Centres promoting sustainable building and living: characteristics, concepts and lessons learned

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Abstract

The project described herein has mapped and described different "climate-centres", i.e. centres (for) promoting sustainable building and living in Europe and includes a description of the characteristics, concepts and lessons that have been learned. The included examples vary in form of organization, localization (urban or rural) as well as in size and activities involved. We have included both centres that are localized in, or connected to, a residential area with the explicit ambition of promoting low-carbon or environmentally sustainable lifestyles and/or technologies as well as "independent" ones. The form of organization, public profile and interaction with the public has been of particular interest as has the centres' cooperation with or effect on local and/or so called "green businesses" and activities.

We have defined a climate centre as "an organization offering activities or information to promote sustainable lifestyles and/or technologies to the public and that are found at a particular location/building". As this is a broad definition, we do not claim to have included all possible relevant examples, but to present climate centres that are, for different reasons, of relevance in the Norwegian context. This means that the centres included in the report are biased to the Nordic countries.

The aim of the project is to *map relevant organisation based strategies to promote sustainable building and living* with the intent of providing inspiration and relevant information for any organisation or individual/individuals considering starting up similar initiatives.

The stated ambitions of all centres we have reviewed generally involve some form of ideological orientation. However, it may be more difficult to maintain these normative goals of promoting sustainable building and/or lifestyles if the long-term economic sustainability is not in place. The combination of core funding and project-based income is thus a frequent strategy that seems to work for a majority of the centres. Forming alliances with the local community and/or public organisations or policy makers is clearly an advantage, and it seems to be a success factor to focus on broader perspectives rather than promoting a particular technology or concept. Access to full-scale demonstration sites seems to be an advantage in relation to marketing purposes as is involving local residents a success criteria emphasised by most of the centres. Therefore, developing ways for the local community to invest in the centre and/or its projects seem to be a promising strategy. In general, it would appear that a strategy of maximising whichever resources are available is a winning concept. Success comes in many shapes and it seems that the ability to utilise available resources, be they financial, geographical and/or social is the most important lesson to convey to centres that want to promote sustainable building and living.

Introduction

As it has been noted in recent debates on climate change, it is obvious that we cannot maintain the current lifestyle in wealthier countries such as Norway, and, at the same time, meet internationally-set goals to meet the threat of climate changes. Also, it has been shown – and is increasingly being acknowledged all over the world – that we cannot rely on technology-focused solutions only to address climate change causes. In spite of this, policies and research often focus on technology and buildings as solutions for the problem of over-consumption. There are

many reasons for this, of which one of the most pertinent may be that user behaviour is both difficult to control, and to predict. These technology-focused attempts to solve the problem do not take place in a societal vacuum, but are planned and developed within a system in which consumption beyond the "necessary" is regarded not as waste, but rather as a central point within economic reproduction (Slater 1999).

In recent times however, a growing number of thought leaders and researchers (see for instance, Jackson, 2009) have started to question the fact that our reigning economical system has built-in over-consumption as part of a societal norm that is seen as fundamental to sustain a prosperous society. Many ambitious projects addressing the challenge of creating the society and settlements necessary to meet the threat of climate changes by combining more resource preserving technologies with that of more sustainable everyday practices – i.e. lifestyles – have been carried out. Few of these question the economic system as such, but nevertheless may be part of a movement that can smooth the transition into a different system.

One such project is the planned climate-neutral settlement of Brøset in Trondheim, Norway. The Brøset Project (BP) was followed by a research group addressing the challenges of both building and planning in a different manner and having people adjusting to a different set of rules, such as living without a private car and in, for Norway, what is a more dense residential area. Other similar projects have shown that such new, sustainable residential areas often do not live up to their predetermined goals, which in many cases is related to the users' carbon-intense lifestyles. In research regarding the Brøset Project by contrast, user participation and how to support the future residents in adhering to the new "set of rules" was thoroughly investigated. (Löfström 2014)

One project finding was that there is a need for supporting both local residents and external actors if the (rather) ambitious set of goals of a carbon-neutral settlement will be met. A "green engine" that can help in choosing the right technologies, building types, materials, heating systems (or absence of such) etc. and – last but not least – helping residents to adjust to a new lifestyle would be needed. As Brøset is only one of many similar noteworthy projects that have shown how difficult it may be to go from theory into practice in building and living low-carbon emission lives, we have carried out a mapping of examples of such "green engines" with the intent of finding out more about the characteristics, common denominators, concepts and lessons that can be learned from these examples. Hopefully, the results of this study are useful for anyone interested in promoting sustainable building and living as well as meeting international set goals of a transition to low-carbon societies.

A mapping and description of a selection of centres in Europe is provided together herein with descriptions of the characteristics, concepts and lessons learned. The included examples vary in form of organisation, localisation (urban or rural) as well as in size and activities involved. We have targeted both centres that are localised in or connected to a residential area and independent centres that have other audiences as a focus. Climate centre is defined as "an organisation offering activities or information to promote sustainable lifestyles and/or technologies to the public that are founded at a particular location/building". As this is a broad definition, we do not claim to have included all possible relevant examples, but to present those that are, for different reasons, of relevance within a Norwegian (Brøset) context. A few centres will be mentioned more briefly with the intent of accentuating particular aspects or characteristics unique to those centres.

METHOD AND RESEARCH QUESTIONS

In the mapping process, different centres have been used as case studies, which is a methodology that aims to explain a complex reality. It thereby differs from methods that focus on only a few variables (such as, for instance, experiments and questionnaires).Each case has to be viewed in its context and unique characteristics (Johansson 2003), and this contextuality should be included in the interpretation and analysis of the data.

The data collected was obtained by means of qualitative methods, and the researchers have performed in-depth interviews in combination with observations. The approach is partly built on action research which means that the research aims to explain phenomenon in their actual context, , but also to explain coherence in inter-human relations, of which the research may be part (Chandler and Torbert 2003). Action research is considered a suitable method for improving the connection between theory and practice (Gustavsen 2003). The results can be generalized analytically or theoretically; i.e. the findings from one study may be used as a model for what may be expected in a similar context (Kvale 1996). This type of generalization is based on analyses of similarities and differences of different situations or cases. In the analysis, topics mentioned in the discussions were, for heuristic reasons, grouped into categories. The interviews have been recorded by means of audio equipment and have been transcribed for use as quotations. The material was analysed using phenomenological methods (Smith 2004), focusing on the informants own understanding of the "problem" as well as taking into account the context of the interviews. The unit of analysis accounts for social, cultural, and/or material practices. Actual quotes and other information from the different cases are used to exemplify, which means the reader is invited to be part of interpreting the data, which theoretically strengthens the conclusions drawn (Yin, 2003).

The primary research questions are twofold: a) what (if any) different categories of climate centres can be identified from the case studies?, and b) what (if any) particular characteristics do these centres typically display? The second intent is to describe what (if any) may be learnt from the climate centres in creating a climate centre to support the planned Brøset Project (or Trondheim regionally) and similar projects?

Results – three climate centre categories

The characteristics and concepts of the mapped centres demonstrate considerable variation. The centres differ in size and physical location as well as in organisational form, funding sources and visions. In addition, the data collected for the project is extensive in size and involves many different aspects of the centres organisation, activities and characteristics. To enable analysing the material and answer the research questions, all visited centres have been classified as belonging to one of three types, namely,

- Technology showrooms

- Full scale demonstration sites
- Research and policy centres

Each centre may well display characteristics from more than one category, but it has still been possible to place all centres as mainly belonging to one of the three.

TECHNOLOGY SHOWROOMS

Five cases that fall into this category. They could be compared with an old-fashioned market place or exhibition event with a particular theme, such as the "farmers market" where each farmer has a stand offering his or her particular products to the public or sub-contractors. However, these *technology showrooms* are more or less permanent and will have *an organisation running them*. In addition, these centres may typically offer a professional network – sometimes including courses or education within particular fields – in addition to being open to the public. Usually these centres are dependent on steady business-based incomes and many are typically based on membership fees. They may also have supplementary direct public funding or benefit from grants for the customers when investing in new efficient technologies etc. The incomes may be generated through membership fees in combination with consulting, guidance and education, in addition to each member promoting his or her own particular products.

In Bauinfozentrum BIZZZ Elztal (Freiburg) 54 small businesses are working together in this project. It is based on a private initiative by architect Andrea Wehrle, who has a ten-year contract with all members. The building itself is a permanent demonstration passive house site, including interrelated technological solutions which are shifted on a regular basis. The centre is staffed by three marketing professionals, but the visitor is not offered the opportunity to buy products on site but instead, are given a list of producers and suppliers. The BIZZZ organizes professional training programs and lectures for the partners. It is cooperating with the Chamber of Crafts, and partakes in the vocational training program of young apprentices in the region. The main challenge for the centre is to secure a steady stream of visitors to the center, but so far the members have benefited from the centre and noone has left the organisation. (Larssæther, Löfström et al. 2014)

Klimatcenter Göteborg (KG) is a joint initiative between two businesses in the building industry, Dahl and Bevego Byggplåt & Ventilation. Together with subcontractors, they have created a showroom for energy efficient products in heating, cooling and ventilation. The centre is built around the idea of offering system solutions rather than just separate technologies. The customers of the centre consists largely of semi-professionals such as building managers, as the house rental market is rather big in Sweden. The centre also offers education to building- and energy managers and purchase department employees (buying agents. Economically, the centre is part of the two organisations' general activities, i.e. as part of their marketing strategy for products and systems and the subcontractors benefit from having their products displayed at the centre.

Centrum Duurzaam Bouven (CeDuBo), in the Antwerp-region is an information and coordination centre located in a former swimming-hall. It is run as private partnership with BBRI as main partner. BBRI is a research institute that has 70,000 Belgian construction partners as members by law (mandatory membership). The CeDuBo also has over 100 partner members from the construction sector that pay an annual fee. The CeDuBo offers their members an extensive knowledge and professional network. The centre has a permanent exhibition aimed at both the public and at professionals. Thematic campaigns are regularily given in cooperation with local partners, and even though there is no government funding, and no permanent subsidy, the centre cooperates with the municipality in matching promoting specific technologies with the possibility of receiving subsidies. The activities are usually project-based, such as the running of campaigns. (Larssæther, Löfström et al. 2014) Obviously, the BBRI's involvement with its strong base in mandatory membership gives a secure source of funding and ensures continuity of the centre.

Innovative Centrum Duurzaam Bouven (ICDuBo), (Rotterdam): This is a private initiative by the real estate developer and entrepreneur Maurice van der Meer. The goal is to offer a link between supply and demand in the sustainable building market. Members pay a fee to showcase their products in a permanent exhibition which is open to the general public. The ICDuBo then selects best products in all aspects of sustainable building to showcase. It demonstrates concepts in their entirety and the members are allowed for only one year at the time, in order to give room for possible better substituting products available on the market. The members paying for a space in the exhibition hall is the core funding source, together with various externally funded campains. The centre also offers a knowledge network for its members and activities for members, such as courses and coaching. The centre actively cooperates with private, public and educational institutions. The mediating role between different parts of the sustainable building market is the core activity. The work is structured in customer communities, each of them consisting of housing associations, corporations and contractors.

The Genesis centre, Taunton: The management of Somerset College initiated this project, and it was translated into student initiatives. The college, in cooperation with industry i networks approached the regional development agency with the idea of creating a sustainable construction center. The centre is an integrated part of the Genesis project and is mainly funded by West Regional Development Agency (SWRDA) and the Learning and Skills Council (of Great Britain?). Its main activities involve education on several levels. It also displays information on materials such as straw, timber, clay and earth in addition to demonstrations of renewable energy systems from commercial suppliers in the region, who are members of the centre. In recent years, the centre has benefited from the Knowledge Exchange Project at Genesis, which is funded by the EU. Knowledge sharing is key in the centres activities for members and it assumes a mediating role in the contact between the public sector organisations and regional actors.

These technology showroom centres are all built on the concept of offering a demonstration arena, a showroom, for technologies that may be implemented in residential and non-residential buildings. However, while some centres (Bauinfozentrum BIZZZ Elztal, CeDuBo, and Genesis) offer separate spaces for smaller businesses to demonstrate their individual products, Klimatcentre and ICDuBo also have the goal of showing t these technologies as part of a full scale energy and heating, ventilation, and air conditioning

Table 1. Overview of the technology showrooms.

Name and location	**Description**	**Demonstrating products as part of systems, or separate**	**Main activities and characteristics**	**Funding and organisation** (commercial and/or public funding)
Bauinfozentrum BIZZZ Elztal (Freiburg)	Technology showroom and knowledge network for regional small businesses in the sustainable building sector.	Separate from "exhibitors" in addition to the building itself, which is a passive house demonstration.	– Offering neutral information. – Function as a regional network and innovator for small firms. – A meeting place for people.	Private initiative by architect. An association of 54 regional small and medium-sized craft businesses, architects, banks and service providers. Partners pay rent and a flat fee.
Klimatcenter (Göteborg)	Technology showroom and forum for marketing and training of and for professionals and consumers.	Separate technologies are shown as part of full systems.	– Offering contractors and consumers (professionals) information. – Highlighting system interdependence.	A joint initiative with two businesses in the building industry and their contractors. Commercial with no public funding.
CeDuBo (Antwerpen region)	Partner based non-profit organisation with technology showroom and knowledge network activities.	Separate technologies are offered, often paired with public subsidies.	*For member organisations*: – Access to knowledge network, updates, news and technical training. *To the public:* – Open exhibitions, regular campaigns and events.	100 partner members (mandatory by law) pay annual fee. No permanent public funding or subsidies, but a strong main partner that ensures continuity.
ICDuBo (Rotterdam)	Entrepreneurial organisation operating a technological showroom and a market place for diverse stakeholders seeking solutions to sustainable housing.	Selected separate technologies are shown as parts of a system as well as separately by each entrepreneur (member organisation).	– Offering a mediating link between supply and demand in the sustainable building market. – Connects all parties involved in the sustainable building market, including customers.	A private initiative of an entrepreneur. Over 250 members exhibit their products and pay membership fees (Marketplace).
The Genesis centre (Taunton)	A regional, educational resource centre at Somerset College.	Separate technologies from different member businesses are promoted.	– Mediating role between public policy initiatives (funding et cetera), regional businesses and their products and services and the general public.	Regional member companies pay fees. The College and companies exchange knowledge (EU-funded).

(HVAC) system. All five centres give priority to professional networking and in building up their respective capabilities in addition to addressing the general public. The public function of these centres is focused largely on end-users as potential customers. The centres provide smaller businesses with the chance to demonstrate their particular solutions and to reach an audience. Potentially, these technology showrooms may function as a greenhouse in which smaller eco-technology businesses can grow larger. The technology showrooms are at least partly dependent on a steady commercial income, but may well qualify for some public funding options and are not uncommonly the result of a single person or organisation's separate initiative.

The model gives smaller businesses the possibility to reach the public with their products and potentially have synergetic effects on its members. Obviously, the model is sensitive to the fluctuations on the market for more sustainable technologies, and it may therefore be an advantage to have the promotion of products as one of its many activities. As we can see from the examples, offering education, consultancy and cooperating with research and policy makers has been a common way to ensure continuity to these centres. Obviously, having access

to members of large existing networks with a steady income from membership fees is an advantage for the technology showrooms. The technical showrooms are usually located close to the member organisations and with access to a large number of potential customers.

FULL SCALE DEMONSTRATION SITES

Four of the cases fit into the full-scale demonstration site category. These are typically localized in or connected to a residential area with an explicit ambition of promoting low-carbon or environmentally sustainable lifestyles and/or technologies.

GlashusEtt is situated in Hammarby Sjöstad, Stockholm. Hammarby Sjöstad is one of the earliest eco-neighbourhood projects that were not founded by environmental enthusiasts, but was developed instead as part of a public strategy. GlashusEtt and Hammarby Sjöstad has become a symbol not only for the neighbourhood and its eco-profile, but for the City of Stockholm. This has enabled the centre to promote the conservation of resources amongst residents, and at the same time, be a demonstration site of a full concept of eco-living in an urban environment. It displays technologies that are in use in the actual neighbourhood, but also other technologies and concepts that may be of interest. The visitors and users of the centre are in general not particularly eco-oriented as it may be just ordinary tourists or people who just happen to live in this neighbourhood. The centre has two employees and even though it has been run on project money, there was no threat of closure until Stockholm Water was due to take over the building at the end of 2013. The financers of GlashusEtt were, up until recently, a split between Stockholm Water Company, Fortum Värme[1] and the City of Stockholm, but from the end of 2014, Stockholm Water (which is administratively part of the City of Stockholm), will continue running the centre. GlashusEtt has become an attraction for visitors of Stockholm in general and functions as a meeting place for people interested in the environment. The centre is used for different kinds of exhibitions related to current environmental issues. Presentations and tours for people interested in the background and function of Hammarby Sjöstad, the technologies, the history and the stakeholders are held regularly (tours involve a fee). It offers a physical and social meeting point for local associations. In addition, the centre is continually being used for public meetings and political discussions. Since its establishment, GlashusEtt has become an important and integrated part of the neighbourhoods' social life. At the same time, it functions as a marketing arena for the City of Stockholm as a whole and its main value is percieved as offering the City of Stockholm a vaulable marketing option:

> Even people visiting Stockholm who are not in the field of environment or building for sustainability will spontaneously ask to be taken to GlashusEtt. For instance, we had a group of medical doctors who were visiting the hospital, and they came to visit us. (Karlsson 2013)

Local residential initiatives are encouraged by the centre, but it does not give economic support to projects that are not part of its regular offerings. One example of activities that have been encouraged by the centre is arranging for allotment gardens. Although local growing of food is not part of Hammarby Sjöstad's official plans, a few tenant-owners' associations in the neighbourhood have allotment gardens. So far, the general interest for local production of food in Hammarby Sjöstad has been rather meagre, but the idea of urban orchards has been introduced and it may eventually become a local practice. Malena, one of the two employees, says that one possible explanation for it not being part of the original plans for the neighbourhood may be that the district is still fairly new and is built on industrial land. In addition to allotment gardens, a local electric car collective has also been established and is up and running.(Karlsson 2013)

The Turning Torso and the Western Harbour, Malmö (TT). As part of a forward-looking strategy, and created by the City of Malmö as a direct consequence of the challenge related the deep economic crisis of the 90s, the Western Harbour with the tall building "Turning Torso" (from hereon called TT) has become the symbol of the successful transformation of Malmö to what is generally referred to as *Malmö* Sustainable City. The area itself has gone through a major transformation with considerable efforts made in relation to mobility and public transport, for instance by providing designated bicycle lanes and priority lanes for buses. An interesting aspect of the Western Harbour is that the idea sprang from an economic crisis, which has led up to an ambitious long-term strategy.

The entrance floor of the Turning Torso building hosts an exhibition open to the public. The Turning Torso exhibition and meeting place were jointly created by one of Sweden's biggest housing organisations, HSB, and Malmö City. The exhibition is self-explanatory with brochures, posters and models providing facts about the building as well as current and future urban developments in the Western Harbour. However, the exhibition in TT only constitutes one small part of the Western Harbour full-scale demonstration site. The whole residential area works as a climate centre presenting a "driving force in Malmö's development towards environmental sustainability"? with the aim of being "an internationally leading example of environmental adaptation of a densely built urban environment" This is done by means of what may be referred to as eco-visualization, i.e. by making the solutions for harvesting natural resources (i.e. sun, wind and water), the human interdependence with nature is accentuated. In a way it re-connects the urban environment with its continual use of natural resources (Löfström, 2014).

Specifically, nature is present through the whole district as a result of conscious planning (raising?) with the aim of efficiently using the space available and promoting biodiversity. The natural areas handle stormwater (rainwater and meltwater). Also, the stormwater runs into canals, ponds and fountains in the area in what is referred to as an "open storm water system". Hereby, the water is biologically cleaned before reaching Öresund and the human interdependence with nature is accentuated.

Also, one of Sweden's largest wind turbines supplies the area with electricity and 120 m^2 solar cells produce electricity in addition to the wind turbine. In addition, 1,400 m^2 solar panels in the area absorb the heat from the sun which is used to heat household water.

> The solar cells are placed on semi-transparent glass roofs that let the light through to the balconies below. A water

1. Fortum Värme is co-owned by Fortum and the City of Stockholm.

Figure 1. The Western Harbour: Detail of the open storm water system. Photo: City of Malmö.

> pump draws energy from natural water reservoirs, known as aquifers, in the underground rock. The system stores warm water from the summer to heat buildings and water in the winter and cold water from the winter to cool buildings in the summer. (http://malmo.se/English/Sustainable-City-Development/Bo01---Western-Harbour/Energy.html 2014)

In addition, two local parks contribute to this re-connection to the ecosystem. While Ankarparken contains many biotopes and functions "like an exhibition of what nature can look like outside of the city", "Daniaparken offers plenty of opportunities to follow the changes in nature from season to season" (http://malmo.se/English/Sustainable-City-Development/Bo01---Western-Harbour/Energy.html 2014).

The Turning Torso and the Western Harbour and GlashusEtt in Hammarby Sjöstad have similar strategies in addressing the general public. However, while Hammarby Sjöstad is just one eco-neighbourhood in Stockholm, TT and the Western Harbour are part of a full scale strategy of gradually transforming the city in a sustainable direction in regard to the built environment, the use of resources and the everyday activities of its residents.

The Samsø Energy Academy, Samsø (EA) is a large full-scale demo site as it involves the whole community as a separate system. This is made possible by the fact that Samsø is an island of a size that allows for developing systems that encompass the whole area. Energiakademiet (from now on referred to as the Energy Academy) at Samsø, Denmark, is deeply integrated with the Samsø community as a whole. The centre itself is founded as a direct consequence of Samsø winning a competition to become Denmark's "Renewable Energy Island" in competition with four other islands. Before the competition, Samsø had experienced a rural decline as a result of local businesses shutting down, leaving many islanders unemployed. Even though winning the competition did not include any additional funding beyond existing Danish and EU funds to promote the use of renewables and energy conservation, it became the starting point for an ambitious energy policy for the community as a whole. The project was backed by the municipality, businesses and farmers.

> A situation occurred, that meant that we had to either go all in or watch our island slowly transfer into a ghost society with summer houses and some tourist attractions. (Skafte Bestmann 18.11.2013)

Local enthusiasts managed to get the ball rolling and gathered support for transforming Samsø into a "self-sufficient" or "cradle-to-cradle" island. As a consequence the Energy Academy opened its doors to the public in 2007. Today, the Energy Academy employs 10,2 positions in 2013. Its budget and funding amounts to €1M (7,4 MDKK) in 2013 (with partly state financed income and income from project work). It is a non-profit organization which is owned jointly by (local) stakeholders although applying for membership is open to all interested parties.

As the Academy did not have long term funding in place from the start, it mainly relied on hard work of local enthusiasts. In order to sustain the initiative beyond the initial enthusiasm, it became essential to find a model that would secure funding and further opportunities for the Samsø community in reaching its ambitious goals. Therefore, the Academy does not only function as a centre and exhibition hall for renewable energy and energy saving schemes, but is also actively involved in facilitating a model where residents of Samsø own shares in the local wind mills. There are different forms of ownership, with some mills cooperatively owned, some are privately owned and some are owned by energy companies. However, 440 of the total 2,000 households (total population approximately 4,300) own shares in the windmills. In this way, the initial opposition to on- and off-shore wind parks was transformed into people regarding the mills as a positive addition to the landscape.

What started as a desperate project to save Samsø has contributed to transform Samsø to an ambitious community which continually fosters new initiatives. In the momentum where one thing leads to another, local businesses and work opportunities keep emerging. The meeting point for new initiatives is the Energy Academy, and it also works as an exhibition window for Samsø as the Energy Island. While the process started out with wind power, many houses at Samsø are now equipped with solar collectors and new wood or straw-burning stoves. In addition, citizen groups have mobilized support for district

heating with a combination of solar collectors and straw burning furnaces. Also, many have chosen to upgrade their dwellings for improved energy performance.

> When weather is bad, and it is windy, you will actually see many people smiling as everyone knows it transforms into electricity. (Skafte Bestmann 18.11.2013)

Samsø has already achieved its initial goal to become fully self-sufficient in energy, based entirely on renewables. However, transport remains the biggest challenge, and it has not yet been realistic to have all cars running on electricity. Therefore Samsø has, so far, exported as much renewable wind energy to the rest of Denmark as the cars consume in oil to reach the goal. Reaching the goal without compensating for the oil used is the next goal for Samsø, and the Energy Academy is actively involved in the process of making this happen.

To simplify things a bit, the Energy Academy contributes to making the "Energy Island Samsø" -vision feasible by working on two levels:

- *Locally,* it provides a discussion arena and meeting point where residents, public officials and other decisions makers and businesses (local and other) can meet and discuss.
- *Globally:* it provides a marketing window to the outside world and functions both as inspiration to other communities and simplifies cooperation with businesses and people outside of Samsø.

Typically, these two levels are combined in projects. The recent project for Samsø Energy Academy is to contribute to establish a bio-gass plant at Samsø. This project directly contributes to the overall goal of Samsø as it would potentially provide enough bio-gass for ferries and heavy land transports.

The main results of the Energy Academy are twofold. It is a great achievement to have an island become fully self-sufficient in energy, based fully on renewables. However, achieving this is only one side of the coin. Samsø Energy Academy has also managed to turn what is normally a difficult process – introducing wind mill parks as a rather prominent part of the landscape – into a symbol of the successful transformation of an island in rural decline. Samsø is now a prosperous community with numerous local business initiatives (in energy and other fields of business), and involved citizens that also work as a marketing window for renewable energy solutions.

According to one of the employees Skafte Bestmann, the Samsø Energy Academy recipe for success is that it a) does not depend on goodwill, but instead has been built on healthy business concepts and local entrepreneurship and; b) "democratic" processes – i.e. it actively involves residents, municipality officials and other decision makers and businesses in meetings and discussions.

> People have invested private money in the energy system of the island. I myself have invested in the wind mills. (Skafte Bestmann 18.11.2013)

> It takes a lot of time to involve people, especially early on in a process, but the results are overwhelming. (Skafte Bestmann 18.11.2013)

Each year, the Academy arranges exhibitions, workshops and corporate events for approximately 5,000 visitors. The Energy Academy continues its involvements in the funding of local energy production and largely functions as a meeting arena for locals, residents, public officials and other decision makers, and businesses of different sizes. The Samsø Energy Academy's recipe for success could be summed up with a rich local support paired with the ability to adapt and react quickly to whichever opportunities (and funding opportunities) may occur.

Samsø has managed to turn an economic crisos and its negative trend as well as the accompanying loss of population into a winning concept which is beneficial for the community as a whole. An additional part of the reason for the deep integration with the Samsø community is that the Academy has managed to involve the local inhabitants from the very start and has let them invest their own money in local energy production.

The BedZED project has, from the start, had the ambition to serve as a test-site for demonstrating to the public cutting-edge building technology, energy systems and green lifestyle. While some elements of the technology that have been installed have failed due to lack of attention from the site owner, it has remained an inspirational project for residential development on a national and international scale. Through the presence of BioRegional at the site, BedZed also combines many of the incubator/networking functions associated with the showrooms presented above. The One Planet programs also share some elements with the more research and policy-oriented centres, although this normative program is presented in a rather streamlined and uncontroversial form.

Figure 2. Workshop at Samsø Energy Academy, Photo: Samsø Energy Academy.

Figure 3. Workshop at Dansk Arkitektursenter (DAC), Photo: Dansk Arkitektursenter.

Table 2. Overview of the full scale demo sites.

Name and location	**Description**	**Demonstrating products as part of systems, or separate**	**Main activities and characteristics**	**Funding and organisation** (commercial and/or public funding)
GlashusEtt, Hammarby Sjöstad, Stockholm	Public centre for environmental information and communication and a full scale demo site for the eco-profiled neighborhood.	– Demonstrates a number of environmentally friendly technologies in the building (models), including a model of the whole area.	– Providing advice to the public on how to conserve resources. – Informing residents on how to conserve resources in context. – Meeting point for residents, – A marketing arena for the City of Stockholm.	Fully publicly funded by the Stockholm Municipality as part of the City of Stockholm administration.
Turning Torso (TT) and the Western Harbour, Malmö	Full scale neighbourhood demo site for innovative eco-friendly solutions at multiple levels.	– Exhibition of the neighbourhood and its technologies inside the TT. – Shows a full scale model as the neighbourhood itself including its residents demonstrates a fully functional system.	– Functions as a full scale eco-systems showroom for Malmö city and its transition to a green region. The resindents are part of the exhibition. – Largely functions as a marketing arena Malmö.	Jointly funded by the City of Malmö and the local builders.
Energiakademiet, Samsø, Denmark	Full scale demo site with the ambition of making Samsø (island) fully self-sufficient in energy based fully on renewables.	– The whole island demonstrates a full scale system including separate technologies on display inside the centre and in use.	– Functions as a full scale eco-system. – Visible energy production technologies accentuates the Samsø identity as a living lab.	Member stakeholders owned. Rising from an economic crisis. Partly state financed and partly by project work. Deeply integrated with the Samsø community.
The BedZed project	Full scale demo site for sustainable building and living.	– Functions as a test-site for demonstrating cutting-edge building technology, energy systems and green lifestyle. – Some technologies failed.	– An early inspirational project that has been acknowledged from National and International environments.	Membership fees funded The organisation "BioRegional" handles the visitors and organises the activities.

Also, Kamp C in Antwerpen Belgium shows some of the characteristics of a full-scale demonstration site in that it has a clear function of achieving the vision of changing practices in its community; the issues and technologies covered in the on-site demonstrations address several aspects of sustainable building and living. Many of the other centres also run projects that share the characteristics of full scale systems, for example the DuWoBo (in Brussels, Belgium, project run by CeDuBo and the Ecopolis project in Antwerp, Belgium, managed by VIBE. These projects apply transition methodology and principles from ecological and spatial planning to change the fundamental practice of building and living in neighbourhoods.

RESEARCH AND POLICY CENTRES

The Passive House Platform (PHP) is a centre working with research, documentation of passive houses and near zero energy houses. PHP is dependent on research funding on a project basis and focuses largely on communication and dissemination of results. It also offers education in passive house technologies to professionals. VIBE has a similar concept, working with labelling, education for professionals and consulting services. Just as PHP, VIBE is dependent on funding and paid projects (consultancy and education) but it is also subsidized by the Flemish government.

Danish Architecture Centre (DAC), Copenhagen, works with architecture, building design and urban development and has a stated ambition to influence National policy development. DAC has a broad portfolio and addresses both private individuals and professionals. Organisation wise, it has two divisions, offering both public service and project based activities. It has long-term funding through Realdania and the national government, but relies on extra funding for projects.

DAC is Denmark's national centre for the development and dissemination of knowledge on architecture, building and urban development. It was founded in 1985 through a collaboration of the Ministry of Culture, the Ministry of Economic and Business Affairs and the Realdania foundation. One of the many stated goals of the centre is:

> To create broad interest in architecture, to clear the way for new ideas traversing traditional boundaries and to show how architecture creates cultural and economic assets for people, the industry and society. (http://www.dac.dk/en/about-us/vision-mission-and-goals/ 2014)

DAC focuses on the built environment and is not based on production. Rather, it is centred around development, which mostly takes the form of implementing specialized projects. One aim is that this basic orientation is reflected on the values behind the day-to-day work performed. DAC offers activities both for professionals and private persons. Activities offered include exhibitions, seminars and guided tours of the City. Most of the work performed at the centre is project based and are performed in conjunction with Danish and international partners who share the visions of the centre. One important goal is to disseminate information and share knowledge about the origins, present conditions and value of architecture with the intent to encourage "a broader recognition in society of the importance of high quality standards in the built environment."(http://www.dac.dk/en/about-us/vision-mission-and-goals/ 2014). DAC focuses specifically on sustainability in relation to architecture and the built environment. It regularly offers exhibitions, events and green city walks as part of its program. In addition, most projects are at least partly focusing on sustainability and DAC participates in numerous national and international sustainability projects (research and others). One such international project is the Sustainable Cities project. (http://www.dac.dk/en/dac-cities/sustainable-cities/ 2014) and one exhibition is the "Reprogramming the city"-exhibition (http://www.dac.dk/en/dac-life/exhibitions/2014/reprogramming-the-city/ 2014)

For DAC, the legitimacy of their work lies in promoting architecture and its societal importance. According to DAC PR Manager Line Juul Greisen, the potential of the centre lies in:

> Promoting co-operation across the professional boundaries of the construction sector and architecture so that the players, working together, are able to contribute to the forward-looking development of society as a whole. (Juul Greisen 2014)

In other words, DAC has the ambition not only to promote lifestyles and solutions to the public directly, but is also engaged in having a direct influence on society as a whole, including actual policy-making. In this sense, DAC is a centre with a particularly clear agenda to promote architecture and physical form as a means to achieve changes on a national level. The vision of DAC is described on the DAC website contains information about their current and past projects (see www.dac.dk) On the public website, four guiding values are listed: Vision, Authenticity, Competence and Cooperative

The visions, image and work processes of DAC are particularly well defined. This may be due to long term funding which has given the centre the opportunity to focus on processes and consistency, as opposed to project-funded centres which may often have to focus on short or longer term grants for their survival. As the press contact Juul Greisen puts it:

> We are lucky to have the basic things in place, so that we can focus on what's important. (Juul Greisen 2014)

DAC is an autonomous, commerce-promoting fund with an economic basis in partnership. The partnership raises an annual operational grant for the Public Service activities of a total of DKK 18.8 million, contributed to equally by Realdania on the one hand and the State on the other hand. However, the centre would probably not have lasted for such a long time (since 1985) and managed to maintain its economic support had it not been successful in its mission. Still, DAC faces some challenges, as Juul Greisen explains:

> We are continually re-inventing ourselves by having an extensive focus on work processes and making continuous project evaluations. (Juul Greisen 2014)

The partnership finances what is defined as the Public Service activities of DAC. However, costs arising from the implementation of professional projects are not covered by the operations grant. These projects are financed with project-related income in combination with subsidies from Ministries, funds, sponsors and collaborative agreements with public authorities and private commercial enterprises. A specific agreement is entered for each project between DAC and the partner or partners of the project.

The DAC organisation is divided into one Public Service-organisation and one Project based organisation. The Public service organisation manages the exhibition- and production facilities, supports personnel who lead and develop the physical premises of the centre, contributes to the implementation of externally financed project initiatives, and helps ensure that external project support is obtained. (http://www.dac.dk/en/about-us/economy/ 2014)

In relation to DAC's ambition to have an impact on societal development and policy making, the project "Build it up" ("Byg det op") in 2013 is a relevant example (www.dr.dk/bygdetop 2014). This project was focused on citizen dialogue and co-creation and was organized as an architectural event. The event concept was developed by DAC in cooperation with DR (a Danish public-service radio and TV broadcaster). It was a major media and architectural event combined with the intent to actively involving residents by giving them the opportunity to change and shape public spaces in their direct vicinity. It was also developed to enable change processes and create new social communities. The project was a success and resulted in a skate-park and an outdoor activity centre for instance. The project was awarded with one of Europe's oldest and most prestigious media prizes, 'Prix Italia'. In addition, "Build it up", and DAC contributed to a new national government architecture policy.

DAC has clearly been successful in its ambitions to promote lifestyles and solutions to the public directly as well as having direct influence on society as a whole, including actual policy making. As an example, The Danish Architecture Centre assisted in the process of discussion around the development of the new architecture policy, and participated in the steering and working committees. DAC and particularly the project "Build it up" actively contributed to a new Government architecture policy. One of its intentions is to "highlight architecture and sustainability by developing a strategy for sustainable urban planning" (www.dr.dk/bygdetop 2014). In addition, the project '"Build it up" is a good example of how the centre promotes citizen dialogue and co-creation. In 2017, DAC moves into the

Table 3. Overview of the Research and policy centres.

Name and location	**Description**	**Demonstrating products as part of systems, or separate**	**Main activities and characteristics**	**Funding and organisation** (commercial and/or public funding)
The Passive House Platform (PHP)	Non-profit research and policy institute promoting highly energy sufficient buildings.	Promoting buildings and materials with high insulation capacities.	– Promoting buildings and materials with high insulation capacities.	– Non-profit research and policy institute – Dependent on project based funding.
VIBE	Non-profit research and policy centre promoting bio-ecological living, natural construction and sustainable urbanism.	No exhibition at site, but participates in other exhibitions.	– Promoting bio-ecological living. – Consulting.	– 1,000 paying members. – Dependent on project based funding.
Dansk Arkitecture Centre (DAC), Kobenhagen	National centre for development and dissemination of knowledge about architecture, building, urban development and related policies.	Vast variety, partly project based and partly run as a meeting point with exhibitions, book store, café etc.	– Promoting architecture and influencing policy making. – Project based research and consultancy.	– Autonomous, commerce-promoting fund with an economic basis in partnership.
Kamp C	Provincial government centre for sustainable building and living with a demonstration site, eco-business zone, technology showroom and a large range of activities.	Demonstration site for technologies and lifestyles.	– Dissemination of good practice and exchange of experience. – Lectures and public meetings.	– Government funded.
The Sustainablity Centre	Research and education centre, focus on hands-on, low-tech, holistic approach to sustainability.	Focuses on Low tech hands on solutions and technologies.	– Public courses. – Rents out yurts to visitors. – Permaculture is demonstrated.	– Run by the Earthworks Trust as a social enterprise charity

Bryghusprojekt, which is situated next to the Black Diamond on Copenhagen's waterfront. The Bryghusprojekt has been designed by the world-famous Dutch architect Rem Koolhaas/ Office for Metropolitan Architecture (OMA).

In addition to the DAC, the premises will be comprised of a café and restaurant, housing, offices, an underground car park, several new urban spaces, and playgrounds. The Bryghusprojektet is financed by the Danish philantropic association Realdania and built by its subsidiary.(www.bryghusprojektet.dk 2014) As Juul Greisen puts it:

> Bryghusprojektet represents an exceptional opportunity for Denmark to have, at last, a world-class architecture centre, which can reflect the Danish architectural tradition. (http://www.dac.dk/en/about-us/a-new-danish-architecture-centre/ 2014)

Kamp C is a mix of a full scale demonstration site (see previous category) and a research and policy centre, but we have choosen to place it in the latter category due to the fact that it has shifted from its original purpose of constructing demonstration buildings to another core purpose of providing information and support on low emission, energy efficient, environmentally friendly building and living. The centre has a large target group since it addresses individual citizens, government, and educational institutes. It is government funded, mainly tied to the business centre, De Basis, which provides access to knowledge and networking opportunities for small local eco-businesses. The financers of the business centre are the Province of Antwerp, the European Regional Development Fund and the Flemish government.

The Sustainability Centre stands out as somewhat of a contrast to the other organisations in this category with its explicit low-tech focus and foundation in permaculture design principles. Here, it represents an alternative route to the more technologically oriented strategies above, and is very much in line with what can be coined holistic sustainability. It also has installed green technologies such as solar PV and woodchip burners on-site, but this is perhaps more motivated by the goal of reducing the footprint of its operations rather than to serve as a demonstration site *per se*.

Concluding remarks

The stated ambitions of all the centres reviewed here generally involve some form of ideological orientation. However, it may be more difficult to maintain these normative goals of promoting sustainable built environment and/or lifestyles if the long-term economic sustainability is not in place. The combination of core funding and project-based income is thus a frequent strategy that seems to work for a majority of the centres. Forming alliances with the local community and/or public organisations or policy makers is clearly an advantage, and it seems to be a success factor to focus on broader perspectives rather than promoting a particular technology or concept. Access to full scale demonstration sites seems to be an advantage in relation to marketing purposes. Involving local residents is a success criteria emphasised by most of the centres. Therefore, developing ways for the local community invest in the centre and/or its projects seem to be a promising strategy. In this respect, Danish Architecture Centre has managed to spread its activities geographically, with projects in different parts of Denmark, managed from the centre in Copenhagen. Also BioRegional has managed to instigate a large number of projects nationally as well as internationally, with a combination of resources from its UK-based office at BedZED and nodes in other countries. In general, it would appear that a strategy of maximising whichever resources are available is a winning concept. Success comes in many shapes and it seems that the ability to utilise available resources, financially, geographically and socially is the most important lesson to take home for centres that want to promote sustainable building and living.

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