



Title	Wise use of Water
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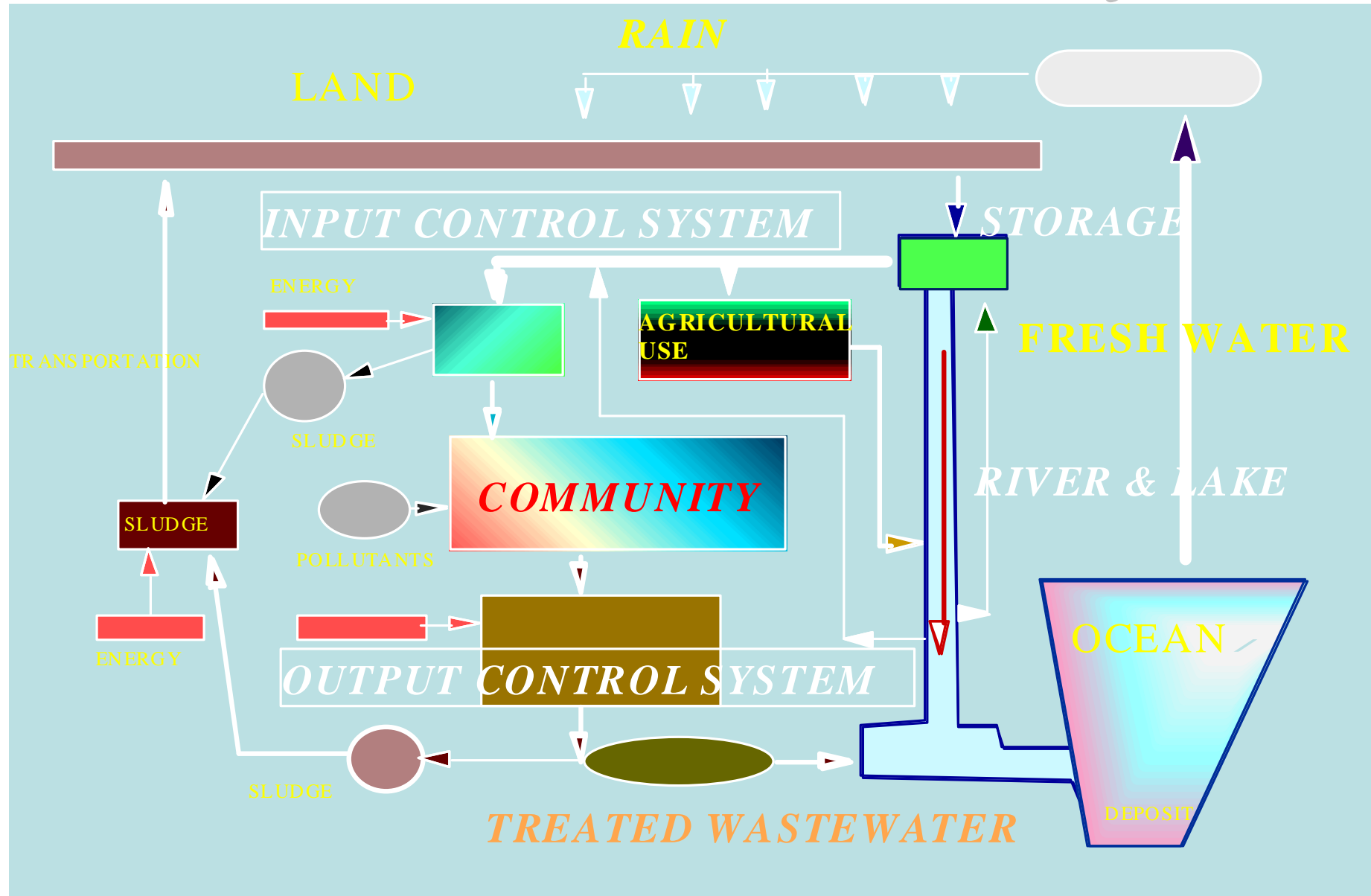


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Wise use of Water

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Natural & manmade water cycle

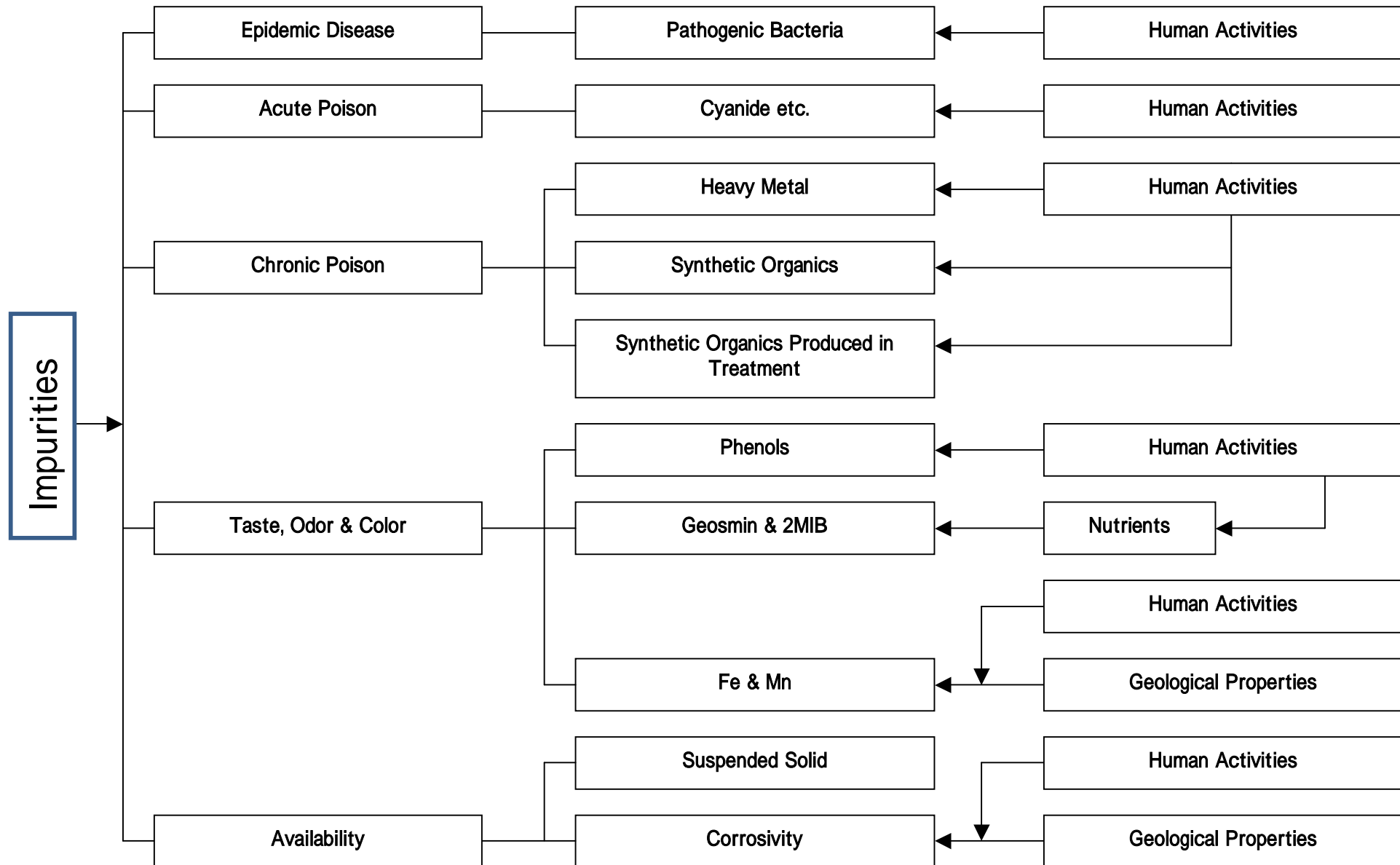


150 X10¹²m³ of fresh water resource/ a week

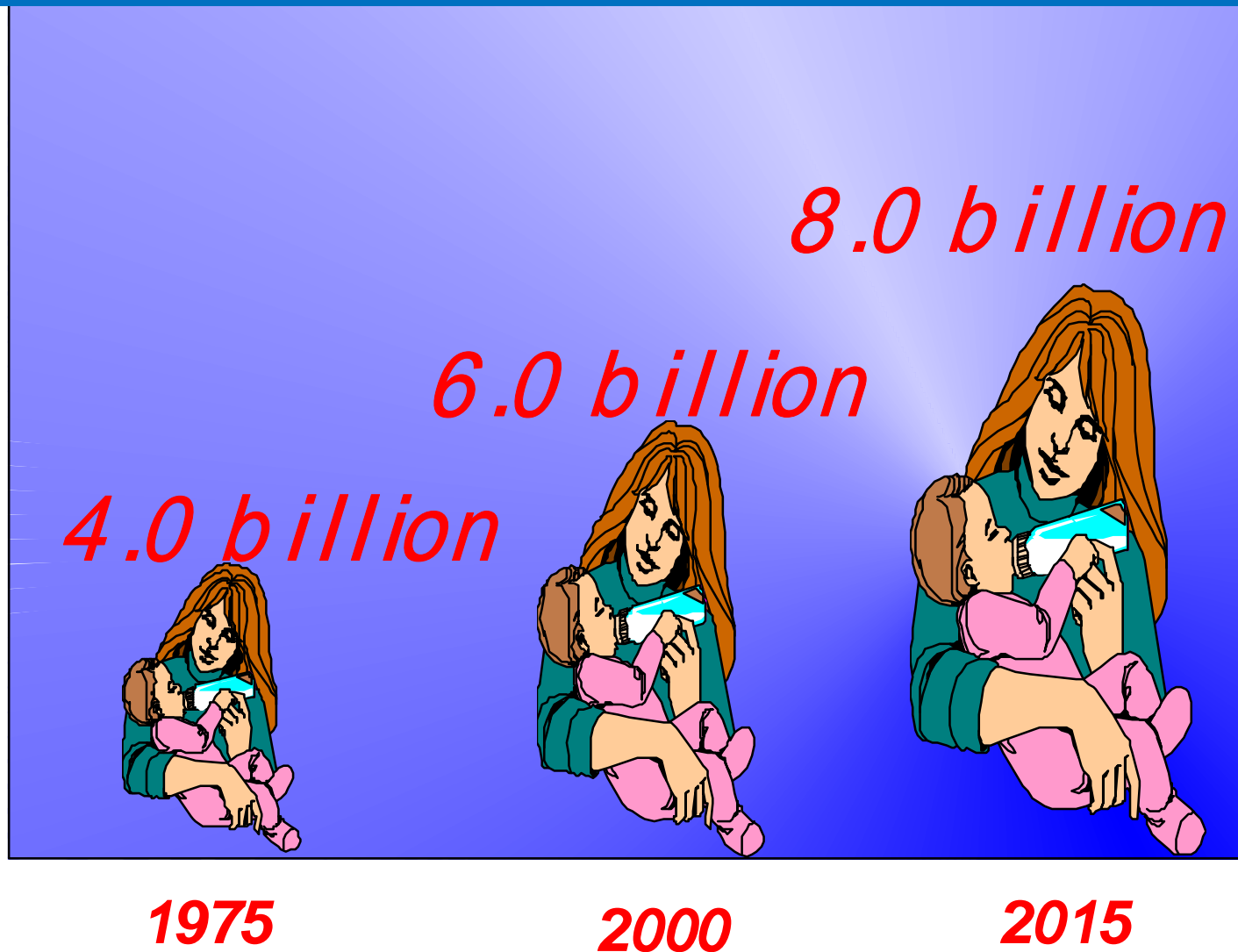
Surface fresh water is safe or not ?

- Rainwater captures pollutants during precipitation ,
flowing processes on ground surface.
- Groundwater is the most appropriate for water source,
since the pollutants are reduced by the soil, unless
some hazardous substances exist in the soil and
elude into the water.
- Most of the freshwater resources cannot be used
without treatment, or much worse,
- Most of them may even cause various health
damages including infectious diseases.

Impurities and their effects and sources in water

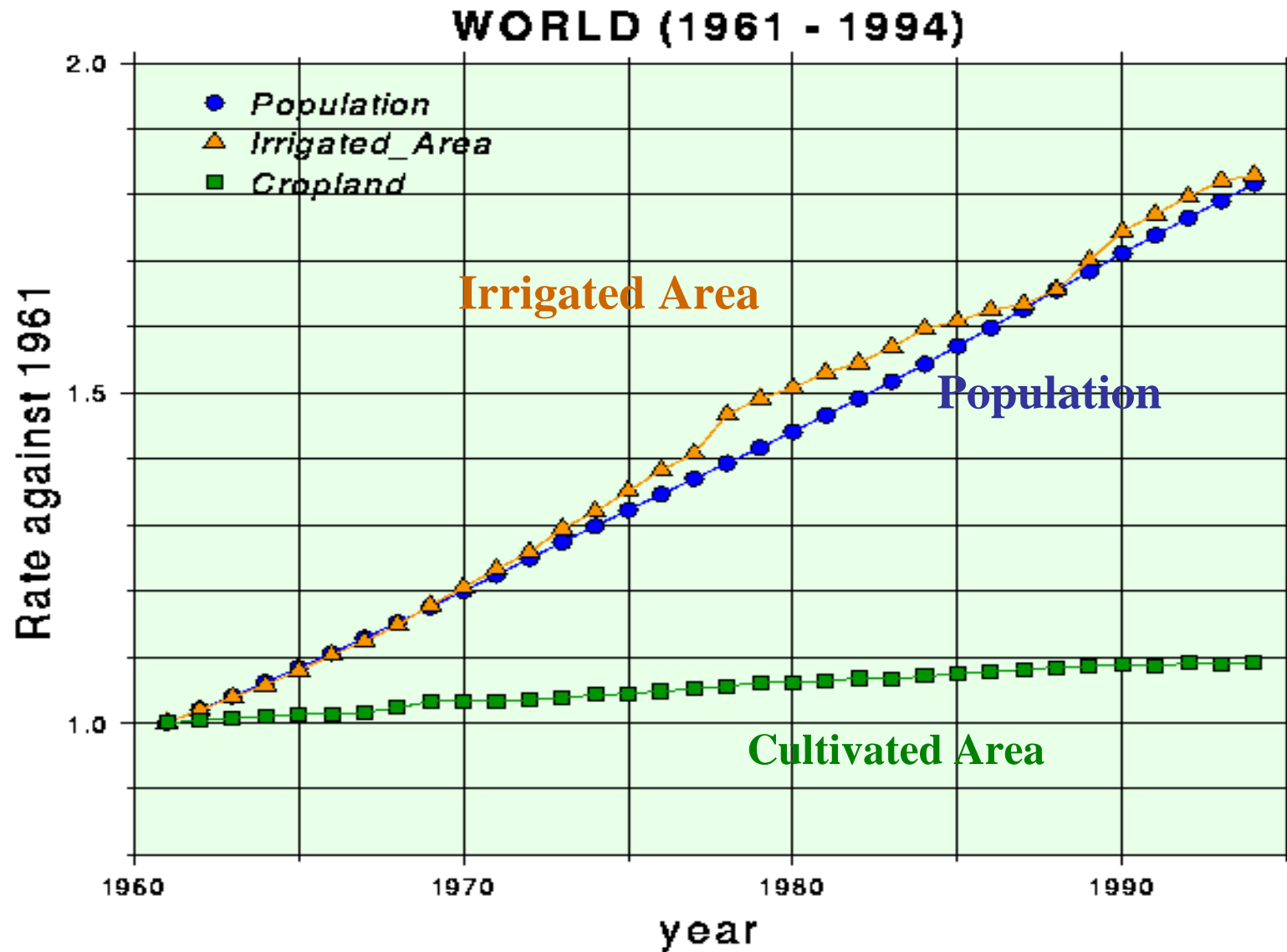


WORLD POPULATION



We must share $150 \times 10^{12} \text{m}^3$ of fresh water resource/ a week

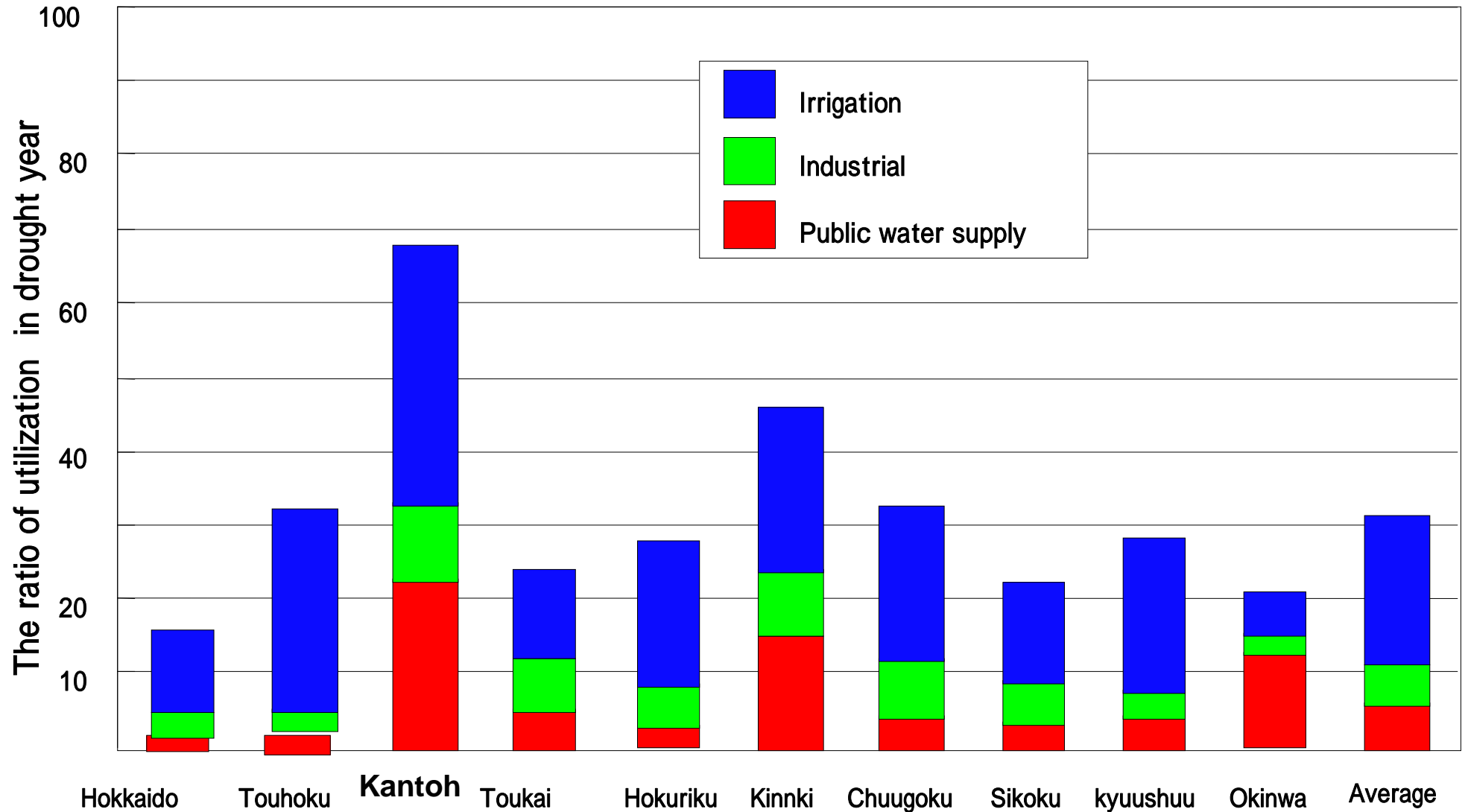
Demand of irrigation water



How much water resource ?

- Average consumption of water per person per day is 250 liters,
- Total consumption are about 90m³/year
- The used water becomes the treated water of BOD 20 mg L⁻¹ when it is treated by biological wastewater treatment process.
- In order to reduce the BOD to about 4 mg L⁻¹ for the maintenance of biological ecosystem in the aquatic environment, there must be about four times more water for dilution.
- In other words, in order to dilute the treated waste water it needs about four times the area required for daily water consumption, which is 360m³
- Total demand 450m³ cpy

Areal Distribution of water resource utilization



Water resource in China (m³/CpY)

Region	Beijing	Tianjin	Hebri	Henan	Shandong	Shanxi
Water	3 2 9	1 5 3	3 6 3	4 4 1	3 8 1	4 5 6

Water resource of Japan is about 1 5 0 0 m³/CpY

China is going to

- Allocate water resource at 2015
 - Agricultural 52%
 - Industrials 18%
 - Domestic 15%
 - Ecological 15%
- Development of water and waste-water facilities are national project
- But the level of performance should superior than global standard of conventional treatment facilities

Traditional Water Supply System in Large Cities



Population of Edo (Tokyo) : 1.3 million

Tamagawa water Supply System in Tokyo: $6\text{m}^3/\text{sec}$.

Transmission line (Open channels): 43Km

Gravity transmission and distribution system: 3700

Distribution wells in town

Never invaded of Cholera and Typhoid fever

Massive outbreak of Cholera in Japan: 1860,

41000 deaths in Edo

John Snow

- *Epidemiology & Environmental engineering*
- *Cholera was transmitted from Asia with trading activities*

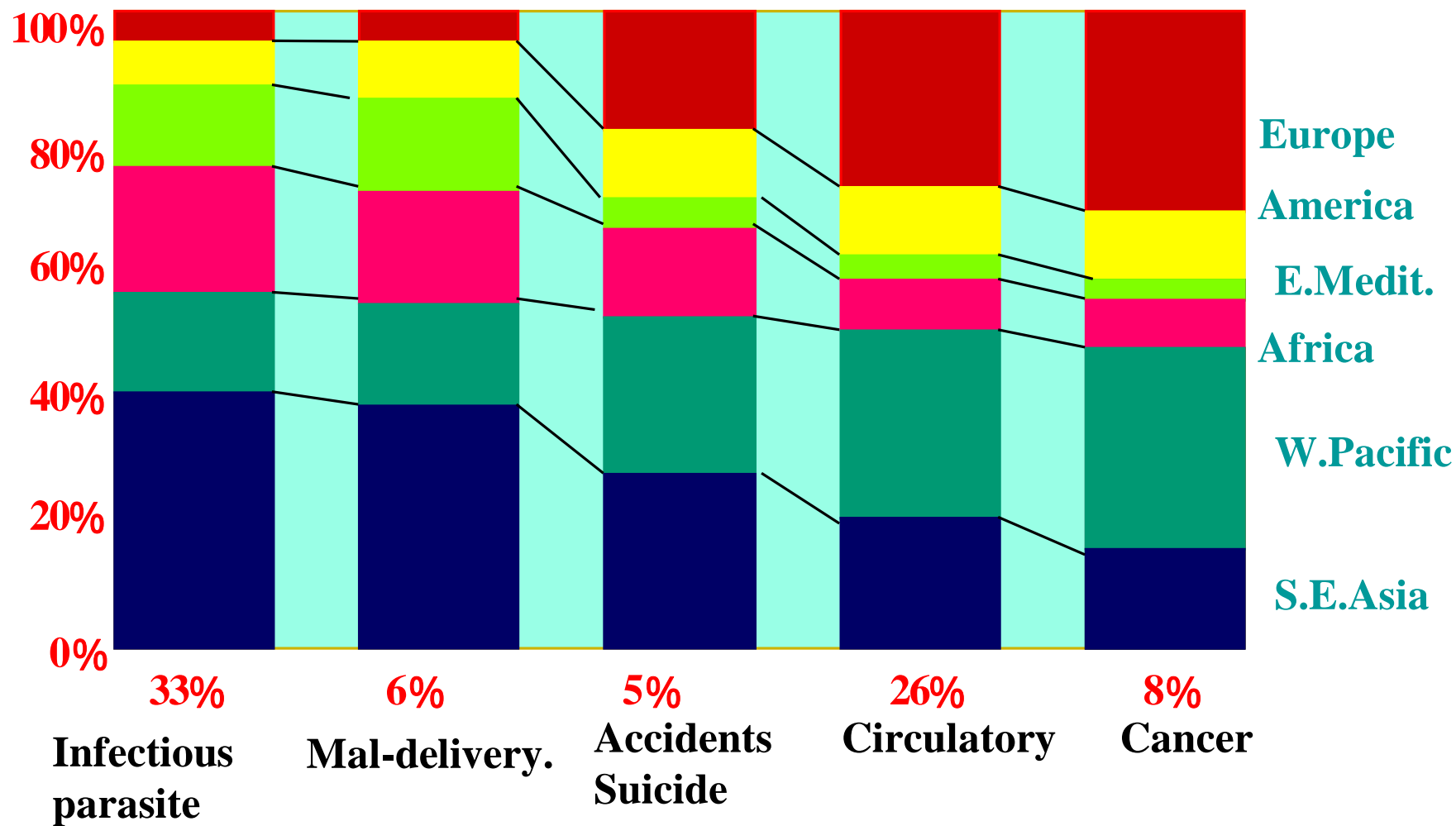
1855

Statistical verification

- ***Cholera and water treatment***

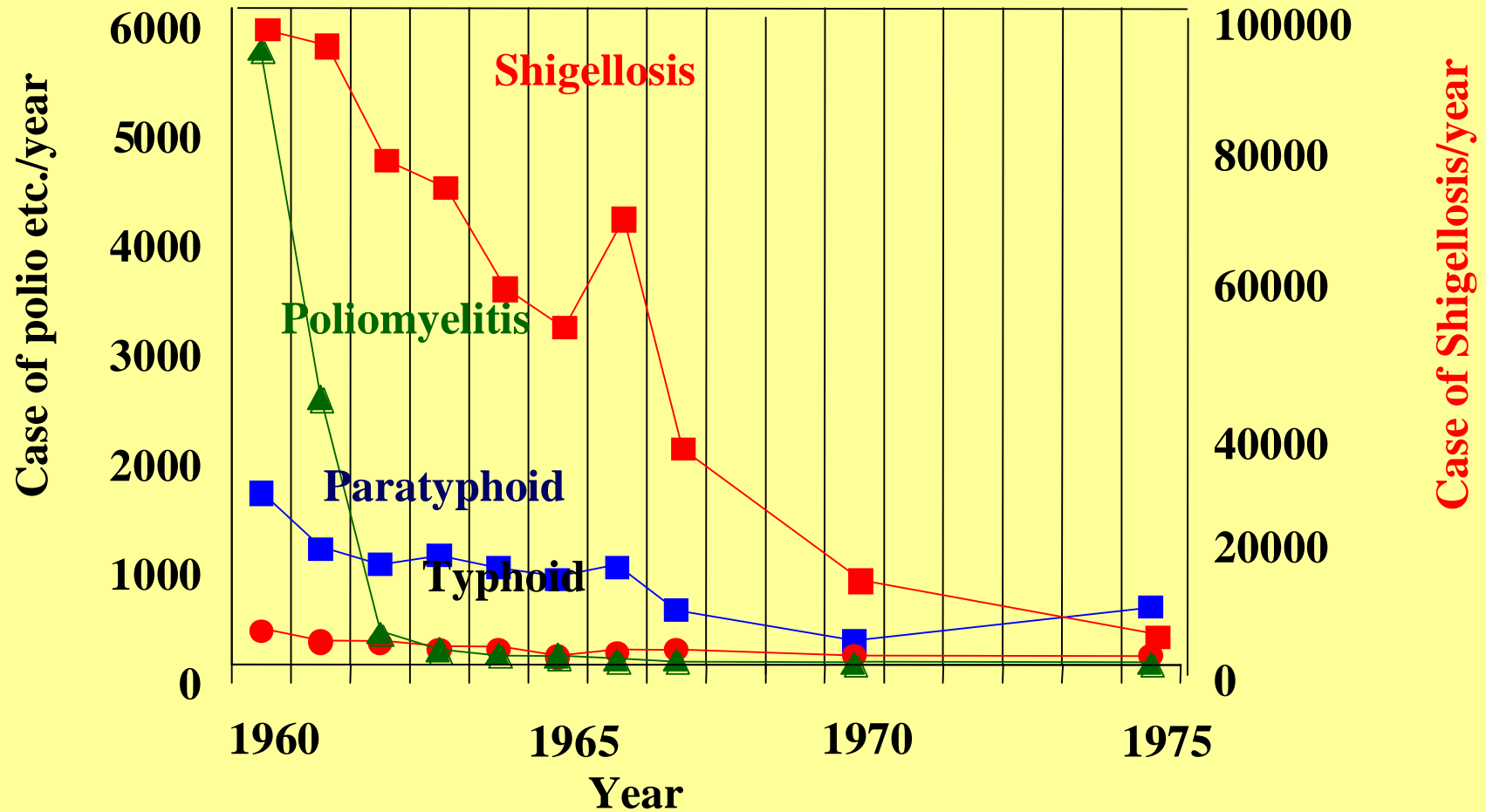


Regional differences of death of cause

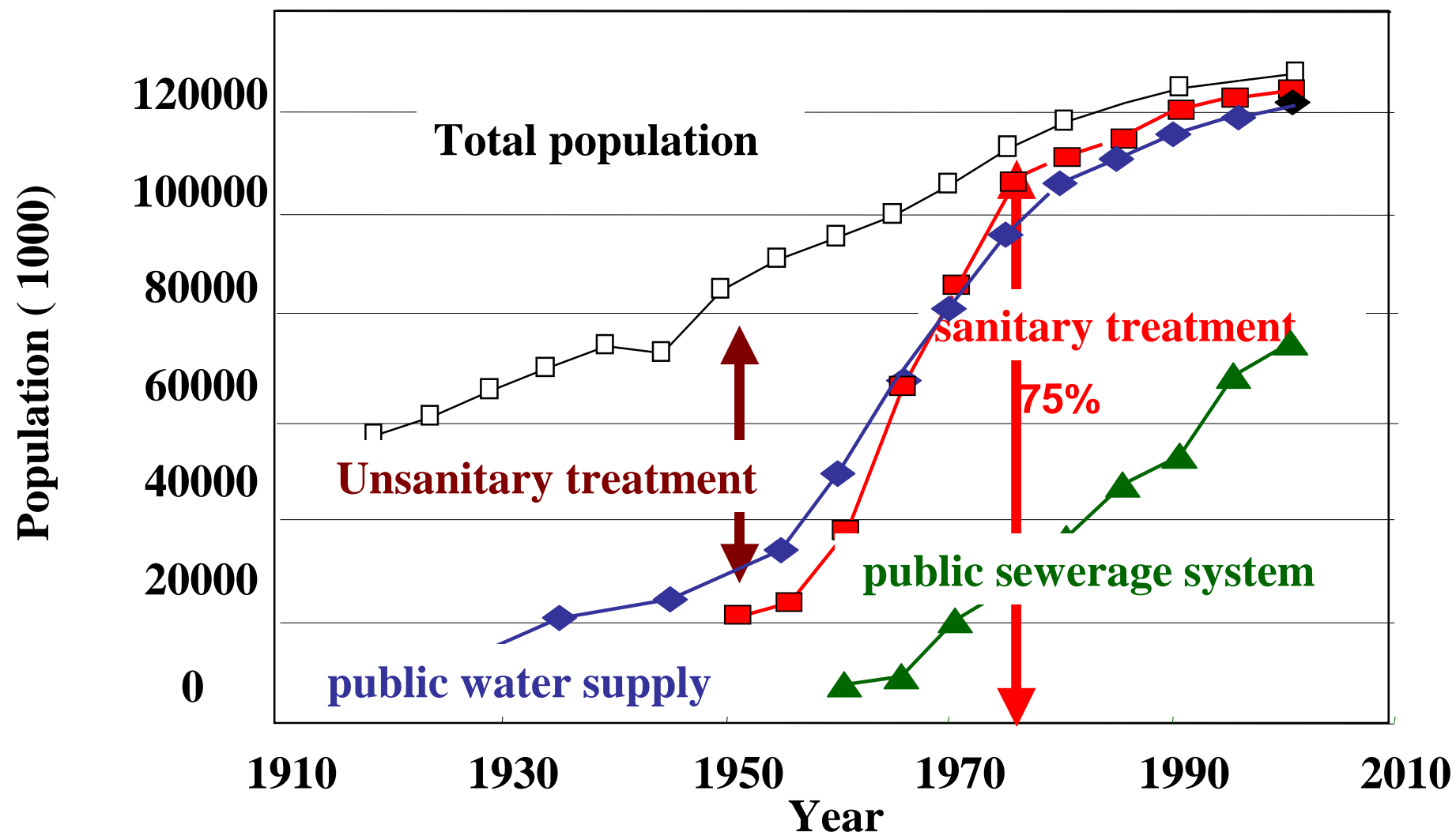


Feces - oral route infectious disease in 1960-1975

1960

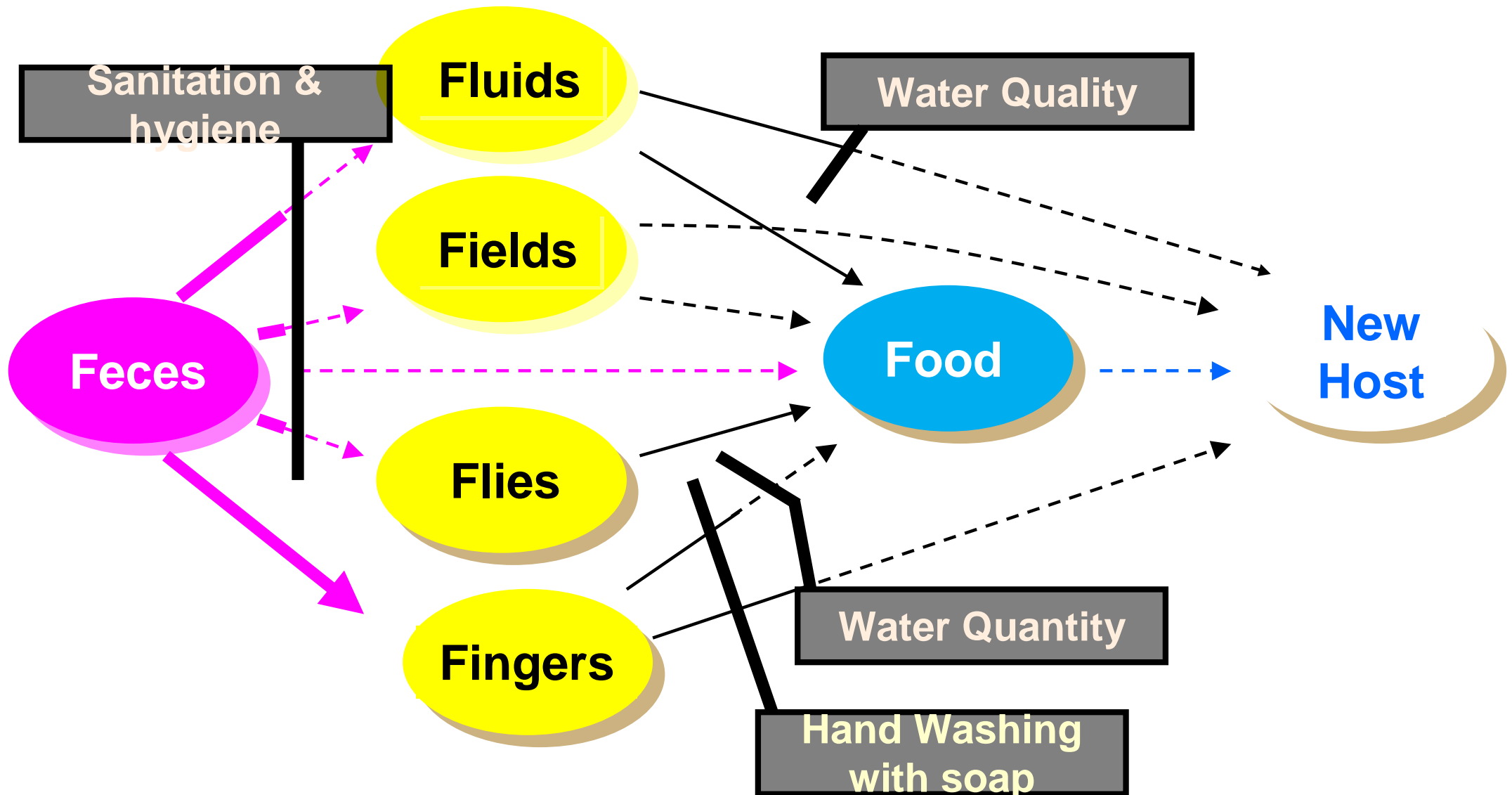


Development of water supply and sanitation



Reducing Exposure

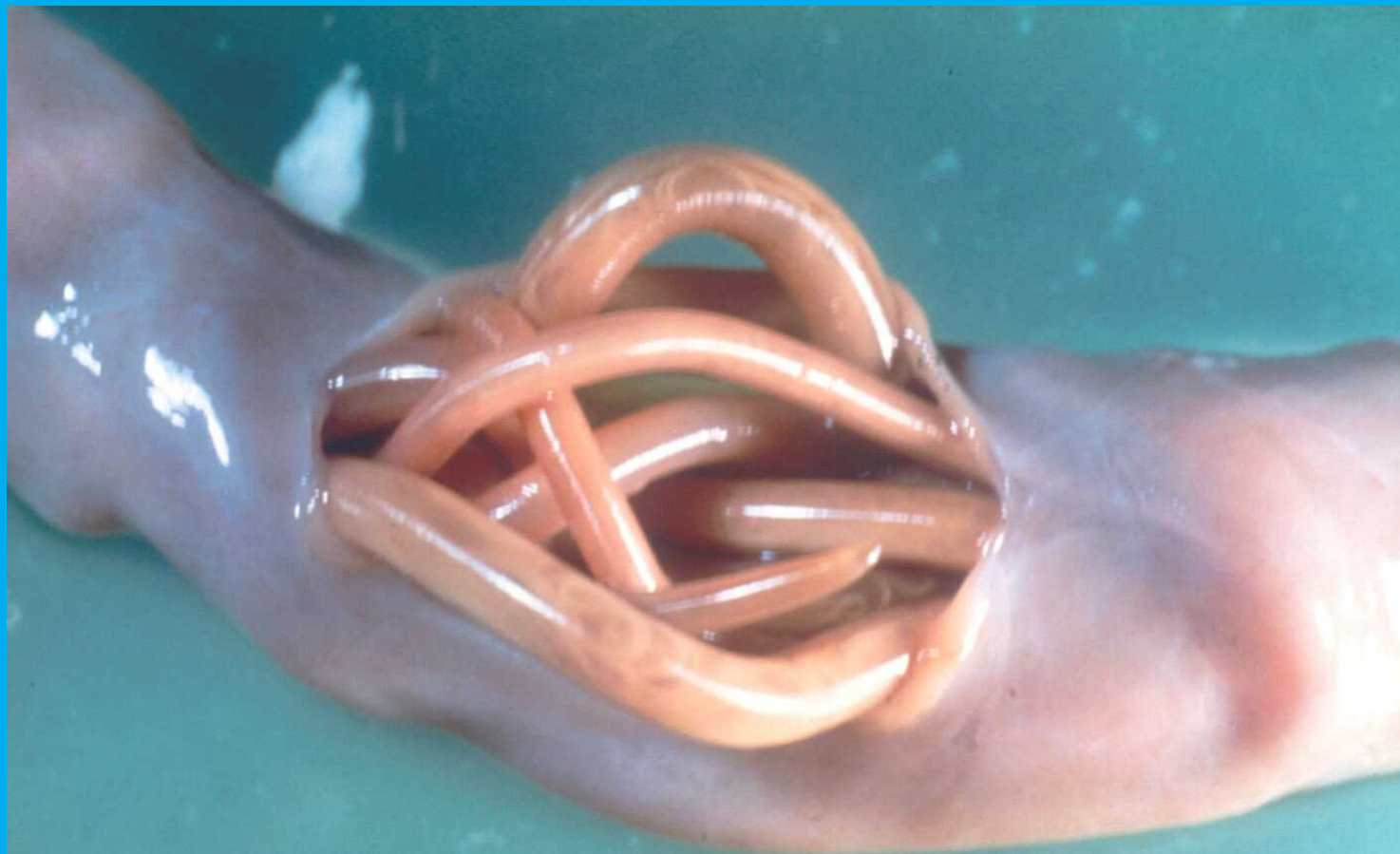
The F-Diagram



Sanitation

- Toilet should be facilitated to prevent the entry of hygienic insects and animals that carry the pathogens in the excreta, and it act as a barrier to release of parasitic worms or their eggs in the excreta into the surrounding environment. However, the role of toilets is lost unless the excreta are eventually removed from the pits or feces tanks.

Intestinal worms





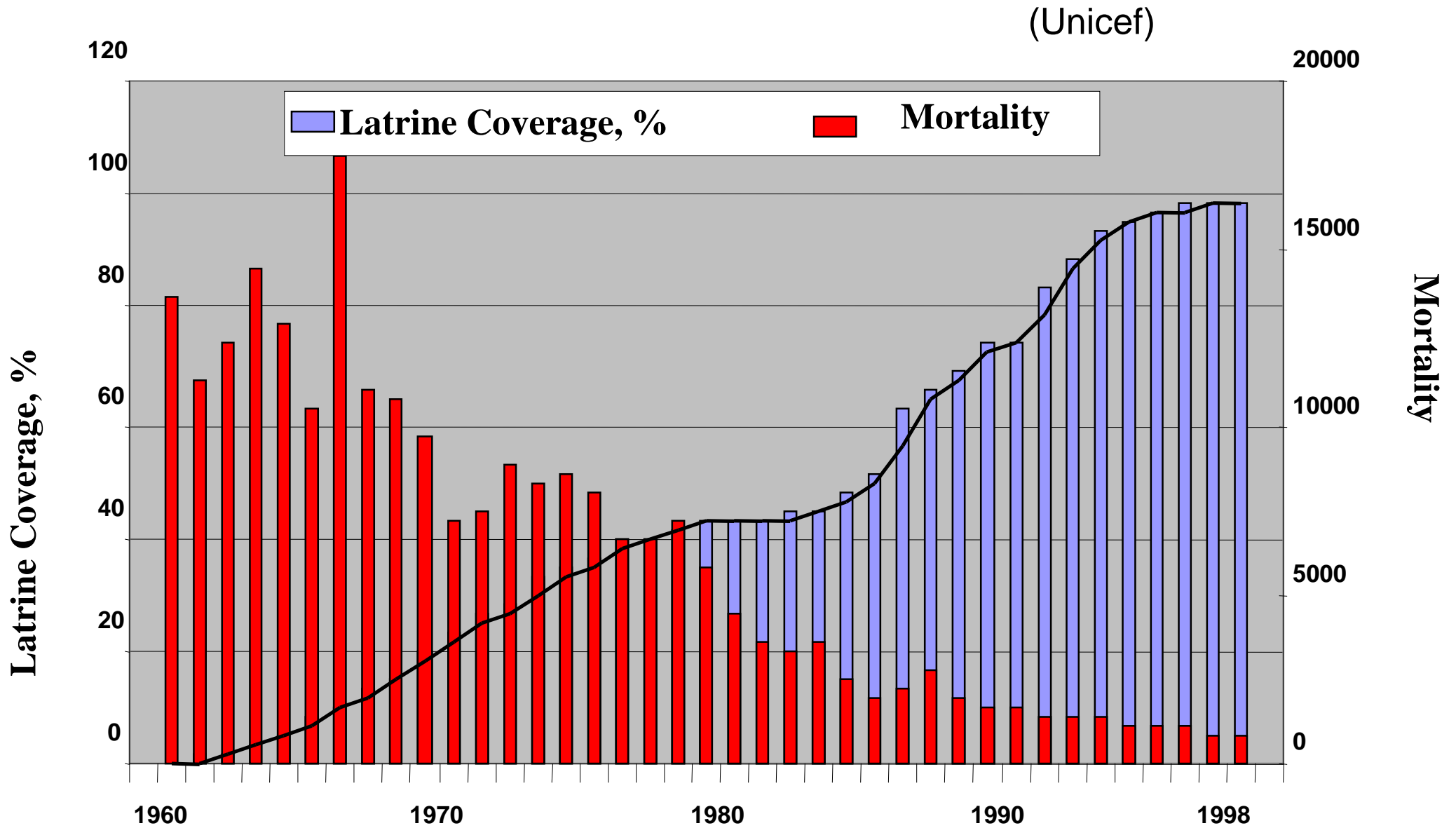
**Malnutrition &
stunting**

Lower IQ

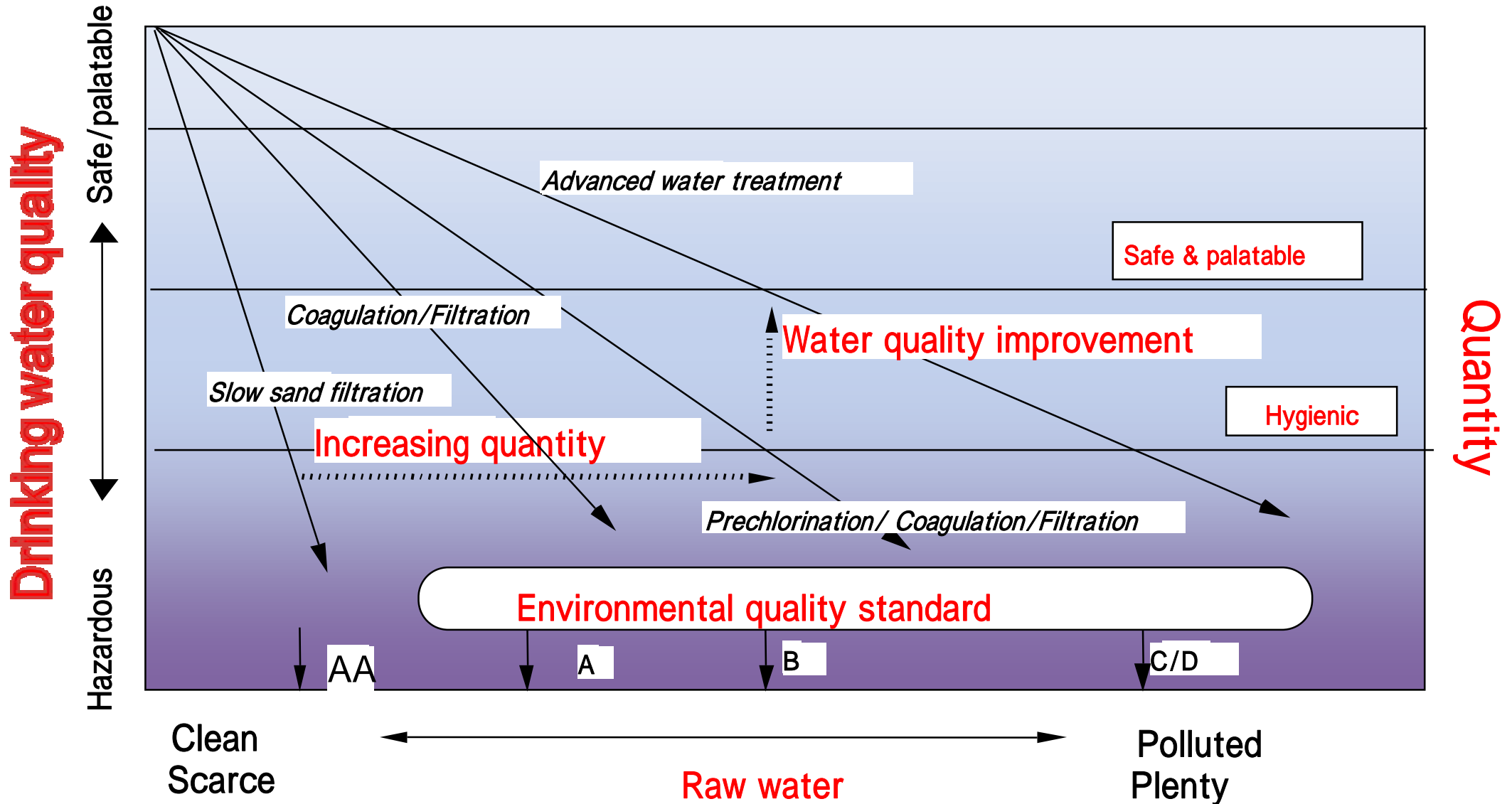
**Shorter body
height**

**Anemia -
contributing to
maternal
mortality**

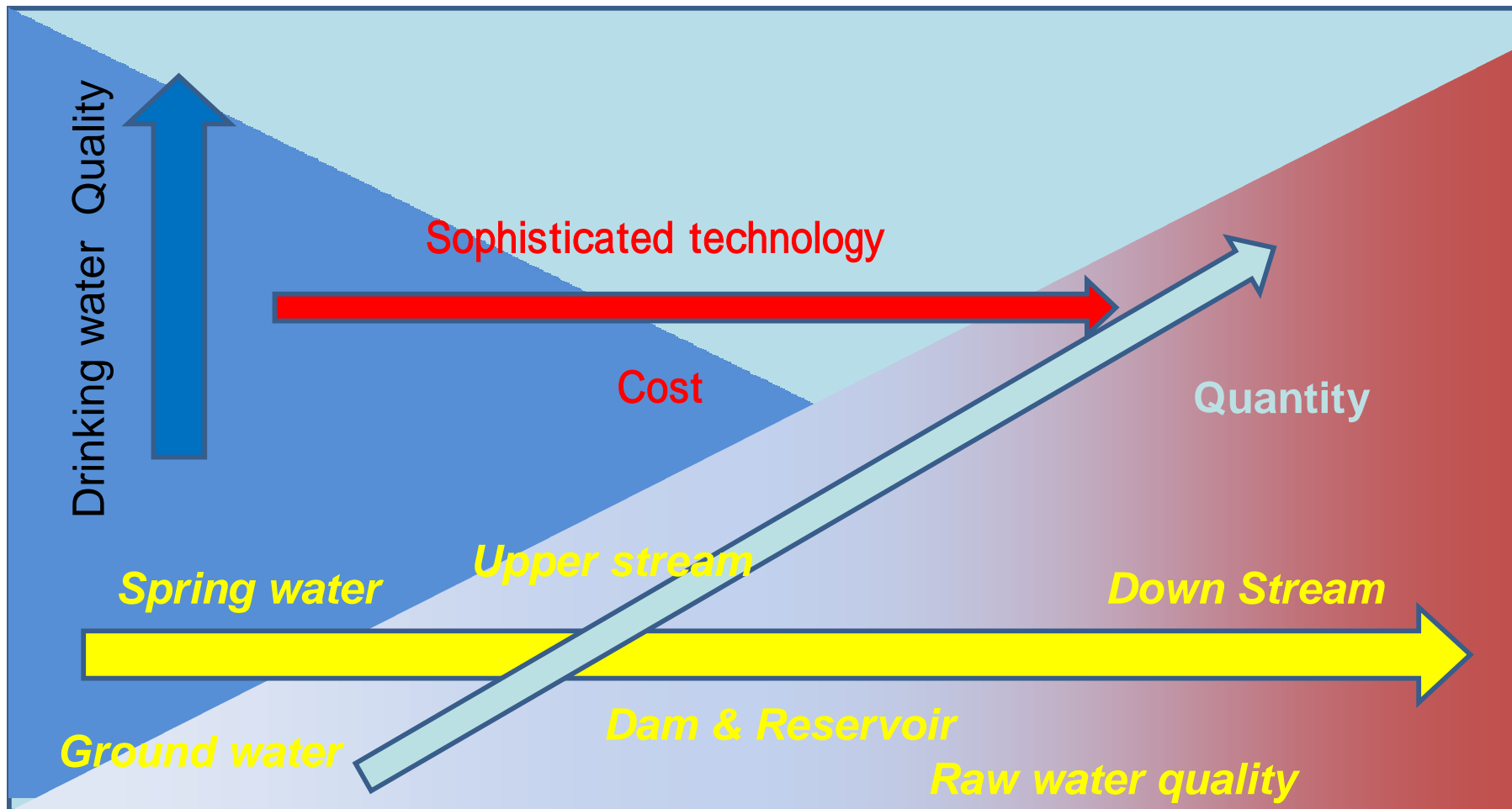
Universal Sanitation - Thailand



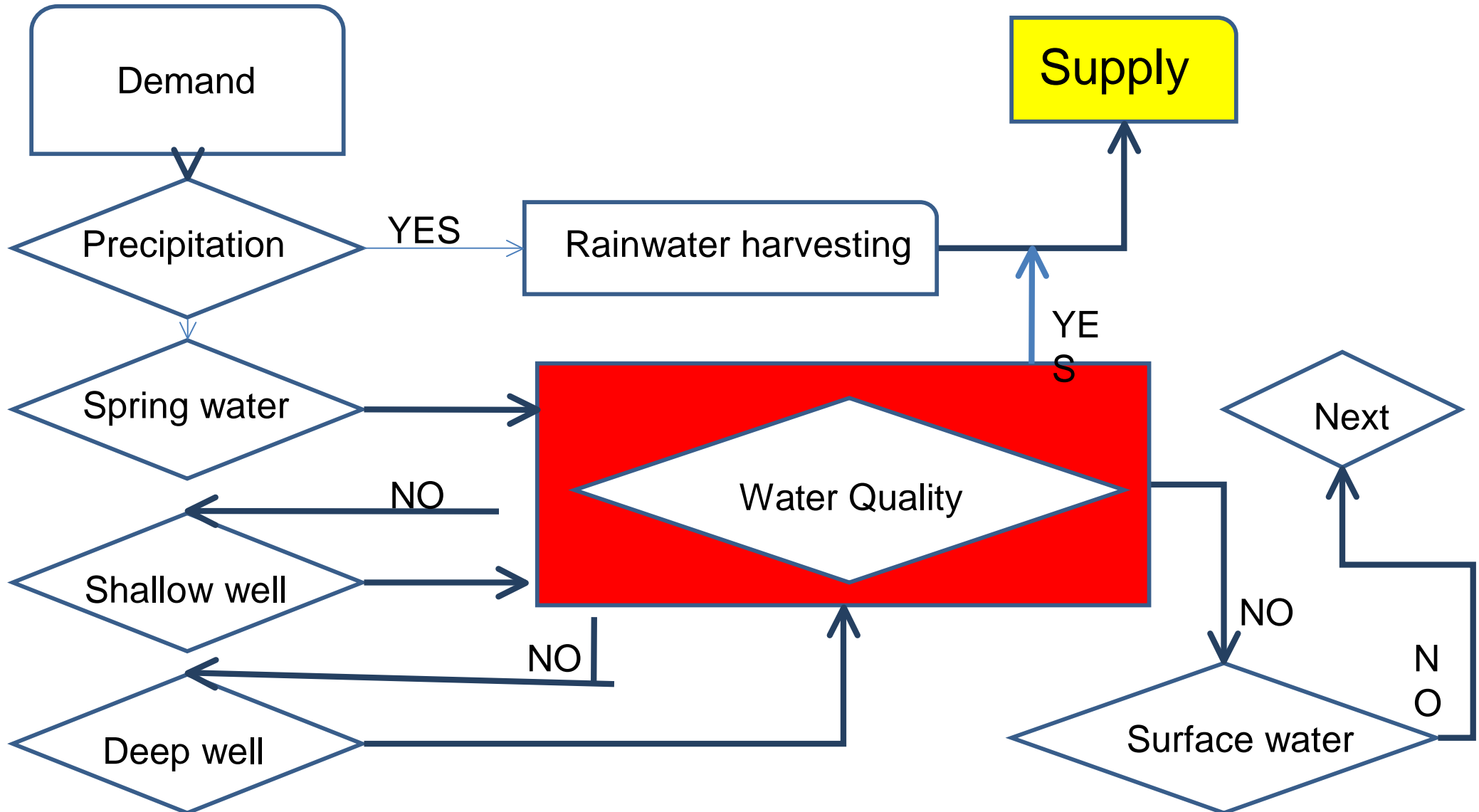
Water treatment system and water quality



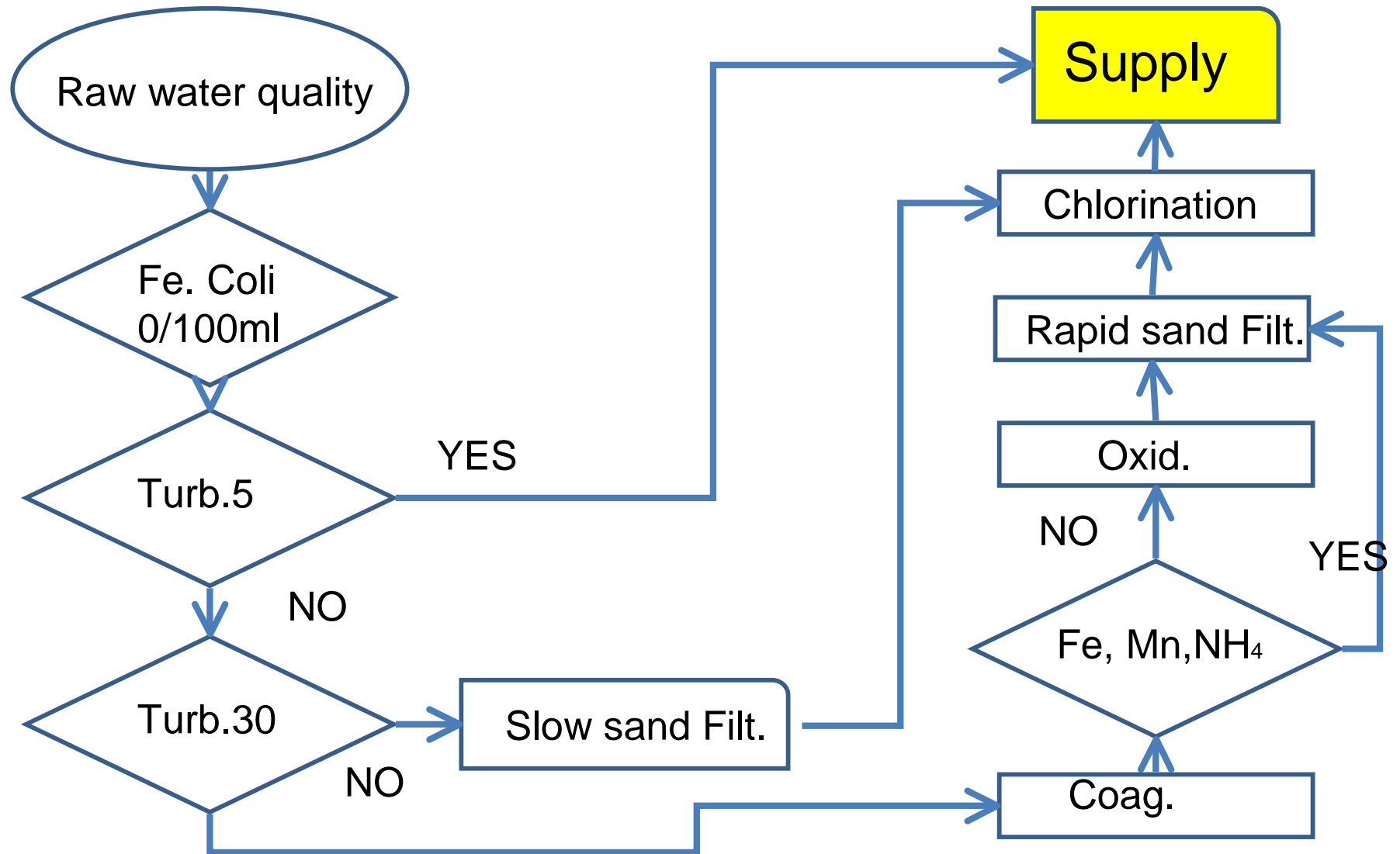
Selection of water purification technology



Cascadian Selection of water system



Selection of system for surface water





深圳市水务集团

SHENZHEN WATER (GROUP) CO.,LTD

深圳市分质供水有限公司

SHENZHEN HIGH QUALITY DRINKING WATER SUPPLY CO.,LTD

深圳市分质供水有限公司是深圳市水务集团的直属单位，专业从事管道直饮水、中水、污水、工业超纯水和节能技术的研究、设计、施工安装、运行管理及其科研、设备制造、检测、调试、验收等行业标准《管道直饮水系统技术规程》的主要编制单位。公司拥有资产8000余万元，专业技术和管理人员200余人。公司在设计、施工、设备制造和项目管理等方面积累了丰富的实践经验，拥有多项国家专利（专利号：ZL033225346、ZL033225338等），率先在国内推出管道直饮水健康饮水新概念，开发建设了60余项管道直饮水工程，30余项医院污水、生活污水、工业超纯水和变频加压节能工程（射流辅助变频加压供水技术、变频加压节能30%-50%），工程遍及全国15个省份。同时，公司代理美国著名品牌膜分离、臭氧消毒、紫外线消毒等系列产品，承接市政污水工程、工业废水处理、还湖、升压等公共饮水系统工程。产品广泛应用于广场、公园、学校、机关等公共场所。

管道直饮水部分业绩

序号	工程名称	建设单位	建筑面积
1	深圳市委	深圳市委	10000㎡
2	深圳市委	深圳市委	10000㎡
3	深圳市委	深圳市委	10000㎡
4	广东国际广场	华城地产	住宅(400套)
5	麒麟山庄	深圳市祥源地产	别墅(400套)
6	莲花山	深圳华侨城地产	住宅(4000套)
7	前山村	深圳住宅公司	住宅(2000套)
8	广佛铁路车场	广佛铁路	住宅(1万套)
9	中山康乐社	普康基金会	住宅(2500套)
10	香港银行中心	深圳市文化局	办公楼
11	上海浦东大厦	德隆集团	办公楼
12	西乡医院	西乡医院	住宅(2000套)
13	天悦花园	深圳市富源地产	住宅(1000套)
14	阳光花园	神州悦美置业地产	住宅(1000套)
15	深圳公共图书馆	深圳公共图书馆	图书馆
16	深圳公共图书馆	深圳公共图书馆	图书馆
17	深圳公共图书馆	深圳公共图书馆	图书馆
18	深圳公共图书馆	深圳公共图书馆	图书馆
19	深圳公共图书馆	深圳公共图书馆	图书馆
20	深圳公共图书馆	深圳公共图书馆	图书馆
21	山东省委党校	山东省委党校	住宅(1500套)
22	山东省委党校	山东省委党校	住宅(1500套)
23	山东省委党校	山东省委党校	住宅(1500套)
24	山东省委党校	山东省委党校	住宅(1500套)
25	山东省委党校	山东省委党校	住宅(1500套)
26	山东省委党校	山东省委党校	住宅(1500套)
27	山东省委党校	山东省委党校	住宅(1500套)
28	山东省委党校	山东省委党校	住宅(1500套)
29	山东省委党校	山东省委党校	住宅(1500套)
30	山东省委党校	山东省委党校	住宅(1500套)

生活污水及医院污水部分业绩

序号	工程名称	建设单位	处理能力
1	深圳市委	深圳市委	10000㎡
2	深圳市委	深圳市委	10000㎡
3	深圳市委	深圳市委	10000㎡
4	虹口人民医院污水处理工程	深圳市虹口人民医院	1000吨/天
5	南山医院污水处理工程	深圳市南山医院	6000吨/天
6	福田中医院污水处理	深圳市福田区医院	1000吨/天
7	罗湖医院污水处理	深圳市罗湖区	1000吨/天

- 管道直饮水
- 中水·生活污水·医院污水
- 工业废水·超纯水
- 变频加压节能技术

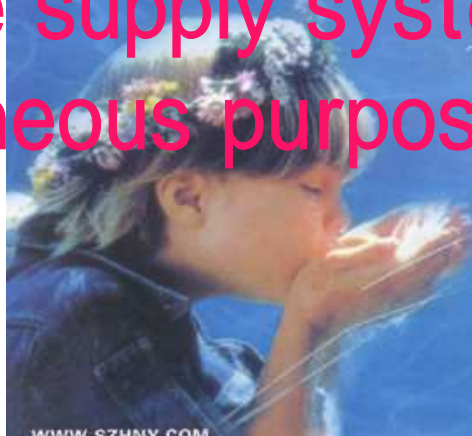


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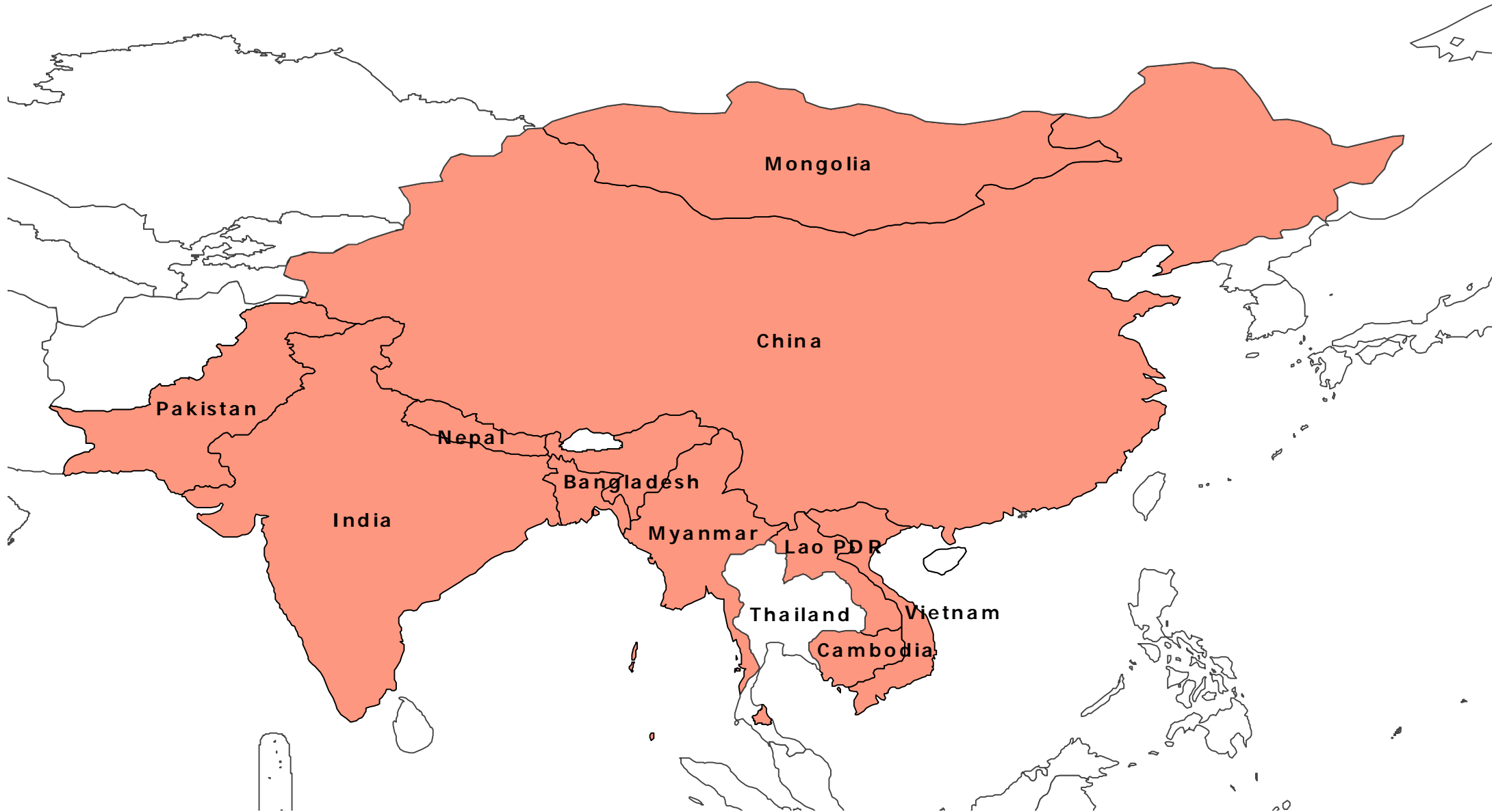
公司地址：深圳市南山区麒麟路水务集团南山大楼9F 电话：(0755) 2651 0999 26510966 传真：(0755) 26510822

Direct drinkable water service

- Decentralized water service system
- Membrane (RO,NF,UF,MF) filtration unit produce 20% drinkable water from distributed piped water
- Separate supply system for drinkable water and miscellaneous purpose water



Arsenic affected countries in Asia





Est. 200 million already affected
Population at risk - not known
Damage to health - irreversible and untreatable

- Arsenic contamination -
- *“An emerging public health problem”*



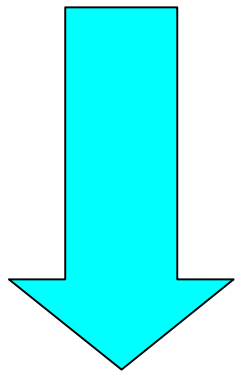
Arsenic

- Toxic and carcinogenic
- Known poison for >4000 years
- Acute poisoning symptoms occur within 30 min. of ingesting lethal dose
- Arsenic toxicity in drinking water & Environment
 - Chronic in nature
 - Takes 5-20 years to develop symptoms
 - Symptoms found in infants in China, India & Thailand (possible transfer from mother to child?)

Bangladesh

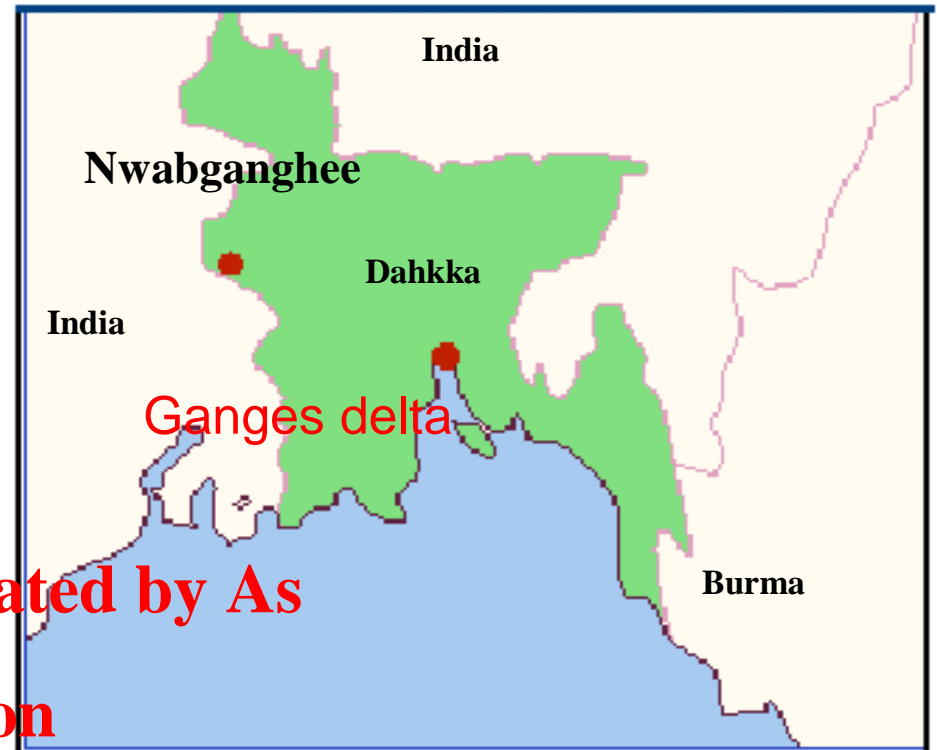
· ~ 1970 water source was surface water & Shallow dug well

High mortality rate especially in infants and children by water related infectious diseases



Many tube well have developed

Decreasing infant & child mortality



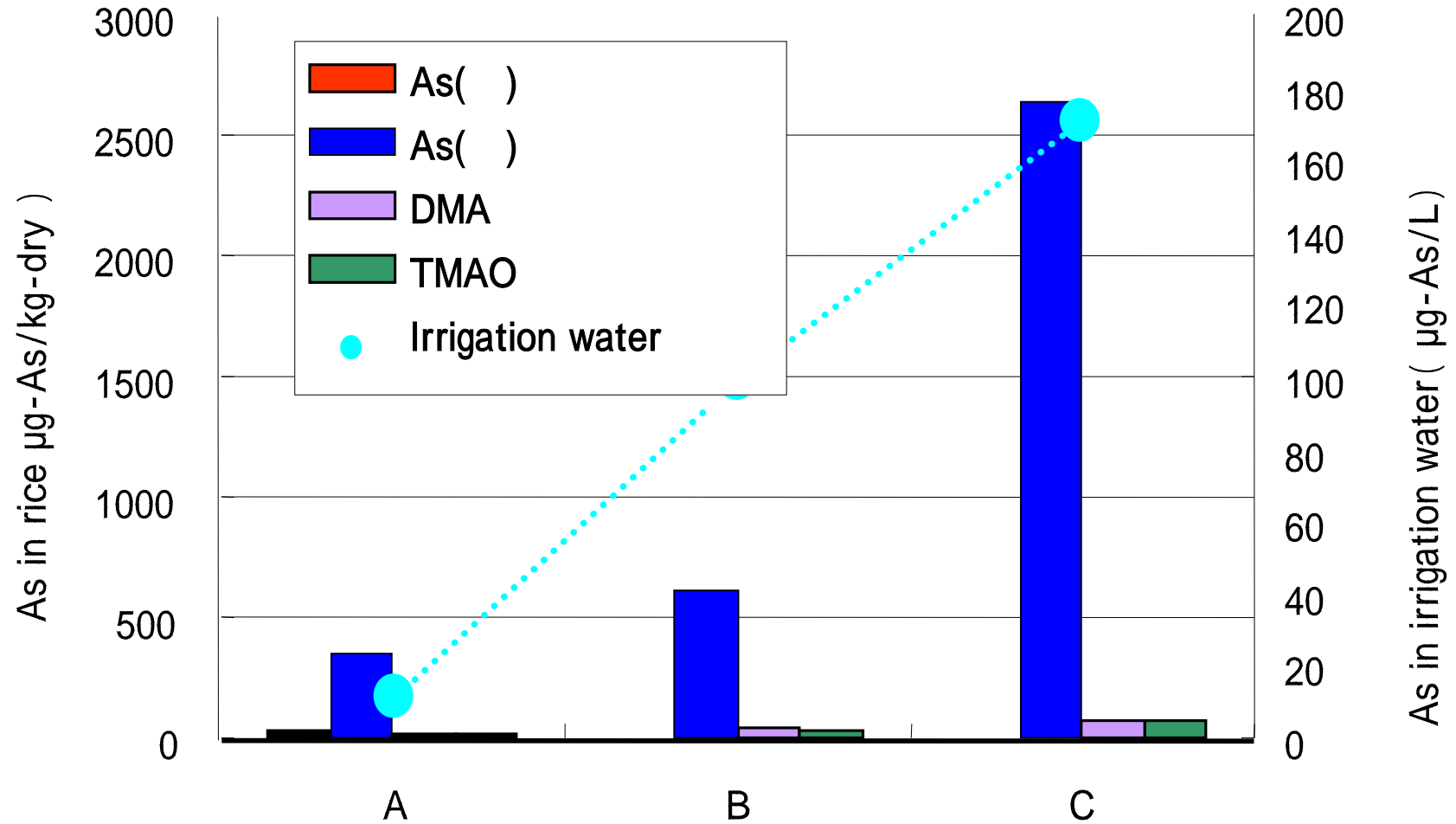
· **In 1990 Ground water were contaminated by As**

Excessive use of ground water irrigattion

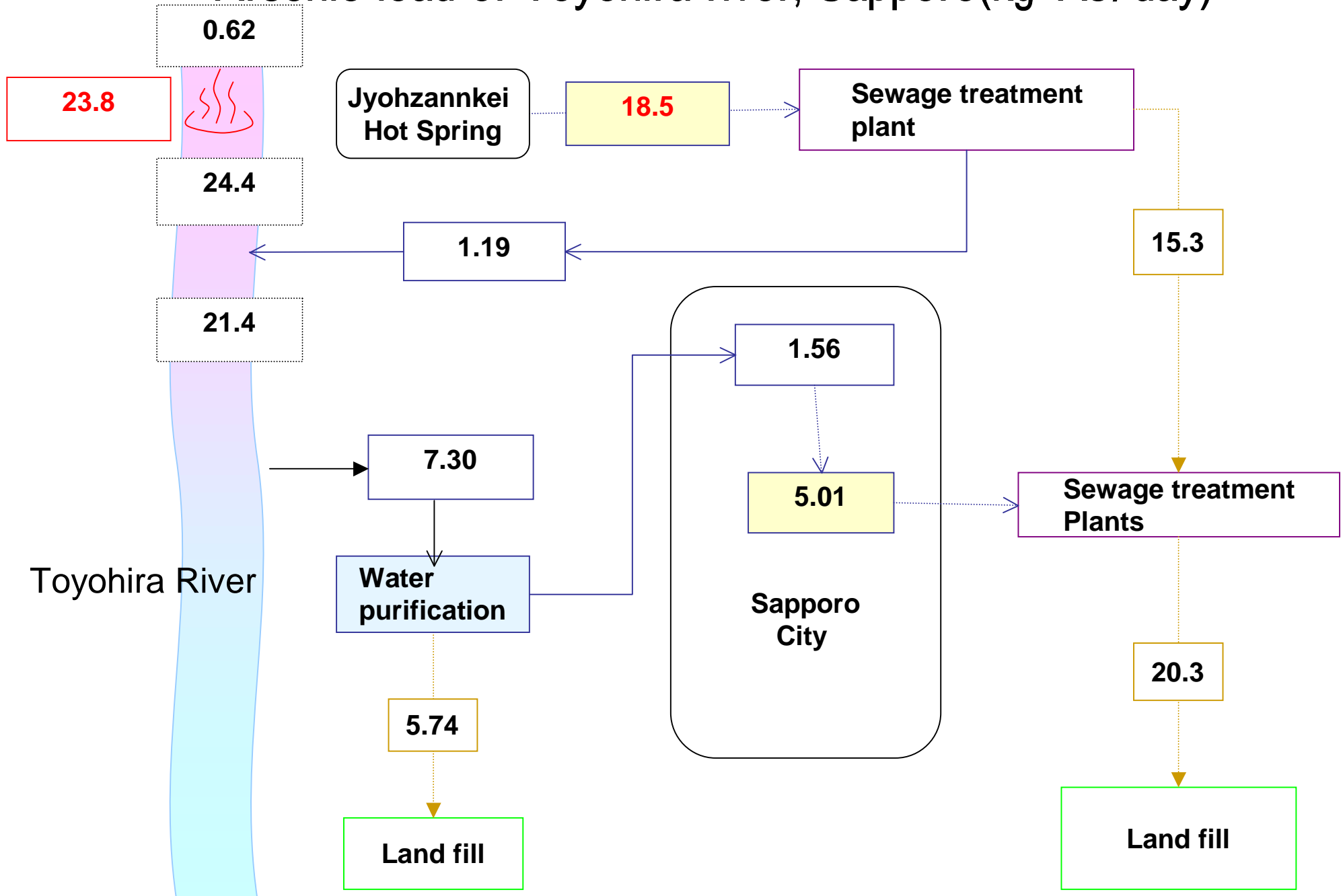
Tubewell & Dugwell



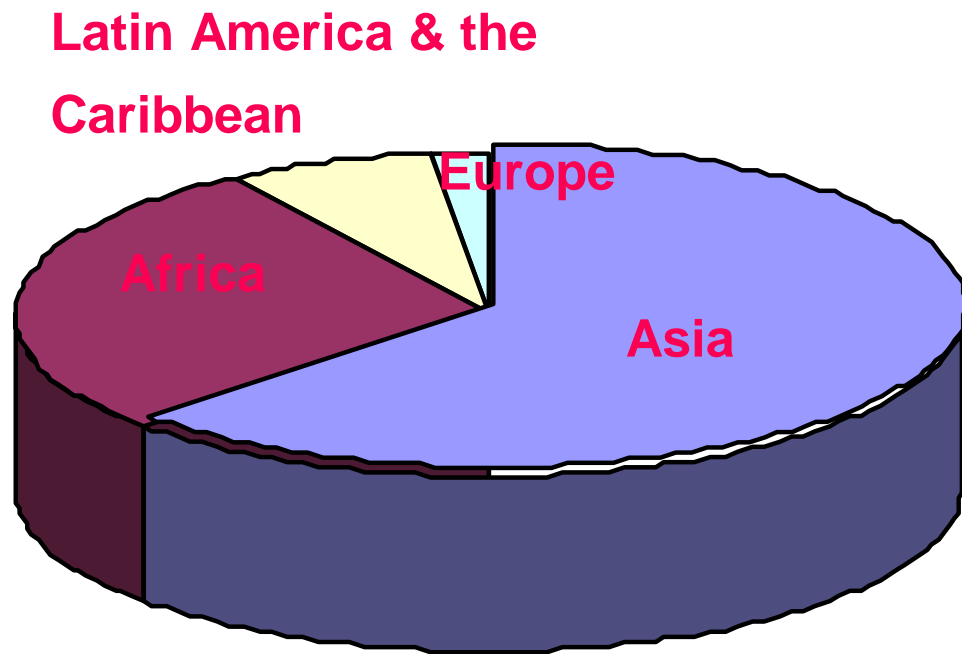
As concentration and rice



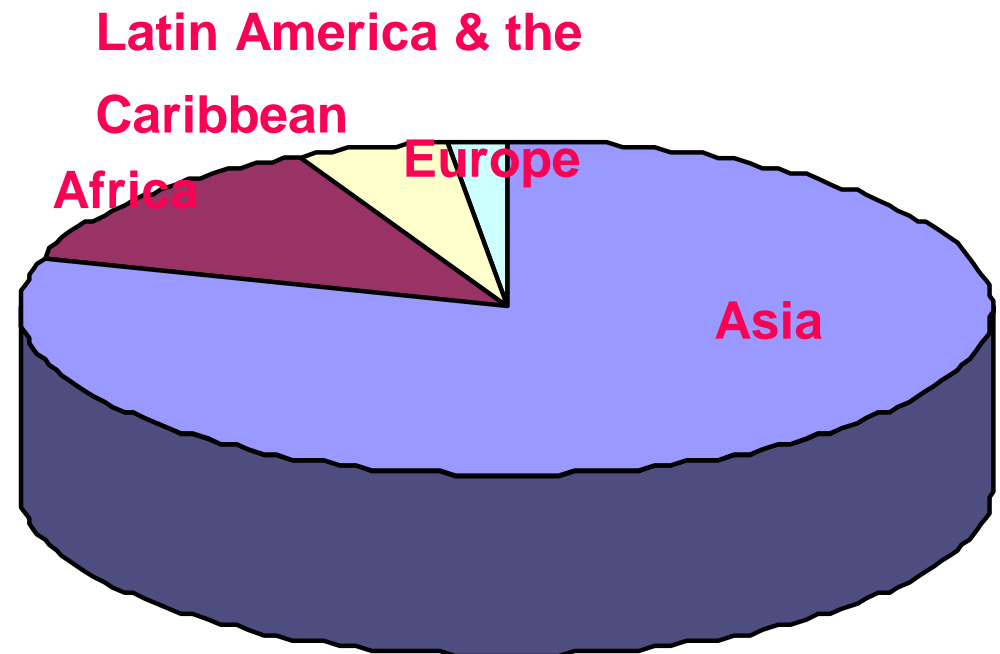
Arsenic load of Toyohira river, Sapporo(kg-As/day)



What are the constraints for safety water and Sanitation

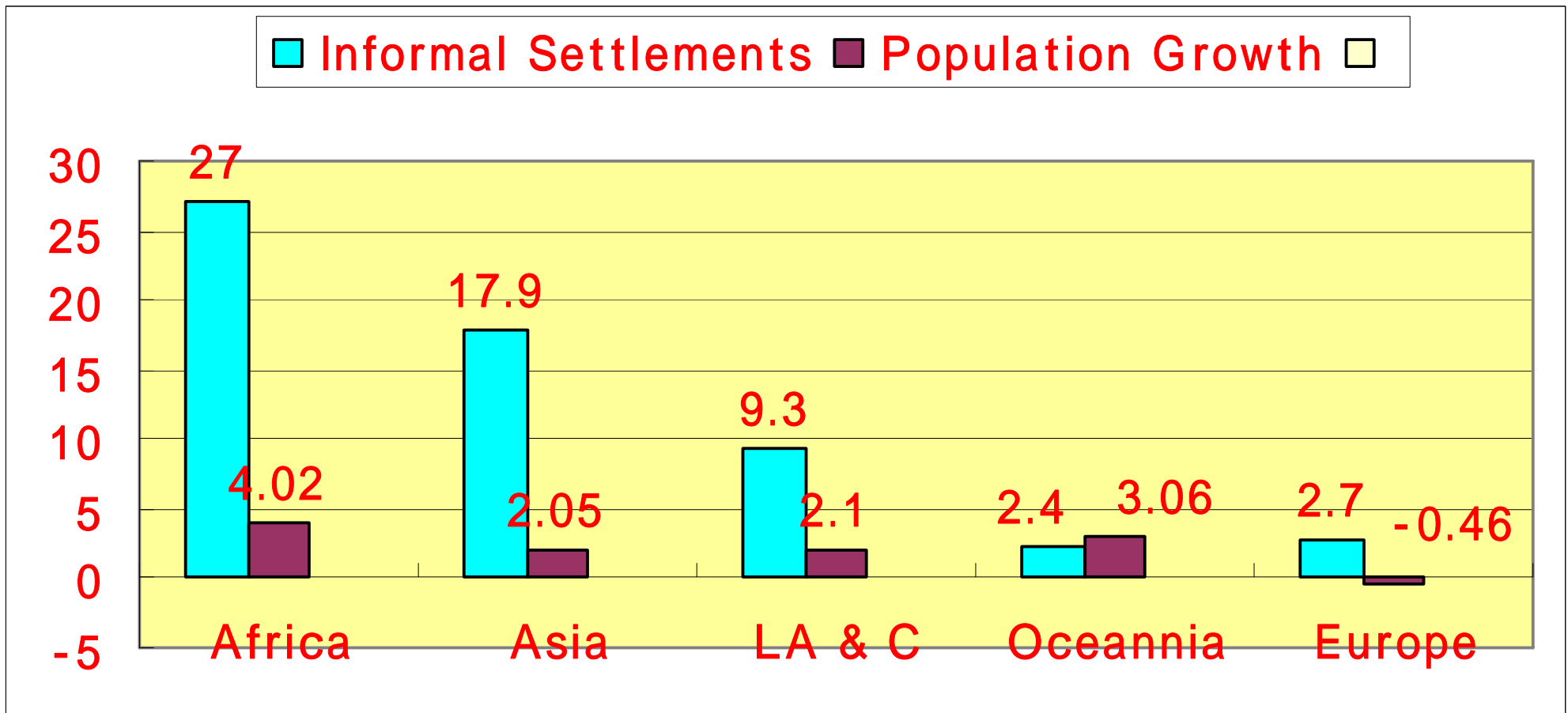


Water Supply
1.1 billion

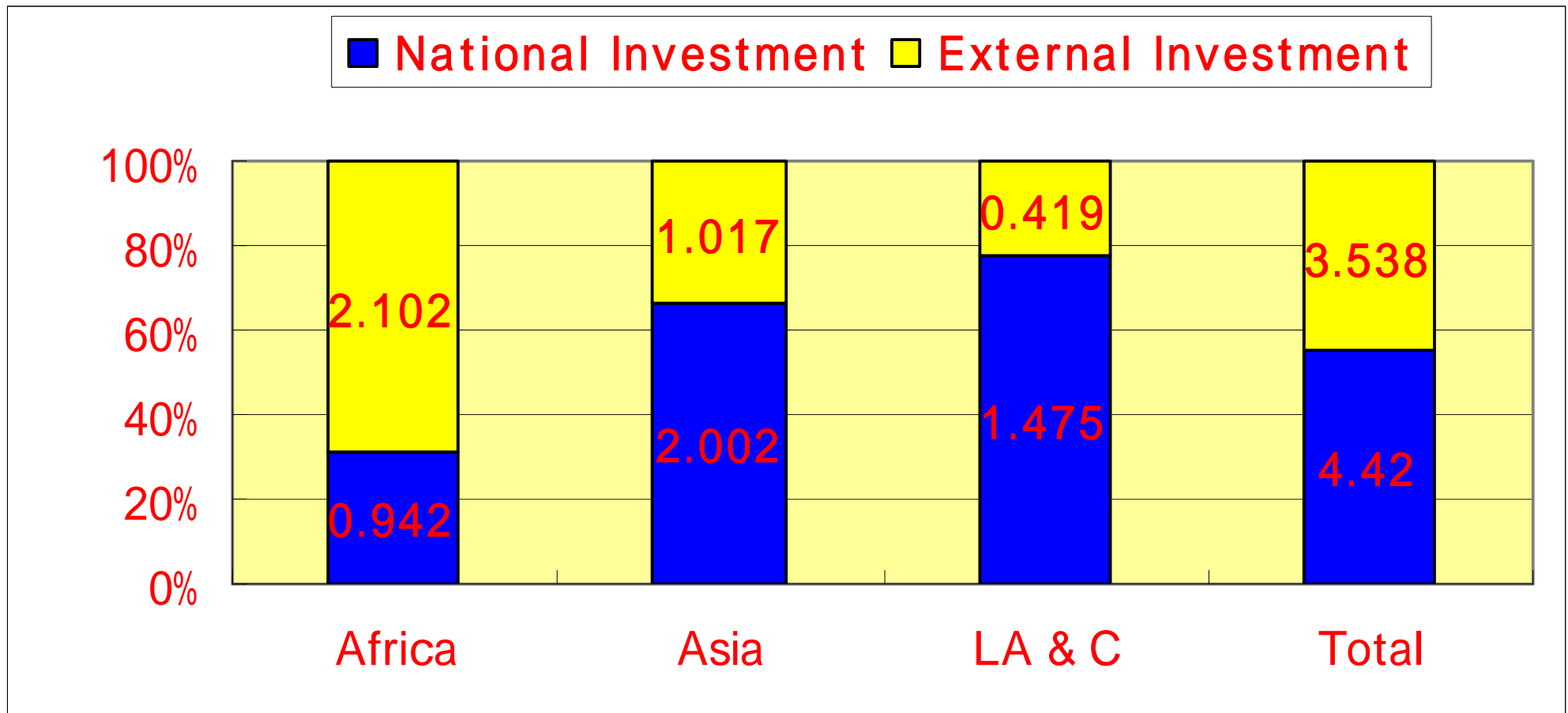


Sanitation
2.4 billion

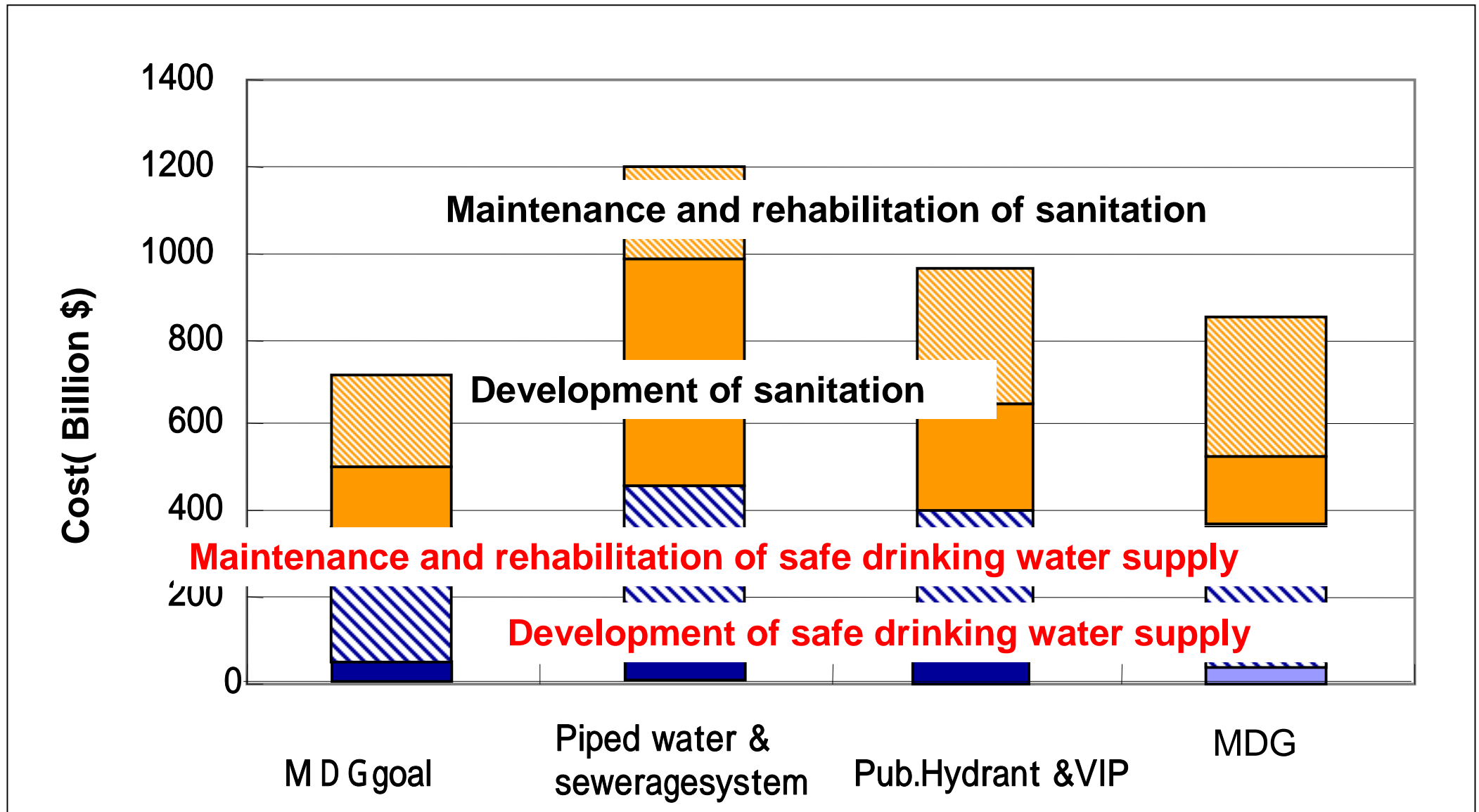
Population growth rates and proportion on informal settlements in urban area



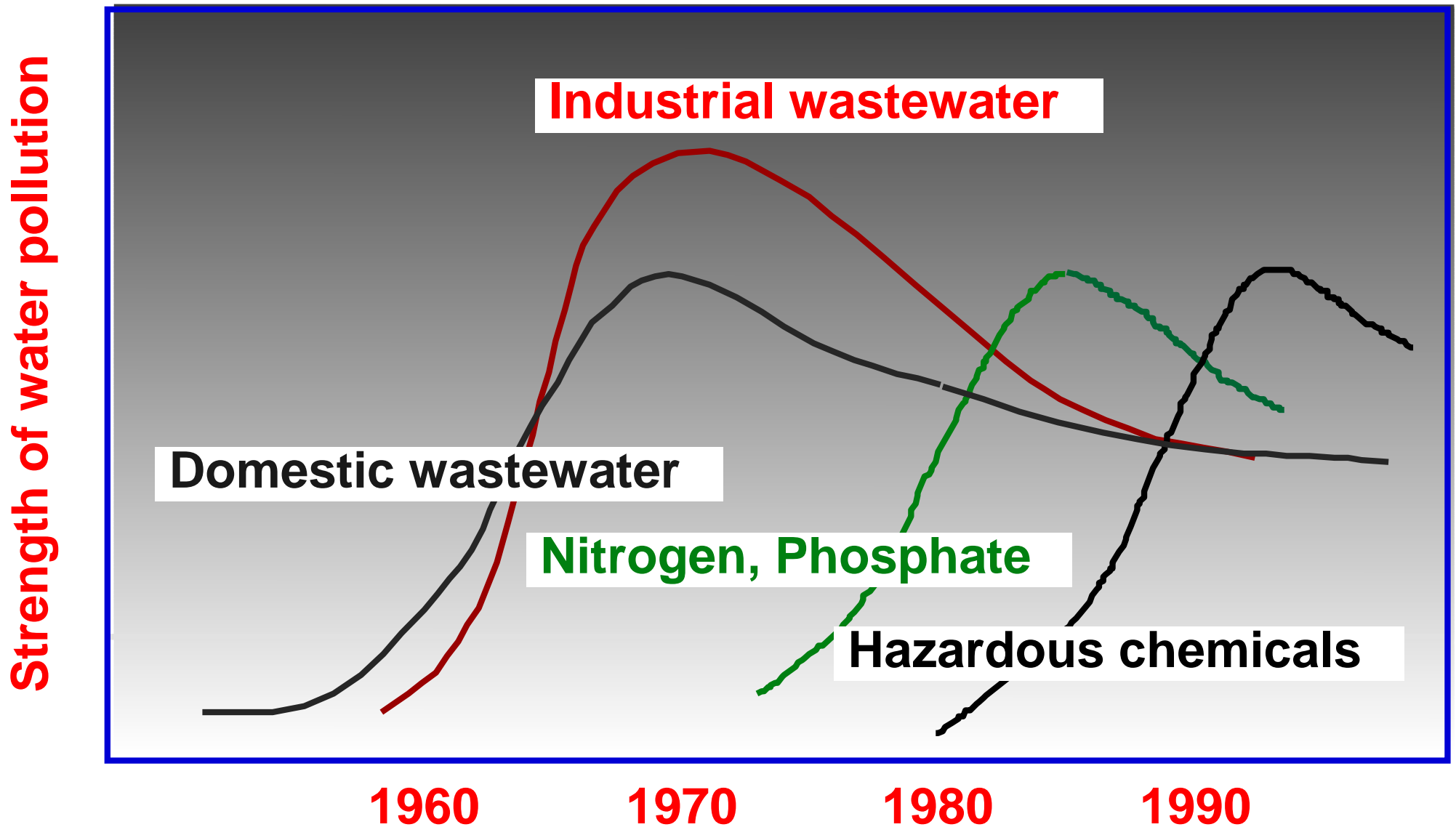
Annual investment in urban water supply



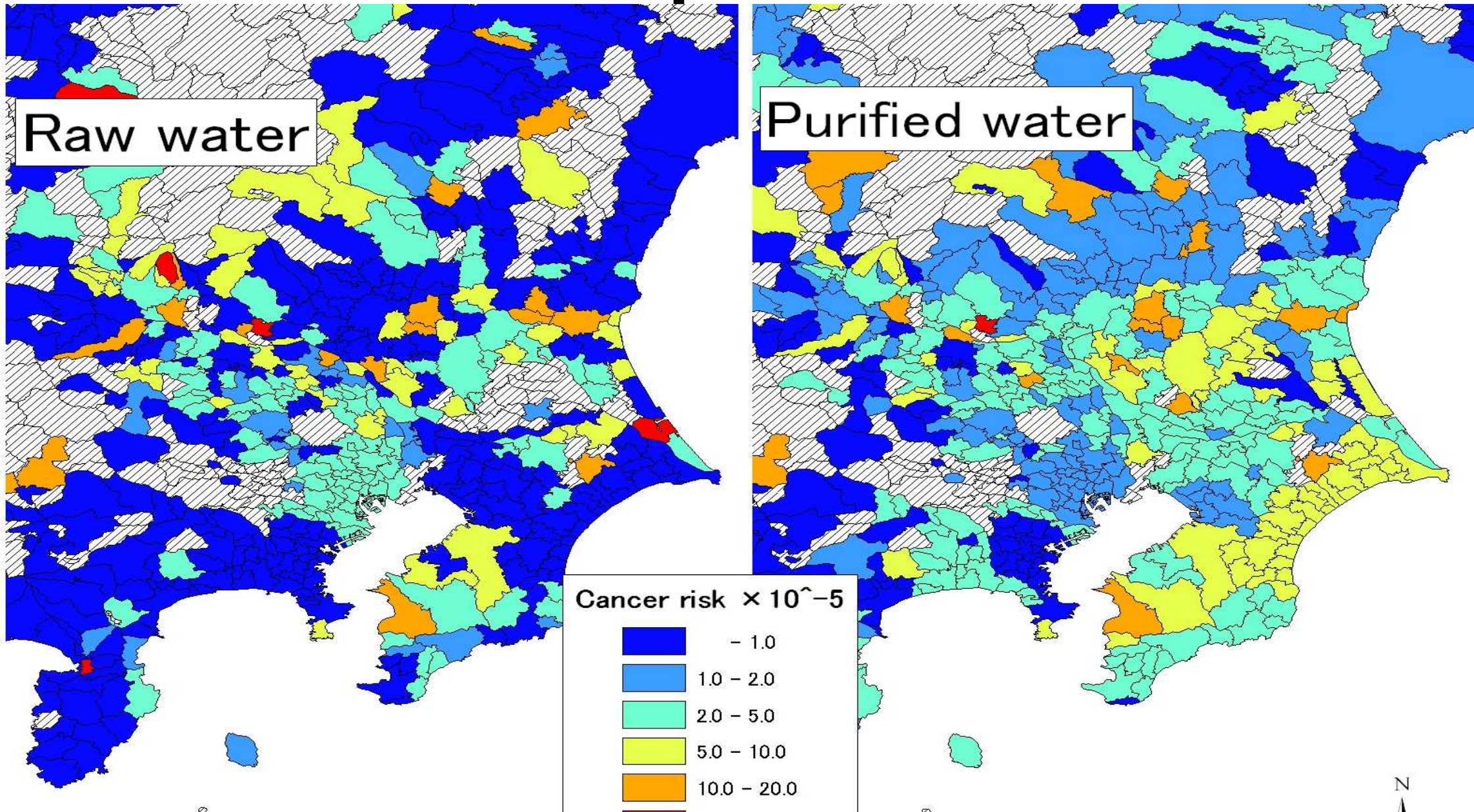
Cost for safe drinking water supply and sanitation (2005-2015): WHO



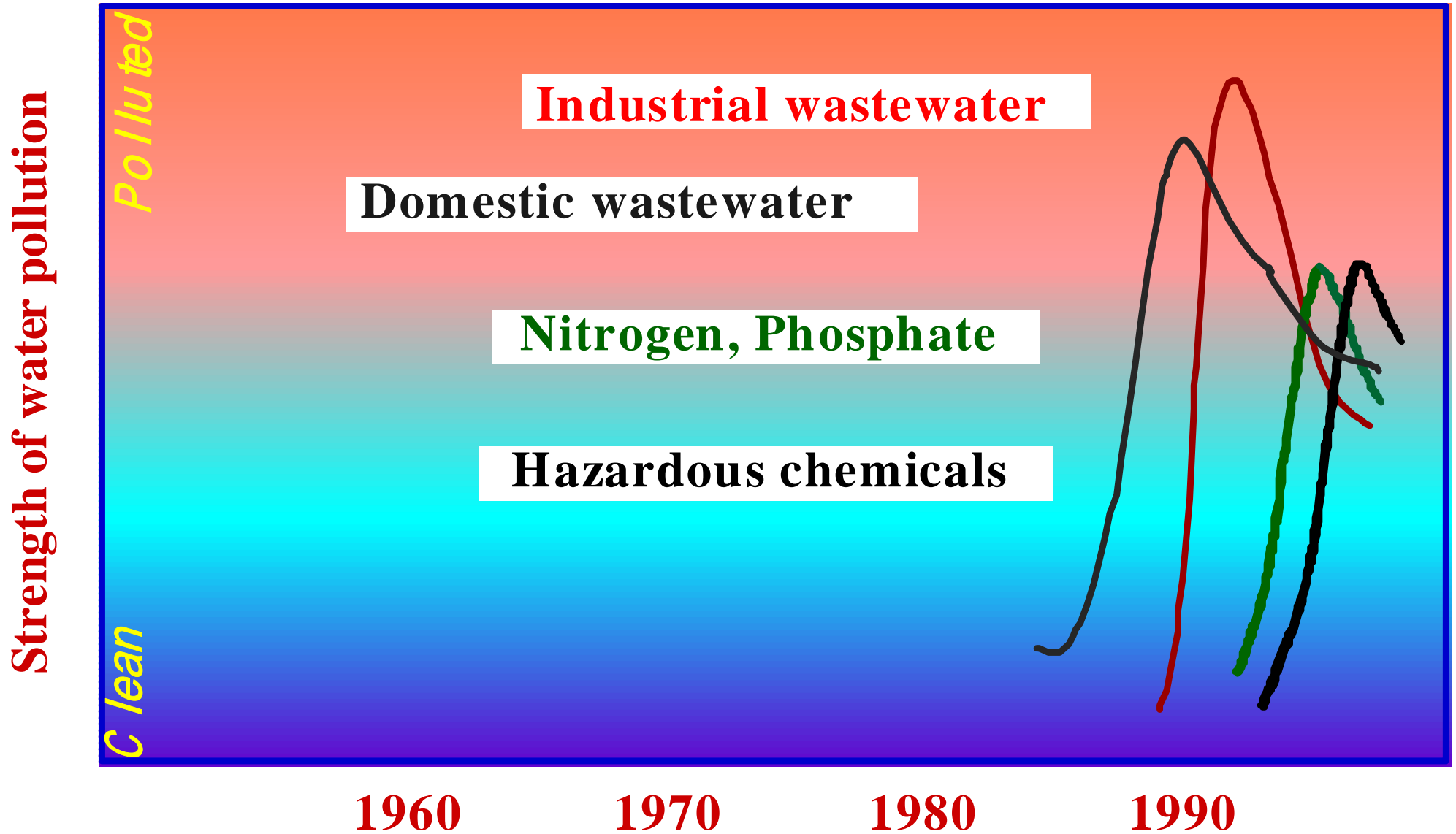
Water pollution aspects of industrialized countries



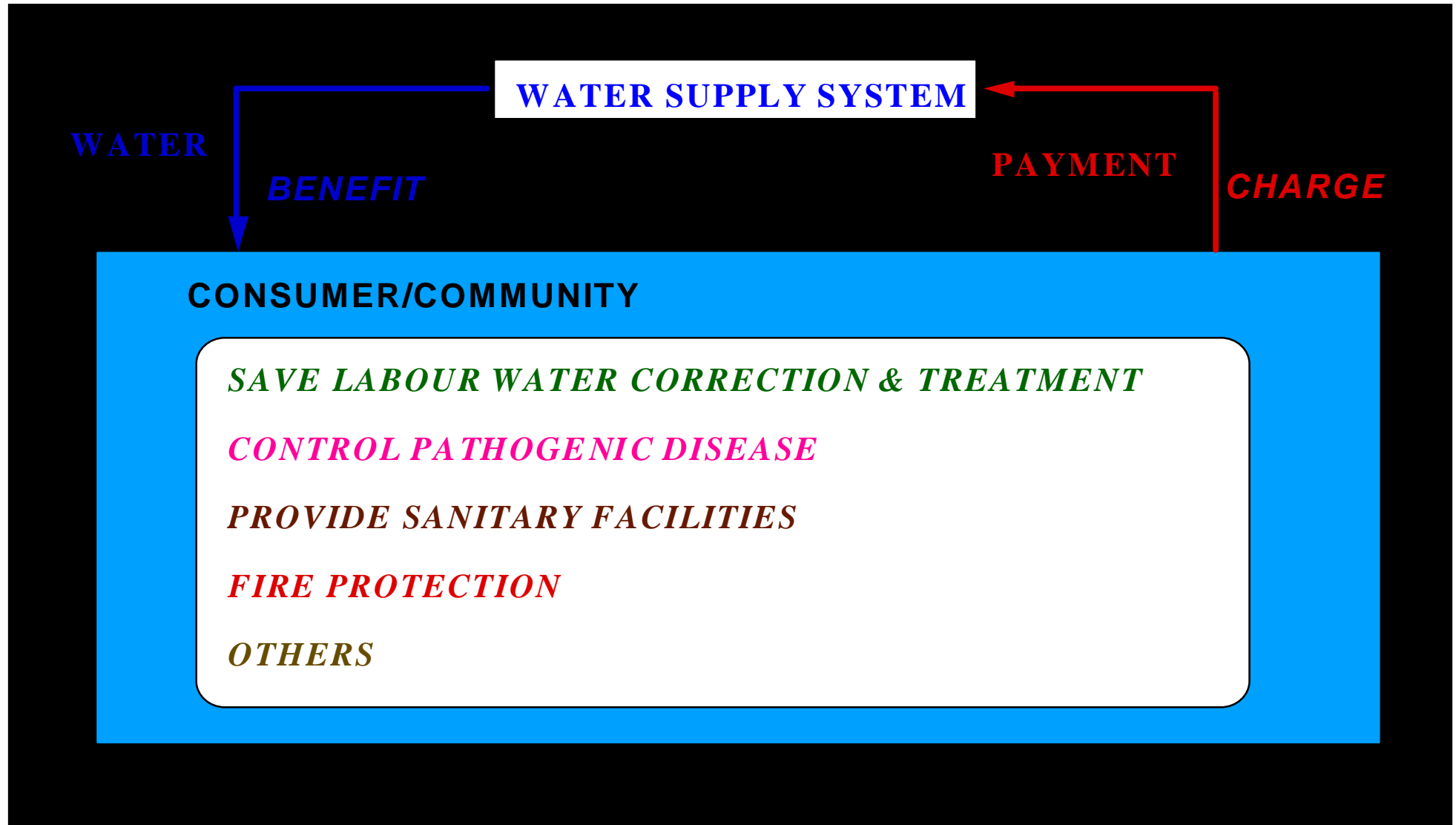
Distribution of Cancer Risk of Tap Water in Metropolitan Area



Current situation in developing countries



Sustainable Development of Water Supply Services



How much can we pay ?

- 0.8% of disposal income for water tariff
- The disposal income of the residents of large cities such as the capital is greatly higher than for the residents of rural areas.
- The dispensable limit varies even within one country must be recognized.
- The problem depends on the system that is feasible to facilitate and maintenance/control for the sustainable services of water and sanitation

Conclusions

- **Full cost pricing**
- **Monopoly system**
- **Water is essential not only in healthy daily life but also economical/social activities**
- **Sustainability**
- **Customers satisfaction**
 - **Governance/Transparency of business**
 - **Financial soundness**
 - **Human resource**