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Science for Poverty Eradication and Sustainable Development: a Call for Action

ACADEMIA BRASILEIRA DE CIÊNCIAS

Science for Water Security: Enhancing Global Access to Water

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Enhancing Global Access to Water

- Mobilize Academies to contribute to the design of the Post 2015 Development Agenda, and subsequent implementation of the Sustainable Development Goals.
- We recognize that poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development are the overarching objectives of an essential requirements for sustainable development.

Sustainable Development Goals to be reached by 2030

6. Ensure availability and sustainable use of water and sanitation for all.

- Achieve **universal and equitable access** to safe and affordable drinking water for all.
- Achieve access to **adequate and equitable sanitation** and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
- **Improve water quality** by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally.
- Substantially **increase water-use efficiency** across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and **substantially reduce the number of people suffering from water scarcity.**

Sustainable Development Goals to be reached by 2030

- Implement **integrated water resources management** at all levels, including through transboundary cooperation as appropriate.
- **Protect and restore water-related ecosystems**, including mountains, forests, wetlands, rivers aquifers and lakes.
- **Expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes**, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.
- Support and **strengthen the participation of local communities** for improving water and sanitation management.

Actual Situation

according to JMP in «Progress on Drinking Water and Sanitation, Special Focus on Sanitation»

Latin American and Caribbean regions advancing in increase of coverage of improved drinking water sources.

- 1990 to 2006 reached 92% coverage

global coverage for developing countries 84%

world 87%

But still
Urban-Rural Disparity

Latin America and Caribbean Coverage

Water Supply Urban 97%

Rural 73%

World

Water Supply Urban 96%

Rural 78%

Rural populations migrating to urban areas.

From 2007 world urban population > rural

Inspite of this:

Joint Monitoring Programmme for Water Supply and Sanitation (JMP) predicts

- 2015 unserved rural dwellers (1,7 billion) more than twice unserved urban residents (7 million)

- Only 49% of rural population access to sanitation services by 2015

Unserved Populations
Basic Sanitation Services

- Sanitation means separation of human excreta from human contact. Basic requirement for human dignity.
- Impacts health, in turn affects

earnings and keeps people in poverty.

World wide population in 2006

equally divided urban and rural but

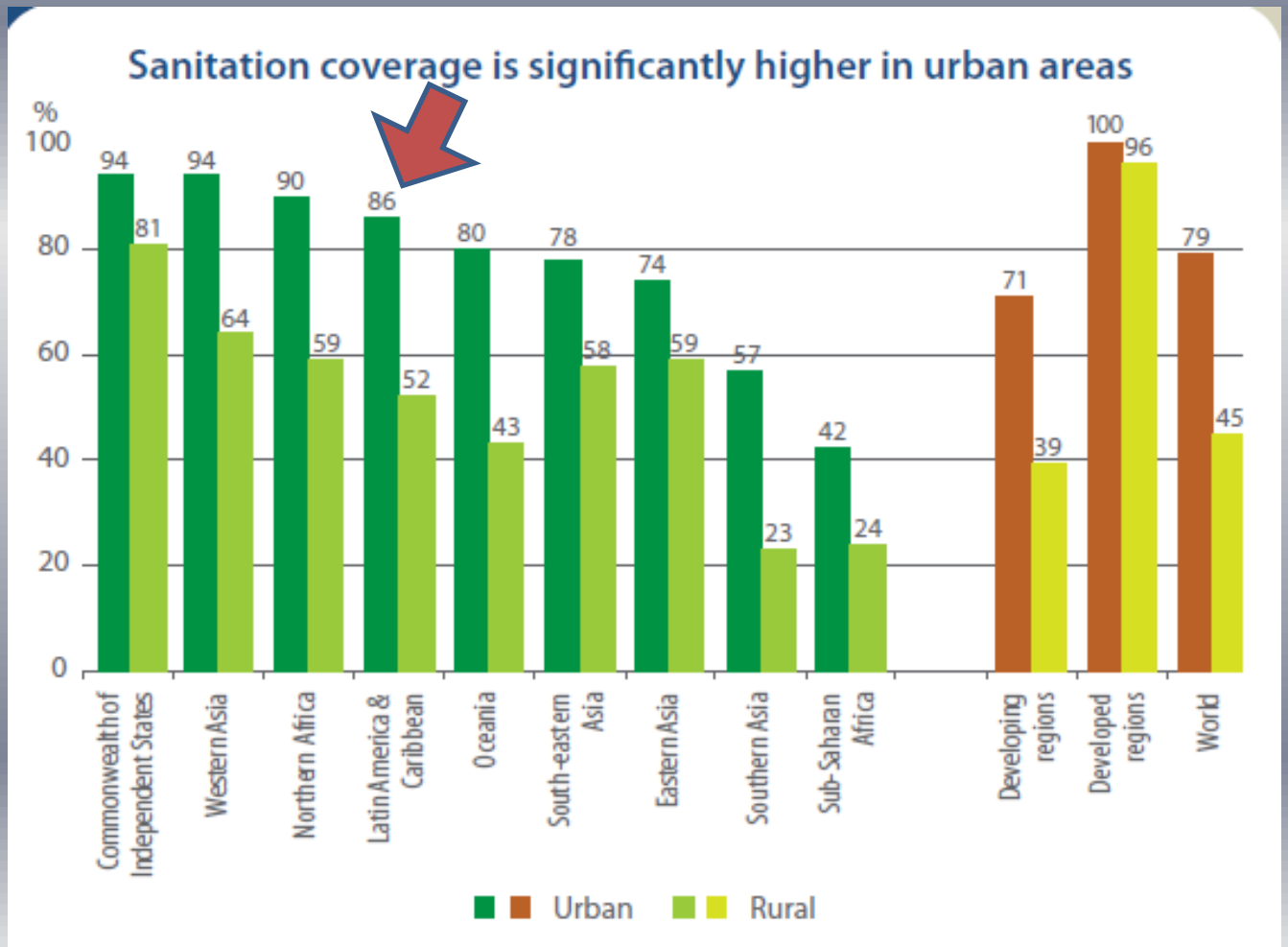
7 out of 10 people without improved sanitation

Rural inhabitants

Latin America & Caribbean

Urban Sanitation coverage 86% / World Coverage 79%

Rural Sanitation only 52%, one of highest disparities urban/rural in the world



Improvement
Piped Drinking Water on Premises

Best system for health improvements of population

Latin America

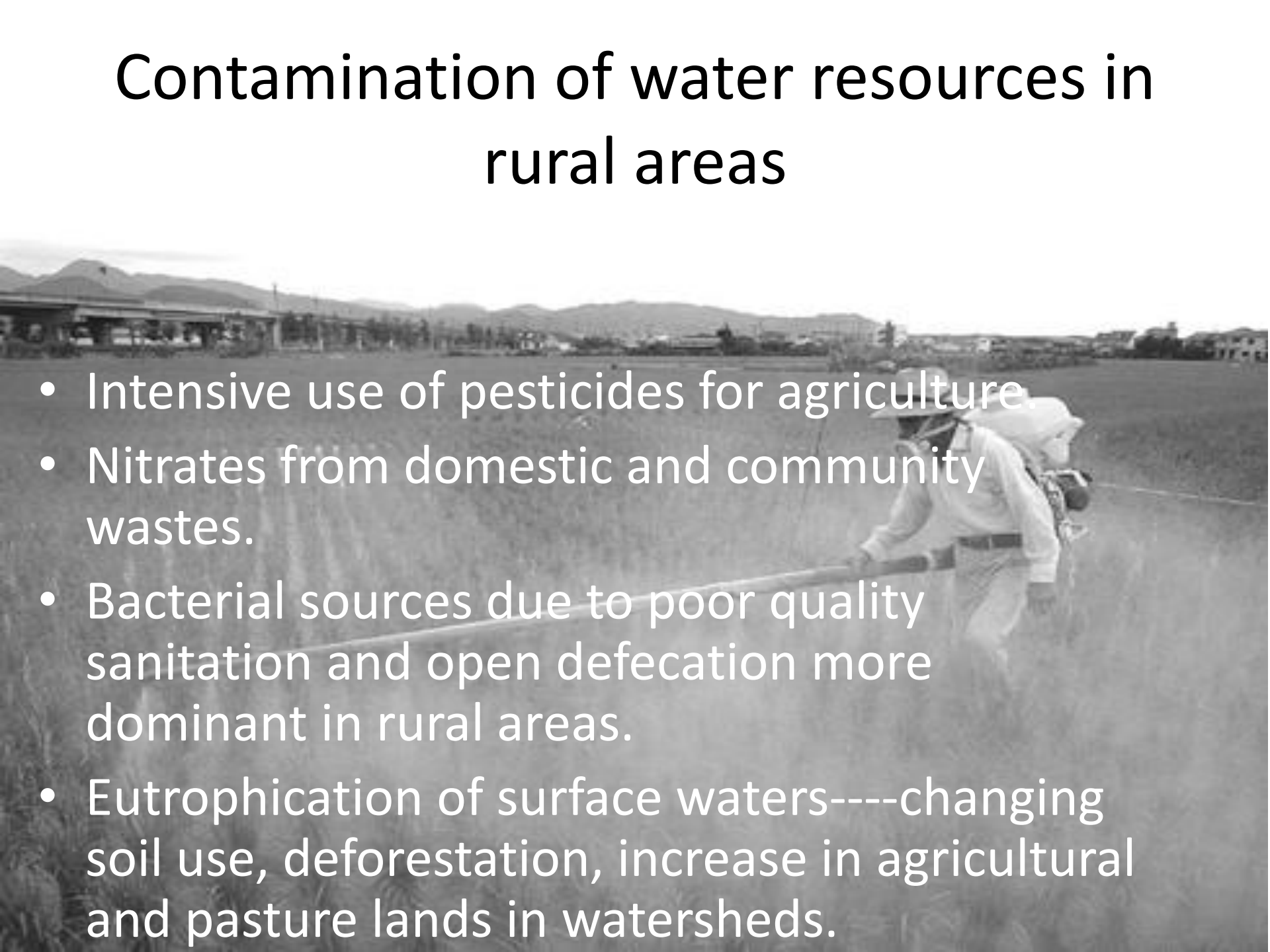
- Progress in Urban regions with 90% coverage

- **Rural areas** only 48% coverage.

Still High Open Air Defecation some countries > 20% in rural regions

- 2 Central American countries: Honduras (28%) and Nicaragua (27%)
- 5 South American countries: Colombia (20%), Surinam (21%), Peru (35%), Brazil (40%) and Bolivia (54%)
- Caribbean countries: Only Haiti (51%)

Contamination of water resources in rural areas



- Intensive use of pesticides for agriculture.
- Nitrates from domestic and community wastes.
- Bacterial sources due to poor quality sanitation and open defecation more dominant in rural areas.
- Eutrophication of surface waters----changing soil use, deforestation, increase in agricultural and pasture lands in watersheds.

URBAN WATER IN THE AMERICAS

New Publication with Participation of 20 countries In the Americas

WATER PROGRAM

IANAS

INTER-AMERICAN NETWORK OF ACADEMIES OF SCIENCES

Science Academies working together to promote science and technology for development, prosperity and equity in the Americas

Percentage of urban population

UNHABITAT 2010

Region	2010	2050
World	51	70
More developed	75	86
North America	82	90
Europe	73	84
Less developed	45	67
Latin America	79	89
Asia	43	66
Africa	40	62

Developing countries are projected to have urban growth rates roughly double those of OECD countries between 2005-2030

Jiménez, 2011

Most Prominent Problems found in urban areas with water resources

Main conclusions of 20 chapters: Urban Waters in the Americas

Water sources and problems caused by the urbanization process

Factors associated with urbanization such as bad management of solid wastes, absence or not sufficient distribution of drainage systems for storm water, absence of appropriate watershed management surrounding urban centers affecting ground and surface waters and contamination due to deficient infrastructure of sanitation and drainage.

Most Prominent Problems found in urban areas with water resources

Water supply services in urban areas

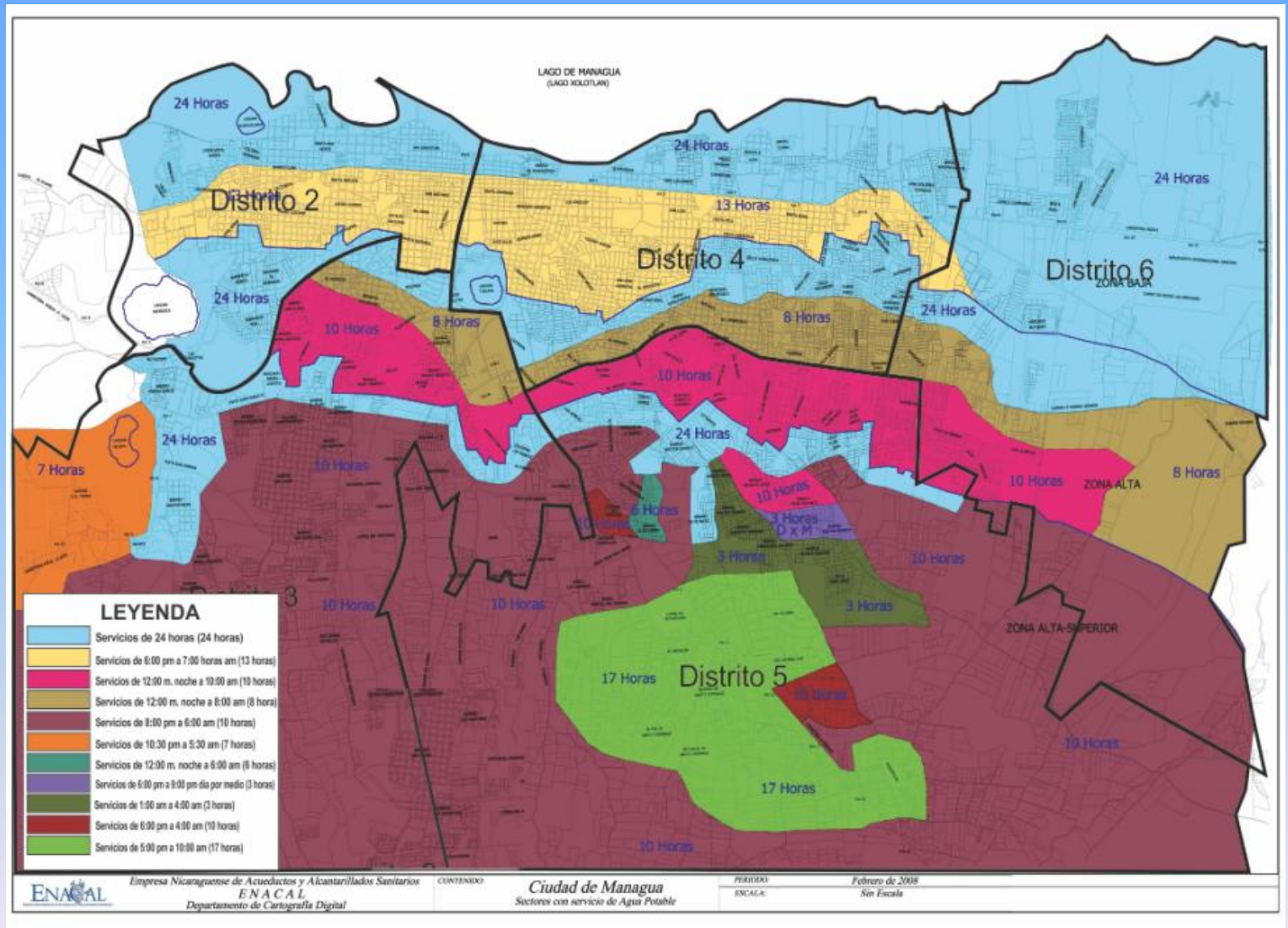
The coverage in urban areas in the great majority of urban areas of the Americas is > 95%.

There are problems with **continuity of services** which can cause health problems as domestic water must be stored in containers which can convert into media for vectors such as mosquitos.

Ruptures in the distribution system in most cities of Latin America and lack of renovations.

Urban Water in the Americas
Book in Preparation for Publication in 2015
IANAS Water Programme

Problems with Continuity of Access to Water



Example of Managua, Nicaragua

Most Prominent Problems found in urban areas with water resources

Water supply services in urban areas

All cities of South America, Central America and Caribbean Islands are affected by the informal growth of periurban areas which have little or no water coverage or sanitation. Usually caused by migration from rural areas. These are the areas with highest rate of water borne diseases and contamination of irregular water sources. Failure to control illegal connections.

Urban Water in the Americas
Book in Preparation for Publication in 2015
IANAS Water Programme

Most Prominent Problems found in urban areas with water resources

Treatment of wastewater in urban areas

- In South America, the coverage of sewage system is around 80% in most countries but a high percentage of waste waters are discharged into rivers and the ocean without treatment. It is a fact that 15% of waste waters do no receive any primary treatment.
- In Central America equally waste waters from Oxidation Lagoons treating domestic waste waters are discharged to surface water bodies which undergo strong eutrophication and lose water quality for human consumption. In most countries today exist many efforts to increase the coverage of sewage systems in cities. Example: In the city of Managua, Nicaragua a large treatment plant was installed in 2009 which has greatly improved environmental sanitation of the city.

Urban Water in the Americas
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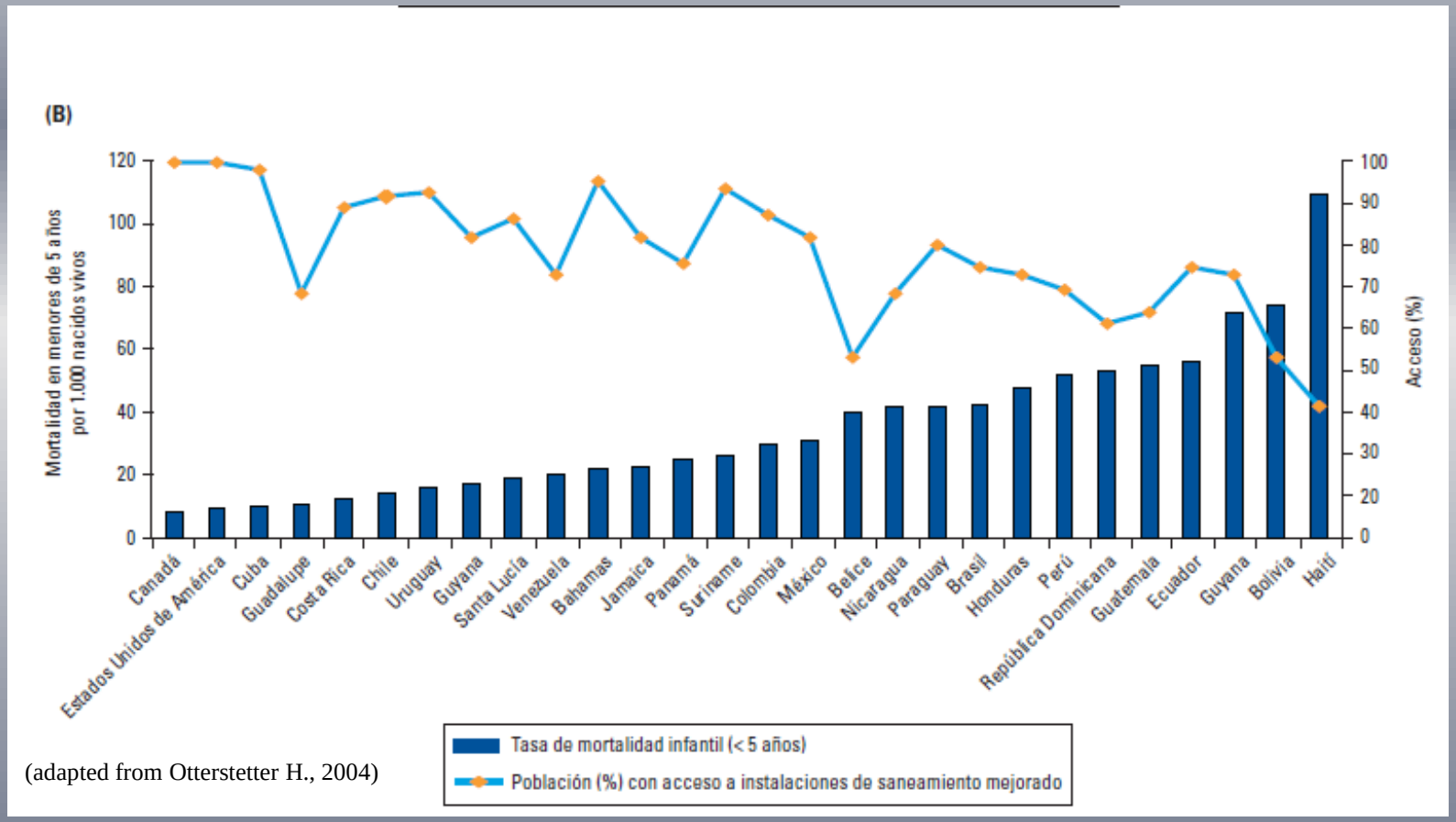
Use of Drinking Water Sources and Sanitation Facilities
% Population in 2012 in Latin America and Caribe

Urban population %	Country	Improved Sanitation %	Use of Improved Drinking Water Sources %	Use of Piped on Premises %
Central America				
65	Costa Rica	95	100	100
65	El Salvador	80	95	86
50	Guatemala	88	99	98
53	Honduras	85	98	97
58	Nicaragua	63	98	89
76	Panama	80	97	96
Mexico				
78	Mexico	87	96	95
South America				
93	Argentina,	97	99	99
67	Bolivia	57	96	95
85	Brazil	87	100	97
89	Chile	100	100	100
76	Colombia	85	97	94
78	Peru	81	91	87
93	Uruguay	96	100	100
94	Venezuela	93 (year 2000)	94 (year 2000)	89 (year 2000)
Caribbean				
75	Cuba	94	96	83
39	Grenada			
70	Dominican Republic	86	82	74

Latin America and the Caribbean has highest drinking water coverage of developing world

Source:
Progress on Drinking Water and Sanitation 2014 Update
UNICEF, WHO

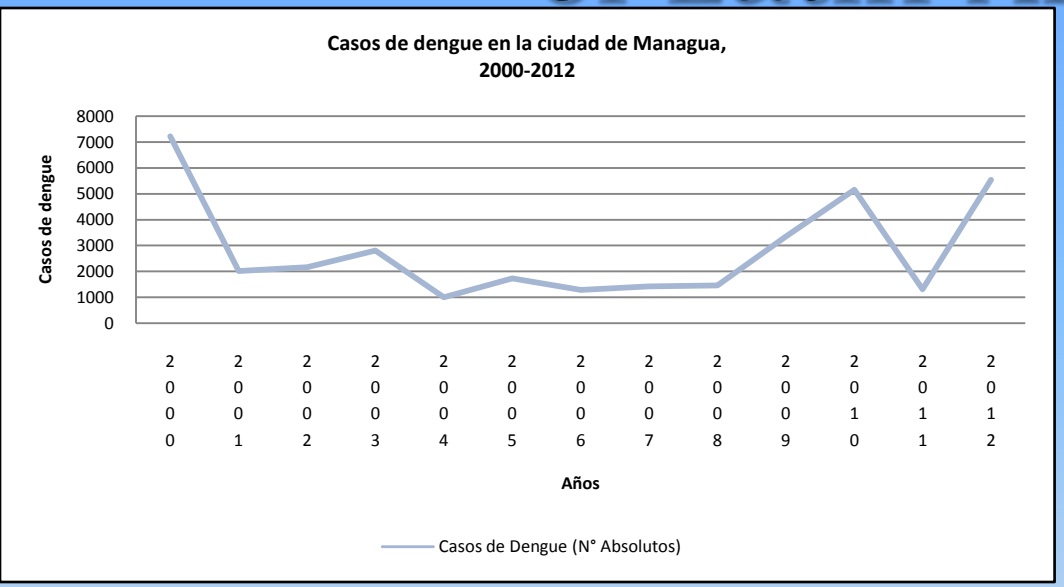
What are the consequences of this lack of coverage of sanitary infrastructure



(adapted from Otterstetter H., 2004)

Reciprocal relationship between mortality in children under 5 years of age vs coverage of sanitation in the countries of the region.

Outbreaks of Dengue in Cities of Latin America



Dengue in Capital City of Nicaragua
Managua

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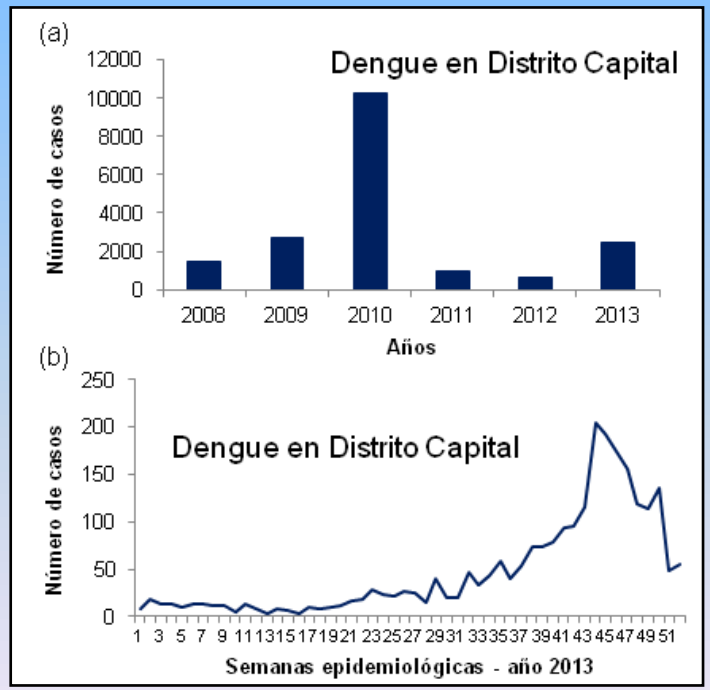

Dengue in Capital City of Venezuela
Caracas

Analysis in cities: Outbreaks in part for necessity to store water domestically due to failure of continuity of access to water and appearance of different serotypes of virus. Cases concentrated in periurban areas and a proximity to surface waters or urban open canal systems.

Lower Income Groups have higher income percentage for access to water

- In Latin America, the income share spent by the poorest quintile is more or less twice the income share for the richest quintile.
- Non piped services (ware vendors and tanker trucks), income share for the lower income groups even more.

- **Globally the higher income group is twice as likely to use improved water services and four times more likely to use sanitation services as the lowest income group.**

Most Prominent Problems found in urban areas with water resources

Treatment of wastewater in urban areas

Latin-American countries are not all on track to reach the Millennium Development Goals for sanitation. The Central American countries studied have a sanitation coverage of 63 to 95%. South America from 57 to 100%.

Source:Improved Sanitation according to Progress on Drinking Water and Sanitation Update 2014, WHO, UNICEF.

Note:

Improved sanitation coverage does not always mean that contamination does not occur to water sources. Case of Dominican Republic with vertical septic tanks and Central America with massive use of septic tanks in new urbanizations which contaminant groundwater used for human consume.

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Problems securing delivery of good quality water

- Monitoring systems don´t include water sources in rural areas.
- Monitoring systems that don´t include organic and metal contaminants.
- Deficiency in laboratories with good functioning quality control systems to provide precise data for evaluation of good water quality.
- Water quality does not meet legal standards.

What about climate change?

- In 20 years, demand for water will increase by 40%.
- Rural areas especially in areas

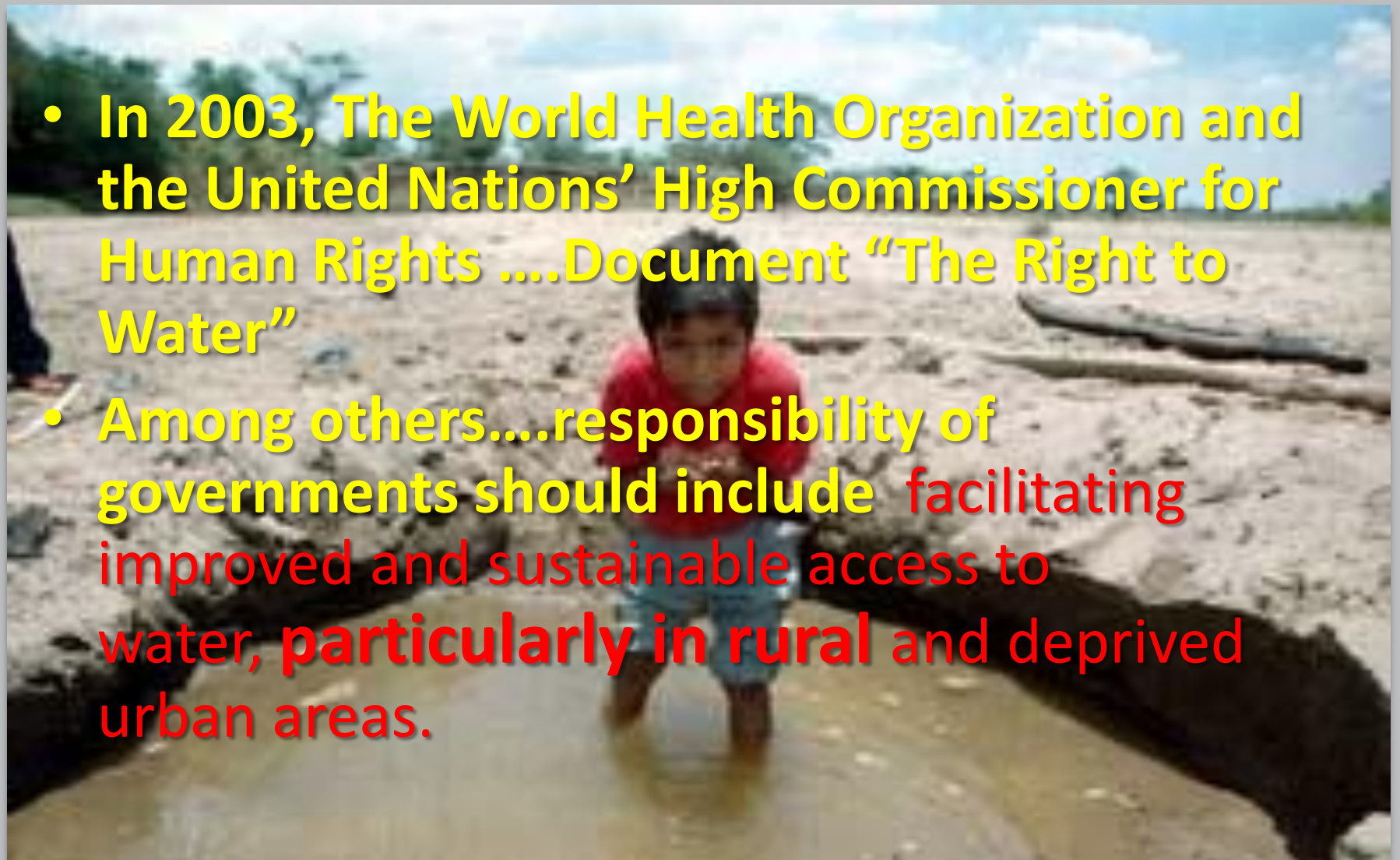
of low coverage and where

Irrigated agriculture dominates

and in semi-arid and arid areas.

-
- All this ….. impacts even more economic growth especially in rural areas.

Efforts to give priority in policies and management for water and sanitation to the **LEAST SERVED**



- **In 2003, The World Health Organization and the United Nations' High Commissioner for Human Rights ….Document "The Right to Water"**
- **Among others….responsibility of governments should include** facilitating improved and sustainable access to water, **particularly in rural** and deprived urban areas.

How can Academies of Science contribute to Improving Water Security

some suggestions

Water Access and Sanitation for Rural and Urban require different technical, institutional and social solutions

Better coverage of large to middle scale sewage systems
in cities
and special solutions for periurban areas
such as sanitation systems per condominium units per barrio
(neighborhoods or other collective organizational units).

Sanitation in Rural Areas deserves Special Remedies

- Some rural settlements don´t need centralized sewage systems.
  - Dry toilets, urine-diversion toilets, vacuum toilets, on-site composting, or anaerobic digestion are all potential means to keep places clean and hygienic.

- Remedies that are widely adapted to specific area that better fit the physical and human systems……assures widespread use.

Education

Increase in Development of Postgraduate Programmes in Water Sciences for Water Managers and Professors

One Example

Maestría Regional Centroamericana en Ciencias del Agua
con Énfasis en Calidad de Agua

Centro para la Investigación en Recursos Acuáticos de Nicaragua
Universidad Nacional Autónoma de Nicaragua CIRA/UNAN

Capacity Strengthening

- Universities, governmental institutions or NGO's need to provide technical assistance and capacity strengthening on different levels from general hygiene education of the population up to the technical and institutional management of the water and sanitation systems.

- Capacity strengthening for local government authorities in order to coordinate activities and negotiations as well as developing monitoring and regulation for decentralized systems.

Increased Development of Research Centers devoted to Water Research in Multidisciplinary Aspects of Hydric Resources

2 Examples

Prof. Jose Tundisi
São Carlos, Brazil
http://www.iie.com.br/

Nicaraguan Research Center for Water Resources

Centro para la Investigación en Recursos Acuáticos de Nicaragua
Universidad Nacional Autónoma de Nicaragua CIRA/UNAN

www.cira-unan.edu.ni

CONTRIBUCIÓN DE LA UNAN MANAGUA PARA EL APROVECHAMIENTO Y PROTECCIÓN DE LOS RECURSOS HÍDRICOS DE NICARAGUA

1980 - 2014

Centro para la Investigación en Recursos Hídricos de Nicaragua de la Universidad Nacional Autonoma de Nicaragua

Strengthening of Governmental Water Management Institutions:

Institutional and Legal:

IANAS, Water Programme Book in preparation on Urban Waters in the Americas

pointed out:

In most countries there are existing Water Authorities and specific legislation for water management and supervision. Some countries mentioned that the effectiveness of the institutions is not yet adequate and the laws are not being enforced.

Improvement of Policies for Water Management based on Science

Better governance through better regulation and equity in service delivery.

- Accountability of public officials through systems of revision.
- Reinforce user participation at all levels so that regulators and service providers respond to interests and needs of users.
- Improvement of local governance can prevent clientilism from affecting equity.
  - Some countries (South Africa) special legislative framework for responsibility for water supply and sanitation transferred from national to local governments.

Strengthening of Water Management Nexus to other areas

NEXUS TO COMMUNITIES

Many examples of community-based water and sanitation projects in Latin America

- **Committee of Drinking Water and Sanitation (Comitees para Agua Potable y Saneamiento, CAPS) in Nicaragua improve availability of water resources in rural areas where private and state companies have not reached.**
  - 1,200,000 Nicaraguans water administered by CAPS.
  - Solicit in coordination with municipal authorities construction works for drinking water and sanitation.
  - Planning monitoring system for water resources in coordination with CIRA/UNAN.
  - Special law for the Committees approved by National Assembly of Nicaragua.

PROMOTE WATER MANAGEMENT RELATED TO CLIMATE CHANGE IMPACTS

Variability and change in climate and consequent influence on water resources in cities.

Cities under pressure due to extreme events of

drought and floods.

Cities are more vulnerable to extreme climate events due to failures in planning of growth and extension, lack of modernization of water distribution systems as well as development of drainage systems adapted to intense precipitation events.

All countries have reported **changes in precipitation patterns** accompanied by **changes in soil use** in surrounding urban watersheds, deforestation which cause increase in erosion bringing **heavier sedimentation into cities**.

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NEXUS WATER TO FOOD SECURITY

Conflicts of Use

Agriculture and Domestic in Rural Areas

- . "Agriculture accounts for approximately 3,100 billion m^3 or 71 percent of global water withdrawals today, and without **efficiency gains** will increase to 4,500 billion m^3 by 2030 (a slight decline to 65% of global water withdrawals)" (Water Resources Group 2009).

Suggestions for Reuse in Rural Areas for Agriculture

- Martijn & Hubers (2001) design of components for treatment systems with effluent use in agriculture.
- Irrigated agriculture could therefore receive and use different qualities of water. Farmers could be inserted into the end point of the sanitation system which economize nutrient uses.
- It is hard to accomplish both hygiene and food safety along with the reuse of excreta. Special monitoring capacities and mechanisms for handling excreta are needed.
- The protection of water quality must be guaranteed which means controlling runoff to local water resources.

NEXUS TO HEALTH

Sustainable Development Goals

3.3 By 2030 end the epidemics of AIDS, tuberculosis, **malaria**, and **neglected tropical diseases** and combat hepatitis, **water-borne diseases** and other communicable diseases.

3.9 By 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, **water**, and soil pollution and **contamination.**

Water and health in urban and rural areas of Latin America and Caribe

- In most countries water transmitted diseases are reported with higher register of cases in the most underdeveloped parts of the cities dominantly in peripheral poor population. **Acute diarrhea disease** and those caused by vectors such as mosquitos, **Malaria and Dengue** and recently **Chikungunya.**

- Health problems observed due to **heavy metals in water** from agriculture, industry and natural sources. Mentioned Arsenic, Mercury and others.

- Increase in **Chronic Renal Disease** more research needed related to common consumption factor of **water resources**. Pesticides, heavy metals, general water quality??

- In the last decade there has been an **improvement** in both Latin America and Caribbean countries in cities due to **better access to water and increasing installation of sanitation**. Also progress in development of public health surveillance systems

NEXUS TO ENERGY

The Link between Energy and Water

Water for Energy

Energy for Water

- **Water is used in production of all types of energy.**

- **Energy is necessary for the provision of water and treatment of wastewater.**

Water for Energy
Energy for Water

- The **use of water for energy is becoming a global challenge**. As the world economy grows at a faster pace the demand for water will increase and will accelerate more rapidly than population growth.

- Water and energy have crucial impacts on poverty alleviation both directly, as a number of the Millennium Development Goals depend on major improvements in access to water, sanitation, power and energy sources, and indirectly, as **water and energy can be binding constraints on economic growth – the ultimate hope for widespread poverty reduction**". (UN World Water Development Report, 2014a).

- ***Renewable energy forms*** such as hydroelectricity, wind, geothermal and solar **require little water** for the raw material production. Even better is that wind and solar use almost no water in the production stage of power except for washing activities

Water Equity

Water problems are fundamentally political and concern equity.

- Water is the quintessential equity issue because it is a public as well as an economic good.
- Rural areas where supplies are diverted and polluted by cities as well as urban poor are slighted.
- Decision making processes are often opaque, closed, and non-participatory.
- Water resource community has ignored water equity and not developed ways to serve distributional and procedural fairness.

Helen Ingram, Professor Emeritus
University of California at Irvine

BRIDGING SCIENCE AND POLICY TO ENHANCE WATER SECURITY IN AFRICA AND THE AMERICAS

INTERAMERICAN NETWORK OF ACADEMIES OF SCIENCE (IANAS) &
NETWORK OF AFRICAN ACADEMIES OF SCIENCE (NASAC)
Panama, October 2014