Development of a guidance document on behavioural & structural measures

Stefan Åström, 7 April 2022

Outline

- Current status of work
  - Identified challenges
- Methods
- Thoughts
- Further work

Current status of work – informal report to the 41st EB

- Recommends exploration of emission reductions from structural measures
- Guidance document to be developed
- Identified challenges
  - How to estimate potential reductions?
  - What are the welfare effects of behavioural change?
  - How to estimate implementation rates?

Informal document on non-technical and structural measures

Prepared by the Gothenburg Protocol Review group (GPG)

Requirements under the Gothenburg Protocol include national emission reduction obligations and the implementation of technical emission limit values (ELVs) for i.e., installations, vehicles and products (ELVs). Their ultimate goal is to protect human health and ecosystems.

Beyond emission limit values

Implementation of ELVs only is not always sufficient to meet national emission reduction obligations or air quality targets. In such cases, additional actions in the form of "non-technical" measures could be considered, at the national or local level. This could include encouraging a faster substitution of old and polluting technologies by new and cleaner technologies, facilitating the use of cleaner fuels or feedstocks, or stimulating a greener behaviour of consumers. The latter could include a modal shift from private to public transport, dietary changes or domestic energy saving. Sometimes such measures prove to be more efficient and less costly than implementing stricter ELVs.

Non-technical/structural measures

Such additional measures are not included in the technical annexes of the protocol and are for that reason sometimes referred to as 'non-technical', voluntary, innovative or non-regulatory measures, although in reality these can still have highly technical components. For example, in the case of building insulation, solar energy, product and process redesign or advanced public transport systems. Examples of measures with almost no technical component include improved maintenance routines (e.g. regular checking of pumps, valves and pipelines for leakages, check-up for cars, heating systems, etc.), reducing indoor temperature, land-use improvements, obeying speed limits and turning off the lights when leaving the room. Examples of hybrid measures or solutions are motion-activated light switches, cruise control functionalities in vehicles, or awareness raising combined with certified product information so people can be sure they select environmental-friendly products.

For example, the U.S. EPA certifies residential wood stoves for meeting emission limits and efficiency. In this case the government has a unique role as a trusted third party. Emissions from wood stoves are the combined result of various aspects like technical standards, choice and placement of appliance, maintenance, fuel choice and wood burning behaviour. Awareness raising is often a first necessary step to change behaviour and can help the acceptance of regulation on how and when to burn wood (if awareness raising alone proves to be insufficiently effective). Checking the right wood burning behaviour by chimney sweepers, such as in Germany, and the obligation to respect the weather forecast in some states in the U.S., are examples of policies to further reduce emissions from wood stoves in addition to technical standard setting.

Often 'non-technical measures' are associated exclusively with behavioural change, however it is clear that it can mean much more. Given that narrow or potentially misleading interpretation of 'non-technical measures', the broader term 'structural measures or structural changes' may be more appropriate when we refer to measuresthat are additional to the end-of-pipe techniques prescribed in the technical annexes to the protocol.The common feature of structural changes is that they cannot easily be implemented via permitting ofspecific activities. They often require a combination of actions by various players in the production chain, as well as by consumers. As the term 'structural changes' suggests, it could even include a transition towards a new economic structure that relies less on the use of fossil fuels or animals.

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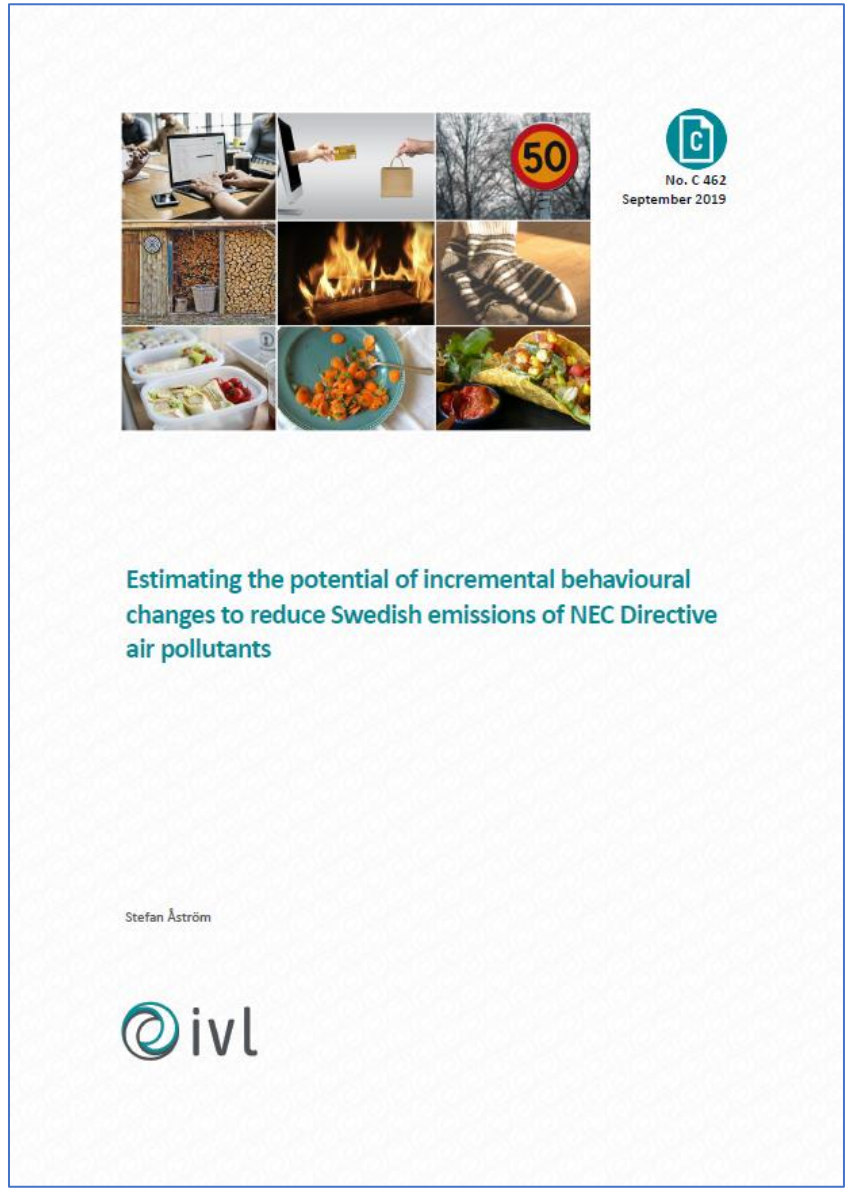
Methods

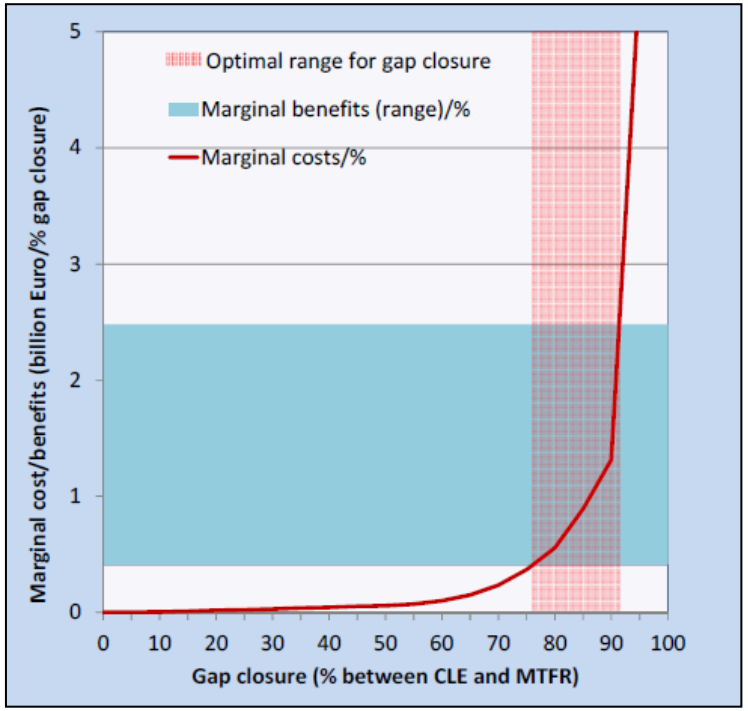
- Swedish EPA financed two studies on Swedish behavioural change
- Based on literature reviews and calculations
- First study focused on 10 individual measures
- Major remaining challenge on:
  - How to estimate implementation rates?
  - How to estimate welfare effects?



Methods – second study

- Builds on the use of welfare economics as support to the European Union National Emission Reductions Commitment Directive

- Based on literature reviews and calculations
- Key question:
  - *How to express and monetize socio-economic costs and benefits of pro-environmental behavioural change?*



Amann et al., 2013

What does the literature propose?

- No concensus on how to achieve pro-environmental behavioural change (?)
  - Key problem seems to be the link between individuals and groups

Ajzen: Theory of planned behaviour

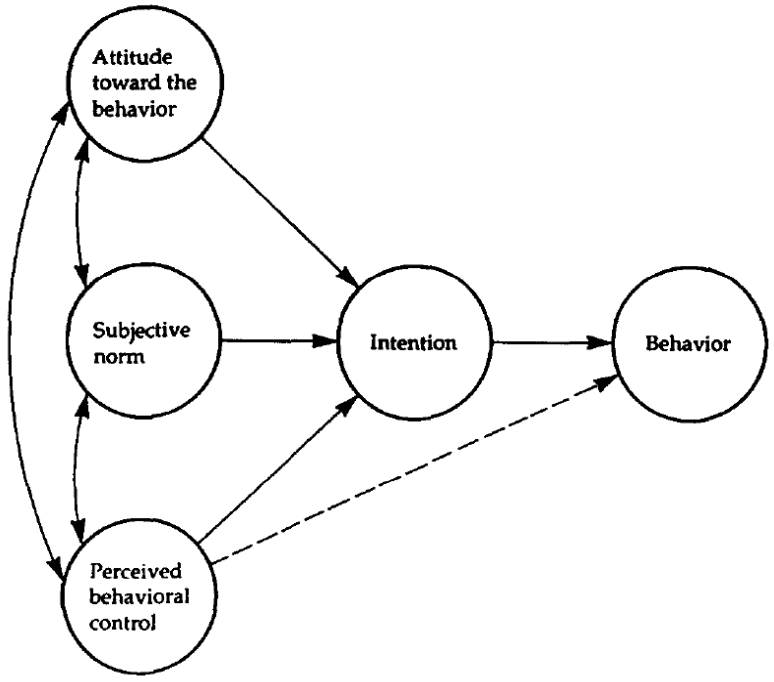


FIG. 1. Theory of planned behavior.

Gatersleben: Needs-opportunities-ability model

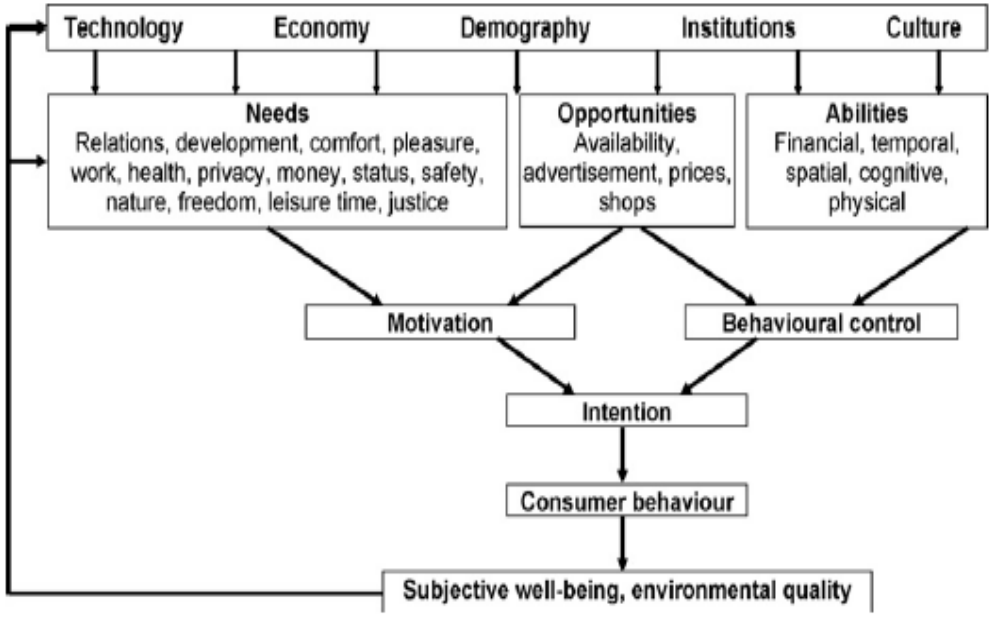


Fig. 1 – 'The needs-opportunity-ability model of consumer behaviour', reproduced from Gatersleben and Vlek (1998), with kind permission from Birgitta Gatersleben.

What does the literature propose?

- For dietary and exercise behavioural change: How to make policy interventions stick?

- If we can't (yet) understand dietary change and how to get us to exercise (both with extremely visceral benefits):

  How to deal with pro-environmental behavioural change?

	THE FOUR STAGES OF HABITS	THE FOUR LAWS OF BEHAVIOUR CHANGE
1. Cue	A trigger that tells your brain to initiate a habit.	Law 1: Make it obvious.
2. Craving	The prediction that compels you to act.	Law 2: Make it attractive.
3. Response	The actual habit you perform.	Law 3: Make it easy.
4. Reward	The result that satisfies your craving.	Law 4: Make it satisfying.

Source: James Clear

https://implementconsultinggroup.com/article/harness-the-potential-of-habits-at-work/

Leaning back on welfare economics

- Pro-environmental behavioural change affects:
  - individual welfare: time, comfort, expenditures, fitness, etc.
  - Societal welfare: property values, etc.
  - Can (some) of these be categorised and monetized?

Table 2. Walkability Economic Impacts

Name	*Description*	*Measuring Techniques*
Accessibility	Degree that walking provides mobility options, particularly for people who are transportation disadvantaged.	Travel modelling, analysis of travel options.
Consumer cost savings	Degree to which walking provides consumer transportation cost savings.	Consumer expenditure surveys
Public cost savings (reduced external costs)	Degree that walking substitutes for vehicle travel and reduces negative impacts.	Determine to what degree walking reduces motor vehicle travel, and the economic savings that result.
Efficient land use	Degree that walking helps reduce the amount of land used for roadway and parking facilities, and helps create more accessible, clustered land use.	Identify the full economic, social and environmental benefits of more pedestrian-oriented land use.
Livability	Degree that walking improves the local environment.	Property values, business activities, consumer preference surveys.
Public fitness and health	Degree that walking provides physical exercise to people who are otherwise sedentary.	Travel and health surveys to determine the number of people who benefit from walking exercise.
Economic development	Degree to which walking makes commercial areas more attractive and shifts consumer expenditures to goods that provide more regional economic activity and employment.	Market surveys and property assessments. Input-output table analysis.
Equity	Degree that walkability helps achieve various equity objectives.	Various indicators of horizontal and vertical equity.

This table summarises various categories of impacts to consider when evaluating walking.

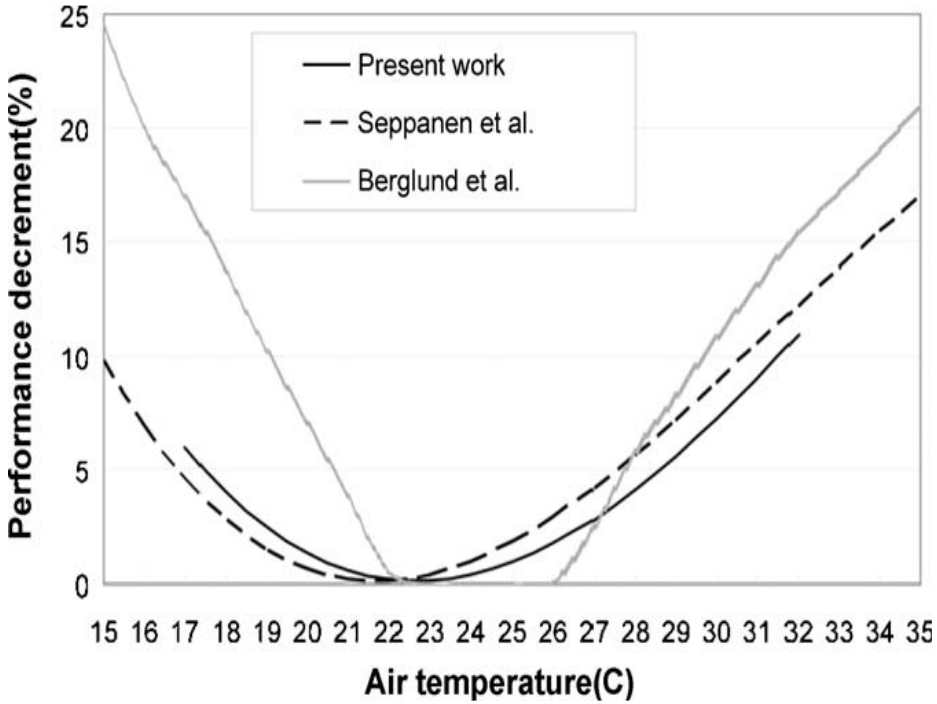
Litman (2004)

An technical cost analogy approach (?)

	I_{an}	$O\&M_{fix}$	$O\&M_{var}$
Terms in GAINS technology abatement cost calc.	I, q, lt,	I, f	λ, c,
Individual - BCM correspondence	Status que bias,	Car pool fee	• Reduced self-reliance, • Increased waiting time, • Increased transport time, • etc
Society BCM correspondence	tbc	tbc	tbc

A numerical example from the literature

Subjective welfare costs of energy efficiency improvements?



Lan et al (2011)

Annualised Life-cycle intangible cost in €2015 per kWh/m2 at 4% discount rate							
		Final energy class					
Initial energy class		F	E	D	C	B	A
class	energy (kWh/m2)	390	280	190	120	70	40
G	750	0.5	0.1	0.1	0.0	0.3	0.4
F	390		1.3	0.9	0.1	0.1	1.0
E	280			1.4	0.2	0.3	1.4
D	190				1.3	0.5	1.5
C	120					2.8	1.0
B	70						
A	40						

Giraudet et al (2012)

Thoughts?

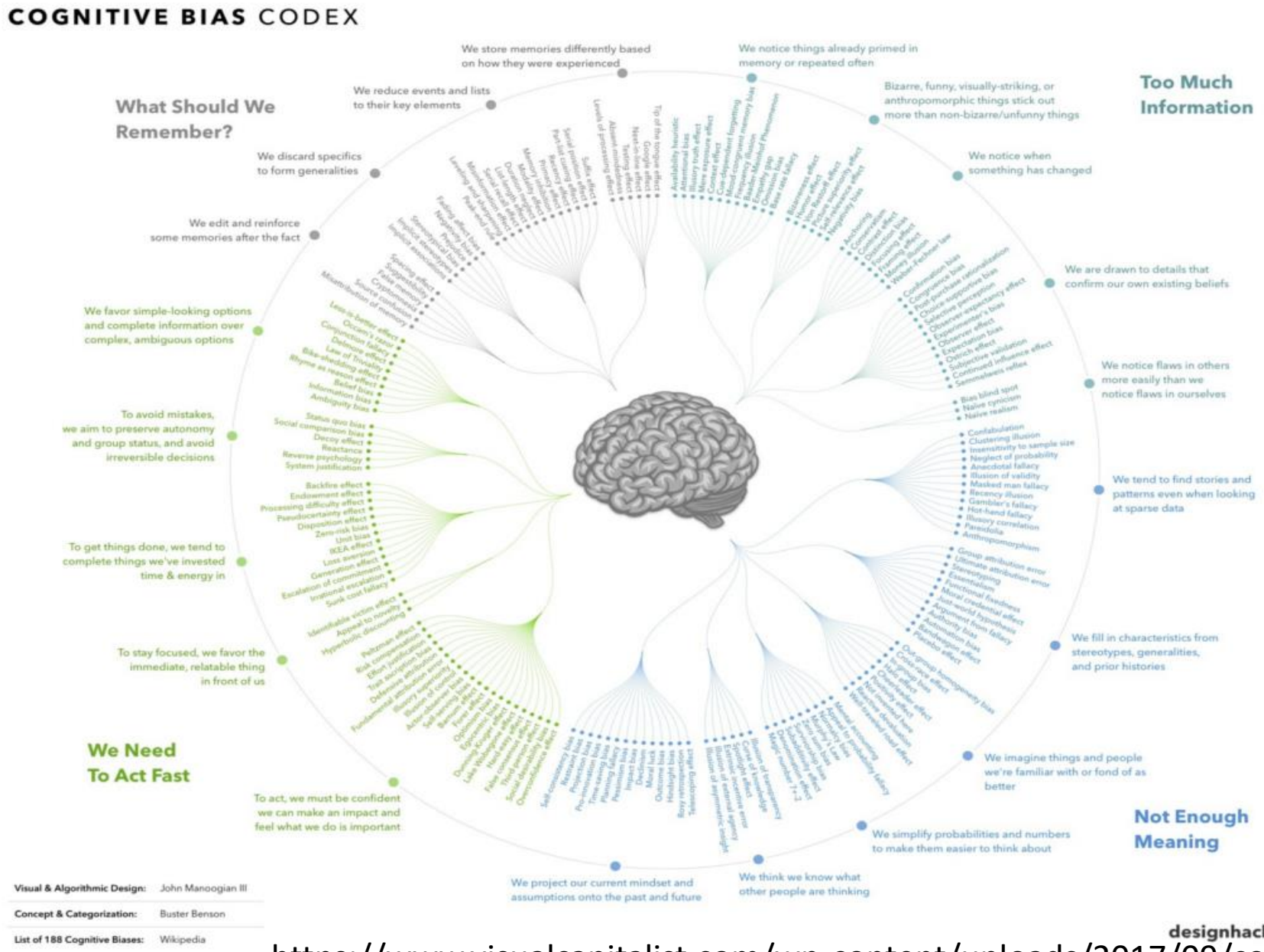
All input is welcome to stefan.astrom@ivl.se

Further work

- Work with the Swedish EPA report is ongoing.
- Plans are to establish unit costs relatable to the 10 BCMs
- The ’technical cost analogy approach’ concept will be tested against the 10 measures and availability of corresponding values

All input (including protests) is welcome to stefan.astrom@ivl.se

Some final food for further thoughts



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