

Kick-off Meeting of IKI project

From NDCs to Pathways and Policies: Transformative Climate Action After Paris

In-country immersion: Brazil

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Current policy landscape

- Main issues in the political agenda of the country
 - ✓ Pensions reform, public deficit, political reform, corruption, public security, education, health
 - ✓ Huge uncertainty about the policies to be adopted in 2019 - 2022 by the new government, in all fields (including climate change)
- Mitigation policy current discourse, main climate mitigation policies in place or under discussion
 - ✓ Reduce illegal deforestation to zero; Promotion of renewable energy (hydro, biofuels, wind, solar) and low carbon agriculture
- Mapping and positioning of the main actors influencing climate policy
 - ✓ The Brazilian Forum on Climate Change; Ministries of Environment, Agriculture, Energy, Economy; Public banks (BNDES, CEF); Others: Business associations (CEBDS), NGOs, Coalition

Current policy landscape

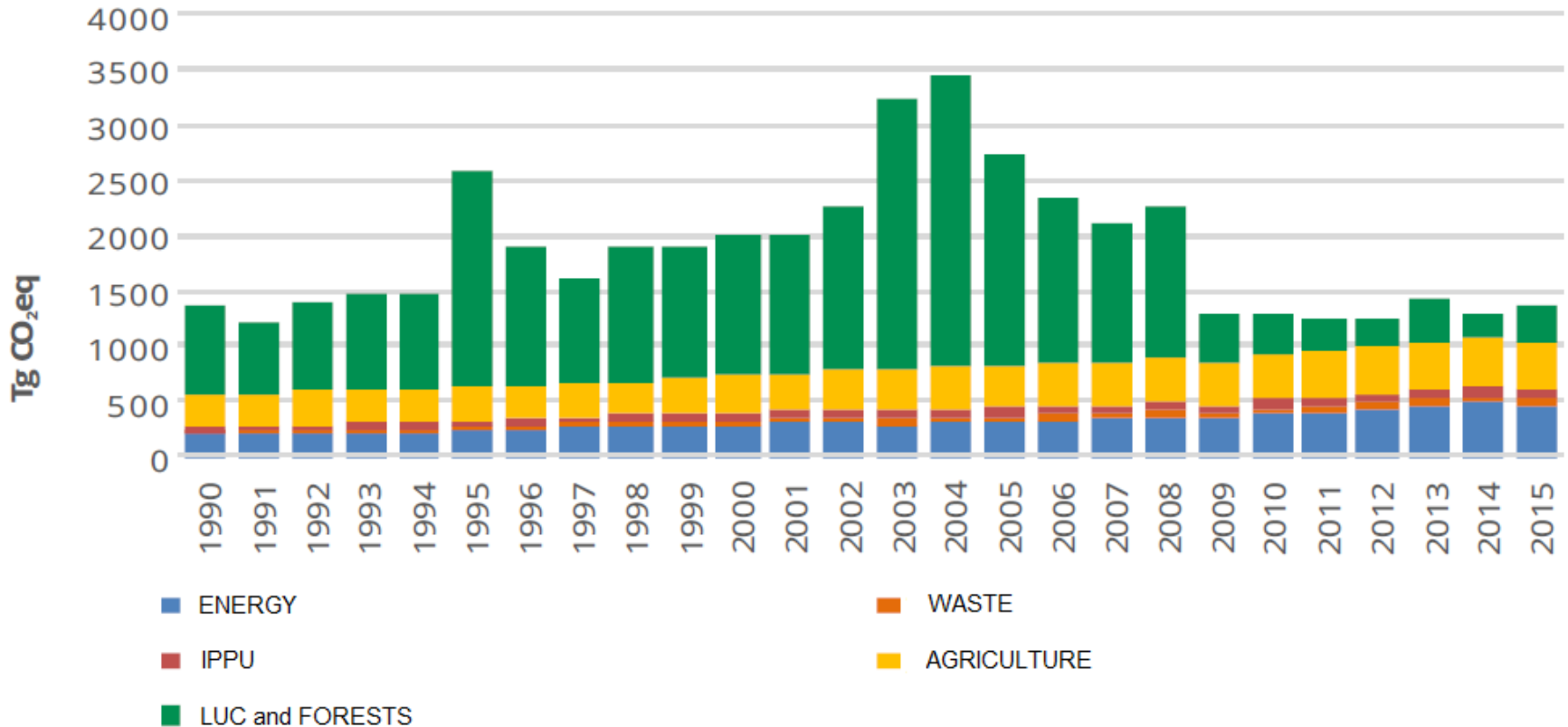
- State of play of the process on long-term strategies and the review of current NDC at government level
 - ✓ Report demanded in by the Presidency to the Forum in June, 2018: How to reach carbon neutrality in Brazil by 2060 - prepared by Centro Clima (using a previous study on an Emissions Pathway for Brazil compatible with the 1.5°C global target), presented at COP24
 - ✓ Report under preparation by Centro Clima for the Forum and ICAT – The Initiative on Climate Action Transparency on a set of criteria and indicators for Monitoring, Reporting and Verification (MRV) of the progress achieved in the implementation of the NDC, including three NDC implementation scenarios up to 2030
 - ✓ A set of studies coordinated by the Ministry of Economy and the World Bank (Partnerships for Market Readiness – PMR): adoption of carbon pricing policies to achieve NDC targets up to 2030
- No relevant impact of IPCC 1.5°C report was perceived.

The Brazilian context

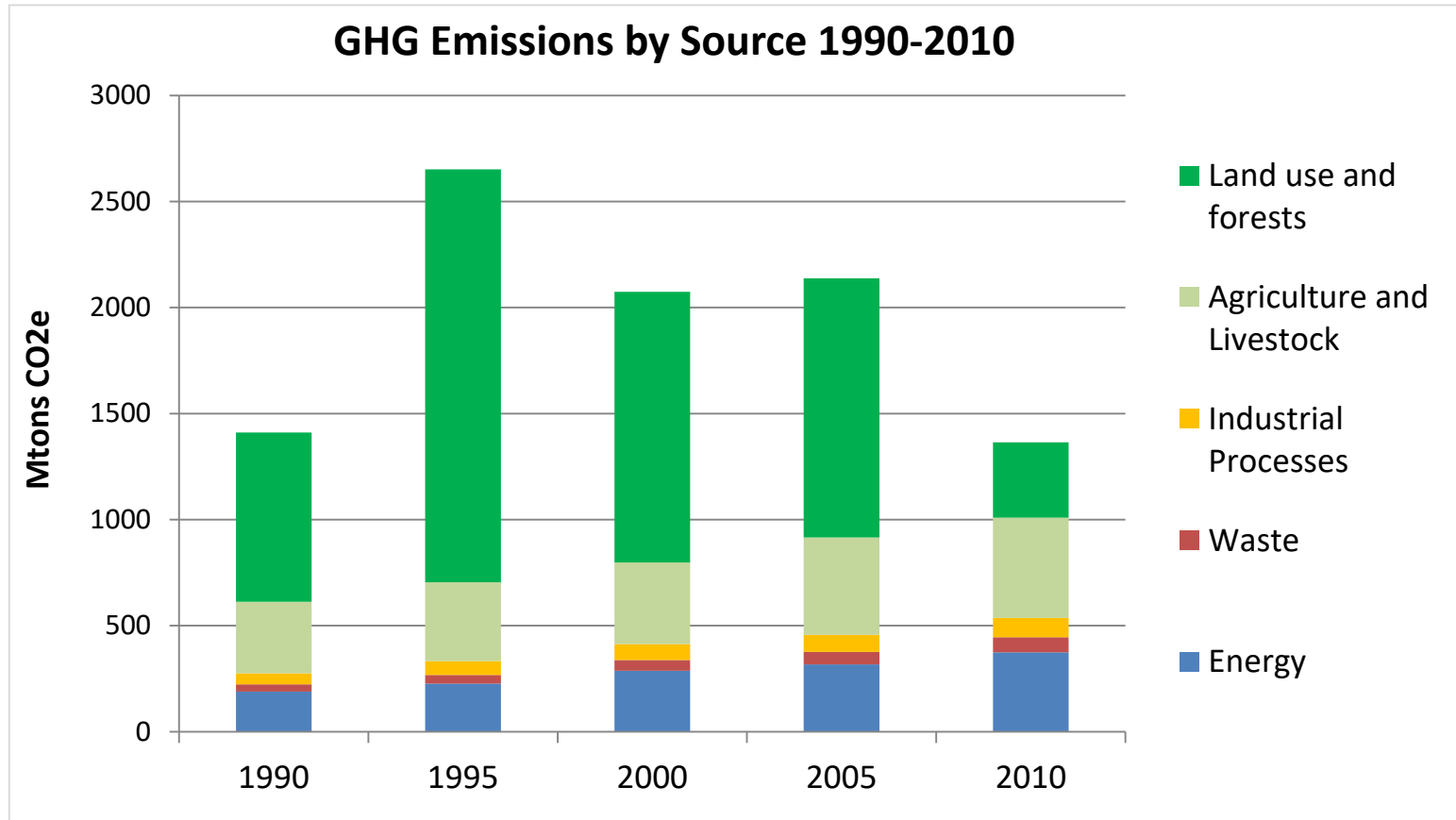
- **Among the largest economies in the world**
- **Mid-range average GDP per capita**
- **Poverty, high income inequality, regional disparities**
- **Low population growth, highly urbanized**
- **Large natural resources basis**

The Brazilian context

Review of GHG emissions based on the 3rd National Communication



The Brazilian context

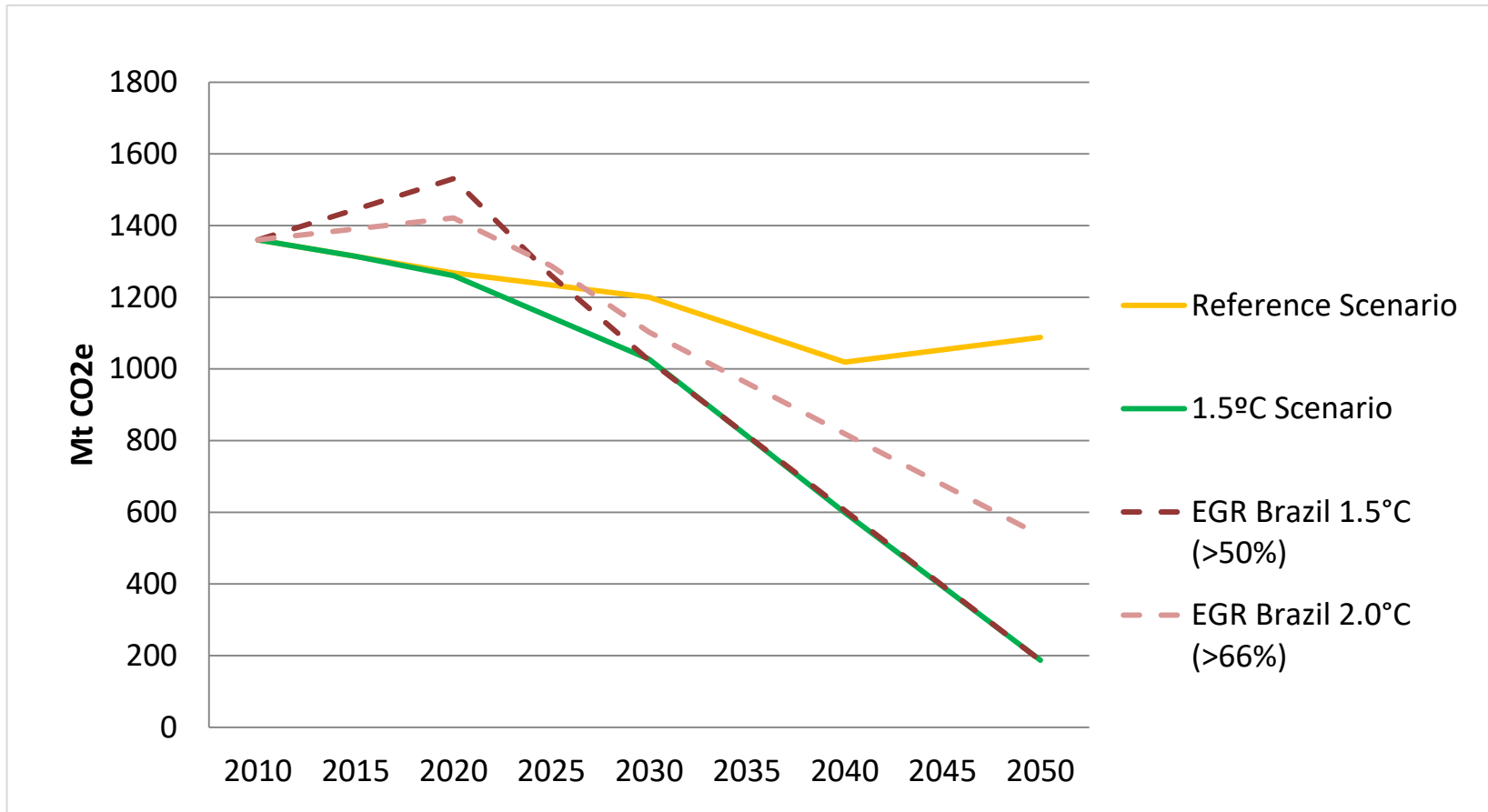


Clean energy mix (hydropower, biomass, wind, incipient solar)

Decreasing emissions from deforestation

Increasing emissions from cattle raising, agriculture and energy

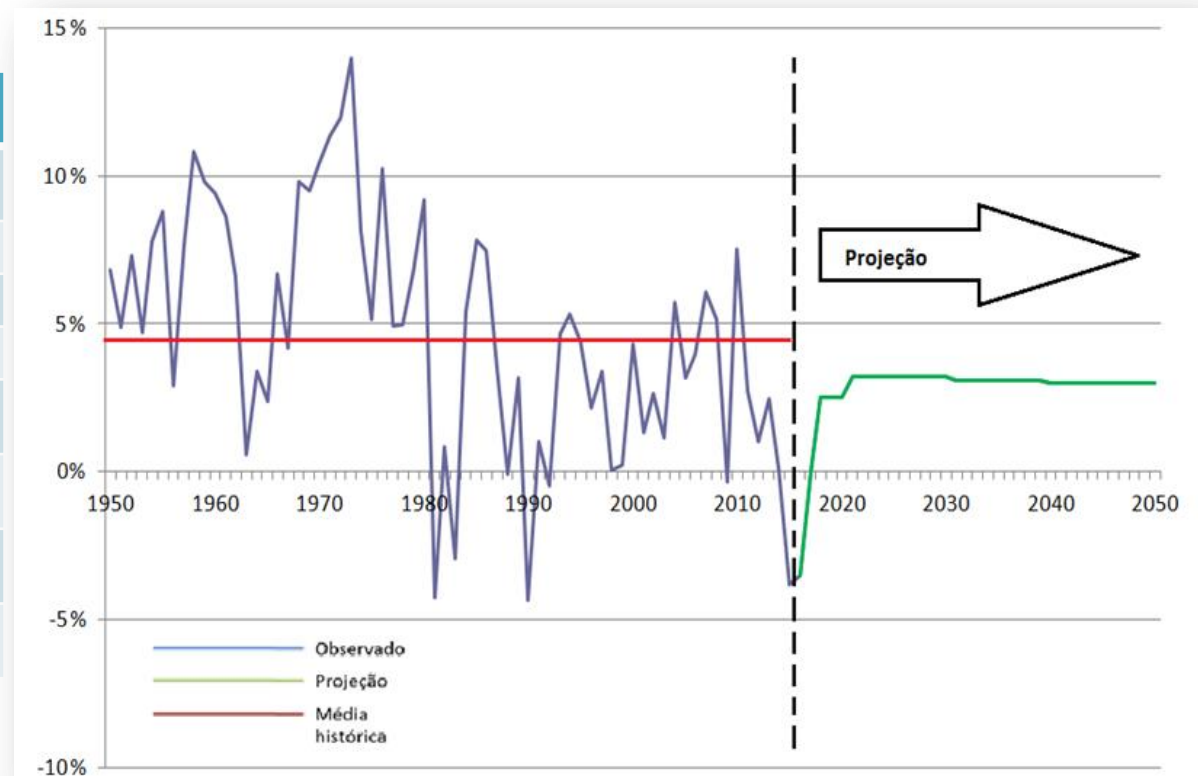
Future GHG Emissions: IES-Brasil 2050: The 1.5°C emissions pathway



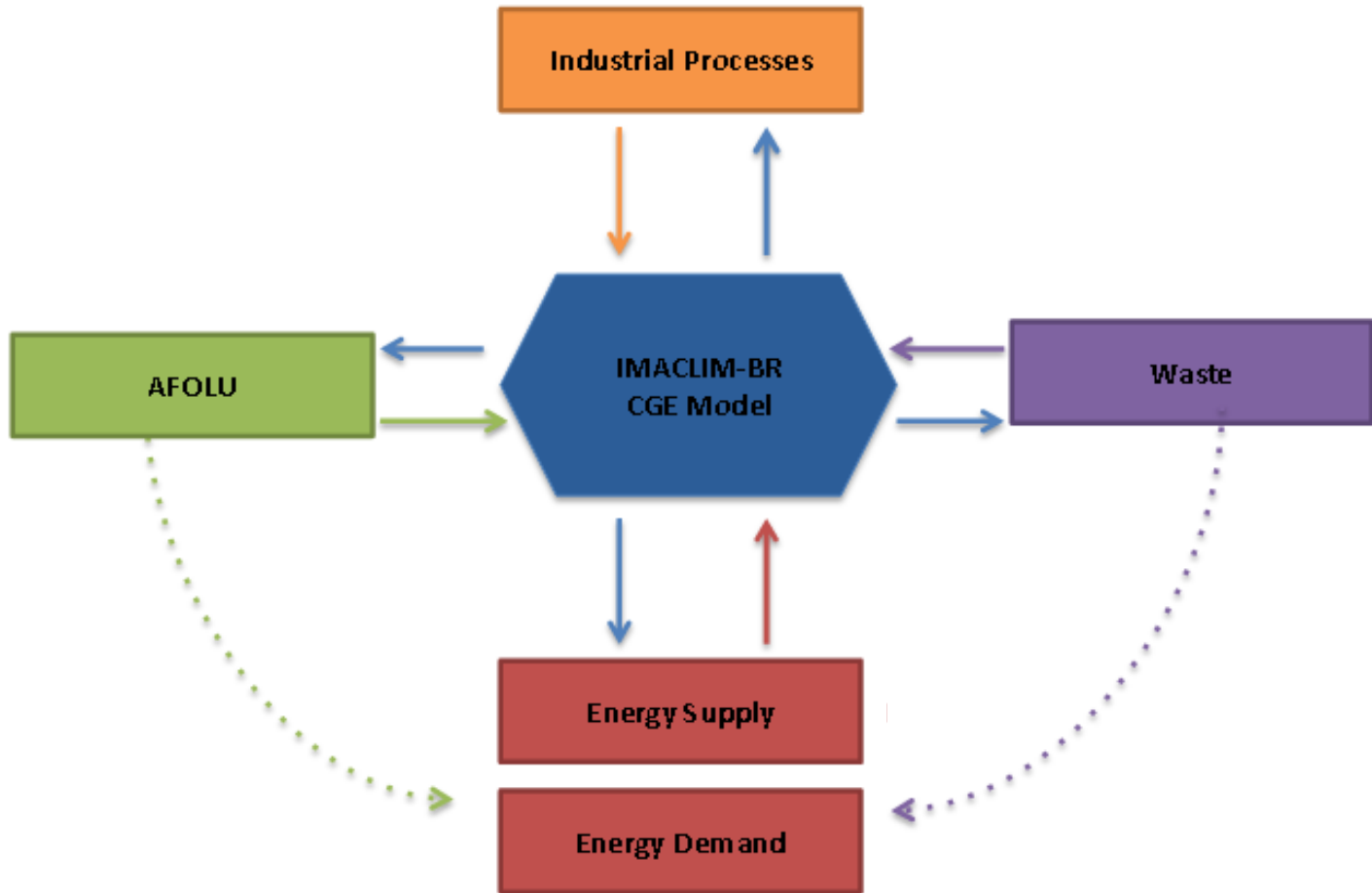
Future GHG Emissions: Macroeconomic Scenario

- ✓ Short-term: Recovery after Strong recession
- ✓ Long-term: Higher GDP growth rates after 2020, slowly decreasing until 2050

| Period | GDP Growth |
|-----------|------------|
| 2010-2014 | 2,2% |
| 2015 | -3,5% |
| 2016 | -3,5% |
| 2017 | 1,0% |
| 2018-2020 | 2,5% |
| 2021-2030 | 3,2% |
| 2031-2040 | 3,1% |
| 2041-2050 | 3,0% |



Modelling framework



IES-Brasil 2050: The 1.5°C emissions pathway

- **Extensive additional mitigation measures:**
 - **High-efficiency biomass production and use**
 - **Renewable electricity generation**
 - **Electric vehicles and modal shifts towards railways and waterways in the transportation sector**
 - **Among others**
- **Along with a domestic carbon tax and recycling of tax revenues to reduce labour costs ensuring fiscal neutrality, but no similar carbon pricing schemes are assumed for trade competitors**

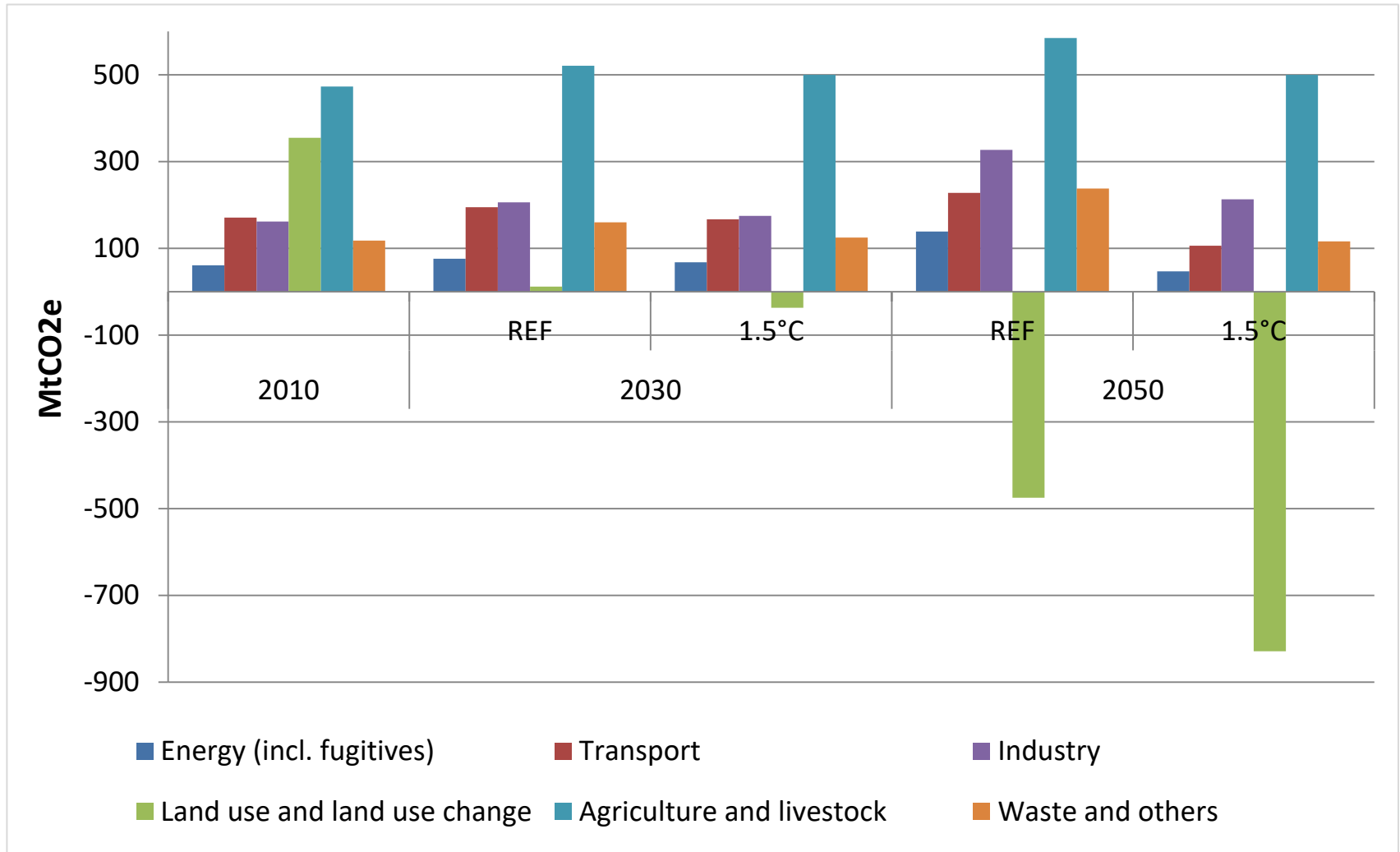
| Year | 2015 | 2030 | 2050 |
|---|------|------|------|
| Carbon Tax (2015 US\$/tCO ₂ e) | 0 | 100 | 100 |

IES-Brasil 2050: The 1.5°C emissions pathway

Cumulative GHG avoided emissions from 2021 to 2050

| | 2021-2030 | 2031-2050 |
|--|--------------|-----------------|
| AFOLU | 335.4 | 2,985.90 |
| Agriculture – low carbon practices | 37.4 | 73.7 |
| Cattle raising – efficiency gains | 138.4 | 1,230.4 |
| Expansion of economic planted forests (pellets included) | 78.6 | 437.2 |
| Native forest restoration | 81 | 1,244.7 |
| TRANSPORT | 46.8 | 653.5 |
| Modal shifts | 15.6 | 157.4 |
| Electric vehicles | 18.1 | 393.3 |
| Biofuels use | 13.1 | 102.8 |
| INDUSTRY | 123.9 | 855.3 |
| Processes and energy efficiency gains | 107.3 | 734.7 |
| Fuel shifts | 16.6 | 120.7 |
| WASTE | 195.9 | 1,493.9 |
| Solid waste management improvements | 136.3 | 1,138.8 |
| Waste water treatment improvements | 59.6 | 355.1 |
| ENERGY SUPPLY | 39 | 818.2 |
| Expansion of renewable sources | 33.3 | 806.6 |
| Reduction of fugitive emissions | 5.7 | 11.6 |
| TOTAL | 741 | 6,807 |

GHG Emissions by Source in the 1.5°C emissions pathway



IES-Brasil 2050: Main economic implications

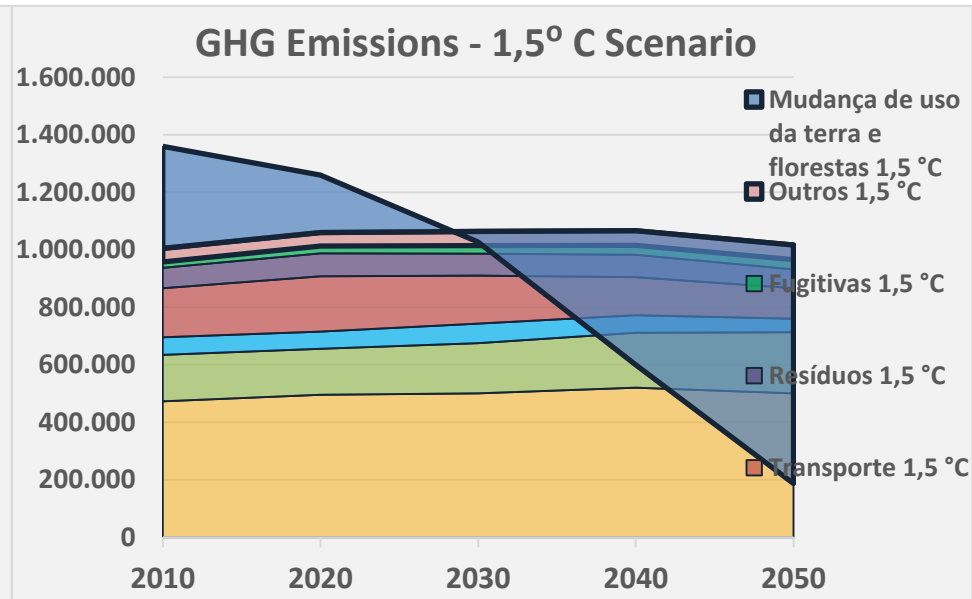
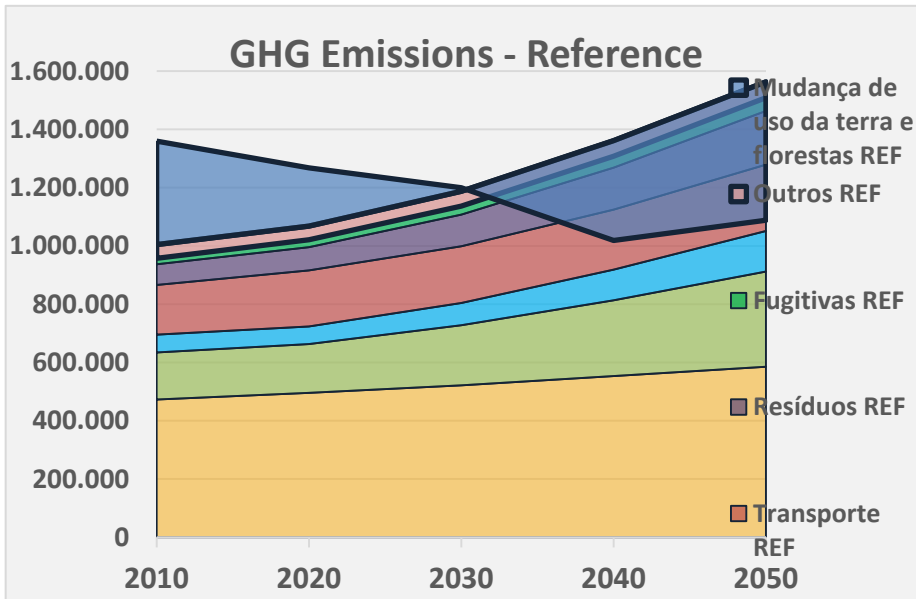
| | Scenario | 2005 | 2015 | 2030 | 2050 |
|---|----------|-------|-------|-------|-------|
| GDP (trillion 2015 USD) | REF | | | 2.85 | 4.67 |
| | 1.5°C | 1.43 | 1.78 | 2.82 | 4.62 |
| Annual average GDP growth since 2005 (%) | REF | | | 2.79% | 2.66% |
| | 1.5°C | - | 2.14% | 2.74% | 2.64% |
| Total investments (trillion 2015 USD) | REF | | | 0.50 | 0.87 |
| | 1.5°C | 0.22 | 0.29 | 0.53 | 0.94 |
| Full time jobs (millions) | REF | | | 112.3 | 111.5 |
| | 1.5°C | 91.2 | 99.8 | 111.2 | 110.7 |
| Unemployment rate (%) | REF | | | 8.3% | 7.3% |
| | 1.5°C | 9.9% | 8.5% | 8.5% | 7.4% |
| GDP per capita (thousand 2015 USD) | REF | | | 12.80 | 20.67 |
| | 1.5°C | 7.75 | 8.71 | 12.65 | 20.45 |
| Accumulated price index since 2015 (%) | REF | | | 8.8% | 15.1% |
| | 1.5°C | | | 46.9% | 42.0% |
| Cumulative investment in additional mitigation measures in 2021-2030 and 2031-2050 (billion 2015 USD) | REF | | | - | - |
| | 1.5°C | | | 35.9 | 634.9 |
| Total GHG Emissions (MtCO ₂ e) | REF | | | 1,200 | 1,088 |
| | 1.5°C | 2,838 | 1,662 | 1,027 | 187 |
| GHG Emissions per capita (tCO ₂ e/capita) | REF | | | 5.4 | 4.8 |
| | 1.5°C | 15.3 | 8.1 | 4.6 | 0.8 |

IES-Brasil 2050: Social implications

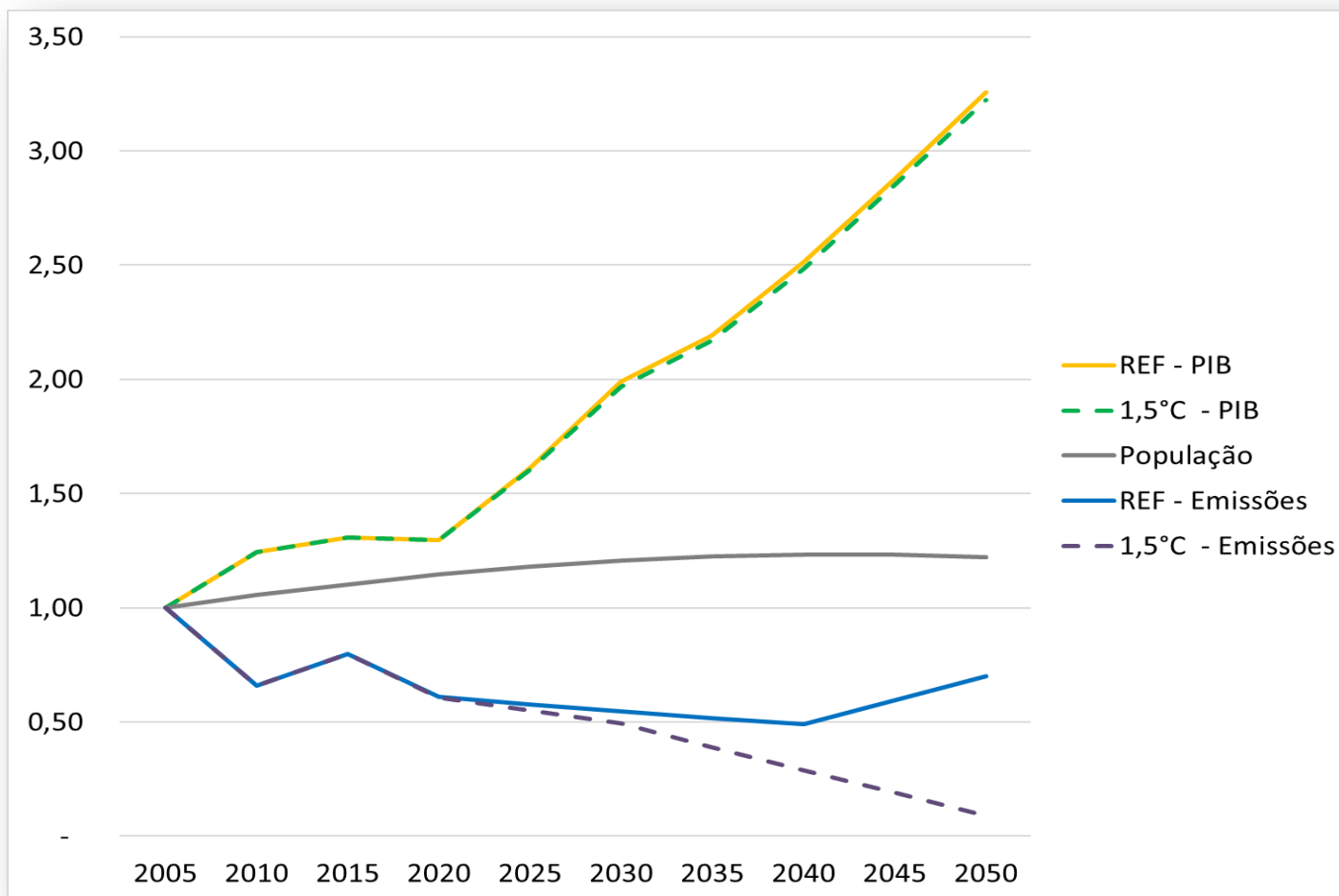
Annual average per capita income per class (thousand 2015 USD)

| | Scenario | 2005 | 2015 | 2030 | 2050 |
|---|----------------------|-------|-------|---------|---------|
| Class 1 (10% poorest households) | REF | | | 1.21 | 4.06 |
| | 1.5°C | 0.63 | 0.76 | 1.21 | 4.03 |
| | Variation to REF (%) | | | (-2.1%) | (-0.8%) |
| Class 2 (20% next) | REF | | | 2.76 | 4.76 |
| | 1.5°C | 1.59 | 1.84 | 2.73 | 4.73 |
| | Variation to REF (%) | | | (-2.0%) | (-0.8%) |
| Class 3 (20% next) | REF | | | 4.44 | 7.75 |
| | 1.5°C | 2.63 | 3.21 | 4.35 | 7.68 |
| | Variation to REF (%) | | | (-2.0%) | (-0.8%) |
| Class 4 (20% next) | REF | | | 7.37 | 12.76 |
| | 1.5°C | 3.68 | 4.92 | 7.21 | 12.67 |
| | Variation to REF (%) | | | (-2.0%) | (-0.8%) |
| Class 5 (20% next) | REF | | | 14.10 | 21.37 |
| | 1.5°C | 8.25 | 10.22 | 13.84 | 21.21 |
| | Variation to REF (%) | | | (-1.9%) | (-0.8%) |
| Class 6 (10% richest households) | REF | | | 52.67 | 84.06 |
| | 1.5°C | 33.81 | 38.89 | 51.87 | 83.43 |
| | Variation to REF (%) | | | (-1.5%) | (-0.7%) |

GHG Emissions by Source



Selected indicators: Partial decoupling of GDP and GHG emissions



IES-Brasil 2050: Implications for industrial competitiveness

- In 1.5°C scenario, additional costs from mitigation measures and carbon pricing lead to high increase in the price index
 - If other G-20 countries don't strongly commit to mitigation with similar ambition, price index in Brazil would grow faster than in G-20 countries
 - Brazilian competitiveness would be strongly jeopardized
- Under a strong global commitment to reduce emissions, price index in Brazil is expected to grow less than in other countries
 - Brazil has great mitigation potential at low costs
 - High share of renewable energy compared to main competitors, especially in industrial sector
 - Brazilian economy would become more competitive

From Pathways to Long-term Strategic Priorities

Requirements, Barriers and Challenges

- Control of deforestation
- Massive sustainable forestry program
- Wide dissemination of low-carbon Agricultural practices
- Half of oil production directed to exports
- Increased bioenergy sustainable production
- Hydropower expansion requiring new technologies to minimize environmental impacts in the Amazon
- Storage technologies needed to complement renewables

From Pathways to Long-term Strategic Priorities

Opportunities and Enabling Conditions

- Cut of fossil fuels subsidies
- Use of oil revenues to fund public education and health
- Active exchange rate policy
- External financial flow to meet upfront investment costs
- Additional financial resources and guarantees
- Adoption of carbon valuation schemes
- International cooperation on low carbon technologies

From Pathways to Long-term Strategic Priorities

Technological Challenges and Opportunities

- New batteries and other storage technologies needed to complement renewables
- Major shift to electrical vehicles
- Breakthrough and higher penetration of second and third generation biofuels
- Massive deployment of solar energy technologies
- Carbon capture and sequestration (CCS) for offshore oil

Conclusions of the Study

- The transition to a low carbon economy can be done with only minor negative economic and social implications in the Brazilian case if appropriate policies are pursued (e.g. ensuring the fiscal neutrality of carbon taxes through recycling of its revenues to reduce labor costs)
- Under low GDP growth rates and with a long period of a high carbon price the negative social impacts may be slightly regressive, requiring appropriate compensation measures to protect the poor
- Even with a great mitigation potential at low costs the challenge of financing the additional investment required in low carbon scenarios is huge due to much higher upfront costs, requiring: appropriate regulatory framework to reduce risks of investing in low carbon infrastructure; and access to capital markets at fair conditions
- International cooperation is required to stimulate emerging economies like Brazil to embark on the transition to a low carbon economy

Informing the transition

What key policy/research questions have been identified that are considered in current research studies or political debates on the transition?

- ✓ Detailed sectorial costs and potentials
- ✓ Integration of BU and TD models
- ✓ What is the most cost-effective economic instrument to reach NDC targets ? (PMR-Brazil)
- ✓ Carbon tax and/or cap-and-trade, with different recycling schemes
- ✓ Long-term GHG emissions pathway for Brazil compatible with the 1.5°C target
- ✓ How to reach carbon neutrality in Brazil by 2060? (Report demanded by the Presidency to the Forum)

Informing the transition

- What analytical and/or modelling gaps exist? What specific analyses
 - ✓ Define an official long-term strategy for Brazil
 - ✓ Understand more precisely what role new technologies will play and how it will affect the economy, labour markets, etc
 - ✓ Simulate disruptive scenarios with an integrated modelling architecture

Informing the transition

- Which relevant stakeholders have not been engaged so far (public or private), and which actors are playing a critical role?
 - ✓ Academia, NGOs, Industry Associations and part of current government (some ministries and public banks)
 - Current government: CC issues still far from high level decision makers but the Minister of Environment.
 - New Government: ?