First Scientific Meeting

Long term uncertainties and potential risks to urban waters in Belo Horizonte

Nilo de Oliveira Nascimento – Federal University of Minas Gerais
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Risks to urban waters in Belo Horizonte

Outlook:

- Urban waters in Belo Horizonte
- Current problems
- Potential risks
- Existing instruments to handle the risk

Risks to urban waters in Belo Horizonte

Risks to urban waters in Belo Horizonte

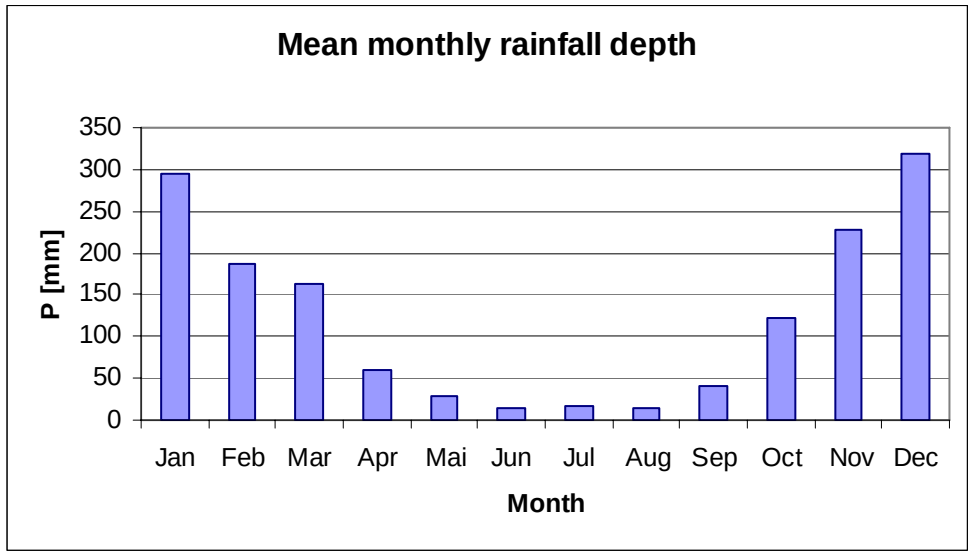
Some figures

- Surface : 330 km^2
- Altitude: 750 to 1,300 m
- Population: 2,2 million

Risks to urban waters in Belo Horizonte

- Climate: Tropical highland
- Rainfall (year): 1.500 mm/y

  (90% from November to March)
- Mean temperature: 21^0 C



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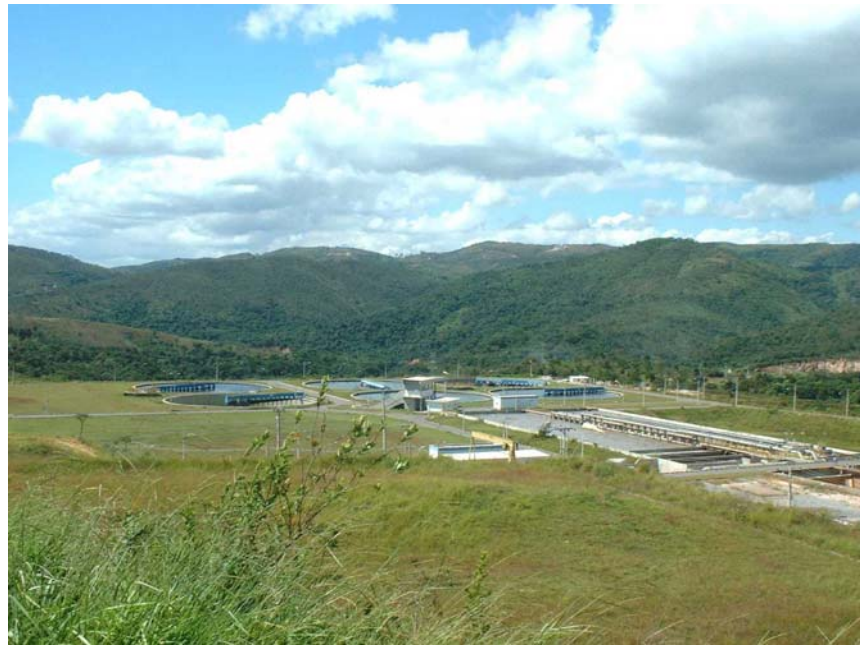
Drinking water in Belo Horizonte

- 99.5% connected to the water supply system
- *Per capita*: 200 l/inhab.day
- Total capacity: 16 m^3/s
- Sources: surface water

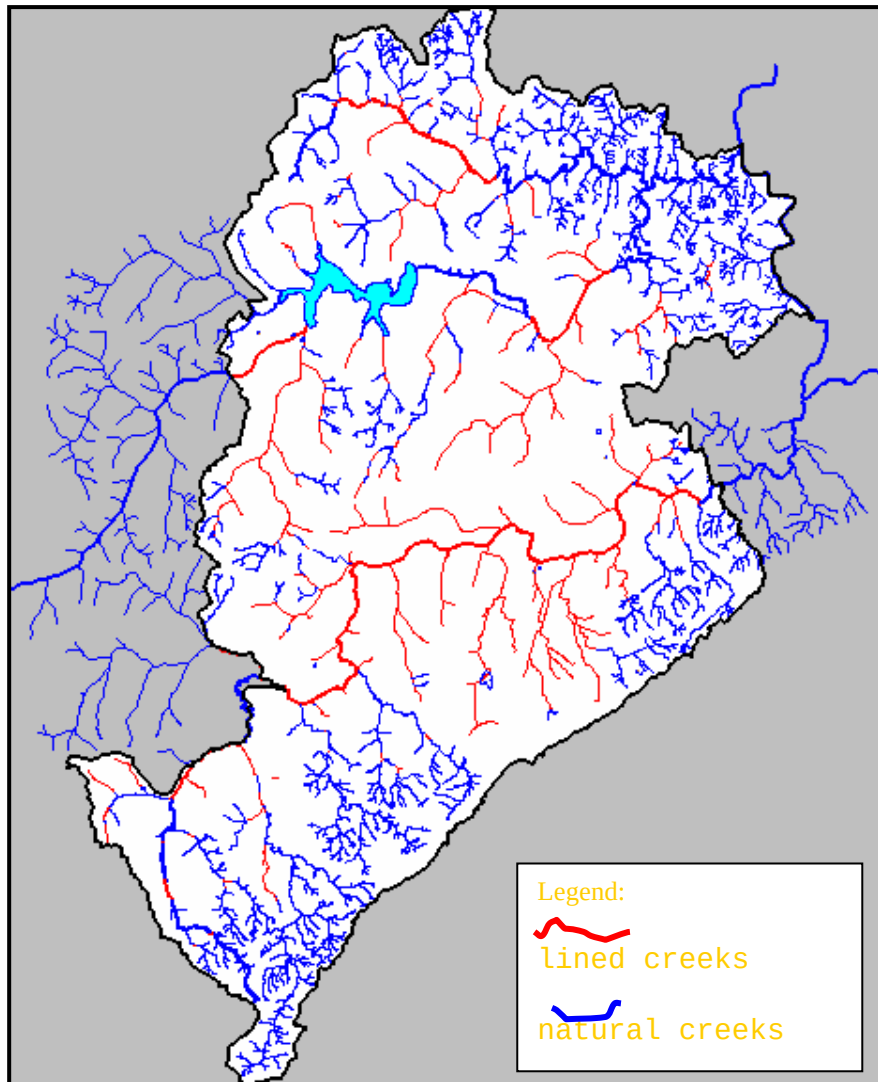
Sanitation in Belo Horizonte

- 91.7% connected to the sewerage system
- Separated sewerage system
- Two WWTP (secondary treatment):
  - Total capacity: 4.0 m^3/s
- Treated wastewater: 38% vol.



Stormwater management in Belo Horizonte
(up to the 90's)

- Conventional and simplified approach:
  - Focus on structural solutions
  - 200 km of lined channels over 700 km of perennial creeks



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Stormwater management in Belo Horizonte
(up to the 90's)

- Oversimplified modelling:
  - Rational method (improved)
  - Permanent uniform flow
- Lack on hydrologic data
- Lack of planning

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Arrudas creek (1920)

Arrudas creek (1920)

Some current problems

Some current problems

- Frequent flooding (flash floods):
  - Urbanisation effects
  - Occupation of flood prone areas (mainly by poor people)
- High pollution of receiving waters:
  - Lack of interceptor pipelines (at about 60%)
  - Diffuse pollution, including solid waste and sediments

SWITCH

Some current problems

- Pollution of drinking water current sources:
  - Mining
  - Urbanisation
  - Agricultural activities
- Losses in the system:
  - Leakages in the water supply system
  - Waste of water

Floods

Flood prone areas

The bridge house or the Frorence inspired house

Lack of interceptor pipelines

Pollution by wastewater and solid waste

SWITCH

Pollution by wastewater and solid waste

SWITCH

Pollution by wastewater and solid waste

Risks

Population growth

Belo Horizonte:

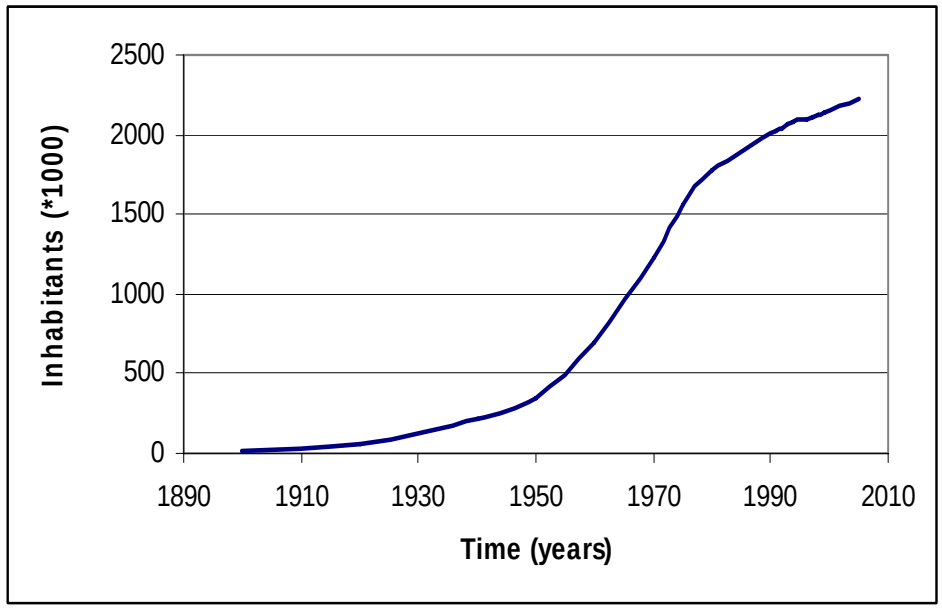
rate: 1.1% per year

But, at the RMBH:

Betim: 6.7% p.y.

R. Neves: 6.2% p.y.

RMBH (-BH): 4.0% p.y.



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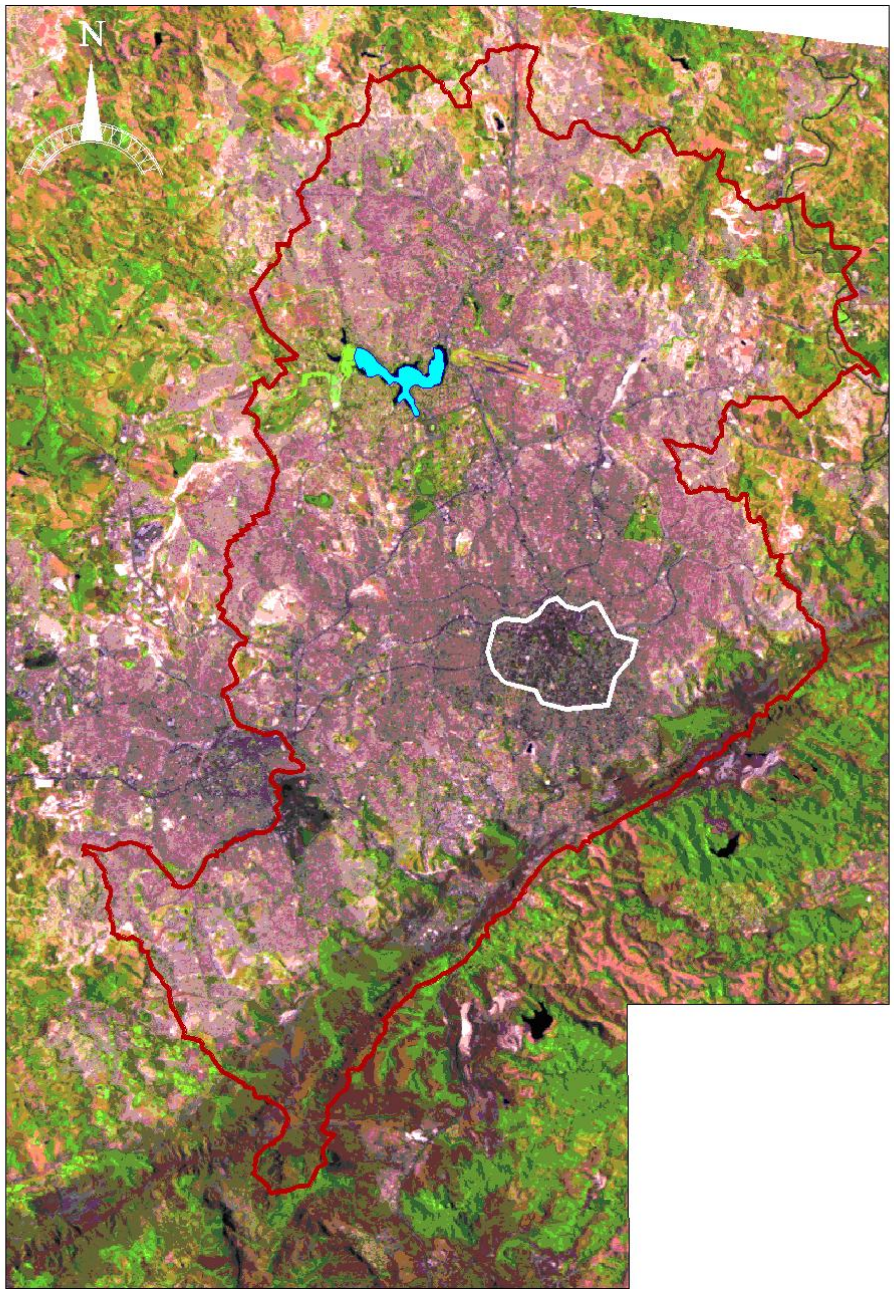
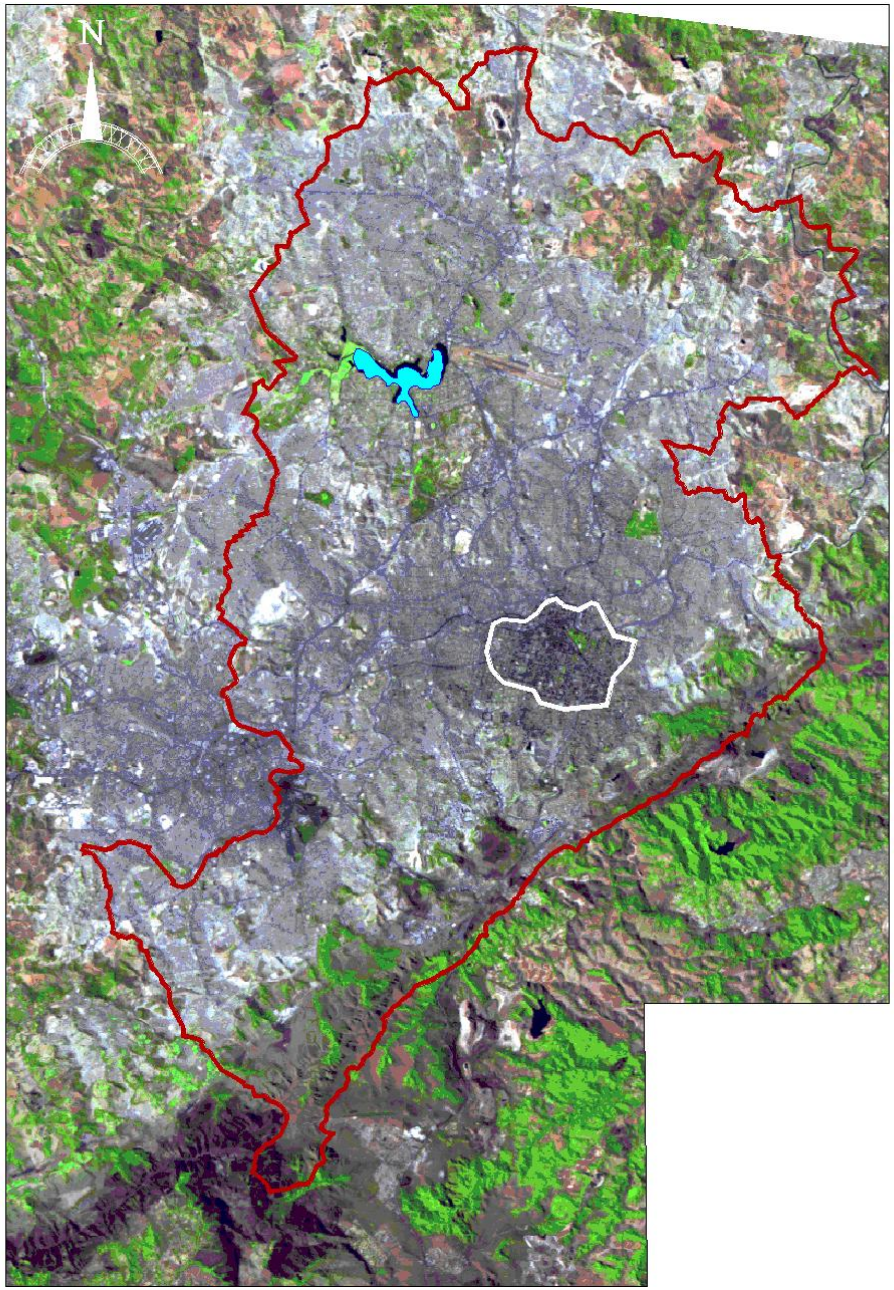


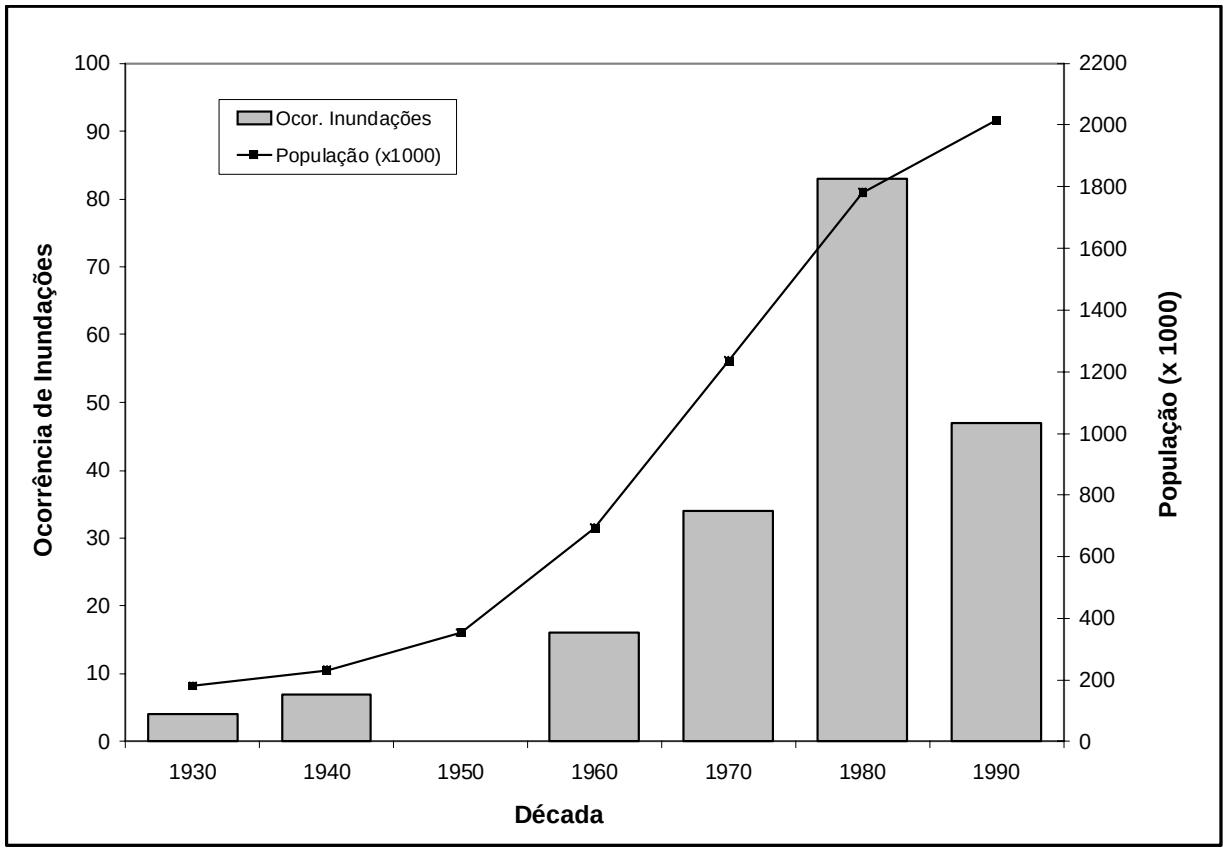
1996



1999

Population growth: some impacts

Floods



Population growth: some impacts

Pollution of receiving waters

Population growth: some impacts

Increasing drinking water demand:

2006:

Population (RMBH):	3,900,000 inhab.
System capacity:	16.0 m^3/s
Present demand:	11.8 m^3/s

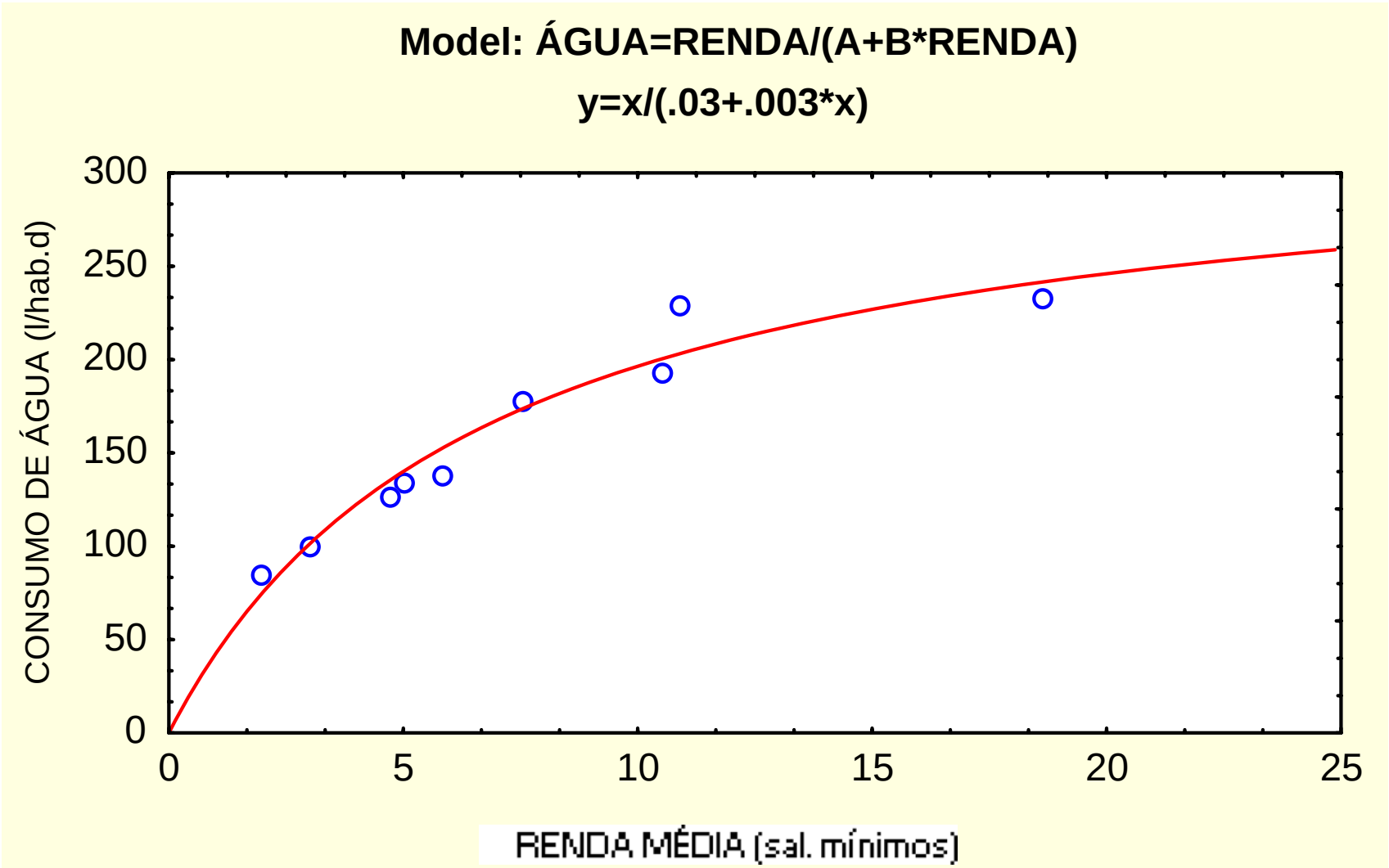
Population growth: some impacts

Increasing drinking water demand:

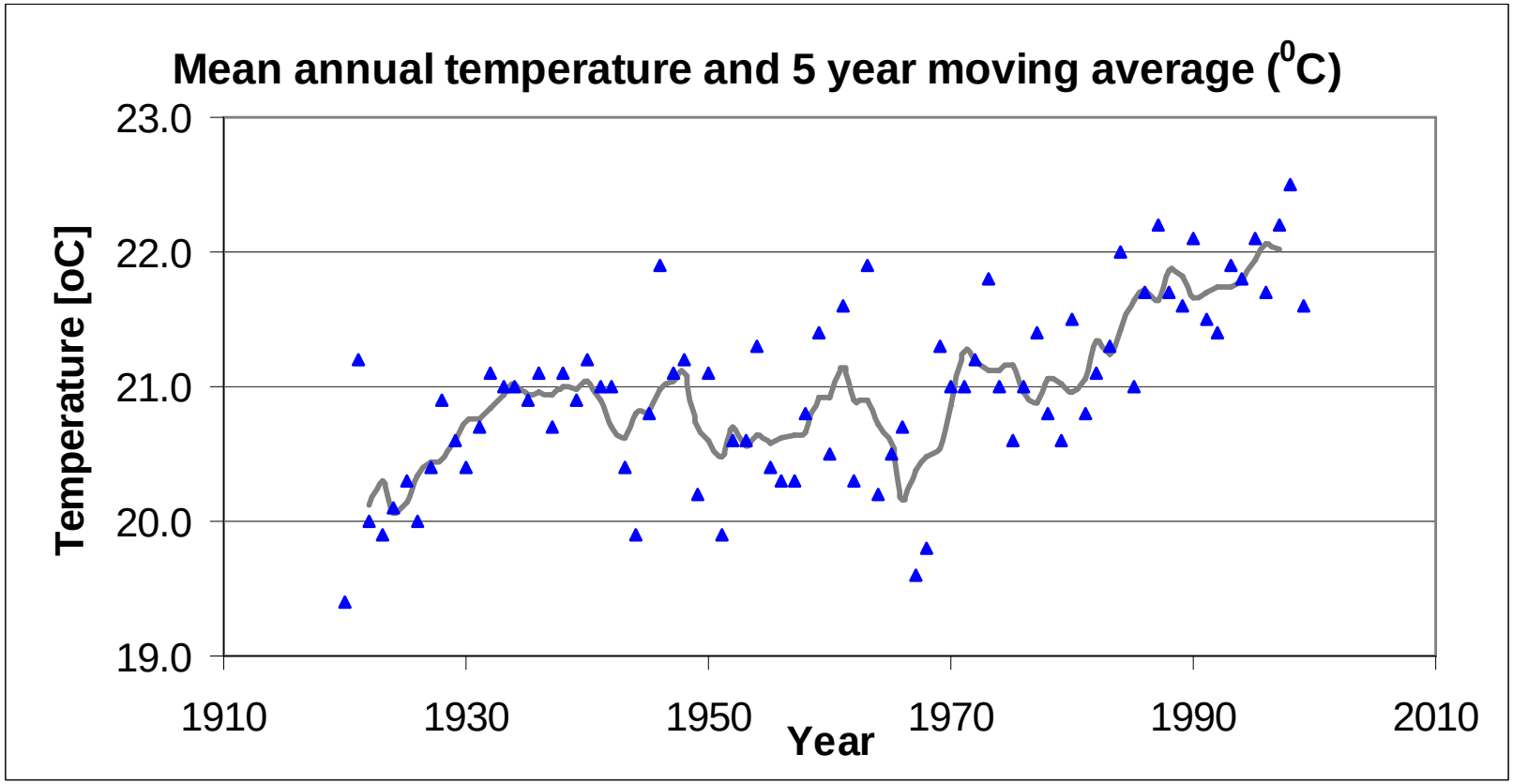
2030 (COPASA projections):

Population (RMBH):	7,900,000 inhab.
Water supply demand:	26.3 m^3/s
Population growth:	68%
Water demand variation:	65%

Population growth: the wage factor



Global change



Global change: some impacts

Possible synergistic combination:

- An increase in 2 to 3º C in T, may lead to a reduction on 25% in the savannah forest
- Expected increases of intensity and frequency of rainfall: possibility of increasing frequency and severity of floods
- Evolution to dryer climates: possibility of water shortage

Risks per water sector

Water supply system:

- Water quality degradation and water shortage due to:
  - conflicting land and water use interests at the river basin scale
  - local anthropogenic impacts on the hydrological regime
  - global change
  - higher demand due to population growth and changes on *per capita* consumption standards

Some initiatives to deal with these risks

Water supply system:

- Systematic measuring
- Acquisition of direct contributing areas to reservoirs
- Promotion of river basin board constitutions

Risks per water sector

Wastewater system:

- Persistent and chronic pollution of receiving waters:
  - Lack of investments (interceptors + WWT capacity)
  - Operational failure or poor operation of WWTP possibly due to poor operational personnel qualification
  - WWTP not designed to remove nutrients and emerging pollutants

Risks per water sector

Stormwater system:

- Increases in the occurrence of floods and in wet weather diffuse pollution possibly due to:
  - Difficulties in regulating land use
  - Technology update is not sufficient to face emerging risks
  - Wet weather pollution is not properly considered
  - Climate change alters storm frequency and intensity

Risks per water sector

Stormwater system:

- Risks associated to an inappropriate use of BMP:
  - Health risks, soil pollution
  - Use of a limited number of alternatives
  - Lack of maintenance
  - Reduced public acceptance of BMP

Risks per water sector

Some initiatives to deal with these risks

- Stormwater strategic plan (on-going)
- Water supply and sanitation plan (on-going)
- Environmental Sanitation Municipal Board
- DRENURBS program

DRENURBS programme

- Main objectives:
  - Keeping urban creeks “natural”
  - Flood control
  - Pollution control
  - Creating areas for leisure and social integration
  - *Housing*
  - *Road system plan*

Green corridors

Risks shared by all the urban water systems

- Disruption of wastewater systems due to natural hazards like flooding or landslides
- Failures due to lack of maintenance or infrastructure ageing
- System failure induced by terrorism, criminal actions or vandalism

Risks shared by all the urban water systems

- Increasing costs due to:
  - Water resources pollution leading to higher treatment costs
  - Water shortage
  - Investment for the modernisation of ageing systems
  - Energy costs

Risks shared by all the urban water systems

Risks associated to water governance:

The implementation of an effective IUWM system will require considerable improvements on governance and institutional development.

Risks in governance

- Institutional and management aspects:
  - Need of integrated planning and management at different scales:
    - Territorial scales (district, city, metropolitan area, river basin, state)
    - Water domains (water supply, sanitation, stormwater)
    - Sectors of urbanism: land use, housing, road system and urban waters

Risks in governance

- Institutional and management aspects:
  - Need of institutional development:
    - Capacity building
    - Decision making
    - Technological and managerial update
    - Policy evaluation
  - Need of the promotion of public participation in decision-making, social control

Final Remarks

Final remarks

Identified risks are mainly related to:

- local environmental impacts of urban, industrial and agricultural land use
- institutional and financial challenges caused by the increasing complexity imposed by the IUWM requirements
- global change effects on natural processes and on the man-made water management systems

Final remarks

Possibility of adequately dealing with these risks:

- BH Water supply and sanitation committee
- Planning efforts at the municipal level
- Federal legislation:
  - Water resources management law (river basin boards)
  - Municipal consortium law (municipality association)
  - Environmental sanitation law (regulation of this sector)

Final remarks

The SWITCH project