Current state of water quality monitoring and lab facilities in Sri Lanka

Expected Needs and Challenges due to Tsunami

AM Mubarak-Director, ITI

Content

- Responsible Institutions for water resources
- Water quality monitoring
  - Surface water bodies
  - Groundwater
- Post tsunami studies
- Status of laboratory facilities
- Future directions

Protection & Management

- **Water Resources Board (WRB)**
  - **Assessment, protection & development of water resources**
- **Water Supply & Drainage Board (WSDB)**
  - **Supply of water for drinking & industrial purposes**
- **Irrigation Department**
  - **Construction, maintenance, operation & maintenance of irrigation tanks, canals & schemes**
- **Mahaweli Authority**
  - **Management of Mahaweli river system/water resources**

Protection & Management

- **MOE/Central Environmental Authority (CEA)**
  - Responsible for water quality; discharge/ambient water quality std
- **Coast Conservation Dept (CCD)**
  - Control/management of the coastal zone; 300 m landwards 2km seawards
- **Marine Pollution Prevention Authority (MPPA)**
  - Control of marine pollution
- **National Aquatic Resources Agency (NARA)**
  - Overall management of aquatic resources- collect, disseminate data, conduct research etc,

Water quality monitoring

- **No comprehensive water quality data**
  - **Diffused management responsibilities**
  - **No systematic monitoring**
- **Many independent studies**
  - **NARA, WRB, NWSDB, NBRO, IFS, ITI, MOE, CEA, Universities**
  - **But analysis difficult as data scattered, unpublished or in unprocessed form**

Surface Water Quality

- Urban Lakes
- Major Rivers
- Estuaries & Lagoons

Water quality-urban lakes

- **Beira Lake Restoration study-UDA 1993**
- **Comparison of Beira, Bolgoda, Kandy, Diyawanna Oya, and Labugama**
  - **Increased degradation with urbanisation**
  - **Proper planning/control necessary to maintain water quality**

Impact of urbanisation

Indicator	Beira	Kandy	Bolgoda	Diyawanna	Labugama
Tot N, mg/l	*13.8*	*3.6*	*5*	*4*	*<1*
Tot P, mg/l	*1.5*	*<0.001*	*<0.001*	*<0.001*	*<0.001*
Chl, mg/l	*0.28*	*0.002*	*<0.001*	*<0.001*	*<0.001*
BOD, mg/l	*46*	*3.3*	*5*	*1*	*<1*

Kelani & Kalu Ganga

- Comprehensive monitoring -NARA 1994
- Catchment waters-good quality
  - Some agrochemical pollution from tea plantations
- Estuaries showed increased pollution with high BOD, TDS and salinity intrusion
- Presence of coliform throughout the river systems- improper disposal of sewage
- Levels within freshwater norms for bathing and recreational use but not for drinking

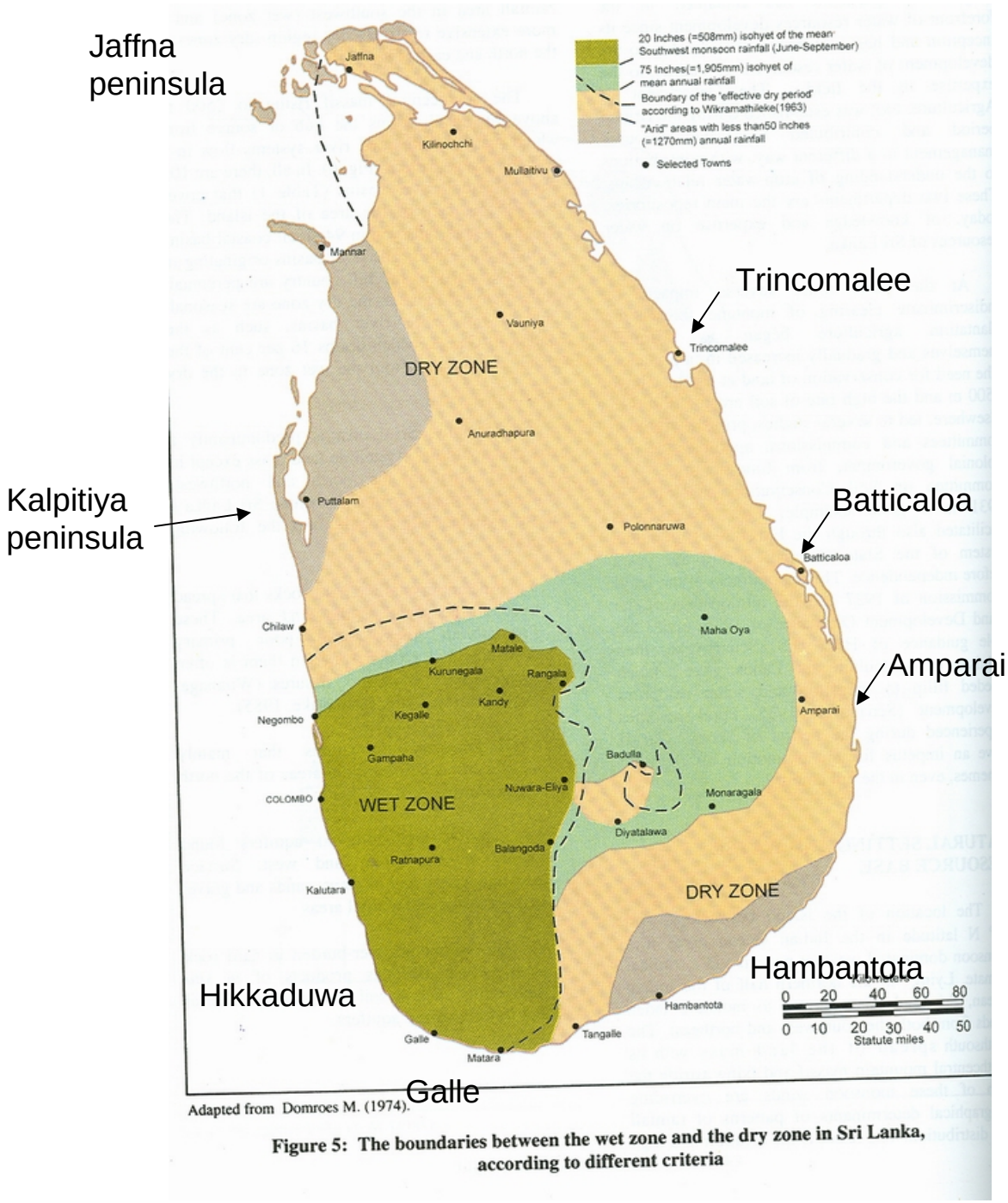
Mahaweli river

- Mahaweli ‘H’ reservoirs (NARA 1992/93)
  - Mostly located in the Anuradhapura
  - Kandalama, Kalwewa, Rajanganya, Nuwaraweva, etc.,
  - Pollution from agrochemicals, urban centres and hotels
- No pesticides detected in the Kandy District (ITI-1994)
- Presence of Cyanobacteria in the Mahaweli River Basin (NWSDB-1994)

Estuaries and Lagoons

- 80,000 ha of estuaries and large deep lagoons
- 40,000 ha of shallow lagoons, tidal flats, mangroves & swamps
- No major lagoons except Jaffna, Batticaloa and Negombo are associated with urban centres
- No coastal towns are heavily industrialised
- Water quality in Kalametiya, Koggala satisfactory (NARA, 1993)
- Significant pollution in small lagoons and bay estuaries
  - Lunawa heavily polluted; Bolgoda gradually deteriorating
  - Valichchenai lagoon heavily polluted (NSF-1991)

Groundwater Monitoring



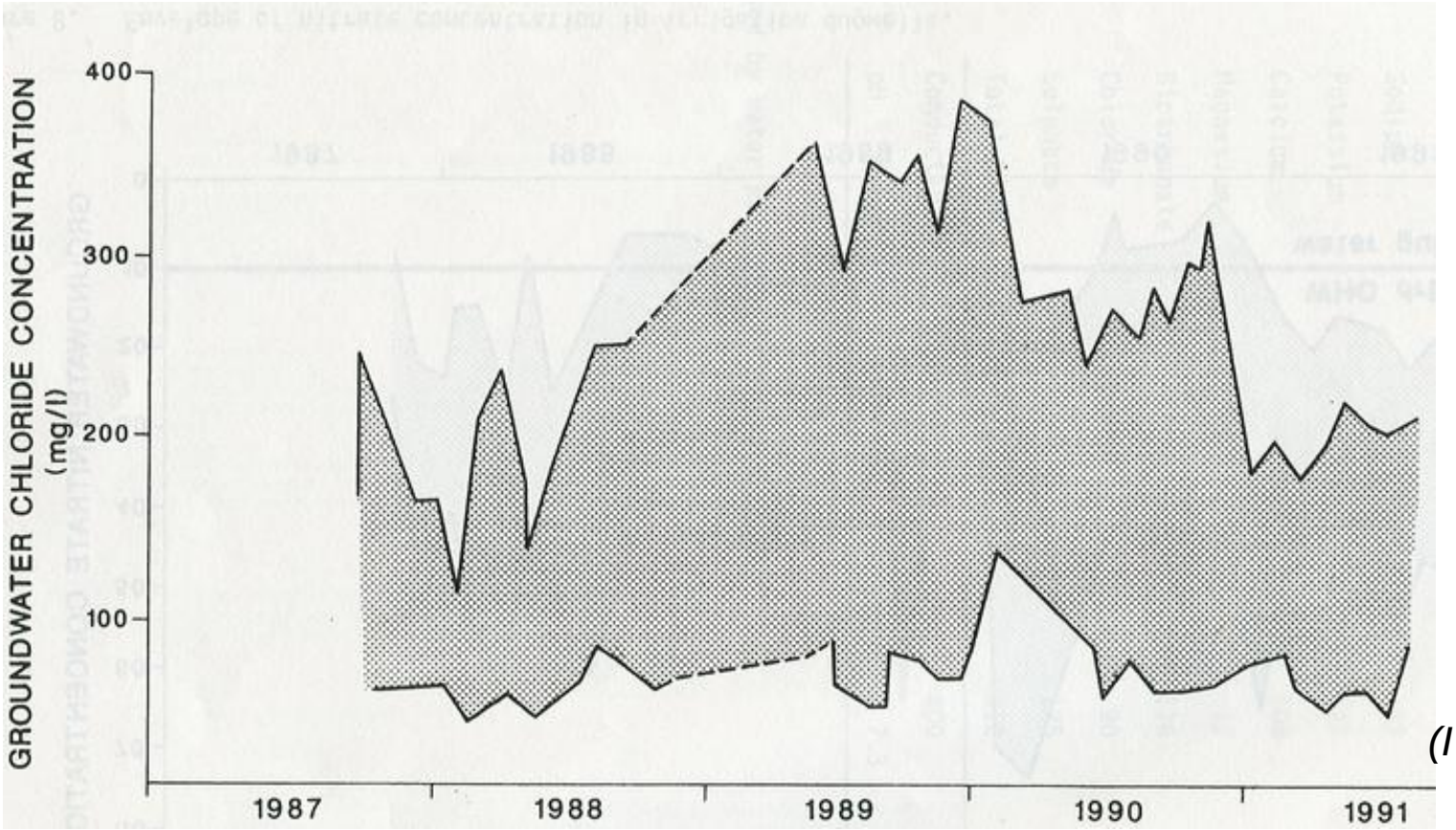
Adapted from Domroes M. (1974).

Figure 5: The boundaries between the wet zone and the dry zone in Sri Lanka, according to different criteria

Groundwater monitoring

- **Jaffna (DOA 1988) & Kalpitiya (ITI 1994)**
  - high nitrate/chloride levels and salinity intrusion
- **Anuradhapura District (WRB-2000/'01)**
  - 94 agro-wells in 34 cascades monitored for 1 year
  - 30% had EC values 1000-2000 μs/cm; 10% >2000
  - High EC may affect yields of sensitive crops
- **Trincomalee District (WRB 2000)**
  - 25 wells monitored for 1 year
  - 50% had EC <1000 μs/cm; 25%- 1000-1500; 25%- 1500-2500
  - No build up of salinity is anticipated as Maha rain is sufficient to flush out salt built up during dry season

Kalpitiya -Chlorides in irrigated wells



(ITI/DOA/BGS)

Kalpitiya sandy aquifer

(ITI/DOA/BGS)

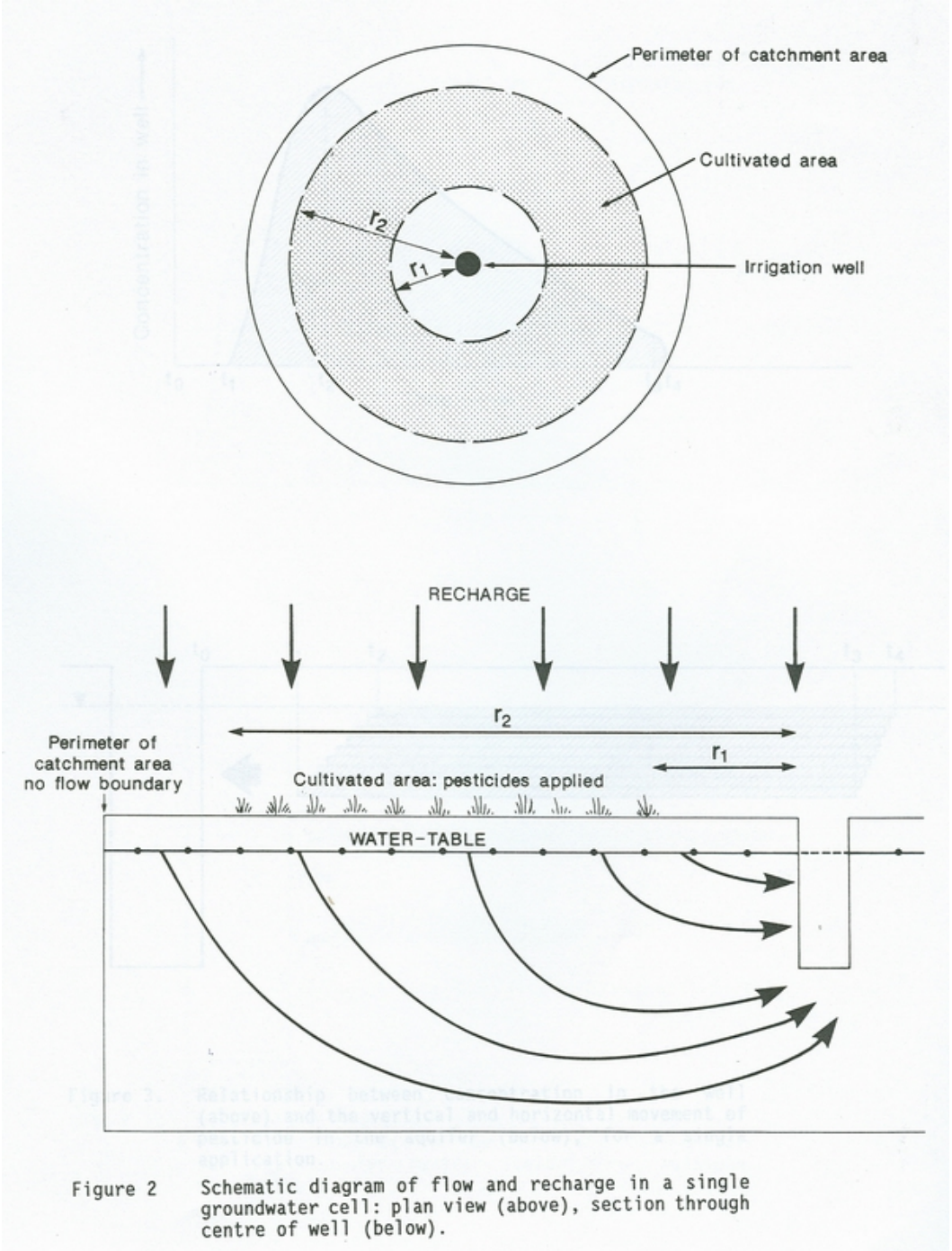
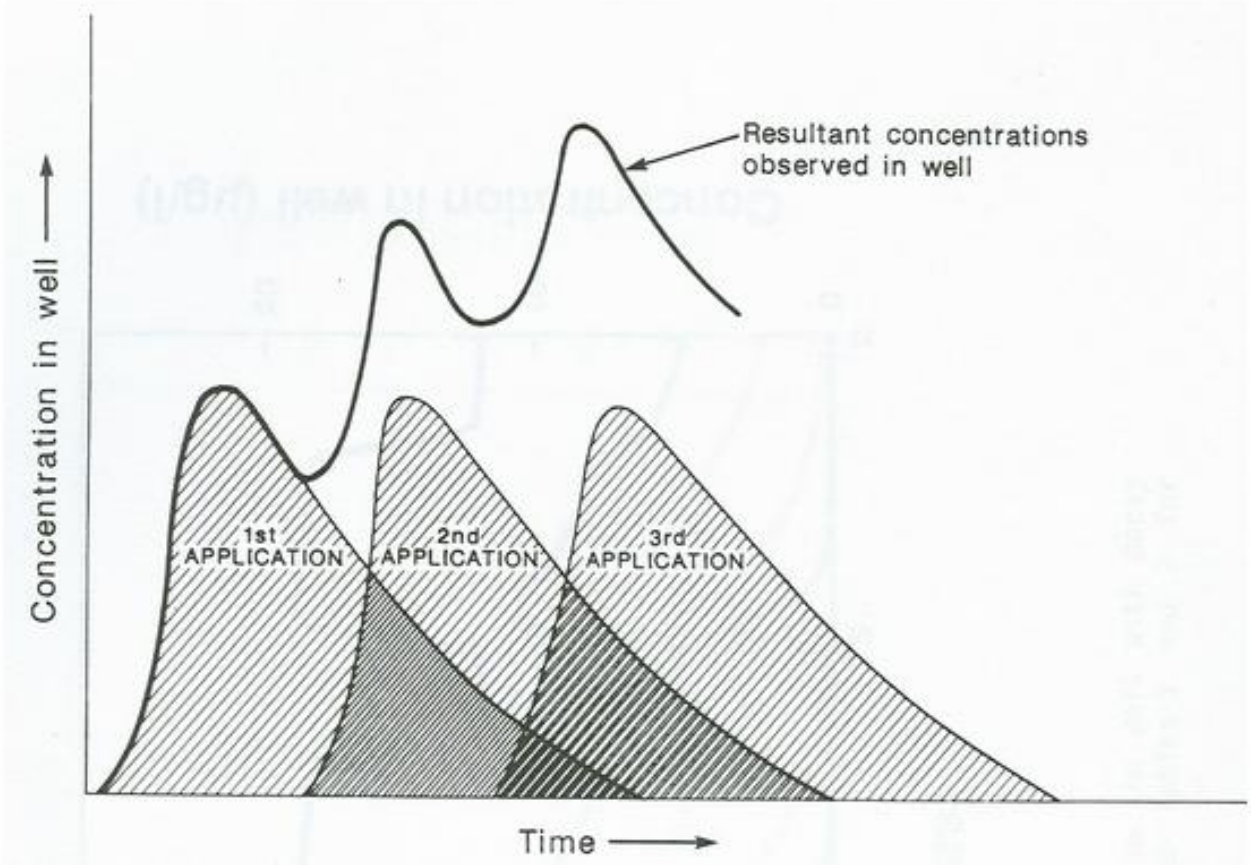


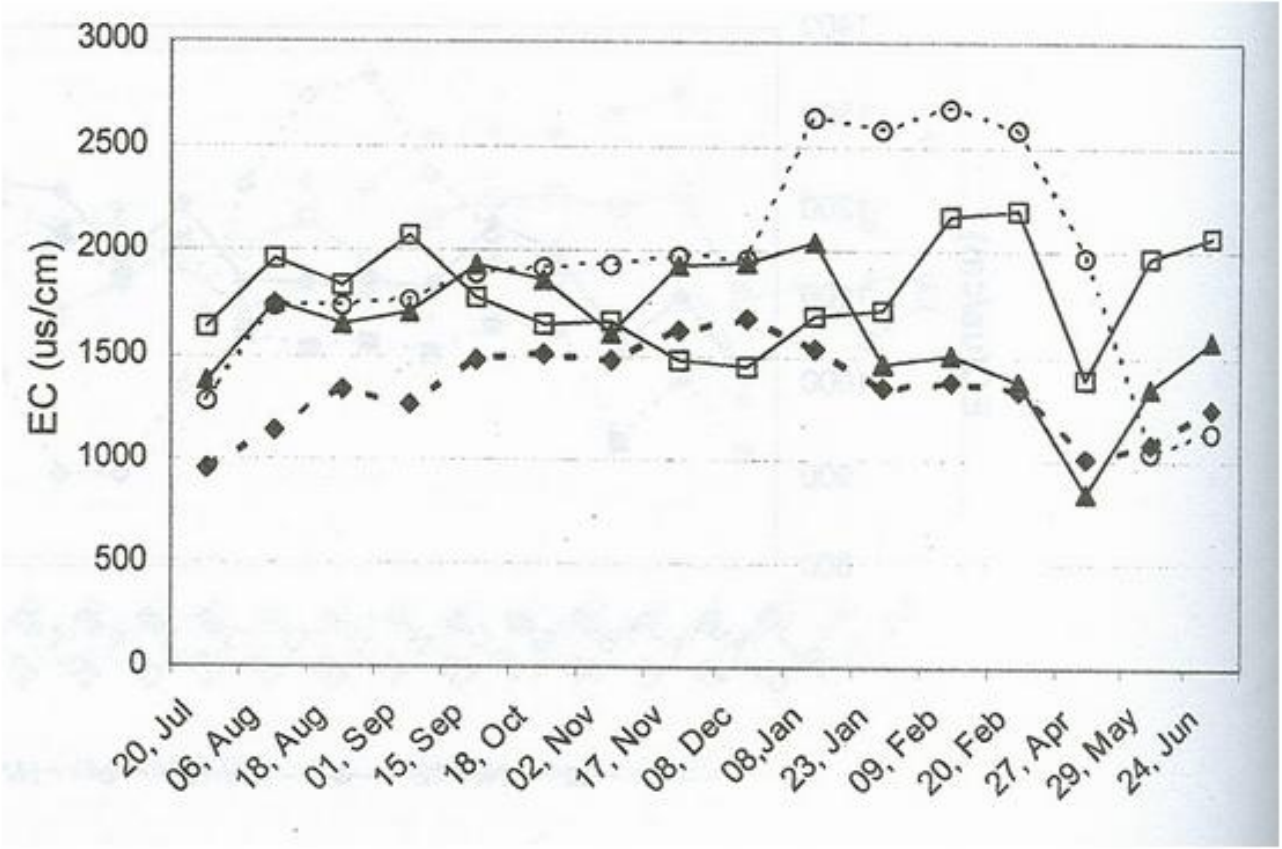
Figure 2 Schematic diagram of flow and recharge in a single groundwater cell: plan view (above), section through centre of well (below).

Kalpitiya – accumulation of Cl



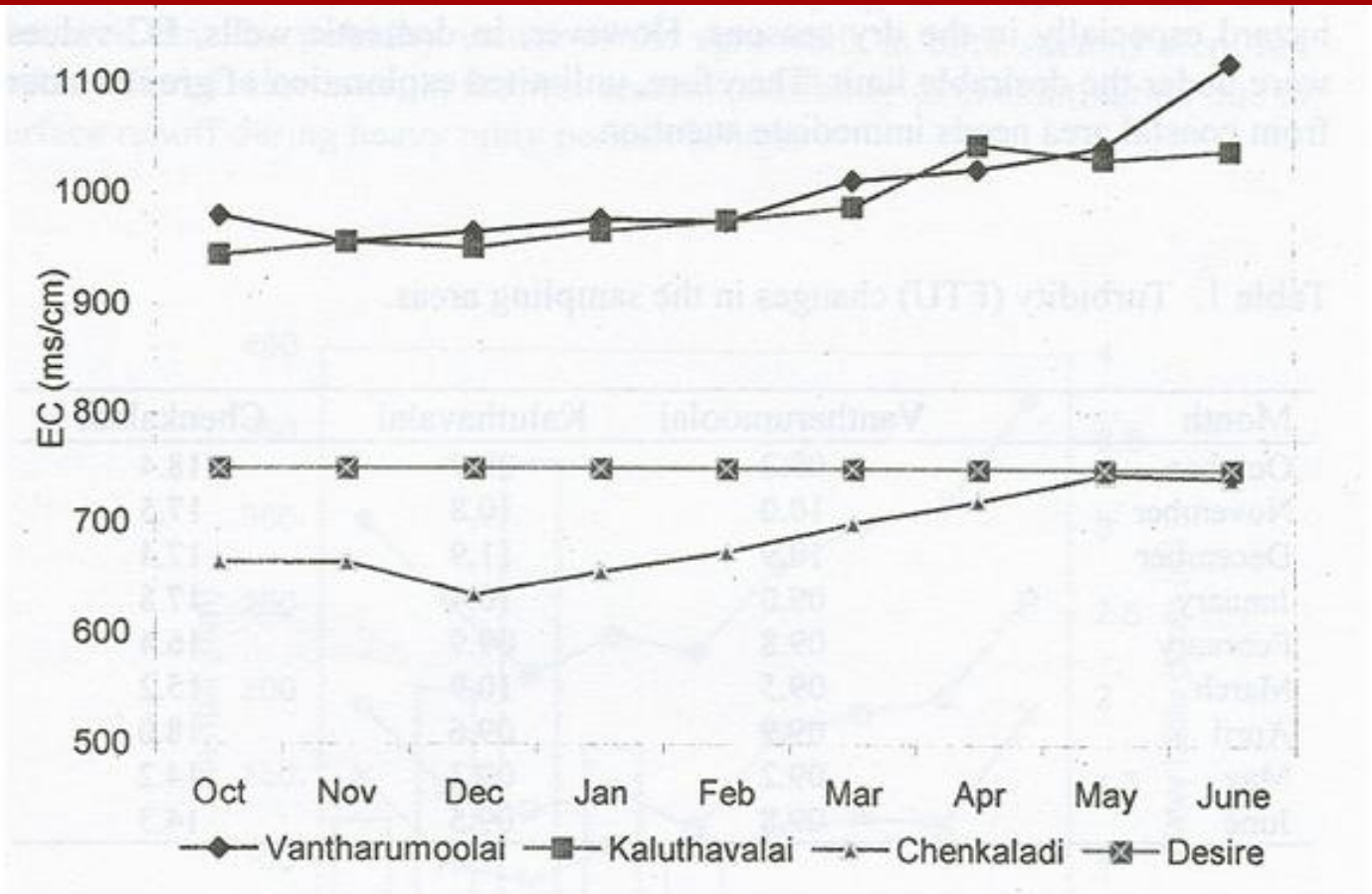
ITI/DOA/BGS

Dug wells - Trincomalee



(WRB)

Dug wells - Batticaloa



(WRB)

Post tsunami studies

- Many domestic wells analysed after tsunami
  - Jaffna, Amparai, Batticaloa, Hambantota
- NWSDB, WRB, ITI, MOE/CEA/Morotuwa, Universities, NGOs
- Basic parameters -pH, EC, salinity, microbiological
- Some studies of sediment for toxic contaminants
- High salinity and coliform
- Little or no PCBs, heavy metals
- But no trend analysis

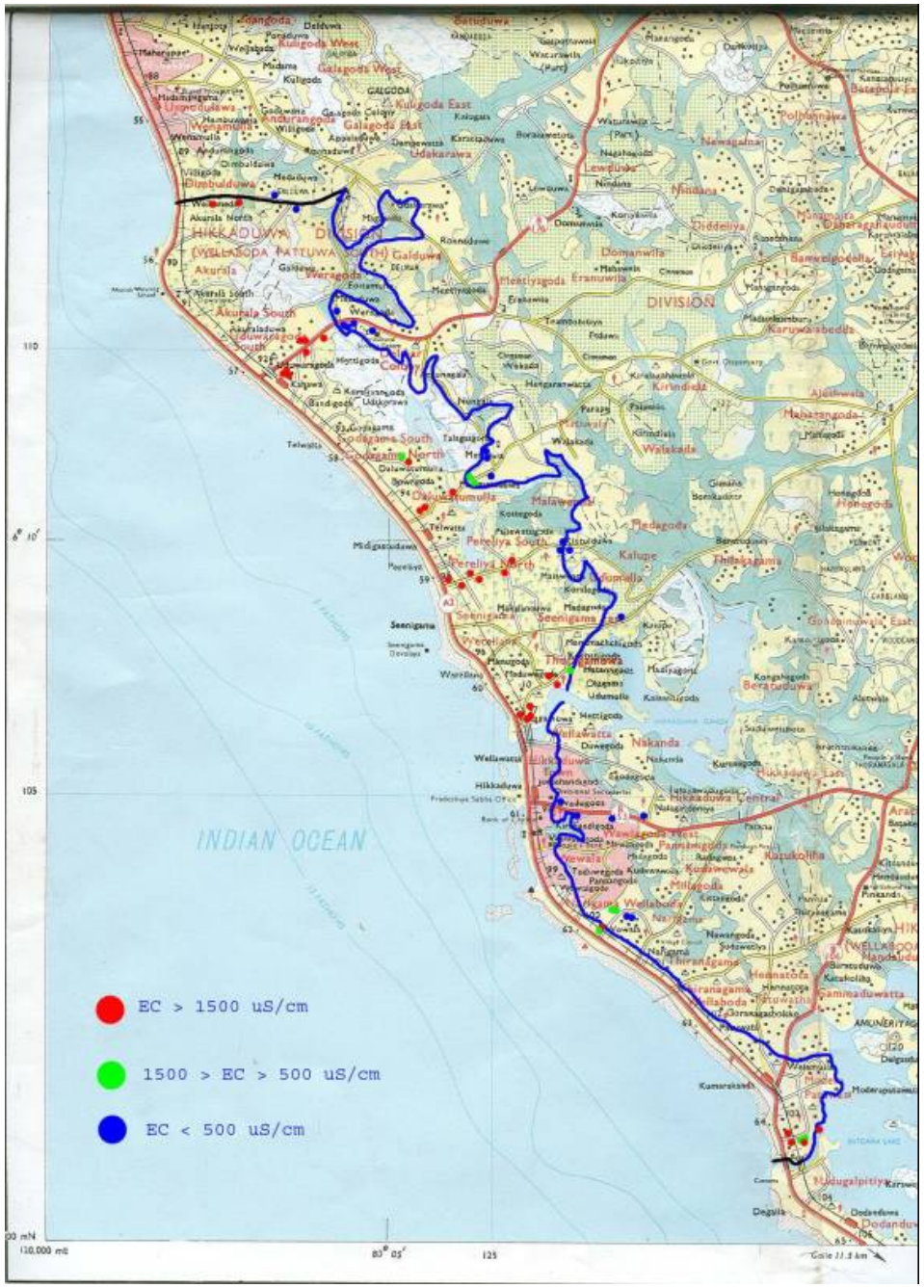
RAE -Brown environment

- UOM/CEA/MOE; 750 sites were studied
- 26 sites studied for water sector
  - Galle, Matara, Hambantota, Ampara, Batticaloa, Trincomalee
  - Number of hot spots; High-16; Moderate-6; Low-2; Very low-2
- Short-term
  - Provision of safe potable water supply from existing mobile unit
- Medium-term:
  - Rehabilitation of water supply & sanitation in tourism sector
- Long-term:
  - Provision of water supply through decentralised plants
  - Establishment of EMP/Regional data collection centres

Impact of tsunami on water quality

- **Jointly undertaken by ITI & UOP**
- **Funded by NSF; 1 year duration; July 2005**
- **Combined hydro geological, geophysical, hydro chemical surveys to**
  - **Estimate the extent of groundwater contamination**
  - **Map saline water plumes & their movements**
  - **Demarcate safe aquifer zones within the affected areas**
  - **Estimate the rate of natural retrieval of the saline water front**
  - **Thematic maps for each chemical parameter depicting safe/unsafe areas**
  - **Develop appropriate method to treat water for domestic use**

Hikkaduwa Division



Tsunami_boundary_wells03 copy.JPG

Lab Facilities -Status

- **Many labs have basic facilities**
  - **ITI, WRB, NWSDB, CEA, NARA, Universities**
  - **pH, EC, TDS, microbiological etc.,**
- **Some labs have facilities to test toxic contaminants**
  - **GC, HPLC, GC-MS for Pesticides, PCBs**
  - **Flame & GF AAS for toxic metals**
- **Only ITI is accredited for water testing for chemical (including pesticides & toxic metals) and microbiological parameters**

ITI Laboratory

- **ISO 17025 Accreditation**
  - **ASTEL (SLSI), SWEDAC (Sweden)**
- **State of the Art Facilities**
  - **Capillary GC/FID, ECD, NPD**
  - **GC-MS with EI, NCI & PCI**
  - **Purge & Trap and Thermal Desorber**
  - **HPLC/DAD & FD**
  - **TOC**
  - **AAS with Flame and Graphite furnace**
  - **Mobile laboratory**

Future directions

- Policies to control groundwater use
- Deep groundwater explorations
- Rainwater harvesting
- Control of agro-wells in low rainfall areas
- Systematic groundwater monitoring in the coastal areas in the dry zones
- Establish systems to capture & generate data on quality and quantity of groundwater for planning, management and modeling etc.,
- Establish Database on groundwater for Public access

Thank you