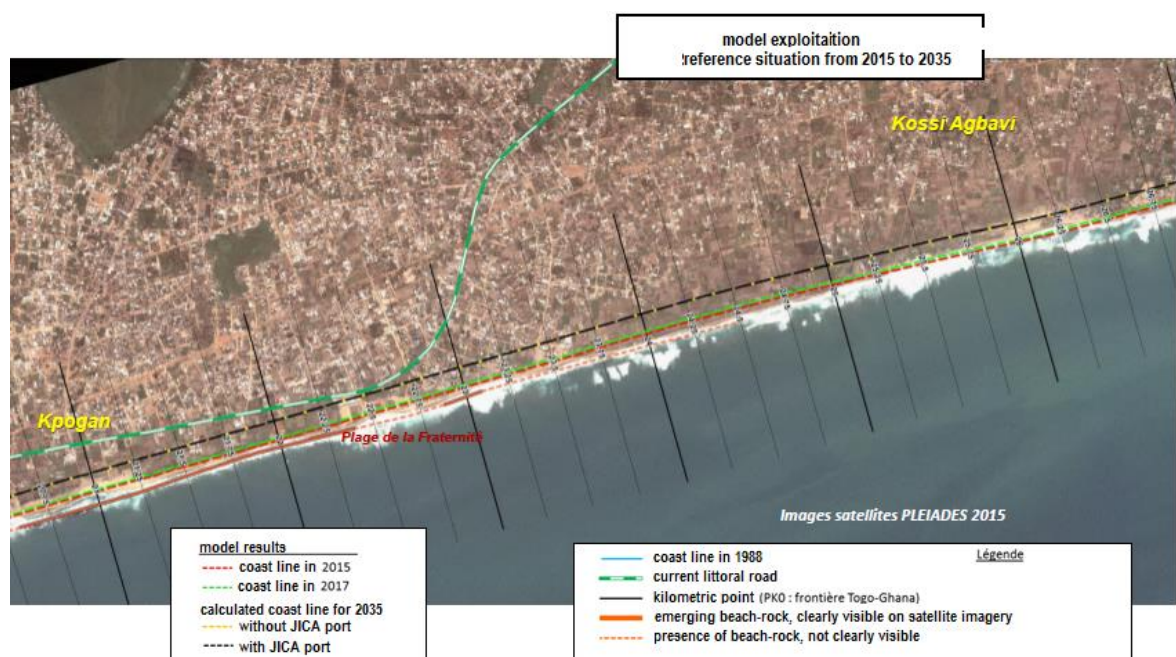


**Figure 5. UNIBEST C+ Simulation for reference situation - Expected JICA port impact in 20 years**

First, the reference simulations allow concluding on the little effect of JICA port on the coast line evolution. Impacts are quite low and remain local, limited to the yellow zone in Figure 5.

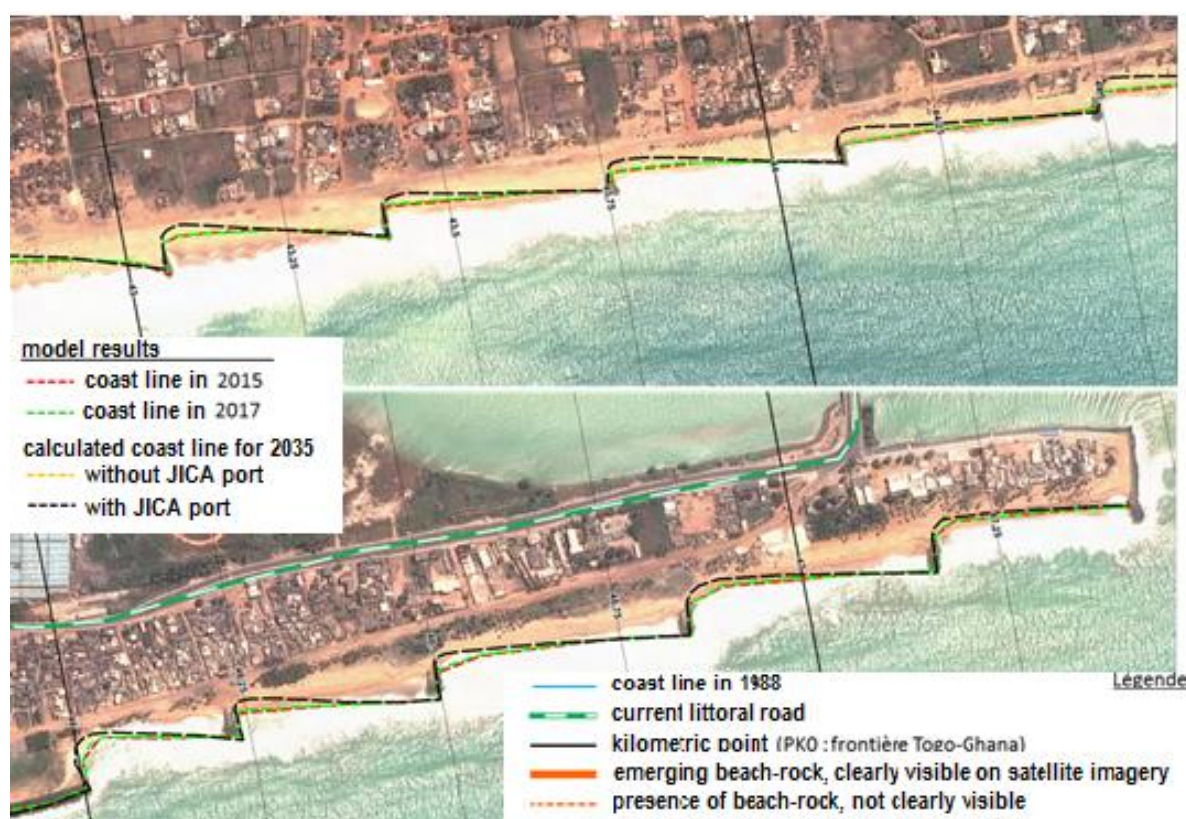
Outside this influence zone, **expected coastal line evolutions for the next 20 years stay in line with trends observed in the recent past.**

- **On the western side of Lomé port, beach accretion is carrying on**, sedimentation is increasing against the western embankment at the rate of 15 à 10 m/an. In order to take into account the cumulative effect of sea level rise, a 6m-retreat has to be applied to the calculated 2035 coast line, but the sector is still in accretion.
- **From immediate east of Lomé port to JICA port, a slight retreat is expected**, in line with trends observed in the past decade. Indeed, the emerged beach-rock prevents locally from erosion. In order to take into account the additional effect of sea level rise, a 6m-retreat has to be applied to the calculated 2035 coast line, but the resultant recession is still slight.
- **On the eastern side of JICA port, shoreline recession is carrying on at the same high rates as in the recent past.** Between Baguida-Plage and Kpogan, shoreline will experience a recession characterized by an annual mean rate varying from 4 to 6 m/year. In 2035, if nothing is undertaken to protect the area, the sea will have significantly gained ground and flooded at least 86 m wide coastal strip under cumulative effect of littoral drift variations, marine aggregate extractions and sea level rise. In front of Fraternity beach (in Kpogan-Kossi Agbavi sector, see Figure 6), if nothing is undertaken to protect the area, the sea will have flooded at least 126 m wide coastal strip under cumulative effect of littoral drift variations, marine aggregate extractions and sea level rise. Consequently, national road is greatly jeopardized in reference situation. Further east, the trend of coastal line recession declines slightly, until encountering the first Kpémé groyne. The eastern shoreline will be roughly stable under cumulative effect of littoral drift variations and marine aggregate extractions. In order to take into account the cumulative effect of sea level rise, a 6m-retreat has to be applied to the calculated 2035 coast line, but the resultant recession will still be slight in the area of Kpémé groynes, as well as the area of UEMOA groynes and in front of Aného (see Figure 7).



**Figure 6. UNIBEST C+ simulation for reference situation - Expected shoreline retreat in 20 years**





**Figure 7. UNIBEST C+ simulation for reference situation - Expected shoreline retreat in 20 years - Zoom on UEMOA and Aného groynes Sector**

## 4.2. VULNERABILITY OF THE AGRICULTURAL SECTOR

Consequently, expected coastal line recession will reduce availability of coastal land for market gardening. Besides it will increase soil salinization that potentially leads to inadequacy of local crops, loss of productivity and loss of product quality.

Local food production and livelihoods will be directly affected.

Apart from these immediate effects, future trends anticipated from climate changes include replacement of crops by extensive animal husbandry in the region will further deteriorate the plant cover and biodiversity.

## 4.3. VULNERABILITY OF FISHERY SECTOR

Local food production and livelihoods will also be affected by increasing difficulties in launching fishing boats and reduced availability of boat landings.

Besides these immediate effects, the coastal upwelling along the Togo coastline is expected to decrease (and may be doing so already). This is likely to decrease the fish stocks, which are already overexploited at the regional scale. As the stocks of the main species are shared between the countries from Ghana to Nigeria, conflict may arise regarding fishing rights.

Moreover, the increased reliance on sea fishing as a source of food may encourage the catching of juvenile fish, making the fish stocks collapse.

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#### 4.4. SOCIO-ECONOMIC VULNERABILITY

Eradication of market gardening (lack of space on the sea front) and decrease in sea fishing will remove income generating activities. The official banning of marine aggregate extractions will absolutely have to be enforced, which will require activity mutation.

Besides, expected coastal line recession will cause further direct destruction of infrastructure such as school, homes, and international coastal road, industrial. Tourism will also be impacted by destruction of dedicated infrastructures, and by the loss of beaches and boat landing sites in addition to potential direct destruction of hotels.

Biodiversity will mainly affected by the inability of turtles to beach and then climb up the beaches. Elimination of sea turtle nesting habitats as the coastline enters urbanized areas.

Health security and sanitary comfort will also be impacted in so far as water supply for a fraction of the population is from the surface water table (domestic use + market gardening), which is getting increasingly saline. Plus, flooding events in Lomé seem to become increasingly frequent causing health issue as sewers interact with the raised groundwater.

Apart from these immediate effects, future trends anticipated from climate changes include climate refugees leaving on agriculture may contribute to urban sprawl around Lomé.

## 5. ENHANCING CAPACITY FOR CLIMATE RISK MITIGATION

The project “Strengthening climate resilience of infrastructure in coastal areas in Togo” first aims at planning new protection infrastructure constructions in order to prevent coastal line (from Baguida to Kossi Agbavi) from strong damaging erosion.

In addition to civil work recommendations, the project is also addressing the three following components:

- Technical support for diversification of Income Generating Activities,
- Technical support for ensuring project monitoring and evaluation,
- Redaction of Terms of Reference for coming studies, concerning coastal management scheme and early warning system implementation.

### 5.1. COASTAL PROTECTION PREVENTING FROM SHORELINE RETREAT

#### 5.1.1. Protection infrastructure proposal

In order to stop or at least to curb and contain the coastal erosion, the project will finance civil works related to the installation of coastal protection infrastructure from Katanga to Gbodjomé. **Recommended civil works will consist in construction of 28 groynes coupled with beach nourishment** (total volume of 920,000 m<sup>3</sup>) within some of critical cells delimited by groynes. Groynes and beach nourishment will be distributed like following:

- from Katanga to Gbétsogbé, 1 groyne will be built, coupled with beach nourishment on both sides (sand supply = 120,000 m<sup>3</sup> + 40,000 m<sup>3</sup>);
- from Gbétsogbé to Avépozo, 10 groynes will be built, coupled with beach nourishment in shelves between groynes (sand supply = 370,000 m<sup>3</sup>);
- in front of Avépozo, 1 groyne will be built and the existing one will be extended.
- from Avépozo to Kpogan, 7 groynes will be built, coupled with beach nourishment in shelves between groynes (sand supply = 270,000 m<sup>3</sup>);
- from Kpogan to Kossi Agbavi, 7 groynes will be built, coupled with beach nourishment in shelves between groynes (120,000 m<sup>3</sup>);
- from Kossi Agbavi to Gbodjomé, the existing groyne will be extended.

These civil works will protect the coastal road section Avepozo-Aného, which is at risk of coastal erosion as described above. The sites above mentioned have been selected in regard to:

- the level of erosion registered along the coastal,
- the proximity of the road from the coast.



The realization of civil works such as groynes and beach nourishment will be made according to up to date best practices with proven technologies for marine works and extremely aggressive environment. Riprap groynes will be dimensioned in order to resist to project wave (the significant height of the project wave considered for dimensioning is 3.2 m at +2.2 m IGN) , regarding their stability, the top level, floor covering...

### 5.1.2. Protection infrastructure expected impacts

During works, some disturbances will be punctually generated like:

- Noise,
- Pollution emanating from comings and goings of trucks,
- Occasional extra-turbidity generated during building of the groynes,
- Difficult access to the beach for fishers, tourists,
- Temporary unavailability of the beach.

These occasional disturbances will cause loss of fishing profits, punctual loss of tourism profitability, and punctual degradation of living conditions.

But in medium term, the proposed coastal protection plan is expected to have direct beneficial impacts on coastal line maintenance.

In order to assess the ability of the recommended protection infrastructure to prevent from significant erosion due to cumulative effect of littoral drift variations, marine aggregate extractions and sea level rise, a UNIBEST C+ simulation was carried out to forecast shoreline evolution in 20 years if protected as proposed in 5.1.1.

The simulation observes building phasing by considering construction of about 15 groynes per year, beginning with the eastern side. To the calculated coastal line position in 2035, an additional 6m-retreat of the coast line has to be applied, in order to take sea level rise effect into account. Resultant position is then compared with reference situation in order to assess benefit from protection infrastructure in terms of coastal erosion prevention.

The main conclusions to be drawn after this simulation are that, looking ahead to 2035:

- On the western side of Lomé port as well as at extreme eastern part of study area (from Gbodjomé (PK 26) to Aného), the project will have no impact on coastal line evolution,
- At the immediate east of the groyne number 27, coastal line retreat is significant ( with the same magnitude than in reference situation) but this strong erosion concerns low issues area,
- Shoreline is switching within cells defined by two groynes, but erosion expected at eastern side of groynes is moderate thanks beach nourishment and consecutive littoral drift restoration as soon as cells are filled with sand,
- There will be no significant evolution on western side of JICA port,
- **The protection system will succeed in subtracting zones concerning by strong economical, human or erosion issues from coastal line recession.**

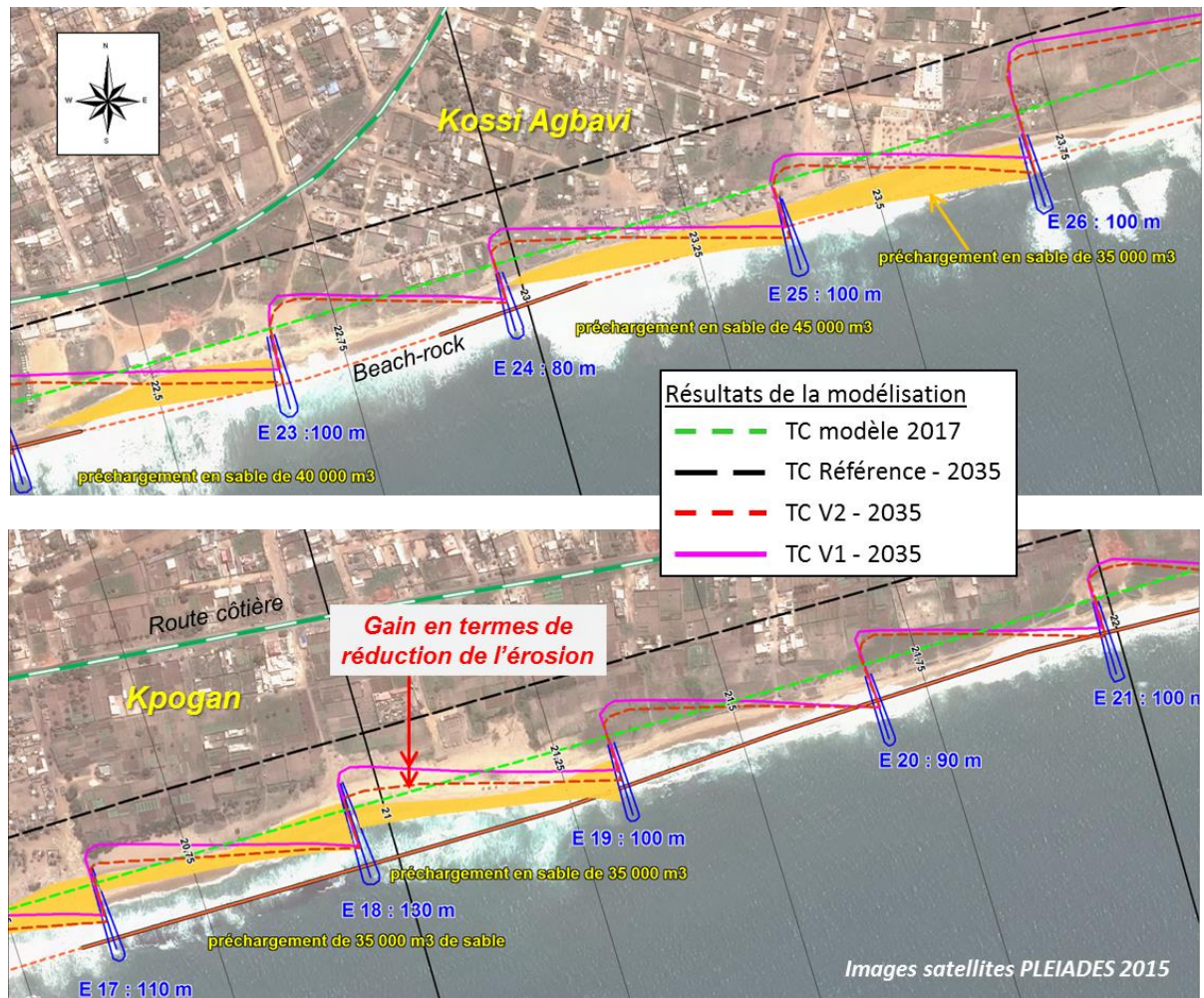
**Benefits from beach nourishment in addition to 28-groyne construction are significant.**

First, beach nourishment will permit to maintain larger beach width in pre-filled cells. This is particularly good for tourism and fishery activities.

In global hydro-sedimentary dynamics terms, benefits are important too, as long as beach nourishment will contribute in restoring littoral drift continuity along Togolese coast and further. It will contribute in by-passing a part of the sand that is accumulating against western embankment of Lomé port. This assertion will be all the more accurate if periodic beach nourishment maintenance is carried out once recommended works done.

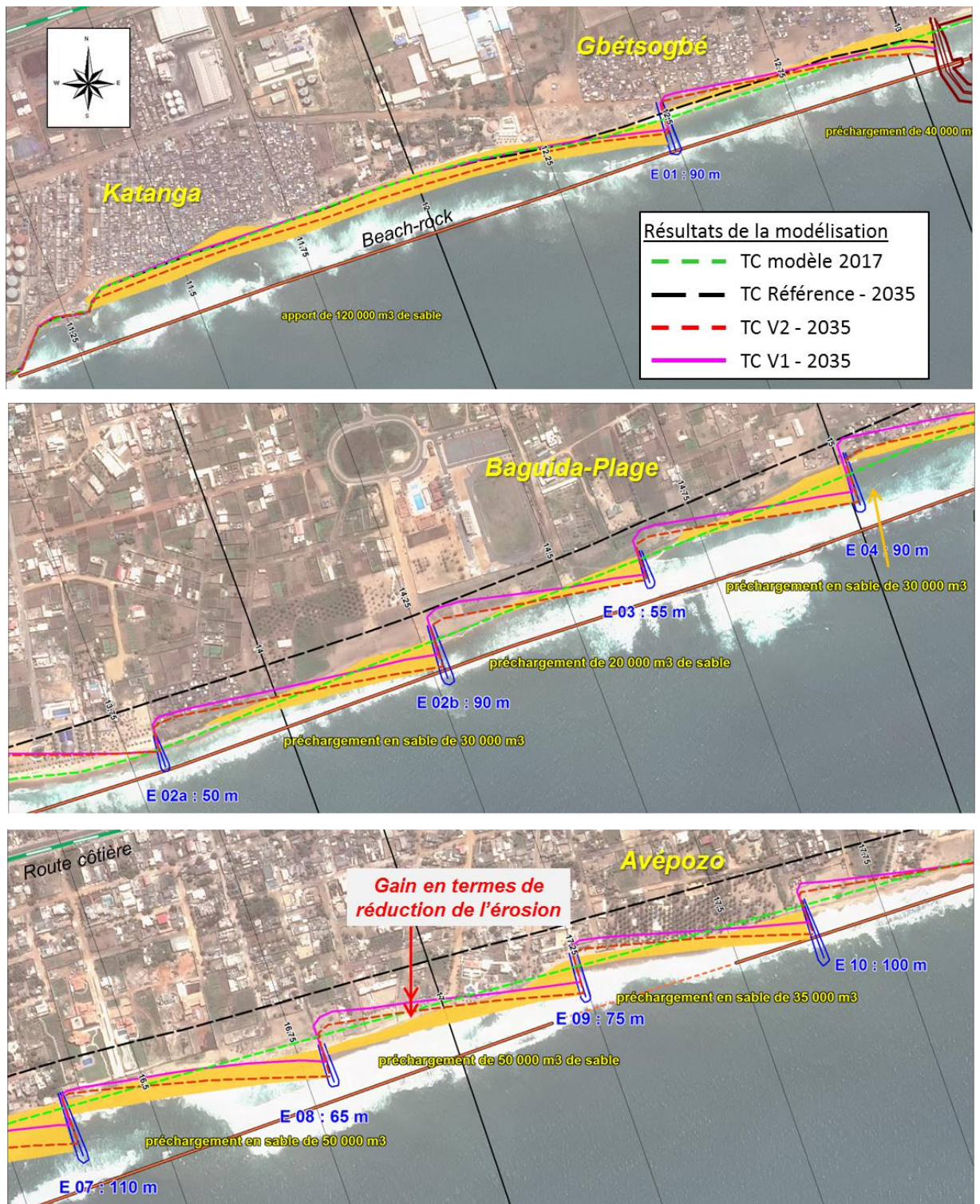
By restoring sediment transport along the shoreline, this preventive action will lead to mitigation of erosion due to current drastic variations of littoral drift. It also mitigate deposition rate in Lomé port.

Following figures show the expected benefits of recommended protection infrastructure.



**Figure 8. Compared evolutions of coastal line position in 2035 - Views 1**





**Figure 9. Compared evolutions of coastal line position in 2035 - Views 2**

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## 5.2. DIVERSIFICATION OF INCOME GENERATING ACTIVITIES

Although marine aggregate extractions are officially forbidden in Togolese coastal area since 2011, this activity is still carried out because it represents the most profitable source of income for number of people, mainly women and young people.

In order to prevent future coastal erosion, the project has also to act at the level of the communities in so far as the exploitation of sands and gravel takes a great part in jeopardizing coastal line stability. The aim of this project component is to provide technical support and dedicated budget to arouse capacity among the communities involved in illegal sand collection.

To do that, strategies have been developed for implementation of Income Generating Activities (IGA) in Katanga, GbétsoGbé, Baguida, Avepozo, Kpogan and Kossi Agbavi. These strategies aim at helping 400 people to change their current illegal economic activity into a legal and sustainable one.

Numerous IGA have been identified and several scenarii of deployment plan are proposed, based on market studies that have been carried out for each identified IGA. Finally, the recommended strategy is relying on combination of 11 IGA. It consists of:

- Strengthening 6 existing IGA : fishing, agro and fish processing, market gardening, small-scale trade, taxi-moto facility, traditional handcraft;
- Creating 5 new IGA: trade of gravels from inland quarries, extensive farming, trade of coal, corn and red oil, trade of liquid soap, beadwork.

The strategy plans technical training and financial support, as well as possible partners and program term.

## 5.3. PROJECT MONITORING AND EVALUATION

Besides, the project has to ensure its monitoring and evaluation by proposing M&E system that will track the project outcomes according two levels.

The system will monitor coastal erosion rate in the future, as well as project outcomes at the communities' level, ensuring that people behavior and economic activities are changing for an improved sustainable management of coastal line within the project area.

In order to achieve these objectives, four critical tasks have been defined:

- Identification of education, information and communication needs in matters of climate change and possible impacts on coastal zone,
- Identification of activities and operations in order to strengthen integration of climate change issue,
- Realization of monitoring and evaluation (M&E) of:
  - coastal erosion,
  - adaptive behavior and knowledge capitalization among local communities coping with climate change impacts,

- Accurate identification of required investment for such M&E implementation.

In order to strengthen integration of climate change issue, recommendations are provided in terms of communication strategy that has to be developed. This strategy depends on:

- Ambitious training program, including technical training of qualified people as well as awareness activities for the local communities,
- Project monitoring and evaluation implementation,
- Creation of an efficient knowledge management system, including data base, code of practice, planning of activities within coastal area...
- Definition of a chart that officially points out each roles and responsibility.

Dedicated budget envelope has also been defined.

## 5.4. REDACTION OF TERMS OF REFERENCE FOR COMING STUDIES

### 5.4.1. Coastal management scheme

The project has written Terms of Reference for coming study dealing with the elaboration of the coastal management scheme, the coastal integrated management plan as well as the training and equipment of personnel in charge of the control of the coastal zone.

Specification and budget envelope are provided for coming study dedicated to establish the regulatory framework for accessing and using coastal area. In fact, adapting the regulations linked to land use planning in the area will enable to reduce the risk of disasters and their negative impacts on livelihoods and overall economy.

### 5.4.2. Early warning system

The project has also written the Terms of Reference for a coming study dedicated to implementation of an early warning system that will involve local communities established in the project sites. This early warning system will ensure that communities are aware about risks with relevant and accurate information in a timely manner. It also will contribute to the setting up of the beach for touristic and leisure activities. Specification and budget envelope are provided for this coming study.

## 5.5. PARTNERSHIPS FOR CAPACITY ENHANCEMENT

In addition to African Development Bank (ADB), stakeholders have been identified among those who take part to project meetings and workshops:

- Institutions / government delegate dedicated to project coordination :
  - Environment Direction – Department of Environment and Forest Resources (ED-DEFR),
  - General Direction of Civil Works - Department of Transports (GDCW-DT),
  - Department of Fisheries and Aquatic Resources - Department of Agriculture, Husbandry and Fisheries (DFAR-DAHF),

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- Lomé University, especially the Integrated Coastal Zone and Environment Management Center (CGILE) and Pr. Blivi, whose research team studies coastal line evolution and could feed data base,
  - Local associations, governmental or not (Red Cross, ...),
  - Tourism professionals,
  - Local populations directly implied and/or affected by erosion issue :
    - Village heads, leading citizens, heads of village development committees, Committees of Wise Men,
    - Representatives of community of marine aggregate exploitation.