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Smarter Cities

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Smarter Cities - after 4 years, what have we learned ?

- **Cities waste a lot of resources through a lack of visibility to activities between agencies**
 - And the knowledge of how to organise them
- **City agencies work together when dealing with emergencies**
 - And begin to understand the value of co-operation
- **Cities badly need to communicate with their denizens to move projects from idea to deployment**
- **Cities see the importance of predictive models which allow the determination of “what if we” and will invest in this capability**
 - IBM is developing these models from observed patterns and analytics
- **The role of denizens in cities to date is rarely understood let alone integrated**
 - It’s not about social networks, it’s about engaging the denizen into the city as a sensor, actuator,
- **The professions that plan, design, build operate and renew cities lack the tools and approaches to create a wholistic - and hence more efficient, view**



Cities Care about

- Operational capacity - making the city work and manage emergencies
- Projected expense – understanding how to optimally apply funds to operations and infrastructure
- What their inhabitants do and want. City leaders need to be re-elected

Analysing Cities

IBM assessment from top 50 cities by population

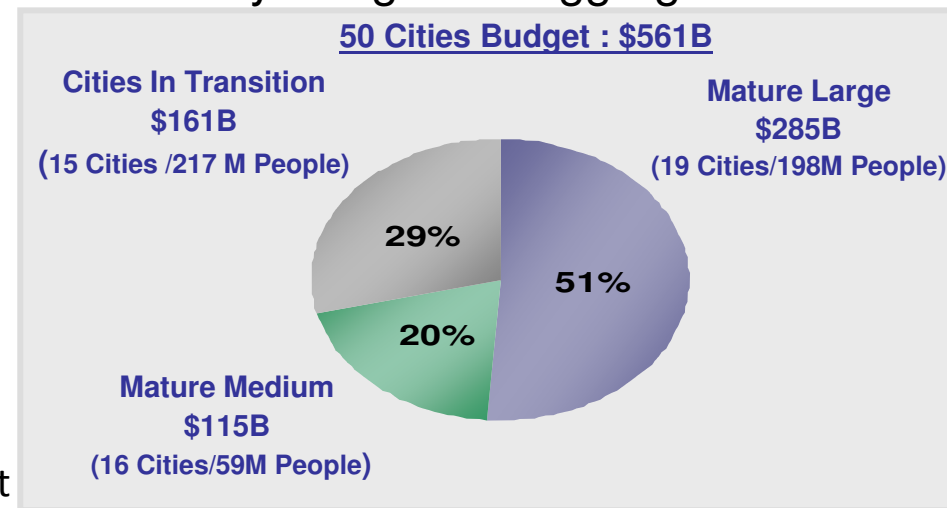
3 City types identified

- Mature Large
- Mature Medium
- Cities in Transition

Each city type has different focus

- Mature Large - safety & security
- Mature Medium - maintenance and resource management
- In Transition - focus on new state of art infrastructure and resource management systems

City Budgets in Aggregate



IBM's Smarter Cities Challenge



- The Smarter Cities Challenge is a competitive grant program awarding \$50 million worth of technology and services over the next 3 years to 100 cities around the globe. These grants are designed to address the wide range of financial and infrastructure challenges facing cities today.

What cities care about most...



The Smarter City - An Analytic Approach

Spatio-temporal analysis
of state, predicted behavior, and
approach to repair replace, renew
infrastructure
Orderly management of work and
resources

FIX REPAIR RENEW BUILD



Asset Management
Buildings, Roads, Wires, Pipes etc,

Resource Optimization
Energy, Water, Traffic etc.

Availability and cost of resource
accurately mapped to predicted
demand

Optimization of supply across entire
value chain

MATCH DEMAND & SUPPLY



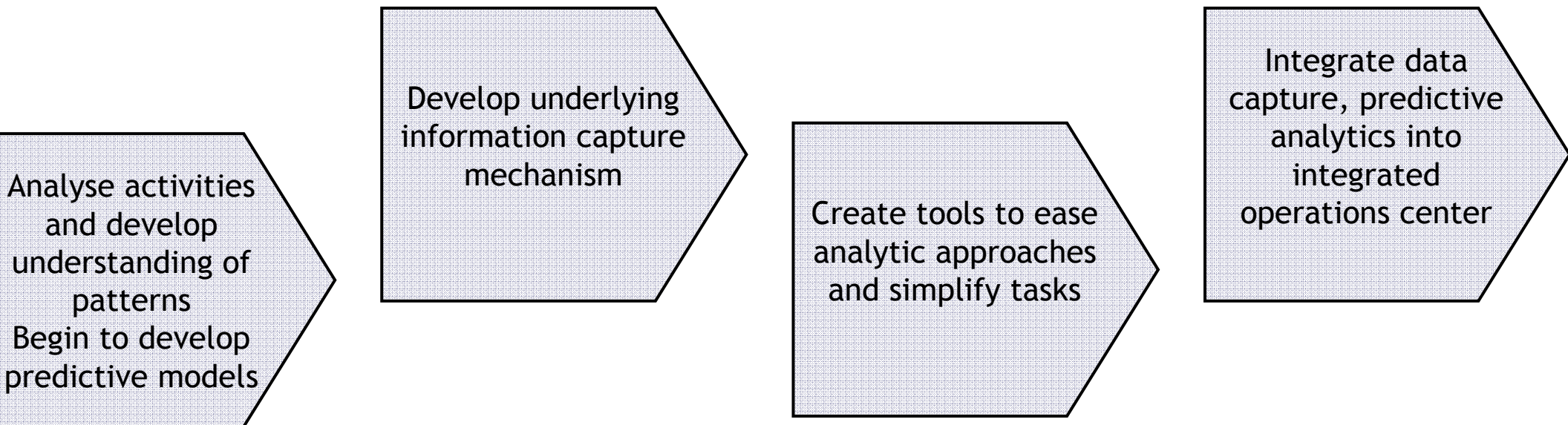
System of Systems

Citizen Mediated Interaction
Desire, motivation communication

Gather insights from citizens' desires and drive their behavior through motivation & communication

COMMUNICATE. ANALYZE & RESPOND

How we have progressed at IBM Research



Our Smarter Cities Approach

Central city operations with multidomain integration providing predictive capability

Integrated management of multiple city activities for operation and planning

Acquisition of multiple data sources, into common framework for analysis and representation

Identification of city operational patterns by agency. Development of predictive models

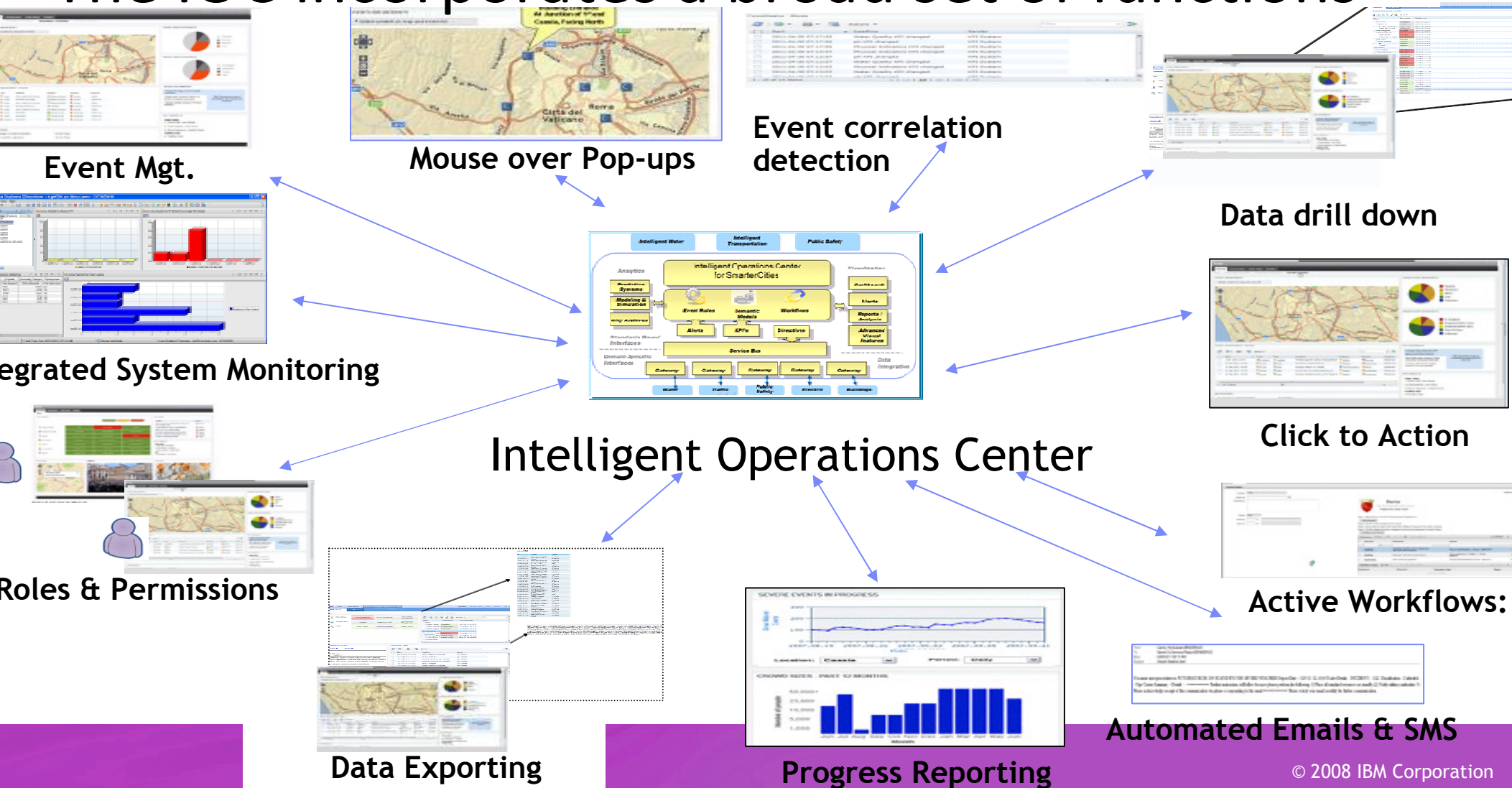
Individual, manual processes
Single domain management

IBM Intelligent Operations Center for Smarter Cities

Coordinate your city to deliver exceptional service to your citizens



The IOC incorporates a broad set of functions



Some examples

Analytics Driven Asset Management

Client [Washington DC water authority](#)

Challenge Prediction of location and nature of state of water delivery infrastructure and remediation of leaks and other faults

Solution Use of Maximo or other asset management approach to identify water delivery infrastructure. Use of statistical analytics to determine future problems - “fix before break” and assign remediation resources. Uses IBM SW including Maximo, SPSS, Cognos and ESRI

Benefits Saved city \$1-2M in expenses. Clustered and discovered important customers and assigned work to repair, predictive maintenance and usage and revenue optimization. Defined stack of SW and approach reusable in other asset management opportunities



Identified common method of analysing failing infrastructure and optimized remediation

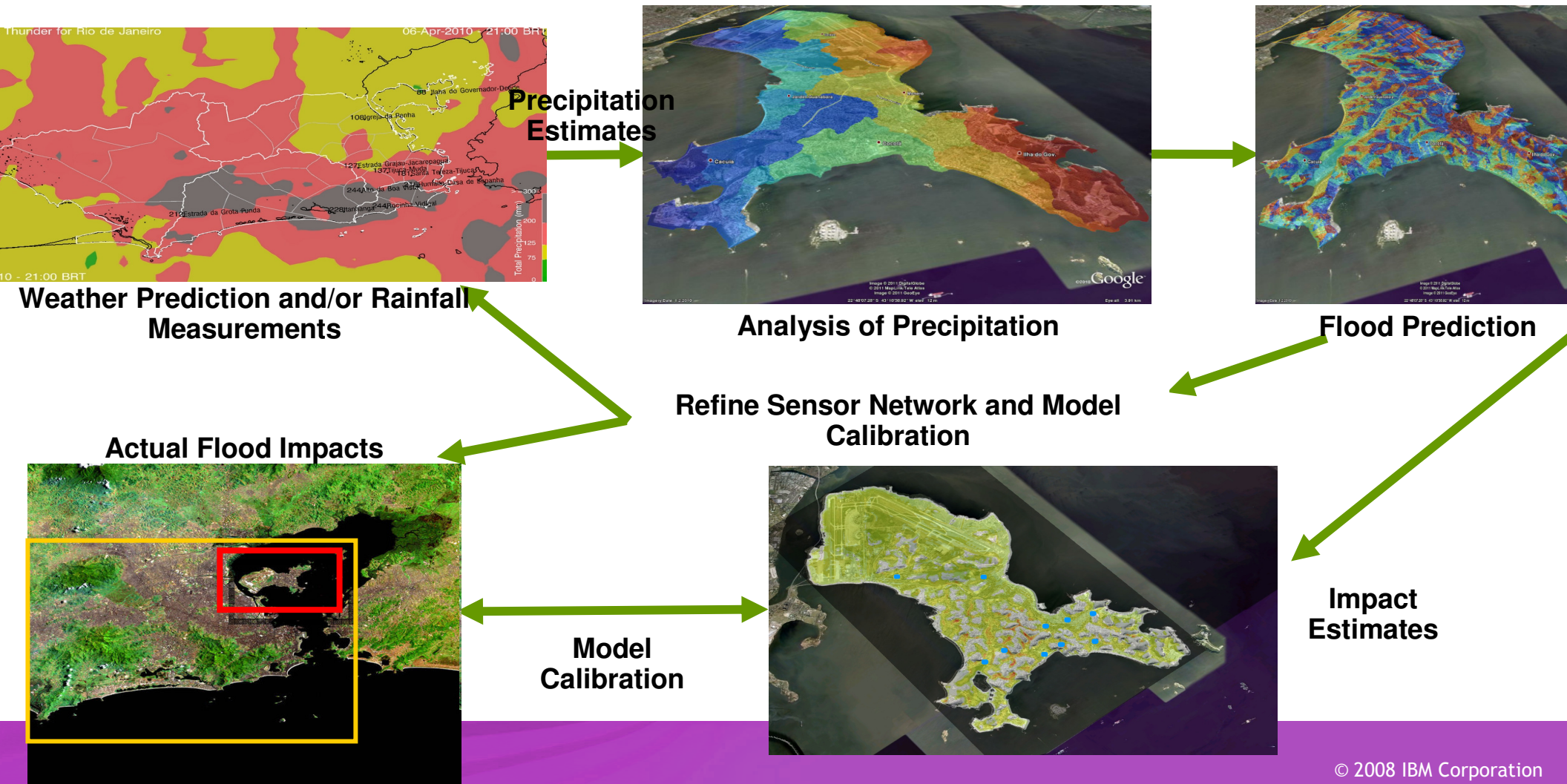
Deep Thunder

Client	Utility, City of Rio de Janeiro, Others
Challenge	The atmosphere by its very nature, causes unpredictable impacts on business directly as a result of not preparing for weather/atmospheric conditions.
Solution	Provide high resolution weather forecast data feeds into a weather-sensitive business system, like Flood Prediction and Emergency Response, enabling those systems to be more detailed, accurate, effective, and efficient.
Benefits	Deep thunder forecasts are providing solutions that enable businesses to pre-deploy assets into specific areas of concentrated damage saving lives, property, and minimising impacts due to extended outages



Using base WRF model and adapting to high resolutions (~ 1 Km) forecasts, develop insight into effect of weather on outages etc.

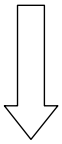
Approach to Urban Flood Forecasting - RIO



Weather and Flood Prediction - PMAR

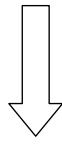
Alerta Rio

(Landslides Monitoring and Alert System)



SMAC

(Environment, Air Monitoring)



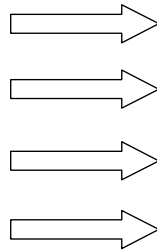
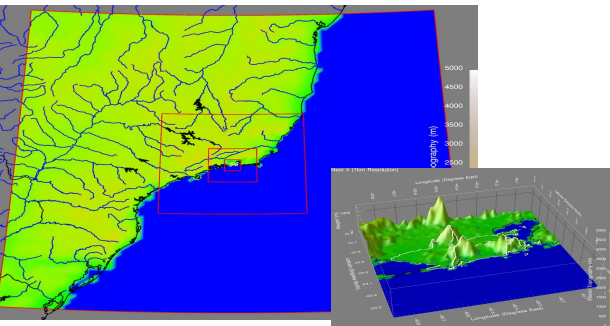
Rio Águas

(Water Levels, Lakes, Hydrographic Basins, Ocean)

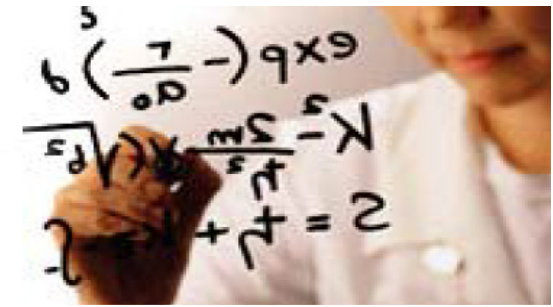
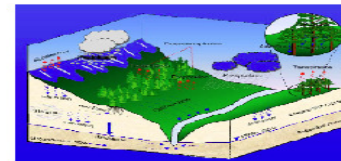


IPP

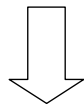
Instituto Pereira Passos
(Geography, cartography, topography, vegetation, urban occupancy and soil usage)



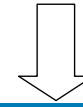
Hydrological Model



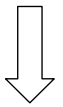
Center of Operations



Mayor's Office



Alerta Rio



CET-RIO

Rio Águas



User

Command Center for Rio de Janeiro



Summary

- IBM is focusing on the improvement of city infrastructure, services and communication through the use of mathematics and ICT
- We envision a future where cities will be both more efficient in their use of resources and provide a much better quality of life through predictive and interactive analytics