A Water Resources Management System as a tool to guarantee the water supply of an iron ore mining project in Brazil

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Outline

- **Water Resources Management in Mining Companies**
- **Minas-Rio Iron-Ore project**
- **Development of the water resources management system**
- **Conclusions**

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Water Resources Management in the Mining Companies

IN THE PAST → No water conflicts between users from the same catchment basin

Water Resources Management = Getting the Water Use Rights for all the abstraction sources and following regulatory legislation

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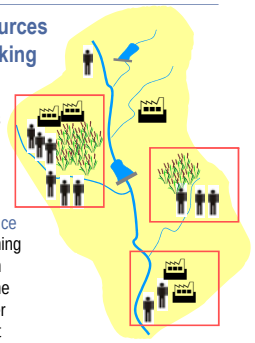
Strategic Vision of the Water Resources Management – Innovative Thinking

MAIN OBJECTIVES

1- Ensure the water supply of the project throughout its lifetime, without affecting other users

2- Ensure a positive balance between the economy coming from the water use from “*cheaper*” sources and the costs related to the water resources management



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1- Ensure the water supply of the project

Main premises

- Long-term thinking: the water resources management should guarantee the water supply throughout the project’s lifetime
- The water resources management should help and direct the integration of the project in its catchment basin with the other water users
- The studies of water availability should be done for the whole catchment basin
- Harmonic coexistence with other water users: the water use rights should be considered as a consequence of the integration of the project in the catchment basin

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2- Positive balance between savings and expenses

Main premises

- The Water Resources Team should be capable of verifying the needs, monitor and evaluate all the developed technical studies
- The water resources management system should pay itself
- The project has always to use the “cheapest waters”. The water sources should be always those with the lower costs of pumping and at the same time sustainable.
- The opportunity to ensure water throughout its lifetime should be considered as a positive saving from the development of the water resources management system

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Minas-Rio Iron-Ore Project

- Open Pit Mine
- Beneficiation plant for pellet feed
- Production of 26.5 Mt of high grade pellet feed per annum

- Currently under implementation phase
- Start up in 2013
- Potential to increase production till 80Mt

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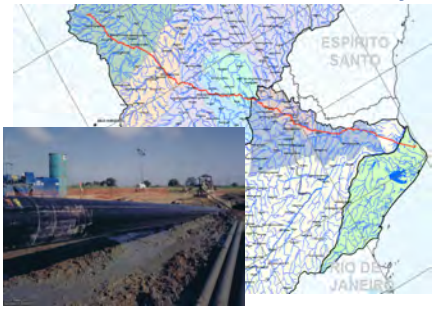
Minas-Rio Iron-Ore Project



Slurry Pipeline

- 529 km of extension
- Transport of the slurry from the pit / beneficiation plant (Minas Gerais) to the Port of Açu (Rio de Janeiro)

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Minas-Rio Iron-Ore Project

- Port of Açu, State of Rio de Janeiro
- Filtration of the slurry
- Loading the ships

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Development of the Water Resouces Management System

Methods

I. Definition of the scale of the studies
II. Technical visit of the whole area of assessment – catchment basin
III. Survey, compilation and systematization of all available information of surface and groundwater of the catchment basin and also the water demands
IV. Critical analysis and treatment of the available data
V. Characterization of the water demands
VI. Characterization of the water availability
VII. Water balance of the whole basin
VIII. Development of technical indicators and the decision support system
IX. Development of the operational water management system

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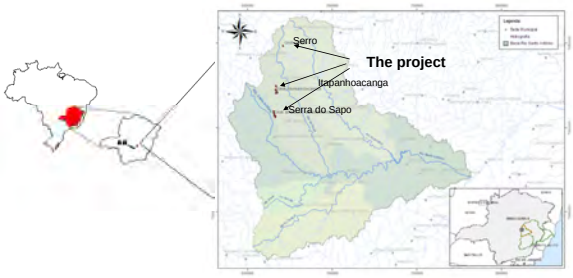
Water Resouces Management System

The project and the Santo Antônio catchment basin – 10,500 km²



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Water Resources Management System

Water demands for the project

Main water uses

- Beneficiation plant process requirements
- Mine and road watering (dust allaying)
- Slurry pipeline
- Water services
- Geological drill hole

Maximum Water Demands for the Project → 2,500m³/h

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Other water users in the same basin

Main water uses

- Hydroelectric power plants
- Irrigation and watering animals
- Public Supply
- Other industries and mining companies

Total Water Demands for Other Water Users

Consumption: Today = 300m³/h → Potential growth to 600m³/h in 20 years

Non counting conflict with hydroelectric power plants

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Water Availability – main water sources

Source	Availability (m³/h)	Distance (km)
Run-of-river abstraction from the Peixe river	**2.500**	**32**
Set of wells for lowering the water level in the mining pit	**250**	**2 - 6**
Hydrologic potential of the dike to contain sediments	**80**	**3**
Hydrologic potential of the tailings dam	**625**	**1**
Total	**3.455**	

* Availability considers the legal environmental flows defined by state organisms for sustainability of aquatic life in this basin.

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Indicators proposal and analysis

Indicators

- Water seasonal demands for each use
- Water seasonal / monthly availability from each source
- Implementation costs for each source / system
- Implementation costs for the pipelines and for pumping
- Distance from the beneficiation plant
- Potential conflicts with other water users
- Impacts on the hydroelectric power plants

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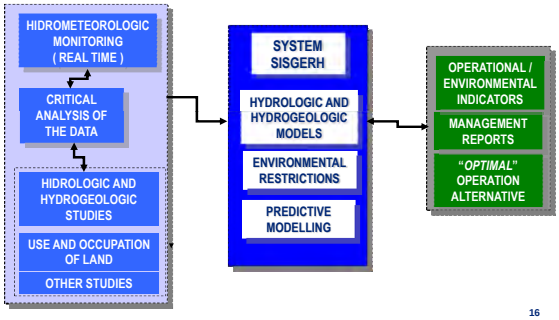

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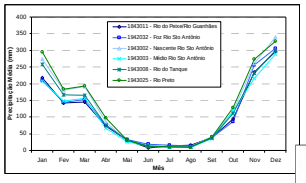
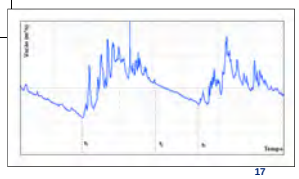
Tipical regime of the catchment basin



Precipitation

Recession flows



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The system main answer for each month after water balances, hydrologic and hydrogeologic models

Which is the best alternative source?

Pump high flow rates from the large stream far from the project ?
(Run-of-river from Peixe river)

X

Pump from multiple smaller sources closer to the project
and less hours from the Peixe river

X

Pump from the dams near the project and increase its reservation closer to the project
Optimize the hydrologic regularization from the dams near the project

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Water Resources Management System

Conclusions

- The water management system could take to important economies to the Project
- The system can indicate the best source each month, based on hydrologic and hydrogeologic predictions and simulations
- The opportunity to abstract water from sources with less energy costs for pumping can be enough to pay the development of the system
- A Team with specialists in the Company (hydrologist, hydrogeologist and specialist in GIS) is important to develop and understand the system’s results
- The system changed the water resources from a weakness of the project to an opportunity

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THANK YOU

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