SWIBANGLA

Water Safety Plans

Deltares
Enabling Delta Life

UNESCO-IHE
Institute for Water Education

Jahangirnagar University
জাহাঙ্গীরনগর বিশ্ববিদ্যালয়

IRC
Supporting water sanitation and hygiene services for life

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জনস্বাস্থ্য প্রকৌশল অধিদপ্তর
Department of Public Health Engineering

WHAT ARE WATER SAFETY PLANS?

- Describe all steps in water supply from catchment to consumer
- Meant to organize and systematise the water management practices applied to drinking-water
- Should be developed for each water and sanitation technology

পানির উৎস
পরিষ্কার ও নিরাপদ রাখুন

সংগ্রহ করুন
পরিষ্কার পাত্রে

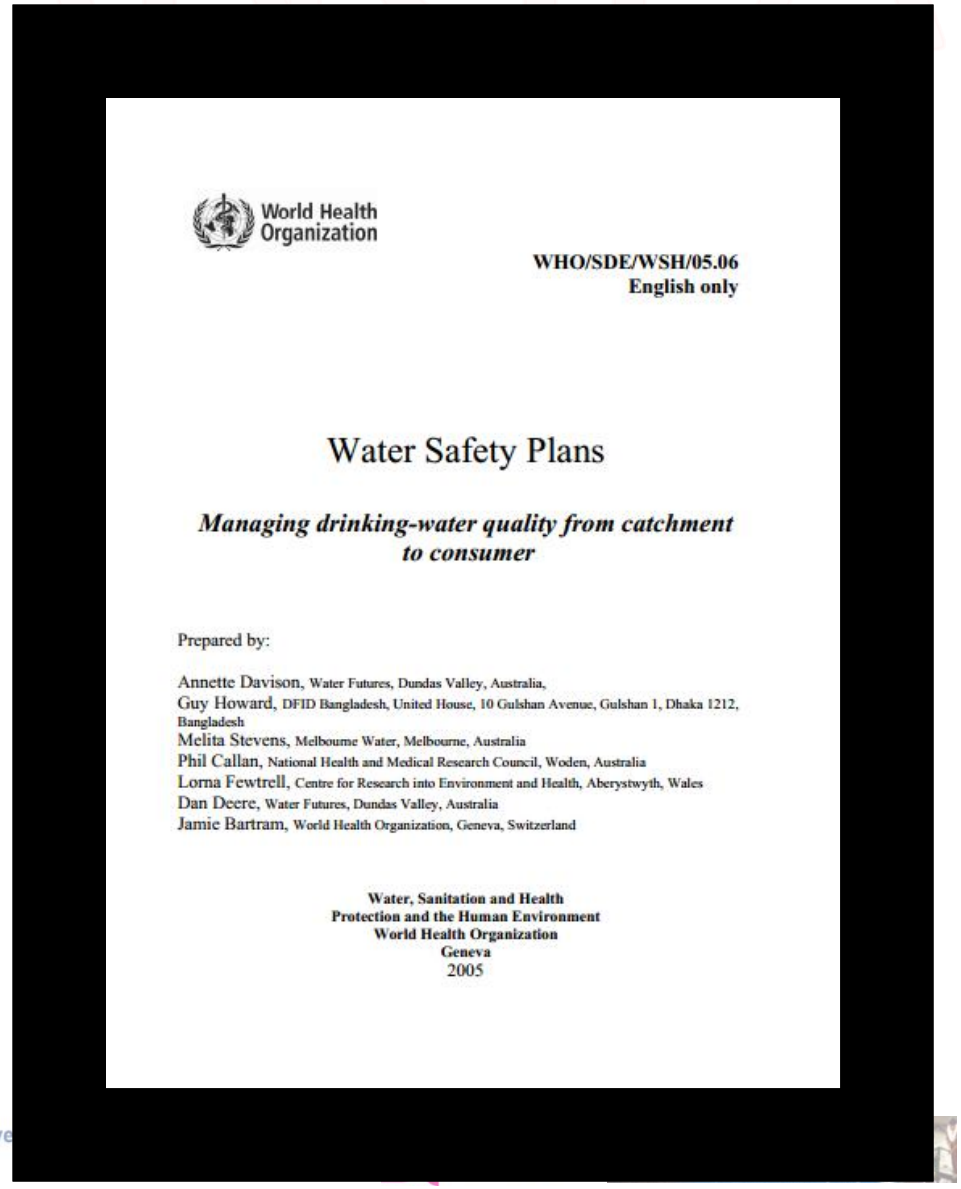
বহন করুন
পাত্রের মুখ ঢেকে

সংরক্ষণ করুন
ঢেকে রেখে

পরিবেশন ও পান করুন
আঙুল না লাগিয়ে

WHAT ARE WATER SAFETY PLANS?

- World Health Organization develops them in general
- DPHE develops them for Bangladesh



World Health Organization

WHO/SDE/WSH/05.06
English only

Water Safety Plans

Managing drinking-water quality from catchment to consumer

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Water, Sanitation and Health
Protection and the Human Environment
World Health Organization
Geneva
2005

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WHAT ARE WATER SAFETY PLANS?

2nd Version

ITN
Bangladesh

Water Safety Plan

For
Dug Well in
Rural Water Supply System

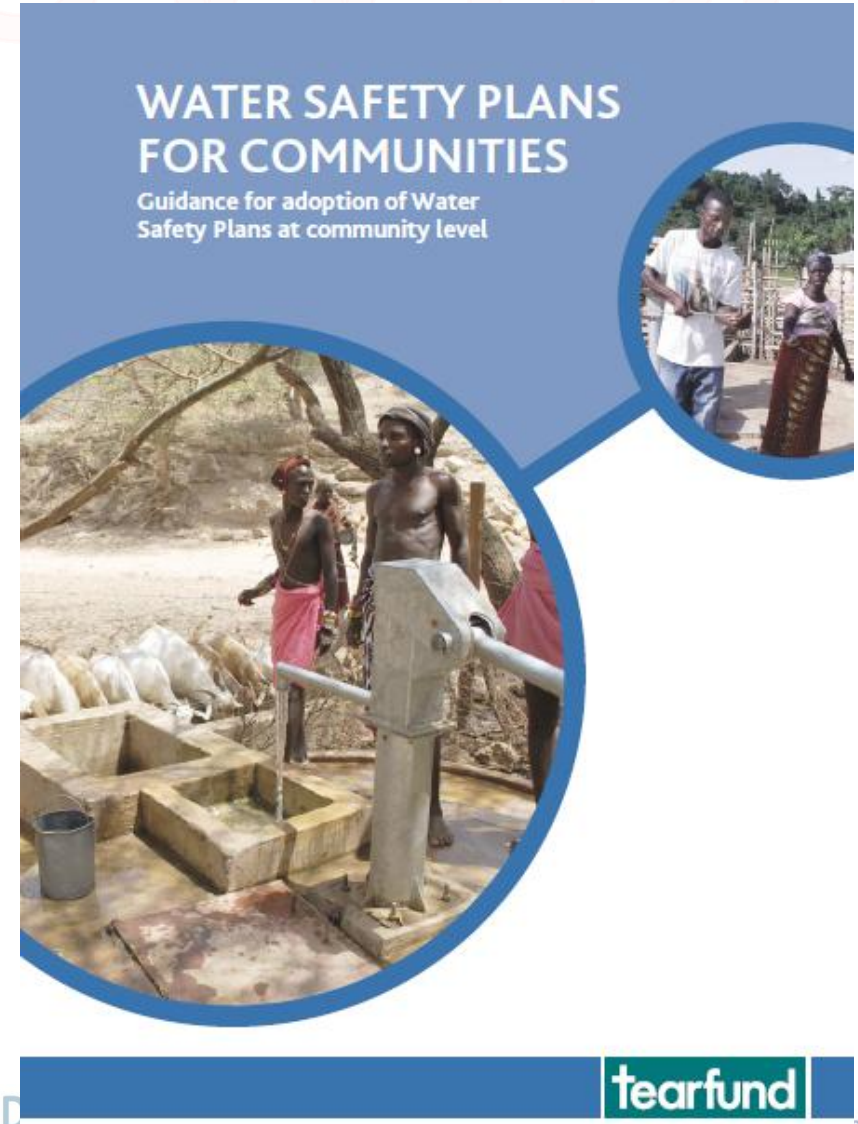
DPHE

April, 2006

DPHE-ITN

April, 2006

WHAT ARE WATER SAFETY PLANS?



- Contribution from other agencies/organizations
  - Water Aid
  - BUET
  - APSU
  - etc

WHAT ARE WATER SAFETY PLANS?

- Open WSP for Hand Tube well

APPROACH SWIBANGLA TO IMPROVE WSPs

1. Group technologies
2. Identify main salinization processes in Bangladesh
3. Divide Bangladesh in characteristic hydrogeological regions regarding salinization processes
4. Identify technologies used per region
5. Identify Hazards per group of technology and region
6. Identify monitoring techniques
7. Identify management processes

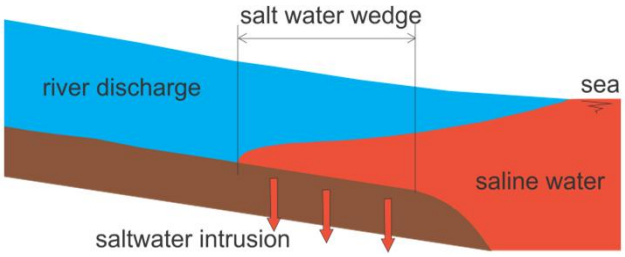
1. GROUPING WATER AND SANITATION TECHNOLOGIES

Shallow wells:
Shallow Tubewells
Tara Tubewells
Ring wells
Dug Well
Hand Pump Tubewells
Shrouded Tubewell (SST)
Very Shallow Schrouded Tubewell (VSST)

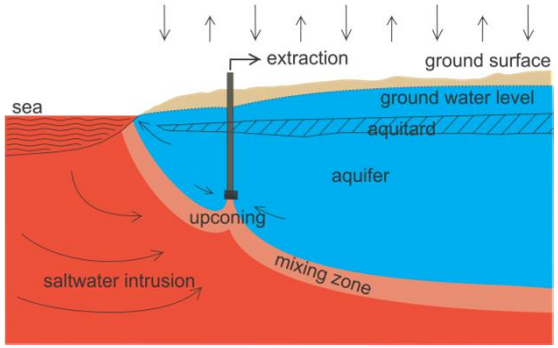
Deep wells (up to 300m):
Deep Tubewells
Tara Tubewells
Hand Pump Tubewells

Rain harvesting and artificial recharge:
Pond Sand Filters
Rainwater Harvesters
Infiltration galleries

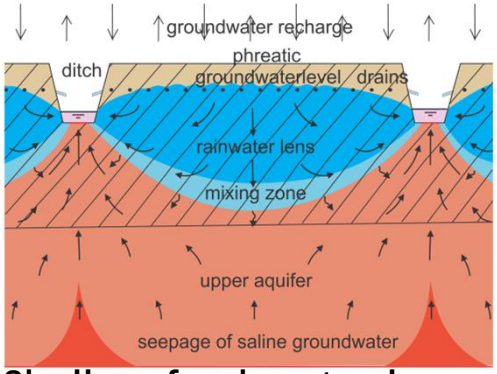
2. IDENTIFY MAIN SALINIZATION PROCESSES IN BANGLADESH



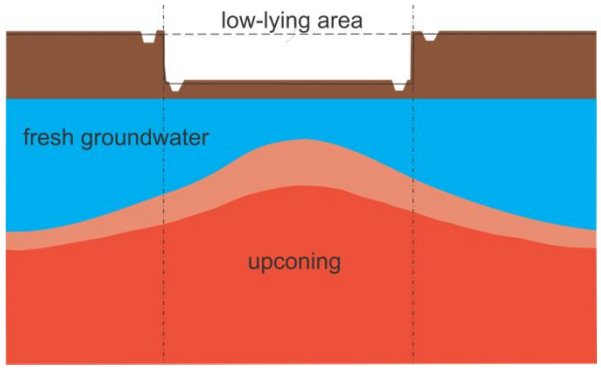
Salt water intrusion surface water (and groundwater)



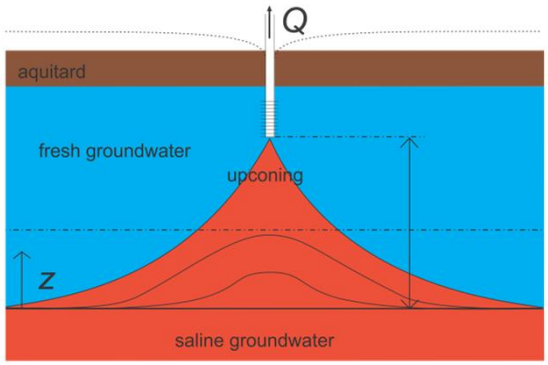
Salt water intrusion groundwater



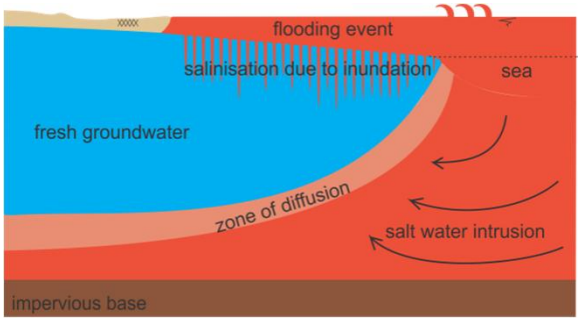
Shallow freshwater lenses and saline seepage



Upconing low-lying area

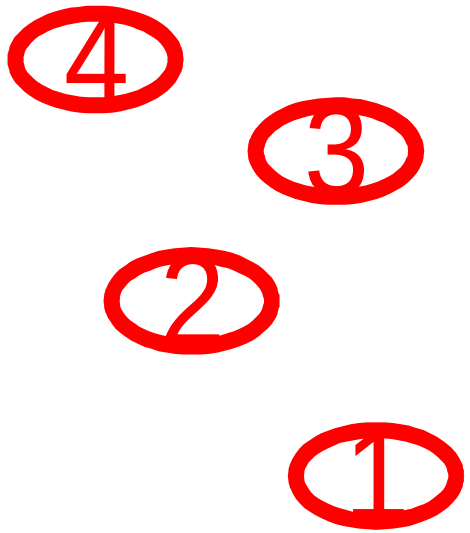


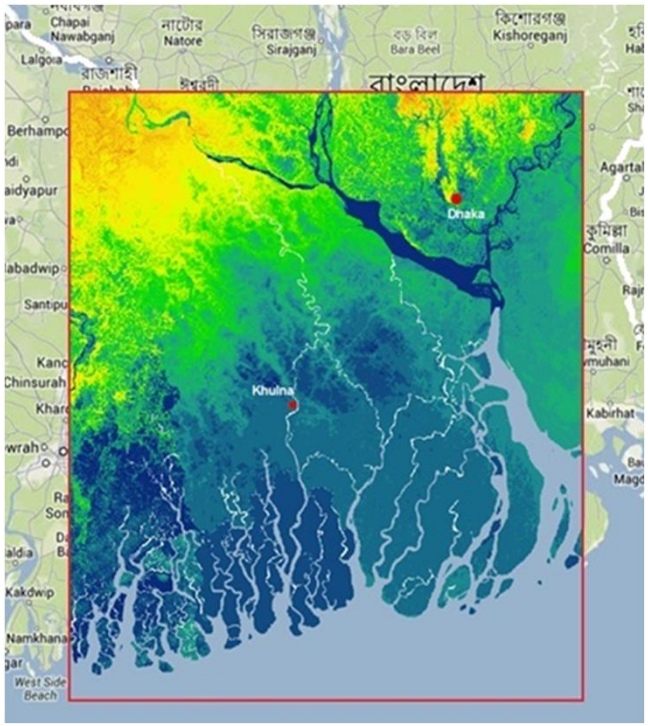
Upconing under groundwater extraction



Shallow vertical salt water intrusion after flooding event (storm surge)

3. DIVIDE BANGLADESH IN CHARACTERISTIC HYDROGEOLOGICAL REGIONS REGARDING SALINIZATION PROCESSES




Chapai Nawabganj
নাটোর
Natore
সিরাজগঞ্জ
Sirajganj
বড় বিল
Bara Beel
কিশোরগঞ্জ
Kishoreganj
Lalgola
রাজশাহী
বাংলাদেশ
Berhampo
Agartal
Dhaka
কুমিল্লা
Comilla
Santipu
Kanc
Chinsurah
Khare
Khulna
Kabirhat
Kakdwip
Namkhana
West Side Beach

Region 1: Eastern coastal Belt

Region 2: Urban and rural areas far from big rivers

Region 3: Urban and rural areas close to big rivers

Region 4: High infiltration areas

4. IDENTIFY TECHNOLOGIES USED PER REGION

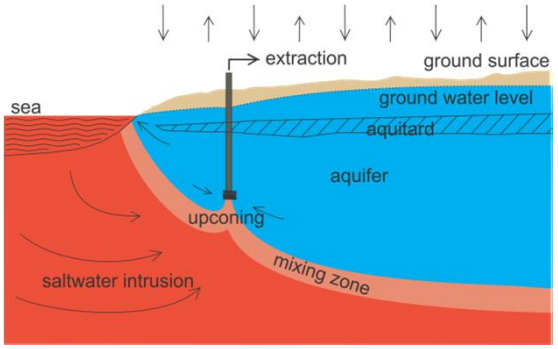
Region	Group of technologies
Region 1: Coastal Belt	Deep wells, rain harvesting and artificial recharge
Region 2: Urban and rural areas far from big rivers	Deep wells (and shallow wells), rain harvesting and artificial recharge
Region 3: Urban and rural areas close to big rivers	Shallow wells (and deep wells), rain harvesting and artificial recharge
Region 4: High infiltration areas	Shallow wells (and deep wells), rain harvesting and artificial recharge

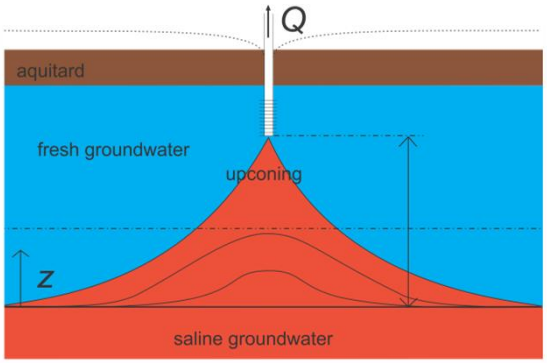
5. IDENTIFY HAZARDS PER GROUP OF TECHNOLOGY AND REGION

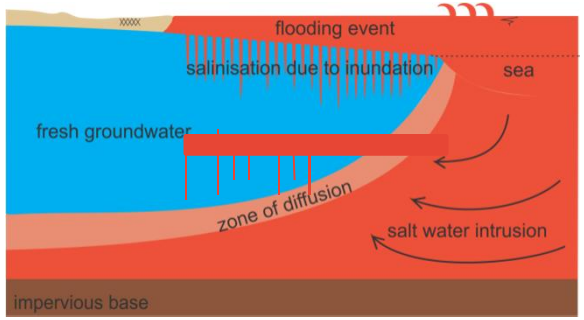
Technology group
Deep wells
Shallow wells
Rain harvesting and artificial recharge

5. IDENTIFY HAZARDS PER GROUP OF TECHNOLOGY AND REGION

Technology group	Hazard
Deep wells	Up-coning Lateral seawater intrusion Vertical percolation at depth

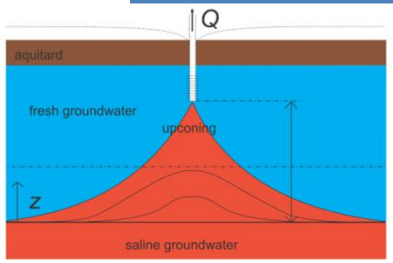


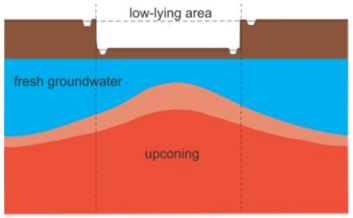


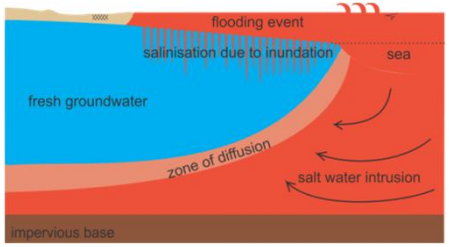


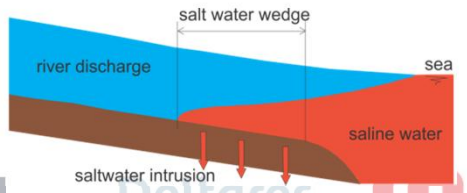
5. IDENTIFY HAZARDS PER GROUP OF TECHNOLOGY AND REGION

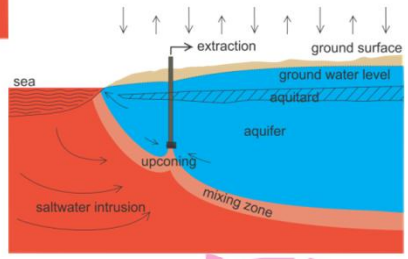
Technology group	Hazard
Shallow wells	Up-coning Lateral seawater intrusion Seepage Lateral salt water intrusion from rivers Salt water intrusion caused by inundation











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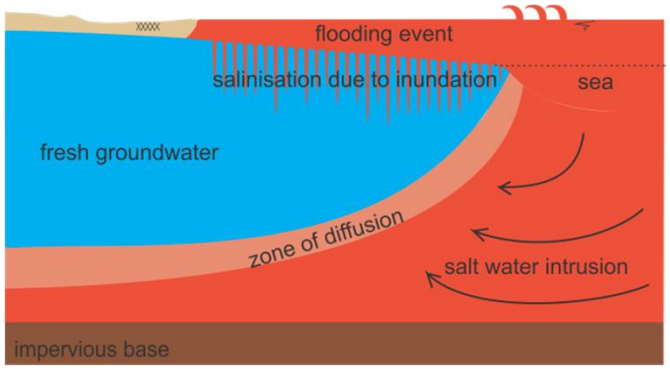
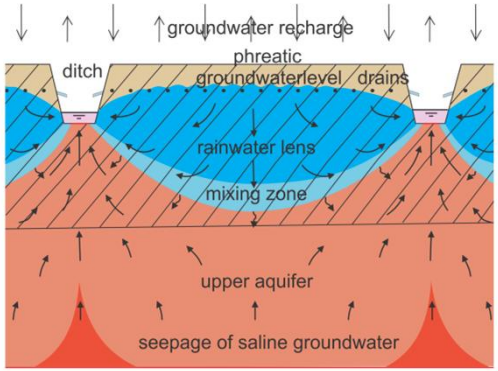
5. IDENTIFY HAZARDS PER GROUP OF TECHNOLOGY AND REGION

Technology group	Hazard
Rain harvesting and artificial recharge	salt water intrusion caused by inundation Seepage under fresh water lenses





6. IDENTIFY MONITORING

Parameters: Chloride and EC

Frequency of monitoring: the monitoring frequency depends on the local conditions around the intake system. Minimum recommended: 1/month

Screen of a monitoring well: For monitoring purposes, wells should not be screened along the entire depth, but at a certain depth → difference between observation wells and abstraction wells

Determine the interaction between surface water and groundwater: for shallow wells located close to rivers

Marking the wells: wells should be marked depending on their chloride concentration

6. IDENTIFY MONITORING

Marking the wells: wells should be marked depending on their chloride concentration

Wells with arsenic in water are painted red. Wells with measured electrical conductivity (EC) should be marked depending on the EC.

Salinity description	mS/cm	mg/l	Type of water	Symbol indication
Non-saline	<0.8*	<600	Drinking and irrigation water	blue filled circle
Slightly brackish	0.7 - 2	500-1500	Irrigation water	Light green filled circle
Moderately brackish	2 – 3	1500-2000	Irrigation water for vegetables	Dark green filled circle
Brackish	3-4	2000-3000	Irrigation water for wheat	Yellow filled circle
Moderately saline	4-10	3000-7000	Primary drainage water and groundwater	black/red cross
Highly saline	10-25	7000-15 000	Secondary drainage water and groundwater	black/red cross
Very highly saline	25 - 45	1 5 000-35 000	Very saline groundwater	black /red cross
Brine	>45	>45 000	(more than) Seawater	black/red cross

7. IDENTIFY MANAGEMENT PRACTICES

- Pumping rate: The water extracted should not over exceed the recharge of the aquifer. Otherwise there is mining of the aquifer.
- The screen should be set as high as possible within the fresh water body, always taking into account the stationary drawdown caused by the extraction.
- If an increase of the chloride concentration above 400mg/l is observed, the pumping rate should be decreased.
- If the salinity continues to increase and it reaches the 600mg/l, the well should not be used for drinking water anymore.

7. IDENTIFY MANAGEMENT PRACTICES

- Regulate the surface water level
- Testing before handing in the wells to the community
- Dilution of the salt concentration
- Cleaning wells after salt water intrusion
- Records
- Responsibility: there should be one responsible for the monitoring and management of the wells

CHALLENGES

- Implement water abstraction control to avoid salinization (and depletion) → groundwater water management is needed
- Simplify contents to reach the communities, also illiterates
- Implement this advice in the Water Safety Plans