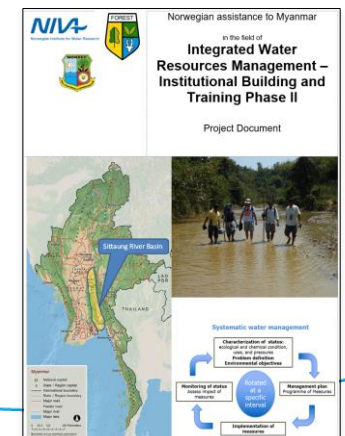
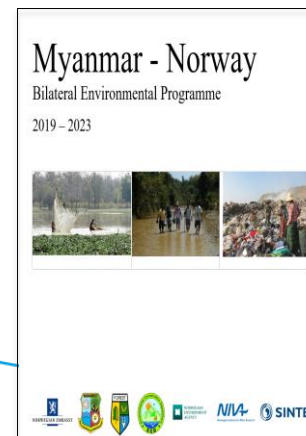
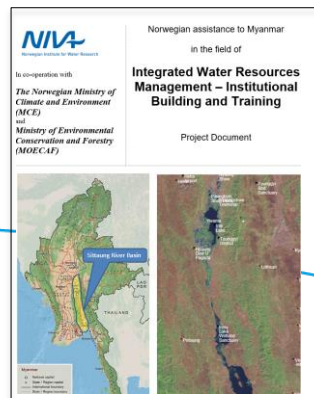
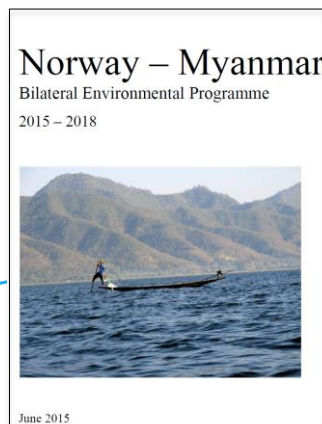




# The IWRM project (2015-2018) – an holistic approach

Norway Myanmar Environmental Programme; Presentation of results  
and introduction of the second phase;  
IBC Yangon, October 25th 2019

**Ingrid Nesheim (NIVA) and Toe Aung (WMD FD)**



Ingrid Nesheim

22.10.2019

# IWRM Institutional Building and Training

- 1. System for ecological water quality assessment**
2. Rehabilitation and instrumentation of the water laboratory at FRI
3. Water Quality Database
- 4. Piloting the River Basin Management Approach in the Bago Sub-basin Area**
- 5. Water quality monitoring in Inlay Lake**

The collaboration is between WMD FD and NIVA.  
IWUMD, MOALI and DWIR, MOTC were in the steering group.



# Myanmar National Water Framework Directive (NWRC, 2014)



Seven directives which focuses on:

- River basin management and plans
- Aim of good ecological status and healthy rivers and lakes (chemical and ecological)
- Good quantitative status
- Coordination of authorities
- Involvement of interested parties

**INTEGRATED  
MANAGEMENT**

**= HOLISTIC and  
Sustainable  
water  
management**

# International IWRM frameworks

**The European Water Framework Directive (WFD)** – a law; all countries in the EU union have to implement



**The UNESCO IWRM guidelines** – no law – a policy brief on recommended steps for water management



# Tools enabling knowledge based decision making

**Water quality monitoring, sampling, status assessment**



**Water quality laboratory at FRI Yezin, NPT**



**A water quality database developed**



**Coordination of authorities and involvement of civil soc. actors for development of Sub-basin Management Plan**

# Ecological water quality criteria adapted to Myanmar conditions, capacity building

**PHD student**

**Master students**

**Skills in sampling and interpretation**



# Macroinvertebrates indicator species in rivers



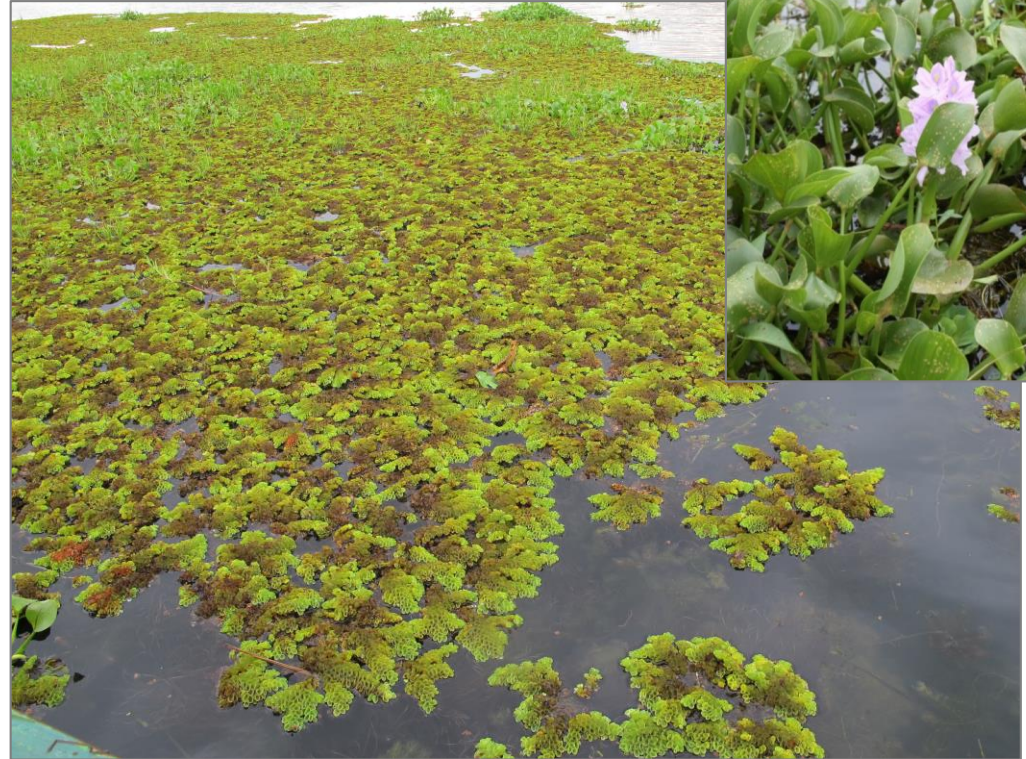
# Macrophytes indicator species in lakes – monitoring in Inlay Lake

*Eichornia crassipes*

(photo: A. Ballot)



*Pistia stratiotes* (photo: A. Ballot)



*Salvinia cucullata* (photo: A. Ballot)



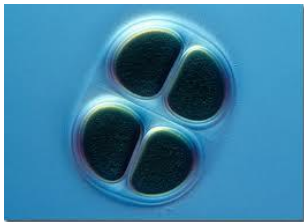
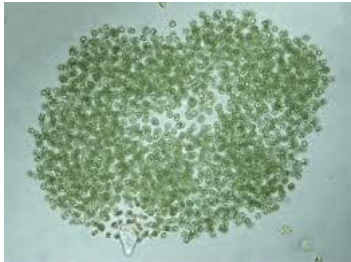
*Euryale ferox* (photo: M. Mjelde)



*Ceratophyllum demersum* (photo: A. Ballot)

# Phytoplankton indicator species in lakes monitoring in Inlay Lake

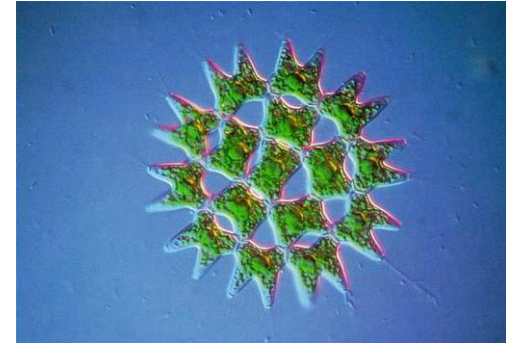
## Cyanobacteria



## Dinoflagellates



## Green Algae



## Diatoms



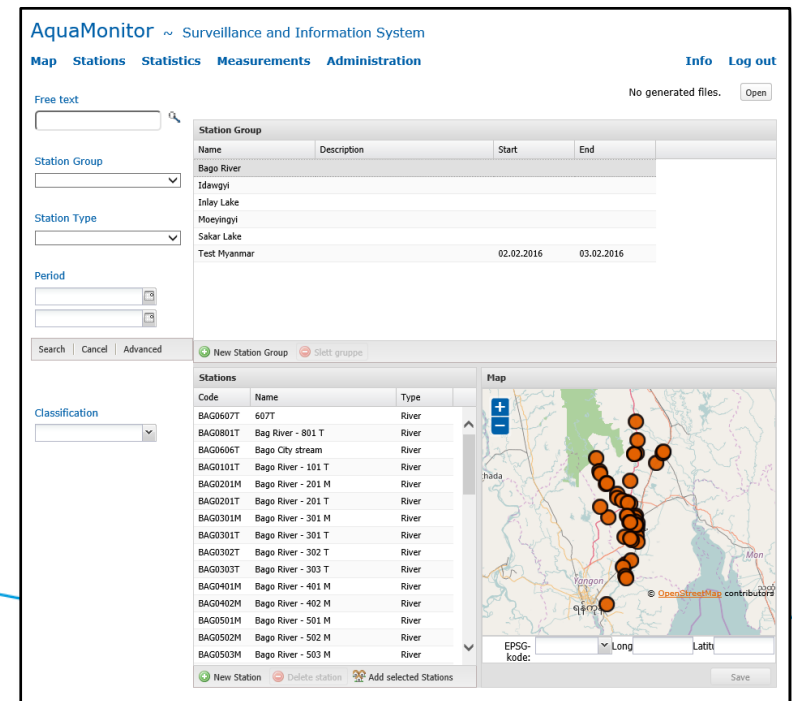
# Development of a water quality database – focus on infrastructure



- ❑ Setup **laboratory** and water quality **database**
- ❑ Database server and PC suite installed at MONREC



- ❑ **Aquamonitor** user interface
  - Data accessible **online**
  - **Search** for data/stations
  - **Plot** time series
  - **Export** results for further analysis



# The river basin management approach in Bago

## **A science - policy - civil society approach:**

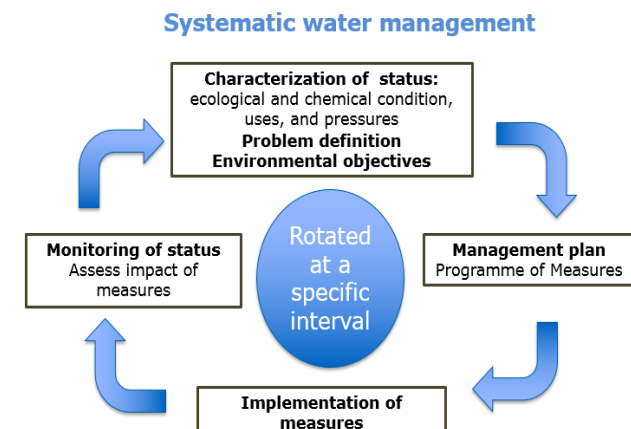
it has included both practical water management tasks, and an administrative river basin management

- Coordination of authorities
- Involvement of CBOs and civil society
- An ecosystem Management approach, and a Knowledge based approach

Adaptive learning approach – a continuous process towards the aim integrated water management

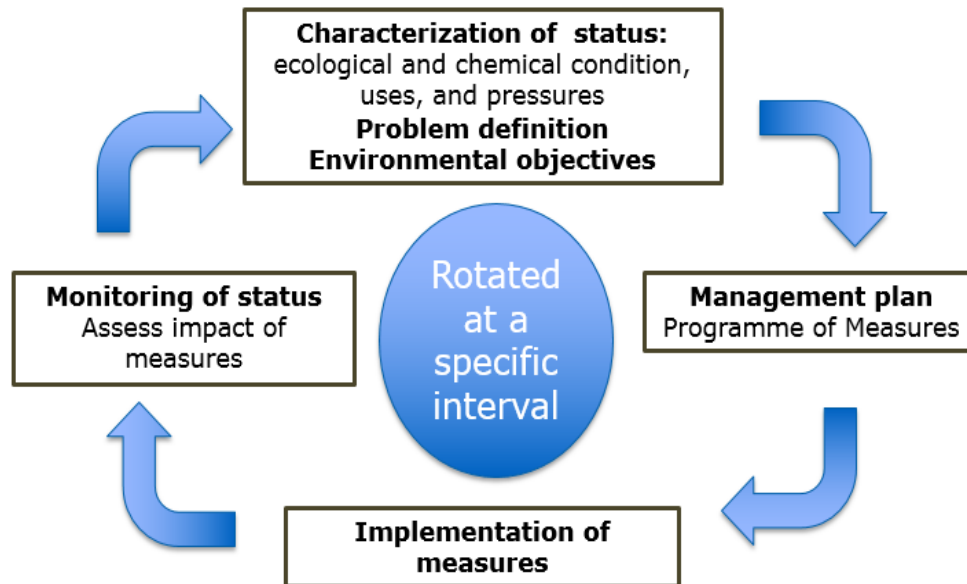
# Coordination of authorities and involvement of civil society for development of Bago Sub-basin Area Management Plan

- **Bago Sub-basin Area Committee**, the Bago MONREC minister was elected as chair person, Directors of Bago FD, IWUMD DWIR were elected as secretaries.
- **Bago Non-governmental Stakeholder Group meetings**, a the arena for regional participation. Three meetings organized. Three secretaries have been elected.
- Several “Bridge meetings” between secretaries of the Committee and the Group were organized.



# Development of a Bago Sub-basin Water Management Plan – a parallel to the EU WFD

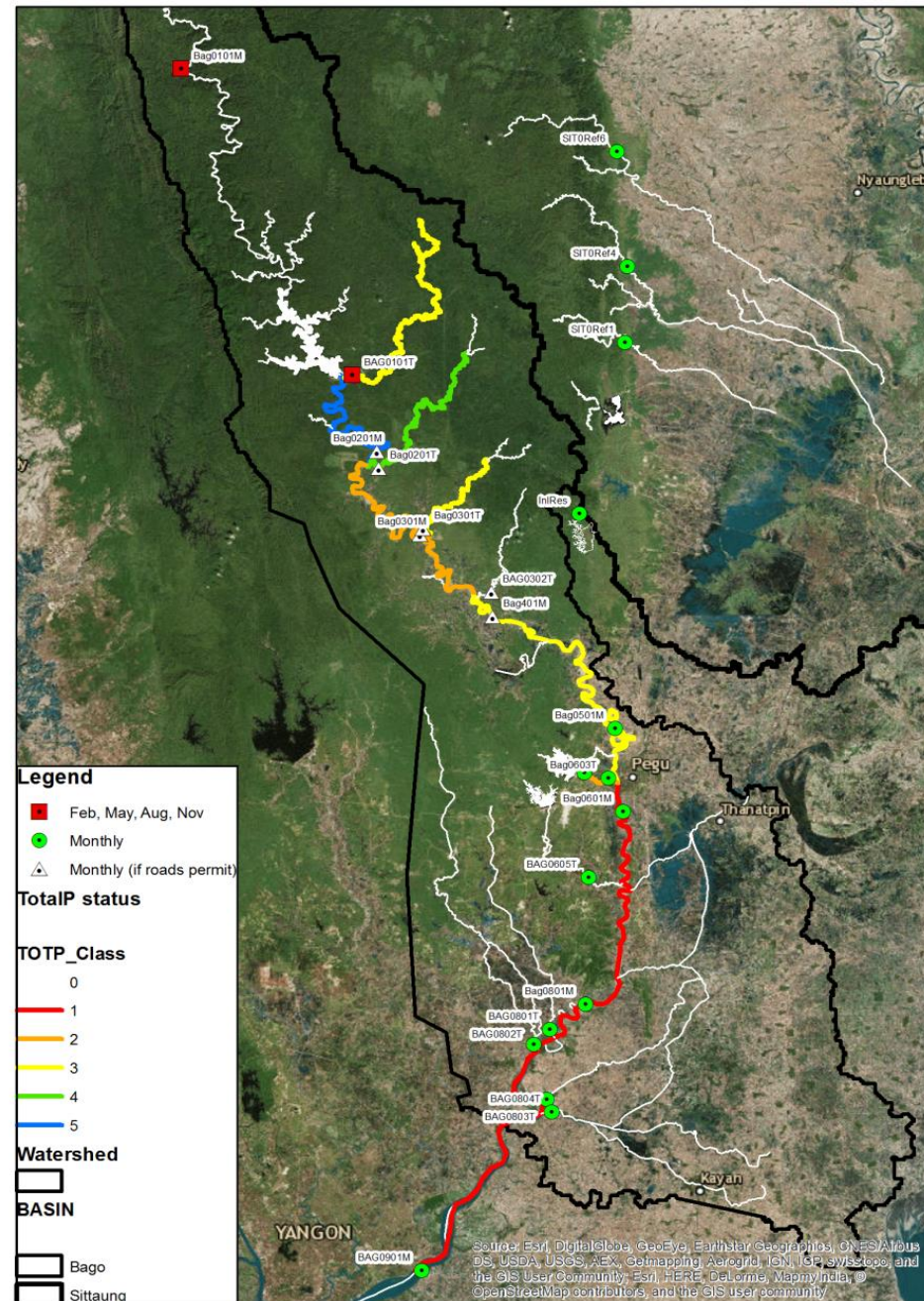
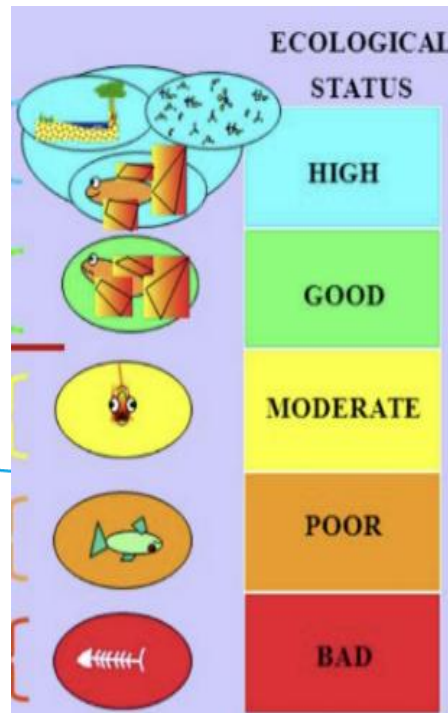
## Systematic water management



Timeline for different steps	Date
Characterization and classification (monitoring)	2015 - Continuous
Prioritized water management issues	2016
Environmental aims of water body types	2016
Abatement measures	2017
Prioritization of abatement measures	2017 - 2018

# Characterization of the Bago Sub-basin – water quality monitoring since 2015

- **FD and IWUMD sampling team** on a bi-monthly basis.
- Samples have been analysed at IWUMD laboratory in Yangon, FRI laboratory in NPT, and at NIVA in Norway.



# Programme of measures

## 5 Abatements measure programme

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Department	Department	Department	Department	Department	Pressure	Impact of pressure	Related environmental objective	Abatement measure			Time-line	Where	Effectiveness of measure (expected effect)	Incentive & enforcement	Funding
								Ongoing (i)	Planned implementation 2018 (ii)	To be implemented within 5 yrs (iii)					
Forest Department (FD)	Irrigation and Water Utilization Management Department (IWUMD)	Environmental Conservation Department (ECD)	Department of Agriculture (DOA)	Department of Rural Development (DRD)	Intrusion of waste water into drinking water well and lakes  Scarcity of drinking water	Contaminated water  Toxic water	Provision of safe drinking water quality from wells and lakes in line with the Myanmar Drinking Water Standard	Construction of wells and lakes: 64 shallow wells, 3 deep wells by machine; 5 wells by hand; 1 soil lake, 304 other lakes  Provision of electricity in villages: Mya Sein Young Project lend 100 lakhs per village (as capital supply)	102 shallow wells and 234 deep wells made by machine.  A hand dug well  35 Soil lake, other 119 lakes.  Total (491) wells and lakes are planned during 2018	From 2016-17 to 2020-21:  570 shallow wells and 859 deep wells made by machine.  37 wells by hand. 127 Soil lakes, other 1165 lakes.  Total (2758) wells and lakes are planned	Unlimited	Bago, Taungoo, Pyi and Tharyar-waddy Districts	-	-	Regional plu Union Government, and UNICEF
				Bago Township Development Committee (Bago TDC)	Waste & waste water	Cloaked drains Poor water quality Flooding Health risks Poor environmental conditions	Sufficient water flow No eutrophication No contamination of water Healthy rivers, lakes and streams	Truck to collect waste  Garbage collection campaigns  3 garbage bins in city centre, emptied every day	Garbage bins near the public places  Fencing alongside the Bago market to prohibit throwing of waste to river  Inspection of waste handling by shopkeepers in Bago City	Awareness -sign alongside river  Awareness information folder for school  Recycling awareness	Unlimited (yearly)	Bago Township	Awareness raised to improve waste collection in Bago City area,	Award giving and penalty	Tax and revenues from people of Bago City
	Directorate of Water Resources and Improvement of River Systems (DWIR)	Department of Fisheries (DOF)			Sewage	E. coli bacteria in water, nutrient pollution reduced level of oxygen in water health risks poor environmental conditions	No eutrophication No contamination of water Healthy rivers, lakes and streams	NIL	Regular awareness campaigns  Patrolling along the Bago river, in particular in Bago City Area	Treatment plant established  Regular Awareness campaigns	Unlimited (yearly)	Bago Township	Pollution reduced and river water quality improved for domestic water use, and water ecosystem restored	Award giving and penalty	Tax and revenues from people of Bago City
														dams, Introduction of capture base culture system	

# Some reflections on the approach

With reference to the goal of IWRM we have achieved:

- Sub-basin platforms for coordination and involvement – including secretariat for the development of this plan.
  - *yet not all water related issues included in discussions so far*
  - *also other water related departments such as MOEE*
  - *outreach for participation and awareness must improve*
- The pilot has contributed to an increasing awareness of the ecological status and pressures in and along the Bago River Basin
- A lot of data has been produced, and a database including a server is available and accessible



RAPPORT L.NR. 7194-2017

### Characterization of the Bago Sub-basin Pilot implementing the EU Water Framework Directive



RAPPORT L.NR. 7271-2018

### Environmental objectives and abatement measures for a healthy Bago River,

A contribution to the Bago River Sub-basin Management Plan



RAPPORT L.NR. 7290-2018

### Bago River Sub-basin Management Plan



RAPPORT L.NR. 7301-2018

### Integrated Water Resources Management in Myanmar. Assessing ecological status in Inlay Lake.



### A proposal for an administrative set up of river basin management in the Sittoung River Basin

By Zaw Lwin Tun, Bo Ni, and Sein Tun and Ingrid Nesheim



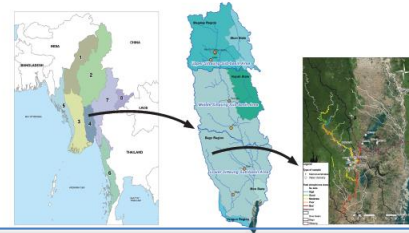
RAPPORT L.NR. 7027-2016

### Framework notes and recommendations for Integrated Water Resource Management in Myanmar



RAPPORT L.NR. 7304-2018

### Piloting river basin management in the Bago Sub-basin, experiences and recommendations



**Reports for download available from:**

**facebook page: IWRM and from Programme homepage**

**<https://mnenvironment.com/>**



# Thank you for your time and your attention!

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project)

## Myanmar: Pilot introducing the National Water Framework Directive

Ingrid Nesheim, Bente M. Wathne, Bo Ni, Zaw Lwin Tun

Myanmar, IWRM, Riv

Myanmar has an abundance of minerals and timber to damage related non-point source pollution. The National Water Framework Directive (NWFD) covers principles and stakeholder participation in the Sittoung River Basin. The situation is pressing support the pilot in such a special situation, and water this pilot initiative.

NIVA

Framework notes for Integrated Water Resources Management

NIVA

RAPPORT L.N.R. 7027-2016

A proposal for an administrative set up of river basin management in the Sittoung River Basin

By Zaw Lwin Tun, Bo Ni, and Sein Tun and Ingrid Nesheim

REPORT SNO 7013-

Norwegian assistance to Myanmar in the field of  
**Integrated Water Resources Management**  
Institutional Building and Training

**The River Basin Management Approach in the Sittoung River Basin**



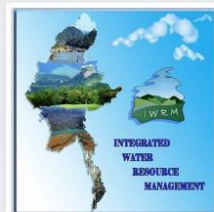
News Brief:  
**The National Water Quality Laboratory, Nay Pyi Taw**



**Introduction**  
Myanmar, previously known as Burma, has received little attention in international attention because of its past as a dictatorship. The country was under military rule until 2011. The country's economic and diplomatic relations with the rest of the world have improved since the 2011 military government transitioned to a civilian government.



Integrated Water Resources Management - IWRM



Integrated Water Resources Management -

