A CROSS-SECTORAL INTEGRATED ASSESSMENT OF NDC ALTERNATIVES FOR MADAGASCAR

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Growing economy; growing energy demand

Highly vulnerable to climate change effects given geography and biodiversity;

It has committed to climate change mitigation – deforestation is the main driver in the country;
  - NDC target: 14% GHG reduction, 32% CDR increase
  - Focus on mitigation measures foreseen in AFOLU and energy.

High uncertainty on emission-related statistics → lack of transparency and high deviations across references.

Holistic perspective of GHG reduction targets due to link between land use change and energy
Connect to recent work done for Africa:


TIAM-ECN: partial equilibrium / bottom-up energy system integrated assessment model with high technological detail, 36 regions, among which 17 for Africa
MODELING APPROACH – AFOLU

- Improvement in AFOLU processes with focus on Madagascar

- Forest harvested for logging and timber production
- Remaining biomass harvested for energy purposes
- Forest burned for low-productivity agriculture or cash-cropping

Demand-driven Link with energy system

GHG Emissions based on carbon stock of forests

Mitigation Options:
- Incl. 4 types of forests
- Ref/Afforestation x3
- 4 measures in agriculture

Photo: www.afronline.org
Photo: www.afrik21.africa
Photo: www.madamagazine.com
MODELING APPROACH – SCENARIOS

Summary for Madagascar:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>GHG reduction</th>
<th>GHG emissions in AFOLU</th>
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</thead>
<tbody>
<tr>
<td>REF</td>
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<td>Fixed GHG emissions and CDR</td>
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<td>NDC</td>
<td>-14% in 2030 w.r.t. REF</td>
<td>Fixed GHG emissions and upper limit on CDR, with moderate costs</td>
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<tr>
<td>NDC+</td>
<td>-14% in 2030 w.r.t. REF</td>
<td>Fixed GHG emissions and upper limit on CDR, with high costs</td>
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</tbody>
</table>

Global scenarios: 2°C PA target in NDC and NDC+;
NDC+: critical land property issues and illegal logging practices;
Mitigation costs and potentials from Madagascar are highly uncertain:
RESULTS

GHG Emissions:

Bars: gross GHG emission (+) or CDR (-)
Dotted lines: net GHG emission
RESULTS

GHG Emissions:

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<th>Stat</th>
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<th>NDC+</th>
<th>REF</th>
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GHG emission [Mt CO₂ eq]
RESULTS

Final Energy
RESULTS

Power Sector

![Power Sector Chart]
CONCLUSIONS

- Madagascar cannot reach its 14% GHG emission reduction target without employing mitigation in AFOLU.

- Biomass remains the most important energy resource in Madagascar until 2050, driven by cooking demand in the residential sector.

- GHG emission reduction in AFOLU only brings together SDG 13 ("climate action") and SDG 15 ("protecting "life on land"”),

  - mitigation in AFOLU and energy adds SDG 7 ("affordable and clean energy") and SDG 3 ("good health and well-being") to the game.

- Providing electricity for household services is key.
THANK YOU!

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From 1st January 2020, “ECN part of TNO” becomes “TNO Energy Transition”

Photo: mypiannotes.com