

Comparing Different Approaches to Addressing Environmental Behavioural Change: A Review of Ten Case Studies from Denmark

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Abstract: *Environmental behaviour change is one of the keys to address global warming. This paper presents ten Danish case studies which attempt to promote environmentally friendly behaviour. They were implemented in four different municipalities and studied within the Citizen Driven Environmental Action (CIDEA) research project. The paper discusses how these cases target individuals or groups, play on monetary or environmental incentives, balance private and collective environmental costs and benefits, adopt a top-down or bottom-up approach, and address daily or one-time behaviour. Given the complexity of environmental behaviour, it is argued that a larger combination of the different options can help promoting behaviour change, and that projects that rely on a larger combination of options are usually locally-anchored projects driven by a few enthusiasts.*

Key words: *CO₂ emissions, behaviour change, house insulation, Denmark*

1. Introduction

Global warming is one of the greatest challenges faced by humanity today. While it requires coordinated action at the international and national level, most scholars and politicians agree that global warming must also be addressed through widespread individual behaviour change. This article reviews different approaches taken by governmental, municipal or local projects to influence environmental behaviour in Denmark and presents them along the lines of five sets of options. Firstly, environmentally friendly behaviour can be approached individually or collectively. Secondly, environmentally friendly behaviour can be promoted by using monetary or environmental rewards. In other words, the motivation can be egoistic/anthropocentric or altruistic/

ecocentric. Thirdly, it is important to find the right balance between the private or collective aspects of environmental costs and benefits. Fourthly, changes in behaviour can be promoted through top-down steering or bottom-up local initiatives. Finally, one must distinguish between daily routines that require making frequent and repeated decisions and 'one-time' behaviours based on decisions that are taken only a few times in a lifetime. These five sets of options have already been discussed in the large literature on environmental behaviour change (including psycho-social, environmental, socio-anthropological and economic studies). The options have been chosen and are discussed here both because they constitute useful tools to better understand how the 10 case studies operate, and because they constitute

options that have wide ranging consequences for the way environmentally friendly behaviour can be promoted. Inspired by several scholars (Darnton *et al.* 2006: 5; Stern *et al.* 1995; Stern 1999; Jackson 2005; Lucas *et al.* 2008: 465; Young 2008: 37; Kennedy 2010: 1153), I will argue that triggering the broadest and deepest behavioural change possible requires going beyond single strategies and adopting instead a holistic approach which combines multiple types of instruments, at a variety of levels, and involving a wide range of partners.

The focus of this paper is less theoretical and more descriptive, looking at some of the different ways in which environmental behaviour is being dealt with in Denmark; in addition, it will discuss the limits of each approach. The theoretical discussion will provide the background necessary for understanding the contribution of the different cases, and theoretical references will be provided mainly as a guide for readers wishing to go beyond the present discussion. The cases presented in this paper derive predominantly from projects found in the municipalities which participate in the CIDEA (Citizen Driven Environmental Action) research project (see the introduction to this special number), complemented by both a nation-wide environmental campaign that preceded the COP15 conference, and the first CO₂-neutral housing cooperative. The presentation of the CIDEA cases is based on participant observation in meetings, both at the municipal level and at the project level, and on interviews with key informants by CIDEA researchers, unless references to reports are made. The cases chosen are not representative of all environmentally related activities, but constitute a broad spectrum of initiatives, which illustrate some of the different ways in which environmental behaviour can be approached. They are particularly interesting in that they come from municipalities or organisations considered to be at the forefront of environmental action in Denmark, a country that is renowned for its environmental commitment and policies.

2. Targeting Individuals and Groups

A first distinction that can be made regarding environmental change is between individual and collective approaches to behaviour change. Policies that target individuals usually focus either on changing knowledge and attitudes (Azjen 1991; Godin and Kok 1995; Armitage and Conner 2001) or on mak-

ing wanted behaviour cheaper/easier and unwanted behaviour more expensive/difficult (Marteau *et al.* 2009; Kollmuss and Agyeman 2002). Such an individual approach is exemplified in Case 1.

Case 1: Esco-light in Middelfart.

Danish energy suppliers are required by law to make their clients save energy. These companies are therefore willing to 'buy' any energy savings that individuals generate when they insulate or reduce energy consumption in their house. In practice, however, most people do not know about this possibility, and it is complicated to organize the selling of energy savings. The Esco-light project aims to train builders (and others working in manual trades) in energy counselling and in calculating the amount of kWh saved in a renovation project. Builders are then able to deliver to their client energy reports which describe the potential energy savings that can be made, how much they would cost, and how long the pay-back period would be. If client asks the builder to realise the work, the builder can help the clients to sell these savings to energy suppliers. This project thus provides an additional 'subsidy' to individuals who renovate their house, triggering thereby more renovation, and creating more jobs in the building industry.

Esco-light encourages house insulation and investments in green energies with additional knowledge on energy savings and additional economic subsidies to the insulation of homes. To date, the project had realised a total saving of more than 500,000 kWh. However, many people are discouraged by the complexity, scale, cost and uncertainty associated with environmentally friendly housing renovation. Moreover, frequent references to a 'pay-back period' (see also Case 3) can become counterproductive when this period is longer than the number of years someone imagines living in a house or apartment (because of old age, or because of plans to move elsewhere). Finally, an important question is whether people who participate in projects like Esco-light are already convinced that housing insulation is a good thing and would carry it out anyway, with or without Esco-light energy consultations and subsidies, and how many 'new investments' (that would not have happened outside of the project) may have been triggered is unknown.

A collective approach tends to analyse individual behaviour as closely dependent on social interactions and political regulations, and tries to influence individual behaviour through creating new social dynamics or even changing society. Such an approach can help overcome some of the obstacles met by the individual approach, encourage people that did not originally consider house insulation to engage in it, and speed up the investments in isolation or in greener or more efficient technologies, as described in Case 2.

Case 2: Føns village.

In 2009, Middelfart municipality offered free energy consultation to any group of a minimum 10 citizens living in the same neighbourhood. The local committee of Føns village (comprising about 160 households) seized this opportunity, wrote a note in the local newspaper and convinced 13 households to create a group. A team formed by energy advisors, builders and the municipality visited all households in the group, provided an energy report with a list of things to do, and a quotation on how much it would cost if this was done by the builders who visited the house. In addition, participating households were offered a 15% reduction on the cost if the work was done at the same time as the other group members. Most households decided to realise part of what was offered and to benefit from the 15% reduction offered; others preferred to do the work themselves, use other builders, or to drop the suggestions. As the news of this process spread in the village, another 10 households formed a new group and benefitted from the same conditions. In 2011, a local committee approached Middelfart municipality and asked for help to establish themselves as a sustainable village. To start with, the municipality helped them access an electric car that is now stationed in the village and has been tried by different families, before it will become part of a 'shared car' programme. The local committee organised a meeting for all villagers and is now in the process of discussing and writing up the goals of its 'sustainable village' project.

Group dynamics create a ripple effect that helps people take decisions and engage in a collective process at the same time. This can hasten decision-making and house insulation. Being part of a group may also simplify the administrative burden (at least for the weakest members of the group for whom it might constitute a greater obstacle than for others) and group solidarity confers some form of collective protection against problems or malpractice. Once a group dynamic is created, it can continue after the completion of the initial project and lead to new activities. Targeting groups can therefore be fruitfully combined with targeting individuals, as both approaches can deliver different and complementary results.

3. Monetary and Environmental Incentives

Behaviour change can be promoted with different kinds of incentives. The most frequent approach is to use economic incentives, for example by making people pay the full environmental cost of their actions and consumption patterns, by subsidising environmentally friendly behaviour, or by informing people about how much money they can save if they invest in energy saving or change behaviour (Millard 2012; Perman *et al.* 2003). This approach, based on 'rational choice theory' (Coleman & Fararo 1992; Elster 1986; Scott 2000), relies on the idea that individuals always act to maximize their own welfare and benefit. When facing two options, an individual will choose what is in his or her best interest. Promoting a specific behaviour is therefore a question of lowering the cost or raising the benefit of this behaviour. For this to work, however, individuals must have a comprehensive knowledge of the consequences of each option and it is believed (or hoped) that if people are well informed about the economic and environmental consequences of their behaviour, and about possible alternatives, they will then adopt the practices that are in their best interest. This is the approach taken in Cases 1 and 2 described above, but also by Case 3 on husetsweb.dk (see also Scheele, this special issue).

Case 3: Husetsweb.

www.husetsweb.dk is a homepage financed by a network of Danish municipalities and energy companies. Individuals visiting the homepage are asked a series of questions regarding their house (year of construction, size, type of windows, walls, roof, etc.), family composition, sources of heating, and energy consumption. The homepage then runs a program that calculates how much money and CO₂ could be saved annually. The report distinguishes between 'rentable investments' that can be paid back within 15 years, and 'long-term investments' that can be paid back after more than 15 years and suggests that 'long-term investments' could be made in combination with other renovation projects. Examples of energy and financing plans are provided and people can then choose to give their e-mail and be contacted by an energy consultant, in case many rentable investments can be made. The consultation is free, but the consultant becomes the beneficiary of the energy savings that are realized (by contrast: in Case 1 on Esco-light, consultation is free and energy savings are sold by clients).

Husetsweb, like many other environmental projects, focuses on how much money can be saved when reducing CO₂ emissions (see also Case 1, 2, 8 and 9). The type of investment that is encouraged most is not necessarily the one that is best for the environment, but the one that has the shortest payback period. Solutions that have a longer payback period are not actively promoted (such as 'long-term investments' in husetsweb), and those that cost more than any potential benefit (those that can never be paid back) are seldom mentioned at all, as if addressing climate change was not worth any economic sacrifice. And yet, altruistic behaviour (and economic sacrifice) can be found whenever a person becomes aware of other people's suffering and feels responsible for alleviate this suffering (Schwartz 1977). Some aeroplane passengers voluntarily buy 'CO₂ compensations' to offset their carbon dioxide emissions. People sort their garbage to maximize recycling, even though this is more complicated and more time consuming than throwing everything in the same bag. AB-søpassagen provides an exemplary case of people willing to pay and sacrifice some of their comfort for a better environment.

Case 4: AB-Søpassagen.

AB-Søpassagen prides itself on being the first CO₂-neutral housing cooperative in Denmark. To achieve this, the cooperative adopted an ambitious plan aiming to come as close as possible to energy self-sufficiency by producing or saving as much energy and water as possible. Solar panels have been installed on the roof, rainwater is now collected in tanks to be reused in the collective laundromat, and a systematic effort has been made to pick all the 'low hanging fruit', such as installing low energy light bulbs and dual flush toilets. An ecotax on the cost of the communal dryers was introduced to shift behaviour towards the use of roof-covered clothing lines that were built to provide an alternative to the dryer. As the sum of the measures taken was not sufficient to achieve carbon neutrality, the cooperative decided to purchase offsets to compensate for its remaining emissions. To finance the project, the monthly rent for residents was increased by 11%. These decisions were adopted at an ordinary general assembly, thereby imposing the project (and associated costs) on all residents of the coop (including the 30% of residents who originally voted against the project). The cooperative has benefitted from its reputation of being a sustainable cooperative, since there is a heightened interest in joining the coop and the willingness of residents to participate in collective activities and in the executive board has increased. The cooperative is currently only CO₂ neutral for the collective spaces (such as the collective laundry, stairs, corridors, toilets, attic and basement), but the ambition is to include the consumption of private apartments in the near future. Measures have already been taken to foster sustainable behaviour among residents. For example, each apartment was offered a visit by a 'climate coach' from the municipality of Copenhagen, and an energy saving competition was organized, with a first prize of 3000 DKK for the household who reduced its energy consumption most. Participation in these activities was on a voluntary basis, and each of the 35 families that participated (out of 89) saved an average of close to 200 kg CO₂ per year, or 1000 DKK (Finken *et al.* 2010).

Although AB-søpassagen (at the collective level) is also interested in making sound investments that have a relatively short payback period, it also buys CO₂ quotas, which constitute a net economic loss. The incentive is therefore not primarily economic, but rather provided by the moral satisfaction to do what is right for the environment.

Thus, people can agree to change their behaviour egoistically for their own private benefit, or altruistically for the sake of other peoples or for the sake of the environment. Some authors use the concepts of anthropocentric and ecocentric approaches to distinguish between those who care for the environment as a means to improve human welfare, and those who care for the environment for its own sake, regardless of the cost (Stern *et al.* 1995; Kortenkamp and Moore 2001). An anthropocentric ethic is considered to be weaker since the motivation for behavioural change can disappear as soon as it threatens human welfare (Bell 1987; Eder 1996: 57). Ecocentric ethic, on the contrary, is supposed to lead to stronger and more permanent commitment as people, in this case, change behaviour for the environment itself. Different actors react differently to these incentives, and saving money and sacrificing for the environment or for collective benefit can therefore be fruitfully combined, as shown in Case 4.

4. Balancing Private and Collective Costs and Benefits

The distribution of environmental costs and benefits is a crucial question in environmental management (Hardin 1968). The air we breathe, the water we drink, the fish in the open oceans, or even the average temperature of our planet, constitutes 'commons' (resources that are held in common) that can be threatened when human behaviour is unregulated. On the one hand, the perception of risk relating to the commons is not always easily visible, which is a problem since behaviour change depends closely on the perception of threats and on the confidence that behaviour change can provide an adequate response (Rosenstock 1974; Bandura 1986; Ajzen 1991; Champion and Skinner 2008). On the other hand, since commons depend on the behaviour of large numbers of people, no one feels responsible for it in particular, and few people are willing to change their behaviour unless others follow suit.

Whenever a resource is used privately but its cost is born collectively, individuals have no incentive to manage the common resource responsibly, unless they are compelled to do so by collective rules. For example, when a group shares collectively the cost of private water consumption (as was the case in Skovparken before water meters were installed, see Case 5), an individual consuming one litre of water benefits fully from the water but pays only a fraction of its cost. This leads to waste.

Case 5: AAB Skovparken apartment block in Kolding.

AAB Skovparken is a complex of 551 apartments built in 1973. Until 2010, water consumption was measured collectively for the whole complex and then divided equally among the different inhabitants, in proportion to the size of their apartment. In 2010, water meters were installed in each apartment and water had to be paid according to individual consumption, which resulted in an immediate drop of about 20% of water consumption. Further advice and help to install water savers on taps and showers were given individually to all people asking for it. Today, water consumption is 34% lower than it was before the installation of water meters. On average, each person consumes 49 litres less per day than before, and each household saves about 2300 Danish kroner per year.

Likewise, each time a private person or a private company is allowed to capture large amount of common resources, or to pollute it, it engenders problems for the group that has to bear the cost. One solution is then to privatize the cost and use the so-called 'polluter-pays' principle. Another solution is to develop communally agreed upon rules that manage the commons in a sustainable way (Ostrom 1990).

One also finds the reverse problem: each time a private person is asked to sacrifice more than others for the common good. Few people are willing to have a big wind turbine or a recycling plant next to their home – a reluctance also known as the 'NIMBY syndrome' (not in my backyard). A solution can be to collectivize the cost by financially compensating those few individuals who are compelled to sacrifice their private welfare for the common good. When

the opposition to wind turbines is broader than the few individuals who live close-by (when the cost, in term of landscape for example, is more collective), a possible solution can be to maximise the collective benefit, for example by setting aside a percentage of the benefit for collective purposes, or making it possible for individuals to buy a share in a wind turbine.

One of the keys to good regulation is thus to internalize all costs and to have private cost each time there is private benefit, and collective costs each time there is collective benefit. Another key is to make sure that that costs and benefits are equally distributed, in a non-discriminatory manner. What is good for the environment is not necessarily socially just (Wenz 1988). Applying the polluter-payer principle, raising taxes on fuel, plane tickets or CO₂ release are certainly environmentally efficient measures, but they are problematic if they prevent the poorest from travelling by plane or even by car, and engender thereby resistance.

5. Top-Down and Bottom-Up Approaches

Projects aiming at changing environmental behaviour can be steered from above or driven by local initiatives (Sabatier 1986). While top-down projects tend to rely either on economic incentives or on penalty for non-compliance, bottom-up initiatives rely more heavily on encouraging a desire 'to do good' and a voluntary compliance to regulations that are trusted and seen as legitimate (May 2004, Kennedy 2010, see also Case 4). Since the same person might be careful to save energy at home (where the cost is private) and behave carelessly at work (where the cost is collective), top-steering is often found at work (as exemplified in Case 6), both because the hierarchical relations existing in professional settings make it easier and more 'natural', and because of the fact that the working environment is often considered as a common resource.

In the TEA project, the goals are set by the council bureaucracy. But as these goals cannot be reached without behavioural change, employees are solicited to participate. Although this is done on a voluntary basis, employees also comply because of the risk that non-compliance could have serious consequences for their employment. Top-down approaches can be useful to set things in motion and to drive collective

Case 6: Technical and Environmental Administration (TEA), Copenhagen Municipality

The TEA of Copenhagen Municipality employs around 2200 persons and has launched a project aimed at reducing CO₂ emissions of its administration by 20% before 2015. Copenhagen Municipality requires each of the TEA divisions to reach these goals and has created local environmental groups in every division, headed by an environmental coordinator who is responsible for making sure that the goals are reached. All employees are encouraged to contribute ideas on how to save energy or to report any material defect, and some money is available to invest in more environmentally sound equipment or technology. But every employee is also asked to change their behaviour and make sure to minimise waste, pollution or energy consumption in all communally related activities. In a time of economic crisis and mass lay-offs, pleasing one's boss by behaving more environmentally friendly can be instrumental in keeping one's job.

action in a certain direction (Uzzell *et al.* 2006) but they can also be expensive to enforce, unpopular, or even inefficient. Many projects therefore try to

Case 7: Sønder Bjert village.

Sønder Bjert approached the municipal authorities of Kolding in 2009, asking for help in bringing district heating to their village. The communal employees first ensured that there was no legal obstacle (Sønder Bjert is served by a network of gas) and facilitated contacts with the district heating company. The company is willing to bring district heating to Sønder Bjert if 450 households (about half of the village) commit to shift to this source of energy and to buy the new heating system at home. A local committee was created to collect the required signatures. The municipality, on its side, worked on convincing local public institutions to commit to the change. The municipality had the right and the power to impose a shift to district heating (and could have considered this option if there was just a few signatures missing to reach 450), but it preferred not use this right and to have the project implemented based on local initiatives. Today, the local committee has collected the 450 signatures and the project is following its course.

balance top steering and local initiative, as exemplified by Case 7.

Projects designed from above often need local support to gain legitimacy, while local initiatives often need to be backed up by authorities to be successful. In practice, many projects present a mixture of top-down and bottom-up approaches, and it is important to reach a certain balance between them.

6. Daily Behaviour and 'One-Time' Decisions

Some environmental behaviour involves making large-scale changes, such as investing large amounts of money to insulate a house, as described in Cases 1 and 2. Such decisions might be taken only once in a decade or even once in a lifetime. Their sheer scale requires careful consideration before taking a decision, and they can only be made if money is available. Insulating houses or investing in greener or more efficient sources of energy takes time, is administratively heavy, never goes as planned, costs often more than originally budgeted, and requires that those who engage in it have a reserve of energy, time and patience to follow the process and manage the problems that ensue.

On the other hand, much environmentally friendly behaviour requires daily and small-scale decision making such as choosing transport to go to work, food to eat, recycling or disposing of waste, switching off lights when leaving a room, etc. One way to approach daily behavioural change is to consider individuals as rational actors who will make the right decisions if they have the right information (see also Cases 1 and 3). But knowledge might not be sufficient to change behaviour, especially when habits and routines undermine rational deliberations and intentions to change, or when the complexity of decision-making and change seems insurmountable. If someone does not perceive behavioural change as achievable, s/he is unlikely to even try (Ajzen 1991; Godin and Kok 1995; Armitage and Conner 2001). Setting small, incremental and achievable goals, using formalized behavioural contracting to achieve goals, together with self-monitoring, can help overcome this problem (Barr *et al.* 2006; Glanz and Bishop 2010). Commitment to an initially small request can lead to larger requests because individuals want to avoid

'cognitive dissonance' (Festinger 1957) and because they want to be perceived as behaving consistently (McKenzie-Mohr and Smith 1999). The campaign described below (Case 8) is an example of such an approach.

Case 8: 'One-tonne less' campaign.

In 2007, shortly before the COP15 climate conference in Copenhagen, the Danish Energy Agency launched a nation-wide campaign to encourage Danish citizens to reduce their CO₂ emissions by one tonne. People were given a leaflet which listed 17 simple things that could be done: unplugging mobile phones after they are recharged; recycling 5 cans of drink per week; eating fruits and vegetables produced in Denmark; washing clothes at 40 degrees instead of 60; taking showers that are 5 minutes shorter than usual; installing a water saver in the shower; avoiding electronic equipment on standby; lowering house temperature by one degree; cycling to work or school; drying clothes on a rope instead of using a dryer; reducing aeroplane travel in Europe and spending holidays in Denmark instead; replacing an old fridge with a new A++ fridge; maximising the number of km per litre of gas when driving; taking public transport; and insulate the roof of the house. Each category showed how many kg of CO₂ and how much money would be saved per year. People could then choose to tick a box labelled 'I do it already' or 'I promise to do it'. The sum of the total CO₂ and money saved was written at the bottom of the 'climate pledge'. By the end of the campaign, more than 92.000 pledges were made, representing a theoretical saving of more than 160.000 tonnes CO₂ (Danish Energy Agency, n.d.).

Setting incremental goals can help people to see an ambitious goal as more realistic and to engage on a new behaviour path. But it might also be necessary to change a social or physical environment that is not conducive to change and to remove barriers in order to promote alternative behaviour (Sallis and Owen 1997; Kollmuss and Agyeman 2002; Pollard 2005; Barr *et al.* 2006; Kennedy 2010). For example, restricting car use around schools can make children cycling to schools safer and promote this practice, as described in Case 9.

Case 9: Car-free schools in Køge.

The Green-House, a semi-independent institution, developed a pilot project, in collaboration with Køge municipality, aimed at reducing car transportation relating to three schools, both to encourage children to have more exercise and to reduce CO₂ emissions. During one week, the streets surrounding the schools were closed to car traffic, to improve traffic safety for children cycling and to prevent cars dropping off and picking up school children. The school registered the type of transport used by its pupils before, during and after the project, and included these activities (as well as the calculation of CO₂ emissions saved) in their teaching. During the project, the number of 'active children' was raised in all classes, sometimes from 30-50% to 75-90%, but dropped again to pre-project levels after one week (Niras 2009).

One often finds a gradation between a desire to change and actual behaviour change. Some people simply recognise the need to change, others think about it, yet others plan for it or adopt new habits, and the most dedicated maintain the new practice to avoid relapse (Prochaska *et al.* 1998; 2008; Slater 1999; Barr *et al.* 2006). While a top-down approach can help to change the physical surroundings of a school and force people to adopt new practices, this might not be enough to create new habits. Old practices might return if the physical barriers are removed, unless interventions address the different stages of change (awareness raising for those who do not recognise a need to change, monitoring for those who have already changed, etc.).

Habits and routines are characterized by low levels of awareness, intentionality, and behaviour control but are beneficial in that they save time and transaction cost whenever a decision has to be taken. To encourage behaviour change while maintaining low transaction costs, cognitive cues (such as an environmental logo for organic food or energy labels for electronic products) can be developed to guide people to sounder behaviour. Role models can be identified and their behaviour taken as examples through social networks (Uzzell *et al.* 2006), as exemplified in Case 10.

Case 10: Neighbourhood mothers and environmental ambassadors.

Bydelsmødre (neighbourhood mothers) are projects found at the municipal level that identify groups of 15-20 key women from migrant or refugee communities who are unemployed. These women then receive basic courses once per week over 12 weeks on topics such as child education, home hygiene, legal rights, citizenship and, in Kolding municipality, environmental behaviour (with focus on recycling and energy saving). At the end of the course, the 'neighbourhood mothers' are supposed to spread their new knowledge and expertise from door to door to the women in their building neighbourhood, becoming thereby some kind of voluntary social and environmental ambassadors. In AAB skovparken (see Case 3), 7 women received additional environmental training and can be called on by neighbours to give advice. As bydelsmødre access jobs or become active in local committees or in local politics, they also become role models for other women, but the impact that this aspect has on behaviour change is more diffuse and difficult to assess.

Energy consumption at home accounts for 22% of total CO₂ emissions in Denmark (Energistyrelsen 2010) and reducing this type of emission is necessary to reach national and European goals on mitigating global warming. Daily behavioural change, as discussed in the last three cases, is an important component of environmental strategies, but it must be complemented by one-time decisions (on the environmentally-friendly renovation of buildings) if environmental targets are to be reached.

7. Conclusion

The 10 cases and 5 options discussed above give an idea of the variety with which environmental behaviour change is approached today in Denmark. As the summary given in table 1 indicates, the different options must not be seen as exclusive of one another, since many projects mix different elements or try to find a balance between them. On the contrary, given the challenge of global warming and the fact that it can only be met by large-scale, wide-ranging and permanent behaviour change, it makes sense to combine the different possibilities.

Table 1: Summary of case studies and options

	Target	Balance between cost and benefit	Top-down or bottom-up initiative	Type of incentives	Behaviour frequency
Esco-light	Individual	Private costs and private benefits	Municipal project, individuals participate voluntarily	Money	One off
Føns village	Individual + Group	Private costs and private benefits + collective costs and collective benefits	Local initiative, with communal backing	Money + Environment + Village identity	One off + Daily
Water metres in skovparken	Individual	Privatizing collective costs of private benefits	Top-down	Money	Daily
Sønder Bjert (district heating)	Individual + Group	Private costs and private benefits	Local initiative with communal backing	Money	One off
TEA Copenhagen	Individual + Group	Internalizing costs, both at individual and group level	Top-down	Administrative incentives	One off + Daily
Husetsweb	Individual	Private costs and private benefits	The homepage provides a framework, individuals access it voluntarily	Money	One off
AB søpassagen	Group + Individual	Private costs and collective benefits + private benefits	Local initiative + majority rule	Environment (at collective level) + Money	One off + Daily
One-tonne less	Individual	Private costs and private benefits	State campaign, individual participate voluntarily	Environment + Money	Daily
Car-free schools	Group + Individual	Private cost and collective benefit	Top-down, with local back up from school staff	Health + Safety + Environment	Daily
Neighbourhood mothers	Group + Individual	Volunteers: Private costs and collective benefits. Target: private benefits and private costs	Municipal project trains local volunteers. Individuals can then ask for a visit and advice of a volunteer	Volunteers: environment + group identity. Target: money	Daily

Yet, most projects have a very fragmented and partial approach. Very few projects combine the full range of possibilities to motivate behaviour change. Among our 10 cases, those who come closest to employing all options are Føns village and AB-søpassagen, i.e. projects that are anchored in a well-defined local community and in which the initiative is taken by a group of enlightened enthusiasts whose motivation is to do something collectively to mitigate climate change. The will to acknowledge a collective responsibility for global warming and to make a difference in the longer run then leads to integrating other aspects as well such as individual behaviour and economic incentives to ensure greater participation, to ask for the support of municipal authorities, and to address both one-off and daily behaviour change.

On the contrary, projects that use a limited range of options are often top-down driven, with little local roots (esco-light, water meter in skovparken, TEA, one-ton less campaign, neighbourhood mothers, husetsweb). In between bottom-up projects with larger range of options and top-down projects with narrower range of options, one finds projects that have a top-down steering but have wider goals, such as the car-free school project, or bottom-up project with narrower goals, such as the Sønder Bjert project on district heating. Both projects have a short-time frame, which distinguished them from bottom-up projects with wider goals that tend to have an engagement on the longer-run.

Top-down projects with narrow goals can have an important impact on behaviour, and can lead to a greater awareness. They can also constitute first steps that lead to new types of projects later on. For ex-

ample, both Esco-light and the Føns village projects were inspired by a former project called 'minklima-plan.nu' (another top-down project proposing free energy check-ups for groups of at least 10 families). They thus have an important role to play in addressing global warming. But the range of actions of such projects is limited and they cannot, alone, motivate large-scale behavioural change. They must therefore be complemented with more ambitious projects that address a large-range of options to motivate behaviour change, have a longer time-frame and are driven locally by enthusiasts. Bottom-up projects that rely on a wider range of options are more likely to convince sceptics to follow the lead and to trigger behaviour change on a wider scale. Citizen driven environmental action must therefore be encouraged whenever possible.

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