

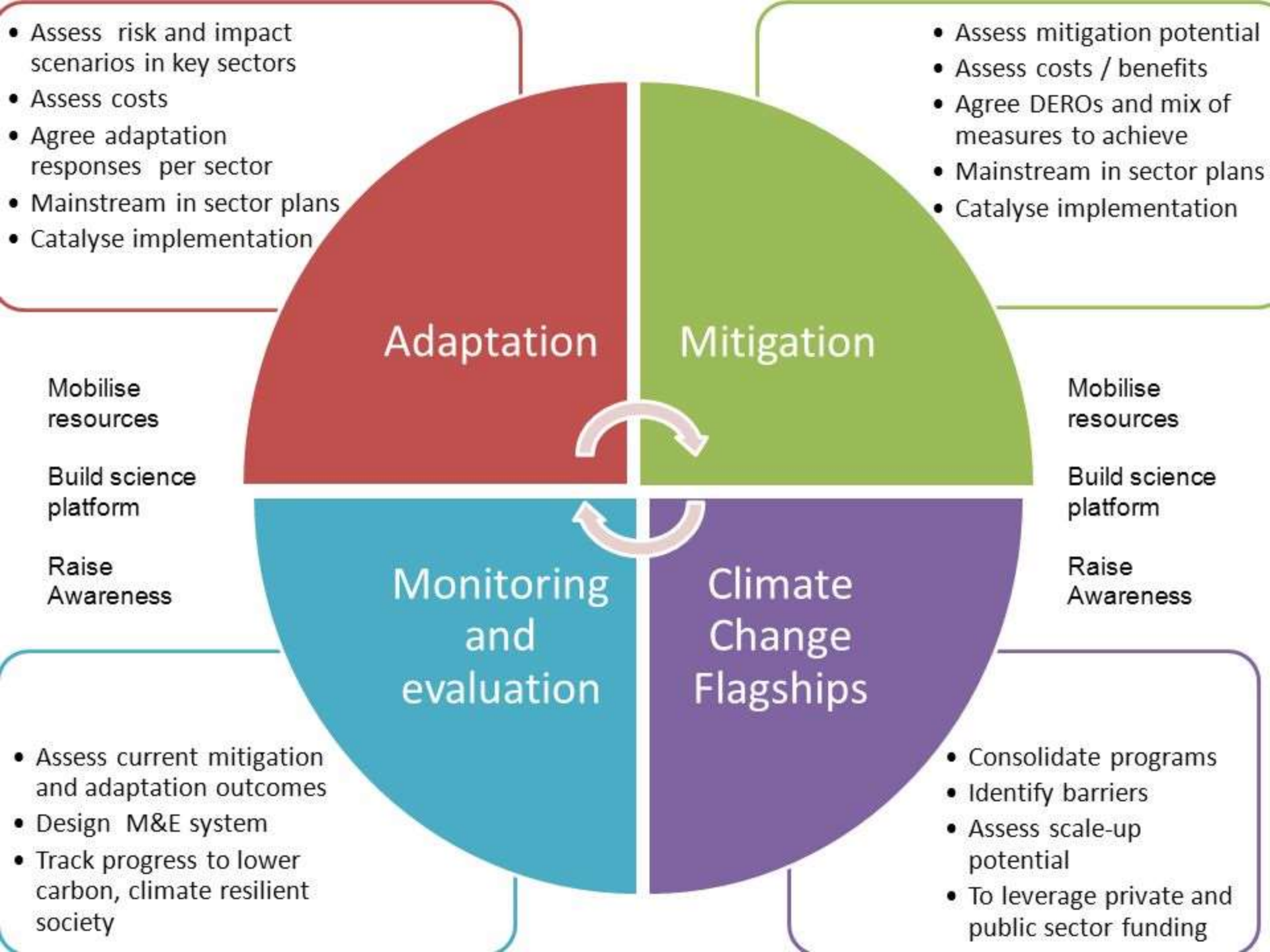


# Africa and Asia: Exchange on Science-based observation for Monitoring, Mitigation and Adaptation

**Oleg SHIPIN**

*WHO Collaborating Centre  
for Water Supply, Waste Disposal and Air Pollution  
Asian Institute of Technology  
Thailand*





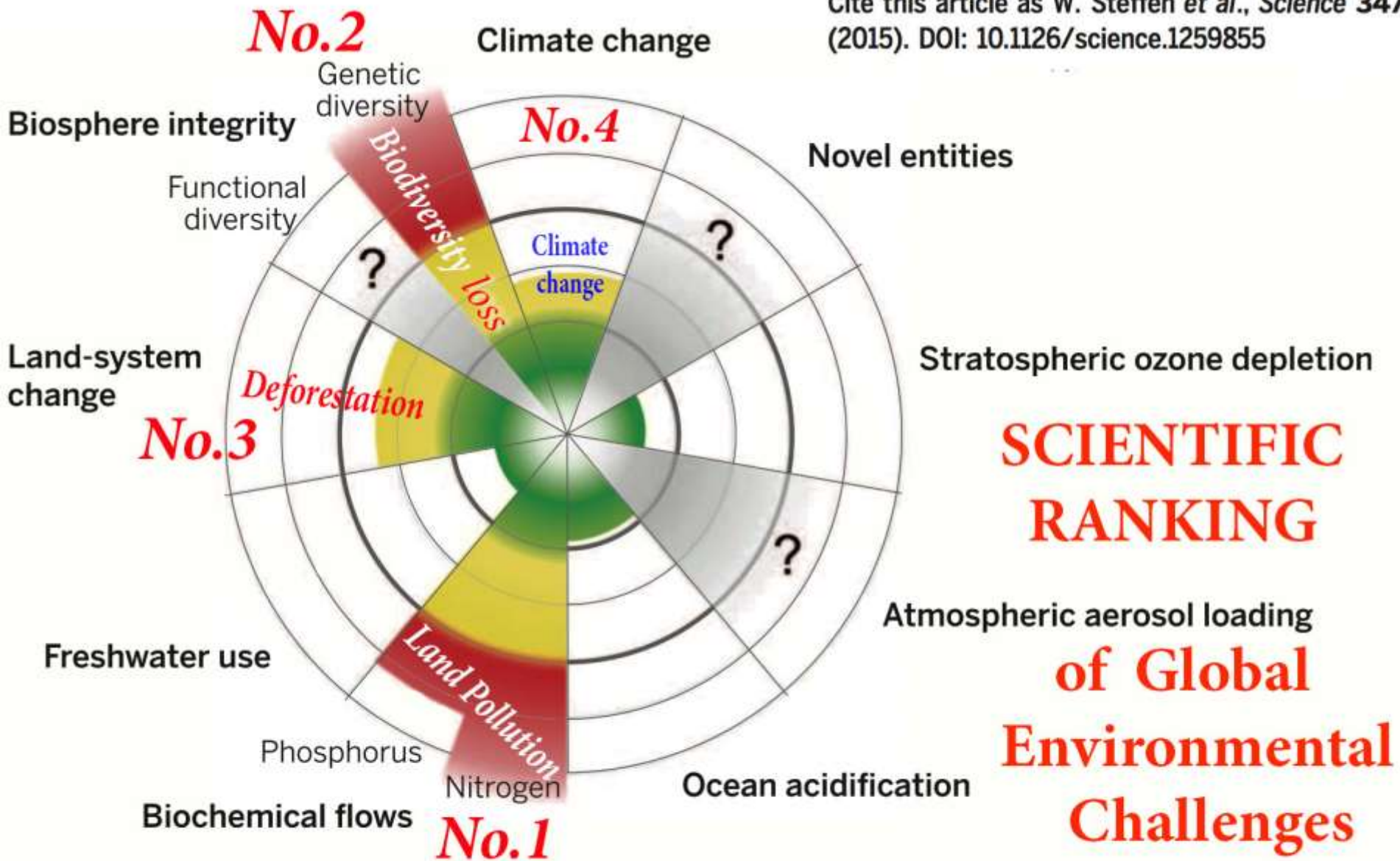


# *Africa versus Asia*

## Relative continental CO<sub>2</sub> emissions in 2014

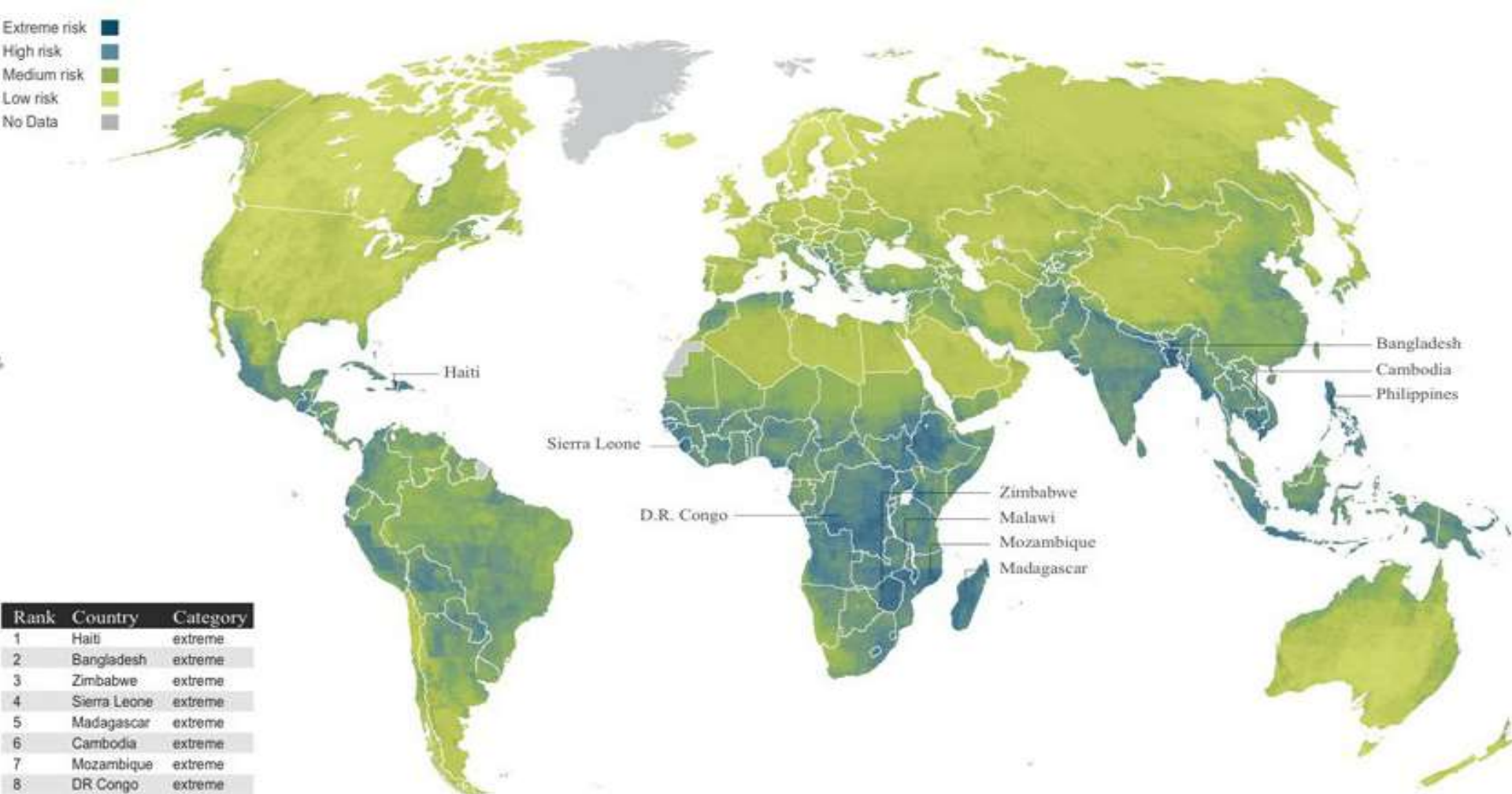








Extreme risk  
High risk  
Medium risk  
Low risk  
No Data



Rank	Country	Category
1	Haiti	extreme
2	Bangladesh	extreme
3	Zimbabwe	extreme
4	Sierra Leone	extreme
5	Madagascar	extreme
6	Cambodia	extreme
7	Mozambique	extreme
8	DR Congo	extreme
9	Malawi	extreme
10	Philippines	extreme

# Climate Change Vulnerability Index Asia vs Africa

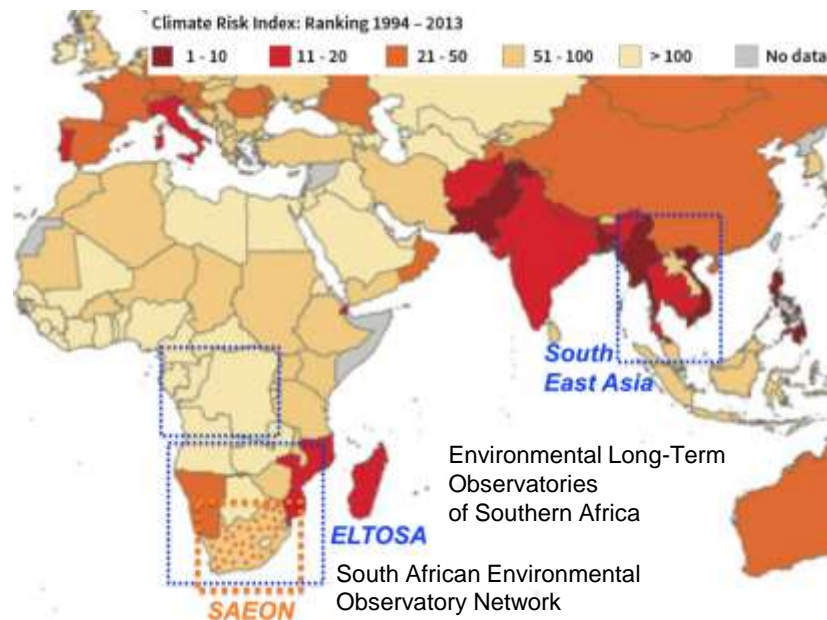


# Transfer of Technology and expertise from South to South

Strategic vectors of monitoring of human activities are similar in the Congo and Thailand. Observation station hub is strategically positioned in Bangkok, connecting coastal areas and the interior of the Kingdom of Thailand.

Southeast Asia, is one of the most suffering regions in the world. Three of the world's worst climate risk countries are in Southeast Asia and South Asia, are the regions that have many lessons and examples of climate change mitigation and adaptation measures to offer to the world and Africa to strengthen CC resilience.

Within the continent, Southern Africa is the region with a high rate of extreme weather events that are followed by SAEON and ELTOSA, observation networks considered to be the most important for the project in the Congo.





**Project**  
**Feasibility study for setting up  
a Watch Observatory for health and  
environmental risks in Pointe Noire,  
Republic of Congo (Brazzaville)**



**Funded by UNEP 2016-2017**







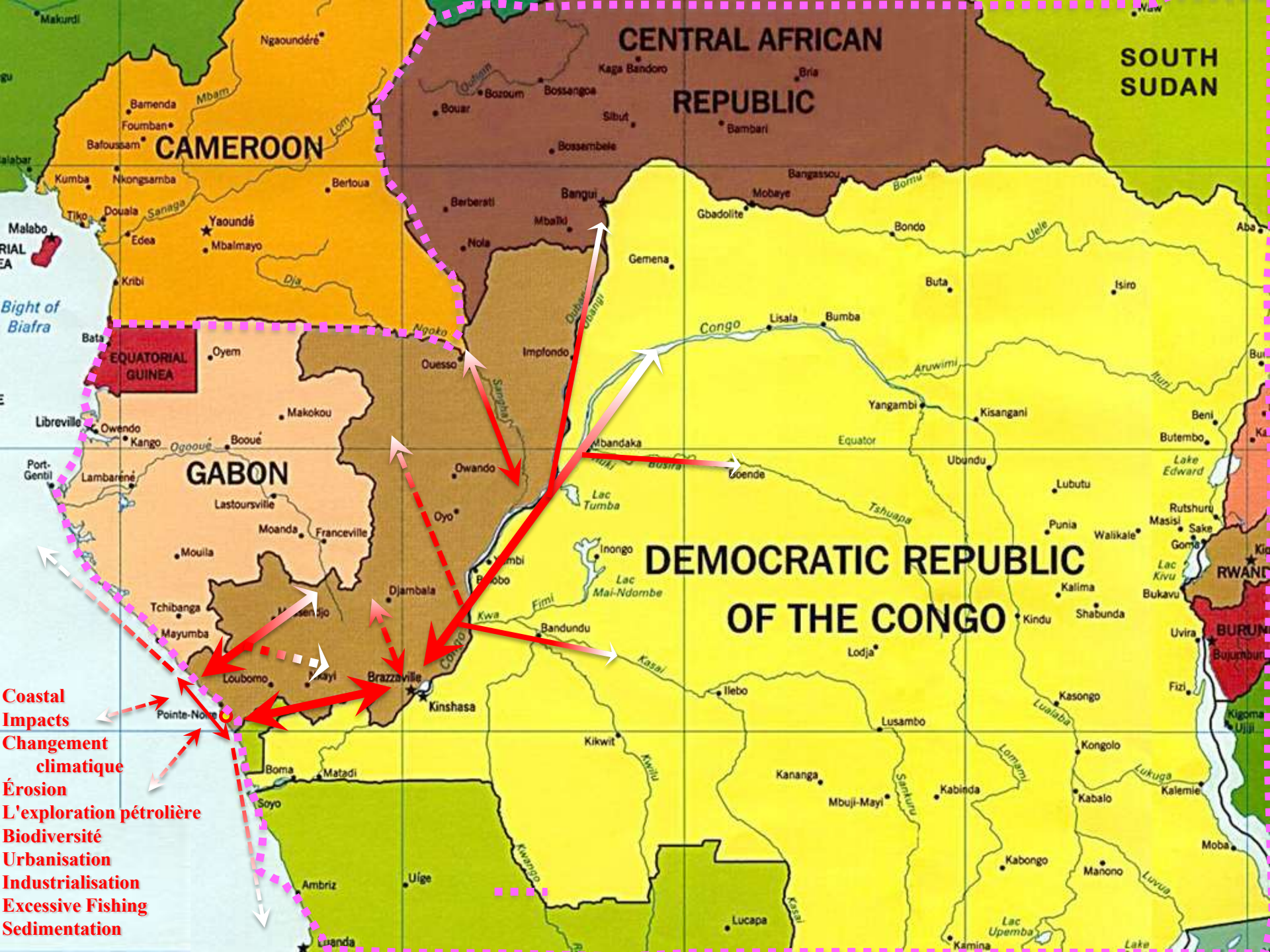
## **TECHNICAL FORCES BEHIND THE WATCH OBSERVATORY PROJECT**

**Representatives:**

- **The Senate**
- **Technical leaders of APEGG (the Association for the protection of the environment of the Gulf of Guinea),**
- **National Institute of Research in Health Sciences, INRSSA,**
- **National Research Institute Forestry (IRF).**

**Strategic coordination from Ministry of Tourism and the Environment), the Designated National Entity of the Center and Network of Climatic Technologies, Brazzaville.**





**CAMEROON**

**CENTRAL AFRICAN  
REPUBLIC**

**SOUTH  
SUDAN**

**GABON**

**DEMOCRATIC REPUBLIC  
OF THE CONGO**

**RWANDA**

**BURUNDI**

- Coastal Impacts**
- Changement climatique**
- Érosion**
- L'exploration pétrolière**
- Biodiversité**
- Urbanisation**
- Industrialisation**
- Excessive Fishing**
- Sedimentation**

Bight of Biafra

Malabo

Bamenda

Makurdi

Makurdi

Usanda

Ambriz

Soyo

Matadi

Boma

Pointe-Noire

Loubomo

Mayumba

Tchibanga

Mouilla

Lambaréné

Port-Gentil

Libreville

Bata

Kribi

Edea

Nkongsamba

Kumba

Bafoussam

Makurdi

Usanda

Ambriz

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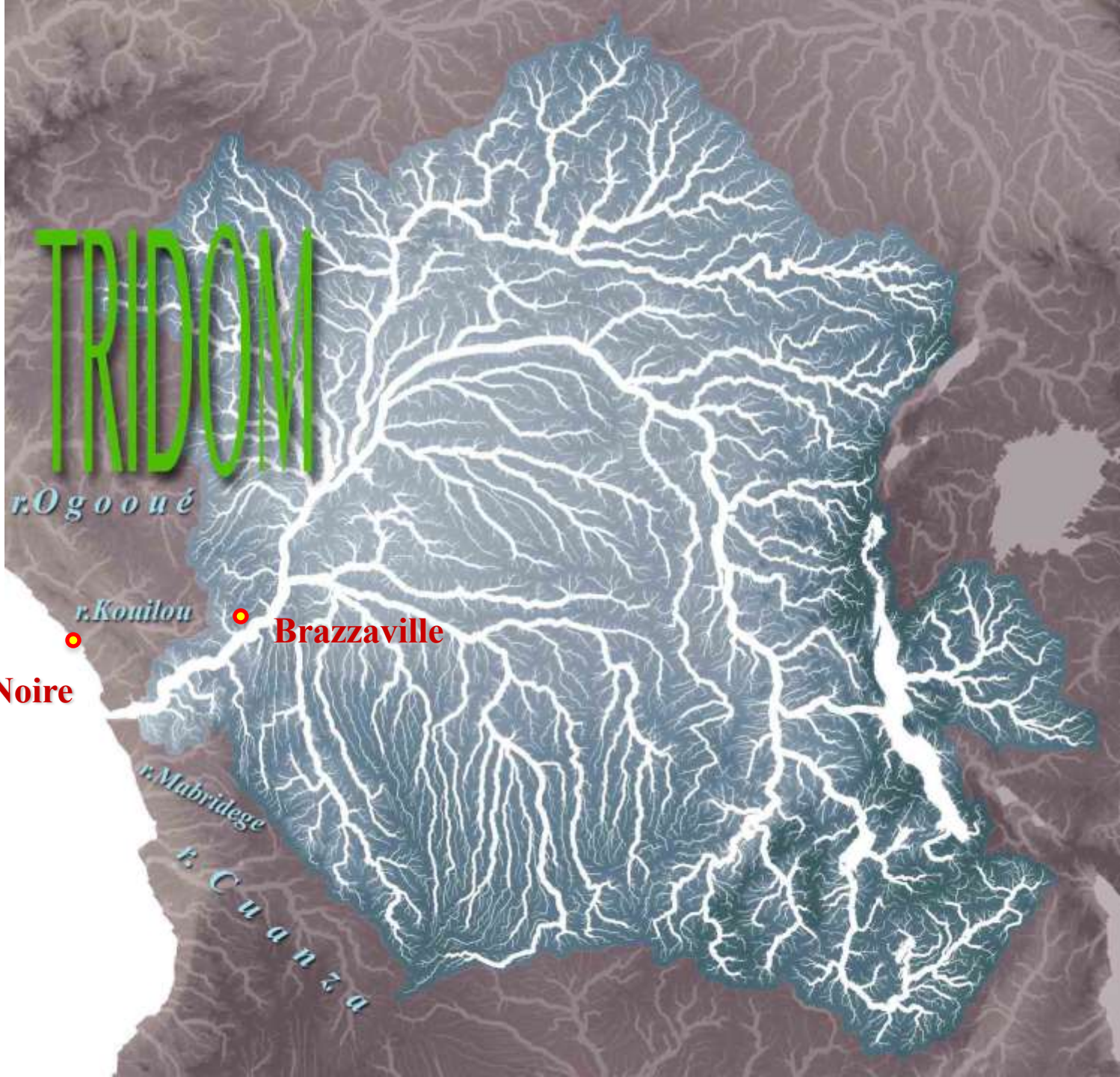
Kumba

Bafoussam

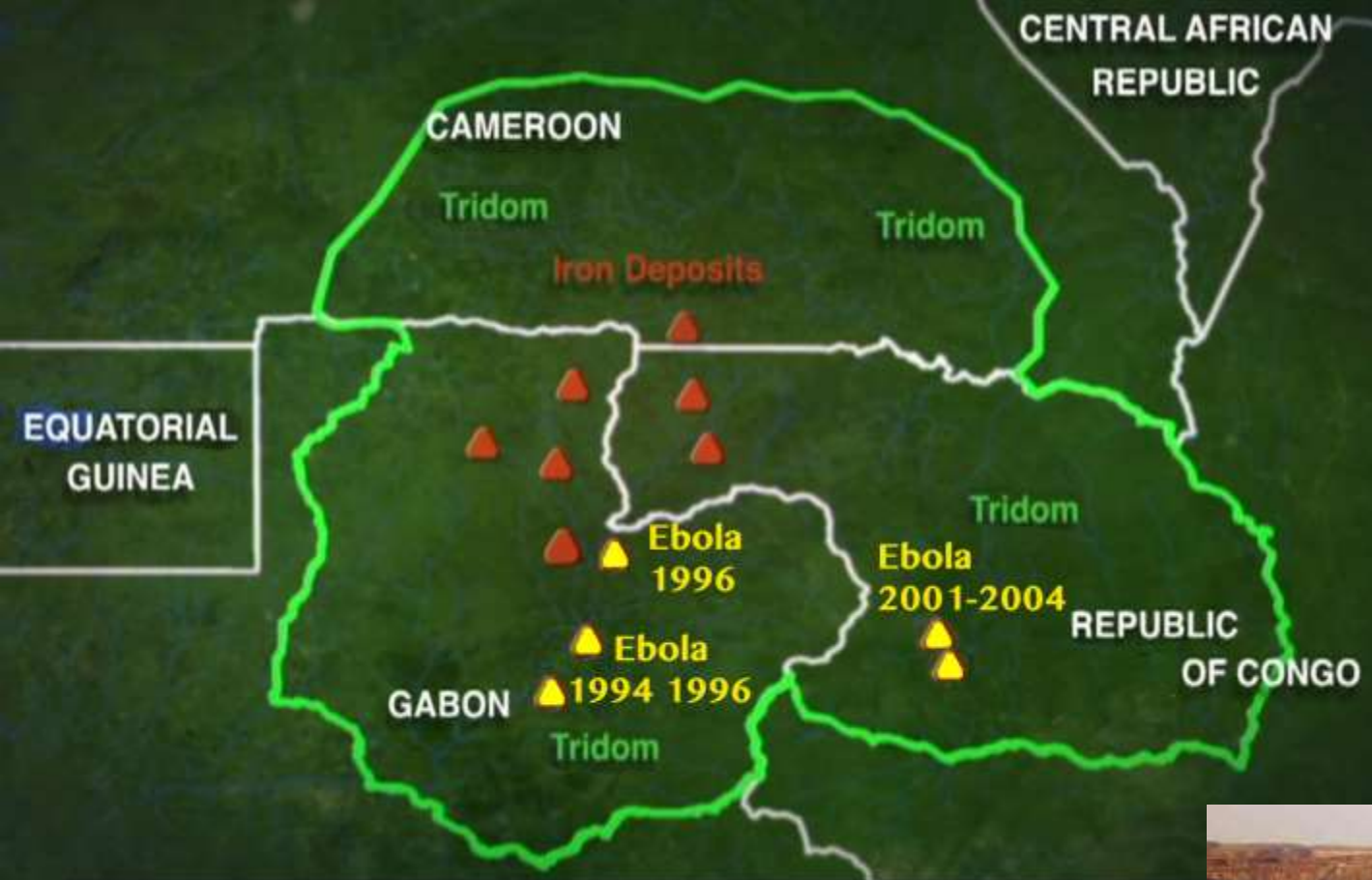
Makurdi



# The Congo River Basin







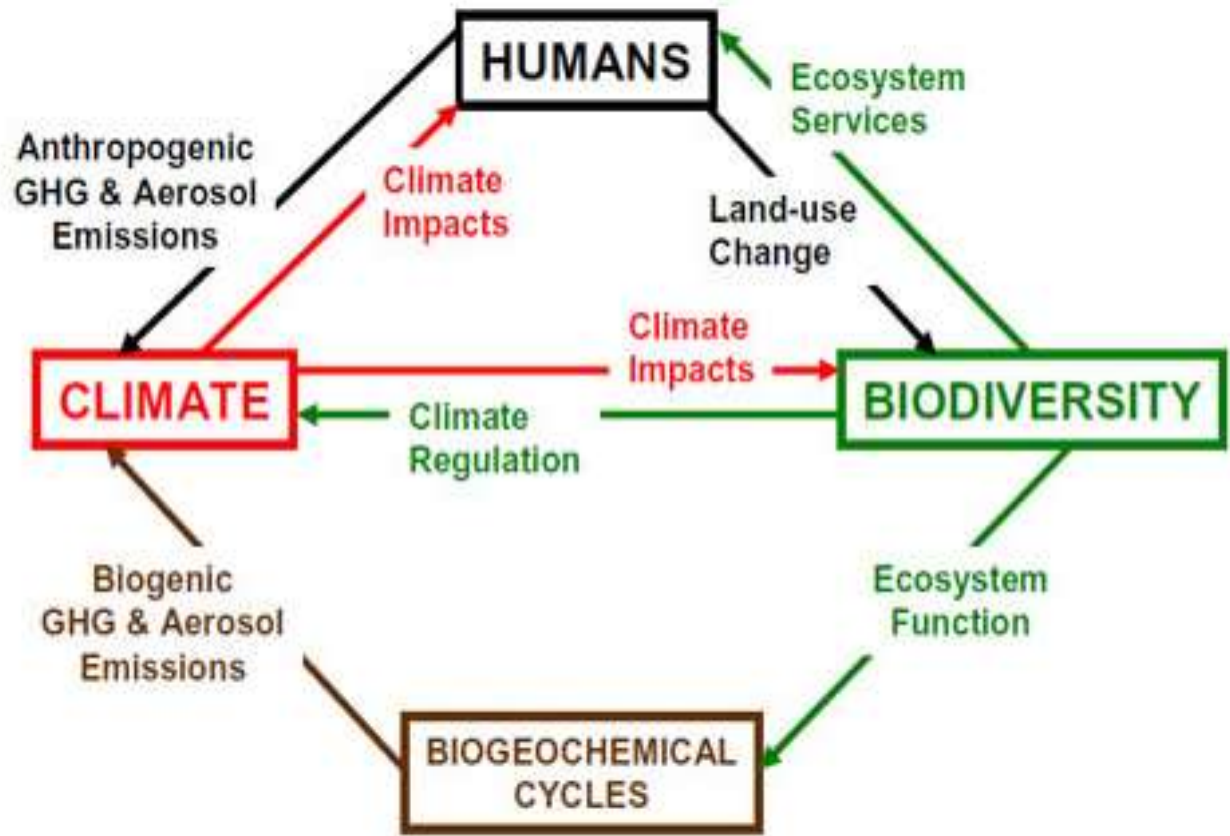
**Tridom area:** an environment conducive to the emergence of infectious diseases and their spread. Enormous Dja-Odzala-Minkébé tri-national zone (400 x 600 km) covering Cameroon, Congo and Gabon holds one of the largest untapped Fe reserves on Earth. First mining was undertaken in 2006. The conditions were met in Tridom to facilitate the emergence of Ebola. Further development will result in the influx of thousands of workers and require railways and ports to transport iron ore to markets, mainly in Asia.



# POTENTIAL VECTORS of REGIONAL MONITORING



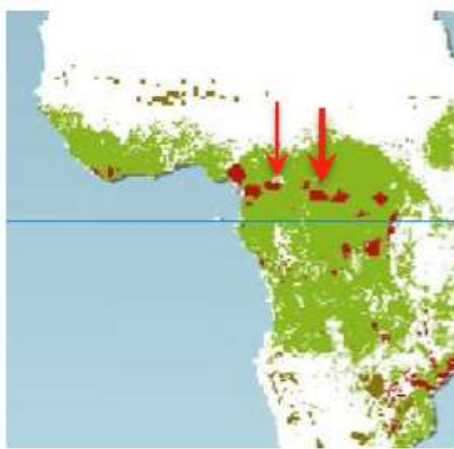




**Complex Interrelations between Climate Change, Human Health and Biodiversity (WHO-SCBD, 2015)**







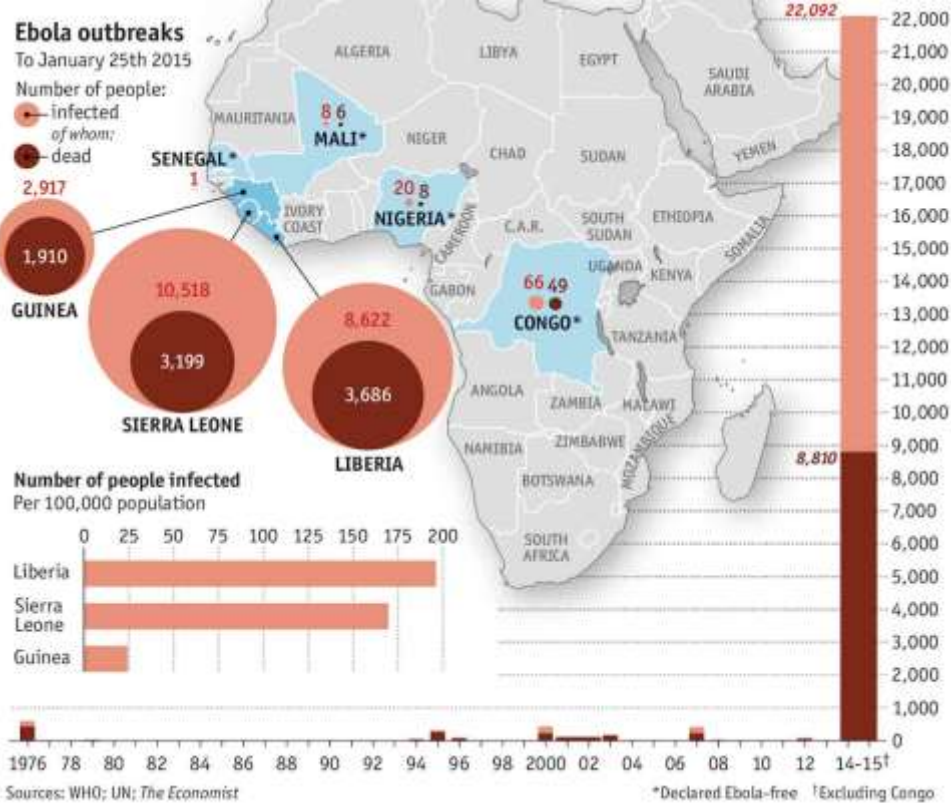
## **Damage to the 2nd lung of our Planet after the Amazon Basin Red and Ebola**

**As a result of deforestation, followed by climate change, ecological structures are changing in the ecosystem of the rain forest inhabited by bats. Three species of fruit bats are strongly suspected to be reservoirs for the Ebola virus, from where it spreads to large animals - rodents, antelopes, dogs, pigs, monkeys, and humans.**

**The fact that they are an important part of bushmeat production complicates the situation of the local economy.**

**The discovery of asymptomatic Ebola infections of three species of fruit bats raises concerns about the risk to local inhabitants preparing bats for human consumption.**

**Appropriate surveillance for the presence of the disease should be carried out before sustainable harvest programs are encouraged.**



## The future Ebola pandemic potentially present in Central Africa can be a devastating blow to Central Africa's economy.

- The 2014-2016 pandemic was beyond the previously known range for the Ebola virus.
- The World Bank predicted that the economies of Guinea, Liberia and Sierra Leone (total population :  $11 + 4 + 6 = 21$ mln, the combined area is comparable to Congo) could lose an estimated US 1.6 billion in economic activity (GDP in Congo 2013 was 14 billion).



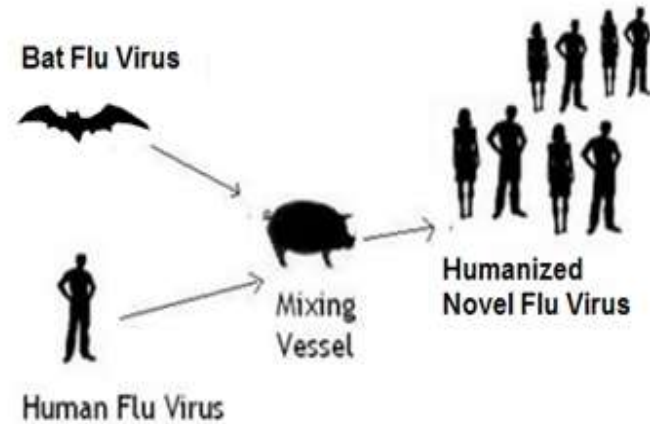
# Emerging Infectious Diseases (EID) and their control in Thailand



**SARS (Severe Acute Respiratory Syndrome) - H5N1 avian influenza - H1N1 swine flu: consecutive epidemics in Thailand over the past 15 years. The lessons learned by the Thai authorities (propagation and control) show striking similarities to the epidemics of the Congo and Central Africa.**



## Reassortment In An Intermediate Host



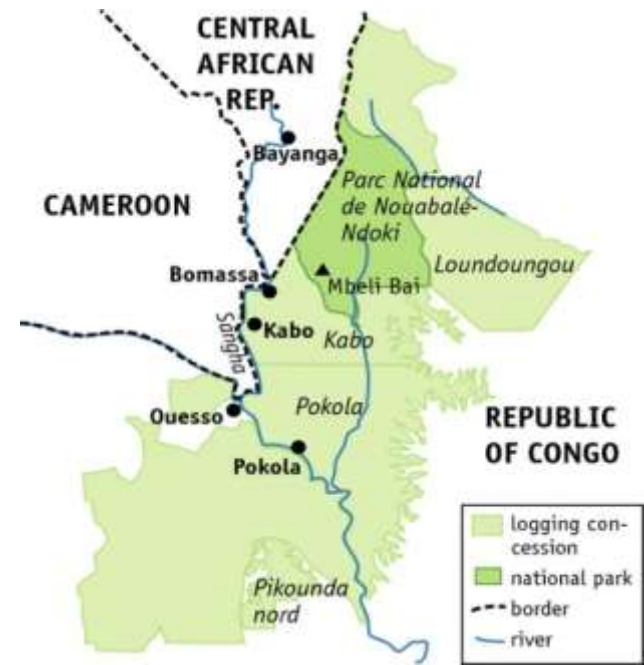
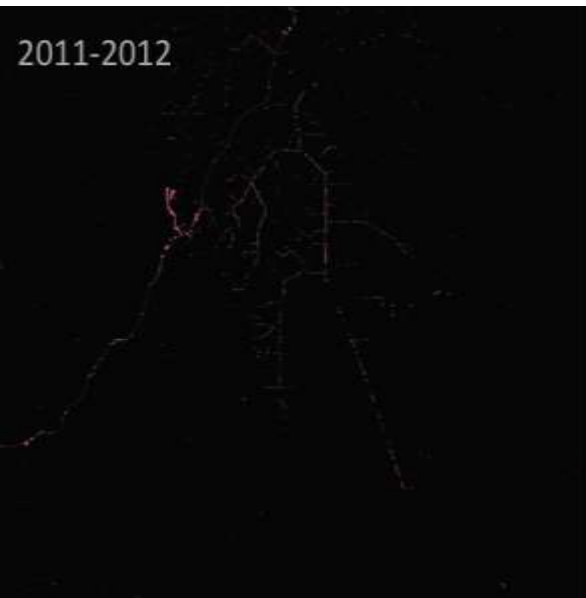
## Comparison to the Ebola pandemic in Africa and Congo

Of great socio-economic importance, the Nipah virus (NiV) is a paramyxovirus whose natural reservoir hosts are frugivorous bats. Three species of fruit bats (*Pteropus hypomelanus*, *P. lylei* and *P.vampyrus*) have now been identified as important reservoirs of NiV in Thailand and the Malay Peninsula. Occasionally, viruses can be introduced into human populations and cause serious illness characterized by encephalitis or respiratory diseases.





Rain forest fires – as a new phenomenon. The map shows most of the fires extending into a virgin forest in the National Park from a degraded forest where logging takes place.





His Majesty the King of Thailand Bhumibol Adulyadeji chaired the opening ceremony of the National Assembly (Parliament / Thai Senate) to discuss *climate change adaptation and mitigation* in the Kingdom of Thailand.

**Drought in 2014.** Northeast Thailand (deep interior). Its analysis and examination through the prism of climate change brings many benefits from Southeast Asia to Africa.





**Rapid urbanization of Bangkok and floods are exacerbated by climate change.**

**The Great flood in 2011 in Bangkok and Central Thailand has seriously affected the AIT campus.**

**Important lessons have been learned by the authorities on how to mitigate major flood threats and adapt to small floods.**



## Importance of the High level political support

The establishment and effective functioning of the proposed Monitoring Observatory is essentially dependent on the enthusiastic support of the Senate and its relevant representatives, such as :

**Senator Loemba Antoine Denis** (First Vice-President of the Committee on Foreign Affairs and Cooperation, Member of the Supreme Court),

**Senator Prosper Abbas Ickoula,**  
Vice President of the Commission,  
Health, Social Affairs, Family,  
Gender and the Environment  
and Network of Parliamentarians  
on the Management of  
Sustainable Forest Ecosystems  
in Central Africa,

**Senator Claire Assambo-Kieli,**  
Coordinator of RENAFECC  
(National Network Women and  
Climate of Congo).



# SOUTH VERSUS SOUTH

## Technology transfer





# South African Environmental Observatory Network



## Environmental Long-Term Observatories of Southern Africa







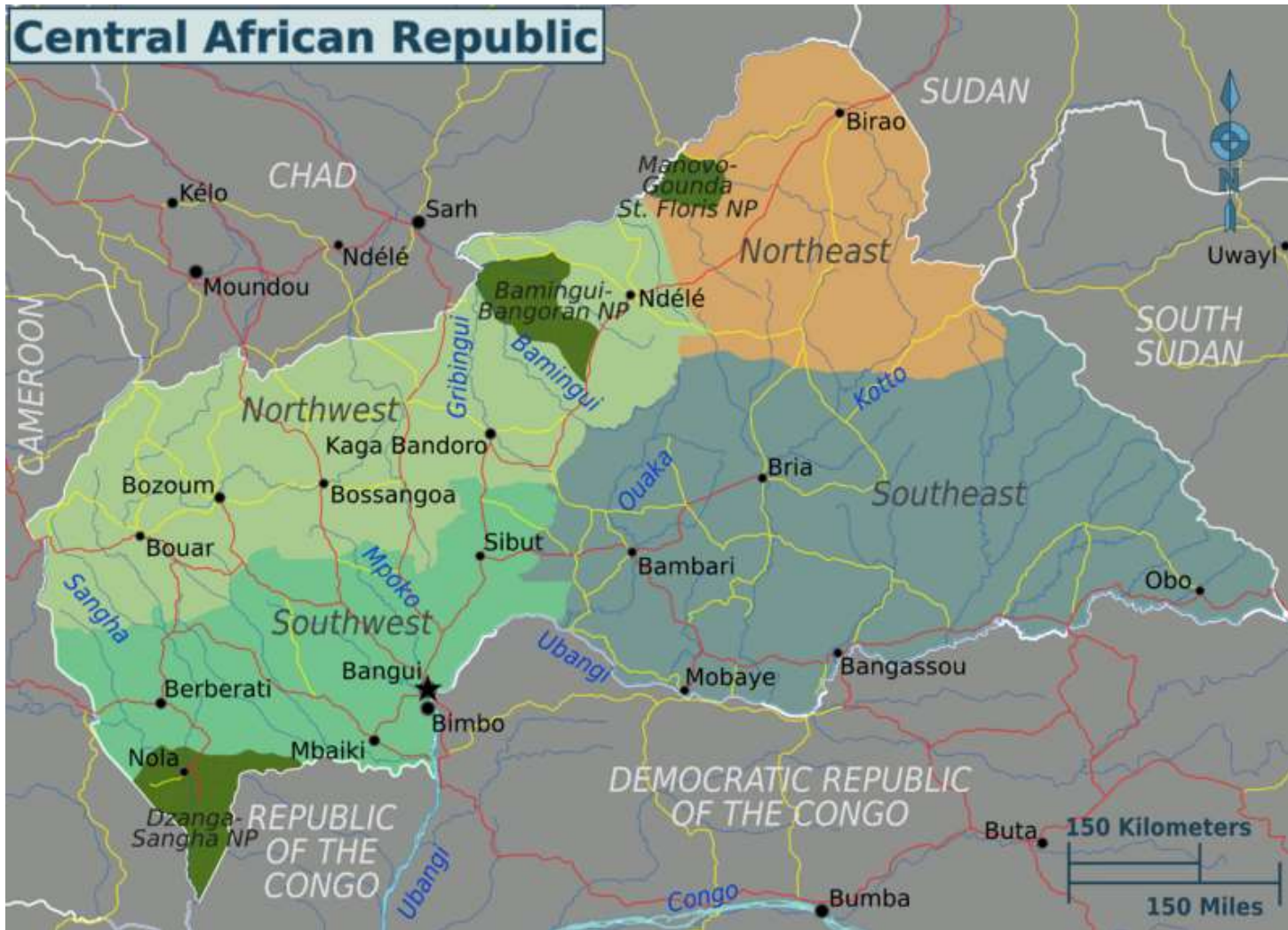
**Project**  
**South-to-South Technical Assistance**  
**Response Plan for Development**  
**of the National Low Carbon strategy,**  
**Technology Needs Assessment and**  
**Climate Finance**  
**in Central African Republic**



**Funded by UNIDO 2016-2017**



# Country's Diverse Provinces



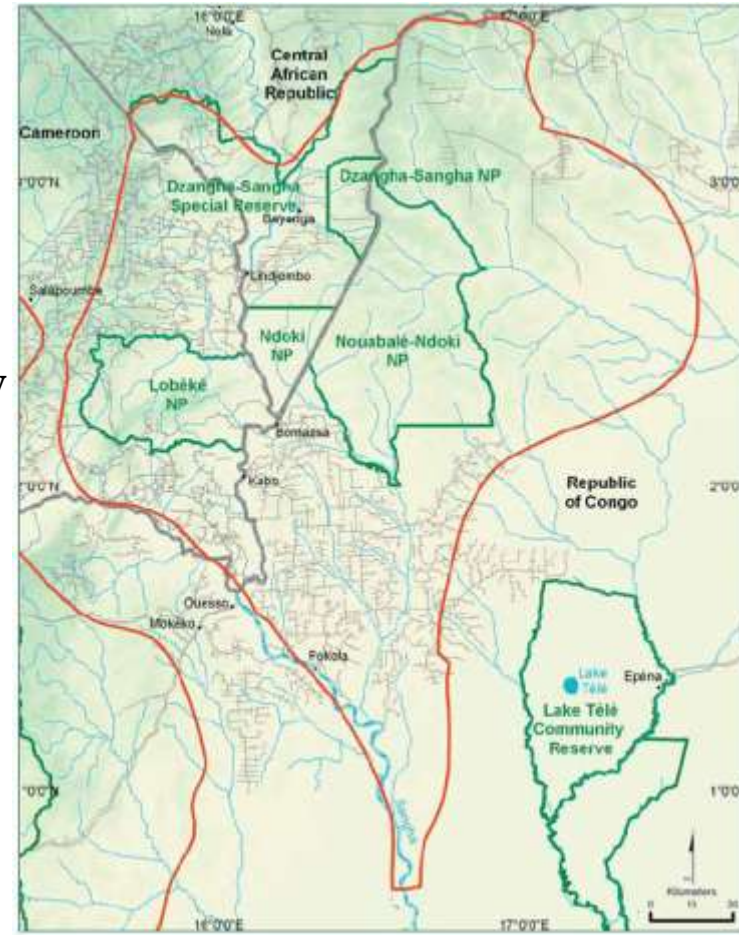
**One of the Least Developed Countries and, in addition, the post-conflict state, must be closely guided by the fundamental Development Goals, which are also prerequisites for the success of the transition to a sustainable situation**

# “Low Carbon” strategy

should be considered as a peacekeeping strategy contributing to the stability of the country through the sustainability of its environment.

L.C. Development priorities are to be considered as follows :  
(in order of precedence)

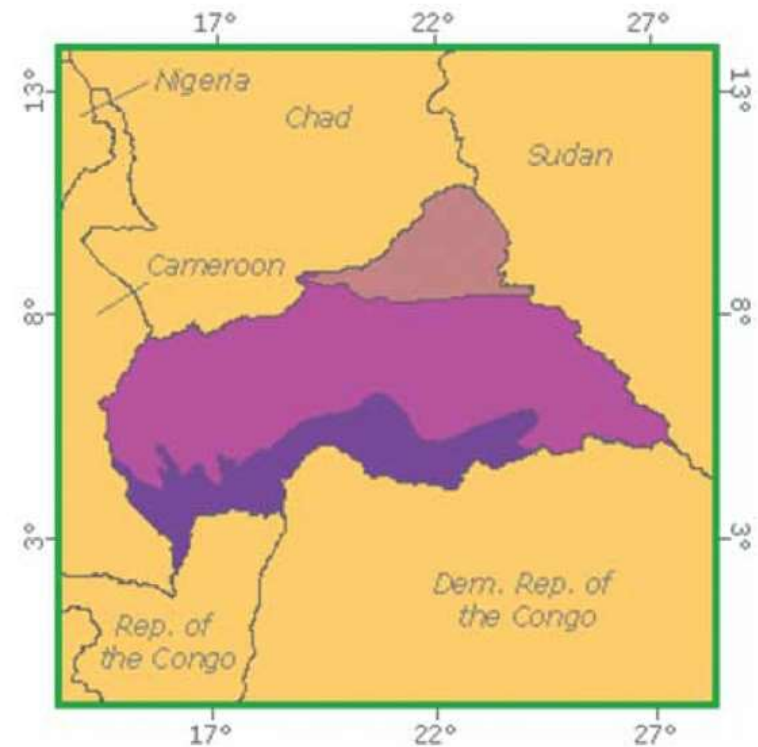
- (i) **Eradication of extreme post-conflict poverty** and the subsequent strengthening of community resilience (food security and water, human health, infrastructure, etc.);
- (ii) **Forests and deforestation issues** (the loss of biodiversity) through REDD + and Agro-forestry;





**(iii) Changes in the agricultural sector (agroecology) and land use, including through means of "diversified agro-ecological systems";**

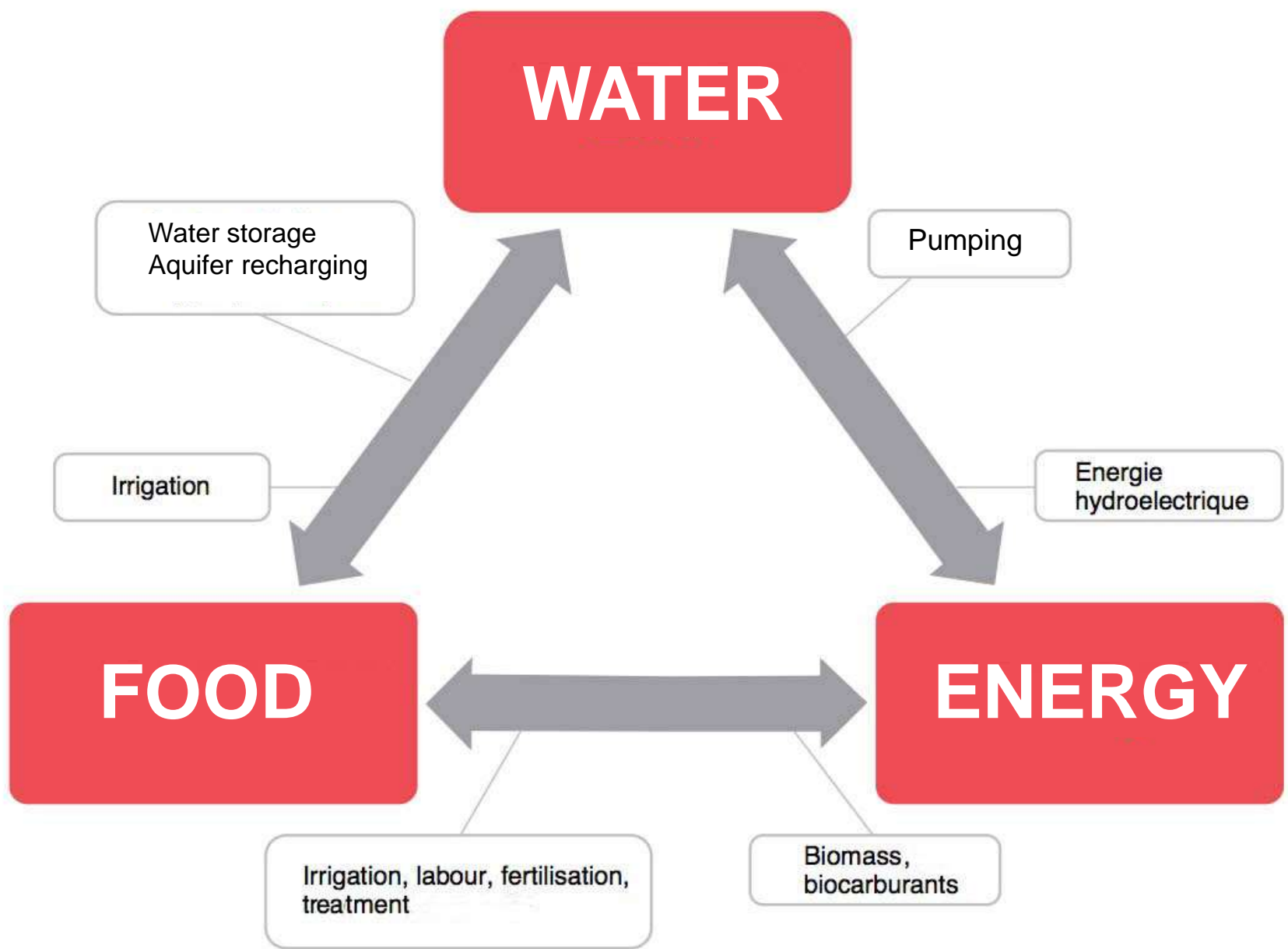
**(iv) Issues of eco-health (bio-diversity) through conservation (including *ex situ* conservation by agro-ecology);**



**Légende**

Forêt tropicale sèche  
Forêt tropicale humide décidue  
Forêt tropicale humide



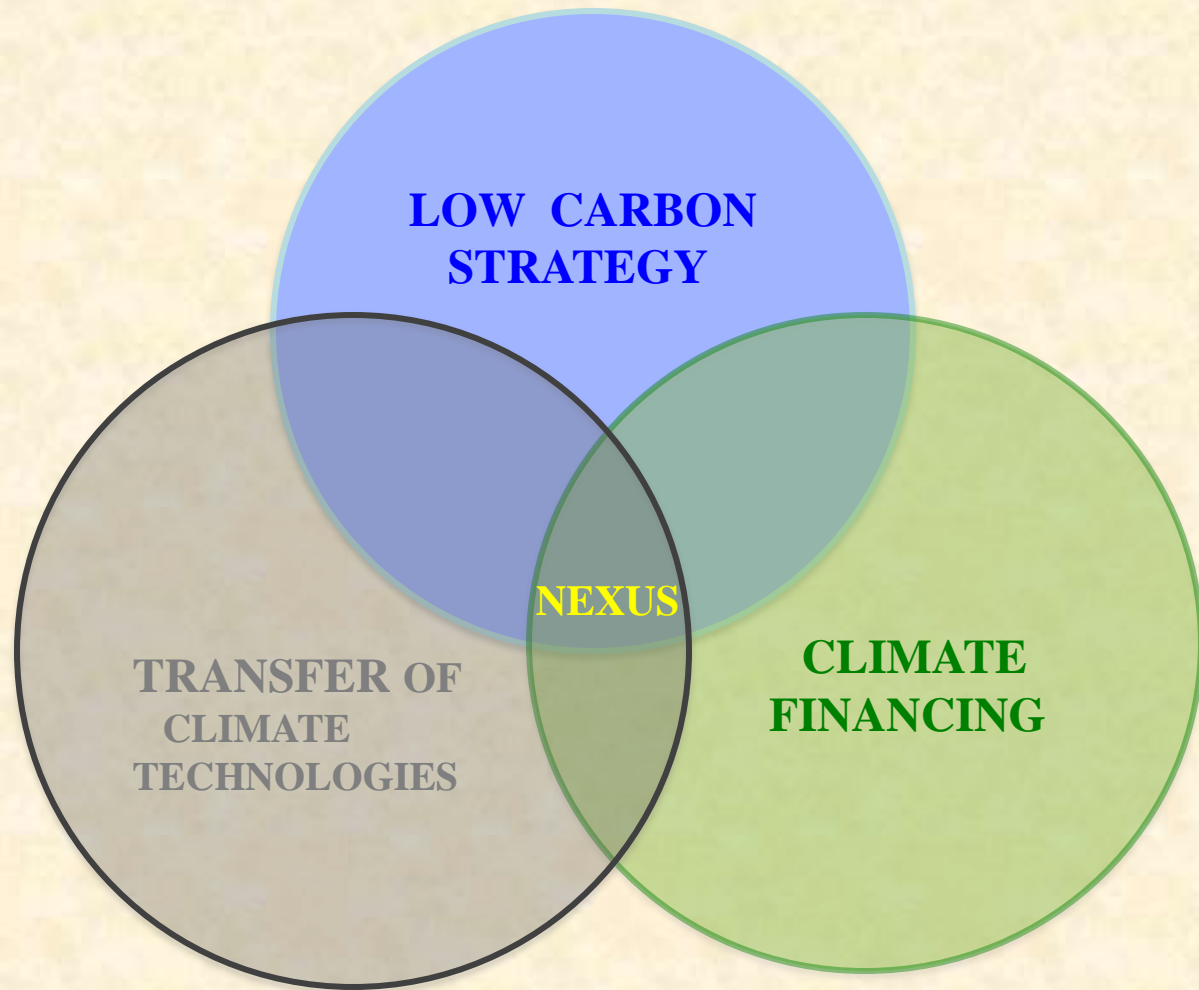


**(v) Water-Energy-Food nexus;**

**(vi) Energy problems and renewable energy sources;**







**NEXUS - INTERDEPENDENCY OF THE ISSUES**





# Global Funding Discrepancies



**PROJECT  
POLLUTION MITIGATION  
IN COASTAL COMMUNITIES  
VIA MULTI-FUNCTIONAL MANGROVE  
APPROACH WITH BIODIVERSITY  
AND SUSTAINABLE AGRI-BUSINESS  
CO-BENEFITS**

**West Papua, INDONESIA**

**Funded by UNEP 2012-2014**





# West Papua, Indonesia



# **SYNERGY with ICI PROJECT**

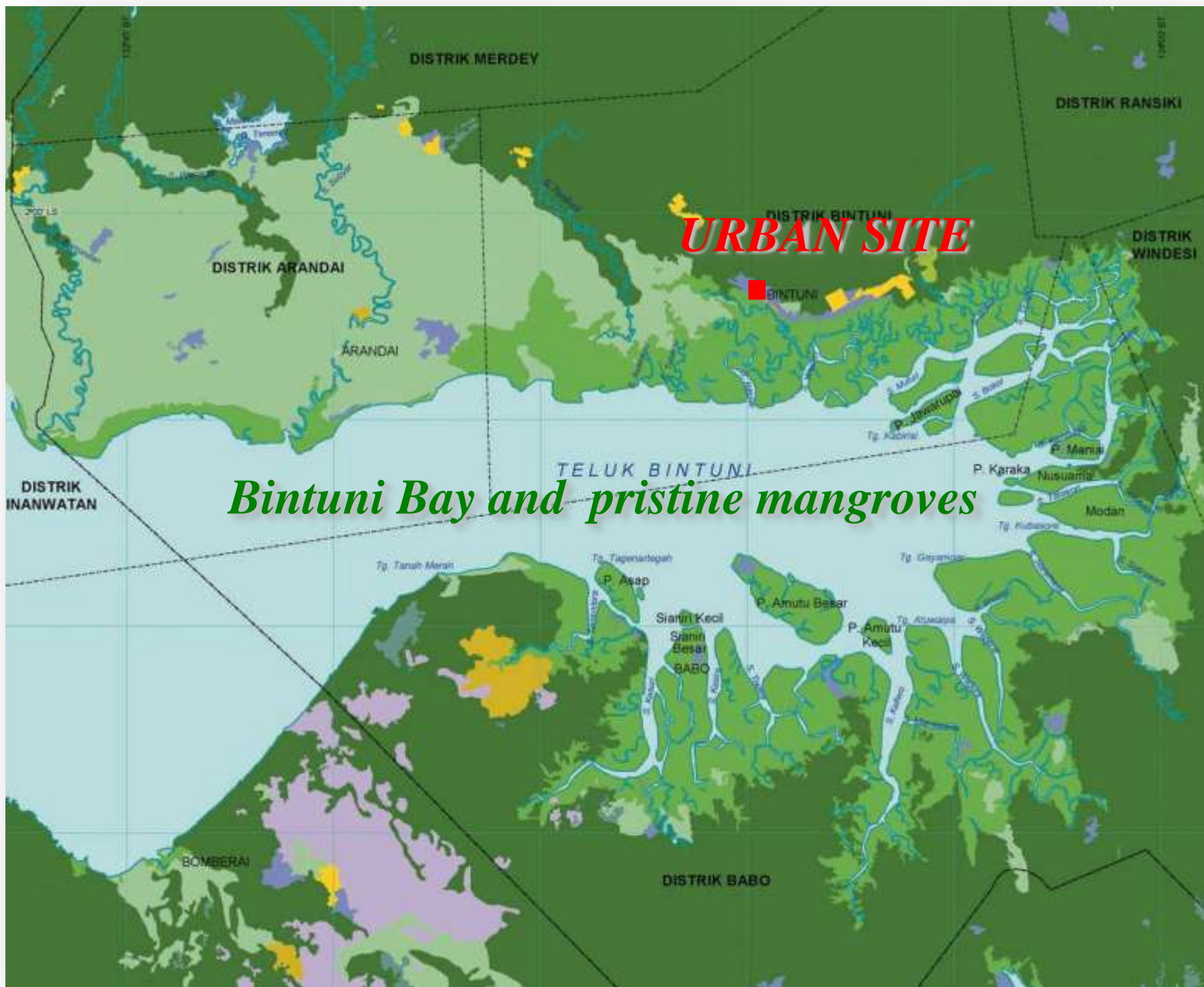
## **Vulnerability and Adaptation to Climate Change for Water Resources Management in Coastal Cities of Southeast Asia (Manokwari)**

***CO-BENEFITS of  
the Mangrove-based pollution mitigation:***

- ✧ Adapting to Climate Change**
- ✧ Building Disaster Resilience**







*Bintuni Bay and pristine mangroves*



*Project's Urban Site: surrounding environment*

Mangrove forest canopy height  
West Papua  
(Simard, JPL Version 0.1)



**Papuan mangrove are still mostly in a great shape**







## **Early Signs of Regional Mangrove Degradation: Wosi Beach, Manokwari**





**Areal view of the Project site (Tahiti park), incorporating Steenkol river and surrounding disturbed mangroves and, on the other side of the river, Bintuni Nature Reserve**





# **BINTUNI MUNICIPAL MARKET**





# MARKET WASTEWATER INFLOW

*by-passing the Tahiti Park  
to flow directly into Bintuni river*







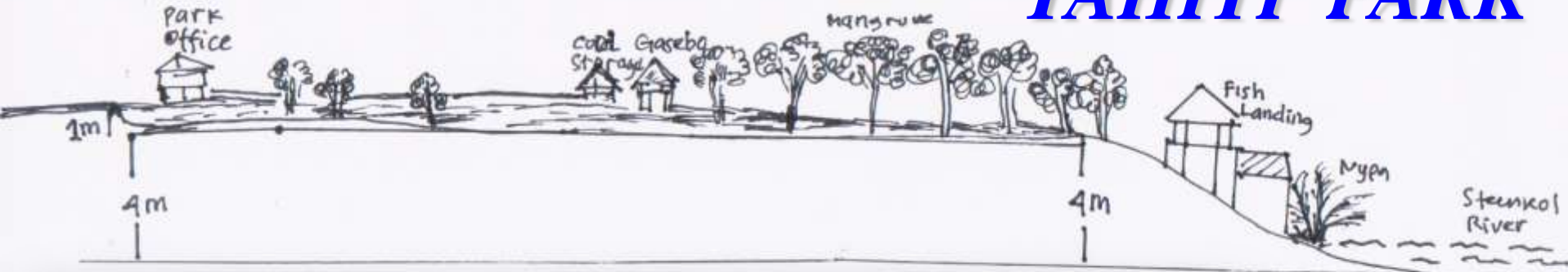
**Adjacent area around Tahiti Park, Bintuni town, featuring Steenkol river and remnant mangrove trees and, on the other side of the river, Bintuni Nature Reserve. The view shows very recent and dramatic development – urban forest logging for further residential area. June 2013. Illegal settlement on the fringes of Tahiti Part is be re-settled soon as a result of the APFED discussions with MFD and Bintuni authorities.**

**Occasional mangrove logging near the Site**



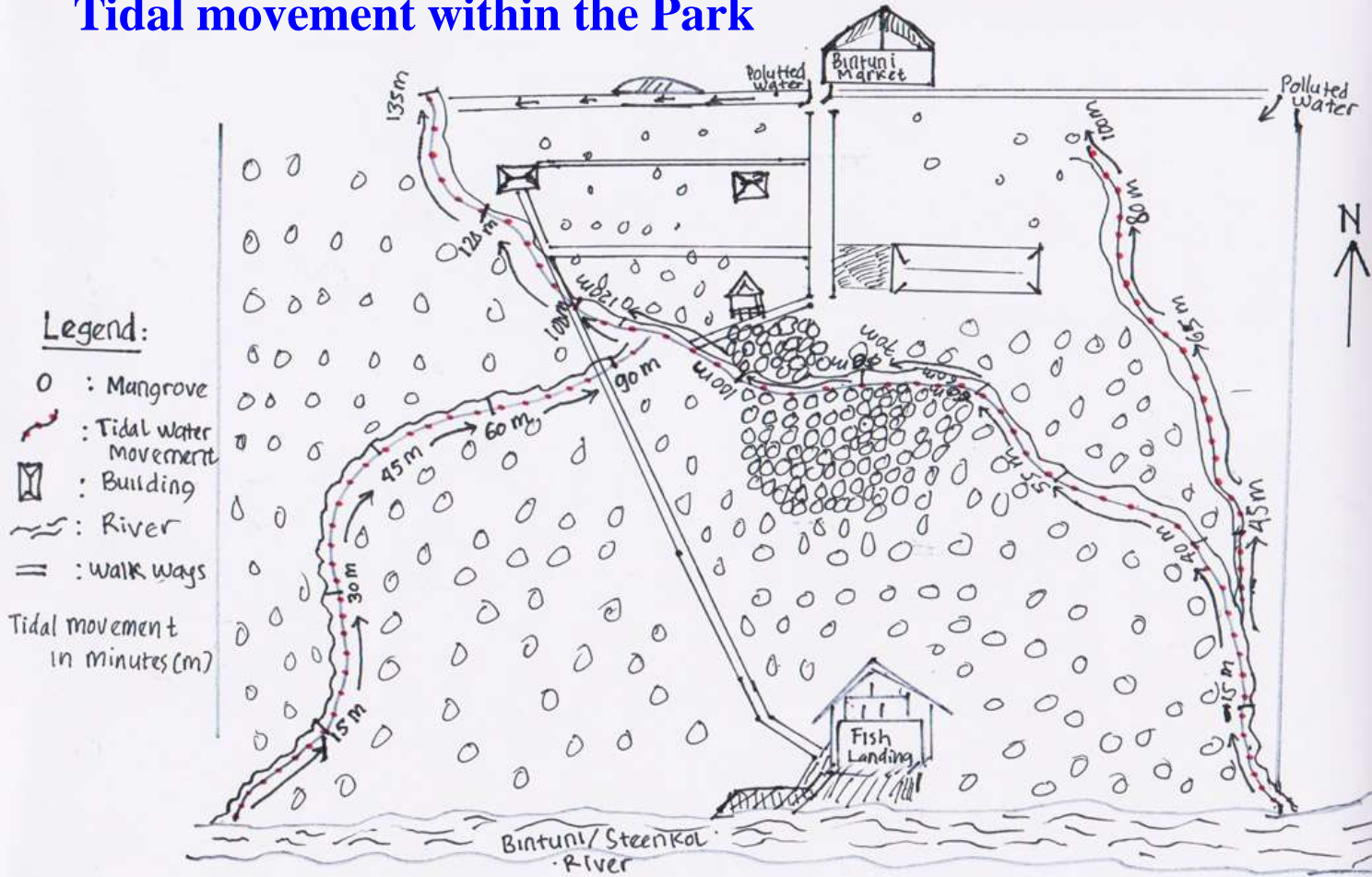


# TAHITI PARK

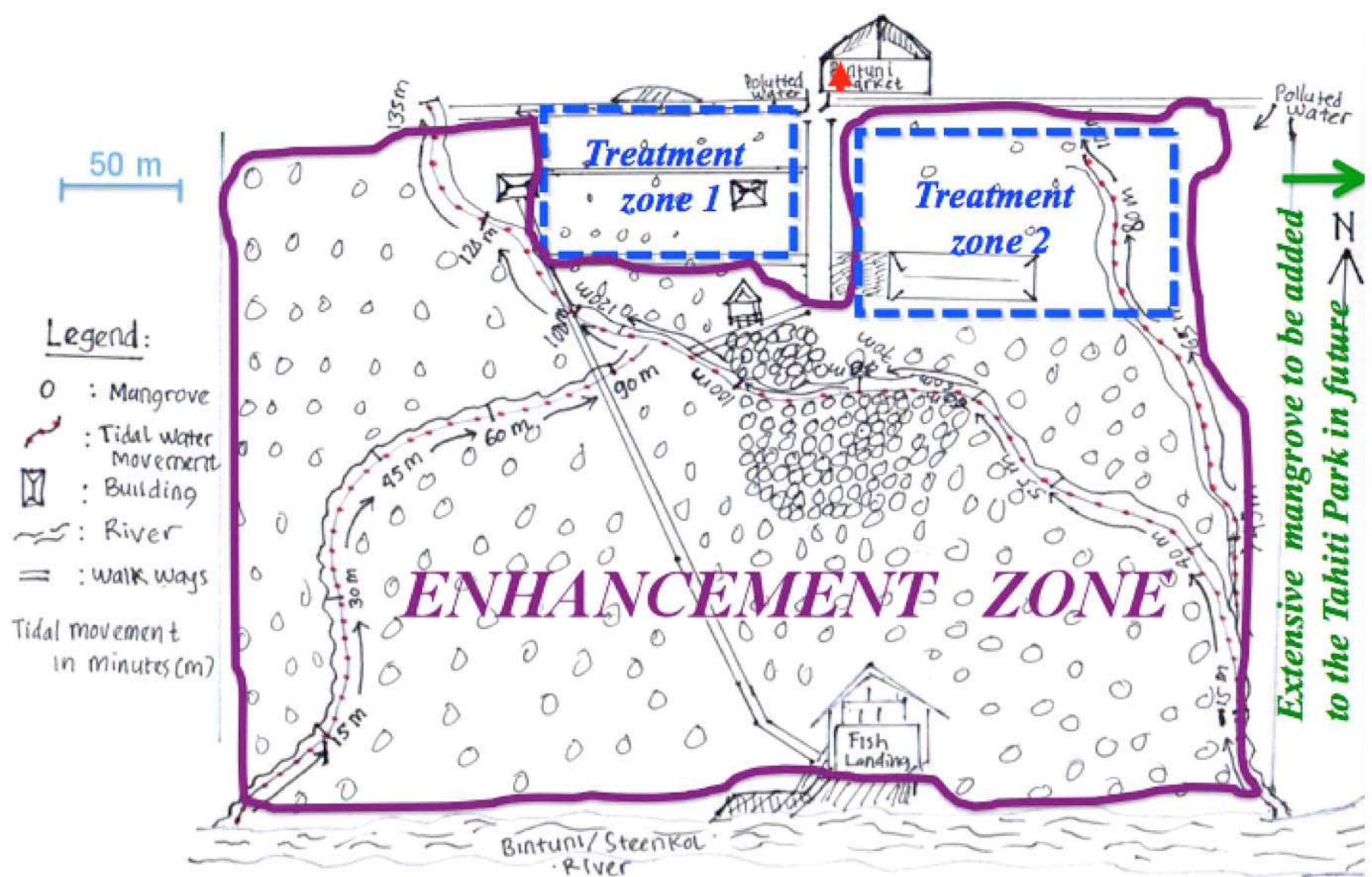


## Tidal movement within the Park

## Cross-section







***Treatment Zone to be introduced through moderate earthworks to increase water meandering and retention time***

**Schematic diagram of the eco-engineered mangrove, site No.2, treating municipal wastewater and preventing Steenkol river pollution. The groundbreaking intervention is based on Thailand's long term expertise.**

# Bang Pu Mangrove Nature Reserve project *THAILAND*



Source of  
the treatment biotechnology



# PROJECT'S INTERNATIONAL TEAM

2005-2008





Muang Samut Prakan



**STUDY AREA**





# BANG PU NATURE RESERVE

Area 1 km<sup>2</sup>

© 2007 Europa Technologies

Image © 2007 DigitalGlobe

© 2005 Google



# **MANGROVES ARE AMONG THE MOST PRODUCTIVE ECOSYSTEMS**





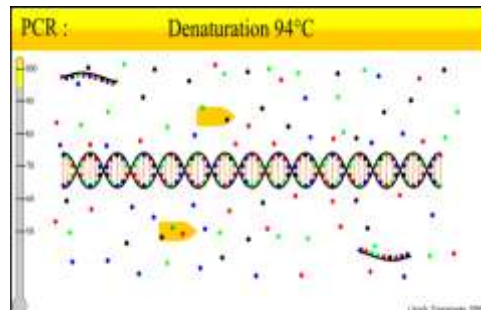
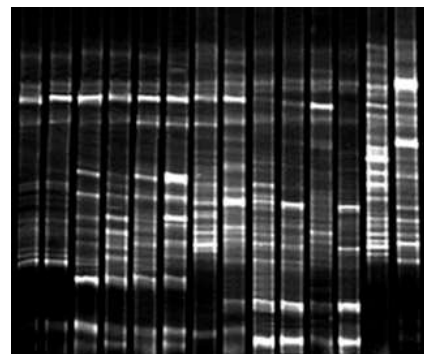
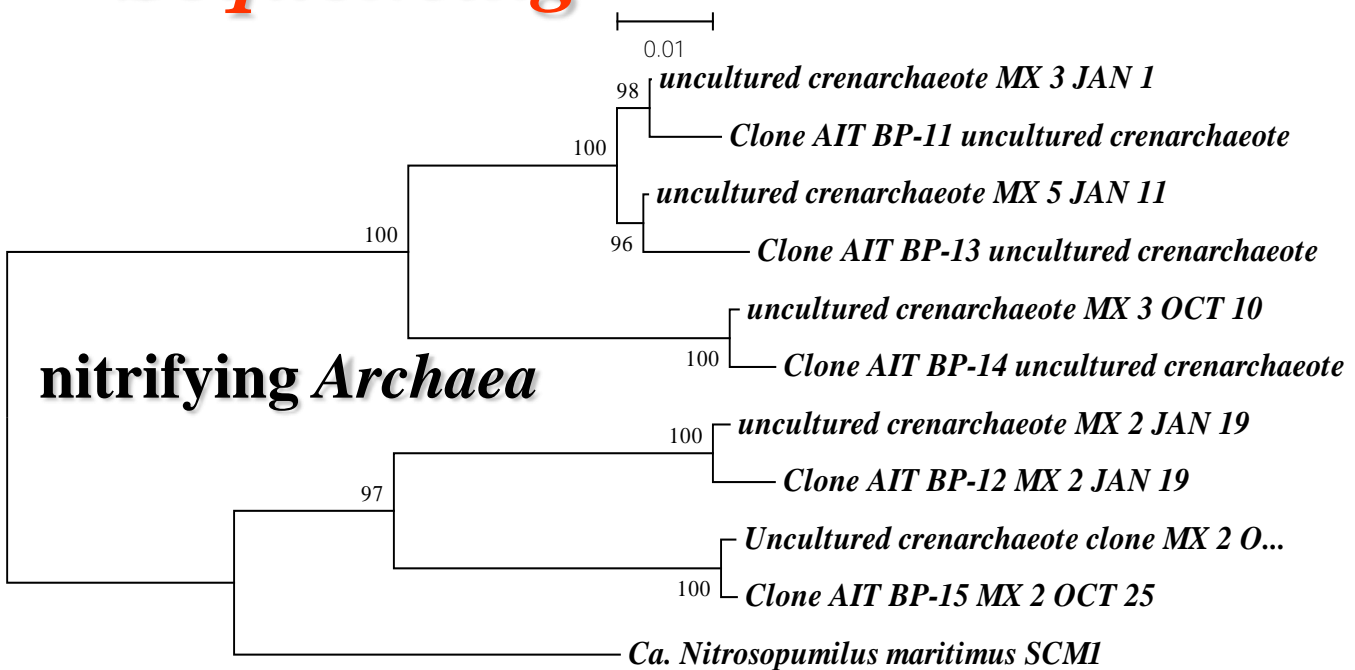
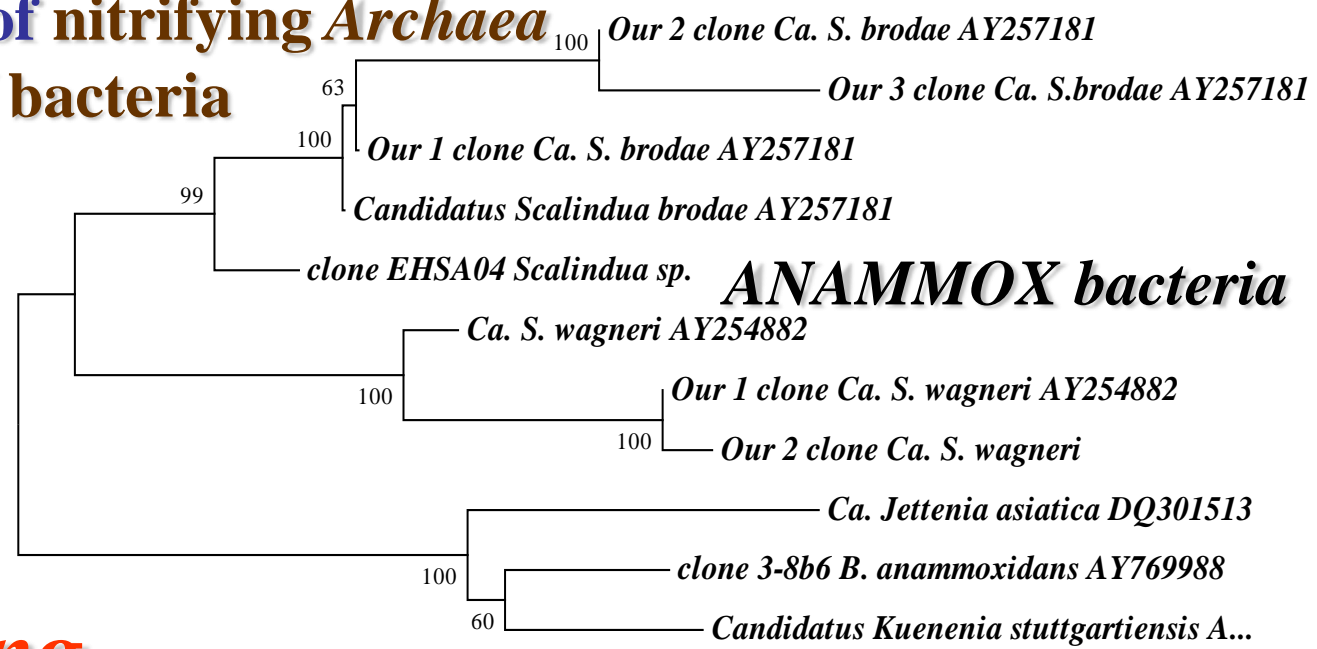
A microscopic view of a microbial mat, showing a complex network of green and brown filaments. The text is overlaid in a bold, yellow, italicized font. The background is a dense, textured surface with various shades of green and brown, suggesting a rich microbial community.

*WHAT ABOUT  
MICROBIAL  
BIO-DIVERSITY ?*



# Microbial diversity of nitrifying *Archaea* and ANAMMOX bacteria

PCR  
DGGE  
Cloning  
Sequencing



# PIG FARM



*Treatment zone*

*Enhancement zone*

*Natural zone*

■ WWF offices

*Mudflats*

*Mudflats*

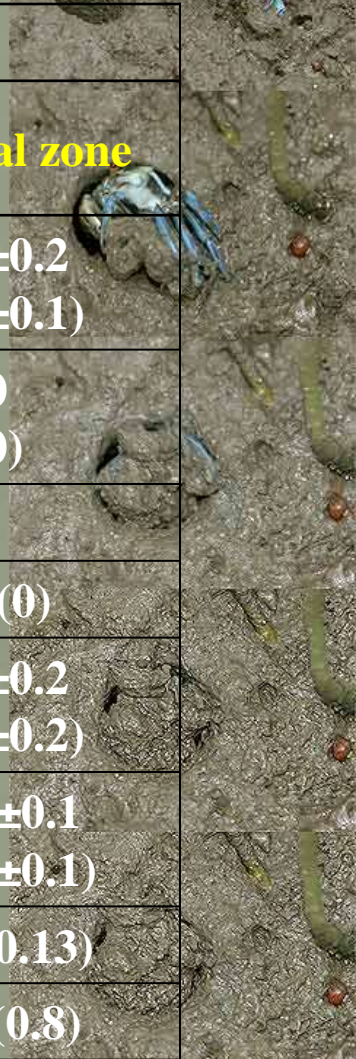
*Mudflats*





# Cell numbers, chlorophyll *a* and diversity of epipellic microalgae and *Cyanobacteria* in zones (rainy season in brackets)

Group	Species	Treatment zone, %	Enhancement zone, %	Natural zone, %
<i>Cyanobacteria</i>	9	31.7 (26.3)	27.8 (42.2)	6.6 (5.2)
<i>Chromophyta</i>	28	50.2 (45.4)	66.7 (45.2)	68.3 (64.7)
<i>Chlorophyta</i>	20	17.0 (26.9)	14.1 (12.6)	25.1 (30.1)
<i>Dynophyta</i>	5	1.8 (1.4)	1.4 (0)	0
Chlorophyll <i>a</i> ( $\mu\text{gml}^{-1}$ of microbial mat )		0.45 $\pm$ 0.1 (0.38 $\pm$ 0.08)	1.57 $\pm$ 0.2 (1.66 $\pm$ 0.11)	0.16 $\pm$ 0.2 (0.14 $\pm$ 0.01)
Diversity Index (H')		2.2 $\pm$ 0.02 (2.7 $\pm$ 0.02)	2.6 $\pm$ 0.02 (2.5 $\pm$ 0.04)	2.4 $\pm$ 0.02 (2.0 $\pm$ 0.02)



Species	Abundance, individuals.100m <sup>-2</sup>		
	Treatment zone <sup>1</sup>	Enhancement zone <sup>2</sup>	Natural zone
<i>Scylla serrata</i>	2.2±0.3 (2.0±0.4)	1.0±0.1 (0.7±0.09)	1.8±0.2 (1.0±0.1)
<i>S. paramamosain</i>	0 (0)	0.03±0.01 (0.04±0.02)	0 (0)
<i>Clibanarius sp.</i>	0	0.03±0.01 (0)	0
<i>Limulus polyphemus</i>	0	0.5±0.01 (0)	0.2 (0)
Total abundance individuals100m <sup>-2</sup>	3.8±0.7 (2.0±0.5)	6.6±0.2***1,3 (6.3±0.2)***1,3	5.4±0.2 (5.5±0.2)
Diversity Index (H')	0.86±0.02 (0.83±0.02)	2.84±0.2***1,3 (2.49±0.2)***1,3	1.85±0.1 (1.98±0.1)
Simpson's dominance (D)	0.42 (0.4)	0.13 (0.18)	0.17 (0.13)
Evenness (J)	0.9 (1.0)	0.84 (0.85)	0.83 (0.8)





**MUDSKIPPER (Oxudercinae)**

## Abundance, evenness, Simpson Index and diversity (H') of mudskippers (*Oxudercinae*) as a function of nutrient availability in zones

Species		Treatment zone	Enhancement zone	Natural zone
Species abundance individuals 100 m <sup>-2</sup>	<i>Boleophthalmus boddarti</i>	0 (0)	7.8±1.4 (3.7±0.8)	0 (3.5±0.4)
	<i>Periophthalmodon schlosseri</i>	2.5± 0.3 (1.3±0.1)	8.7±0.9***1,3 (5.7±0.7)***1,3	5.9±0.8***1 (2.7±0.2)***1
	<i>P. septemradiatus</i>	0	0	0.6 (0)
	<i>Periophthalmus chrysopilos</i>	0 (0)	3.0± 0.4 (1.2±0.2)	0 (0)
	<i>P. novemradiatus</i>	0 (0)	2.7±0.4 (2.5±0.5)	0 (0)
<b>Total abundance individuals 100m<sup>-2</sup></b>		<b>2.5±0.3 (1.3±0.1)</b>	<b>29.7±4.7***1,3 (18.0±2.5)***1,3</b>	<b>8.0±0.9***1 (3.0±0.4)***1</b>
<b>Diversity Index (H')</b>		<b>0 (0)</b>	<b>1.26±0.2***1,3 (1.09±0.1)***1,3</b>	<b>0.35± 0.02 (0.3±0.04)</b>
<b>Evenness (J)</b>		<b>1.0</b>	<b>0.9 (0.8)</b>	<b>1.0</b>
<b>Simpson's dominance (D)</b>		<b>0</b>	<b>0.19 (0.39)</b>	<b>0.15 (0)</b>



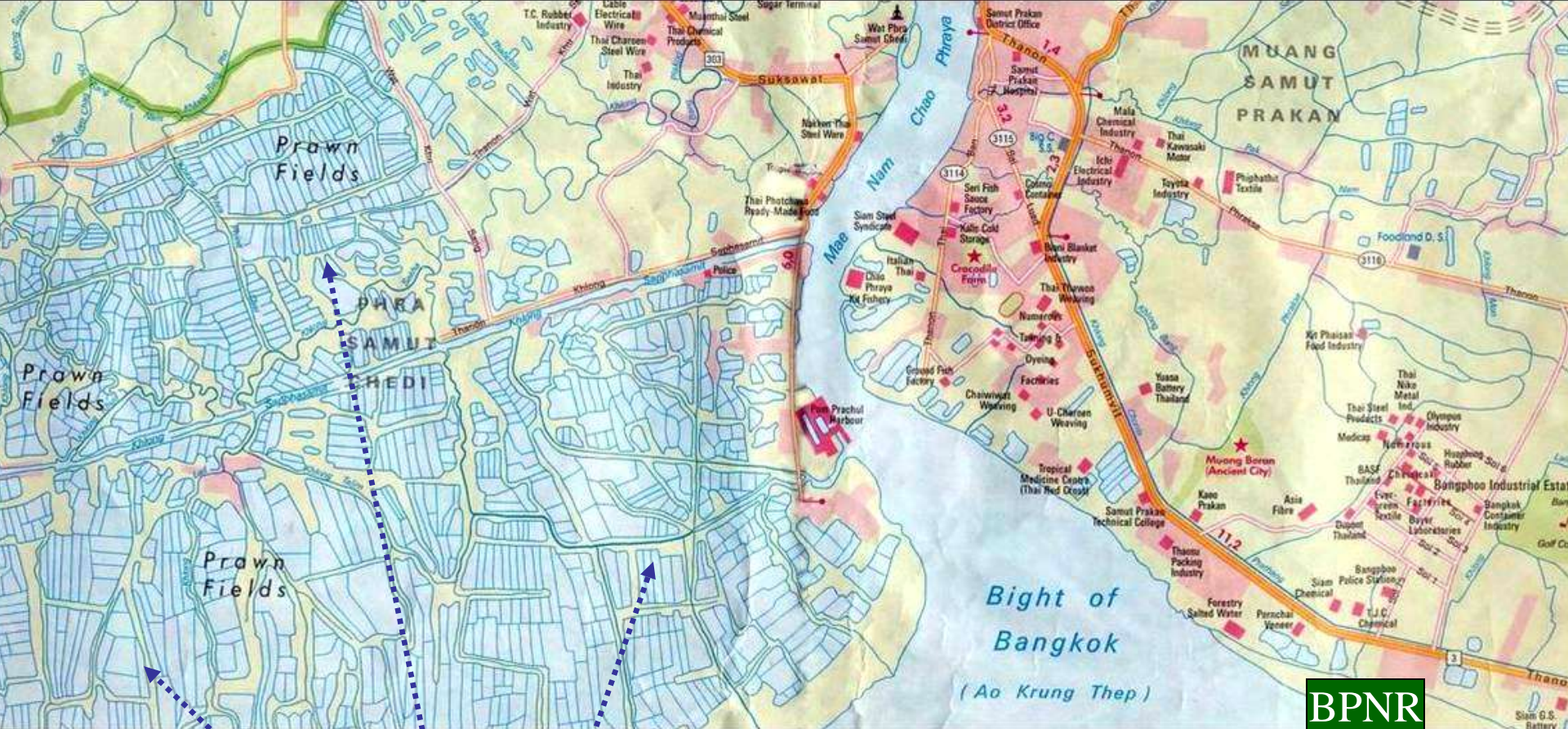
**AT LEAST IN CASE  
OF MANGROVES  
MANAGED MUNICIPAL  
POLLUTION  
MAY BE**

**A WELCOME FRIEND**

**RATHER THAN**

**A PROVERBIAL FOE**





What is the possibility for the shrimp ponds across the river to follow Bang Pu NR ?





# CONCLUSIONS

**The South-to-South cooperation dealing with Climate Change issues is synergistically and mutually beneficial activity**

*It stimulates not only Scientific thought and technical support but leads to high level contacts involving Parliamentarians (Senators)*

**In turn, this increases potential for informing relevant institutional and policy developments.**





# *Papua*

*Many striking parallels with Africa*

