URBAN WATER MANAGEMENT
THE PLANNING OF BELO HORIZONTE

SWITCH

SWITCH Project– Belo Horizonte

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The City of Belo Horizonte
Capital of the State of Minas Gerais
The City of Belo Horizonte

- Population of the City: 2.4 millions of inhabitants;
- Population of the metropolitan area: 4.0 millions
- Municipal area: 330 km2;
- Foundation year: 1897;
- Climate: Tropical altitude climate
  - (Average minimum temperature: 13° and average maximum: 28°);
- Average annual precipitation: 1500 mm (highly seasonal: distributed in the summer months)
The City of Belo Horizonte

A City with two social realities

22% of the population live in shantytowns, occupying 5% of the municipal area
Urban Water Management Policy in Belo Horizonte

MUNICIPALITY

Public Health

Vectors control

Urban and Environmental Policy

Urban Drainage

Solid waste management

Regional Company COPASA (water utility)

Concession

Drinking water

Wastewater: Collection and treatment
The Components of the Municipality Sanitation Plan (BH)

- Drinking water: 99.5%
- Wastewater: 90.0%
- Solid waste: 95.0%
- Vectors control

Urban Drainage
The Environmental Sanitation* in Belo Horizonte Water Treatment

Water System (COPASA - Regional Public Company): 99.5% connected

Water supply: 7,430 l/s
Per capita consumption: 154 l/dia hab

Water supply ensured up to 2025

Rio Manso Water Treatment Plant
(2,000 l/s)

Serra Azul Reservoir (2,600 l/s)

Metropolitan water supply plan (1980) continuously updated

* Environmental Sanitation: refer to water supply, sanitation, solid waste management, stormwater drainage and vector control
The Environmental Sanitation in Belo Horizonte

Wastewater Treatment

- Arrudas treatment plant
  (secondary treatment)

- Metropolitan wastewater management
  Plan (1980) continuously updated

- Onça treatment plant
  (primary treatment)

- Sewage collection (COPASA): 90% connected

- Interceptor pipelines: 61% of the required extension

- Wastewater treated: 34.5% of the total volume
The Environmental Sanitation in Belo Horizonte
Hydrography and Urban Drainage

- Artificial channels - 250 km
- Natural channels - 500 km

The Wastewater Treatment

The Elementary Catchments (111)
The Municipal Sanitation Plan

Decision to develop a plan taken in 2001 (law n. 8.260/2001)

• **General objectives:**
  – Universality of access to environmental sanitation services;
  – Reduce Pollution in natural channels (receiving bodies);
  – Social inclusion and popular participation;
  – Public management and integration of sanitation services (IUWM).

• **Instruments:**
  – Municipal council of sanitation;
  – Municipal fund of sanitation;
  – Municipal conference of sanitation;
  – Executive secretary.
The Municipal Sanitation Plan

ISA - decision making indicator to define priorities of actions

ISA : Sanitation indicator

Employed
 – for the assessment of the sanitation service cover;
 – for the evaluation of the efficiency of actions and public policies;
 – to help in the decision making on the priorities of actions.

ISA components:

- Iab: the drinking water indicator - weight adopted 5%
- Ies: the wastewater indicator - weight adopted 45%
- Irs: the solid waste indicator - weight adopted 35%
- Idr: the urban drainage indicator - weight adopted 10%
- Icv: the control of vectors indicator - weight adopted 5%

ISA formulation:

\[ ISA = [Iab] \cdot 0.05 + [Ies] \cdot 0.45 + [Irs] \cdot 0.35 + [Idr] \cdot 0.05 + [Icv] \cdot 0.10 \]

\[ 0 \leq ISA \leq 1 \]
The Municipal Sanitation Plan
Sector Index

Drinking water indicator

I_{ab} = \frac{% \text{coverage}}{100}

Wastewater indicator = I_{es}

I_{es} = 0,65 \times I_{ce} + 0,35 \times 0,35 \times I_{ie}

Ice - Indicator of sewage collection = \frac{P_a}{P_t}
Pa: Population connected
Pt: Total population

I_{ie} - Indicator of interceptor pipelines in a catchment = \frac{L_{ie}}{L_{ti}}
L_{ie}: Existing interceptor pipeline length in the catchment
L_{ti}: Total interceptor pipeline length (existing + planed)
The Municipality Sanitation Plan
Sector Index

Solid Waste: Irs = Icl + ...

Indicator of coverage of residential solid waste collection (Icl) = Pcl / Pt

Pcl: Covered population
Pt: Total population of considered area

Storm Water Drainage: Idr = Iev + ...
Indicator of flooding events (Iev) = 1 – (ev / EV)
ev: number of flooding events in a catchment
Ev: total number of flooding events in the city

Vector control: Icv = Idg + ...
Indicator of dengue (Idg) = Number of occurrences per 1000 inhabitants
Idg = Number of occurrences in the municipality x 1000 / Municipality population
Planned sanitation actions: map of priorities

**Priority criteria:**

1. Lowest score to ISA;
2. Highest demographic densities;
3. Highest percentage of low income population.

- High Priority
- Medium Priority
- Low Priority
- Not a Priority
Map of the ISA indicator

Very High
High
Medium
Low
Very low
Urban Drainage Strategic Plan (1999 ...)

Initial Conditions

• The urban drainage integrated to all the environmental sanitation services - water supply system, wastewater system, solid waste management system and vector control;

• Elementary catchments is the geographic unit of action planning and drainage services;

• Watercourses integrated to city landscape;

• Social inclusion and Popular participation applied to planning and services,

• Real knowledge of hydrologic phenomenon and urban runoff;

• Permanent Technological Updating ;

• Financial sustainability;

• Public Management.
Cooperation Between Municipality and University

The University contribution to the Municipality:

• Applied researches of municipal interests;
• Scientific and Technological Updating;
• Universal understanding of local problems.

The Municipalities contribution to the University:

• Contact with concrete reality;
• Source of themes for Studies and Researches;
• Funding of research projects;
• Joint participation in scientific and technical workshops and seminars.

Problems with cooperation:

• Different terms for the conclusion of studies and researches;
• Discontinuity of the projects.
Recent examples of participation between University and the Municipality of Belo Horizonte

• Biology / Ecology: Biologic studies for the handling of urban lakes;

• Geology: Production and dynamics of sediment movements in urban catchments;

• Engineering: Hydrologic and Hydraulic Studies (hydraulic structures, regional formula of heaviest rainfall, etc.). Best Management Practices (BMPs) to treat stormwater run-off;

• Social Sciences: Studies about healthy indicators and human developments.
Items of interest for technological actualization in urban drainage

DRENURBS – Program of Environmental Recovery of Belo Horizonte

• Hydraulic Micro-drainage structures;
• Hydraulic Macro-drainage structures;
• New coating materials for canalizations
• Studies of the rugosity coefficients of the canalization of the macro-drainage system;
• Technical Instructions for the Preparation of macro-drainage system;
• Mathematical Modelling of the Macro-drainage system;
• Comparative analysis of the unitary, separator and mixed sewerage systems of effluents.
Items of interest for tecnological atualization in urban drainage

SWITCH PROJETC OF BELO HORIZONTE

- Use of non-conventional solutions in the infrastructure of the urban drainage;
- Studies for the implementation of a support system to decisions taking for occurrences of urban floods risk;
- Organization of an optimized system of mathematical modeling for the macro-drainage system of Belo Horizonte;
- Organization of a system of quality indicators of the services rendered for urban drainage;
- Studies for a management model of the city water services;
The End

Thankyou for your attention

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