GENERAL INFORMATION

PETUS description of tool in use	
Name of the case	Evaluation of the Folehaven Green Laundry
Name of the tool	Evaluation of the Folehaven Green Laundry
Country	Copenhagen, Denmark
City / region Total area (km2) Population Density (people/km2)	Copenhagen 89 km^2 502,000 5640 people/km^2
Tool user's profile a. Organisation name (municipality, NGO, national or regional department, company, etc.) b. Field of activity c. Detailed contact/feedback (project website, e-mail, address, tel., fax)	a. - Lading Architects (evaluator of the green laundry) - FB (Fagforeningernes Boligforening), a non-profit housing association (owner of green laundry, and contributing with information to the evaluation) - 3B, the business manager of FB (initiator of the Green Laundry, contributing with information to the evaluation) b. holistic / building c. Lading Architects: Store Søndervoldstræde 9, 1 1419 København K, Tlf 32 83 19 68 Fællesadministrationen 3B Kronprinsessegade 14, 1306 København K Tlf. 70 20 76 00 web: http://www.3b.dk/3b.htm
Reviewer, date: Jesper Ole Jensen, 26.11.04	

Short description of the case

The green laundry is a communal laundry in a non-profit housing department. It is designed as a "green laundry", with a number of environmental features including storm water collection and utilisation, local biological treatment of waste water, recirculation of water, using renewable energy and others. It also includes an aquarium and a "marshland" with fish and turtles, giving the green laundry educational qualities. Due to this new concept, the laundry received massive attention from the medias, from environmental experts and from other non-profit housing associations. In 2002 the green laundry was evaluated, on environmental, social and economic issues. The evaluation was designed for this specific case, and was not based on a general concept. The evaluation pointed out a number of problems and questioned the environmental benefits, but it also encouraged the owners and their consultants to set up an action plan to improve the laundry. The evaluation report recommended that the green laundry should not be replicated (in the present form) other places. The owners are however proud of the result, and have gained other benefits from the laundry (for instance positive attention in medias), therefore this might motivate others to make a similar project.

Why was the case chosen? To which PETUS key-problem is this case study related?

It is one of the few evaluations of a "green" project, and it illustrates some of the problems related to such evaluations (lack of data, disagreements on the results from the initiators etc.). The evaluators have similar experiences from evaluation of other projects. The case study is mainly related to the key problems in the water sector (6.1, 6.2, 6.3), to energy key-problems (7.2 and 7.3), and partly to green-blue key-problems (1.2)

Sector	Waste	Energy	Water	Transport	Green/blue	Building & Land Use
		(x)	X		(x)	(x)

Scale of project	Component	Building	Neighbourhood	City	Region
		X	(x)		

Status of project	Starting up	Ongoing	Finished	Start date	End date (exp.)
		(x)	x	1997	

Key words

Laundry, storm water collection, biological treatment, waste water, renewable energy, exhibition.

Project a. Object (building, city park, wind farm, etc.) b. Type of activity (regeneration, renovation, new development, etc.) c. Type of product (plan, scheme, design project, etc.)	a. Communal/shared laundry for housing estate. b. Renovation. c. Scheme
Tool a. Character (according to WP3final0704.doc) b. Benchmarks (qualitative or quantitative) c. Availability (paid/ free)	a. Evaluation b. The project set a number of quantitative and qualitative goals, which were included in the evaluation. c. The evaluation report is available for free (in Danish only, at

	http://www.3b.dk/nyheder.htm)
Decision-making process a. Stage of the tool implementation (preliminary, midterm, etc.) b. Level (political, technical, etc.) c. Public participation	a. Post-project evaluation. b. Technical. c. The residents have been involved in the decision making process of the project (approving the project), and in the evaluation report.

DETAILED INFORMATION

A. Detailed description of project and tool	
1. Description of context (existing strategies, laws, policy, action plans, etc.): EU, national, regional, municipal	The handling of sewage in Denmark is to a large extent influenced by the Aquatic Environment Action Plans. These plans stem from the late 1980'ies, at that time focus was on the eutrophication of the Baltic and other Danish seas. They meant large investments in sewage treatment plants, basically financed by an increase in the price of water (a sewage tax). The increased water price, a number of campaigns and other measures have lead to a decrease in the water consumption, especially the water consumption in private households. The focus on water and sewage in the early 1990'ies generated a number of experiments with alternative ways of handling wastewater. The sewage infrastructure in Copenhagen is mainly a one-line system, where rainwater and sewage from households come in the same pipelines. When there is heavy rain, the pipes overflow. The water is lead to retention trenches where it is kept for until the rain is over, and is then lead to the sewage treatment plant. If the capacity of the basins is not big enough, there will be overflow of polluted rainwater and wastewater into the recipients in times of heavy rain. Local collection or percolation of rainwater can help to solve this problem.
2. Description of project a. Background (What caused the initiation of the project?; What was the problem? Who initiated the project?);	The green laundry is a communal laundry in a non-profit housing department for 1.600 people. The laundry was renovated in 2000, and designed as a "green laundry". The idea is to collect, cleanse and reuse all wastewater from the washing machines for new washes, in order to reduce water consumption and to avoid outlet of sewage. Also, rainwater is being collected and used for washing. The wastewater is cleansed biologically, including an aquarium and a "marshland" with fish and turtles. This serves as an exhibition on the water circuit, especially for children. Furthermore, use of renewable energy has been included in the laundry. Due to this concept, the laundry received massive – and generally positive – attention from the media, from environmental experts and from other non-profit housing associations. In 2002 the green laundry was evaluated, on environmental, social and economic issues. It is important to notice, that the renovation consists of two parts: A "traditional" renovation of the laundry, where old washing machines, tumble dryers etc. have been changed with new and more efficient equipment – and a "green" (and more spectacular) part, which includes the recirculation of the waste water, storm-water collection and biological treatment of the wastewater. a. The main actors in establishing Folehaven Green Laundry were: • Folehaven social housing department and its local board • The residents of Folehaven (users of the laundry) • FB: the Social Housing Association of Folehaven • 3B: Social Housing Administrators of FB (and Folehaven) • EBO-consult: Consultants on the biological plant in the laundry • Lading Arkitekter: evaluators of the laundry The process started in 1997 when the non-profit housing association FB was planning to renovate the laundry in the Folehaven housing department. Folehaven includes 941 dwellings with app. 1.600 residents. They decided to make the laundry as

"green" as possible, by using a concept of cleaning and re-using the water locally in the laundry. The renovated laundry has 24 washing machines, 12 tumble dryers and two large rotary ironers, and it runs app. 50.000 machine-washes per year

The board of the social housing department in Folehaven heard about the possibilities of making a local biological recirculation through the green guide in 3B. "Green Guides" is a national arrangement of local environmental guides, employed by local organizations (for instance municipalities, housing associations or sports organizations). The guides have to promote a more sustainable way of living, which can be done by informing, inspiring and activating people on a local scale. The green guides were established in 1997, financed by "The Green Fund", a national funding for local environmental initiatives. In 2000 there were app. 100 Green Guides all over Denmark. Although the Green fund in 2001 was abolished by the new right-wing government, some Green Guides have continued.

The board of Folehaven went to the EBO-consultants to have a look a demonstration-plant that had been set up another place in Copenhagen (Kompagnistræde). The idea was presented for the residents, and in spite of some skepticism, it was decided to include a similar plant in the laundry.

The space needed for the water treatment was possible, as a part of the renovation works involved the heating provision in Folehaven being changed from coal fired to district heating, and a former swimming basin was converted for collection of wastewater. The former coal storage (60 m^3) is now used for septic tank.

Above: Pictures from the green laundry

The following elements have been included in the green laundry:

- A biological treatment plant and a storm water collection,
- Heating of the washing water with the district heating's return water from the apartments of Folehaven,
- Change of energy supply from electricity to gas (for tumble dryers and rotary ironers),
- Ventilation with heat recovery and solar heating,
- Solar cells to produce power for pumps etc.

The biological treatment plant and a storm water collection have been established to avoid use of groundwater. The biological treatment plant cleanses the washing and rinsing water to drinking water quality before it is reused in the machines. As a part of the cleaning process, an 8.5 m^3 large aquarium with many fish and plants in it has been established for the users to look at. Other parts of the biological cleaning system also include living

b. Objectives/aims (sustainability statement – what issues of sustainability were attacked); c. Time interval and stages of project realization; d. Financing – amount, sources, institutions involved, partnerships, levels. e. Other sectors involved in the particular project/problem (conflicts and/or links)	organisms (turtles, snails, fish etc.) and different types of plants. These organisms have no functional purpose (e.g. cleaning the water), but aims to illustrate water as an element in nature b. The environmental goals of the laundry were defined as: • Not use water from the waterworks and to reuse the water from the washing machines, • To avoid disposal of sewage • That the water consumption should be reduced from 11.000 m^3 to app. 500 m^3 per. year, emissions of CO_2 reduced to app 125.000 kg per year and use of soap reduced by app. 1/3. The soap can be reduced as the rainwater used for washing is much softer (less concentration of chalk) compared to tap water, and therefore requires less soap. This would result in savings on app. 0,5 mill. DKr per year (app. 70.000 € per year). • To visualize the possibilities to care for the environment, and to include the residents in the establishment of the green laundry. c. The green laundry was completed in 2000, and the evaluation was made in 2002. However, the evaluation caused the owner to improve the laundry, therefore it is both finished and ongoing. d. The project was financed by support from the Green Fund (a national fund), the Urban Ecological Fund in Copenhagen and Valby Bydel (a local council representing the district (Valby) where Folehaven is located) e. The project relates to the energy sector (use of renewable energy and consequences for energy consumption when water management and water equipment is changed locally) and the blue-green sector (recreational and educational use of water).
3. Description of tool	The Green Laundry was evaluated with an "ad-hoc" method, containing the following points: Functionality: Quality of the washes (how clean do the clothes get?) Water quality Technology Environment: Water consumption and quality Energy consumption and CO2 Unwanted contaminants Smell Economy: Savings (compared to "as expected") Running costs (compared to "as expected") Savings on running (how much is due to the "green" parts?) User satisfaction: Washing quality Function / Social effects Process: Preconditions Documentation and gathering of experience Managing of unexpected problems The evaluation was to assess whether these pre-defined goals were reached. This was made through quantitative measures (for instance water reduction, costs, use of soap, water quality) as well as qualitative (for instance, how clean the clothes get, the social effects etc., which was mainly based on statements from the residents)). It was a precondition that only existing data were to be used in the evaluation, i.e. the evaluation did not intend to make further measuring of the green laundry. However, as there was actually rather few data, the evaluators had to do a lot of extra work to collect the necessary data. This was especially for data on electricity use in the laundry and the number

	of washes in the laundry, which are rather essential data for assessing the environmental benefits of the laundry.
a. Character (according to WP3final0704.doc) - calculation tools, process tools, assessment methods, generic tools, simulation tools, guidelines, framework tools, schemes, indicators and monitoring, checklists, case-specific tools; b. Availability of the tool (web-based / paper, paid / free, etc.) c. Based on existing tool or newly elaborated; d. Adaptation of the tool to the local context (are there local experts involved in tool's development?) e. Other tools implemented to support the project development	a. evaluation, designed for the specific case. b. The evaluation was financially supported by the Green Fund, under the Municipality of Copenhagen. The evaluation report is available for free (in Danish only, at http://www.3b.dk/nyheder.htm) c. The evaluation method is based on the general experience of the evaluator, and therefore newly elaborated. d. The evaluation was designed for the specific case. e. The laundry was also evaluated in "The poster-exposition", a presentation and simple evaluation of different green projects, carried out by the independent organisation, The Ecological Council (an independent Danish environmental organisation). It basically emphasized that the actual (measurable) environmental improvements gained by the laundry was more due to "traditional" efforts (such as changing washing machines to more environmentally friendly models), than to the spectacular "green" parts of the project (i.e. the local cleansing and recycling of waste-water).
B. Tool implementation	
1. Argumentation for choosing the tool a. What were the reasons for the implementation of the tool? (voluntary or requested by what local, national, etc regulation) b. Who took the initiative for choosing /elaboration the tool? c. What were the criteria for choosing the tool? d. Was there knowledge of other tools and were they considered?	a. The decision of evaluating the laundry came from the administrator (3B), as several preconditions for choosing the green laundry were presented to the residents. b. see a. c. The evaluators had not considered certain tools for the evaluation. Designing the evaluation was not considered a difficult task, and did not represent any barrier or problem, therefore the incentive to find certain evaluation tools was not very strong. Using for instance an LCA-assessment (as for buildings, BEAT 2000) would hardly be appropriate for this case, and more general tools would probably be not specific enough (Lading Architects, interview). d. see c.
2. Barriers for the tool implementation What were the main problems in the tool implementation? (Regulation, information available, public awareness, lack of clear SD definitions and benchmarks, communication etc.)	A main problem for the evaluation was that little data was available. No systematic data collection had been made since the project started.
C. Influence of the tool on the decision-making process	
1. Description of the decision-making process/ procedures	The environmental assessment is based on imprecise measures, as the consumption of water and electricity in the old laundry was not measured (only the number of washes), and also not measured separately in the new renovated laundry. Therefore, the evaluation to some extent had to be based on estimates. The main conclusions of the evaluation were: *Functionality.* Generally, the plant does not function optimally, and there are still unsolved problems; this includes too high pH-value and salt concentration. *Environment.* The sludge contains environmentally damaging substances LAS (Linear Alkylbenzen Sulfonat) and NPE (NonylPhenolEthoxylater). It is uncertain where they come from, but it could be due to residents using other types of washing powder than the eco-labelled ones that the functionality of the laundry was based on. The first year the water consumption has been reduced from 30 to

	13m^3 per day, which is far more than expected. Most of the reductions (70%) are due to the new and low-consuming washing machines, 22% are due to use of storm-water and re-circulated wastewater, and 8% are due to fewer washes. However, the percentage provided by storm-water and re-circulated water has recently been increased to app. 60% of the water consumption for washing. The consultants expect that the green cleansing plant will be able to provide all the necessary water for washing in the future. According to the evaluator this will be difficult, as the washing machines uses less water, and the wastewater for recirculation therefore is reduced also. A consequence of the efficient and water saving machines is that the environmental and economic benefits of the recirculation plant become relatively smaller. The electricity consumption has been reduced by app. 10%, so the total today is app. 600 MWh. However, there has been no separate measuring of the electricity consumption on the laundry, so the 600 MWh include all the shared consumption in Folehaven (i.e. all the electricity that is not used in the households), for instance light in stairways and in common rooms. As there have no changes in these facilities – except that a coffee automat that has been installed in the laundry – it is estimated that the reduction is all due to the new laundry. The reductions are mainly due to new efficient washing machines, whereas the recirculation plant has implied an increase in electricity consumption due to UV-light, pumps and others, but all in all the net result is a reduction in electricity consumption. A part of this reduction has been reached by changing electrically based equipment to equipment based on district heating and gas. Therefore this energy consumption has increased, so that the total energy consumption today is bigger than before the renovation. The precise amount is however uncertain, as no precise data for water and electricity consumption before and after the renovation were available. Therefore the environmental benefit of the green part of the laundry is uncertain. *Economy.* The investments in new washing equipment is good, both in economic and ecologic respect. The green part of the laundry (local cleansing and recirculation of the wastewater) is however more problematic, because of the electricity consumption and the reduced water consumption of the washing machines, which reduces the profitability of the green waste-water treatment. *User satisfaction.* The users are generally satisfied with the laundry; it has apparently increased their environmental awareness, and they spend more time in the laundry. The satisfaction with the washing quality could be better, but this can also be due to a change in the types of washing powder (eco-labelled). *The process.* There have been many problems, which is not surprising as it was an innovative project. However, measures and monitoring should have been better, and a monitoring program should have been established at the outset. The evaluation recommends that the project should not be copied or repeated. The main benefits have been achieved by the traditional modernisation, changing the washing machines and other equipment to more modern models. However, it was also recognised that this is a development project, which should leave room for learning from the experiment. Along with the evaluation, the inspector of Folehaven, the administrator 3B and EBO Consult have continuously had meetings to solve problems as leaking silo and pipes, consumption etc., and to check the quality of the laundry.
a. Stages	a. The evaluation was applied in the final stage of the project (after the laundry was completed)

b. Levels (political, technical, etc.) c. Sources of information used during the dmp; d. Who are the decision-makers? e. Who made the final decision for the project implementation? Was it political or technical decision?	b. Technical level. c. Partial evaluation reports on themes, and a final report. d. The main actors were: FB (Social Housing Company), 3B (Social Housing Administrators), the local housing department in Folehaven, and the residents, EBO-consult (consultants on the biological plant), and Lading Arkitekter (evaluators of the laundry). The decision involved technical experts and the local housing politicians (chairmen and administrators) e. The social housing association FB
2. Tool in decision-making process a. At what stage was the tool implemented? By whom? (experts, politicians, etc.) b. How did the tool output influence the process (added or skipped levels/stages in the existing decision-making process, etc.)? c. Quantitative goals or benchmarks defined? (If YES, which – and what were they compared to?) d. Was the tool used to support argumentations?	a. The evaluation was carried out after the project was completed. b. The evaluation has since caused the initiators (owner and consultants) to improve the laundry, on the points criticised in the evaluation report. An action plan has been developed by FB, to follow up and improve the points criticised. In this way, the evaluation report added an extra stage to the project. However, the initiators (FB, Folehaven and EBO consult) were very dissatisfied with the evaluation report. Part of this is due to disagreements on the number of washes in the laundry, which affects the environmental assessment. As the total amount of energy and water used has to be seen in relation to the number of washes in the laundry; in case of a small number of washes, the energy and water consumption is high per wash, and opposite, in case of a large number of washes. Other disagreements are about the Grander-equipment (an equipment for alternative water treatment produced in Austria, for "revitalizing" water) that was installed to solve problems of water quality. According to the evaluators the Grander-equipment has made no difference, and has little scientific value, whereas Folehaven and EBO-consultants claim that the equipment clearly has improved the water quality. c. Quantitative data and goals were used to compare the present situation of the laundry to the environmental and economic goals formulated when the laundry was designed. Due to a lack of data before and after the renovation, the assessment is – on some points – based on estimates. Several qualitative goals were formulated; for instance the residents were promised that the green laundry would have at least the same washing quality a traditional one. This has been done by asking the users about their opinion of the washing quality (spots and whiteness on the washed clothes) in the new laundry, compared to the old laundry. d. Yes. The evaluation pointed out several points for ways to improve the green laundry.
3. Transparency of decision-making process a. How was the information of the dmp disseminated? - directly (decision makers – public) or indirectly (decision makers - NGO, PR company, etc. - public); sources of dissemination used (mass media, internet, brochure, etc.) b. How was the public involved? c. Was there a public discussion over the project and at what stage of the project development?	a. The results of the evaluation were published in a report, and were communicated directly to the initiators. b. Residents were interviewed about their views on the laundry, as part of the evaluation. c. Yes. The local residents were involved in the planning and decision procedure of the green laundry.
D. Expert assessment/analysis/comment of the tool effectiveness	
1. Assessment by tool users a. Were there measurable improvements as a result of the tool implementation? If YES, what? If no: why not? b. Were there any spun-off's or unintended consequences? c. General view on the tool? Lessons learned?	a. The evaluation has afterwards caused the initiators to improve the conditions that were criticised in the evaluation report (see C.2.b.). b. A spin-off from the evaluation was that it made the initiators carry out improvements on the laundry, to meet the critics raised in the evaluation report. The green laundry itself gained a lot of spin-off, through the attention and has helped the department and the generally positive media c. The evaluators have used the experiences from this evaluation in other evaluations: An evaluation of public supported "green"

d. Potentials for further use of the tool? e. Will the actors recommend it or use it in other cases – why / why not?	projects in Copenhagen, and on the assessment of green buildings for an architectural competition in Ørestad. The main lessons learnt from the evaluation: • There was no measuring program planned and set up by the beginning of the project. • There were too few data to complete a satisfactory evaluation • The estimation of certain data led to disagreements with the owner about the results. • There is generally little incentive for the owners to evaluate green projects. d. As sustainable projects are rarely being evaluated, there is a huge potential for using evaluations. e. Yes.
2. Reviewer's assessment of the tool (usefulness, sustainability relevance, who are the actors excluded? etc.) Suggestions and needs for further development of the tool	The case demonstrates the importance of evaluating initiatives for sustainability, and to plan for an evaluation from the beginning of the project, including a measuring program. The case also raises the questions on whether "tangible" environmental achievements as the residents' experience of the laundry, can be measured, and how? Folehaven received a lot of attention from the initiative, and the local initiators (the local board, the staff, the administrators and others) are very proud of having completed this green project, which in the long run might include a social strengthening of Folehaven. These subjects are not included in the evaluation, although it seems like very important benefits for the housing department, the business manager, the housing association and their consultants
E. Additional information on the case study available	
Websites	Homepage of the Folehaven laundry: http://www.folehavensvaskeri.dk/
References *concerning the case but also the key words or problem* (papers, articles, reports, laws, etc.)	Lading Architects (2001). *The Green Laundry in Folehaven. Evaluation (Det grønne vaskeri i Folehaven. Evaluering*).
Other sources (Interviews, conferences, discussions, etc.)	Interview with Mrs. Lena Holm Christensen, Lading Architects d. 7.10.03 Interview with Mrs. Tove Lading Arkitekter, d 9.10.03.
Contact details for further information	Mrs. Bettina Fellow, 3B Mr. Villy Sørensen, the estate committee in Folehaven