Journal of Cleaner Production 107 (2015) 455–466

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Combinations of policy instruments to decrease the climate impacts of housing, passenger transport and food in Finland

Ari Nissinen [a, *], Eva Heiskanen [b], Adriaan Perrels [c], Elina Berghäll [d], Virpi Liesimaa [a], Maija K. Mattinen [a]

[a] Finnish Environment Institute (SYKE), P.O.Box 140, FI-00251 Helsinki, Finland
[b] National Consumer Research Centre, P.O.Box 5, FI-00531 Helsinki, Finland
[c] Finnish Meteorological Institute, P.O.Box 503, FI-00101 Helsinki, Finland
[d] Government Institute for Economic Research (VATT), P.O.Box 1279, FI-00101 Helsinki, Finland

ARTICLE INFO

Article history:
Received 15 October 2013
Received in revised form
8 August 2014
Accepted 28 August 2014
Available online 16 September 2014

Keywords:
Consumption
Energy consumption
Greenhouse gas emissions
Policy instruments
Policy packages
Policy interactions

ABSTRACT

Policy instruments and measures already target the global warming impacts of housing and transport in many countries, although many of those instruments were not originally developed for the purpose. However, the challenge of curbing climate change calls not only for innovative and improved instruments, but for integrated policy packages that address consumption across the entire product life cycle, recognize links between different consumption sectors, and identify and harness synergies between instruments. To this end, we first evaluate the effectiveness of existing policy instruments targeted at housing, passenger transport and food in Finland. The results show large impacts on greenhouse gas emissions. Second, we integrate instruments into packages, which minimize potential negative interferences, while strengthening synergies and complementarities between instruments. We estimate the potential of the consequent emission reductions to be considerable. By 2020, housing and passenger transport emissions are estimated to decline by 4.2 million tons (Mt). Integrated food related policy packages are estimated to reduce emissions 0.3 Mt in Finland and life-cycle based emissions by 0.5 Mt. Altogether the emission reduction would be 4.5 Mt in Finland, which is over 6% of Finland's average emissions 68 Mt for years 2008–2012. In conclusion, though greenhouse gas emissions of household consumption have already been affected by policy instruments, it is better to develop policy packages by which the synergies between measures can be reinforced and hence overall effectiveness can be improved. We found acceptability of policy instruments to be a key issue, necessitating careful implementation, long-term consistency and research showing evidence of their effectiveness. The full realization of the policy package potential requires improved co-operation across relevant ministries and public authorities, which can be facilitated by common policy programs and objectives for all related public authorities. The project results were used in the preparation of a revision of Finland's program for sustainable consumption and production. We propose that similar policy package development processes in other countries would increase further our understanding about effective policy packages, reinforce each other, and speed up the changes for more sustainable consumption.

1. Introduction

Consumption offers a powerful lever for environmental policy (Tukker et al., 2008). This is all the more so in countries where environmental policy concerning point-source emissions from industry and urban agglomerations is already well developed. Changes in consumption patterns can offer a cost-effective way to significantly reduce life-cycle based greenhouse gas emissions of products and services (EC COM, 2008), and hence, offer a promising approach to climate policy. The challenge of curbing climate change

List of acronyms: CO_2eq, carbon dioxide equivalents (unit of greenhouse-gas emissions); ETS, EU's emissions trading scheme; GHG, greenhouse-gases; Mt, million tons.

* Corresponding author. Tel.: +358 400 148813; fax: +358 9 5490 2190.
E-mail addresses: ari.nissinen@ymparisto.fi (A. Nissinen), eva.heiskanen@ncrc.fi (E. Heiskanen), adriaan.perrels@fmi.fi (A. Perrels), elina.berghall@vatt.fi (E. Berghäll), virpi.liesimaa@ymparisto.fi (V. Liesimaa), maija.mattinen@ymparisto.fi (M.K. Mattinen).

http://dx.doi.org/10.1016/j.jclepro.2014.08.095
0959-6526/

calls for better and more innovative instruments that address consumption across the entire product life cycle, recognize the links between different consumption sectors, and identify and strengthen synergies between the various policy instruments.

However, steering consumption is complex. It requires an extensive knowledge base, while policy makers are also concerned about the acceptability of interventions into the private sphere of consumption (Heiskanen et al., 2014). Because of this, most policies targeting sustainable consumption focus on voluntary and informative instruments and are generally perceived of as lacking in ambition (Mont and Plepys, 2008; Berg, 2011; Power and Mont, 2012). Hence, consumption is at the same time a promising, but also a challenging avenue for climate policy.

A focus on consumption suggests a new approach to the calculation of greenhouse gas emissions in climate policy development. The officially adopted approach is to calculate emissions originating from within national borders (i.e., the direct emissions or territorial emissions), which form the basis of the annual national greenhouse gas inventories and the international climate negotiations (IPCC, 2006). However, in a small, open economy, trade flows also entail large flows of "embodied emissions", i.e., greenhouse gas emissions from the production of goods that are imported or exported (e.g. Seppälä et al., 2011; Mozner, 2013). The consumption-based emissions can be termed the 'carbon footprint' of a nation (Peters and Solli, 2010), i.e., they consist of the sum of greenhouse gas emissions from domestic production consumed in the country, imports into the country, and domestic investments. For clarity, in this context the word 'consumption' denotes household consumption only, while the term 'life-cycle based emissions' includes everything.

A focus on consumption also suggests a new approach to examining the effects of policy instruments. These are traditionally divided into regulatory, economic and informative instruments (Vedung, 1997), frequently administered by different ministries and government agencies (Heiskanen et al., 2014). From the perspectives of global and national climate policies, however, the important questions pertain to the outcomes and impacts (Vedung, 1997; Neij and Åstrand, 2006) of the entire instrument package, or their mix directed at a certain issue. When evaluating or anticipating these, we need to account for interactions between different instruments (Vedung, 1997).

There is widespread agreement that interactions among policy instruments are important, since separate instruments can be mutually reinforcing, or merely overlapping and hence redundant (Bye and Bruvoll, 2008; Harmelink et al., 2008); in the worst case, they might even have contradictory effects. However, there is as yet no commonly agreed method to analyze policy instrument interactions. A widely used approach is to develop matrices of interaction effects in order to examine potential complementarities and antagonistic effects (Sorrell, 2003; Simoes et al., 2005; Boonekamp, 2005; Child et al., 2008). For example, Simoes et al. (2005) used a matrix to examine the interactions between pairs of policy instruments, examining whether the objectives are complementary or antagonistic, whether there is co-ordination between the mechanisms used in the instruments, and whether the steering effects of the instruments are complementary or antagonistic.

In Finland, several policy instruments have been introduced over the years, which have influenced greenhouse gas emissions from consumption (Mickwitz et al., 2011). Regulations have been used, for example, to set requirements on the specific energy consumption of new buildings and energy using products. Urban planning is another regulatory instrument, which has an impact on energy used in transport. Economic instruments such as energy and carbon taxes have been deployed in order to raise the price of electricity, district heat and fuels, as well as to influence the demand for vehicles with different levels of energy performance. Informative instruments aim to inform the public of the energy and environmental performance of products and thus enhance the transparency of markets. Recently, new proposals have been made such as carbon footprint labeling of products in combination with monitoring and incentive systems for consumers (Perrels et al., 2009).

However, until now, most of these policy instruments have been developed for other reasons than to reduce greenhouse gas emissions, and there has been no integrated overview of their combined effects, even though there is now widespread agreement among researchers that policy packages are more effective than individual instruments (Mont and Plepys, 2008; Wolff and Schönherr, 2011). This situation set the stage for the present study and the KUILU-project, which investigated the possibilities

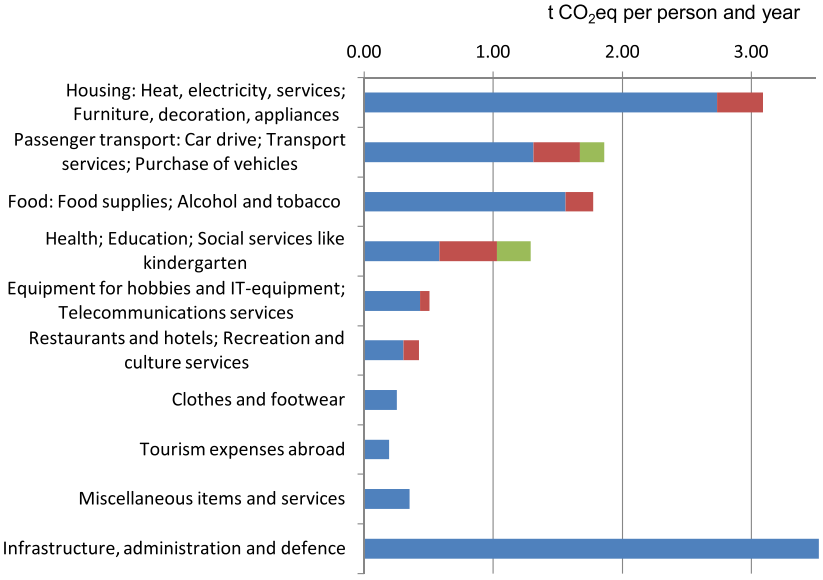

Fig. 1. Greenhouse-gas emissions in year 2005 from private consumption in Finland. Health, education, and social security services take also into account individual public services. Based on data from Seppälä et al. (2009).