11.479J / 1.851J Water and Sanitation Infrastructure in Developing Countries
Spring 2007

Introduction to Water and Sanitation Infrastructure in the Developing World

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Water and Sanitation Infrastructure in Developing Countries
Week 2 – February 13, 2007




To begin, I want to share with you some images that visually show the scope and gravity of the crisis of water and sanitation in developing countries, based on photos taken by my students and I, or photos taken by others which I have collected.


Photo: Melinda Foran

(Credit: Genevieve Connors)

Drinking Arsenic Contaminated Water Causes Melanosis (left) and Keratosis (right)

Tugu, Ghana, highest guinea worm endemic village in Ghana (60 recent cases – Jan, 2007)

Kibera, Nairobi, Kenya

Kibera, Kenya


Haiti

Recently Demolished Slum in Mumbai, India – Summer 2006 (Photo: Neil Tangri)

Heavily eutrified Nitra River in Slovakia

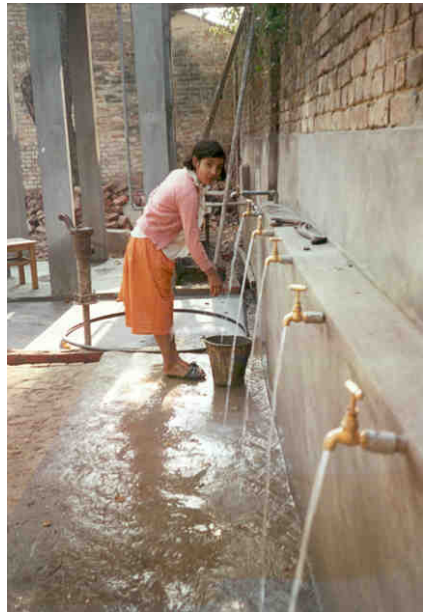
Water Rich - Safe Water

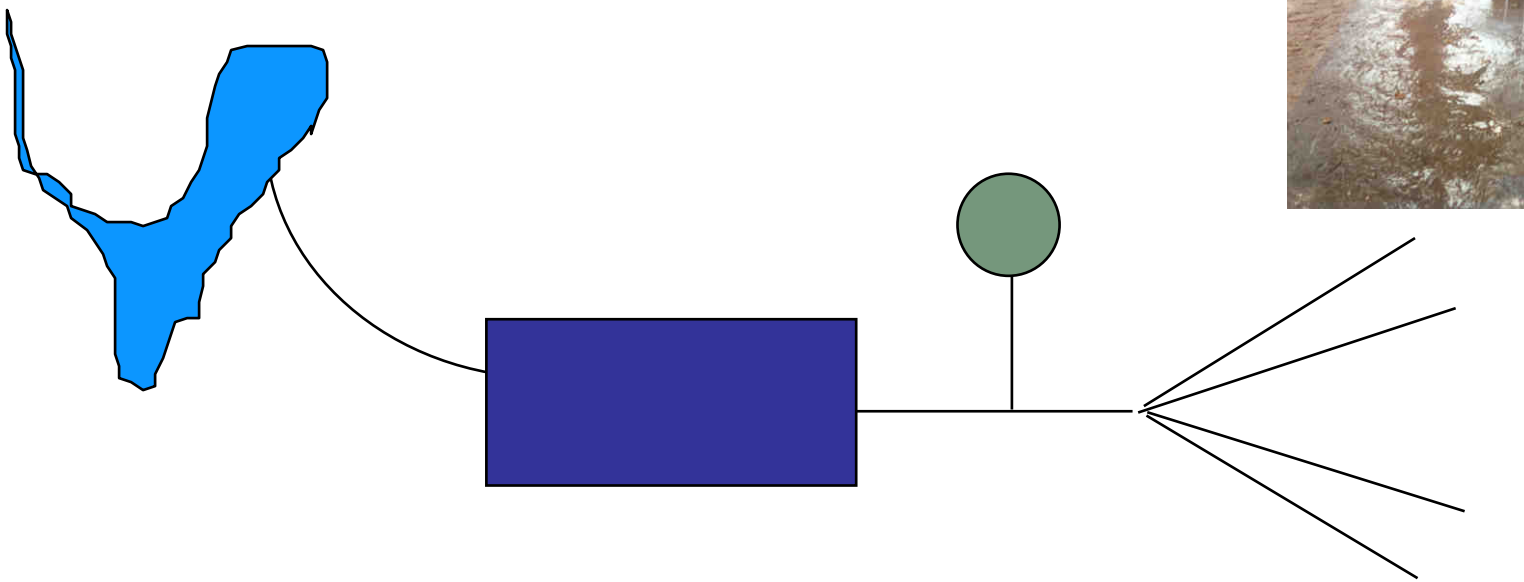
Water Poor - Unsafe Water

Global Economic Classes

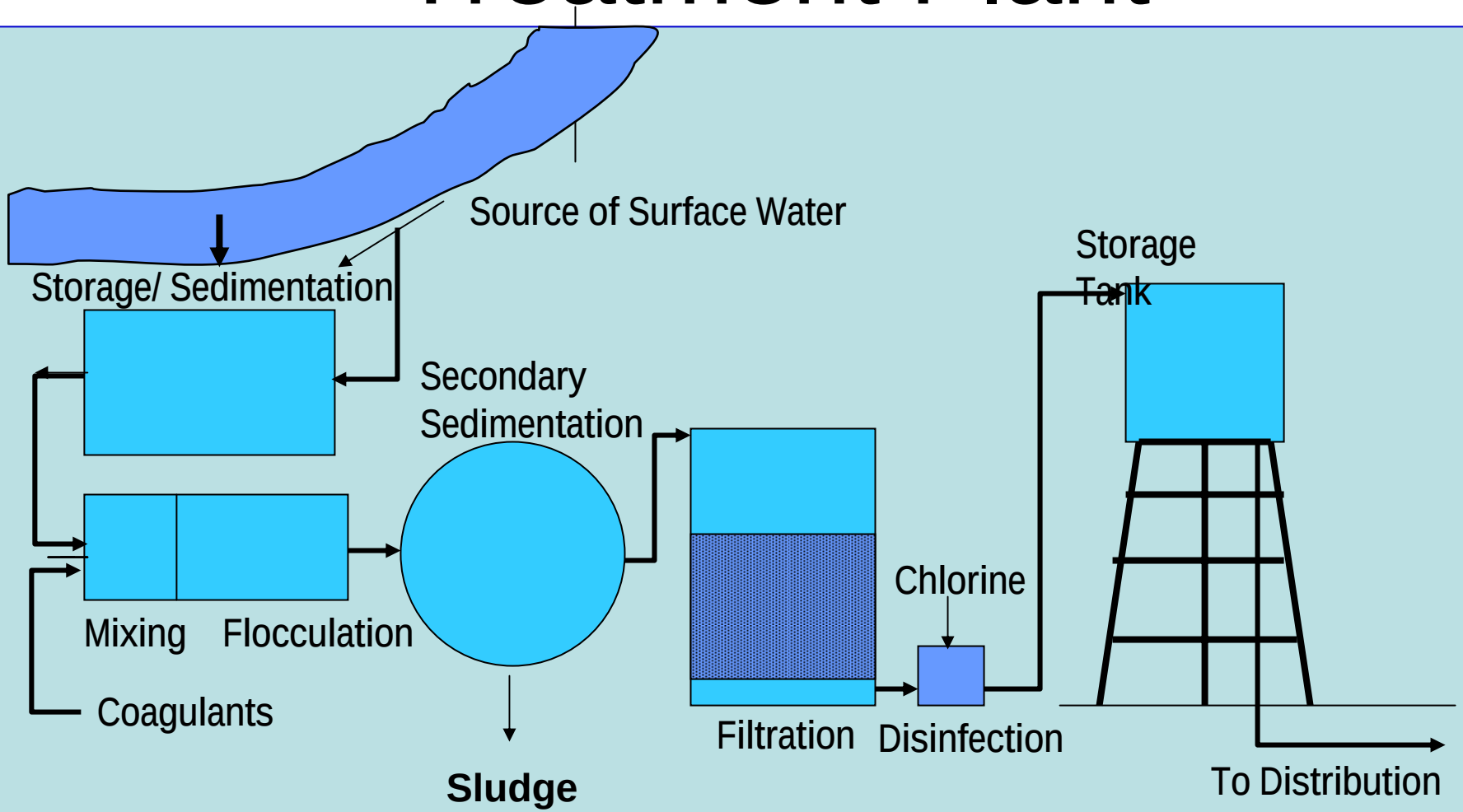
Income	High > $20/day (20%)	Middle $2/day (60%)	Poor $1/day (20%)
Food and Water	Meat, canned and packaged food, soft drinks, bottled and tap water	Grain, clean water (maybe?)	Insufficient grain, unsafe water
Transportation	Private cars	Bicycles, buses	Walking
Materials	Throw-aways	Durables	Local biomass

Piped Water Supply



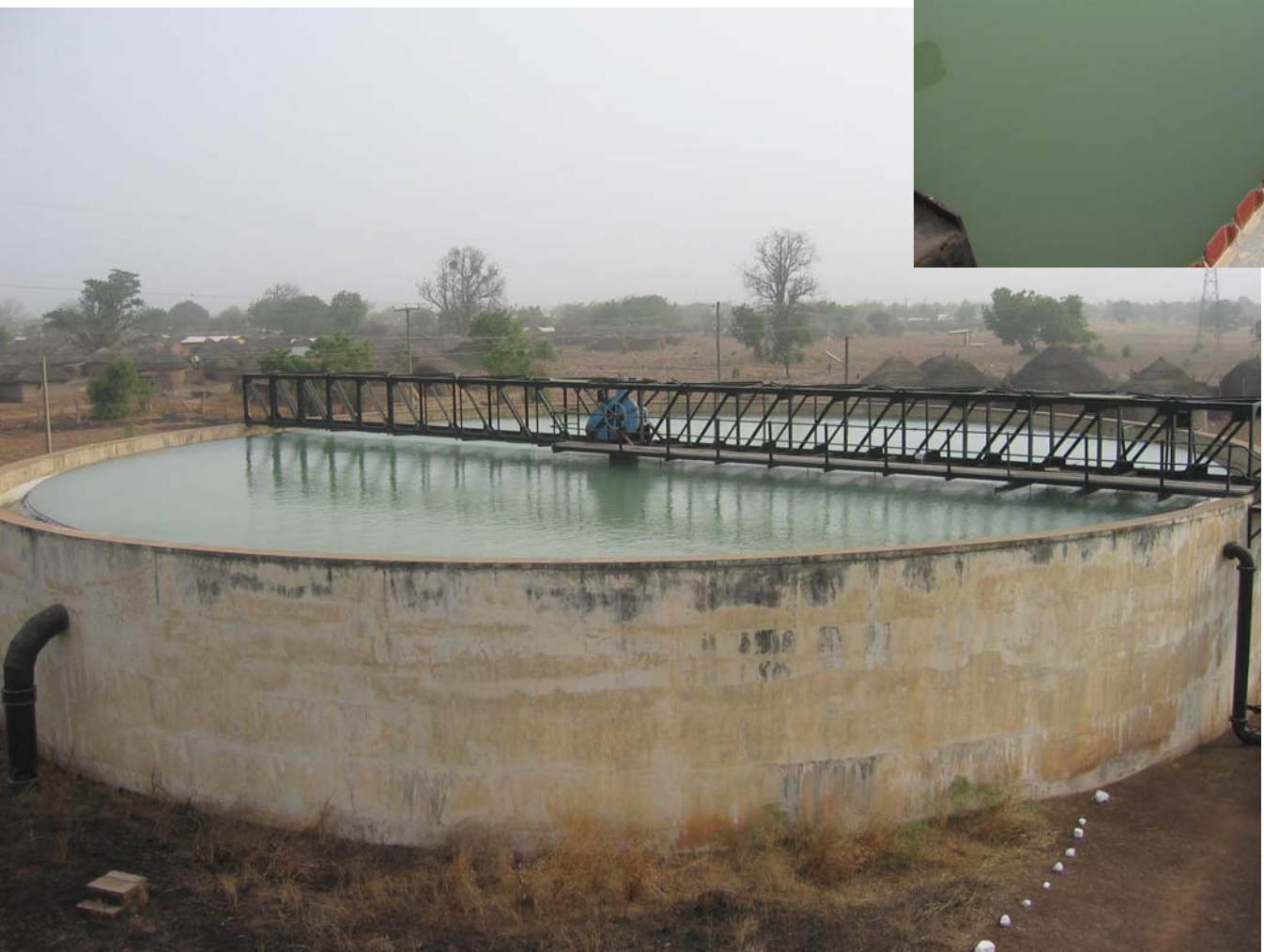


Conventional Water Treatment Plant



Alum Coagulation Tank

Sedimentation Tank

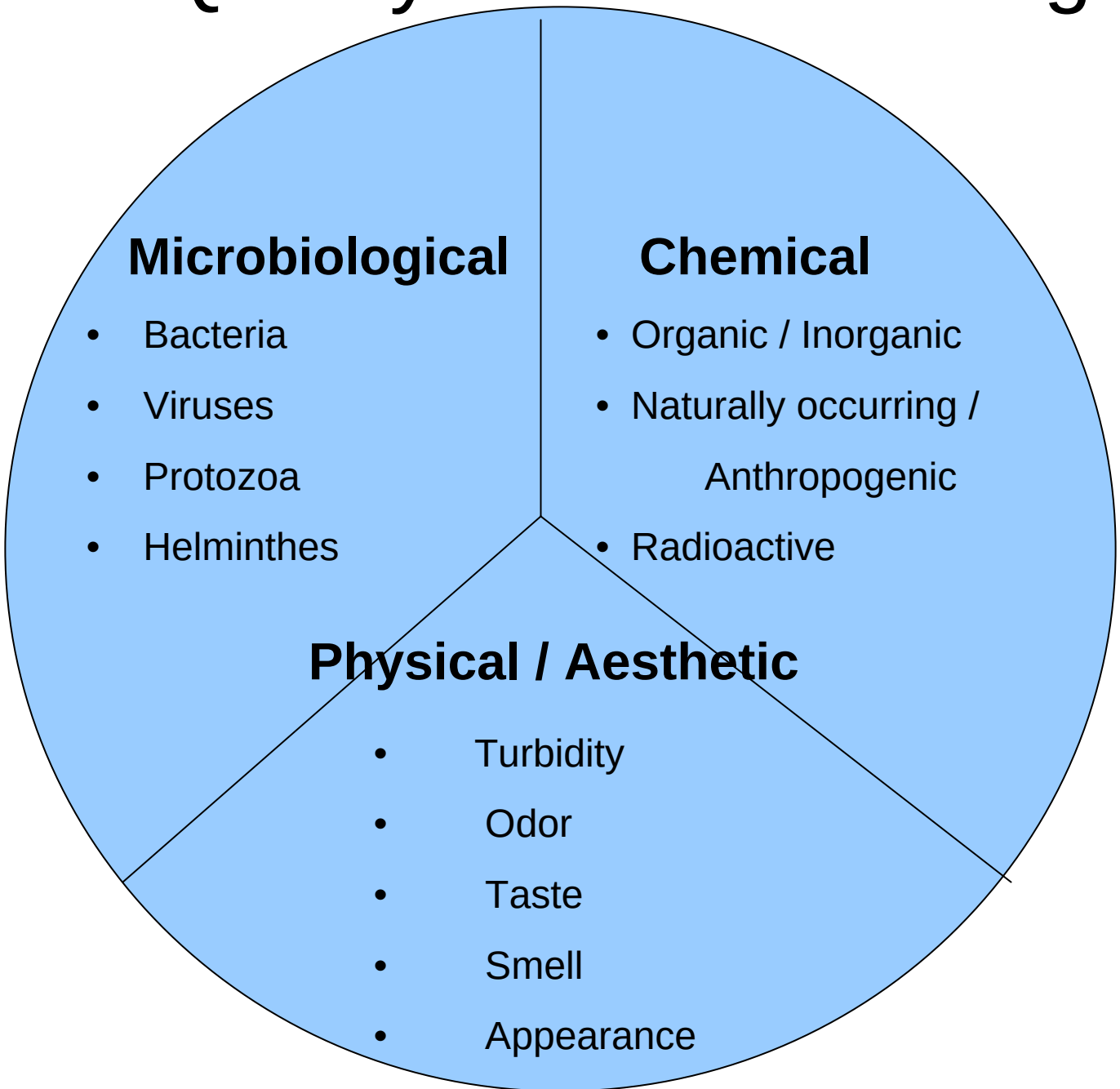


Sand Filter

Non-Piped Water Supply

Watershed **Human (and Animal?)** **Distribution System** **Home**

Water Quality – 3 Broad Categories



Microbiological Contaminants

- “Infectious diseases caused by pathogenic bacteria, viruses, protozoa and helminthes are the most common and widespread health risk associated with drinking water.”

- (WHO, 2004. *Guidelines For Drinking Water Quality* 3rd Ed. p. 123)

At the international level, how would you go about solving the problem of disease and death from unsafe drinking water, inadequate sanitation and poor hygiene?

One approach is the Millennium Development Goals (MDGs)

Millennium Development Goals & Targets

Goal 1: Eradicate extreme poverty and hunger - *Targets 1 & 2*

Goal 2: Achieve universal primary education – *Target 3*

Goal 3: Promote gender equality and empower women – *Target 4*

Goal 4: Reduce child mortality – *Target 5*

Goal 5: Improve maternal health – *Target 6*

Goal 6: Combat HIV/AIDS, malaria and other diseases – *Targets 7 & 8*

Goal 7: Ensure environmental sustainability – *Targets 9, 10, 11*

Goal 8: Develop a global partnership for development – *Targets 12- 18*

http://www.developmentgoals.org

MDG – Goal 7 - Target 10

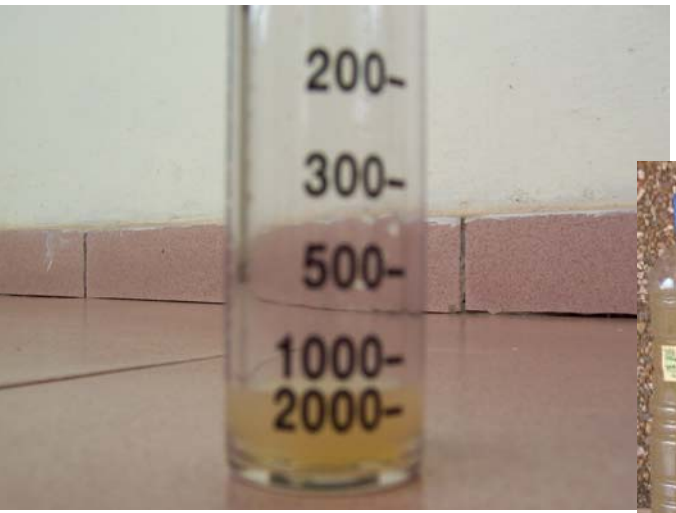
Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation

The following 6 slides supplement the 1st Tech Tutorial on coagulation

They show the high turbidity waters in Ghana and the effect of alum coagulation

Surface Water Sources in Ghana

- Extremely high turbidity, between 500 – 2,000 NTU



Turbidty Test (NTU)

Drinking Water Sources- Northern Region, Ghana

Ghanasco Muali Dam

Kaleriga Dam

Locally Available Alum Product in Markets in Ghana

Before and After Alum Coagulation

Cloth Filter

Turbidity Results (Melinda Foran, 2006)

Location	Date	Turbidity [T.U.]	
		Source Water	Post Alum
Ghanasco Muali Dam	20-Jun	~1600	<5
Kaleriga Dam	22-Jun	>2000	<5
Bipelar Dam	27-Jun	38	~6
Bipelar Dam Turbid	27-Jun	38	38
St. Mary's Dam	29-Jun	>2000	<5
Dungu Dam	4-Jul	400	<5
Libga Dam	6-Jul	75	<5
Bunglung Dam	11-Jul	300	<5
Diare Dam	13-Jul	23	<5
Diare Dam Turbid	13-Jul	23	23
Libga Dam	17-Jul	50	<5
Gbanyami Dam	19-Jul	~1000	<5
Vitting Dam	25-Jul	~125	<5
Average Turbidity		690	-