Affordable Green Housing: Two Emerging Developments

The residence of an individual represents the most fundamental means of truly living a sustainable lifestyle that is both healthy for the Earth and for oneself. In an era where renewable energy sources, sustainable materials, and water efficiency require a substantial extra investment in addition to creative planning, green housing is most often unattainable for lower-income households. In this way, a large section of the population is excluded from the sustainability movement, and one of the three essential aspects of sustainability, social justice, is ignored. Through a combination of cooperation between municipalities, federal agencies, and nonprofit organizations, green affordable developments are slowly becoming available. Two types of developments appear to be emerging: a chiefly green development with an affordable approach and a chiefly affordable development with a green approach.

The Skotteparken residential area in Ballerup, Denmark provides an excellent example of the first style of development. Skotteparken was completed in 1992 as an experimental building project funded in part by the EU Thermie Program. Situated outside Copenhagen in Ballerup, the development contains 100 units within six buildings, providing affordable housing for 250 people (Kolbeck, 1998). The project received the World Habitat Award in 1994 for its innovative strategies in successful energy reduction (World Habitat Awards).

In contrast, Sara Conner Court is a low-income rental housing development in Hayward, California that took great strides to incorporate sustainability into its affordable mission. The four buildings of the multi-family apartment complex create 57 units that serve the residential needs of 160 inhabitants (Urban Land Institute, 2008). Built on a site that once housed a milk and juice processing plant as well as a dry cleaner, Sara Conner Court demonstrates the utility of brown field remediation. The development was also one of the first projects to be certified under GreenPoint, the Bay area’s sustainability rating system and received a respectable overall rating of 72 (Green Building, 2007).

These two residential areas provide insight into the different levels of green measures, economic affordability, and community support that can be incorporated into developments described as “affordable green housing.”

Ecological Sustainability

Skotteparken

The initial concept for Skotteparken was to create a sustainable urban development that deals with social, cultural and ecological issues (Kolbeck, 1998). On the ecological level, one of the main goals for the project was to
save 60% of the energy consumption for heating and domestic hot water, as compared to conventional building projects (Pedersen, 1-4). To accomplish this, a high-technological district heating system, partly based on solar energy, was installed. Six solar heating systems at 100m² each are now used for heating water and buildings. When additional heat is needed, an energy management system (EMS) directs heat from a back-up heat-and-power plant in a nearby school instead. The system is designed so that the combined heat-and-power plant is only in use when the six solar stations do not produce enough power to heat the whole neighborhood (Pedersen, Agores). The solar stations are placed on top of the six residential blocks and they are all connected to a boiler room that is then linked to the heat-and-power plant through a computer controlled system (World Habitat Awards).

All the buildings in Skotteparken are also built with a wide range of energy-saving features. These features help keep the energy-use down and allow the residents to save money. The features include extra insulated ceilings, two layers of low energy glass windows, counter-flow heat recovery units for ventilation air, local heat and water consumption meters in each apartment, low-energy bulbs on outdoor lighting, and thermostat fittings in showers and water-saving taps in kitchens and bathrooms (Pedersen, 1-4). With the exception of the water-saving features in the apartments, the energy-savings in the individual homes are mostly based on the residents’ own motivation to save energy. Financial incentives, information and guidance have been given to the inhabitants to encourage further energy-saving (World Habitat Awards).

With the energy-saving features in combination with the efficient heating system, Skotteparken was able to achieve the goal of 60% energy savings. The normal amount of energy used for heating and hot water in conventional building complexes is 180kWh/m². In 1993, one year after the development, Skotteparken’s energy use was only 92kWh/m² (49% less than standard measures). Since then, the energy-use has decreased steadily every year (Pedersen, Agores). Today the amount of energy used in Skotteparken has reached the 60% goal of only 72kWh/m² (Pedersen, 2005).

Water is a limited resource in Denmark, and dealing with water in an economically and ecologically sustainable way was therefore a key part in the development of Skotteparken. Rainwater that falls on roofs or roads on the site is collected and led to a nearby lake instead of flushed down the sewage system. In this way the pre-development hydrology conditions can be preserved to a greater extent. Greywater from the residential blocks is also being reused within the dwellings (World Habitat Awards). The amount of hot water used in the apartments is considerably less than in normal apartment complexes. The daily consumption of domestic, hot water is normally 100-150 liters per apartment, while that of Skotteparken is only is only 66 liters per person (Kolbeck, 1998).

Rainwater runoff from the site is led through a bio-retention area in the middle of the development to a nearby lake.

Picture Source: http://www.worldhabitatawards.org/galleries/awards.cfm?offset=198&lang=0&theGalleryID=01
A major component of people’s “carbon footprint” is the amount of miles travelled by car every day. Planning for a neighborhood that promotes walking, cycling or use of public transport is therefore an important part of creating a “green” neighborhood. In terms of ecological sustainability, the car travelling mileage might be less successful in the Skotteparken development. The amount of cars in the neighborhood is not considerably lower than anywhere else in the region. The average rate of car ownership in the suburbs of Copenhagen is 25% (one vehicle per four residents), and in Skotteparken the number is the same. In Skotteparken, 41% of the trips are made by car, motorcycle or taxi, which is considerably more than in other green developments in the Copenhagen region (for example Hyldepsjaeldet, Bo09 and Torup) despite a similar public transportation service. The reasons for this difference could be the level of activity in community based groups to “move the crowd” towards more sustainable travelling, or the way the neighborhood is designed, such as including convenient front-door parking (Scheurer, 165-176).

Sara Conner Court

When programming the affordable housing development for Sara Conner Court, a green approach was one of the key goals. Three main focal points for the ecological sustainability plan were developed, including energy efficiency, healthy landscaping, and high indoor air quality (Pyatok). The project aimed to be 15% more energy efficient than required by California’s Title 24-2001 building standards. To accomplish this, an efficient gas-fueled hydraulic heating system was installed in the complex. The water in the gas-fueled furnace is heated up and distributed throughout the apartments, serving as both heat and hot water (Green Building, 2007). To complement the efficient heating system, a number of energy-saving features were also integrated in the buildings. Water efficient toilets, taps and showerheads, natural linoleum and low-emission carpets, and low-VOC interior paint were some of the features installed (Green Communities, 2008). All appliances were also Energy Star rated (Urban Land Institute, 2008).

To save extra energy, the apartments were built without air conditioning, despite the hot California climate. Instead, a design that provides natural ventilation with ceiling fans was built. To save heat during the colder winter months, the roof trusses were raised to fit extra insulation. This also helps to create good indoor air quality. When designing the buildings, extra consideration was put into the choice of materials. Durable materials, such as 50-year roofs, were chosen to reduce use of resources over time. (Urban Land Institute, 2008) During the construction phase, 50% of the jobsite waste was reduced, recycled or reused (Green Building, 2007).

A lot of effort was put into creating high quality common spaces that were at the same time environmentally sustainable. Most parking lots on the site were placed under ground to save room for high quality common spaces. The parking garages had an open design though, so that natural ventilation could be used instead of energy-consuming fans. The rainwater that falls on the buildings on site, or on different pervious surfaces (such as streets, paths and parking lots), is led to bio-swales where the water filters down through a layer of soil instead of being piped out through the sewage system. This helps keep the ground water table on a good level and
prevents the sewage system from being overburdened. The used plant material on the site was chosen specifically to be drought-tolerant to avoid the need for irrigation during the dry season (Urban Land Institute, 2008).

Sara Conner Court is situated in an area with both an elementary and a middle school, and different grocery stores within walking distance. Public transportation is also reached very conveniently from Sara Conner Court through a bus stop just outside the property (Green Communities). This encourages people to leave the car and instead walk, cycle or take the bus.

Comparison

There is no doubt that Skotteparken is the more advanced of the two developments in terms of ecological sustainability. The latest technology has been used throughout the whole development. Low energy-use is the main focal point in Skotteparken, and the impressive goal of 60% energy-savings was targeted a few years after the development. The project has an advanced sustainable approach in almost all ways possible. The storm water management system is well developed and the greywater is being reused, all kinds of energy-saving features are installed, and a well developed public transportation system connects the area with other parts of Copenhagen. The only obvious thing that perhaps could have been done differently is removing the front-door parking which encourage usage of cars. There is also no information on the source of the materials used in the buildings. To use locally produced materials to reduce transportation is an important aspect of building green houses.

Sara Conner Court on the other hand, has taken a milder approach towards ecological sustainability. No fancy features like solar panels or greywater reuse systems are installed, and the goal of 15% energy savings does not seem very bold compared to Skotteparken’s 60%. A lot of little things like energy-saving features, climate considerate landscaping and rainwater swales are built though, which together creates quite a green project. There are of course some possible improvements that could be done though. In the hot Californian climate where water is a scarce resource, it seems relevant to collect the rainwater during rainstorms and reuse it. The water could, for example, be used to flush toilets. The hot and sunny climate would also be excellent for installing solar panels. A solar-based district-heating system similar to the one in Skotteparken could make a big difference in energy-savings.
Economic Cooperation, Viability and Affordability

*Skotteparken*

The Skotteparken Project was initially envisioned by the Danish non-profit organization KAB, which seeks to construct housing developments that utilize novel sustainable methods of building and energy use while fitting within the network of social housing (World Habitat Awards). Quickly KAB created a partnership with Cenergia Energy Consultants and gained the financial support in 1987 from the European Union Thermie Program (World Habitat Awards). Skotteparken fits perfectly within the mission of the Thermie Program to improve energy security and affordability as well as minimize environmental impact, key challenges that the EU has sought to address through investment in projects such as Skotteparken (Scheurer, 2001). Together they shared the goal of optimizing energy supply and improving the comfort and affordability for tenants so that Skotteparken may become the “housing quarter of the future” (Scheurer, 2001).

Due to project’s ambitions to reduce energy use by 60%, these partnerships became essential to Skotteparken’s completion. Particularly at the level of technology and research in 1992, there were inevitably extra capital and revenue costs required for the type of energy innovations employed in the development. The total pay-back period for the energy system has been calculated at twenty years, ten of which are from the installation of solar heating (World Habitat Awards). Grants from the European Union, the Danish Energy Agency, and the Danish ministry kept the extra investment of 8% compared to conventional housing feasible without transferring too many of the costs onto tenants through higher rents (Kolbeck, 1998). Moreover, the Skotteparken Project was able to receive extra social investments since the total energy saving can lead to continued benefit for the tenants (Kolbeck, 1998).

Skotteparken is classified as social rental housing in Denmark, which means that it is open to any individual regardless of income level but typically targeted at those who have difficulty providing their own housing needs (CECODHAS). Within this type of not-for-profit housing, rents are fixed according to costs mostly below market prices, and dwelling opportunities are allocated via waiting lists (CECODHAS). While rents at Skotteparken may be slightly higher than other housing projects within Ballerup, this is more than offset by the savings the tenants accrue to in terms of reduced energy and water bills (World Habitat Awards). The average heating bill for residents of Skotteparken is approximately 33 DKK/m², which is 40% of the normal heating bill of conventional reference houses and allow Skotteparken to remain affordable (Kolbeck, 1998). The general socioeconomic background of the development is thought to be lower-middle class, with low income families as well as “more economically active households” (Scheurer, 2001). With these measures, Skotteparken has evolved into a green development with an affordable approach.

*Sara Conner Court*

The Sara Conner Court Apartments were constructed by the nonprofit organization Eden Housing in conjunction with the city of Hayward and the Enterprise Foundation. With Sara Conner Court, Eden Housing
sought to create affordable rental housing targeted mainly at working families while using green materials and construction methods, demonstrating the project’s status as an affordable development with a green spin in contrast with Skotteparken as a green development with an affordable spin (Urban Land Institute, 2008). As with most affordable housing projects, Sara Conner Court was financed through the cooperation of numerous sources. City loans and grants in the form of Community Development Grants (CDBG) from Hayward provided approximately 30% of the $20.5 million development costs, while federal low-income housing tax credits (LIHTCs) accounted for another 55% of funding (Urban Land Institute, 2008). The remaining costs were financed through the donations of three nonprofits that were mainly put towards the various green features of the project (Urban Land Institute, 2008).

With such subsidies, the units within Sara Conner Court are able to be reserved for households with annual incomes ranging from $17,400 for one individual to $61,620 for a seven-member family (O’Brien, 2006). The specific affordability targets of the development are as follows: 6 units for those with 30% of the area median income (AMI) of Hayward ($83,800 for a family of four as of 2006), 6 units for 40% of AMI, 28 units for 50% of AMI, 16 units for 60% of AMI, and 1 unit for an onsite property manager (Green Building, 2007). As with the Skotteparken development, places within Sara Conner Court are distributed through a waiting list system in which eligible households apply and undergo stringent tenant screening (O’Brien, 2006). These include a proof of income through pay stubs and tax returns as well as employment verification and extensive background checks (Urban Land Institute, 2008). As of September 2007, the waiting list had reached 200 applicants, of which only twenty-five were for the units at 50% and 60% of AMI (Urban Land Institute, 2008). The majority of those on the waiting list were for the units priced at 30% to 40% of AMI, demonstrating that the development’s twelve units are insufficient to keep up with the demand for very affordable, decent housing.

Comparison

While the United States does not have as an established system for social rental housing as Europe, both Skotteparken and Sara Conner Court can be considered social housing projects due to their level of affordability and their system of allotting residency. The cooperation of nonprofit organizations, federal subsidies, and municipal support were integral for the composition and completion of both developments. However, the majority of the larger government support for Skotteparken came from the EU Thermie Program to subsidize the environmental and energy efficient aspects of the community, which thus in turn kept the rent of these very green units more affordable. In contrast, most of the federal subsidies for Sara Conner Court were devoted to targeting the lower income segment of the population through LIHTC, while less money was devoted to the sustainable features of the development that were funded by nonprofit partners. These differences may reflect a divergence in the emphases of sustainability, ecological versus social justice, with which the two respective governments of Denmark and the United States are most concerned. On a larger scale, the contrast in the type and purpose of funding has played out to create two distinct developments. On the one hand, Skotteparken is advertised as low
income but is mostly chronicled for its extensive energy efficiency with little information on the actual affordability of the development. On the other hand, Sara Conner Court is portrayed as an affordable community that happens also to be environmentally friendly.

**Community Involvement and Resident Empowerment**

*Skotteparken*

The main concept behind Skotteparken is to ‘ensure a better social, cultural, and ecological environment’ that is rooted in sustainable urban development (Kolbeck 1998). Although Skotteparken is characterized as a top-down development, focused on building technology and infrastructure, it is intended to be an example for other housing developments not just in Denmark or Europe, but also in third world countries and around the world (Pedersen, Agores).

A key statistic is that 34% of Skotteparken residents say that the development’s ecological measures were a motivating factor to move there (Scheurer, 2001). The extra investment of 8% over normal building costs corresponds to the savings that resident will accrue over time (Pedersen, 1-4). Buildings are arranged on six separate blocks (World Habitat Awards). There is a community center, and residents have a counsel to discuss and vote on pertinent issues. However, is it noted that the local sustainability movement is still small and consists mainly of a few enthusiasts (Scheurer, 2001). It has been difficult to drum up enthusiasm among residents and have an effect on their personal habits and choices (such as using public transportation instead of private cars). Skotteparken residents seem to view the resources around them as a relief- a way to lessen the number of worries that they have, in comparison to residents of other similar housing projects, who seem to be more concerned with contributing to their environment and finding personal fulfillment by building the community around them (Scheurer, 2001).

Residents have a variety of resources available to them and care has been taken to ensure that residents are aware of the energy saving aspects of the development (World Habitat Awards). For example, they can compost using the available machines (Scheurer, 2001). Local heat consumption meters are located in each apartment, as well as thermostat fittings and water saving fitters in the bathrooms and kitchens, so that residents can see their energy savings and are more closely involved with the energy that they use everyday (Kolbeck, 1998). Since units are individually billed for their energy use, residents have every incentive to conserve (Kolbeck, 1998). Residents make their own decisions about the appliances they choose to have in their homes, but the individual meters are considered an encouragement to use the most efficient products possible (Pedersen, Agores). Consequently, residents are fully involved in the energy saving aspects of the project and financial incentives are used to encourage full participation. In addition, a caretaker lives permanently on site and deals with routine maintenance.
The buildings that comprise Skotteparken are just a few stories high. This lends itself to a more inviting environment and a stronger sense of community. Picture source: [http://www.panoramio.com/photo/3475515](http://www.panoramio.com/photo/3475515)

*Sara Conner Court*

The main goal of Eden Housing was to build a safe, attractive, and affordable community that is simultaneously healthy for the residents and the environment (Green Building, 2007). Sara Conner Court is described as a ‘livable community’ that provides a ‘supportive family environment’. The design of the development intentionally emphasizes the value of open space and the importance of human-scaled design (Urban Land Institute, 2008). It is comprised of four buildings, each three or four stories high, arranged around an 8,500 square foot central courtyard with areas for playing, relaxing, barbecuing, etc. (Green Building, 2007). Since communal space was a key aspect of Sara Conner Courts’ design, five additional courtyards provide another 3,350 square feet of recreation space (Urban Land Institute, 2008). A podium parking structure saves even more space. The buildings aren’t physically imposing - you won’t find any high rises here - instead they are compact and efficient, leaving ample space for residents to live life outside of their homes (Green Building, 2007). The buildings have varied heights, exterior stucco walls, and pitched roofs (Urban Land Institute, 2008). Every effort was made to ensure that these buildings are welcoming. In addition, there is beautiful, smart landscaping that keeps the local climate in mind (Green Building, 2007).

The community is within walking distance of the local elementary school, middle school, various grocery stores, public parks, a low-cost medical clinic, etc. (Green Building, 2007). There is public transit available nearby, as well as a bus stop directly on the property. Regular bus service connects Sara Conner Court to the nearest Bay Area Rapid Transit (BART) station. Residents without cars have access to public transit, and residents with cars are given a choice to conveniently reduce their greenhouse gas emission (Urban Land Institute, 2008). Individual gas meters in units act as an incentive for residents to monitor and moderate their energy usage. They have the power to track their progress and set goals for lowering energy costs (Pyatok).

There are community rooms, gathering spaces, laundry facilities, etc in each building (Green Building, 2007). Patios attached to each unit encourage interaction among residents. These features make living at Sara Conner Court a pleasant experience and provide many opportunities for social interaction and community building. Many of the evils of low-income housing have been eliminated, and residents have many of the services they need within walking distance. Eden Housing, as part of their commitment to providing ‘service-enhanced living’, also
organizes a variety of youth and adult education programming that encourages educational and economic advancement. Programming is on site at Sara Conner Court. There is a financial literacy program, homebuyer training, parenting classes, technology training, and a resident scholarship program. There are also comprehensive after-school and summer educational programs for children. These services are offered by Eden Housing’s affiliate, Eden Housing Resident Services Inc., as a demonstration of their commitment to meeting a wide spectrum of needs for a variety of lower-income families, seniors, individuals who were formerly homeless, first-time homeowners, and people with disabilities (Green Communities, 2008). In addition, Eden Housing partners with the South Hayward Neighborhood Collaborative, a social services network, to provide residents with exceptional access to local resources and information (Kimura, 2008).

Not surprisingly, there is a very high demand for units in Sara Conner Court. However, the stringent application process turns away many applicants, including anyone who previously faced eviction (Urban Land Institute, 2008). Residents claim that they feel secure and ‘...don’t have to worry about my neighbors’ because there have been background checks on the residents of Sara Conner Court (O’Brien, 2006). In addition, staff members are educated about the green measures and practices in place so that they can perform their jobs accordingly (Urban Land Institute, 2008).

Comparison

Skotterparken and Sara Conner Court offer their residents a variety of services and amenities that emphasize the importance of conserving resources and strengthening community. Both provide information and guidance related to the energy-saving techniques that are used throughout the development and within individual units. Residents of both Skotterparken and Sara Conner Court are encouraged to monitor their energy use and set goals for using less and saving more. In this way, both housing developments have established a level of responsibility for their residents and provide a means for them to alter their lifestyle in order to do their part to help the environment. This on its own creates a sense of community. Residents of both Skotterparken and Sara Conner Court have a common thread and purpose. There are some differences between these two developments, however. Sara Conner Court is a rarity in its location. It is exceptional and will serve as an example for future housing developments in the Hayward community. Skotterparken is one of many similar housing developments in the area, and has its own identity from the rest. The residents of Sara Conner Court have a variety of educational resources available to them, right where they live. They can take courses and build life skills with the intention of then finding better job. Not surprisingly, Sara Conner Court is lauded for its supportive environment. Many aspects of the individual are catered to at Sara Conner Court. Residents at Skotterparken, however, seem to require less of an immediate sense of community. The desire to live at Skotterparken was less likely a result of their need for supportive facilities and localized services. They seem more mobilized and as a result, there are no community programs or services that come close to the array of opportunities at Sara Conner Court.
Consequently, residents of Skoteparken are not as personally involved in their surroundings, and they may not establish the same connection to their living environment as residents at Sara Conner Court.

In conclusion, Skoteparken and Sara Conner Court take two different approaches to affordable green housing. However, both developments have proven successful. Skoteparken is focused mainly on being green but has an element of affordability, while Sara Conner Court is focused primarily on affordability, but incorporates a degree of environmentally friendly features. Neither development would have been viable without cooperation from local and federal government as well as non-government organizations. Skoteparken was funded in large part by the EU Thermie program, which subsidized many of the green features of the development, but was not as focused on affordability as Sara Conner Court. In contrast, Sara Conner Court was funded with federal subsidies aimed primarily at maintaining the affordability of the development, but placed less emphasis on green features than Skoteparken. This may reflect the current political climate in Denmark and in the US and may also demonstrate a difference in their respective priorities as related to sustainability. However, both Sara Conner Court and Skoteparken have established a level of responsibility and provide residents with a means for adjusting their lifestyle in order to do their part to help the environment. It is in this way that affordable green housing fits into the larger scope of this course specifically because a city is, at the very minimum, composed of individuals living and working in close proximity to one another. In order for a city to be green, it must incorporate environmentally responsible practices into its fabric, and at the very heart of that fabric is housing. Skoteparken and Sara Conner Court serve as examples of how truly sustainable housing can be viable in both the US and Europe, even when there are different priorities in terms of sustainability. Ideally, the success of both developments will encourage similar endeavors in and around these areas in the future- which will further the strength of the sustainability movement in both Denmark and the US.
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