INNOVATION AND SUSTAINABILITY PARTNERSHIP – TOWARDS GREENING INDUSTRIES WITH GREEN CHEMISTRY

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Largest Polymers Producer of the Americas
Largest Biopolymer producer of the World
**SURVIVAL**
Focus on client and market
Competitive Raw Material and Energy
Operational productivity and Efficiency

**GROWTH**
International at Americas
Supply the Brazilian Market
Renewable Chemistry

**PERPETUITY**
Competences and Technology
People and Organization
Sustainability and Innovation
Braskem in Numbers

8000 Team Members

70 Countries

US$ 83

40 Industrial Units

EXPENSES IN INNOVATION

83

US$ 14.3

NET REVENUE OF

6.8

EBITDA OF

US$ 2.8

US$ 2015 Figures

+ 300

INNOVATION PEOPLE

US$ 14.3

US$ 6.8

EXPORT REVENUE OF

(US$ 9.4 BI)

400

R$ 47 BI

R$ 280 MM

2015 Figures
Sustainability Challenge

Source: Global Footprint Network (2010), UNDP (2009)

Human Development Index (HDI) – UN

Ecological footprint (global hectares per capita)

World average biocapacity per capita in 2006

High-level development within the Earth’s limits

Source: Global Footprint Network (2010), UNDP (2009)
Climate Change Challenge

Source: IPCC, 2014
Our Contribution for Sustainable Development

Braskem Purpose
Improve people's lives by creating sustainable solutions through chemicals and plastics

Increasingly sustainable resources and operations
Increasingly sustainable products
Solutions for a more sustainable life

BUSINESS ALIGNMENT
STRONG CULTURE AND MANAGEMENT ALIGNED WITH THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT
Sustainability and Innovation Nexus

Improve people's lives by creating sustainable solutions through chemicals and plastics

Innovation is our way of doing businesses seeking for productivity, competitiveness, with responsibility and considering the whole value chain.
Our Strategy and Green Chemistry Nexus
Our Strategy and Green Chemistry Nexus

- Safety
- Economic and financial results
- Post-consumption
- Renewable resources
- Water efficiency
- Climate change
- Energy efficiency
- Local development
- Strengthening of practices

Braskem
Brazilian Opportunity on Renewables

Energy Balance creates competitiveness along with GHG emissions reduction

<table>
<thead>
<tr>
<th>Source</th>
<th>Brazil</th>
<th>USA</th>
<th>EU</th>
<th>EU</th>
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</thead>
<tbody>
<tr>
<td>Country</td>
<td>Brazil</td>
<td>USA</td>
<td>EU</td>
<td>EU</td>
</tr>
<tr>
<td>GHG emissions reduction</td>
<td>90%</td>
<td>35%</td>
<td>34%</td>
<td>45%</td>
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<tr>
<td>Energy balance</td>
<td>9.3</td>
<td>1.4</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Productivity (liters/hectare)</td>
<td>7,000</td>
<td>3,800</td>
<td>2,500</td>
<td>5,500</td>
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</tbody>
</table>

Disruption Throughout Renewables

Natural Gas
- Methane
- Ethane
- Propane
- Butane

Natural Processing

Oil Refinery
- GLP
- Naphtha
- Kerosene
- Diesel
- Paraffin

Oil

Natural Processing

Cracking

- Ethylene
- Propylene
- Acrylic
- Butene
- Isobutylene
- Butadiene
- Isoprene
- Hexene
- Cyclohexene
- Adipic Acid
- Toluene
- Toluene Diamine
- Toluene Disocyanate
- Benzene
- Xylene
- p-Xylene
- Terephalic Acid

Ethylene Oxide
- Ethylene glycol
- Polyester
- Polyethylene
- Propylene Oxide
- Propylene glycol
- Polyester
- SAP
- Polipropylene
- Polisobutylene
- Polibutadieno
- Polisopreno
- Nylon 66
- Caprolactam
- Nylon 6
- Polyurethane
- Polyester
Disruption Throughout Renewables

Raw Material
- Ethanol (1G/2G)
  - Methane
  - Ethane
  - Propane
  - Butane
- Sugar (1G)
  - GLP
  - Naphtha
  - Kerosene
  - Diesel
  - Parafin
- Biomass (2G)
  - Xylenes
  - Cyclohexane

Chemicals & Polymers
- Ethylene Oxide → Ethylene glycol → Polyester
- Ethylene → Polyethylene
- Propylene Oxide → Propylene glycol → Polyester
- Acid acrylic
- Butene → Isobutylene → Polisobutylene
- Butadiene → Polibutadieno
- Isoprene → Polisopreno
- Adipic Acid → Caprolactam → Nylon 6
- Toluene Diamine
- Toluene Disocianate → Polyurethane
- Benzene → Terephalic acid → Polyester
Green Polyethylene helps reduce greenhouse gases and is 100% recyclable.

Sugarcane captures CO2.

Production of ethanol and renewable energy.

Packaging made from Green Polyethylene.

Production of Green Ethylene and Green Polyethylene.

Green PE Carbon footprint from Cradle to Braskem's gate:

1 mt of I'm green™ Polyethylene captures 2.78 mt CO2 eq.
Contribution for Sustainability

- Lightness
- Accessible
- Durable
- Recycling

1 kg of Green Polyethylene = 2.78 kg of CO$_2$e in the Atmosphere
Avoided Emissions

Addressing the Avoided Emissions Challenge

Guidelines from the chemical industry for accounting for and reporting greenhouse gas (GHG) emissions avoided along the value chain based on comparative studies.

October 2013

Reduction of Greenhouse Gas Emissions via Use of Chemical Products

Case Studies

Exemplifying the Application of the IOCA & WBCSD Avoided Emissions Guideline

Braskem
Contribution for Sustainability

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals
Our 2020 Goals

Be among the leaders in the production of renewable-based chemical products and thermoplastic resins. Also, continue to be the largest global producer of renewable-based thermoplastic resins.

Be recognized as a company that supports its customers in the development of environmental and social solutions in Chemistry and Plastics. Plastic perceived as solution for sustainable development due to its contribution to improves people’s life.
Investment opportunities in the production of chemicals in Brazil, using alternative technologies from renewable sources (notably biomass) could contribute US$15 billion to US$35 billion in revenue for the industry in 2030, positively impacting the Brazilian trade balance.

Source: BNDES (2015)
Conclusions

► Sustainability Challenges ask for disruptive innovations
► Braskem has a clear business strategy that would like to bring a strong contribution to sustainability aligned with the green chemistry principles
► Braskem more important contribution is through the renewable based chemicals. They are part of the solution for climate change
► Chemicals in general represent a solution to climate change due to its avoided emissions characteristic, but are also solution for the SDGs implementation
Thank you for your attention
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