OVERVIEW OF WASTE WATER ON SELECTED SECTORS IN BRAZIL

REFERENCE GROUP WASTE WATER

February 2014
São Paulo
AGENDA

- Background and summary of findings
  - Brazil in brief
  - Overview of waste water sector in Brazil
    - Water availability vs water price
    - Trends and water treatment players
    - Regulations
  - Public sector
    - Overview
      - Decision making process
      - Public Private Partnership (PPP)
    - State analysis
      - Minas Gerais
      - São Paulo
    - Municipality analysis
  - Industrial sector
    - Overview
      - Steel industry
      - Food & Beverages
      - Pulp & Paper
  - Conclusions & Next steps
THIS REPORT OUTLINES THE BRAZILIAN WASTE WATER SECTOR AND POTENTIAL FOR SWEDISH COMPANIES

The overall objective is to increase knowledge about potential for Swedish technology within the waste water sector in Brazil

Key Issues:

- Understand trends, players and regulatory requirements
- Understand purchasing behavior of the public sector and identify municipalities with upcoming investments
- Analyze the structure of public private partnerships (PPP) and its potential for Brazil
- Map opportunities within the steel industry
- Map opportunities within food and beverages
- Map opportunities within the Pulp and paper sector
FINDINGS SO FAR (1/2)

Overview
- Difficult access to water affect the price in several regions. South and South East show high water prices. Average price is 2,30 BRL per m3.
- The industry is mostly taking water directly from basins to reduce water cost, although several basins are charging for this water.
- In São Paulo prices for water from basin are: 0,01 BRL per m3 for caption; 0,02 BRL per m3 for consumed water (influenced by activity) and 0,10 BRL per kg of DBO5,20 discharged.

Players and Regulations
- Odebrecht ambiental has more than 30% of the market for sanitation in Brazil and is expanding. Several companies such as Degremont, Centropjekt, Enfil, CAB have been losing market shares.
- Nova Opersan has been growing inorganically with help of external investment. The company will focus completely on offering BOT and offsite.
- CONAMA has established national minimum standards for effluents- Brazilian state agencies are responsible for executing and controlling that the environmental resolutions are followed.

Public Sector
- Brazil has a goal for 2020 to increase sewage collection and volume of treated sewage. This goal can only be achieved through partnerships with the private sector; which is why PPP are becoming more common.
- In common concessions wastewater projects will probably use procurement modalities of competitive bidding or invitation.
- São Paulo and Minas Gerais were selected as the most promising states when analyzing macro data such as percentage of GDP invested in waste water treatment and value of state population with sewage network but no waste water treatment.
- These two states plan for high upcoming investments both on municipal and industrial areas.
- The Inter-American Development Bank (IDB) is lending money to Rio de Janeiro to treat the Guanabara bay area. This particular project is interest to investigate further.
## FINDINGS SO FAR (2/2)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel industry</strong></td>
<td>- The southeast region concentrates 94% of the steel production. 9 out of the 29 Brazilian plants are located in Minas Gerais.</td>
</tr>
<tr>
<td></td>
<td>- Steel industry has a high index of water reuse, the ratio was 96.5% for 2012</td>
</tr>
<tr>
<td></td>
<td>- Steel industry is affected by increasing charges on the use of water from the basins which is a driver for implementing new technologies.</td>
</tr>
<tr>
<td><strong>Food &amp; beverages</strong></td>
<td>- The southeast region concentrates 40.6% of the food and beverages (F&amp;B) companies. Large companies are using water treatment. However, small and medium size companies are not fully committed to treatment of effluents.</td>
</tr>
<tr>
<td></td>
<td>- Cost reduction combined with environmental friendly actions drives investments in water treatment.</td>
</tr>
<tr>
<td></td>
<td>- Due to low investments in other sectors such as oil &amp; gas, several suppliers are starting to approach the F&amp;B sector.</td>
</tr>
<tr>
<td></td>
<td>- One of the goals of the sector is to reduce quantity of water consumed</td>
</tr>
<tr>
<td><strong>Pulp &amp; paper</strong></td>
<td>- The pulp and paper industry is concentrated throughout the center-south of Brazil.</td>
</tr>
<tr>
<td></td>
<td>- Although the pulp and paper sector is highly dependent on water it still reuses only 34%</td>
</tr>
<tr>
<td></td>
<td>- Fibria, Suzano and Klabin are the most important pulp and paper companies in Brazil.</td>
</tr>
</tbody>
</table>
AGENDA

- Background and summary of findings
  - Brazil in brief
    - Overview of waste water sector in Brazil
      - Water availability vs water price
      - Trends and water treatment players
      - Regulations
    - Public sector
      - Overview
        - Decision making process
        - Public Private Partnership (PPP)
      - State analysis
        - Minas Gerais
        - São Paulo
      - Municipality analysis
    - Industrial sector
      - Overview
        - Steel industry
        - Food & Beverages
        - Pulp & Paper
    - Conclusions & Next steps
BRAZIL IS 7TH LARGEST ECONOMY IN THE WORLD WITH A GDP ESTIMATED AT 2,2 TRILLION USD IN 2013

GDP DIVIDED BY ECONOMIC ACTIVITY

- Services: 67%
- Industry: 28%
- Agriculture: 5%

MANUFACTURING SECTOR DIVIDED BY SUB-SECTORS

- Food & beverages industry: 21%, 256 BUSD
- Automotive: 12%, 152 BUSD
- Chemical: 9%, 117 BUSD
- Cokes and oil/petroleum refinery and biofuel (such as ethanol): 9%, 109 BUSD
- Metallurgy: 6%, 81 BUSD
- Textile products: 3%, 34 BUSD
- Pulp & paper: 3%
- Pharmaceuticals: 2%
- Other: 36%

FOOD AND AUTOMOTIVE INDUSTRY ARE THE LARGEST MANUFACTURING SECTORS

SOURCE: BRAZILIAN STATISTICAL BUREAU
FAST GROWTH TREND IN FOOD AND BEVERAGES INDUSTRY

MAIN SECTORS OUTPUT (2007/2011) BILLION USD

BEVERAGES INDUSTRY SHOULD BE A TARGET FOR WATER TREATMENT OPPORTUNITIES

EXCHANGE RATE 1USD (2007=1,94; 2008=1,83; 2009=1,99; 2010=1,759; 2011=1,67; 2012=1,95)
SOURCE: BRAZILIAN STATISTICAL BUREAU (IBGE)
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
DIFFICULT ACCESS TO WATER AFFECT THE PRICE OF WATER

The water supply in Brazil is dominated by public-sector bodies, such as municipal water utilities.

In some regions, a small proportion of the water consumed is obtained from privately-owned wells, and springs.

From 20% to 60% of the treated water is lost in the distribution process, due to bad infrastructure.

In areas with lack of water resources such as Rio Grade do Sul and Santa Catarina in the South and Mato Grosso do Sul and Goias in the MidWest, the water prices are very high.

Also in the Northeast the prices are higher than average for Brazil (2.30 BRL/m3).

SOURCE: BRAZIL’S WATER AGENCY AND NATIONAL SYSTEM FOR INFORMATION ABOUT SANITATION

AVG. STATE TARIFF OF CONCESSIONAIRES OF SANITATION IN 2011 BRL/M3

<table>
<thead>
<tr>
<th>REGION</th>
<th>AVERAGE TARIFF BRL/m3</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>2.05</td>
</tr>
<tr>
<td>North East</td>
<td>2.23</td>
</tr>
<tr>
<td>South East</td>
<td>2.19</td>
</tr>
<tr>
<td>South</td>
<td>2.72</td>
</tr>
<tr>
<td>Mid West</td>
<td>2.73</td>
</tr>
</tbody>
</table>

SOURCE: BRAZIL’S WATER AGENCY AND NATIONAL SYSTEM FOR INFORMATION ABOUT SANITATION
TO A LARGE EXTENT THE INDUSTRY IS TAKING WATER DIRECTLY FROM BASINS TO REDUCE WATER COST

The number of basins charging for water consumption is increasing throughout the last 20 years.

- The industry has to get a permission from the government to be able to capture water from a basin.
- The government, afraid of an excessive exploration of the basins, supported the creation of several committees to increase control.
- The trend is to start charging for the water from basins with the aim to give the consumer awareness of the water value, promote the rational use of water and obtain financial resources for the recover of hydric basins.
- Over the states of São Paulo and Rio de Janeiro, most of basins are already being charged or in process of acceptance of charging for consumption of water.
- However the price from taking water from the basins is lower than the price from concessionaries.
- In São Paulo prices for water from basin are: 0,01 BRL per m³ for caption; 0,02 BRL per m³ for consumed water (influenced by activity) and 0,10 BRL per kg of DBO5,20 discharged.
- The total revenue coming from tax collection of basins committees totalized 144,9 million BRL.

THE PULP & PAPER, STEEL AND FOOD & BEVERAGES ARE LOCATED IN CHARGING AREAS

Source: Water National Agency (ANA) and National Law Nº 9,433/97, Part of the National Policy for Hydric Resources.
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
BUILD-OPERATE-TRANSFER IS A NEW TREND WITHIN WASTE WATER SECTOR

SECTOR STRUCTURE

- EPC (Engineering, project and construction) projects require large investments and only clients with strong financial capacity can proceed with this structure.
- Municipalities and companies are starting to work more actively with BOT (build, operate and transfer) projects.
- BOT is a new tendency in Brazil. Clients will pay investor through long term contracts calculated on m3 of effluent.
- Various autonomous municipalities such as Itu and Jundiaí are using BOT. The reasons are usually when public does not have financial resources, local political conditions.
- Another model is offsite when effluents are sent to a treatment plant. Clients will pay a monthly fee to have their waste water treated.
- This approach is appropriate for smaller companies that cannot invest in waste water treatment plants.
ODEBRECHT AMBIENTAL HAS MORE THAN 30% OF THE MARKET FOR SANITATION SPECIFICALLY WASTE WATER IN BRAZIL

MAIN PLAYERS TURNOVER DEVELOPMENT (2010/2012) MILLION BRL

CAB, DEGREMONT, CENTROPROJEKT AND ENFIL HAVE LOST MARKET SHARES

SOURCE: ORBIS; EMIS AND DESKRESEARCH
THE LEADING SUPPLIERS HAVE RECEIVED INVESTMENTS TO EXPAND ACTIVITIES IN BRAZIL

<table>
<thead>
<tr>
<th>CURRENT MARKET WINNERS</th>
<th>CURRENT MARKET LOSERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ODEBRECHT AMBIENTAL</strong> ➔ Odebrecht Ambiental is owned by large industrial conglomerate. The company will receive 615 Million BRL from two funds to reinforce investments in 2014. They are well positioned towards the public segment and intend to extend presence within water and wastewater for residential sewage.</td>
<td><strong>DEGREMONT</strong> ➔ The company has focused on the industrial sector mostly within oil &amp; gas, pulp &amp; paper and petrochemical, but wants to start working with BOT. They are developing a new solution called Omobile which is a mobile solution for treatment of industrial effluents.</td>
</tr>
<tr>
<td><strong>ESTRE AMBIENTAL</strong> ➔ Inorganic growth through recent acquisitions of several companies such as Resicontrol (Veolia’s company before), Cavo (from Camargo Correa), Soma, Viva ambiental, CGR Itaboraí and GEO vision</td>
<td><strong>CENTROPROJEKT</strong> ➔ High focus on industrial segments, specially pulp &amp; paper, but have had difficulties in keeping market shares on the industrial segment.</td>
</tr>
<tr>
<td><strong>OAS SOLUÇÕES AMBIENTAIS</strong> ➔ OAS has earlier focused on highways, railway and airport concessions, but decided in 2012 to act within waste water mostly for concessions and PPP. The first project is Aracatuba a concession of 30 years with a value of 370 Million BRL.</td>
<td><strong>ENFIL</strong> ➔ Enfil is mostly an EPC contractor, but has been losing market shares due to reduced investments particularly from Petrobras. The company is therefore interested in positioning themselves towards new segments and new tendencies such as BOT</td>
</tr>
<tr>
<td></td>
<td><strong>CAB Ambiental</strong> ➔ CAB failed to launch an initial public offering (IPO) in 2011, but received, in early 2012, a stronger support from BNDES, who bought 33% of the company for 120 million BRL. Last year, the group began negotiations to sell a new slice of the company, but the operation did not materialize.</td>
</tr>
</tbody>
</table>
### NOVA OPERSAN HAS AN AGGRESSIVE APPROACH POSITIONING AS BOT SUPPLIER

<table>
<thead>
<tr>
<th>Formal Name</th>
<th>OPERSAN RESIDUOS INDUSTRIAI S/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website</td>
<td><a href="http://www.novaopersan.com.br/">http://www.novaopersan.com.br/</a></td>
</tr>
<tr>
<td>HQ Location</td>
<td>São Paulo (SP)</td>
</tr>
<tr>
<td>Main Business</td>
<td>BOT player</td>
</tr>
<tr>
<td>Import license</td>
<td>N/A</td>
</tr>
<tr>
<td>Approx. turnover 2013 (BRL)</td>
<td>84 million</td>
</tr>
<tr>
<td># employees</td>
<td>300</td>
</tr>
</tbody>
</table>

- Nova Opersan is a new company originated by merger of Opsesan and Enasa and the P2 fund (Pátria and Promon)
- The company has in less than one year acquired Brasquip Ambiental, and two companies HZT and HAZ part of the Haztec group.
- Company has as strategy to support Small and Medium clients such as industrial plants, commercial buildings, shopping centers, etc.

**Approximate turnover development 2012-2013**

<table>
<thead>
<tr>
<th>Year</th>
<th>Million BRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>45</td>
</tr>
<tr>
<td>2013</td>
<td>90</td>
</tr>
</tbody>
</table>

CAGR 68%
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
  - Decision making process
  - Public Private Partnership (PPP)
- State analysis
  - Minas Gerais
  - São Paulo
- Municipality analysis
- Industrial sector
  - Overview
  - Steel industry
  - Food & Beverages
  - Pulp & Paper
- Conclusions & Next steps
### SISNAMA – BRAZIL’S SYSTEM FOR PROTECTING AND IMPROVING ENVIRONMENTAL QUALITY (1/2)

<table>
<thead>
<tr>
<th>Level</th>
<th>Agency</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>CONAMA</td>
<td>Consultative and deliberative forum</td>
</tr>
<tr>
<td></td>
<td>Environmental Ministry</td>
<td>Implementation of environmental policies</td>
</tr>
<tr>
<td></td>
<td>National Agencies: IBAMA &amp; ICMBIO</td>
<td>Execute and control</td>
</tr>
<tr>
<td>State</td>
<td>CONSEMA</td>
<td>Implementation of environmental policies</td>
</tr>
<tr>
<td></td>
<td>State Secretary of Environment</td>
<td>Execute and control</td>
</tr>
<tr>
<td></td>
<td>State Agencies: CETESB, INEA, etc</td>
<td>Execute and control</td>
</tr>
<tr>
<td>Municipal</td>
<td>COMAM</td>
<td>Implementation of environmental policies</td>
</tr>
<tr>
<td></td>
<td>Municipal Secretary of Environment</td>
<td>Execute and control</td>
</tr>
<tr>
<td></td>
<td>Municipal Agencies</td>
<td>Execute and control</td>
</tr>
</tbody>
</table>

**GENERAL PUNCH-LINE/CONCLUSION TO BE MADE FROM THIS PAGE**
The technical groups have representatives from different levels of society. Anyone with interest in environmental issues can participate. The results from these discussions are introduced to a council.

The council is composed by representatives from different stakeholders defined by a governmental decree. The council define resolutions that will later be introduced to the government.

The resolutions are not laws, but shall be executed by the Brazilian states.

Brazilian state agencies are responsible for executing and controlling that the environmental resolutions are followed.

State agencies are also responsible for issuing environmental licenses:

In São Paulo, the state agency is called Cetesb and is seen as a role model for the country.

Brazilian state agencies, such as CETESB, are increasing their human & technical capabilities to enforce the new environmental legislation.

Also state agencies are playing an important role in communicating to the industry about positive effects of clean technology.
CONAMA HAS ESTABLISHED FIXED STANDARDS FOR EFFLUENTS

HOWEVER, THE LEGISLATION CAN BE HARDER AT STATE LEVEL *

<table>
<thead>
<tr>
<th>EFFLUENT ISSUES</th>
<th>SOURCES OF POLLUTANT</th>
<th>NATIONAL LEGISLATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOCHEMICAL DEMAND OF OXYGEN (BOD)</td>
<td>• Industrial activity in general</td>
<td>Minimum Removal of 60%</td>
</tr>
<tr>
<td></td>
<td>• Industrial activity in general</td>
<td>Between 5 and 9</td>
</tr>
<tr>
<td></td>
<td>• Industrial activity, mainly food and beverages</td>
<td>• Mineral: 20 mg/L</td>
</tr>
<tr>
<td></td>
<td>• Industrial activities, steel industry</td>
<td>• Vegetal/Animal: 50 mg/L</td>
</tr>
<tr>
<td></td>
<td>• Industrial activity in general</td>
<td>There is a specific maximum level for each metal</td>
</tr>
<tr>
<td></td>
<td>• Industrial activities, steel industry</td>
<td>Total absence</td>
</tr>
<tr>
<td></td>
<td>• Industrial activities, pulp and paper</td>
<td>5 mg/L</td>
</tr>
<tr>
<td></td>
<td>• Mainly pulp and paper and steel industry</td>
<td>1 mg/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 mg/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 40°C (maximum variation of 3°C in the dumping area)</td>
</tr>
</tbody>
</table>

* SÃO PAULO STATE HAS RIGID MAXIMUM LEVELS FOR METALS AND ORGANIC SUBSTANCES

SOURCE: CONAMA RESOLUTION N430
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations

Public sector

- Overview
  - Decision making process
  - Public Private Partnership (PPP)
- State analysis
  - Minas Gerais
  - São Paulo
- Municipality analysis

Industrial sector

- Overview
  - Steel industry
  - Food & Beverages
  - Pulp & Paper

Conclusions & Next steps
BRAZIL HAS A GOAL FOR 2020 TO INCREASE SEWAGE COLLECTION AND VOLUME OF TREATED SEWAGE

- **CURRENT SITUATION** ➔ In 2011, only 37.5% of the generated sewage is treated. More than 50% of the Brazilian population is not connected to a sewage network system.

- **GOAL for 2020** ➔ Increase the volume of treated sewage reaching 58% of total. Another goal is to increase with 45% the total of population assisted with sewage collection.

- **PUBLIC SECTOR** ➔ Brazil’s inefficient public sector and difficult structural problems such as bureaucracy, corruption, low technology and lack of training retains the development.

- **OVERCOME INEFFICIENCY** ➔ Government enabled PPP (private public partnerships) as an intent of faster development within sanitation.

**SOURCE:** NATIONAL COMMITMENT FOR ENVIRONMENT, HEALTH AND SANITATION
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations

- Public sector
  - Overview
  - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
There are 6 different types of procurement:
- 5 stated in Law No. 8.666 and an additional one in Law No. 10.520 from 2002

**Procurements modalities**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive bidding</td>
<td>Used for high value contracts and complex orders and services. Time frame*: 45 or 30 days</td>
</tr>
<tr>
<td>Comparison of prices</td>
<td>Participants may be companies that are registered or interested in registering. They have to meet the requirements and send proposal no later than the third day after launch of tender</td>
</tr>
<tr>
<td>Invitation</td>
<td>Procurement method limited to short listed companies (minimum of three invited by the responsible department)</td>
</tr>
<tr>
<td>Auction</td>
<td>Modality applied when government wants to dispose assets that are not being used or have been acquired through legal intervention</td>
</tr>
<tr>
<td>Bidding contests</td>
<td>Selects the competitor that offers best performance, example scientific capacity</td>
</tr>
</tbody>
</table>


Wastewater projects will probably use the modalities of competitive bidding or invitation.
THE LEVEL OF INVESTMENT WILL DEFINE WHICH MODALITY TO CHOOSE

PURCHASE OF ENGINEERING WORKS

- Invitation to bid
  - Up to USD 88 000
- Comparison of prices
  - Above than USD 882 500

PURCHASE OF GOODS AND SERVICES

- Invitation to bid
  - Up to USD 47 000
- Comparison of prices
  - Between USD 47 000 and USD 383 000
- Competitive bidding or public tendering
  - Above than USD 383 000

The amount estimated

SOURCE: LAW NO 8.666/ 1993, INTERVIEWS
# Engineering Consultants Play an Important Role on the Decision of New Treatment Plants

<table>
<thead>
<tr>
<th>WHO?</th>
<th>DESCRIPTION</th>
<th>WHAT?</th>
<th>DESCRIPTION</th>
<th>ACTION</th>
<th>DESCRIPTION</th>
<th>RESULT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLIENT:</strong> PUBLIC (eg. SABESP) or INDUSTRY (eg. STEEL)</td>
<td><strong>ENGINEERING CONSULTANCY FIRM or CONTRACTOR</strong></td>
<td><strong>1. DEFINITION OF PROJECT SUPPLIER</strong></td>
<td>Procurement process or invitation for waste water plant project → Engineering firms present offers</td>
<td><strong>PROJECTS ARE EVALUATED ON 3 REQUIREMENTS</strong></td>
<td><strong>ENGINEERING CONSULTANTS DELIVER PROJECT AND RECOMMEND TECHNOLOGY</strong></td>
<td><strong>OFFERS ARE EVALUATED ON 3 REQUIREMENTS</strong></td>
<td><strong>DELIVERY OF PLANT</strong></td>
</tr>
<tr>
<td><strong>CLIENT:</strong> PUBLIC (eg. SABESP) or INDUSTRY (eg. STEEL)</td>
<td><strong>CONTRACTOR</strong></td>
<td><strong>2. DEVELOPMENT OF PROJECT</strong></td>
<td>Project development → design of plant with indication of adequate method of effluent treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CONTRACTOR</strong></td>
<td></td>
<td><strong>3. DEFINITION OF CONTRACTOR</strong></td>
<td>Procurement process or PPP for construction of plant present offers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>4. CONSTRUCTION AND DELIVERY OF PLANT</strong></td>
<td>Construction of plant → purchase of technology from equipment suppliers to be implemented into the plant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Interviews

---

**Projects are evaluated on 3 requirements**
- Engineering consultants deliver project and recommend technology
- Offers are evaluated on 3 requirements
- Delivery of plant
COMPETITIVE BID WINNER IS THE COMPANY WITH HIGHEST GRADE

PARTICIPATING COMPANIES HAVE TO FULFILL 3 REQUIREMENTS

- Suppliers interest in participating monitor official bid announcements
- The official documents express different requirements that the companies will have to meet
- The official documents also indicates a "recommended price"
- Companies will be evaluated on three steps, receiving a grade for each
- On step 2 technical offer consultants specify technology to be used and in cases suggest companies that offer equipment
- Winner will be the company with the highest grade

<table>
<thead>
<tr>
<th>EVALUATION STEPS</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 TECHNICAL QUALIFICATION</td>
<td>LEGAL DOCUMENTS, etc</td>
</tr>
<tr>
<td>2 TECHNICAL OFFER</td>
<td>DOCUMENTS DESCRIBING SOLUTION BEING OFFERED</td>
</tr>
<tr>
<td>3 COMMERCIAL OFFER</td>
<td>COMMERCIAL OFFER WITH DISCOUNT ON “RECOMMENDED PRICE”</td>
</tr>
</tbody>
</table>
THE DECISION MAKING PROCESS FOR THE INDUSTRY OFTEN STARTS LOCALLY

**Locally at the Plant**
1. Engineer has an issue at the plant
2. Engineer reports issue to plant’s director
3. Plant director investigates budget and decides for a project
4. Development of technical specification

**Centrally**
5. Department for development of new technology may also receive input and participate in the project team
6. Procurement department is responsible for initiating tender process and receiving proposal from suppliers

**Impact on decision**
- **ENGINEER** participates as knowledgeable person about the issue at the plant
- **PLANT DIRECTOR** participates as responsible for budget and plant
- **DEPARTMENT FOR DEVELOPMENT OF NEW TECHNOLOGY** participates with global knowledge about the company and interest in improving processes globally
- **PROCUREMENT DEPARTMENT** focuses on evaluating suppliers that match specification and offers for lowest price

**Where?**
- **What?**
- **DECISION**
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
      - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
# THE GOVERNMENT GETS SUPPORT FROM PRIVATE SECTOR THROUGH PPP PROJECTS

**What’s PPP?**

PPP is a concession to support the federal government mainly with investments and improvements of infrastructure in Brazil. The Federal Union, States or Municipalities select and contract private companies to provide public services during a defined period of time.

**Legislation**

- The PPPs are governed by Federal Law No. 11.079/2004
- Federal units and municipalities can develop their specific PPP law

**Types**

- **Sponsored** - Government subsidizes the tariff paid by the users of the services (maximum of 70%). Mix of tariff and budgetary contribution.
- **Administrative** - Government pays a monthly fee to the supplier according to the tender. Compensation is paid fully by the Government based on type of PPP and performance criteria.

**Process**

1. Companies must show their interest and prove ability according to requirements within the “study tender”
2. A study must be done to develop the process and project. The private companies can present their suggestions in a complete project. Projects can be selected to be part of a final PPP project
3. Representatives need to define which type of PPP is going to be used by evaluating technical studies, engineering project/Investment programs, environmental studies, measurement and demand projection, fiscal impact (financial and economic model, risk analyzes, business model) and legal studies (legal modeling, contracts)
4. The bid starts with the aim to choose a winning project

**Limitation**

- Contract value must be higher or equal 20 Million BRL
- Contract must be between 5 and 35 years
- It’s necessary to constitute a Special Purpose Company (SPC)

**PROS**

- **Public** - The government can do the payments at the end of the project. Also if the project is not as agreed the government does not pay This means higher quality services and private partner responsibility
- **Private** – Companies are able to participate on larger and more expensive public sector projects

**CONS**

- **Public** - The government undertakes long-term investments with stricter regulation only for selected sectors. Complex contracts can make the process and negotiation more difficult
- **Private** – Payment by the end of the project risks and financial resources

---

**SOURCE:** FEDERAL LAW NO. 11.079/2004, TCU/CU, INTERVIEW WITH SAO PAULO GOVERNMENT, SECRETARIA DE PLANEJAMENTO DO ESTADO, WEBSITE
**THE END-USER PAYS FOR THE SERVICES OF THE CONCESSION**

| What’s common concession? | • The concession is an administrative contract to transfer management and operation of a public service to a private company under public sector restrictions.  
• Payment is done by end-users  
• A common concession is an administrative contract, whereby the administration is granted for a certain period of time (1-45 years), and by bidding on specific modality competition. |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislation</td>
<td>• It is governed by Federal Law No. Lei 8.987/1995</td>
</tr>
</tbody>
</table>
| Types | • **Public service concession** – the government defines the legal entity or consortium of companies that demonstrate capacity to perform, at its own risk, and for a specified period of time  
• **Construction and service** - The government defines the legal entity or consortium of companies that demonstrate capacity to perform, at its own risk, and for a specified period of time, to construct total or partial public works (related to conservation, renovation, expansion or improvement works) through a competitive bidding. Afterwards the company will be responsible for public services. |
| Process | 1. Companies must show their interest and to prove ability to participate according to the invitation to bid.  
2. By signing the service agreement, the concessionaire assumes all losses (risks).  
3. Compensation is fully paid by users according to the requirements disposed in the beginning of the process. |
| PROS | • Public – all the activities are responsibility of the private partner  
• Private - It is not necessary to constitute a special purpose company |
| CONS | • Public – Conflicts with the private company related to determination of end-user tariffs  
• Private - The common bidding for concession-trading competition created by the PPP Law cannot be used |
STATE OF PERNAMBUCO INVESTS IN THE LARGEST PPP CONTRACT

PUBLIC PRIVATE PARTNERS

PUBLIC PLAYER

- COMPESA operates in 173 of the 185 municipalities of Pernambuco
- Turnover: Approx 1 Billion BRL in 2012

PRIVATE PLAYERS

- Special purpose company formed by Foz do Brazil and Lidermarc Contrações
- Foz do Brasil is part of the giant Brazilian group Odebrecht. The company is participating in several PPPs around the country
- Lidermarc has 15 years of experience within the construction sector and will support Foz do Brasil

CASE: RECIFE AND SURROUNDINGS

- Contract value: 4.5 Billion BRL
  - 3.5 Billion BRL will be invested by the private partner
  - 1 Billion BRL invested by the public sector (Compesa & state of Pernambuco)
- Objective: Increase sewage coverage from 30% to 90% for 14 municipalities in the state of Pernambuco
- Duration of contract: 35 years
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
- State analysis
  - Minas Gerais
  - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
BRAZIL’S 27 STATES WERE EVALUATED USING SEVERAL CRITERIA

CRITERIA:

- Size of state population and value of state GDP
- Number of municipalities with sewage treatment compared to total municipalities
- Percentage of population attended by sewage network
- Water prices
- Percentage of state GDP invested in waste water treatment
- Value of state population with sewage network but NO waste water treatment

SOURCE: BRAZILIAN STATISTICAL BUREAU, NATIONAL SANITATION SYSTEM
4 MAIN CRITERIA WERE USED TO SELECT 2 STATES

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Bahia</th>
<th>Minas Gerais</th>
<th>Rio de Janeiro</th>
<th>Rio Grande do Sul</th>
<th>São Paulo</th>
</tr>
</thead>
<tbody>
<tr>
<td>High % population attended by sewage network</td>
<td>🔴</td>
<td>🔴</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
</tr>
<tr>
<td>High water prices</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
</tr>
<tr>
<td>High % of state GDP invested in waste water treatment</td>
<td>🟢</td>
<td>🟢</td>
<td>🔴</td>
<td>🟢</td>
<td>🟢</td>
</tr>
<tr>
<td>High absolute number of state population with sewage network but NO waste water treatment</td>
<td>🔴</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
</tr>
</tbody>
</table>

- High potential
- Medium potential
- Low potential

SOURCE: BRAZILIAN STATISTICAL BUREAU, NATIONAL SANITATION SYSTEM
THE INTER-AMERICAN DEVELOPMENT BANK (IDB) IS LENDING MONEY TO WASTEWATER PROJECTS IN BRAZIL

<table>
<thead>
<tr>
<th>PROJECTS</th>
<th>STATUS</th>
<th>VALUE</th>
<th>STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program of Environmental Sanitation of CAESB</td>
<td>In preparation</td>
<td>171 Million USD</td>
<td>Federal District</td>
</tr>
<tr>
<td>Sanitation for Nova Estrada Watershed II - PROMABEN II</td>
<td>In preparation</td>
<td>125 Million USD</td>
<td>Pará</td>
</tr>
<tr>
<td>Strengthening the Governance and Management of the Guanabara Bay</td>
<td>Approved</td>
<td>1 Million USD</td>
<td>Rio de Janeiro</td>
</tr>
<tr>
<td>Environmental Sanitation Program for Municípios in the Guanabara Bay Area-PSAM</td>
<td>Approved</td>
<td>452 Million USD</td>
<td>Rio de Janeiro</td>
</tr>
<tr>
<td>Environmental Sanitation Program for Ipojuca Basin</td>
<td>Approved</td>
<td>200 Million USD</td>
<td>Pernambuco</td>
</tr>
</tbody>
</table>

THE GUANABARA BAY PROJECT IS SPECIALLY INTERESTING DUE TO COMPLEXITY AND HIGH VALUE

SOURCE: IDB
RIO DE JANEIRO SHOWS POTENTIAL DUE TO INVESTMENTS FROM IDB ON GUANABARA BAY AREA

OBJECTIVE OF THE PROJECT

The objective of the operation is to help reverse the environmental degradation of Guanabara Bay. Its purpose is to expand coverage of wastewater collection and treatment in this urban area, thus helping to reduce the organic load discharged into Guanabara Bay from domestic sources. The Environmental Sanitation Program will be implemented through three components:

- Wastewater collection and treatment works and equipment;
- Operational improvement and institutional strengthening;
- Support to make municipal sanitation policies sustainable.

GENERAL INFORMATION

- **Time frame**: Project was approved in 2011 and will be finalized in 2016
- **Loan value**: 452 Million USD (9 Million USD has been used until now)
- **Where to invest**: 70 % of financing will go to municipalities ➔ The project will expand the coverage of wastewater collection and treatment
- **Low corruption level**: High transparency about where money has been applied to fulfill obligations towards IDB

SOURCE: IDB
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
  - Decision making process
  - Public Private Partnership (PPP)
- State analysis
  - Minas Gerais
  - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
  - Steel industry
  - Food & Beverages
  - Pulp & Paper
- Conclusions & Next steps
HIGH INVESTMENTS IN WASTE WATER IN MINAS GERAIS DUE TO GOVERNMENT PLAN

**OVERVIEW**

<table>
<thead>
<tr>
<th>Population</th>
<th>19,273,506</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average water price</td>
<td>2,09 BRL / M3</td>
</tr>
<tr>
<td>Municipalities</td>
<td>853</td>
</tr>
<tr>
<td>Main player/operator</td>
<td>COPASA (public)</td>
</tr>
</tbody>
</table>

**WASTE WATER PROJECTS**

- COPAM determined through legislation in 2006 the implementation of Water Treatment Plants in all municipalities in Minas Gerais, as a part of the government plan Minas “Trata Esgoto.”
- COPASA will invest 4.5 Billion BRL in improvements of water supply and waste water.
  - 107 new sewage treatment stations ➔ 85 of these are already under construction. For 13 a tender process will be started soon.
- PPPs are also playing an important role
  - PPP Sistema Rio Manso
  - PPP SES Divinópolis

**GENERAL INFORMATION**

- The central area of MG (Belo Horizonte and surrounding municipalities) accounts for 46.6% of state GDP and 34% of the state’s population
- The state has increased capacity of waste water treatment from 29% in 2008 to 39% and more investments are planned
- Approx. 1 Billion BRL was invested in waste water treatment in 2011, which made them the second state with highest investments in Brazil
- Several industries that are dependent on water and waste water treatment are located in MG: Food and Beverages, textile and shoes, metallurgy (zinc and aluminum), mining; steel, automotive and auto-parts

**SOURCE:** FEAM
ANAEROBIC REACTOR IS THE MOST COMMON TREATMENT METHOD FOR MUNICIPALITIES IN MINAS GERAIS

TREATMENT METHOD USED BY THE MUNICIPALITIES OF MINAS GERAIS

- Anaerobic reactor: 32.2%
- Biologic filter: 19.7%
- Other: 9.4%
- Facultative lagoon: 8.0%
- Mixed lagoon: 0.6%
- Aerated lagoon: 1.4%
- Oxidation ditch: 1.6%
- Wetland/ application on land, aquatic plants: 3.1%
- Aerobic lagoon: 3.5%
- Matured lagoon: 4.5%
- Anaerobic lagoon: 4.9%
- Septic tank of closed system: 5.5%
- Activated sludge: 5.8%

SOURCE: MINAS GERAIS’ SYSTEM OF SANITATION
### MINAS GERAIS’ 853 MUNICIPALITIES WERE EVALUATED USING SEVERAL CRITERIA

#### CRITERIA:
- Population higher than 40 thousand inhabitants
- High GDP per capita of municipality
- Finalized sanitation plan
- High number of upcoming and ongoing projects within waste water

853 municipalities

50 municipalities

4 municipalities

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population</th>
<th>GDP/capita (BRL)</th>
<th># Upcoming and ongoing wastewater projects</th>
<th>Finalized sanitation plan?</th>
<th>Who is operating?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ouro Preto</td>
<td>70 281</td>
<td>25 413</td>
<td>7</td>
<td>Yes</td>
<td>SEMAE</td>
</tr>
<tr>
<td>Muriaé</td>
<td>100 765</td>
<td>8 800</td>
<td>5</td>
<td>Yes</td>
<td>DEMSUR</td>
</tr>
<tr>
<td>Juiz de Fora</td>
<td>516 247</td>
<td>14 379</td>
<td>3</td>
<td>Yes</td>
<td>CESAMA</td>
</tr>
<tr>
<td>Itabira</td>
<td>109 783</td>
<td>25 673</td>
<td>2</td>
<td>Yes</td>
<td>SAAE</td>
</tr>
</tbody>
</table>

Source: MINAS GERAIS’ SYSTEM OF SANITATION
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
SÃO PAULO HAS INVESTED THE MOST IN WASTE WATER TREATMENT IN BRAZIL

**OVERVIEW**

<table>
<thead>
<tr>
<th>Population</th>
<th>39,827,570</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average water price</td>
<td>2,07 BRL/M3</td>
</tr>
<tr>
<td>Municipalities</td>
<td>645</td>
</tr>
<tr>
<td>Main player</td>
<td>SABESP</td>
</tr>
</tbody>
</table>

**WASTE WATER FACTS**

- The state is investing in several programs to increase levels of waste water treatment such as:
- Tiete project aims to collect and treat the sewage of 18 million inhabitants in the metropolitan region of São Paulo. Phase three of the project will soon start.
- SABESP the main player is also active in developing projects for water reuse together with Odebrecht and also in reducing loss of water due to bad infrastructure, a problem common in Brazil.
- The municipalities of Jundiaí and Limeira are success cases for São Paulo:
  - Limeira started with a concession already in 1995 and has invested around 200 Million BRL in projects such as restructuring of, monitoring key indicators, etc.

**GENERAL INFORMATION**

- Invested approx. 3 Billion BRL in waste water treatment in 2011 positioning as number one in terms of waste water investments in Brazil.
- SABESP is cooperating with private companies such as Odebrecht, Estre and others through concession or PPP.
- In several municipalities the percentage of collected waste is 87%. However level of treatment is around 67%.
- The state has suffered of scarcity of water, which has also led to higher control of usage, e.g., the committee for several basins in São Paulo are charging the industry for the water use.

SOURCE: NATIONAL SANITATION SYSTEM
## SÃO PAULO´S 645 MUNICIPALITIES WERE EVALUATED USING SEVERAL CRITERIA

### CRITERIA:

- Population higher than 50 thousand inhabitants
- High GDP per capita of municipality
- Finalized sanitation plan
- High investments in wastewater

---

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population</th>
<th>GDP/capita (BRL)</th>
<th>Investments in wastewater projects (BRL)</th>
<th>Finalized sanitation plan?</th>
<th>Who is operating?</th>
</tr>
</thead>
<tbody>
<tr>
<td>São Bernardo do Campo</td>
<td>765 463</td>
<td>47 000</td>
<td>23 798 175</td>
<td>Yes</td>
<td>SABESP</td>
</tr>
<tr>
<td>Osasco</td>
<td>666 740</td>
<td>59 000</td>
<td>6 183 713</td>
<td>Yes</td>
<td>SABESP</td>
</tr>
<tr>
<td>Mogi das Cruzes</td>
<td>387 779</td>
<td>25 000</td>
<td>13 500 000</td>
<td>Yes</td>
<td>SEMAE</td>
</tr>
<tr>
<td>Barueri</td>
<td>240 749</td>
<td>133 000</td>
<td>6 844 596</td>
<td>Yes</td>
<td>SABESP</td>
</tr>
<tr>
<td>Cotia</td>
<td>201 150</td>
<td>35 000</td>
<td>2 103 172</td>
<td>Yes</td>
<td>SABESP</td>
</tr>
</tbody>
</table>

**SOURCE:** NATIONAL SANITATION SYSTEM
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
MUNICIPALITIES THAT INVEST IN ENVIRONMENTAL ISSUES RECEIVE RESOURCES FROM “ECOLOGICAL ICMS”

“ICMS” IS A STATE VALUES ADDED TAX, TRANSFERRED IN PART TO MUNICIPALITIES

- States such as Minas Gerais, São Paulo, Rio de Janeiro, Rio Grande do Sul and Paraná instituted a specific transfer of ICMS resources for municipalities investing in environmental protection.
- “Ecological ICMS” was created to stimulate municipalities to preserve ecological reserves and invest in sanitation.

<table>
<thead>
<tr>
<th>State</th>
<th>% of ICMS transferred</th>
<th>Criteria (% ICMS transferred)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minas Gerais</td>
<td>1</td>
<td>Conservation index - preservation of ecological reserves (0,5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental sanitation index - landfills, sewage, composting centers (0,5)</td>
</tr>
<tr>
<td>São Paulo</td>
<td>0,5</td>
<td>Special protected areas (0,5)</td>
</tr>
</tbody>
</table>

“ECOLOGICAL ICMS” IN MINAS GERAIS

- Minas Gerais has invested in environmental sanitation, such as sewage, in order to receive additional ICMS resources.
- In 2013, the state of Minas Gerais transferred 81,4 MBRL to municipalities under “Ecological ICMS” system.
- Itabira is one of the municipalities that received the most resources.

Over Minas Gerais, the “Ecological ICMS” represents a driver to invest in sanitation.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Ecological ICMS transfer (BRL) - 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ouro Preto</td>
<td>82717,08</td>
</tr>
<tr>
<td>Muriaé</td>
<td>143580,61</td>
</tr>
<tr>
<td>Juiz de Fora</td>
<td>177843,59</td>
</tr>
<tr>
<td>Itabira</td>
<td>318395,82</td>
</tr>
</tbody>
</table>

Source: ICMS ECOLÓGICO, FUNDAÇÃO JOÃO PINHEIRO
BUSINESS SWEDEN HAS ESTABLISHED CONTACT WITH SÃO PAULO AND MINAS GERAIS’ MAIN OPERATORS

SABESP OPERATES IN 364 OF SÃO PAULO’S 645 MUNICIPALITIES

- SABESP is cooperating with Foz do Brasil (Odebrecht) in a water reuse project for industrial purpose (up to 1 thousand litres / hour to supply the petrochemical pole in Capuava in Santo André)
- SABESP is interested in several solutions such as dewatering of sludge, online dosage of chemical polymer, high efficiency pumps, sensors for analyzing water and measuring pressure
- The engineering department located in the HQ is involved in most procurement processes. The Manager Mr Americo Sampaio is on top of most investments.

COPASA OPERATES WITH SANITARY SEWAGE IN 283 OF MINAS GERAIS’ 853 MUNICIPALITIES

- Copasa will invest approximately 1,5 Billion BRL in sanitation projects this year. 150 Million are already being
- The engineering department located in the HQ is involved in most procurement processes.
- They are interested in learning how other countries are dealing with sewage treatment.
- The Manager of the engineering department Mr Rodrigo Varella is on top of most on going investments.

SABESP is interested in more hands on cooperation in terms of exchange of experience and on going communication.

Chief of engineering Mr Americo Sampaio

Chief of engineering Mr Rodrigo Varella

SOURCE: INTERVIEWS

It is a good moment for the Swedish companies since we have several upcoming projects. Other countries have also contacted us, and we are open to learn from your experience.
DEMSUR PLANS TO BUILD 4 NEW WATER TREATMENT STATIONS IN MURIAÉ

<table>
<thead>
<tr>
<th>Company</th>
<th>DEMSUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website</td>
<td><a href="http://www.demsur.com.br/">http://www.demsur.com.br/</a></td>
</tr>
<tr>
<td>HQ Location</td>
<td>Muriaé (MG)</td>
</tr>
</tbody>
</table>

Contact | Maria Aparecida Monteiro |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Architect Director</td>
</tr>
<tr>
<td>Phone</td>
<td>+55 32 3696-3460</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:setortecnico@demsur.com.br">setortecnico@demsur.com.br</a></td>
</tr>
</tbody>
</table>

UPCOMING INVESTMENTS:

- 98% of population has collected sewage, but only 50% of Muriaé sewage water is treated.
- It is planned the building of 4 new units of sewage treatment, with investment of 2 MBRL each. Districts: Belisário, Boa Família, Bom Jesus and Itamuri.
- The municipality will invest 5,5 MBRL in the main unit system, with resources from the Growth Acceleration Program II (PAC II).
- Muriaé and Juiz de Fora are working together in the water treatment issue.

SOURCE: INTERVIEWS
CESAMA IS INVESTING 130 MBRL IN SEWAGE TREATMENT FACILITIES IN JUIZ DE FORA

<table>
<thead>
<tr>
<th>Company</th>
<th>CESAMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website</td>
<td><a href="http://www.cesama.com.br/">http://www.cesama.com.br/</a></td>
</tr>
<tr>
<td>HQ Location</td>
<td>Juiz de Fora (MG)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact</th>
<th>Marcelo Amaral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Development Director and Engineer</td>
</tr>
<tr>
<td>Phone</td>
<td>+55 32 3229-1207</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:mamaral@cesama.com.br">mamaral@cesama.com.br</a></td>
</tr>
</tbody>
</table>

UPCOMING INVESTMENTS:

- They are developing works for the expansion of sewage interceptors and collectors, to be concluded in 2015-2016.

- Juiz de Fora will invest 130 MBRL in water treatment stations (“ETEs”). Locations are: Granja Betel (new), Barbosa Lage, Santa Luzia (new), Barreira do Triunfo.

- Bidding for ETE Barbosa Lage will happen this year. Funds (20 MBRL) will be released by Caixa Econômica Federal.

Juiz de Fora

<table>
<thead>
<tr>
<th>State</th>
<th>Minas Gerais</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>516 247</td>
</tr>
<tr>
<td>GDP/capita</td>
<td>14 379 BRL</td>
</tr>
<tr>
<td>Projects</td>
<td>3</td>
</tr>
<tr>
<td>Sanitation plan</td>
<td>Yes</td>
</tr>
</tbody>
</table>

SOURCE: INTERVIEWS
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
  - Conclusions & Next steps
THE SOUTHEAST REGION CONCENTRATES 94% OF THE STEEL PRODUCTION
9 OUT OF THE 29 BRAZILIAN PLANTS ARE LOCATED IN MINAS GERAIS

- 14 private companies (administered by 11 corporate groups) operate 29 plants distributed amongst 10 Brazilian states.

- Due to high iron ore deposits, Minas Gerais is the state that holds the highest number of plants (9). Followed by São Paulo (6) and Rio de Janeiro (5).

- All of these states are located in the Southeast region, which concentrates 94% of the steel production.

- The corporate groups are: ArcelorMittal, Gerdau, Aperam, Sinobras, Vallourec, Vilaiores Metals, Votorantim Siderurgia, Usiminas, Thyssenkrupp CSA and CSN.

- In 2012 34,5 million ton of steel was produced.

- Brazil is a major steel exporter – 13th in the World ranking.

SOURCE: AÇO BRASIL
ARCELORMITTAL BRASIL, GERDAU, USIMINAS AND CSN ACCOUNT FOR 81% OF CRUDE STEEL PRODUCTION

**Gerdau**
- **Net Revenue 2012**: 37.98 Billion BRL
- **Headquarters**: Porto Alegre, RS
- **Main plants**: Sorocaba, Araçariguama, Mogi das Cruzes, Pindamonhangaba, SP; Recife, PE; Barão dos Cocoias, Divinópolis, Ouro Branco, MG; Maracanaú, CE; Rio de Janeiro, RJ; Araucária, Curitiba, PR; Sapucaí do Sul, Charqueadas, RS, Simões Filho, BA.

**CSN**
- **Net Revenue 2011**: 16.52 Billion BRL
- **Headquarters**: São Paulo, SP.
- **Main plant**: Volta Redonda, RJ

**A.Mittal Brasil**
- **Net Revenue 2012**: 15.7 Billion BRL
- **Headquarters**: Belo Horizonte, MG
- **Main plants**: Juiz de fora, João Monlevade, MG; Cariacica, Serra, ES; Piracicaba, SP

**Usiminas**
- **Net Revenue 2011**: 11.9 Billion BRL
- **Headquarters**: Belo Horizonte, MG
- **Main plants**: Ipatinga, MG; Cubatão, SP.

**Crude Steel Production by Company 2012 - 10^3t**

- 24%
- 22%
- 21%
- 14%
- 10%
- 9%

**SOURCE**: AÇO BRASIL, VALOR ECONÔMICO, COMPANIES' SUSTAINABILITY REPORT
In 2012, the Brazilian steel industry used a total of 4,9 billion m³ of freshwater.

75% of water usage is associated to cooling processes, 13% to pollution control and 12% to the conditioning of the material.

In some cases depending on the location it is possible to use seawater (In 2011 36% of all the water used came from the sea).

The high rate of water reutilization is due to the expected lack of water supply in the coming decades, which is associated to:

- Unavailability of water in certain regions (i.e. Northeast).
- Conflict in usage (i.e. Rio Paraíba do Sul). In this case, the priority of the supply is given to the municipalities rather than the industry.

“Being ‘green’ is not a matter of marketing, it is a matter of cost (...) International pressure does also contribute to a more sustainable approach by companies. World Business Council for Sustainable Development calls for more transparency, through mandatory sustainability reports.”

Patrícia Bosón – Environment specialist at the Industrial Federation of the State of Minas Gerais
STEEL INDUSTRY IS AFFECTED BY INCREASING CHARGES FOR THE USE OF WATER

COMPANIES’ HIGH REUSE RATIO IS BOTH A CONSEQUENCE AND A SOLUTION TO THE BASINS COMMITTEES’ NEW TARIFFS

Case: ArcelorMittal Tubarão

- The cost of using water is very low, due to an old contract established with the local water concessionary.
- 96% of the water used in the productive process comes from the sea.
- An agreement was made with the local authority (IMEA) to expand its productivity from 4 to 7.5 million ton of steel per year using the same amount of water.
- In order to accomplish this commitment, in 2006 ArcelorMittal built a ‘reuse treatment station’ so as to treat the reused water that was not being treated within the production units.

"By that time its purpose was genuinely ecological. But now, since a committee of the Santa Maria river is being made and the water consumption probably will be charged, it turned out to be a very smart investment.”

Fabiana Passamani - Biologist specialized in Water Resources at the Environment department of ArcelorMittal Tubarão

"We’re investing in closing the water cycles so as to increase our reutilization rate (which is already around 90%). By doing so, we will become less dependant on our sole ressource Paraíba do Sul river.”

Antônio Carlos Simões – Water Resources Specialist at CSN

"We are getting ahead of ourselves from the future water restrictions imposed by the law – that is the reason for our 96.7% reuse water ratio. Our plants from Piracicaba, João Monlevade and Juiz de Fora already pay to the basins committees for the use of water and we see this as a trend for the other basins.”

José Otávio Franco - Manager at the General Environment Department of ArcelorMittal
STEEL INDUSTRY IS ATTENDING LEGAL STANDARDS
OLD TECHNOLOGY IS ENOUGH TO GUARANTEE THE ACCOMPLISHMENT OF LEGAL OBLIGATIONS BUT BIG COMPANIES ARE GOING FURTHER

- Following CONAMA’s standards and acquiring a license to use the water are key drivers to the water treatment.

- Since the cost of using water depends on both the caption rate and the pollution load of the effluent, treating the used water leads to a reduction of this cost.

- Some companies not only fulfill their legal obligation but go beyond that, by monitoring in real time the water quality (even parameters that are not mandatory) and by making daily reports to local authorities.

<table>
<thead>
<tr>
<th>Treatment method</th>
<th>% of production units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation of oil from water</td>
<td>96,0%</td>
</tr>
<tr>
<td>Neutralization adjustment of PH</td>
<td>93,2%</td>
</tr>
<tr>
<td>Flocculation &amp; coagulation</td>
<td>81,3%</td>
</tr>
<tr>
<td>Cooling</td>
<td>77,7%</td>
</tr>
<tr>
<td>Biological treatment</td>
<td>76,9%</td>
</tr>
<tr>
<td>Filtration</td>
<td>76,6%</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>75,1%</td>
</tr>
<tr>
<td>Clarification</td>
<td>67,5%</td>
</tr>
<tr>
<td>Equalization</td>
<td>65,0%</td>
</tr>
<tr>
<td>Aeration</td>
<td>62,1%</td>
</tr>
<tr>
<td>Dehydration of sludge</td>
<td>62,0%</td>
</tr>
<tr>
<td>Heat exchange</td>
<td>51,0%</td>
</tr>
</tbody>
</table>

SOURCE: INTERVIEW, AÇO BRASIL
Gerdau S.A. is a market leader for the long steel segment in the Americas and it is present in 14 countries.

It has presented one of the highest reutilization ratio in 2012: 97% - more than 2 trillion liters of water was reused, considering all Gerdau’s plants.

In 2012, BRL 178,4 million was invested in the environmental area.

**Focus on Gerdau Riograndense**

- Many investments have been made over the last 15 years.
- Among these investments one may find:
  - New effluent treatment stations;
  - New pond to keep rainwater and sanitary water;
  - Implementation of anaerobic filters;
  - Increasing of water recirculation systems.
- The effluent discharged into the Sinos river presents higher quality parameters than the raw water captured.
- Gerdau Rio Grandense claims to be constantly updating its equipment’s technology.
- The plant monitors the effluent, through flow, temperature and pH measurements and also physicochemical/biological treatment.
- Not only surface but groundwater is monitored by Gerdau Riograndense.
**ARCELORMITTAL: AWARDED FOR SUSTAINABLE WATER RESOURCE MANAGEMENT**

96.7% REUSE RATIO IN 2012

- National Water Agency (ANA) has awarded ArcelorMittal Brasil in 2010 for its investment in water treatment/reuse and also in education and the recovering of ciliary woods.
- For the last 13 years more than 30 Million BRL were spent in new equipment’s to treat the water and also for the education of the plants employees.
- The company claims that this whole investment was made at ArcelorMittal’s own initiative – it was not a requirement of a Conduct Adjustment Declaration (TAC)*.

**ArcelorMittal Brasil’s main projects:**

- **‘Zero Discard’ Project** (Projeto Descarte Zero): the plants from João Monlevade (MG), Juiz de Fora (MG) and Piracicaba (SP) present a small percentage of water captation and no effluent is disposed. The objective is to expand the project to other plants.

- **‘Water Balance’ Project** (Projeto Balanço Hídrico): ArcelorMittal Sabará was one of the first steel plants in Brazil - its water captation systems were oversized and obsolet. To solve that problem, Balanço Hídrico project was implemented to monitor and control water’s inflows and outflows. The result was a more effective control of leaks and the reduction of water captation.

---

* TAC is a company’s commitment to follow the National guidelines
**Guidelines for the future**

- Constantly improve the water/sewage treatment process;
- Enlarge water reuse;
- Reduce the caption of water and improve freshwater quality;
- Capture seawater in an efficient manner;
- Capture water from the rain;
- Preserve the river beds and ciliary woods;
- Contribute to the awareness of the local communities, the society and the employees, concerning the rational water consumption;
- Improvement of the supply system’s autonomy, allowing 2 hours of maintenance operations without stopping the productive process.

"In 2013 we have invested in a slag filter that removes phosphorus from the water. It was a creation of a Canadian teacher and it costed around 15,000 USD (...) Although the quality of the water we treat is very high, there is always something to improve – for instance, the effluent that comes from the melt shop could be better."

Fabiana Passamani - Biologist specialized in Water Resources at the Environment department of ArcelorMittal Tubarão

---

**ARCELORMITTAL'S ENVIRONMENTAL POLICY HAS ALWAYS STIMULATED INVESTMENTS IN TECHNOLOGY – THE SAME TREND FOR THE COMING YEARS**

SOURCE: ANA’S REWARD, INTERVIEW
CSN NEEDS TO MAKE WATER A PRIORITY
CONFLICT OF USAGE OF PARAÍBA DO SUL RIVER COMPELS CSN TO INCREASE ITS REUSE RATIO

CSN Today
- Capacity to produce 9.5 million ton of crude steel per year, that corresponds to 1/4 of the Brazilian production.
- In 2011 311 Million BRL was invested in environmental initiatives.
- They have 15 effluent treatment stations.
- CSN monitors the quality of Paraíba do Sul river, by sending online reports to Inea - a system that allows the measurement of the temperature, pH, level of oxygen, etc.
- In 2011, a cooling tower of the effluent that comes from the Chemical Effluent Treatment Station was built.

Why?
- Paraíba do Sul basin is under consumption pressure: 10 % of the Brazilian GDP comes from municipalities located in its banks.
- Since 2003 CSN has been paying Paraíba do Sul basin committee for the use of water.
- There are no means to capture the water from other resources than Paraíba do Sul river.

Water Consumption
- Reused water: 9.3%
- Captured water: 89.7%

TOTAL: 1 252.8 Million m³/year

Future investments
- CSN is working on its first water inventory.
- The company intends to increase its water reutilization rate, by closing water cycles.
- Part of the investment will be allocated in technology that reduces the amount of oil in the water.

RELATIVE VULNERABILITY LEADS TO POSSIBLE INTEREST IN NEW TECHNOLOGIES
SOURCE: COPPETEC FUNDAÇÃO, INTERVIEW
Usiminas invests around 3.9% of its revenue in water treatment.

The water discharge by Usiminas’ plants has declined in the last years, from 139 millions m³ in 2010 to 137 millions m³ in 2011.

It plans to invest 100 Millions BRL, until 2020, in the water resources area for Cubatão and Ipatinga’s plants.

Usiminas always used EPC for the treatment of effluents of its plants.

In 2011 CETESB has applied 7 fines to Cubatão’s plant, because effluent discharges did not obey legal standards. Total fine: 584.679,70 BRL

INITIATIVES TO MITIGATE THE ENVIRONMENTAL IMPACTS

Ipatinga: adaptation of the coke plant’s Biological Water Treatment Station, including physicochemical treatment to enhance the quality of the effluent.

Cubatão: recirculation of the effluent of the Acid Water Treatment System to reduce industrial effluent discharge.

Programa Mata Ciliar: ecosystem maintenance for the preservation of water resources.

"The most relevant criteria [for investing in water treatment] are performance and cost"

Grace Mitkiewicz – Environmental Specialist of Usiminas

USIMINAS IS INVESTING IN WATER TREATMENT SEEKING COST REDUCTION

SOURCE: USIMINAS’ SUSTAINABILITY REPORT, INTERVIEWS
USIMINAS REUSE 96% OF THE WATER IN IPATINGA UNIT

CUBATÃO PLANT WATER TREATMENT
- Direct system recirculation water: sedimentation, oil separation, filtration, cooling, clarification, chemical treatment and microbiological control. Main equipment: clarifiers, pressurized cylindrical filters, recirculation towers (cross flow or countercurrent).
- Cubatão plant also treats oily, acid and domestic effluents for discharge and reuse.
- This plant also uses sea water. None of this water is reused.

IPATINGA PLANT WATER TREATMENT
- Direct system recirculation water: similar to Cubatão’s treatment station.
- The plants use Skimmer bombs for oil removal in water treatment. Sludge dryers are used in waste treatment.
- The plants have direct and indirect water recirculation center systems.
- Ipatinga plant also treats oily, acid, galvanic and domestic effluents for discharge and reuse.

### Water Consumption - 2013

<table>
<thead>
<tr>
<th>Source</th>
<th>Water Consumption</th>
<th>Reused Water</th>
<th>Discharged Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubatão (SP)</td>
<td>11.55% of average discharge in 2011</td>
<td>3.5%</td>
<td>96.5%</td>
</tr>
<tr>
<td>Ipatinga (MG)</td>
<td>2% of average discharge in 2011</td>
<td>4%</td>
<td>96%</td>
</tr>
</tbody>
</table>

TOTAL: 582.434.880 m³

TOTAL: 982.415.904.289 m³

*Numbers do not account for sea water. After it enters the system, it is rapidly returned to the sea through a special tube. This water is used merely for cooling purposes.*
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
THE SOUTHEAST REGION CONCENTRATES 40,6% OF THE FOOD AND BEVERAGES COMPANIES
IT ALSO HAS THE HIGHEST PERCENTAGES OF MEDIUM AND LARGE BUSINESSES

The food and beverages industry is concentrated in the most populous and industrialized region of Brazil. However, there are many industries in remote parts of the country.

The Southeast region has the highest number of micro, small, medium and large companies.

Accordingly to SEBRAE criteria, medium and large companies account for more than 75% of the total production value.

The largest companies of the beverage sector, as AMBEV, Coca-Cola Group and Brasil Kirin, keep production units throughout the country, but the Southeast (mainly São Paulo and Rio de Janeiro) is still the largest producer.

NUMBER OF COMPANIES BY REGION – 2012*

* IT INCLUDES MICRO, SMALL, MEDIUM AND LARGE COMPANIES

SOURCE: ABIA, IBGE
The largest companies treat most of their own effluents internally. The percentage of treated water often reaches numbers superior to 98%.

It is common for medium companies to treat their effluents externally, since the main factor considered for building their own facility is the volume of effluents.

It is reported that some small companies do not treat their effluents, dumping untreated water directly in receptor bodies.

Water is raw material for the food and beverages industry, so the companies keep a goal for reduce of usage and reuse of this water.

However, is not common for all companies to treat water so it will go back directly into the production process. The reuse water goes into refrigeration, irrigation, cleaning processes and so on.

SOURCE: DEASKRESEARCH, INTERVIEW
COST REDUCTION COMBINED WITH ENVIRONMENTAL FRIENDLY ACTIONS IS A NEW TREND FOR BRAZILIAN FOOD & BEVERAGE COMPANIES

- The largest companies in the industry are trying to reduce costs while implementing environmental goal as reusing water and solid waste.

- Producers of beverage have a goal of reducing the water usage in the production. To do that, the companies publish annually the liters of water consumed for the production of 1 liter of beverage.

- Also, many companies are adopting the GRI model (Global Reporting Initiative) as a way to present to customers and investors their environmental achievements.

- Coca-Cola and Brasil Kirin are also reusing rain water in the production process, but not in the final product.

- They are also investing in smart “green buildings”, as well as funding awareness programs.

"For us, the environmental issue is not a matter of cost, but a matter of gains”

Milton Seligman – Vice-president of the department of Corporate Relations at Ambev

REUSING WATER IS AN EFFECTIVE WAY FOR COMPANIES TO REDUCE COSTS

SOURCE: DEASKRESEARCH, INTERVIEW
EFFLUENT TREATMENT COMPANIES ARE FOCUSED ON THE FOOD & BEVERAGES INDUSTRY

- F&B companies are demanding technology to install more effective effluent treatment, pursuing reduction of costs.
- At the same time, the reduction in the building of new plants in the heavy industry has made water treatment companies focus on the food & beverages industry.

OCCUPORTUNITIES

- Small companies still have problems with losses from leakage and bad management of water in the production processes. They are seeking technology to solve the issue and reduce costs.
- The legislation is getting more restrictive and the cost of water is rising in distant areas of the country, like remote areas in Mato Grosso and Minas Gerais states. Many industrial units are located in these areas, which raises the demand for effluent treatment.

NEW TECHNOLOGY OFFERED BY EFFLUENT TREATMENT COMPANIES

- Enfil is working with biological treatment. The company has invested in technology for MSBR (Modificate Sequence Battery Reactor) in a facility, with anoxic cycles intercalated in aerobic tanks. The restrictions for total nitrogen are lower than 5 mg/L.
- Kurita is also focused on the chemical treatment of effluents for F&B industry. The new methods seek to reduce the dosage of chemical products in the water treatment process.
- Mann+Hummel is betting on MBR (membrane bio-reactor) and on supplying of skids of the same system. The focus is treatment of 50 to 100 m³/day.

SOURCE: DEASKRESEARCH, INTERVIEW, QUÍMICA E DERIVADOS MAGAZINE
LARGE COMPANIES ARE INVESTING IN TECHNOLOGIES TO REDUCE WATER CONSUMPTION AND INCREASE REUSE

- Mostly large companies have a water treatment facility within the productive units. If not, the effluent is treated externally.
- Small companies still have problems with losses from leakage and bad management of water in the production process. So they are seeking technology to solve the issue and reduce costs.

WHAT IS DISCOURAGING INVESTMENT?

- Refined treatment as that from filtration membranes is not of common use for medium or small companies, since, generally, the legislation does not require very high standards for effluents dumping.
- The companies don’t recycle water to be reintroduced in the final product. Even if the technology was available, the practice is not well received by the consumers.

WHAT LARGE COMPANIES ARE DOING?

- AmBev has a new facility for water treatment in the Uberlândia beer producer unit, built by Enfil in 2013 (the delivery is set to the middle of 2014).
  - Anaerobic and aerobic treatment:
    - Capacity for 600 m³/h.
    - DBO: 2.000 mg/L, clearance of 95%.
- Coca-Cola, in business with Mann+Hummel in the Itabirito (MG) unit, is trying to get the LEED (Leadership in Energy and Environmental Design) certification.
- And, in Jundiaí unit (FEMSA), the company has implemented a technology that recovers an average of 80% of water to be reused in the production process. This unit is a reference in water saving.
- Brasil Kirin is reusing biogas from effluent treatment as a mean of reducing natural gas usage. The measure has reduced in 5% the demand for this energy resource.

SOURCE: RESEARCH, INTERVIEW, SCHOLAR ARTICLE
COCA-COLA, AMBEV AND BRASIL KIRIN ARE THE MOST IMPORTANT BEVERAGES COMPANIES IN BRAZIL

TOGETHER THEY HOLD 87% OF THE SOFT DRINKS MARKET SHARE AND 79% OF THE BEER MARKET SHARE

**Coca-Cola Group System**
- **Net Revenue:** 16,89 Billion BRL
- **Soft drinks market share (value):** 62,4%
- **Brazilian Headquarter:** São Paulo, SP (FEMSA)
- **Focus:** soft drinks, juice, energizers, tea, bottled water

**AmBev**
- **Net Revenue:** 5,68 Billion BRL
- **Soft drinks market share (value):** 21%
- **Beer market share (value):** 68,0%
- **Headquarter:** São Paulo, SP
- **Focus:** beer, soft drinks, tea, energizers, bottled water

**Brasil Kirin**
- **Net Revenue:** 0,98 Billion BRL
- **Soft drinks market share (value):** 3,6%
- **Beer market share (value):** 10,7%
- **Headquarter:** Itu, SP
- **Focus:** beer, soft drinks, juice, bottled water

In 2012, these 3 groups accounted for 86,97% of the revenue from the soft drinks market.
Coca-Cola claims that since 2001 it has been relatively reducing the water consumption for the production of beverage.

In 2012 the company used in average 1,9 L of water in the production of 1 L of beverage. Coca-Cola expects to be “water neutral” by 2020, with 1,5 L used for 1 L produced.

The company is recycling water from cleaning processes, aiming for a 100% rate.

Coca-Cola started collecting water from rain to reduce costs. It accounted for 1% of the total consume in 2009.

Jundiaí unit (FEMSA) has implemented a technology (“Coliseu”) that recovers an average of 80% of water to be reused in the production process.

INVESTMENTS:

- Installation of smart mechanisms in the offices for water saving, as in bathrooms. There was an economy of 21% in the company head office.
- Measure, maintenance and control of the water usage in production units, preventing from leakages. There is an average potential of 10% water saving in each unit.

**Water Caption by source - 2011**

- Underground water
- Superficial water
- Public water supply
- Rain water

TOTAL: 19 Million m³

**Dumped and Reused Water - 2011**

- Reused
- Discarded

TOTAL: 9 Million m³

**SOURCE:** COCA-COLA'S SUSTAINABILITY REPORT, INTERVIEW
AmBev has been saving water in the production. In the last decade, it has used 30% less water.

Today, the average number of water liters used in the production of 1 L of beverage goes around 3.5. The goal for the next years is 3.2.

AmBev claims that the concern about water shortage made the company invest in water reuse in cooling towers.

The AmBev system maintains 37 facilities for water treatment, which deals with 100% of the effluents and have a capacity for treatment of 240.000 m³ per day.

In 2010, the company spent more than 5.8 MBRL with investments in water reuse and reduction of consumption.

INVESTMENTS:
- The company keeps investing in EPC. Enfil is building a new facility including biological treatment in Uberlândia (MG).
- It is also investing in technology for recovery of biogas generated within the anaerobic process of effluent treatment.

Dumped Water - 2012

2,61 L 30,7 million m³

of dumped effluents per 1 L of beverage produced in average

of generated effluents*

* This is an estimate considering the sales of 3.25 billion liters reported by Kirin
From 2008 to 2012, Brasil Kirin reduced in 12% its consume of water in the production.

Today, the company uses 3,61 L of water in the production of 1 L of beverage.

The dumped water quality is reported to be above 96% in BOD.

Most of the productive units have a water treatment facility, with the exception of Campos do Jordão, Blumenau and Manaus units.

In the Horizonte (CE) unit, there is a system for reuse of the effluent in irrigation. Besides, that unit captures rainwater to be used in production (but not in the final product).

In other units, the water is reused in the pasteurization process.

INVESTMENTS:

- To reach higher energy efficiency, the company is investing in reuse of biogas from the effluents treatment, as well as biomass as fuel for the boilers. Together the investments had a cost of 9 MBRL.

**Water Caption by source* 2012**

- Underground water: 29%
- Superficial water: 66%
- External source: 5%

**Dumped Water - 2012**

- 2,4 L of dumped effluents per 1 L of beverage produced in average
- 7,8 million m³ of generated effluents**

* The rain caption is still not quantified
** This is an estimate considering the sales of 3,25 billion liters reported by Kirin
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Decision making process
    - Public Private Partnership (PPP)
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
THE PULP AND PAPER INDUSTRY IS CONCENTRATED THROUGHOUT THE CENTER-SOUTH OF BRAZIL
THREE STATES HOLD 38% OF THE PULP AND PAPER FOREST BASES OF THE COUNTRY

- The biggest industry concentration is mainly throughout the boarder of three neighbor states: São Paulo, Paraná and Santa Catarina.

- Eight production units of the three biggest Pulp and Paper companies are located in São Paulo.

- It also corresponds to the concentration of forest bases of the sector: São Paulo (420 thousand hectares), Paraná (269 thousand hectares) and Santa Catarina (169 thousand hectares).

- Since the Pulp and Paper industry is a huge exporter, the industries are located close to the biggest exportation ports: Santos (SP), Paraná (PR), Itajaí (SC) and Vitória (ES).

NUMBER OF COMPANIES BY STATE * – 2010

* Companies Associated with the Brazilian Pulp and Paper Association
ALTHOUGH THE PULP AND PAPER SECTOR IS HIGHLY DEPENDENT ON WATER IT STILL REUSES ONLY 34%

- The Pulp & Paper industry uses great water volumes and therefore produces a lot of effluents. These latter might be strong colored and contain substances at times toxics, depending on the type of pulp, on the quality of the raw material employed and on the final product.

- It estimates that the pulping process and the pulp bleaching produces over 62 millions m³/day of effluents, which represents the domestic water consumption of approximately 200 million people.

- It is essential for this industry to use a large amount of treated water, about 30 thousand Liters/ton in pulp production and 20 thousand Liters/ton in paper production.

- Over the last twenty years the pulp and paper industry lowered its levels of water consumption from 80 thousand Liters/ton to an average of 25 thousand Liters/ton.

- The total consumption of water on the sector was of 668 million m³ in 2010.

**Water statistics**

<table>
<thead>
<tr>
<th>Water Discharged, 10^6 m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
</tr>
</tbody>
</table>

**Characteristics**

SOURCE: SUSTAINABLE REPORT – BRACELPA
FIBRIA, SUZANO AND KLABIN ARE THE MOST IMPORTANT PULP AND PAPER COMPANIES IN BRAZIL
THE THREE GROUPS CONTROL OVER 64% OF THE PULP MARKET

<table>
<thead>
<tr>
<th>Company</th>
<th>Net Revenue</th>
<th>Forest Base</th>
<th>Headquarter</th>
<th>Focus</th>
<th>Future Investments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibria</td>
<td>5.8 Billion BRL</td>
<td>970 thousand hectares</td>
<td>São Paulo</td>
<td>Eucalyptus Pulp</td>
<td>BRL 1.5 billions in 2014</td>
</tr>
<tr>
<td>Suzano Papel e Celulose</td>
<td>4.8 Billion BRL</td>
<td>819 thousand hectares</td>
<td>Bahia</td>
<td>Eucalyptus Pulp</td>
<td>BRL 2.3 billions in a new production unit in Maranhão</td>
</tr>
<tr>
<td>Klabin</td>
<td>4.1 Billion BRL</td>
<td>505 thousand hectares</td>
<td>São Paulo</td>
<td>Paper and Cardboard</td>
<td>BRL 7.2 billions for Projeto Puma</td>
</tr>
</tbody>
</table>

The three companies together hold 64% of the total pulp production and 30% of the total paper production.

SOURCE: VALOR MAGAZINE
In 2011 Fibria consumed a total of 186.71 million m³ of superficial water.

The reused water is utilized before the effluent treatment, for example in cooling towers and backwash circuits for filtered fiber.

76% of the captured water recirculates 4.2 times before being disposed.

The Aracruz unit discharges its wastewater into the ocean.

The Jacareí unit is world known for its low water consumption, 22.1 m³/lsa, and has the capacity to treat water for a city of 300,000 habitants.

In 2012 a system of caption of rain water was implemented for irrigation.

In 2013, Fibria entered the Dow Jones Sustainability World Index as the leader of forestry products and paper.

INVESTMENTS:

- In 2012, 5.16 millions BRL was invested on hydric resources.
- The cost of the effluent emission was of 12.25 millions BRL.

Dumped and Reused Water - 2011

- Reused: 24%
- Discharged: 76%

Source: Fibria’s Sustainability Report
It is estimated that the reuse rate is approximately of 35%.

The Suzano unit lowered its water consumption from 44 m³/ton to 34 m³/ton.

Around 10% of the daily consumption of water out in the forest base is reused.

The usage of the reuse water depends upon the unit and the purity level of the water reused, for example, within the Mucuri unit it is used for cleaning only.

INVESTMENTS:

- In 2012, BRL 1,64 millions was invested in freshwater management and BRL 5,18 millions was invested in effluents management.
- Centroprojekt was responsible for the construction of the biggest effluent treatment plant of the pulp and paper sector, for Suzano Papel e Celulose at Imperatriz (MA) unit in 2013.

**Water Caption by source - 2011**

- Underground water
- Superficial water

**Dumped and Reused Water - 2011**

- Reused
- Discarded

**TOTAL: 107 Million m³**
The reuse water is used on the packaging sector for producing glue, for cleaning, and irrigation, and also on the production process of paper, on cooling hot water and condensate return.

Five production units reutilize 100% of its factory effluents.

They’ve got a medium-term goal of lowering its water consumption for 38 m³/paper ton. Currently it is at 41,67 m³/paper ton.

Their water treatment plants are removing BOD at a level of 85,5%, which is considered excellent.

Around 80% of its water consumption is discharged at a Waste Water Treatment Plant.

INVESTMENTS:

- New plant for treatment of waste water from the chemical thermochemical-mechanical pulp (CTMP) in Monte Alegre (PR) unit worth an investment of 6 millions BRL.
- Acquisition of a new Waste Water treatment plant in São Leopoldo unit worth 600 thousand BRL.

Water Caption by source - 2011

- Underground water: 0.3%
- Superficial water: 0.16%
- Public water supply: 99.53%

Dumped and Reused Water - 2011

- Reused: 33%
- Discarded: 67%

TOTAL: 69 Million m³
THE MAIN EFFLUENTS OF P&P INDUSTRY ARE SUSPENDED MATERIAL AND ORGANIC SUBSTANCES
BESIDES THAT THERE ARE CHEMICAL SUBSTANCES USED IN THE PRODUCTION PROCESS WHICH ARE TOXICS

The treatment is divided in four phases, the first two are mostly solid waste removal.

- **PRE-TREATMENT**
  (Gross Solid Waste Removal and Cooling)
  - Sedimentation Tanks
  - Screening System
  - Temperature and pH adjustment

- **PRIMARY TREATMENT**
  (Suspended Solids Removal)
  - Flotation or Decantation
  - Primary Sedimentation
  - Homogenization Tanks
  - Flocculation Process
  - Temperature and pH adjustment
THE BIOLOGICAL TREATMENT AIMS TO REDUCE THE BOD LEVELS

BEFORE THE BIOLOGICAL TREATMENT STARTS SOME NUTRIENTS HAVE TO BE ADD IN THE WATER, SUCH AS NITROGEN AND PHOSPHOR

The effluents undergo biological treatment over the two last phases.

**SECONDARY TREATMENT**
(Lowering down the BOD levels through removal of biodegradable organic matter)

**TERTIARY TREATMENT**
(Additional removal of effluents, color and polishing)

THE ACTIVATED SLURDGE IS THE MOST EFFICIENT AND THE ONE THAT BEST MEETS THE LEGAL STANDARDS OF WATER DISPOSAL, HOWEVER THE INDUSTRY STILL FINDS DIFFICULTIES WITH SLUDGE DISPOSAL AND ACCUMULATION

UNIVERSITY OF CAMPINAS
AGENDA

- Background and summary of findings
- Brazil in brief
- Overview of waste water sector in Brazil
  - Water availability vs water price
  - Trends and water treatment players
  - Regulations
- Public sector
  - Overview
    - Public Private Partnership (PPP)
    - Decision making process
  - State analysis
    - Minas Gerais
    - São Paulo
  - Municipality analysis
- Industrial sector
  - Overview
    - Steel industry
    - Food & Beverages
    - Pulp & Paper
- Conclusions & Next steps
The objective of the market analysis is to increase knowledge about potential for Swedish technology within the waste water sector in Brazil.

Based on the findings from the report, Business Sweden recommends the following:

- **Approach waste water players**: Establish contact and build up relationship with market "winners" with the aim to participate on important projects.
- **Approach selected states and municipalities**: Establish contact and build up relationship with municipalities that are about to invest in upcoming projects.
- **Approach pulp & paper**: Establish contact and build up relationship with key decision makers from the pulp & paper industry.
- **Approach food & beverages**: Introduce technology to key decision makers from the food & beverages industry.
TWO PRELIMINARY DATES FOR JOINT ACTIVITIES

- Participation on a joint presentation for a technical audience consisting of consultants, municipalities, etc.
- B2B meetings with waste water players that have shown satisfactory results with the aim to establish a future cooperation where Swedish solutions can be included in projects both for the public and private sectors.
- Roadshow visit to selected municipalities, SABESP and COPASA. Possibility of arranging a seminar in conjunction with the Symbiocity project.

- Business Sweden is arranging a pulp & paper delegation to Sweden in Mid October. The participants are decision makers from important pulp & paper groups in Brazil.
- We plan to include a seminar about environmental technology and increase of efficiency as part of the program. One of the topics could be about waste water treatment and water reuse.

1 week trip to Brazil (July 28th to August 2nd)
1 day in Sweden (October 13th TBC)

IS YOUR COMPANY INTERESTED IN PARTICIPATING ON SUGGESTED ACTIVITIES?