# *IMPLICATIONS OF DIFFERENT MITIGATION PORTFOLIOS ON STAKEHOLDER PREFERENCES*

Cristina Pizarro-Irizar, University of the Basque Country (UPV/EHU) and Basque Centre for Climate Change (BC3), + 34 946 01 3657, mariacristina.pizarro@ehu.eus/cristina.pizarro@bc3research.org
Mikel González-Eguino, Basque Centre for Climate Change (BC3), +34 94 401 46 90 ext. 132, mikel.gonzalez@bc3research.org
Iñaki Arto, Basque Centre for Climate Change (BC3), +34 94 401 46 90 ext. 142, inaki.arto@bc3research.org
Jon Sampedro, Basque Centre for Climate Change (BC3), +34 94 401 46 90 ext. 137, jon.sampedro@bc3research.org
Dirk-Jan Van de Ven , Basque Centre for Climate Change (BC3), +34 94 401 46 90 ext. 136, dj.vandeven@bc3research.org
Krisztina Szendrei, JIN Climate and Sustainability, + 31 50 524 8430, krisztina@jin.ngo
Wytze van der Gaast, JIN Climate and Sustainability, + 31 50 524 8430, wytze@jin.ngo

## Overview

According to the Intergovernmental Panel on Climate Change (IPCC), human influence on the climate system is clear (IPCC, 2014). Observed impacts of climate change are “widespread and consequential”, but future effects still largely depend on current actions worldwide to reduce emissions. Defining feasible and cost-effective low-emission pathways for the next century has therefore become crucial, in order to avoid the most severe impacts of global warming.

In this context, scenario-based model projections play an important role in evaluating different mitigation options. Scenarios are commonly used to facilitate short and long-term decisions associated with climate change, given the uncertainty in the underlying environmental, social, political, economic and technological factors. Models are then used as an instrument to develop projections of climate scenarios. Although the results arising from model simulations (quantitative approach) could be attractive from a theoretical standpoint, they could become unfeasible to implement due to technological, institutional, social or economic reasons. In this sense, stakeholder participation (qualitative approach) could provide complementary information to adjust the likely scenarios for policy analysis and make them more realistic.

This paper links qualitative and quantitative approaches as a tool to assess options for decision making on climate policy at a global level. The rationale is that the combination of stakeholder engagement and modelling not only improves the quality of the analysis, by integrating stakeholders’ practical experience and preferences, but also enhances ‘buy-in’ options that are eventually negotiated and could become important decision support tools for policy making.

The paper is structured as follows. After the introduction, the second section describes the methods used to develop this analysis, including a qualitative approach based on stakeholder engagement by means of a two-round survey, and a quantitative approach based on the Global Change Assessment Model (GCAM), which is an integrated assessment model for exploring consequences and responses to global change. The third section presents the results of the model simulations and discusses at what extent this quantitative information affects stakeholder preferences. Finally, conclusions and policy implications are presented in the last section.

## Methods

In a first survey we asked a selected group of stakeholders about their preferences for shaping climate change mitigation in the 21st century. The objective of the survey was to collect information on how they perceive and assess the risks related to a changing climate, and which low-emission pathways (i.e. temperature limits and technology options) they prefer to mitigate these risks. The driving force of the survey was technology, i.e. the availability of different technology options for mitigation. Participants came from public agencies, private and public sector industries, scientists and researchers, international associations, NGOs and the finance community.

Second, we simulated a set of mitigation scenarios in line with those presented by the IPCC (Edenhofer et al., 2010 and Kriegler et al., 2014) using GCAM, which is a dynamic-recursive model with technology-rich representations of the economic, energy, land use and climate systems that can be used to examine the effect of technology and mitigation policies (Calvin et al., 2015). Those scenarios included a no climate policy scenario and several climate policy scenarios with all the technologies available and with limited technology options (i.e. nuclear phase out, no carbon capture technologies, limited renewable energy and limited bioenergy). We explored both the 2ºC and 1.5ºC temperature increase limits with respect to pre-industrial levels (Rogelj et al., 2015).

Third, we conducted another round of surveys to the same sub-set of stakeholders that had taken part in the first survey. In this second round we asked the very same questions, but we provided more detailed information on the implications of the simulated technology portfolios, placing particular attention on their positive and negative trade-offs. Finally, stakeholder preferences were evaluated; in particular, assessing whether their preferences changed with the new information on the simulated mitigation portfolios; and if so, how and why.

## Results

Simulations showed that it is possible to limit global warming up to a 2ºC increase even if some mitigation technologies are restricted; however, carbon capture and storage (CCS) and renewable energy sources are essential to achieve the 1.5ºC temperature target. Based on this information, stakeholders changed their initial 1.5ºC temperature target choice (indicated in the 1st round of survey) to 2ºC in the 2nd round. Related to the technology preference for the future, renewable energy and energy efficiency turned out to be the most preferred options in both surveys, but after being provided with the simulation results, no one reported fossil technologies anymore among the first two preferred options. Furthermore, concerning the level of support that technologies should receive, renewable energy and energy efficiency were the preferred options for investment in both surveys, but the preferences for bioenergy and CCS increased in the second round. The preferences for nuclear remained the same in both surveys. When asking about the relevance of different sectors for climate change mitigation, industry and transport were the most important sectors in both rounds, but industry surpassed transport in the second survey. Finally, we also found differences depending on the country of origin and professional background of the stakeholders.

## Conclusions

This paper shows that the interaction between stakeholders and scientists/modellers can play an important role in creating options and improving decision making in climate policy. Stakeholders changed their preferences when they were provided with simulations on mitigation portfolios towards a 2ºC and 1.5ºC targets with limited technology options. Translating these preferences to the policy level, the dilemma lies between promoting investment in technology development in the short term or facing more costly mitigation options in the long run. Additionally, our stakeholder-model interaction also proves that a single approach will not work for all countries, since the resources, technologies and public acceptability of different options vary by geographical scales and change with time. The challenge is to find the best possible pathway attending to the existing trade-offs between the different technology options. In this sense, this paper contributes to show some of those trade-offs and how stakeholders respond to them.

## References


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