Swiss TPH

Swiss Tropical and Public Health Institute
Schweizerisches Tropen- und Public Health-Institut
Institut Tropical et de Santé Publique Suisse

UNEP

Second Global Conference on Land-Ocean Connections
'Building bridges through partnerships'

GPA

October 2-4, 2013, Montego Bay, Jamaica

Developing the future agenda for joint actions to promote sustainable WW management

Wastewater Reuse: Opportunities, Risks and Challenges

Guéladio Cissé

Ecosystem Health Sciences Unit

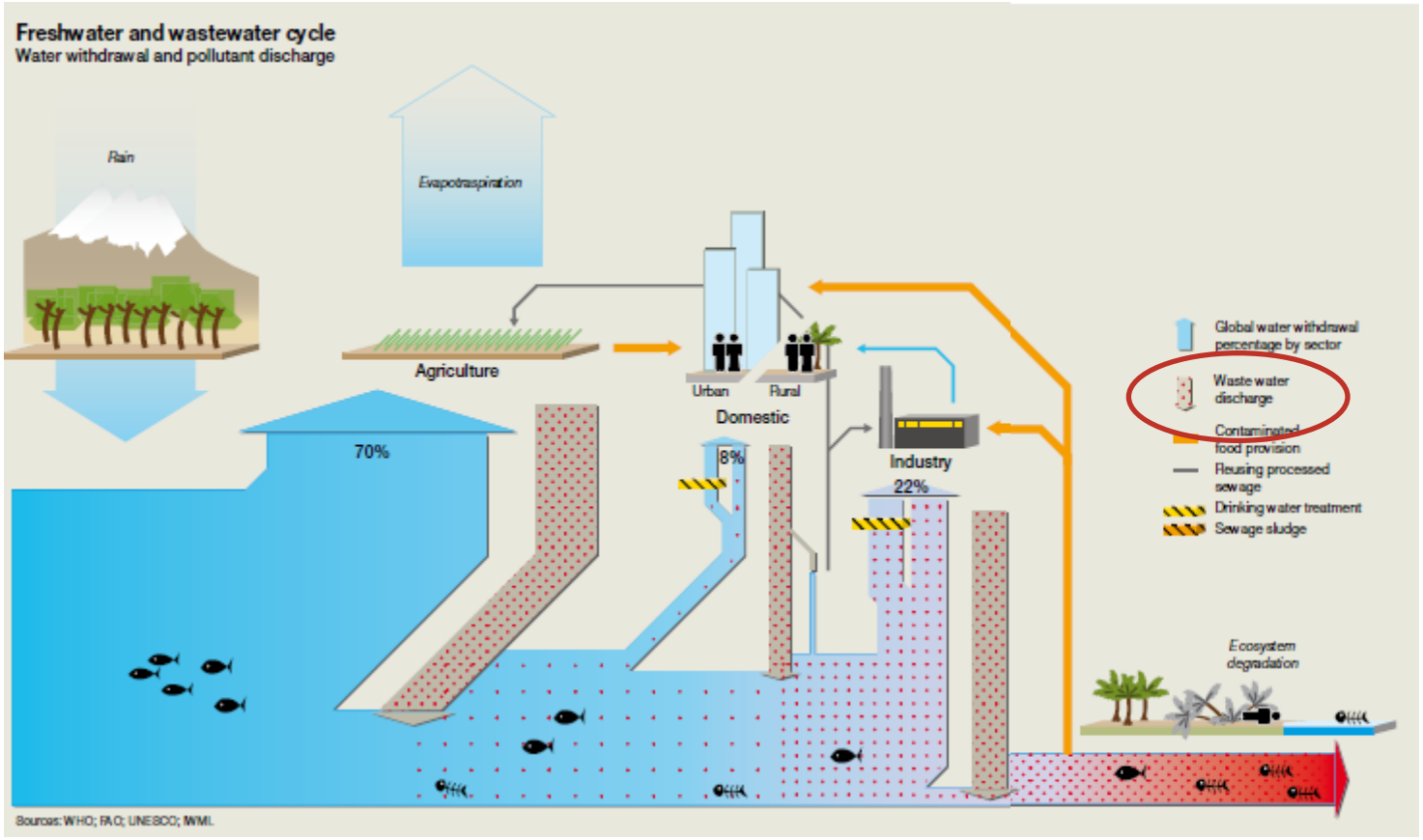
Swiss Tropical and Public Health Institute

Overview

Swiss TPH

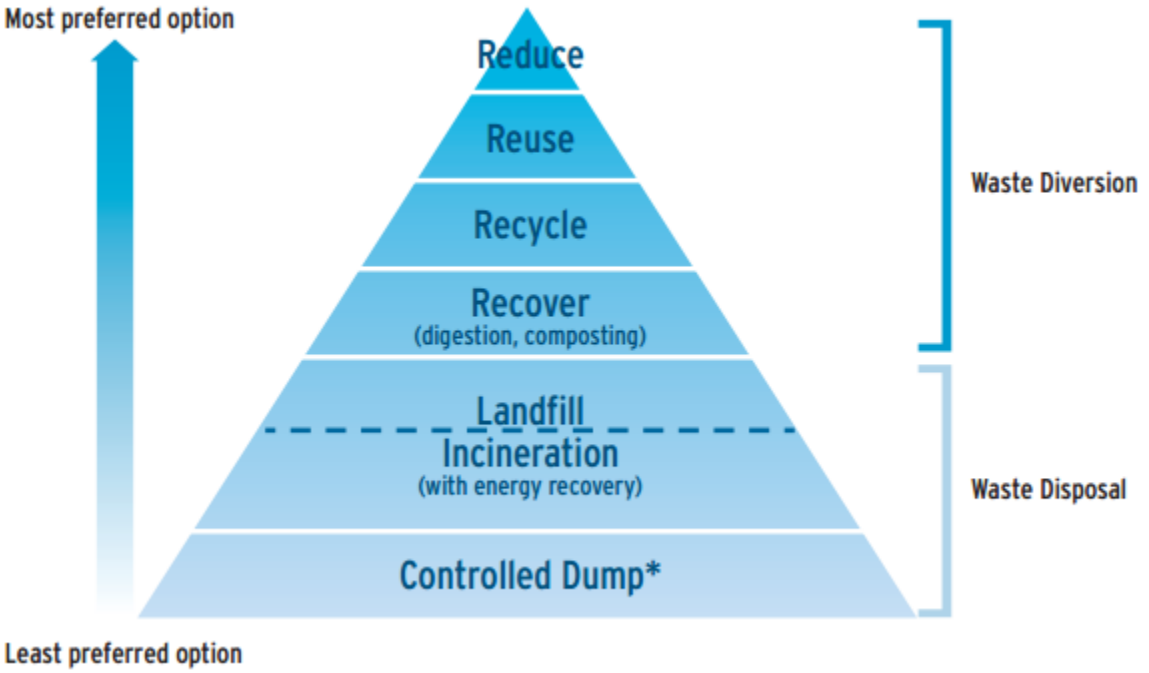
1. Some facts
2. Opportunities
3. Risks
4. Challenges
5. Ways Forward

1- Some facts



Source: Corcoran et al 2010

Waste management options



Reduce: reduce the amount

Reuse : someone's waste used else

Recycle: use in another way or process

Recover: handle, keep, clean, transform, improve, return to the economy

Many other R's: reduce, reuse, recycle, recover, repair, rethink …

- Repair: take old and little defected things and repair them
- Rethink: environmentally sound management of waste

(Source: WB 2012)

Waste management options

Worldwide, the new environmental paradigm is to eliminate the concept of throwing away waste and replace it with the concept of considering waste as a resource

Focus on "Reduce, Reuse, Recycle" paradigm

Considers both solid waste and wastewater

- **Solid waste**
- **Wastewater**
- **Feacal sludge**

Wide range of wastewater sources

Swiss TPH

Wastewater

Used water of different qualities ranging from raw to diluted; usually a combination of one or more of the following (Scott et al 2004):

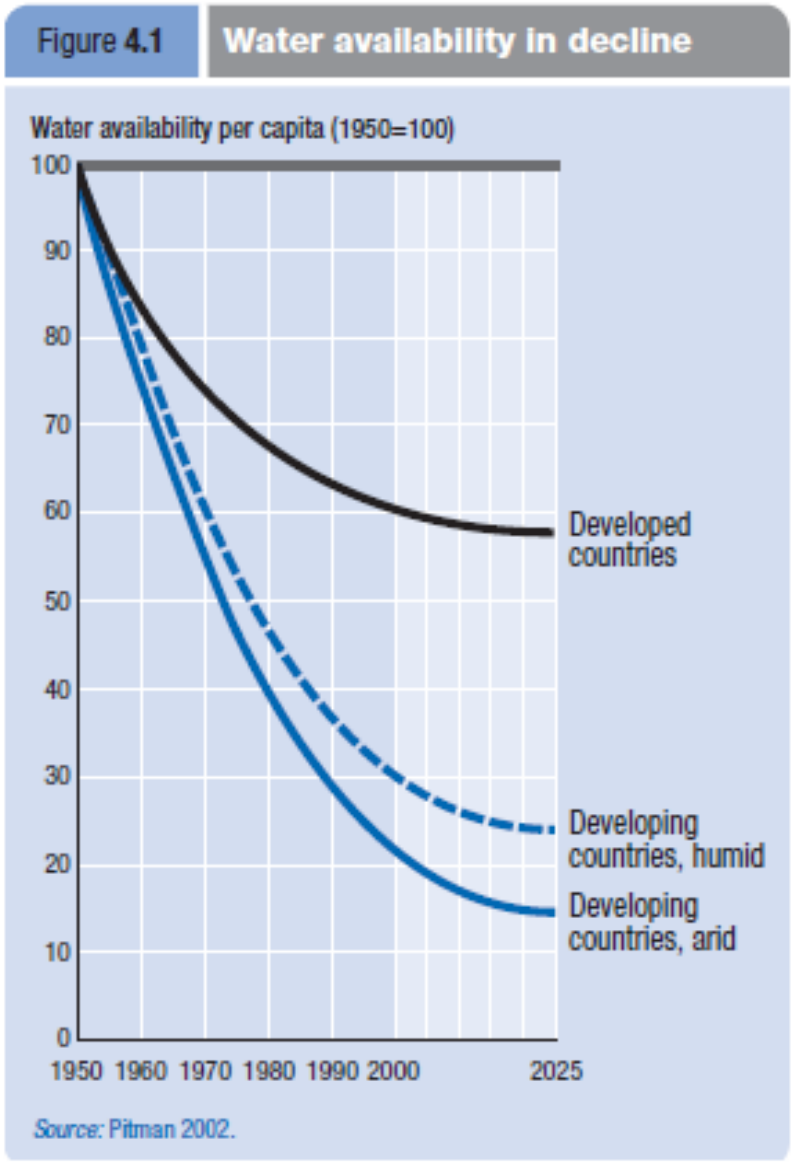
1. **Domestic effluent consisting of blackwater (excreta; urine;) and grey water (kitchen and bathing wastewater)**
2. **Water from commercial establishments and institutions including hospitals**
3. **Industrial effluents where present**
4. **Storm water and other urban run-off**

Reclaimed wastewater or recycled wastewater

- **Treated wastewater that can officially be used under controlled conditions for beneficial purposes such as irrigation**

Water scarcity --- reuse

Swiss TPH



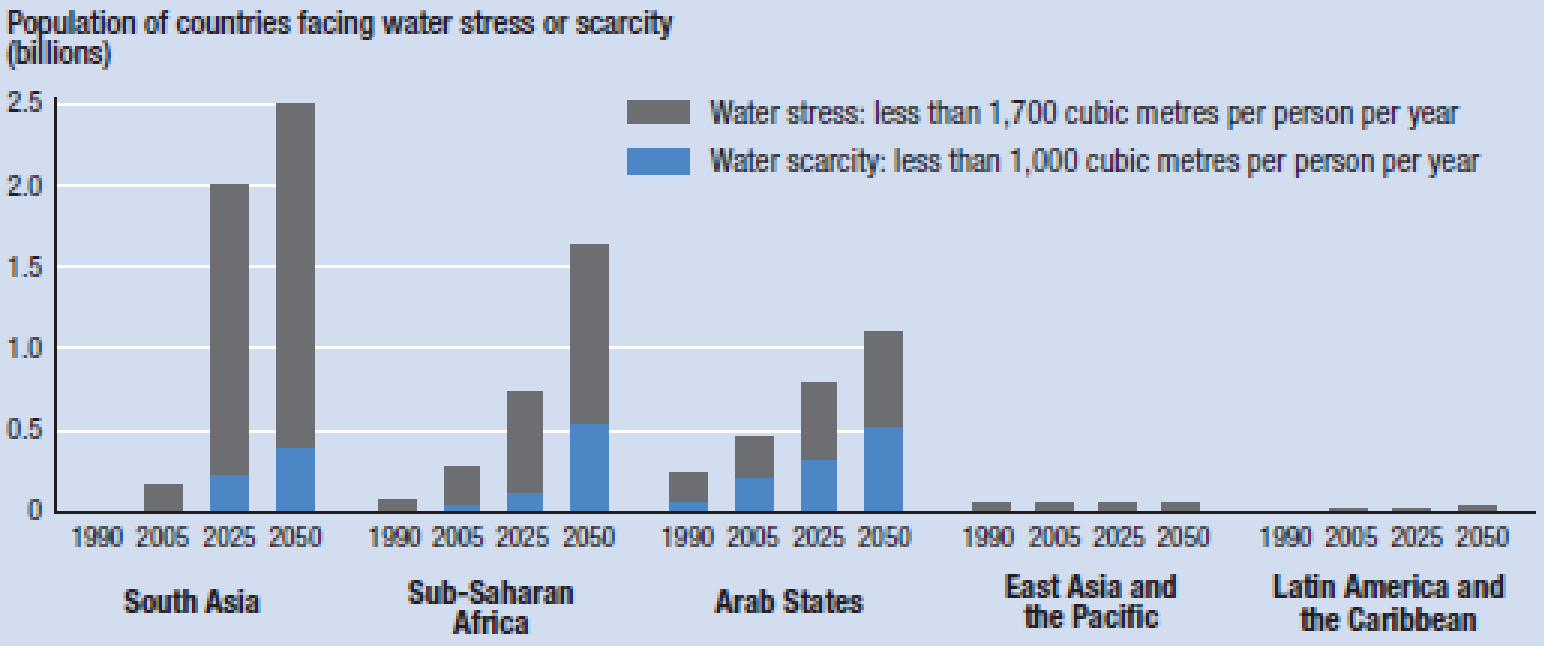
Water availability in decline, while agriculture accounts for more than 70% of global water use

By 2025, half of the world population will live in water stressed areas, which makes reuse important

Water stress --- wastewater

Swiss TPH

Figure 4.2 **Water stress is projected to accelerate in intensity in several regions**



Source: Calculated on the basis of FAO 2006.

Particularly in water stressed areas, an integrated water resources management is needed that involves considering waste water reuse as an important opportunity

2- Opportunity

Wastewater --- opportunity

- **An approximate estimate of global wastewater production is 1,500 km3 per day**

- **Recycling wastewater for peri-urban agriculture already happens around 4 of 5 cities across the developing world**

- **Wastewater is estimated to directly or indirectly irrigate about 20 million hectares of land globally—almost 7% of total irrigated areas**

"Wastewater: tomorrow a resource rather than a problem - *Rationale for a shift in thinking"* *(Malin Falkenmark)*

Source: UN World Water Development Report 2003; Malin Falkenmark 2011; Pay Drechsel 2010

Wastewater --- opportunity

Swiss TPH

Wastewater reuse

Involves: direct use of untreated wastewater; indirect use (diluted wastewater); direct use of treated wastewater; planned wastewater reuse; unplanned wastewater; controlled or uncontrolled wastewater reuse

Wastewater reuse Advantages

- **Reliable source of water (not seasonal)**
- **Nutrient content; reduce of demand of chemical fertilizers**
- **Contribution to food production; food security**
- **Economics gain**
- **Many direct and indirect beneficiaries in the chain (farmers; transporters; vendors; processors; inputs suppliers; consumers)**

Wastewater --- opportunity

- Cost-recovery/ income generation
- Food security
- Environmental benefits/ ecosystem services
- Social benefits

Worldwide
Informal, private,
Traditional, modern, …

Informal waste pickers at scattered collection points
Urban and peri-urban agriculture …

3- Risks

Human Health Risks

Ecosystem Health Risks

Wastewater --- Health Risks

Swiss TPH

- **Major wastewater related diseases** **(Diarrhoea, Typhoid, Schistosomiasis, Ascariasis, Hookworm disease, Lymphatic filariasis, Hepatitis A)**

- **Vector-borne diseases of relevance to wastewater use (Dengue, Filariasis, Japanese encephalitis, Malaria)**

- **Survival of various organisms (Viruses, Bacteria, Protozoan cysts, Helminths)**

Wastewater --- Health Risks

Swiss TPH

Direct Health Effects

- Disease outbreaks (food, water and vector borne)
- Persistent diseases (e.g. intestinal helminth infections, diarrhoeal diseases)
- Non-communicable diseases (eg from industrial waste)

Indirect Health Effects

- Potential impacts on food and drinking water and recreational water safety

Human Health Risks

Swiss TPH

- Risks of crops contamination (pathogens; chemicals, ..)
- Risks for human exposure / 4 exposed groups:

  i) agricultural workers and their families

  ii) crop handlers

  iii) consumers of crops

  iv) those living on or near the areas

Ethical dimensions

Developing countries vs Developed countries

Ecosystems Health Risks

Swiss TPH

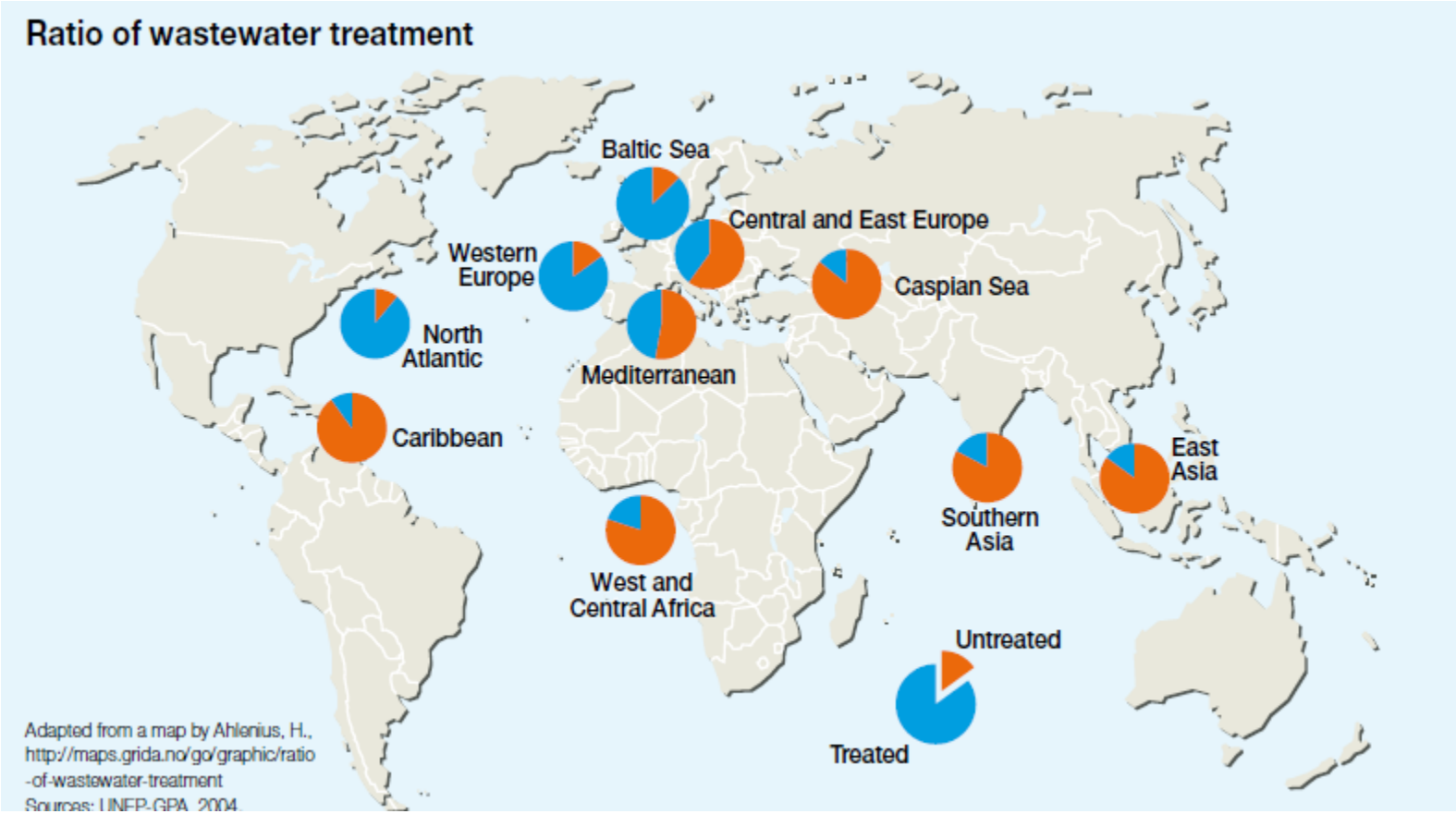
- Wastewater from industries is in rise!
- Global annual water use by industry is expected to rise from an estimated 725 km3 in 1995 to about 1,170 km3 by 2025,by which time industrial water usage will represent 24% of all water abstractions
- This will particularly impact on aquatic ecosystems receiving wastewater from industries
- Many wastewater flows from land end up at freshwater bodies (rivers, oceans, lagoons, lakes)

Source: UN World Water Development Report 2003

Ecosystems Health Risks

Swiss TPH

Low ratio of wastewater treatment in developing countries
> 80-90% of urban wastewater improperly discharged or insufficiently treated
Complex chemical and industrial pollutions …. Impact on ecosystems



Source: Corcoran et al 2010

4- Challenges

2013 !!!
Nouakchott

2009 !!!
Ouagadougou

Afrique de l'ouest

Pluie exceptionnelle, inondations dévastatrices…

« Une pluie pareille, ça n'arrive que tous les mille ans au même endroit, voire tous les dix mille ans, mais cela fait partie des aléas climatiques de cette région ! », affirme l'hydrométéorologue Thierry Lebel[1], coresponsable du programme international de recherche sur la mousson africaine[2], en évoquant le déluge qui s'est abattu sur la capitale du Burkina Faso le 1er septembre dernier. Quelques heures d'intempéries avaient suffi à provoquer d'importantes inondations. À l'arrivée : 7 personnes ont perdu la vie, 150 000 sont sans-abris et des équipements publics, des stocks de marchandises, des biens meubles et de nombreuses archives ont été détruits. *« Cette pluie était d'une que les plus grosses précipitations enregistrées jusqu'ici. Mais, rappelle-t-il, une inondation c'est le croisement entre un événement pluvieux intense et des conditions locales de ruissellement »*. La ville, avec ses aménagements qui contribuent à imperméabiliser les sols et sa forte concentration de population qui représente autant de sinistrés potentiels, est particulièrement exposée à de tels aléas. Le même épisode, s'il avait eu lieu en brousse – comme il ne peut manquer de s'en produire ponctuellement selon le chercheur –, n'aurait pas eu le même impact humain et économique. *« Des sinistres similaires frappent régulièrement la région. La ville d'Agadez au Niger a également été dévastée par les eaux cette 2007. Ce genre d'événement très violent est une caractéristique intrinsèque du système climatique de la région, où la pluie est provoquée par des systèmes convectifs localement intenses mais très variables dans l'espace et dans le temps »*, explique-t-il. Enfin, coupant court aux spéculations sur le rôle du changement global dans cette catastrophe, le scientifique assure *« qu'il est hasardeux de faire des déductions sur l'évolution du fonctionnement climatique à partir de quelques événements isolés »*.

1. IRD UR012, *Laboratoire d'étude des transferts en hydrologie et environnement.*
2. AMMA-CATCH.

© IRD/A. Ali-Lamine

Climate extreme events: floods in Nouakchott (Mauritania)

Climate extreme events: floods in Ouagadougou (Burkina Faso)

Credit photos: Noor Info, IRD

Challenges

Swiss TPH

Climate variability and change

Climate extreme events and disasters

Urbanization

Vulnerabilities at urban –rural interface

Human and Ecosystems Health protection

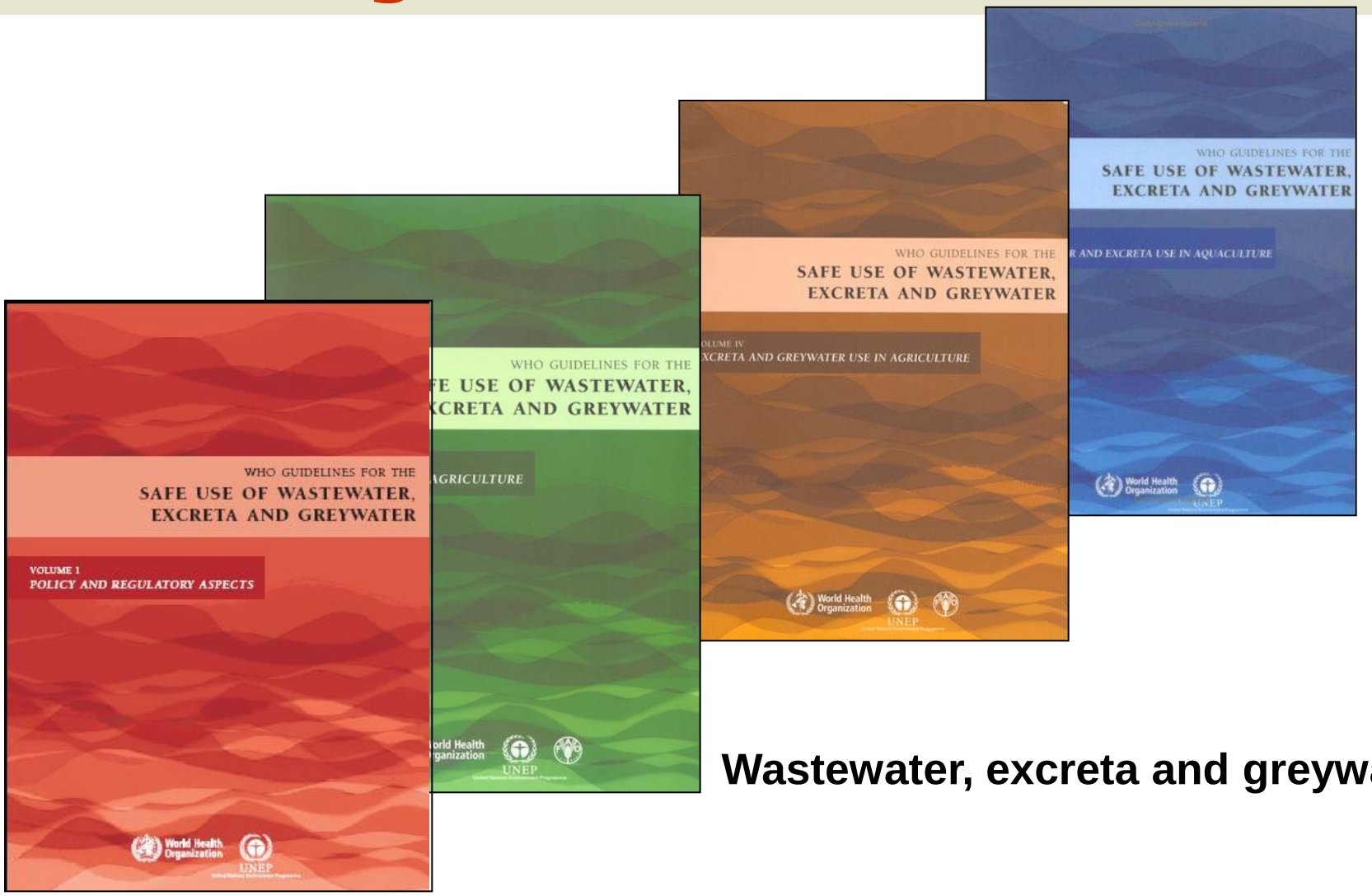
Ways Forward

WHO (1973), *Reuse of Effluent: Methods of Wastewater Treatment and Health Safeguards*, Technical Report 517, WHO, Geneva.

WHO (1989) *Health Guidelines for the Use of Wastewater in Agriculture and Aquaculture. Report of a WHO Scientific Group,* Technical Report Series No. 778, WHO, Geneva

WHO (2006) Guidelines for the Safe Use of Wastewater, Excreta and Greywater

WHO 2006 guidelines



Wastewater, excreta and greywater

Implementation?

Sanitation Safety Plans (SSP)

Ways forward

Swiss TPH

Wastewater Reuse as a strategic component of the Global Initiative on Wastewater

- **Reduce – Recover – Reuse (RRR)**
- **Adaptation to Climate Change**
- **Disaster Risk Reduction**
- **Integrated management & Partnerships**

Ecosystem health approach

Water Safety Plans (WSP) & Sanitation Safety Plans (SSP)

Thank you

And many thanks to
- UNEP and all the organizing committees

gueladio.cisse@unibas.ch