CHALLENGES OF INTEGRATED URBAN FLOOD MANAGEMENT IN THE DEVELOPING WORLD: THE CASE OF METROPOLITAN SÃO PAULO

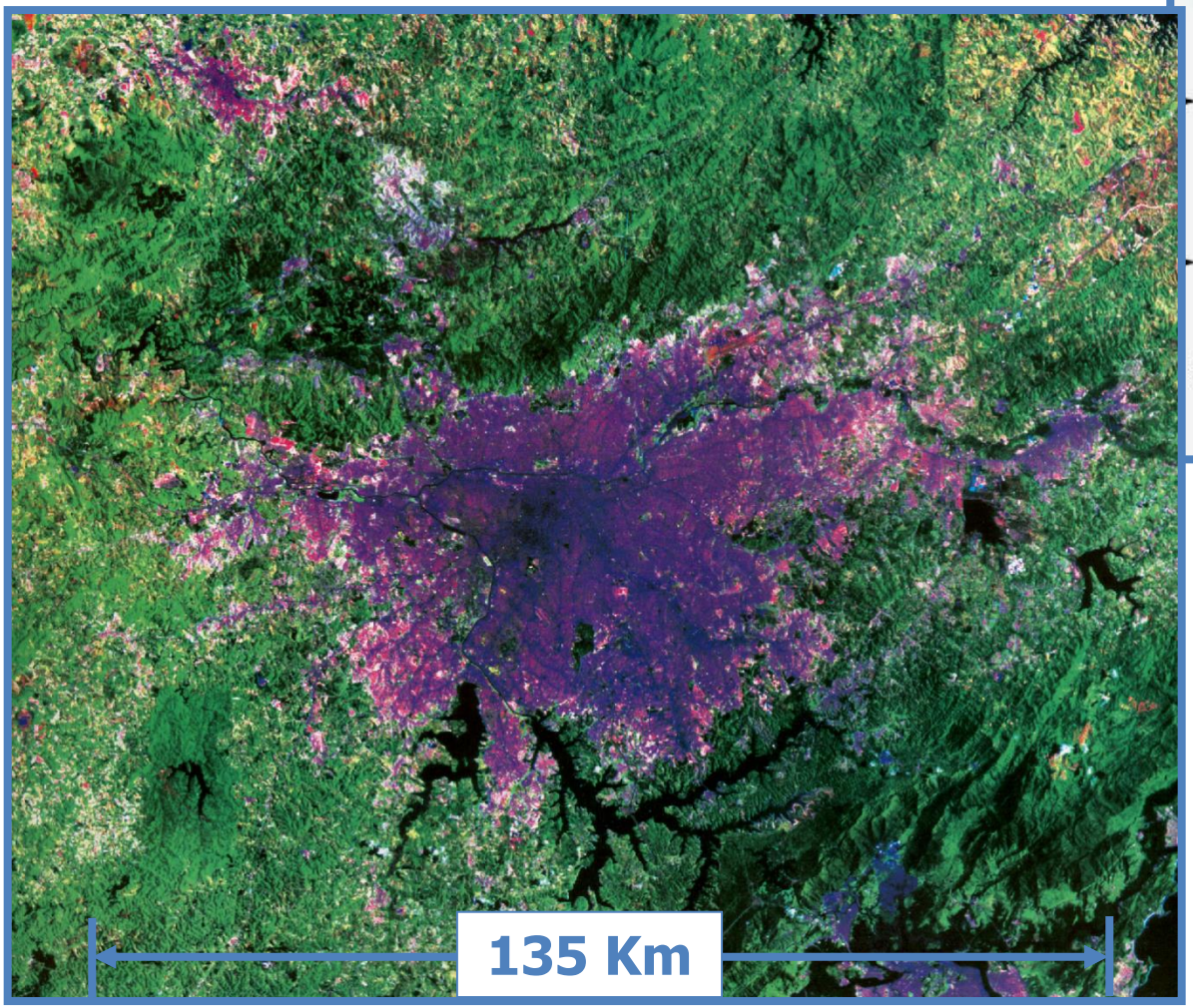
B.P.F. Braga, President
World Water Council

12th HELP meeting
International Symposium on Water and Disasters: Learning from Historical Lessons and Good Practices

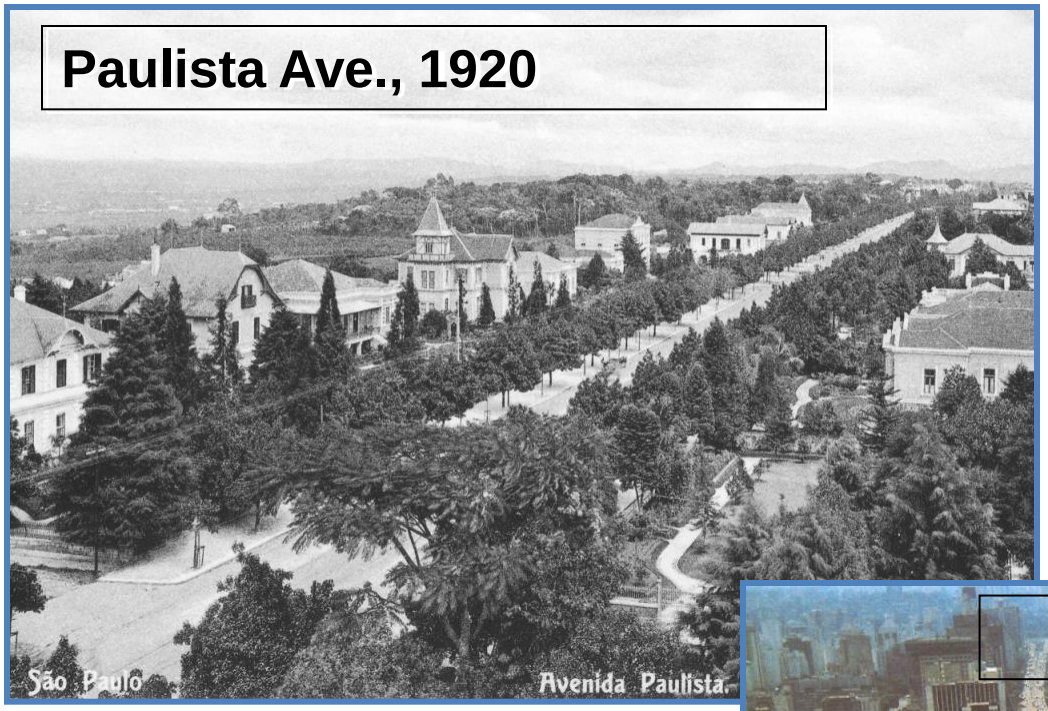
November 27, 2018 - Tokyo, Japan

WORLD WATER COUNCIL

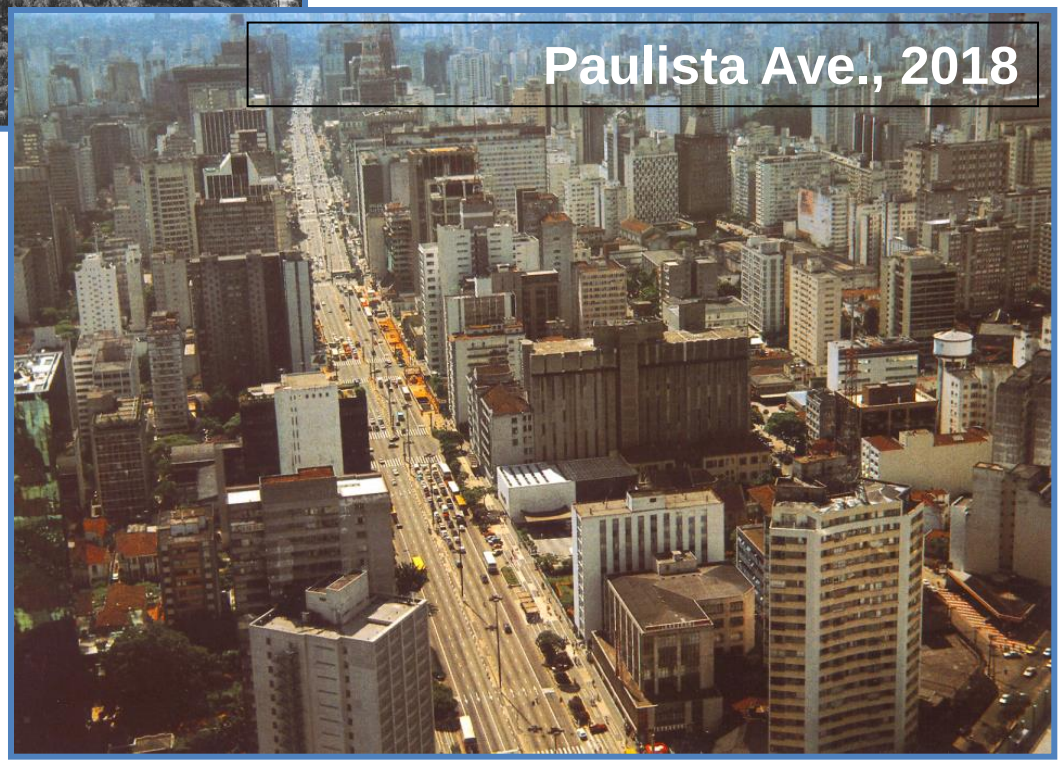
SÃO PAULO METROPOLITAN REGION



Metropolitan Region



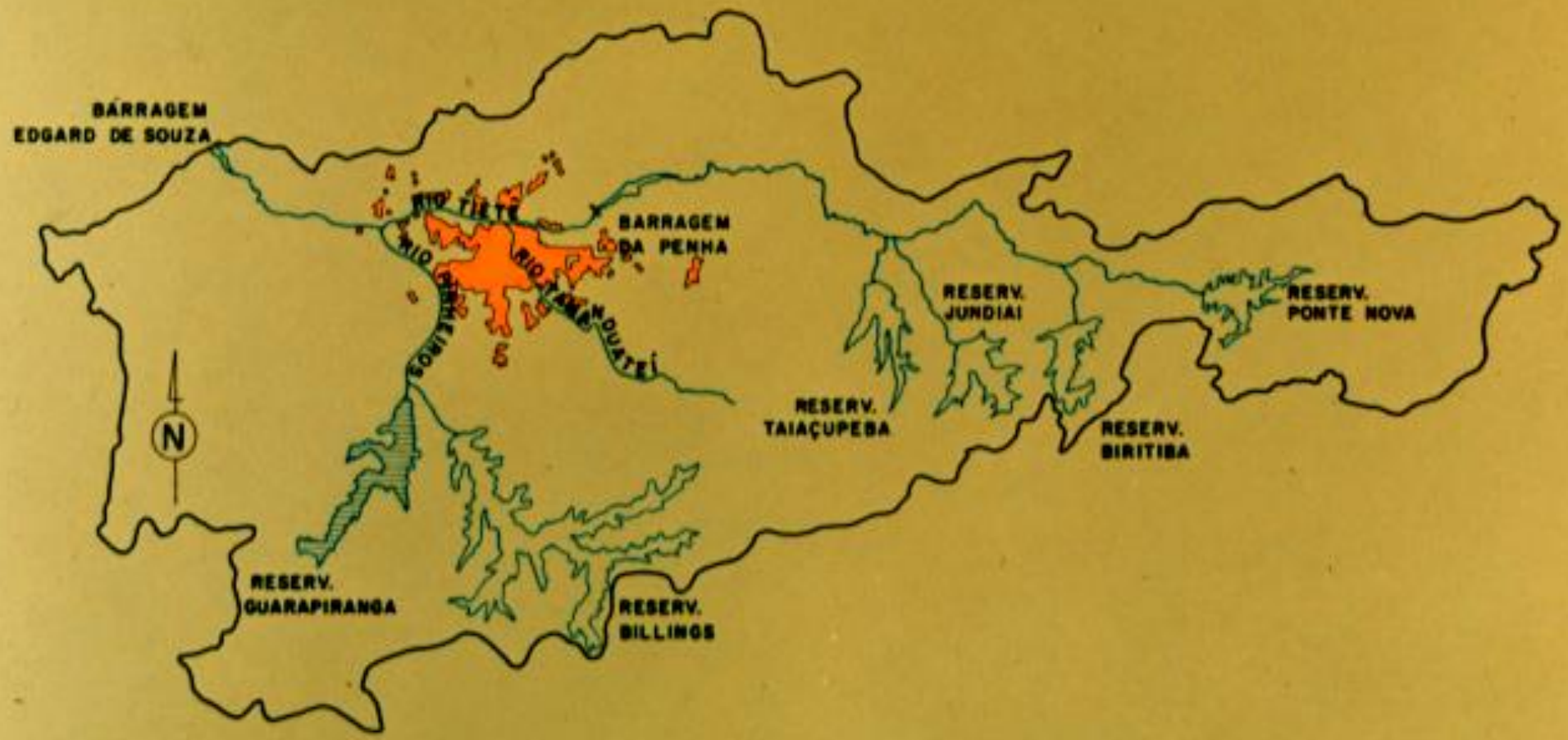
Rapid growth of urban population has been a general trend in most developing countries over the past 40 years



The Great Flood of 1929

Largest Precipitation Record in the Basin

OCUPAÇÃO URBANA - 1930



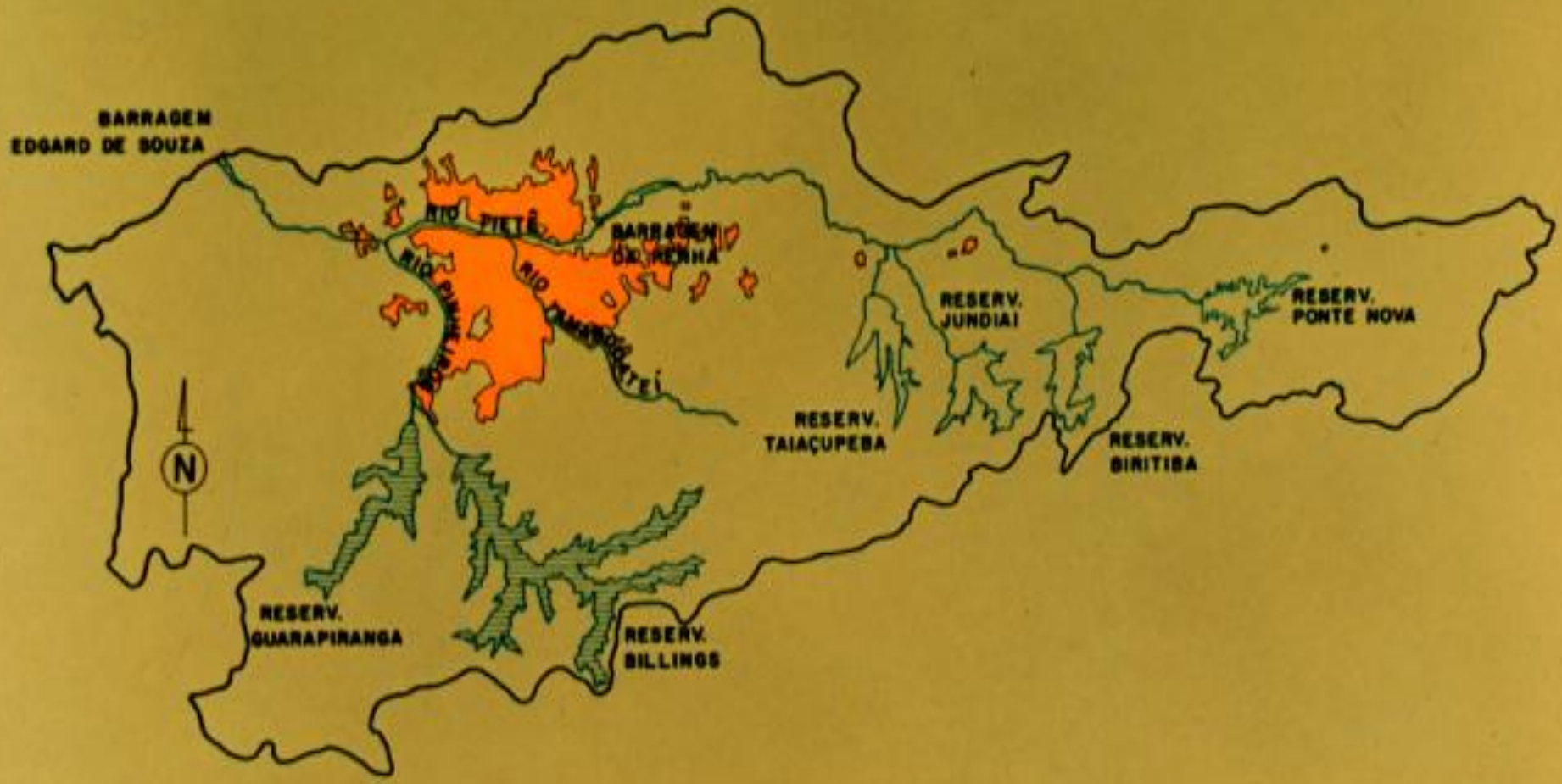
GOVERNO QUÉRCIA

DEPARTAMENTO
DE ÁGUAS E ENERGIA ELÉTR

DIRETORIA
DE ENGENHARIA E APOIO TÉC

THIRTY YEARS LATER ...

OCUPAÇÃO URBANA - 1954



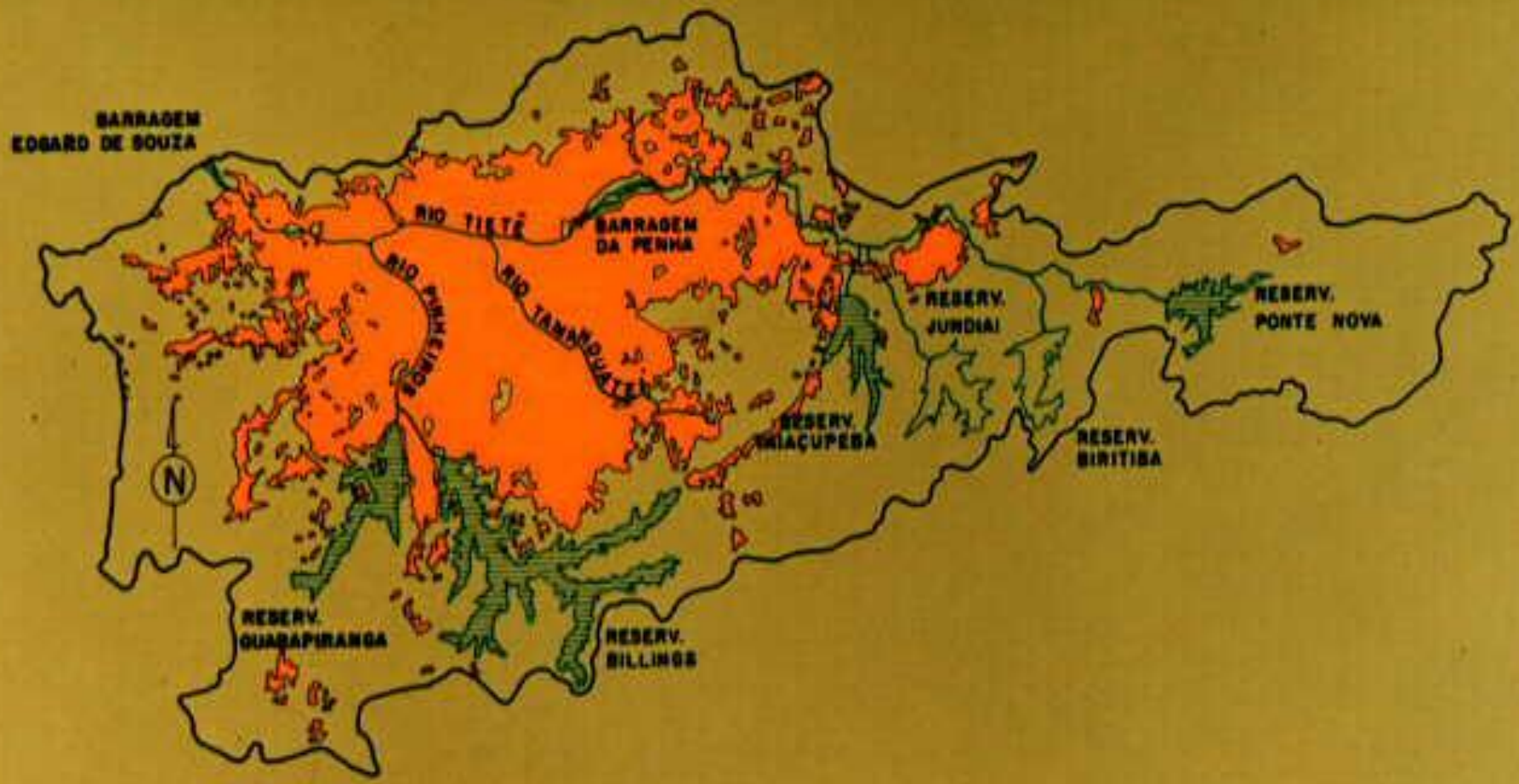
GOVERNO QUÉRCIA

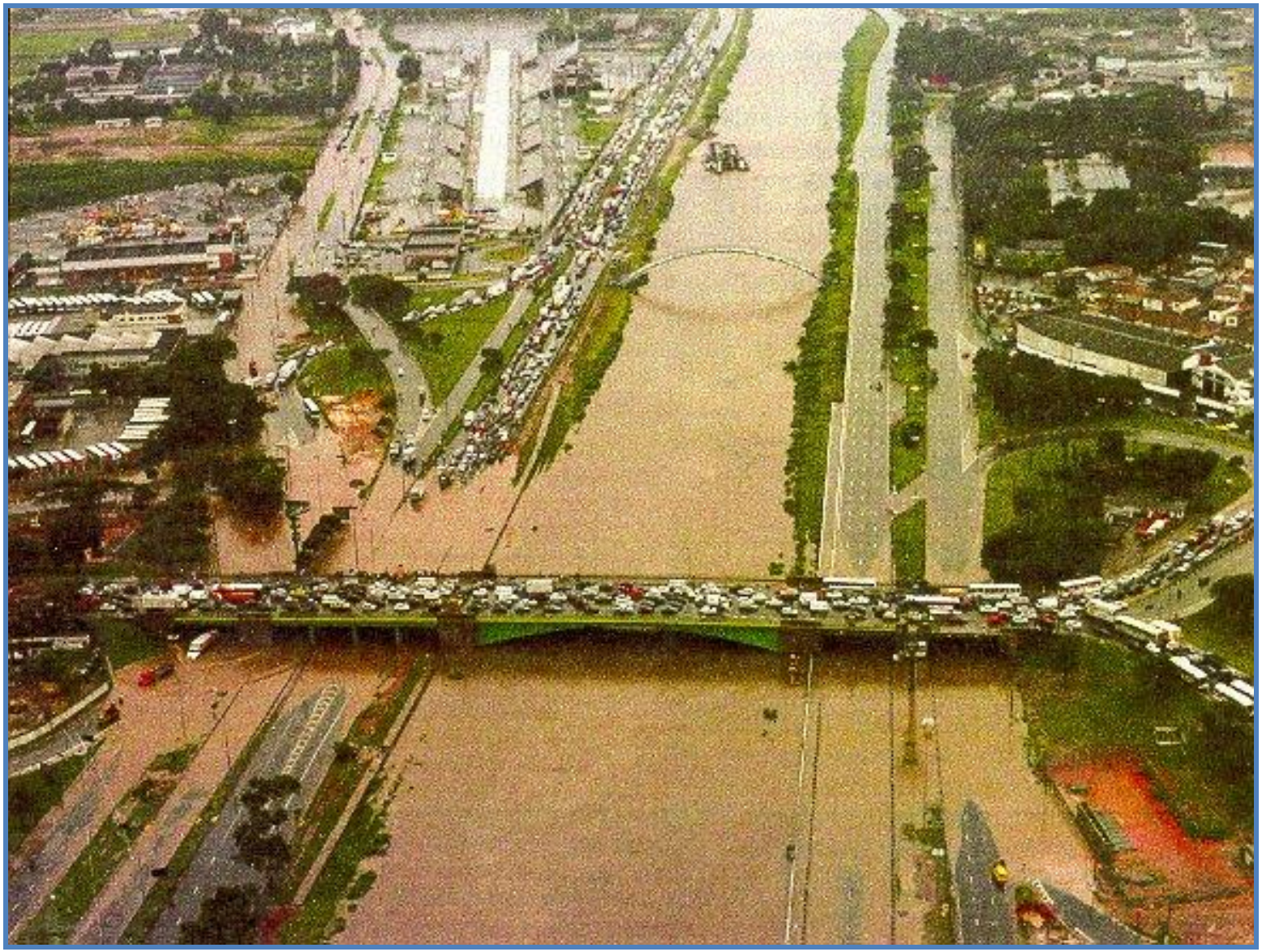
DEPARTAMENTO
DE ÁGUAS E ENERGIA ELÉTRICA

DIRETORIA
DE ENGENHARIA E APOIO TÉCNICO

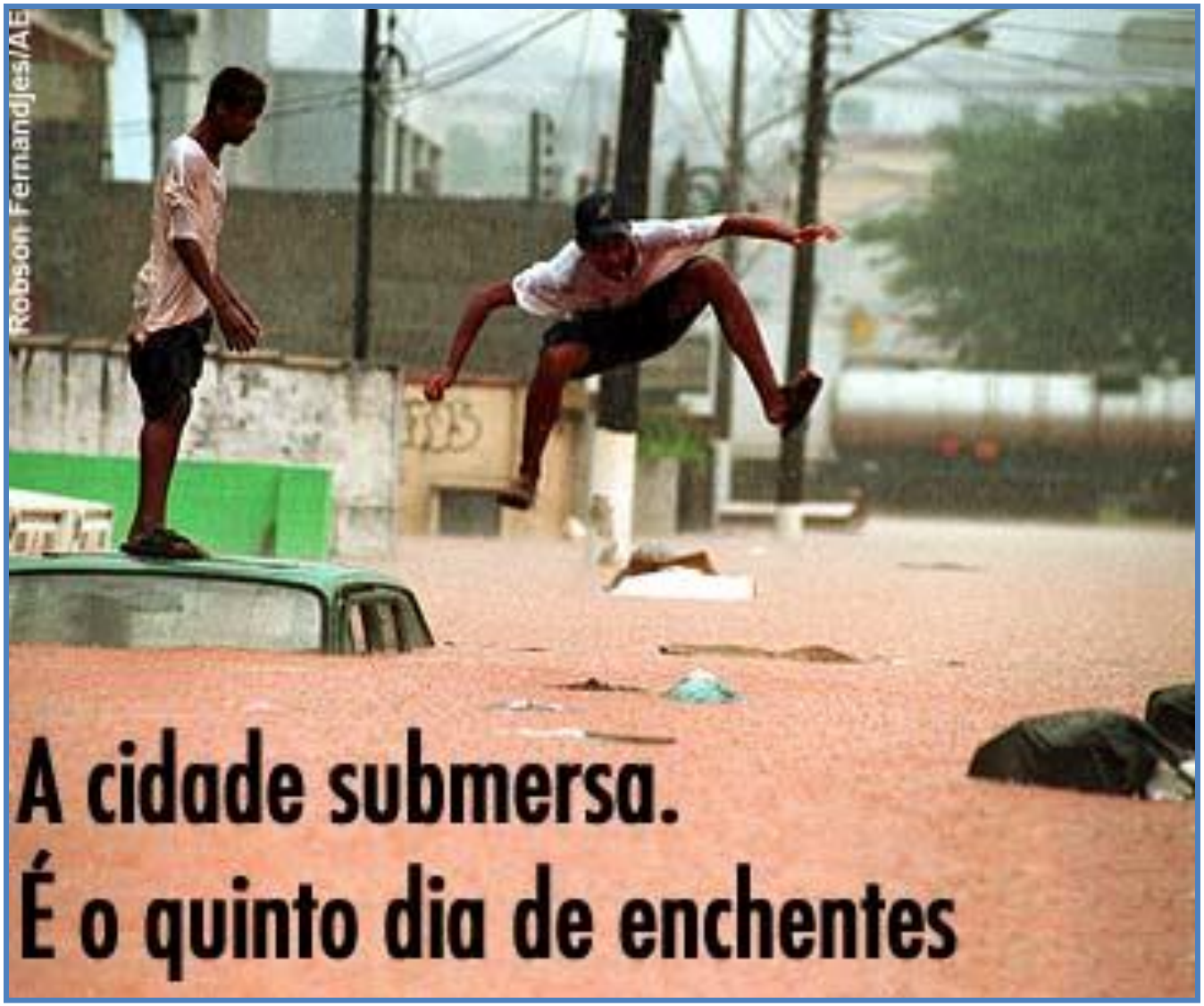
SEVENTY YEARS LATER...

YEAR 1995


BARRAGEM
EDGARD DE SOUZA
RIO TIETÊ
BARRAGEM
DA PENHA
RIO PINHEIROS
RIO TAMANDUATEI
RESERV.
JURUBAI
RESERV.
PONTE NOVA
RESERV.
GUARAPIRANGA
RESERV.
BILLINGS
RESERV.
RIACUPEBA
RESERV.
BIRITIBA
N



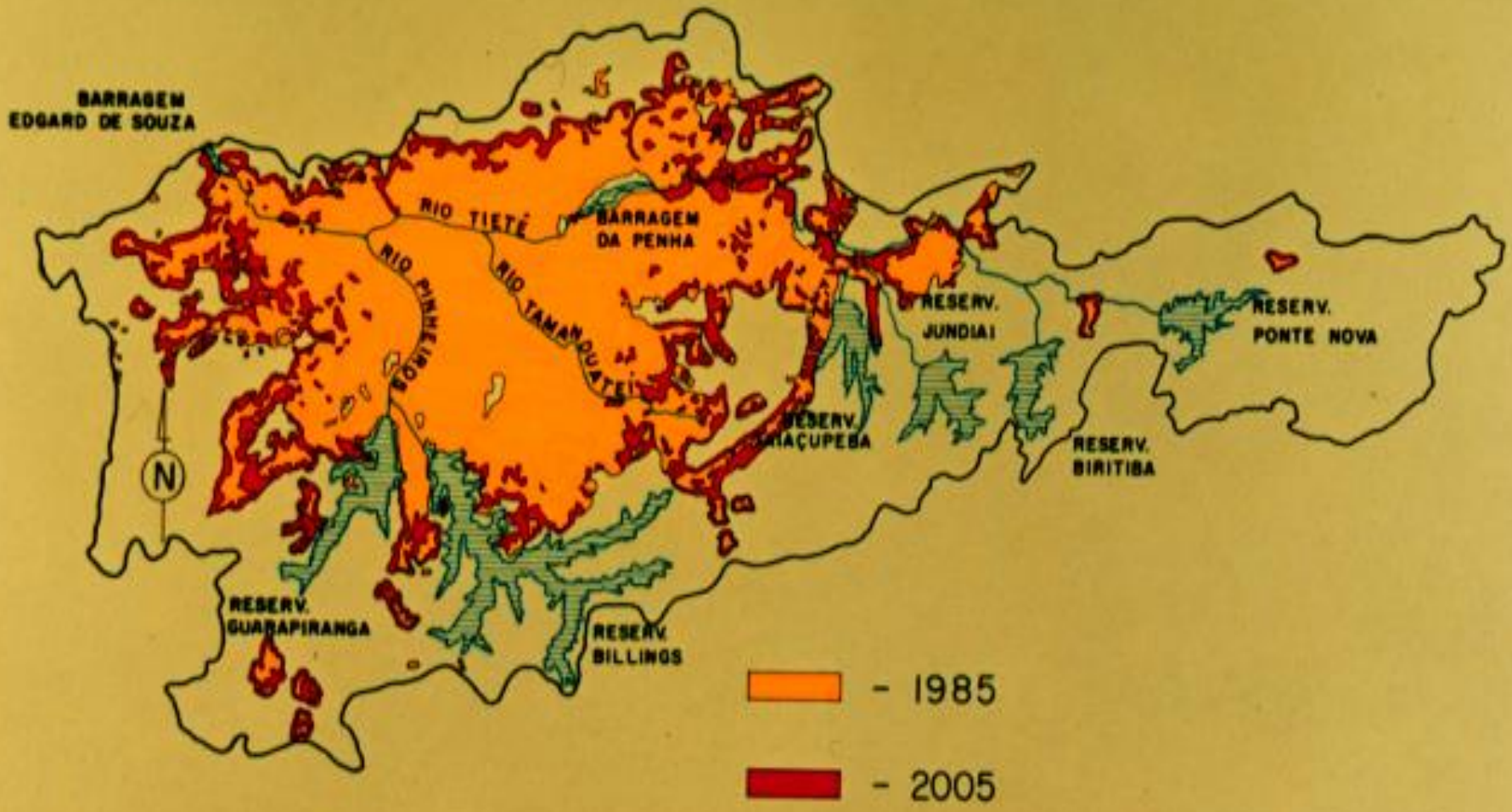
Inundação da Marginal do Rio Tietê em 01.03.1999



Cheia de 22.02.1999

LAST IMPORTANT FLOODING 2010…

EVOLUÇÃO URBANA



GOVERNO QUÉRCIA
DEPARTAMENTO
DE ÁGUAS E ENERGIA ELÉTRICA
DIRETORIA
DE ENGENHARIA E APOIO TÉCNICO

DEC 2009 – JAN 2010

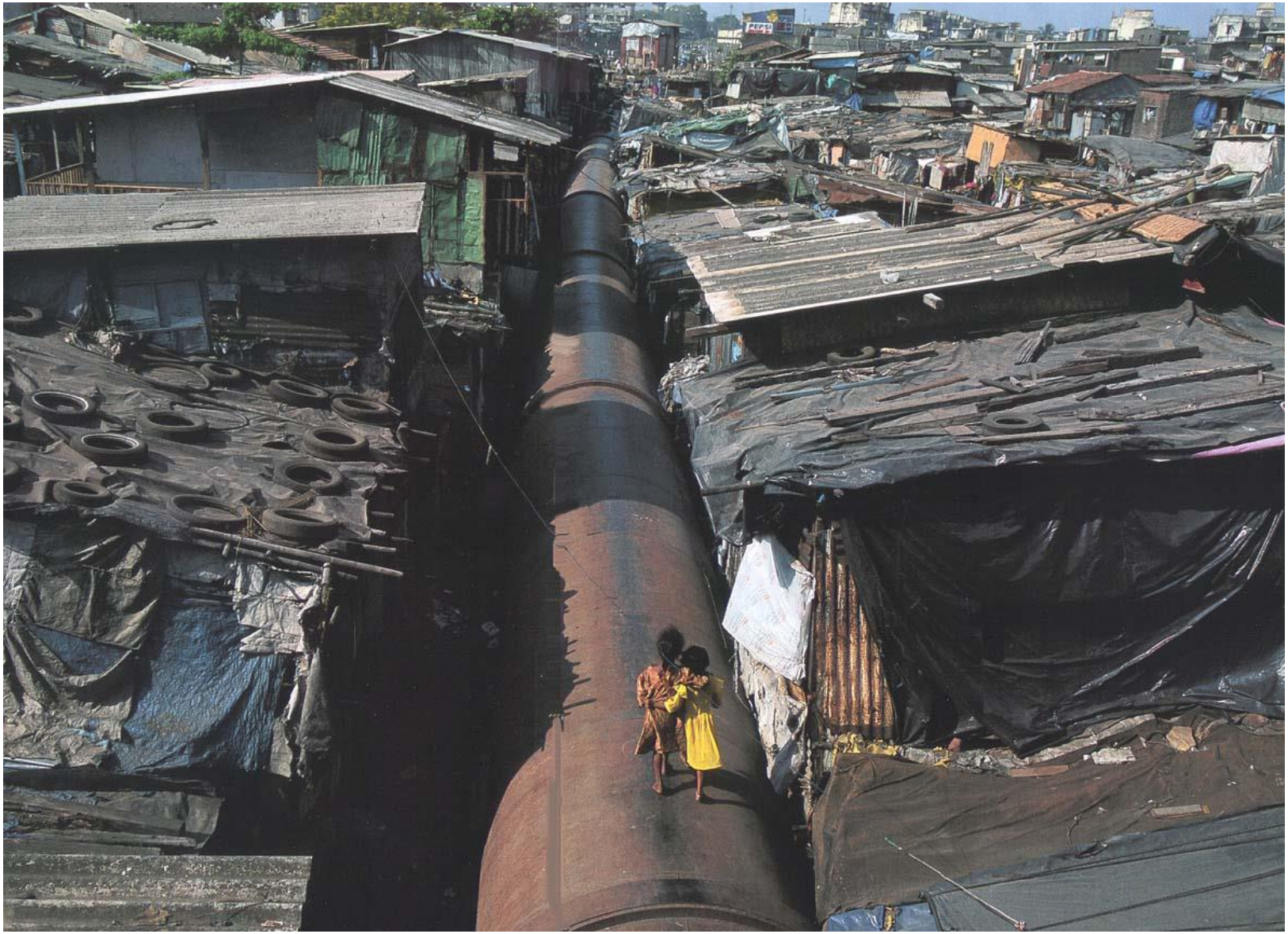
Landslides from forested soil

IS THIS A UNIQUE PROBLEM THAT METROPOLITAN SÃO PAULO FACES ?

- Jakarta, Bombay, Lagos, Shanghai, Mexico City, Caracas, Bangkok, etc.

- All megacities in the developing world have similar problems


RC

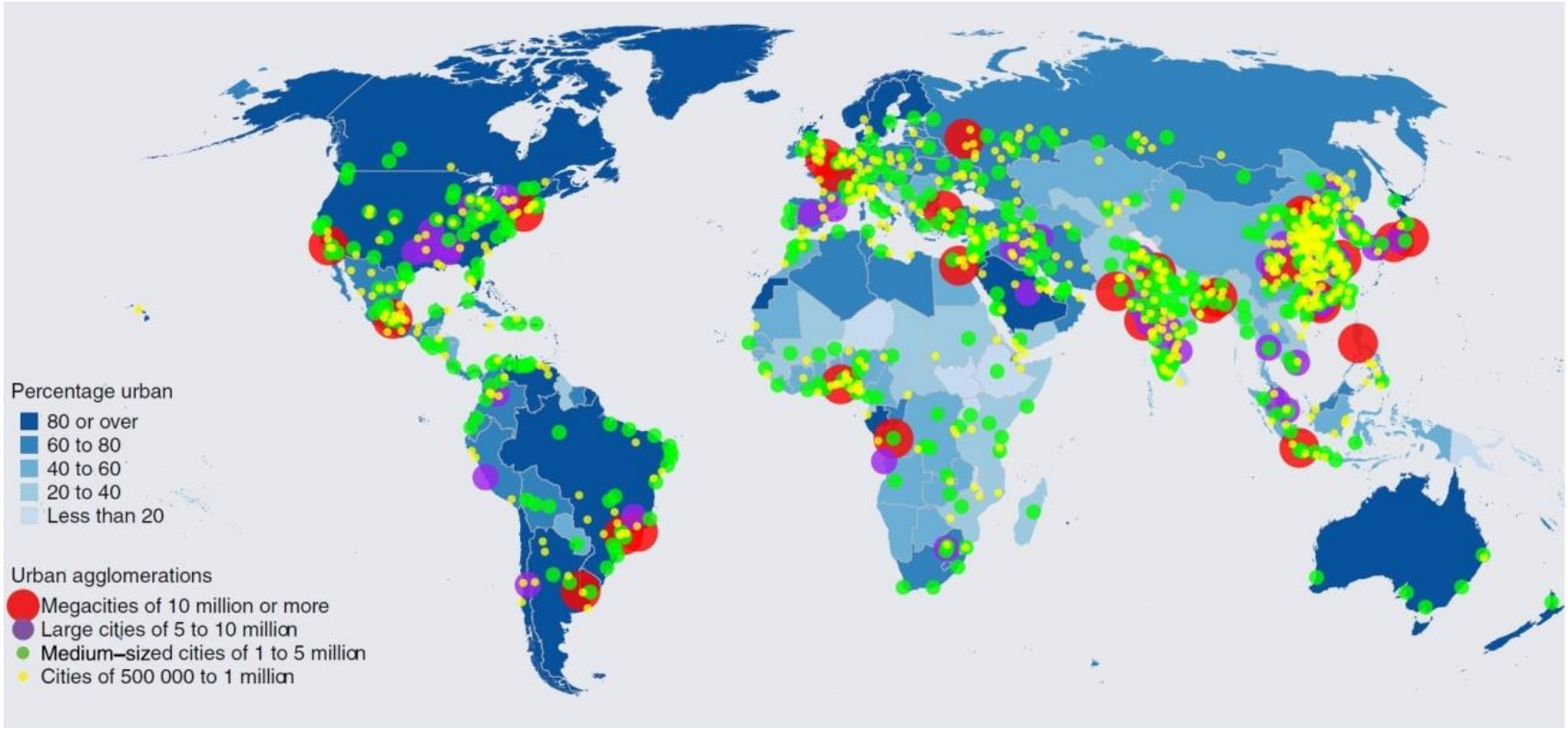


DIMENSIONS OF URBANIZATION

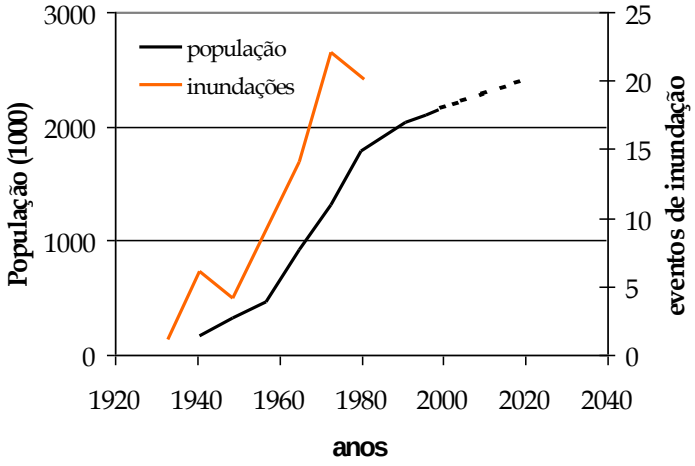
- Growth, a world growing larger and less equal - add U.S.A. population every 3 years with 98% of growth in developing countries.
- Smaller families - falling fertility rates but such large youth population in developing countries will still cause big growth.
- Urbanization and closer quarters - now 71 cities greater than 5 million, increasing to 104 by 2030.
- Longer lives - between 1950 and 2015 life expectancy increased from 40 to 70 years and population more than doubled.

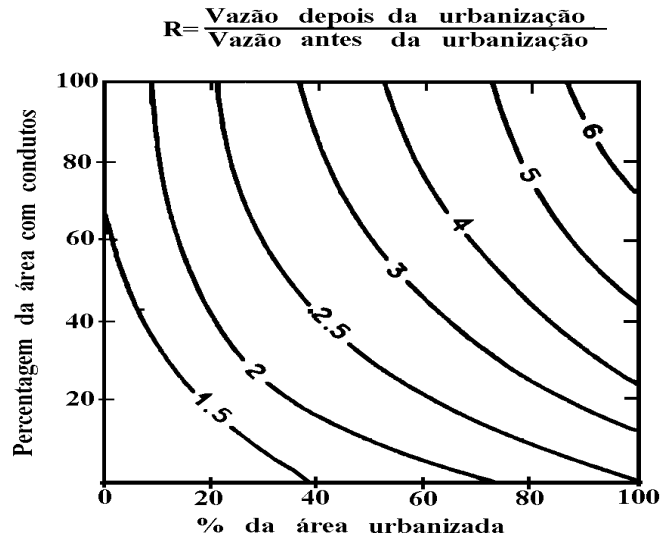
URBANIZATION TRENDS

- **71 cities already have population greater than 5 million**



URBANIZATION IMPACT





- Impervious areas and building of canals result in increased surface runoff, peak flows, and reduced groundwater flow and evapotranspiration

CURRENT SITUATION

Flood control has been based in transferring floods from upstream to downstream urban areas through the building of canals and conduits:

- Channel building can have costs 10 times larger than source control;
- Difficulties in the implementation of source control in large urban centers
- Increase frequency of flooding

Lack of institutional mechanisms for implementing non-structural measures in metropolitan areas

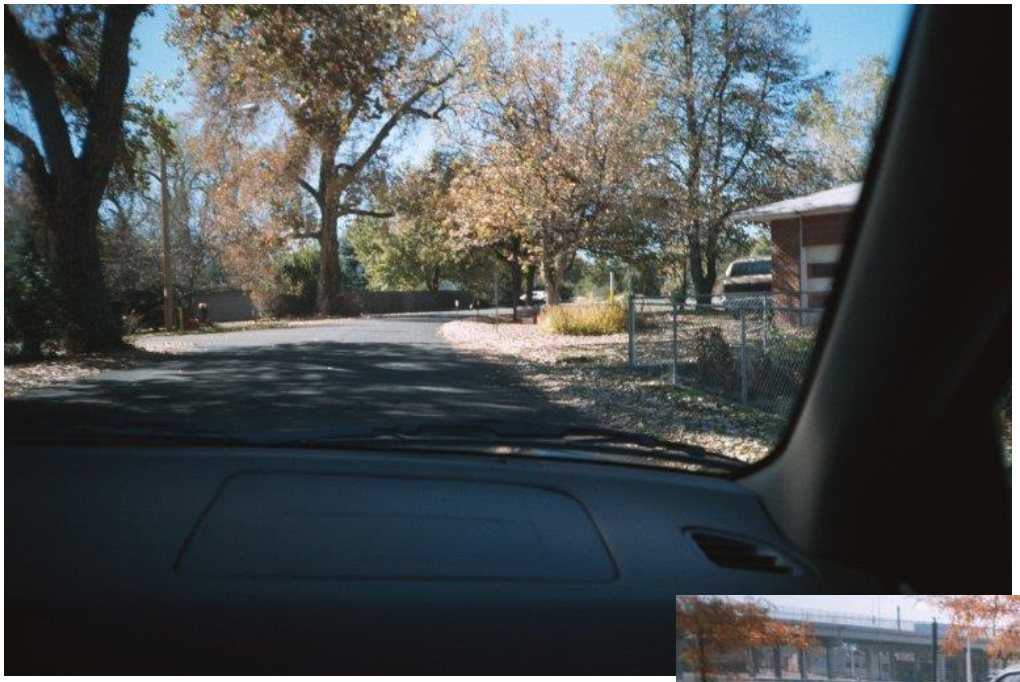
Urban drainage treated on a single-sector basis

POSSIBLE WAYS FORWARD

- Retain water instead of transfering the problem downstream
- Flood plain zoning;
- Flood warning systems
- Flood insurance
- River basin planning with consideration of both structural and non-structural measures

INFILTRATION AREA

DETENTION POND

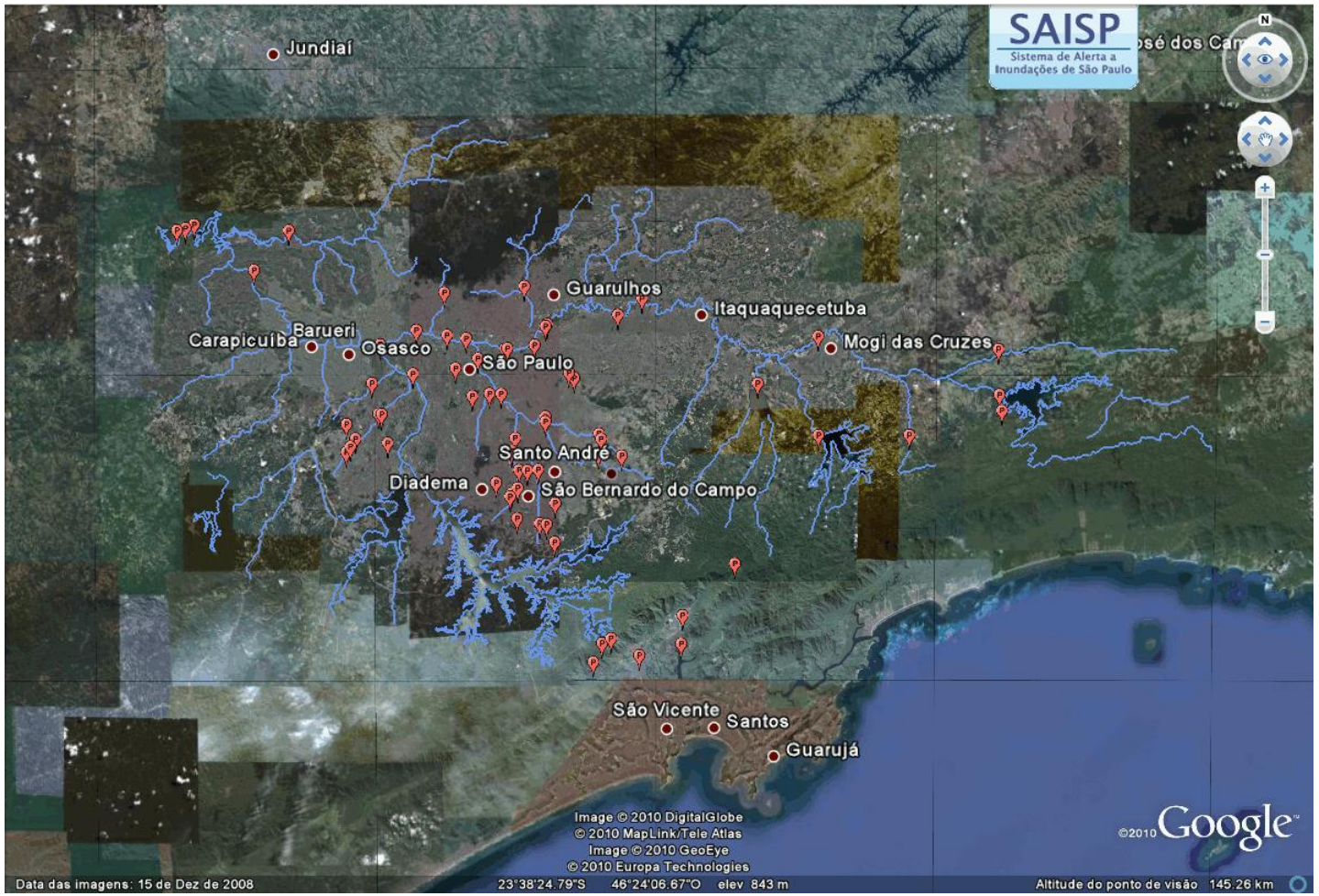


PERVIOUS PAVEMENTS

ON-LINE DETENTION PONDS

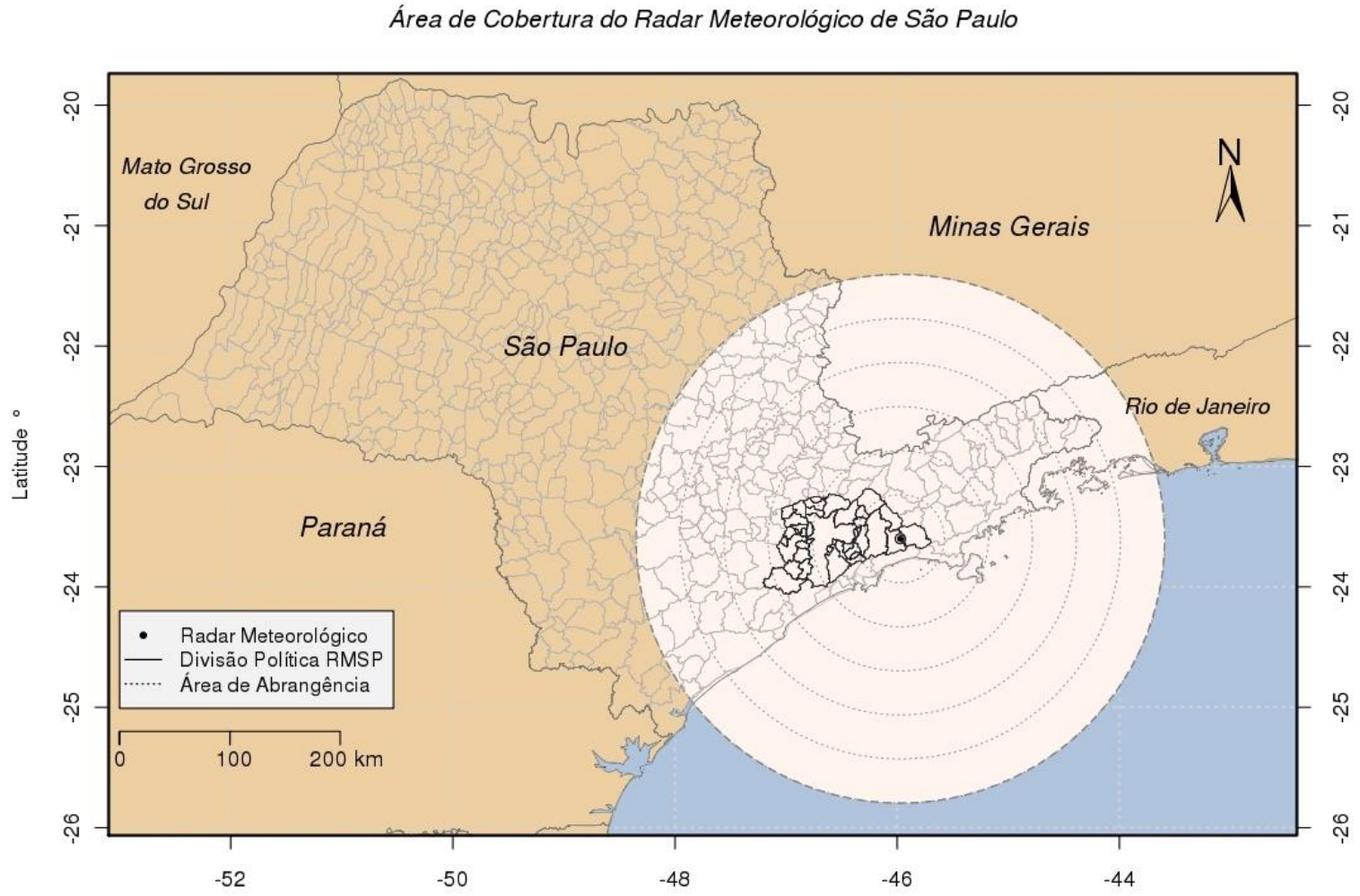
OFF-LINE DETENTION PONDS

RAINFALL AND RIVER STAGE TELEMETRY



WEATHER RADAR RAINFALL MONITORING

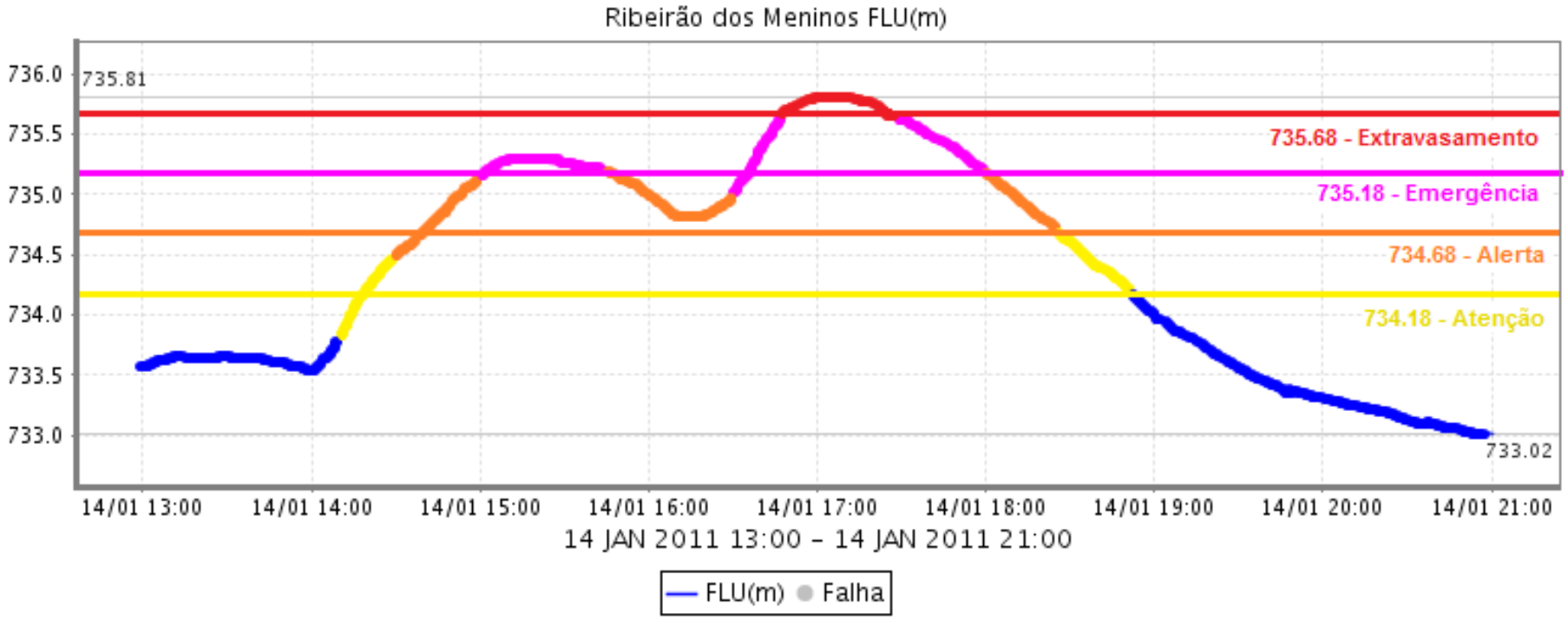
WEATHER RADAR RAINFALL MONITORING



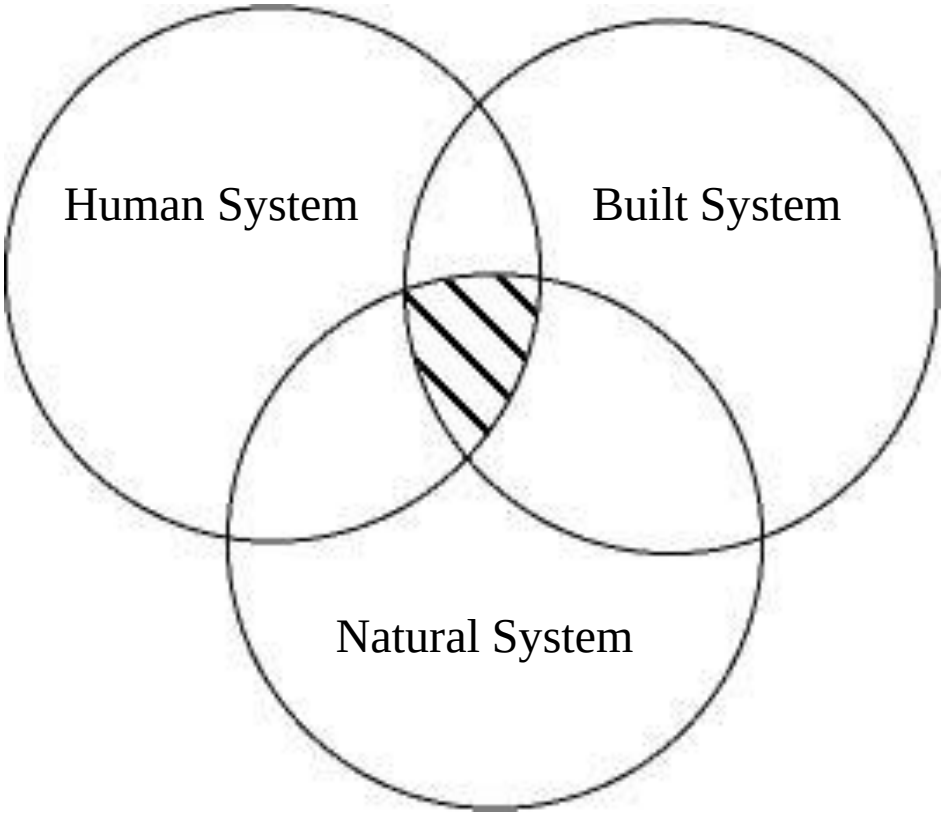
WORLD WATER COUNCIL

FLOOD FORECASTING AND WARNING

Station Ribeirão dos Meninos

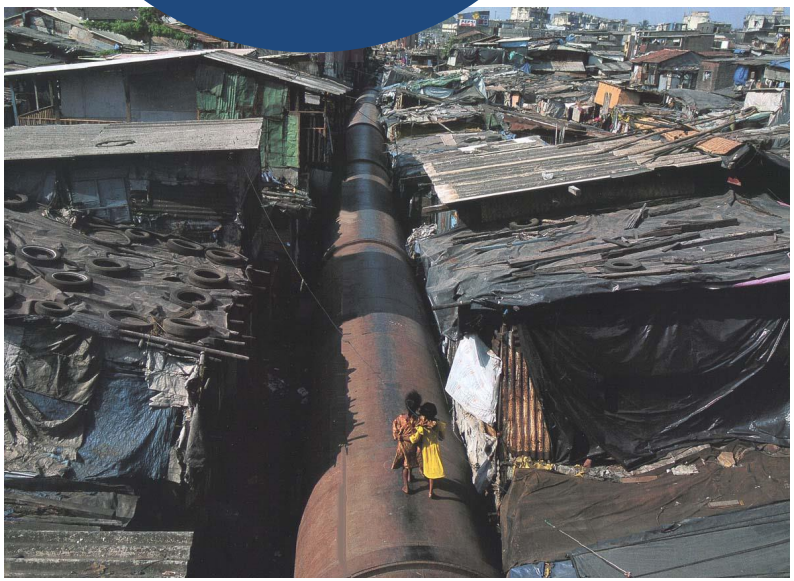


THE URBAN SYSTEM



TRADITIONAL APPROACH

Water Supply and Sanitation



Urban Drainage

Solid Wastes

INTEGRATED URBAN WATER MANAGEMENT

Water Supply and Environmental Sanitation

Transportation and Housing

Urban Drainage

INTEGRATED URBAN WATER MANAGEMENT

Concepts

- River basin as the unit of planning and management
- Interdisciplinary: transportation, housing, urbanism, etc.
- Multi-objective consideration: economic, social and environmental issues
- Public Participation

- INTEGRATION OF LAND + WATER MANAGEMENT

and

- COORDINATION OF INSTITUTIONS' ACTIVITIES

Urban Water Supply
Sanitation
Urban Drainage and Flood Control
Solid Waste
Housing and Transportation

MUST WORK UNDER AN ARTICULATED

Planning

and

Operation

Framework

MANAGEMENT SYSTEM

- State and Local Government
- Organized Civil Society
- Water Users

CONCLUSIONS

- Accentuated urban development in the less developed countries did not allow infrastructure (water supply, sanitation, solid waste and urban drainage) to follow the same rate of development.

- Problems are not exclusive of developing nations, aging infrastructure in the developed world will require intensive capital investment to be adequately rehabilitated.

- Urban drainage sector and urban flood control mechanisms should be part of a larger urban system to be planned and managed in a holistic way.

CONCLUSIONS

- Urban water systems will be sustainable if modern methods of monitoring and dissemination of information are implemented (eg. Rainfall and stream gaging telemetry, satellite and weather radars).

- Urban water systems will be sustainable if modern methods of management are considered, including: non-structural measures and public participation.

- Integrated Urban Water Management could provide means of moving from chaotic to livable cities in the next decades.

THANK YOU

---

worldwatercouncil.org
b.braga@worldwatercouncil.org