The Potential of Behavioural Change for Cliumate Change Mitigation: A Case Study for the European Union

Dirk-Jan van de Ven, Basque Centre for Climate Change (BC3)
Iñaki Arto, BC3
Mikel Gonzalez-Eguino, BC3

ABSTRACT

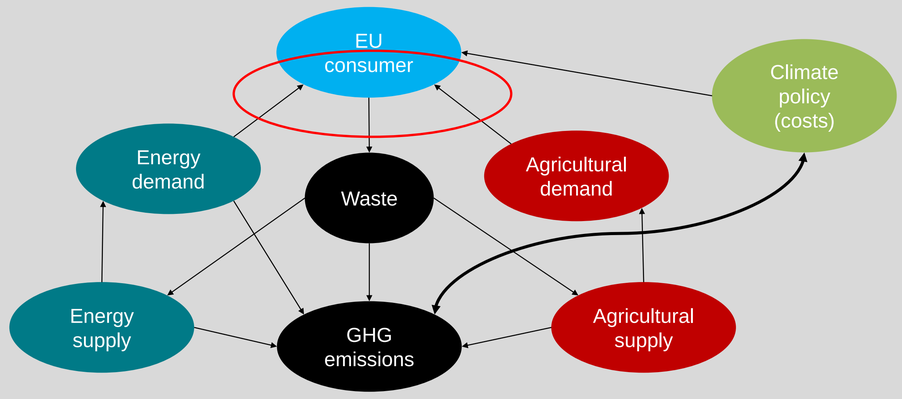
This study focuses on the potential climate mitigation by behavioural change in the European Union (EU) covering many behavioural options in food, mobility and housing demand which do not require any personal up-front investment. We use an Integrated Assessment model (GCAM model), capturing both their direct and indirect implications in terms of greenhouse gas emissions. Our results indicate that modest to rigorous behavioural change could reduce per capita footprint emissions by 6% to 16%, out of which one fourth will take place outside the EU, predominantly by reducing land use change. The domestic emissions savings would contribute to reduce the costs of achieving the internationally agreed climate goal of the EU by 13.5% to 30%. Moreover, many of these options would also yield co-benefits such as monetary savings, positive health impacts or animal wellbeing.

1 INTRODUCTION

Research effort has focused primarily on how the portfolio of existing and future technologies can contribute to meet the world's energy demand over the next century and, at the same time, limit greenhouse gas (GHG) emissions so that they are consistent with a stabilisation of temperature increase below 1.5 – 2 degrees Celsius with respect pre-industrial levels. However, the mitigation effort that will be needed is so great that additional changes in human behaviour will be necessary. Samadi et al (2016) argue that since behavioural changes towards more sustainable lifestyles have considerable potential to contribute to public policy goals and may even be indispensable for achieving some of these goals, future lifestyle assumptions should be assessed separately from technological assumptions in future energy scenarios.
Two studies so far have used a multi-sectoral Integrated Assessment Model (IAM – in both studies using IMAGE) to model the overall impacts of preference changes in housing and mobility demand (van Sluisveld et al 2016) and food demand (Stehfest et al 2009). Although IAMs might not be ideal to represent the mitigation impacts of behavioural change due to methodological limitations, the limited representation of lifestyle changes in IAMs and general limitations in integrated assessment (van Sluisveld et al 2016, p. 316-317), they are useful to analyse the interaction of behavioural change with other measures, such as technological change or policies.

2 METHODOLOGY

This study applies the Global Change Assessment Model (GCAM), an integrated assessment model that links the world's energy, agriculture and land use systems with a climate model. The way GCAM is used however differs significantly from previous studies. The model is usually used to test the impact of mitigation polices. Since climate policies, energy policies and land policies usually focus on either the price or the production of certain goods, services or gases, demand is indirectly impacted due to a change in prices. In contrast, we use GCAM to model preference changes by consumers in the EU region. Indirectly, these preference changes will have an impact on prices and production of goods and services, which will have an impact on GHG emissions within and outside the EU.

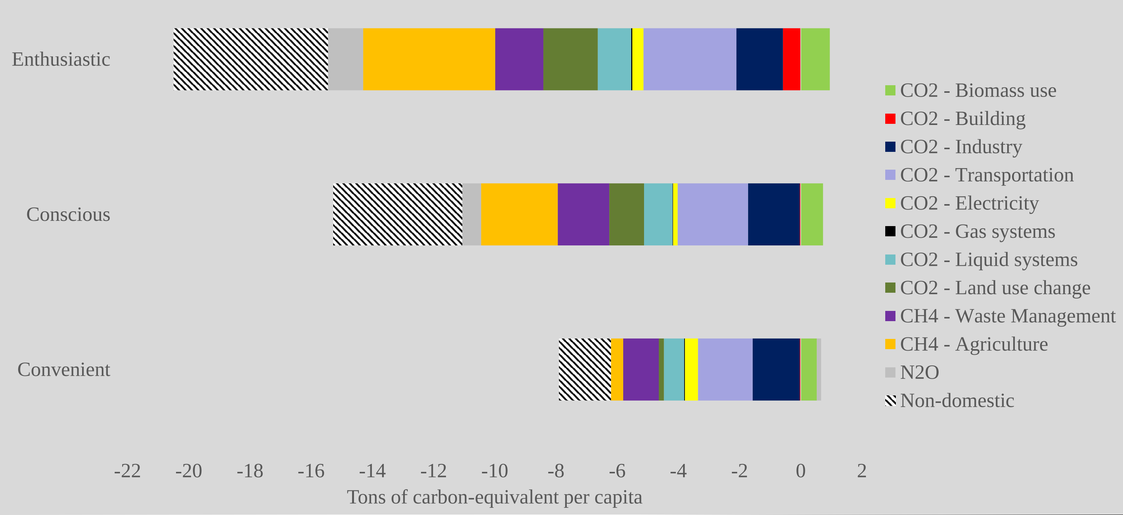


This study focuses on the behavioural options within these three consumption categories: food, mobility and housing. See Table 1 for the specific options within each category. These options are chosen for their behavioural aspects. The idea behind the selection of these options is that they are free of charge, can be adopted from one day to another without the need of personal monetary investments and do not significantly lower the quantity of personal final needs in terms of food, mobility and housing.

3 RESULTS: GHG EMISSIONS

Behavioural option	Avoided GHG emissions:			
	Total 2011-2050	% CO2 (FFI) [1]	% Domestic [2]	Part of profile: [3]
Food demand:				
Vegan diet	-8.2%	3.6%	66.1%	ENTH
Vegetarian diet	-7.0%	4.7%	51.0%	
Healthy diet	-5.3%	4.6%	58.9%	CONS
Food waste reduction	-2.4%	3.1%	49.5%	ENTH, CONS, CONV
Mobility demand:				
Public transport commuting	-0.7%	93.1%	86.2%	ENTH, CONS
Carpool commuting	-1.2%	92.3%	89.3%	CONV
Teleworking	-0.3%	92.3%	89.1%	ENTH, CONS, CONV
Urban Cycling	-0.6%	92.8%	89.3%	ENTH
Car sharing / Car club	-1.1%	87.3%	89.6%	ENTH, CONS
Avoid short flights	-0.5%	93.2%	88.1%	ENTH, CONS
Closer holidays	-0.5%	93.4%	88.9%	ENTH
Eco-driving	-0.6%	92.3%	89.4%	ENTH, CONS, CONV
Housing demand:				
Reduce heating / cooling	-0.6%	88.7%	89.0%	ENTH
Organic waste recycling/composting	-1.1%	8.1%	93.6%	ENTH, CONS
Paper waste recycling	-0.6%	86.2%	125.9%	ENTH, CONS, CONV
Plastic/metal/glass waste recycling	-1.7%	93.9%	92.9%	ENTH, CONS, CONV
Behavioural Profiles:				
Convenient profile (CONV)	-5.6%	59.4%	76.4%	x
Conscious profile (CONS)	-12.0%	35.7%	71.1%	x
Enthusiastic profile (ENTH)	-16.2%	34.8%	74.5%	x

[1] Fossil Fuel & Industry: Includes all CO2 emissions related to fossil fuel use, but no CO2 emissions from land use change [2] Share of emission reductions within EU-27 region [3] ENTH: Enthusiastic profile, CONS: Conscious profile, CONV: Convenient profile.



4 RESULTS: POLICY COSTS

Scenario		Accumulated GHG emission savings within EU-27 in 2011-2050 [1]	Total policy costs 2020-2050 Trillion €(2010)	Per capita policy costs 2020-2050 €(2010)
Baseline + Convenient profile		-4.5%	N/A	N/A
Baseline + Conscious profile		-8.5%	N/A	N/A
Baseline + Enthusiastic profile		-12.1%	N/A	N/A
EU NDC [2]		-39.6%	1.99	3971.6
EU NDC + Convenient profile		-39.6%	1.72	3431.0
EU NDC + Conscious profile		-39.6%	1.54	3080.9
EU NDC + Enthusiastic profile		-39.6%	1.40	2793.2

[1] Percentages with respect to baseline emissions, see section 2.4
[2] Nationally Determined Contribution related to the 2015 Paris Agreement

5 CONCLUSIONS

Policy makers predominantly look at taxes and subsidies in order to provide technological solutions to reach their climate targets. As follows from this analysis, behavioural effects can play a significant role in climate change mitigation portfolio and this potential should therefore be reflected in scenario studies aiming to provide comprehensive advice to policy makers (Samadi et al 2016). More specifically, the results from this study imply that policymakers should put more effort in education and awareness programs in order to promote green behaviour by citizens, where it is important to focus on a more holistic view of a low-carbon future (Howell 2013) as well as individuals' everyday emotions and concerns in the context of climate change (O'Neill and Nicholson-Cole 2009), for example by linking pro-environmental behaviour with the additional benefits that come along with them. The policy costs of such measures are usually low compared to the implementation of taxes and subsidies and, in addition, they often lead to significant public co-benefits in terms of health, land use and overall well-being.

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dj.vandeven@bc3research.org

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