How ambitious can the Israeli Green Deal be?

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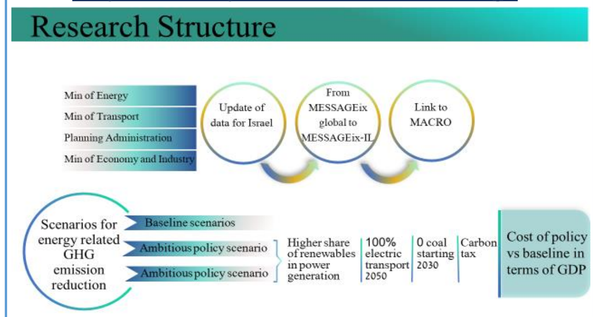
Introduction

Policy makers around the world are in the process of establishing national development plans projected to the year 2050 to combat climate change. In the present study, we simulate the adoption of energy-related carbon emissions reduction targets and their impact on the economic growth in Israel by means of an original dynamic integrated energy-macroeconomic framework, MESSAGEix_IL-MACRO.

The energy sector in Israel is at a crossroad. Traditional energy sources are in the process of replacement by natural gas (NG) and renewable energy (RE) in power generation. Industry and transport sectors are being gasified and electrified. Long a resource-poor country, Israel now has more NG than it needs for the next thirty years. As Israel's energy bill before the NG discoveries was about $10 billion—more than 5% of the gross domestic product (GDP)—the supply of domestic NG and its export have been contributing to the country's trade balance (Palatnik, Tavor, & Voldman, 2019).

The Israeli policy makers are skeptical as to how far greenhouse gas (GHG) emissions reduction in Israel can go without hampering economic growth. The aim of this study is to investigate the economic impacts of alternative paths for GHG emissions reduction in Israel.

Co-production process and research design



The research was conducted in the following steps, as shown in Figure 1.

1. The global energy model MESSAGEix-GLOBIOM was rescaled to represent the energy sector in a small open economy with imports of crude and refined oil and coal together with exports of natural gas and oil products.

2. The key parameters that characterize the Israeli energy sector were updated. Those include NG reserves discovered offshore Israel (900 BCM), energy taxes, power-generation capacity according to fuel mix, costs of power plants, storage, and others. Close collaboration with the Ministry of Energy resulted in obtaining the most updated data for MESSAGEix_IL.

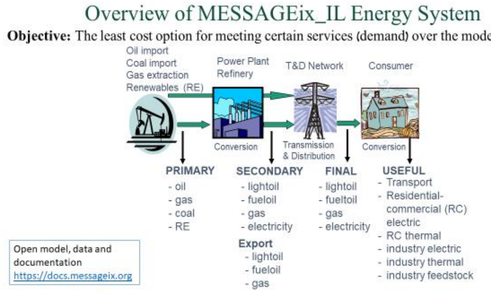
3. In collaboration with stakeholders, the future development of the energy sector in Israel until the year 2050, following official policy plans, was identified. Accordingly, the "baseline" scenario for the future development of the energy sector in Israel until year 2050 was generated by MESSAGEix_IL.

4. The "baseline" scenario generated by MESSAGEix_IL served for calibration of the aggregated macroeconomic model, MACRO.

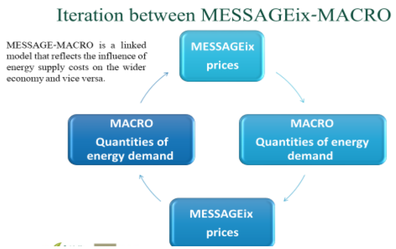
5. Alternative policies, such as a higher share of power generation from RE, complete electrification of the transport sector by the year 2050, and carbon taxes were imposed as external shocks to the energy system in MESSAGEix_IL.

Models

We utilize a novel long-term-horizon, linear, least-cost, integrated-assessment model of the Israeli energy system, MESSAGEix_IL. MESSAGEix_IL is a country-level application of the integrated assessment model MESSAGEix, developed at the International Institute of Applied Systems Analysis (IIASA). MESSAGEix is a dynamic bottom-up, technology-based optimization model designed for medium- to long-term energy planning and policy analysis that provides a framework to represent energy systems with all their interdependencies and correlations.



To obtain macroeconomic feedback for changes in an energy system, MESSAGEix_IL is linked directly to the MACRO module that maximizes the intertemporal utility function of a single representative producer-consumer.

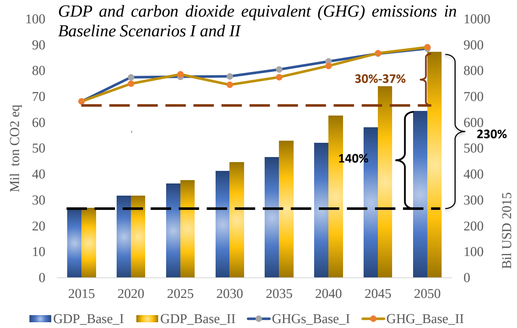


Simulated scenarios

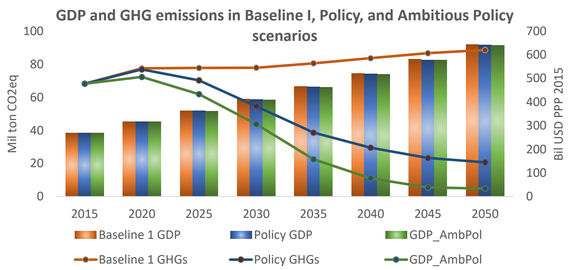
Scenarios:		Baseline Scenario I Low population growth, renewables & EV	Baseline Scenario II High population growth, renewables & EV	Policy Scenario Targets & low carbon tax	Ambitious Policy Scenario Targets & High carbon tax
Socio - economic	Population average annual growth	1.7%	2.0%	follow baselines	
	GDP average annual growth	2.5%	3.5%		
Electricity	RE in power generation	17% from 2030 on	30% from 2030 on	25% in 2030, 85% in 2050	
	Coal	Reduction of the capacity of coal power plants by 2030, remaining 3400 MW available till 2050		Gradual reduction to 0 by 2030	
	Gas	NG export of 25% of reserves by 2050		No bound on NG capacity after 2025	
Electric Transport		30% in 2050	60% in 2050	100% electric transport	

Carbon tax Average annual in a period		
No Carbon Tax		
2020	$0	$0
2025	$23.3	$61.8
2030	$48	$145
2035	$53	$160
2040	$58	$176
2045	$62	$190
2050	$67	$205
2055+	$69	$212

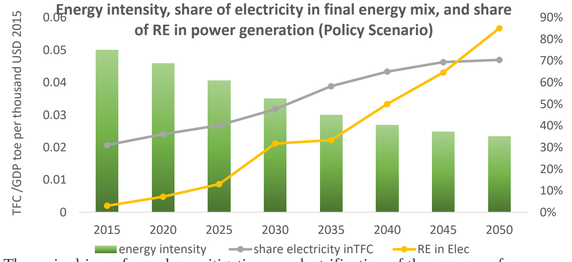
Results



As the GDP growth in the baselines is significantly higher than that of GHG emissions, partial decoupling between economic growth and carbon emissions in the Israeli economy might be achieved if currently planned policies are indeed implemented. Yet, GHG emissions in the baseline are projected to grow.



Policies that promote reaching 85% of RE in the energy mix for power generation and full electrification of transport by 2050, combined with modest carbon tax rates reduce emissions by about two-thirds (Policy Scenario). A higher carbon tax rate might achieve an even sharper decline of 73% to 92% (Ambitious Policy Scenario). The estimated direct economic cost in 2050 is between 0.02% and 0.62% of GDP.



The main drivers for carbon mitigation are electrification of the economy from about 30% today to 70% in 2050, while the energy intensity declines by 53%. The share of RE in power generation sharply increases to reach the goal of 85% by 2050.

Discussion

- Only energy related GHG emissions are analyzed
- Only direct costs of the transition are evaluated
- Related benefits for health, productivity, are not in the model

BUT

- Khan et al (2019) analyzed climate impact on countries' productivity
- Israel will **loose 1.15%** GDP per capita in 2050 in case of "no global climate mitigation policy"
- Israel will **gain 0.24%** GDP per capita in 2050 in case of "global climate policy"

Conclusions

- Relatively low carbon tax values reduce energy-related GHG to 33% in 2050 comparing to 135% in the Baseline-I with only a minor impact on GDP growth.
- Carbon tax speeds up phase out of oil in transport and decarbonization of industry
- Another important step for decarbonization is diverting energy production from the use of polluting fossil fuels to RE while electrifying the economy.
- The improved efficiency and transition to RE are partly due to the exogenous targets for RE in power generation and full electrification of transport and are partly due to the imposition of a carbon tax.

Policy recommendations

• There is a synergy between adopting emission reduction targets and the need for considerable investment in infrastructure to achieve the Israeli economy's growth targets, given the expected demographic growth:
•To meet the goals of RE in power generation, demand management and storage of electricity, as well as wind and waste-to-energy, should be promoted.
• For solving road congestion and the continuing increase of new vehicles, which are driven by demographic and economic growth, we recommend rapid electrification of light-duty vehicles and public transport. Accordingly, we call for investment in electric and efficient public transportation.
• Carbon tax internalizes the negative externalities created by GHG emissions and found to be the first-best solution to mitigate GHG emissions. In the post- Covid We recommend accompanying the policy targets with the adoption of a carbon tax.

Accepted for publication in

Palatnik Ruslana Rachel, Davidovitch Ayelet, Volker Krey, Nathan Sussman, Keywan Riahi and Matthew Gidden.(Forthcoming) How ambitious can the Israeli Green Deal be? (2021), Tsani and Øverland (Eds.) *Handbook on the Sustainable Politics and Economics of Natural Resources*. Edward Elgar.

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