Modelling a Global Inclusive Green Economy COVID-19 Recovery Programme

Final presentation to Steering Group

Stijn Van Hummelen, Richard Lewney (Cambridge Econometrics)
Calum Maney (UNEP-WCMC)

4 March 2021
Overview

- Objectives and approach
- Global modelling results
- South Africa case study
- Environmental implications (in addition to CO₂ emissions)
- Conclusions
Objectives

- Undertake a credible, quantified analysis of the impact of alternative COVID-19 recovery plans
  - ‘non-green’
  - ‘green’
  on key indicators
  - economic
  - social
  - environmental

- Global analysis, with country case studies

- Communicate the results in an effective, accessible form (South Africa Policy Brief)

- Develop a complementary analysis of economy-biodiversity/natural capital links
  - which so far have been harder to codify in formal modelling
Team

- Energy-economy-environment modelling: Cambridge Econometrics
- Biodiversity/natural capital analysis: UNEP World Conservation Monitoring Centre
- South Africa expert: Professor Margaret Chitiga-Mabugu, University of Pretoria
- UNEP / ILO Steering Group
Approach

- Scenarios were developed in CE’s E3ME economy-energy-environment model
  - a global model distinguishing c. 60 countries, including South Africa
  - macro, output and jobs by sector, detailed energy use, CO₂ emissions

- Scenarios
  - no virus (what growth was expected before the pandemic)
  - COVID-19 baseline (no recovery measures)
  - ‘green’ and ‘colourless’ recovery packages

- Geography
  - global
  - South Africa
  - Latin America and the Caribbean (ECLAC 2020)

- Extension to natural capital indicators (UNEP-WCMC)
## Approach

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<td>Global (same policies in every country)</td>
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<td>• ‘colourless’ package (sales tax cut)</td>
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<td>Examines implications of sector growth rates projected by</td>
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Global GDP results

- Green Recovery gives global GDP boost that is stronger...
- ... and more persistent after policy measures are phased out..
- ... but the scale of the program is not large enough to return GDP to its pre-pandemic path
Global jobs results

- Similar pattern of impacts for jobs as for GDP
Global CO₂ emissions results

- ‘Colourless’ (VAT cut) recovery sees rebound in emissions
- Green Recovery achieves substantial cut in emissions...
- ... although more to do to keep warming to 1.5–2°C
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Elements of the ERRP

A – Conventional policies
- Infrastructure investment (10% gov’t – 90% private)
- Localization, 10% supported locally by 2030 in given sectors, FDI increase
- Tourism relief through gov’t subsidies
- Food consumption boost through vouchers

R 835 bn over 10 years

B – Public works
- Public works, all gov’t funded – job addition in several sectors
- Additional employment in agriculture, water, forestry, construction, education, health and public admin
- Growing employment addition until end of 2025

R 68 bn over 5 years

C – Green elements
- RES subsidies (20% gov’t, 80% private) for 5 years, thereafter all private investment
- Grid investment to accommodate new renewables (gov’t funded)
- Energy efficiency: 10% total reduction in h/hold energy by 2025 (gov’t funded)
- Restrictions on new coal investments to meet IRP 2030 goal

R 190 bn over 10 years

D – ‘Green push’
- Limit annual investment in coal-fired plant to current levels
- Further gov’t funded grid investment
- Further subsidies for renewables investment

R 300 bn over 10 years
Findings in SA case study

- Largest element is conventional policies – boost GDP
- Public works programmes give temporary boost to jobs
- Without green measures, recovery leads to renewed growth in CO2 emissions (and degradation of natural capital more generally)
- Green element gives further boost to GDP (little net change in jobs) while making substantial reductions in CO2 emissions
  - but requires limits on coal-fired power generation capacity
- A more ambitious green package cuts emissions more rapidly and boosts GDP further
- Financing issues
  - reliance on private sector for financing much of the Plan’s stimulus
  - will other government spending be cut to fund public finance contributions?
- The green package needs to include measures to mitigate impacts of growth on other natural capital assets
- As elsewhere, ‘just transition’ policies will be needed to support coal restructuring
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Previous economy-natural capital linkages

- Previous global studies have tended to use scenarios developed to understand the impacts of energy and agriculture on climate change or land use.

- Based on these, projections show:
  - Biomass of fish decline 5 - 17% by 2100 depending on scenario, even in absence of fishing pressure.
  - Even under global sustainability scenarios, moderate land-use-induced biodiversity losses by 2050 will occur. These projections are exacerbated when climate impacts are also considered.
  - Up to 5 billion people could face higher water pollution and insufficient pollination of food crops.

- However, few studies consider the feedback on the economy from these changes to natural capital.

- One study suggests that by 2050, GDP would be 0.67% lower each year under a business-as-usual scenario.
Linking E3ME to the ENCORE modelling framework

ENCORE:
- 86 production processes, 11 impact drivers, 25 drivers of environmental change, 8 natural capital assets, 21 ecosystem services
- Links between nodes are qualified (per-capita effect low, medium, high)
- Outputs comparative, use fuzzy cognitive mapping
Major changes

- Most of the structure is established pre-2020, and maintained beyond then.

- Most depleted assets in 2030: water, species, habitats, soil & sediments, atmosphere.

- Greatest ES deficits: Water (quality, availability on surface and in ground), flood & storm protection.
Changes in node size across scenarios

- Easiest to compare scenarios looking at relative change (normalised)

- Atmosphere experiences little change, suggesting it is heavily impacted but this does not get much worse

- Species and habitats are the most at-risk assets over the 2020-2030 period
Green push case study: declines in coal sector may not lead to declines in ecosystem impacts

- Coal-driven declines in mining in the second half of the 2020-2030 period in the "green push" do not lead to similar changes in the impact drivers linked to mining (Sensory disturbances here)
- The ENCORE network is highly connected; the child-nodes of "mining" are linked to multiple other processes
Growth in other sectors offsets declines in mining

- Increases caused by construction and infrastructure processes outweigh the mining-driven decrease
- "Disturbances" is linked to over 20 processes
No growth for free and next steps

- Many natural capital assets are already under pressure – even a scenario with no changes would continue to cause damage
- Biggest determinant of increased impact is overall scale of regrowth – though efficiencies can be greater in green push
- Need to mitigate impacts of economic growth within sectors
- Feedbacks: agriculture sector most at risk
- Next steps
  - Improve specificity of models -> greater constraint & more quantification
  - Measure and compare how depleted ecosystem service provision feeds back on economic productivity in sectors
  - Use spatially explicit sectoral development to link to more accurately infer natural capital impacts
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- If recovery policies focus only on GDP and jobs they will result in further environmental degradation
- There is an opportunity now for policy to steer investment decisions to ‘build back better’
- Green Recovery policies can be at least as effective in boosting GDP and jobs while curbing environmental degradation
- Green Recovery policies should target protection of a broad range of natural capital assets
- Green Recovery involves economic restructuring, so needs to include Just Transition policies
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Modelling tool: the E3ME energy-economy-environment model

- Scope: economy, labour market, energy & environment,
- Detailed disaggregation (40+ sectors)
- Global coverage, 60+ countries / regions
- Econometric approach /empirical grounding
- Dynamic, year-by-year path
- Simulation, not optimisation
- Recently used by UN ECLAC for its October 2020 green recovery report Building a New Future