

# EMERGING WATER ENVIRONMENT ISSUES IN ASIA

by

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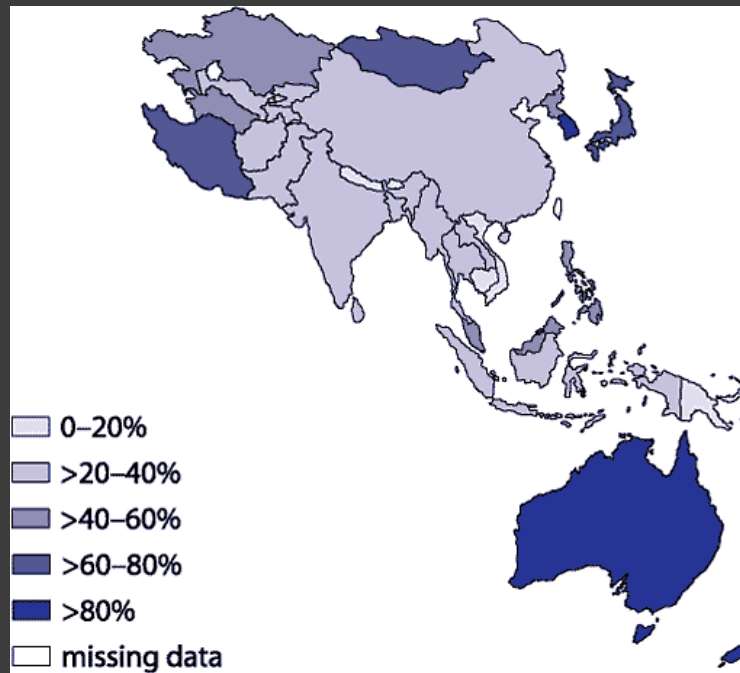
# Asia and the Pacific at a Glance

- Total land area- 23 % of the world's total land area
- Great variation in geography, topography and climate
- Diverse environmental conditions
- Increase in environmental degradation with the increase of population, industrialization and development activities
- Most populous region of the world - 58% of the world's population reside in the region

# Urbanization and Industrialization

## Urbanization level (%)

### Asia and the Pacific



**White light attraction**  
Singapore



**Slum: human tragedy,**  
Mumbai, India



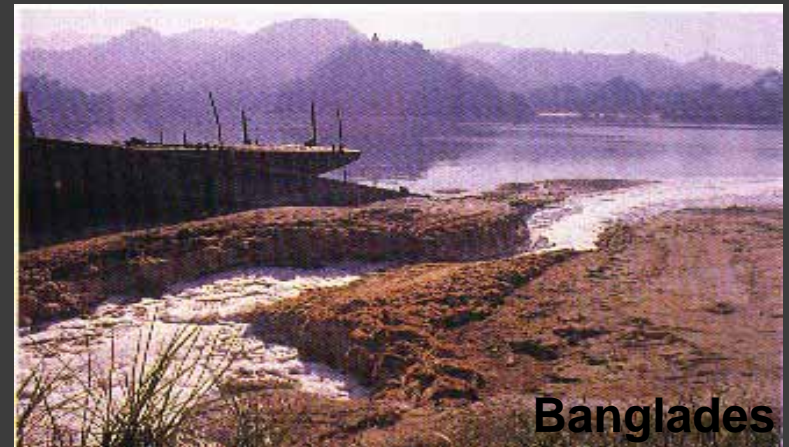
**Industrialization**  
Petroleum Industry



**Industrialization & shadowed environment**  
Steel Industry



# Water Pollution



Discharge of untreated or partially treated wastewaters pollute nearby water bodies, eliminating downstream use

# Water pollution problems



Anaerobic condition



Polluted canals

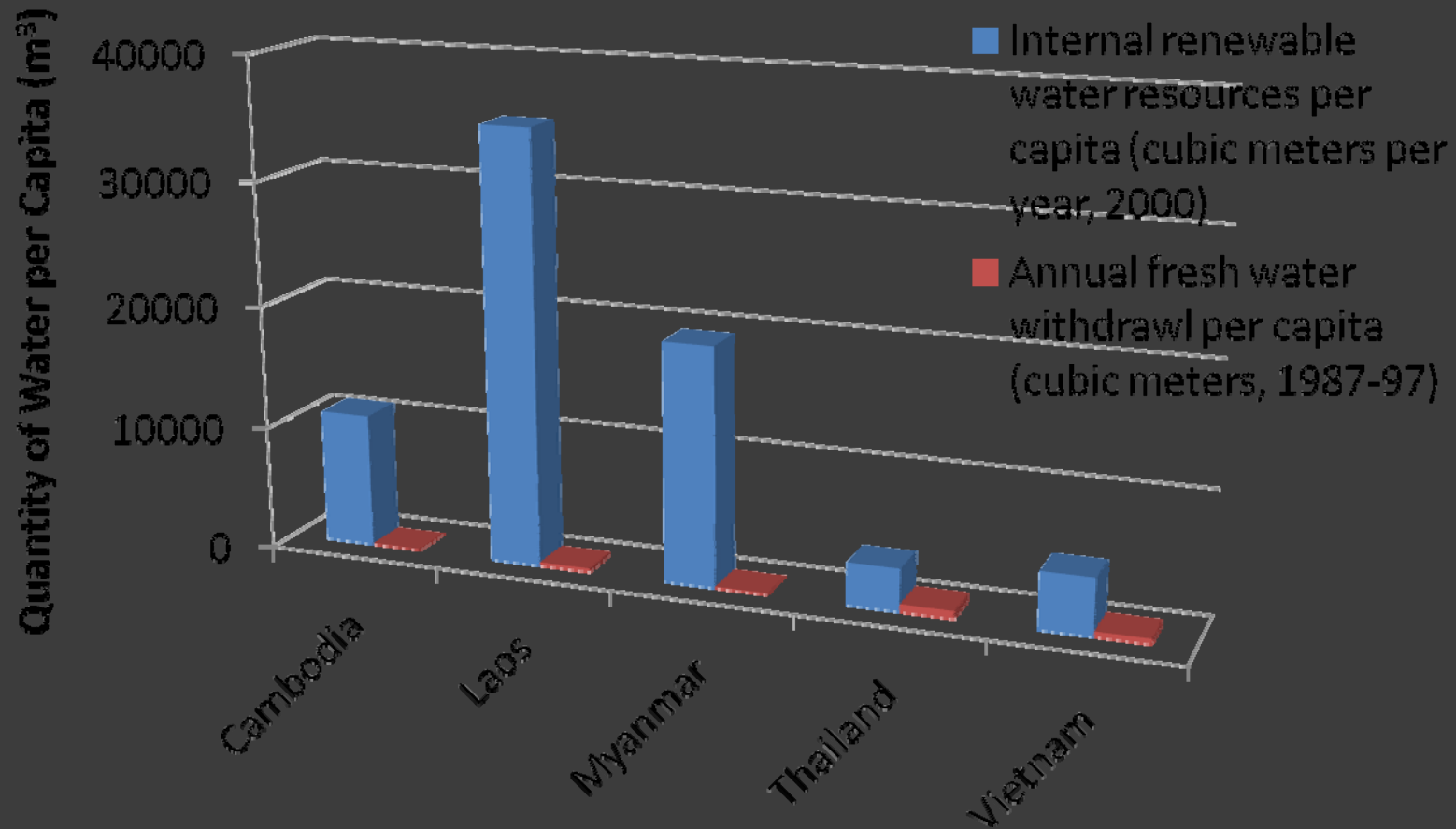


Health impact of arsenic



Fish death

# Fresh Water Withdrawals in the GMS





# Existing Environmental Conditions



The water level in Kulekhani reservoir sharply declined in dry season. The water level in the reservoir is decreasing by as much as 30 centimeters a day. An NEA official warned that the reservoir will run dry in three weeks.

Reservoir in Nepal

Source: *The Kathmandu Post* , March 04, 2006

# Emerging Environmental Issues

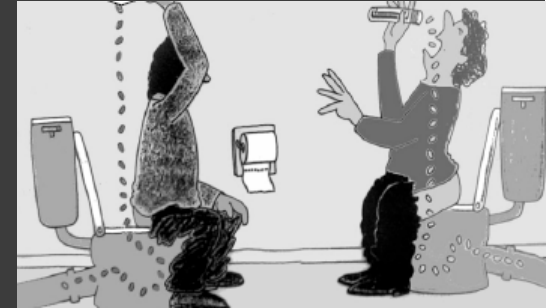
## ⦿ Micro-pollutants

- Pharmaceuticals and Personal Care Products (PPCPs)
- PFOS/PFOA



# Distribution of PPCP in Aquatic environment

**Large quantities** of PPCP can enter water bodies  
E.g. *Flushing* unused medications down the toilet,  
*Rinsing* soap, shampoo and cosmetic down the drain



Drug residues discharged into SW → **Antibiotics and Hormone** steroids  
have been identified in water sample



**Human health effect** and aquatic organism

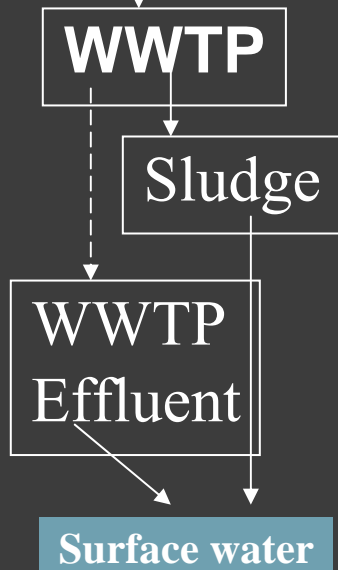
(Higher risk at low dosage)

- Resistance to antibiotic
- Disruption of endocrine system
- Carcinogen



## PPCPs compound

# Occurrence of PPCP in water aquatic



- ▶ **In Italy**, amount of PPCPs (antibiotic, anti-inflammatory, cardiovascular etc.) discharged to SF water in amount ranging between **60-180 Kg/d**
- ▶ **In USA**, Naproxen was detected in *Louisiana and Ontario surface water* at **22-107 ng/l** and Tricosan detected at 10-21 Ng/l of sewage treatment plant effluent.
- ▶ **In China**, the distribution of clobric acid (lipid regulation drug), caffeine, and DDET (*N,N*-diethyl-3-toluamide or insect repellent) at 19, 16 and 1.1 ng/l

**Conventional treatment** system can not take out PPCP completely

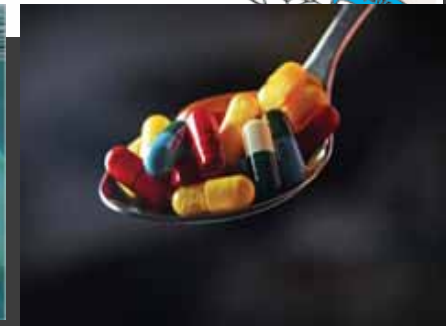
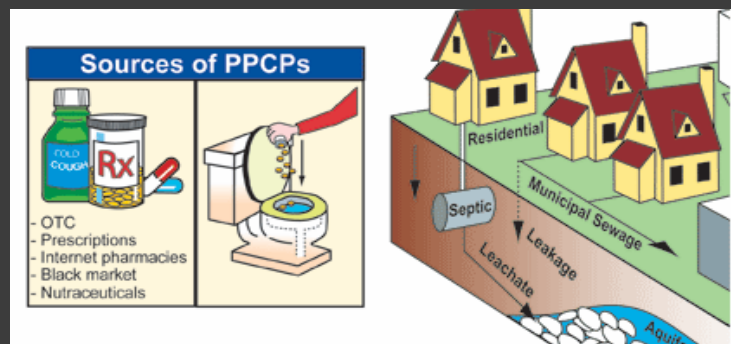
Promising technology include.....

*Oxidation*

*Ozonation*

*Activated Carbon*

*Reverse Osmosis*



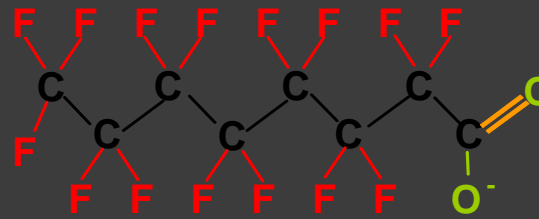
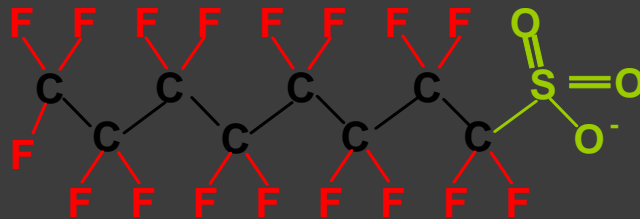
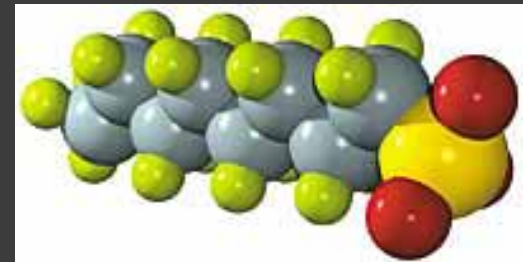
# PFOS / PFOA: New POPs of Concerns

*What are PFOS and PFOA?*

**Fully Fluorinated Organic Compounds (FOCs)**

PFOS: *Perfluoro-octane Sulfonate*  $C_8F_{17}SO_3^-$

PFOA: *Perfluoro-octane Acid*  $C_8F_{15}OO^-$



*Where are they from?*

**PFOS:** *surface treatment, paper protection, performance chemical*

**e.g. Carpet; Cup & plate; Fire fighting foam; Semi-conductor;  
Scotchgard**

**PFOA:** *Emulsifier and surfactant*

**e.g.; Soap; Shampoo; Teflon; Gore-tex**



# Data from U.S.A. – Surface Water and Industrial Wastewater

## New York State

- PFOA - 10-173 ng/L
- PFOS – 0.8- 30 ng/L
- Lake Onondaga has PFOS 198-1,090 ng/L

## California State

- Wastewater from semi-conductor industry,  
PFOS – 1,650 mg/L

Bioconcentration Factor (BCF) =  
concentration in fish/concentration in water

◎ **PFOS**

◎ Japan, Lake Biwa –  
46,000

◎ Japan, Tokyo Bay –  
6,600

◎ U.S.A , New York –  
8,850

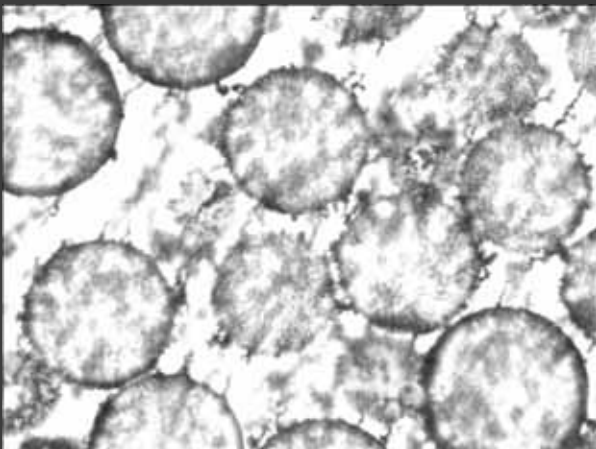
◎ **PFOA**

◎ U.S.A., New York -  
184



# Potential Technology

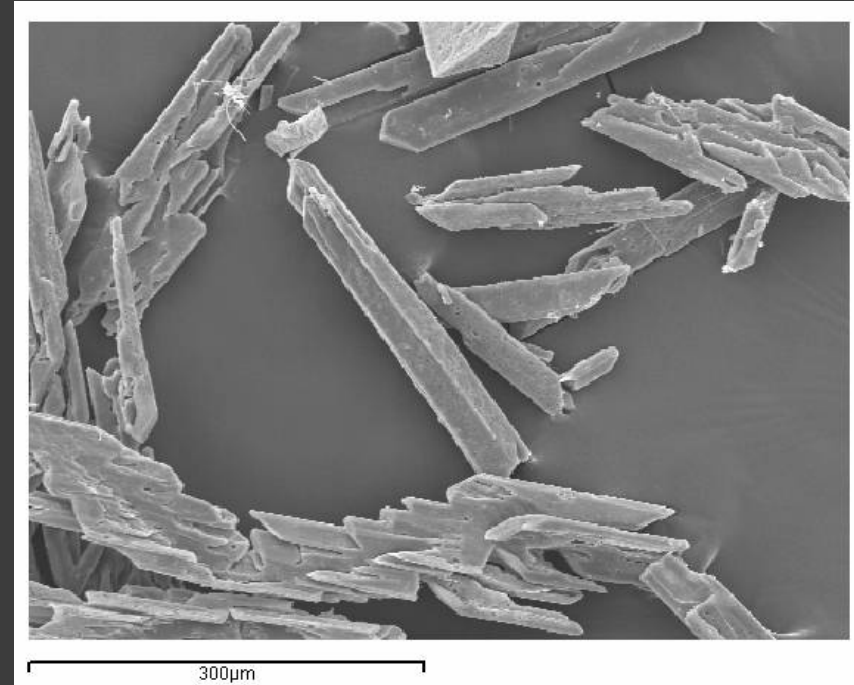
- Nanotechnology: application to degrade/monitor environmental pollutants and etc.
  - ZnO nanoparticles for degradation of pesticides and POPs
  - Onsite application of gas monitoring system using nanoparticles/nanosensors



# P Recovery Through Struvite Crystals



Synthetic  
wastewater



Struvite by SEM



Urine



Piggery  
wastewater



Struvite

# Role of Higher Education Institute

# The Mission of AIT

## In the Context of the Emerging Environment is

“To develop highly qualified and committed professionals who will play a leading role in the sustainable development of the region and its integration into the global economy”

