INSPIRING STORIES FROM ECOVILLAGES

EXPERIENCES WITH ECOLOGICAL TECHNOLOGIES AND PRACTICES

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Ecovillages

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PREFACE

This publication, titled "Inspiring stories from ecovillages: Experiences with ecological technologies and practices", is one of three case study-based manuals that serve as the main outputs of the "Ecovillages for sustainable rural development" project. This project aims at fostering the development of ecovillages as a more sustainable way of living in rural areas of the Baltic Sea Region. The project has been implemented by project partners from Lithuania (the lead partner), Finland, Latvia, Poland and Sweden; in addition the project has involved associated partners from Belorussia, Finland, Germany, Russia and Sweden. The duration of the project was from 2010 to 2013.

The main outputs of the project include three manuals based on case studies from ecovillages mainly from the Baltic Sea Region. This manual covers guidelines for eco-settlement practices and environmentally friendly technologies. The other two manuals focus on ecovillage establishment and governance, and ecological business cases practiced in/by ecovillage communities. The other key outputs of the project include: an online tool for socio-economic sustainability assessment (see www.balticecovillages.eu./ecovillage-sustainability-self-evaluation-test); the "Ecovillage road" virtual network for the Baltic Sea Region (see www.ecovillageroad.eu/); and recommendations for decision makers concerning the development of ecovillages.

A great number of people have contributed to the work captured in the pages of this manual. The project has involved a large and diverse pool of ecological expertise, including researchers, national ecovillage networks and ecovillage inhabitants. In the role of manual editors, we want to express our gratitude to all the ecovillage inhabitants and experts who have kindly shared their experiences about eco-technologies and practices, either as authors of stories or in their role as interviewees and informants. We also want to thank the authors of the case studies from the country teams of the 'Ecovillages' project who have participated in the making of this manual.

The contents of the cases and stories in this manual are the sole responsibility of the authors and reflect their experiences and opinions. The cases and stories are not intended to be read as technical specifications describing in detail how to install or implement a given technology or practice. Instead, they are illustrative and inspirational in nature. Hence, even though the information reported herein is believed by the authors to be reliable, we offer no guarantee with regards to its accuracy or completeness.

We gratefully acknowledge the financial support from the European Union (European Regional Development Fund and European Neighbourhood and Partnership Instrument). As a project partly financed by the "Baltic Sea Region Programme 2007-2013" of the European Union, the project's funding comes from several sources. In addition to the major contribution from the EU, contributions to the total budget of the project were also made by funding from various sources in the project partner countries, so we wish to thank all of them as well.

We wish our readers inspirational moments with the stories! For further inspiration and information about the project, please visit the project homepage at www.balticecovillages.eu.

Helsinki, November 2013
The editors

INTRODUCTION

THE QUEST FOR MORE SUSTAINABLE WAYS OF LIVING

All over the globe, we are witnessing multiple forms of exhaustion. Nature is exhausted, largely due to our unsustainable use of natural resources, energy, and food. And we humans and our societies are showing signs of exhaustion, not just physiologically but also socially, economically and psychologically (or spiritually). These predicaments are related, since humans' detachment and distance from our immediate environment is increasing in many regards. Generally we are divorcing ourselves from nature, from other people and cultures, and then even from our human-made environments and from ourselves. In other words, and in the vocabulary of the sustainable development discourse, we are faced with a quest to regain the balance between the ecological, socio-cultural and economic dimensions of sustainable living. In this quest we may learn and benefit a lot from the experiences of ecovillages.

Ecovillages are communities which aim to bring the three dimensions of sustainable development together into a holistic, ecological way of living. They seek to reduce the ecological harm generated by human living practices and 'technologies', preferring to create solutions that would enable and foster a thriving, diverse ecology (in the broad sense of the term). So ecovillages function as living laboratories for ecological innovations, developing sustainable solutions with regard to issues such as construction, energy sources and use, waste and waste water management, agriculture and food production, transport and consumption.

SUSTAINABLE SOLUTIONS FROM THE ECOVILLAGES IN THE BALTIC SEA REGION

This manual presents merely a sample of the wide range of ecological innovations collected and documented from the ecovillages of the Baltic Sea region. The sample does not (and cannot) represent an exhaustive or complete list of the multiplicity of ecological technologies and practices found in ecovillages in the area. The intention was not to collect a sample of 'best practices' that could function as a 'blueprint' for establishing a successful ecovillage. Instead, this manual intends to present an inspiring range of real-life stories and descriptions of eco-technologies and practices as told by the inhabitants from many kinds of ecovillages – large and small, old and young, loosely and tightly knit, ideologically committed and uncommitted, and so on. In this vein, the cases in this compilation are designed to give the reader an overview of the diversity of ecological innovations with which challenges of sustainability are being tackled. As such, they are designed to serve as sources of inspiration, insight and food for thought in our acute quest for more sustainable ways of living.

ECOLOGY

Established uses of the word 'ecology' refer to holistic systems: viewed as consisting of interactions and interlinked processes among organisms and their environment, these work together to sustain life and 'make systemic sense'. For example, Gregory Bateson, an anthropologist who was one of the pioneers of ecological thinking, referred to 'the patterns that connect' living beings and processes to each other and to their environments (see e.g. Bateson 1980). Teaching these patterns in a way that makes ecological, systemic 'sense' is not a simple task: "[Y]ou cannot learn to dance by merely reading a book. You must also have the actual experience of dancing, which the book necessarily leaves undescribed. It is practice that enables you to put the pieces of instruction together to form patterns." (Bateson & Bateson 2005, p. 163.)

References:
Bateson, G. (1980). Mind and Nature. A Necessary Unity. New York: Bantam Books.
Bateson, G. & M. C. Bateson. (2005). Angels Fear. Towards an Epistemology of the Sacred. New Jersey: Hampton Press (Published originally in 1987 by Macmillan).

READER'S GUIDE TO THE MANUAL: GET INSPIRED!

The collection of examples and stories of technologies and practices presented here is designed to cover essential themes and aspects relevant to ecologically sustainable ways of living. The manual covers the following:

- Planning and design of the ecovillage area
- Building
- Energy solutions for households and settlements
- Waste water management
- Dry toilets
- Composting, recycling and ecological consumption
- Food production
- Transport and commuting

All these themes are important for an ecologically sustainable settlement; this is especially so if the settlement wishes to pursue maximum self-sufficiency and perfection as an ecologically sustainable system (including e.g. minimization of the ecological burden in terms of transport and commuting needs). The individual chapters and case studies may, of course, be read separately and independently, depending on the reader's interests and preferences.

The selection and composition of the case studies was based directly on the experiences of the 'practitioners' themselves: that is, the inhabitants of ecovillages. Each case originates from a real-life context and most of them come from an ecovillage or ecosettlement context. These ecovillage contexts are described in the next section of this manual. Reading these ecovillage descriptions together with particular case studies will enable the reader to form a tangible and – hopefully – inspiring view of the Baltic Sea region ecovillages' variety, particularities and creative innovativeness, on the one hand, and similarities, familiarity and respect for tradition on the other.

In the selection of the case studies we have paid special attention to the characteristics and particular features of the Baltic Sea region in terms of factors such as climate, nature, natural resources, culture, history and infrastructure. For instance, North European climatic conditions make it particularly important to apply ecological construction and energy solutions such as resource-efficient, nature-friendly heating and insulation technologies. Furthermore, we have selected examples of both small-scale and large-scale eco-technologies and practices. Small-scale solutions may be tailored for a single household use, whereas large-scale solutions may be technologies or practices that cover several households or the entire ecovillage. Similarly, we have included examples of eco-technologies that are rather easy and simple to install and use ('low-tech' solutions) and also examples of more complex and more 'high-tech' solutions (which are typically also more expensive). With this we hope the manual will provide inspiration to all readers, regardless of their needs, situations and user requirements.

The manual and the 'lessons learned' are primarily addressed to people who have been 'infected' by these ideas and are considering (or have already chosen) an ecovillage environment as their lifestyle context. However, the manual is also written in a way that does not presuppose any previous knowledge or firsthand experience of the issues involved. So we hope the manual can also reach out more widely as a source of inspiration to anyone interested in searching for ecological solutions to housing and living issues, wherever they live. As many of the interviewed ecovillage practitioners emphasized: Sustainable living necessitates practice, experimenting and learning by doing! Start searching for inspiration and for the appropriate solutions to your particular situation and needs. Explore, experiment and then, when things click into place, spread the word on sustainable solutions and practices!

DESCRIPTIONS OF THE ECOVILLAGES

All the inspiring stories in this manual come from ecovillages in the Baltic Sea Region. Short descriptions of these ecovillages and stories from each context are listed below.

FINLAND

Kangasala Communal Village

Kangasala Communal Village is located in the municipality of Kangasala, in a rural landscape, 4 km away from the municipal centre. The nearest major city is Tampere about 20 km away. The site of the village is rented from the municipality by a real estate company in which all the families are shareholders. The real estate company then rents out the building plots to its shareholders. The land consists of 1.9 hectares of building area and 2 hectares of field. In the field the village has its vegetable gardens and waste water treatment system.

The construction of Kangasala Communal Village started in 1997 and the last of the nine residential houses was finished in 2004. In the village there is also one common building which includes the heating plant and a room for hobbies and meetings. Construction was carried out according to guidelines agreed by all the residents beforehand, satisfying high ecological standards. For example, all the households have dry toilets. The houses and the common infrastructure were mainly self-built by the residents, who included architects and professional builders.

At the moment 14 adults and 18 children or youth live in the village. Many of the residents work from home in their workshops. The common infrastructure is maintained together by voluntary work sessions or by shared shifts. As well as the ecological principles, doing things together with joy is an important value for the villagers. They do not arrange public events or actively participate in ecovillage networks but they do want to be a living example, helping to change general attitudes and make them more favourable towards sustainable lifestyles based on collaboration.

Contact: www.yhteiskyla.net/index_en.htm, op@arkinor.fi

Stories from this ecovillage:
· Utilization of recycled building materials
· Dry toilets indoors – a common system in the village
· The eco-concept of Kangasala Communal Village

Keuruu Ecovillage

Keuruu Ecovillage.
Photo by Pirta Ala.

Keuruu Ecovillage was established in 1997. As of January 2013, Keuruu Ecovillage was home to 31 people from 0 to 73 years of age, with seven of them under 17. Keuruu Ecovillage is located about 280 km north of Helsinki in the countryside, some 8 km from Keuruu's municipal centre, which has a few thousand inhabitants. Keuruu Ecovillage is a communal residence and an organic farm; a place developed for learning and experiencing sustainable lifestyles. Recycling, sorting waste and composting all function efficiently at the ecovillage and 100% of its electricity and heat energy comes from renewable energy sources. The idea is to create the most interesting village community and most self-sufficient local economy possible.

The Keuruu Ecovillage site used to be a private farmstead – one of the oldest in the region. From the 1920s on it was owned by the state, it then had different uses and the last previous use was as a refugee reception centre.

Keuruu Ecovillage now owns an area of 53 ha, of which 25 ha are agricultural land and 17 ha forest. There are many different kinds of buildings in different conditions. They were built during different periods: the oldest are more than 150 years old, the youngest were built in the 1980s. At the moment there are four residential buildings. For common use there are plenty of different spaces indoors and a canteen equipped for 100 people. Keuruu Ecovillage association owns the farm and the buildings and Keuruu Ecovillage co-op runs the business. The GEN Europe General Assembly was held at Keuruu Ecovillage in 2009.

Contact: www.keuruunekokyla.fi

Stories from this ecovillage:
· Waste sorting, material recycling and the 'exchange room'

Vihti Ecovillage

The Vihti Ecovillage is a small, newly built settlement area located close to Nummela, the population centre of the municipality of Vihti in the southern part of Finland. It is an ecologically oriented settlement area consisting of detached and semi-detached houses. The majority of the settlement consists of conventionally built houses, but there is an ecological sub-area consisting of seven ecological housing projects which have efficiently realized the principles of ecological construction and living (five are built and two started). The first inhabitants moved to this ecologically built sub-area in 2010. Currently all of the inhabitants of the ecovillage are families, but there are also some elderly individuals actively involved in the ecovillage project and planning to move in in the near future.

The 'Linnanniittu cooperative' is a voluntary body for inhabitants who want to facilitate and participate in the joint ecological solutions and initiatives. However, the actual decisions concerning individual construction solutions are made by each house's inhabitants. The ecovillage cooperative was founded in 2006.

Contact: www.vihdinekokyla.fi

Stories from this ecovillage:
· A heat-storing low-emission fireplace system

GERMANY

ZEGG (Zentrum für experimentelle Gesellschafts-Gestaltung) Community

ZEGG was founded in 1991 by members of an intentional community which had started in 1978. The name stands for Zentrum für experimentelle Gesellschafts-Gestaltung: Center for Experimental Culture Design. ZEGG is located near Berlin on 16 hectares of land with 30 buildings, large and small. Most of these are brick and between 50 to 100 years old. The facilities on site include: meditation room, village pub, artists' studios, workshops and the "Children's Building", as well as a guesthouse and range of other rooms and facilities for seminars.

Considering itself as a living and learning centre, ZEGG currently has 100 members experimenting with cooperative ways of living and working together. Members co-own a limited company which is the owner of the property. Focussing on social, spiritual and ecological issues, the community sees itself as a living experiment for the establishment of new and deeply sustainable ways of living. As well as the ecological imperative, these new ways of living also need to be created in order to support inner growth. ZEGG brings these two aspects of change together.

The large communally run seminar centre passes on experience and knowledge by means of four large annual festivals with up to 400 participants, several community trainings and numerous seminars. These offer a space for new experiences in the area of love, community, communication and creativity. Additionally, guests have the chance to come and work alongside members, learning about gardening, permaculture and soil improvement and providing a direct and tangible experience of community in action.

The ZEGG community stands for an ecological way of living. Practical examples include the CO2-neutral energy supply and a closed water cycle with its own plant-based sewage treatment. In a two-hectare garden, fruits and vegetables are grown according to organic agriculture standards. Composting and other soil enhancement play an important role here on soil which is glacial sand with a very thin layer of humus and with less than 600 mm of annual precipitation.

Contact: www.zegg.de, www.zegg-forum.org

Stories from this ecovillage:
· Retrofitting technology: Foam glass perimeter insulation and cellulose fibres for walls and roof
· Energy efficient heating of warm water and houses and electricity from renewable resources
· Reed-bed wastewater purification system for an ecovillage
· Healthy soil restoration

LATVIA

Camphill Village Rozkalni

Camphill Village Rozkalni.
Photo by Mia Saloranta.

In 1999, the Neimani family and their friends returned to Latvia from an ecovillage in Norway in order to start developing their Camphill Village Rozkalni into a farm-based community. The village and farmstead are located about 135 km from Riga, or 25 km from the district centre Valmiera, in Burtnieku novads, Rencenu parish. Rozkalni provides a home for adults with various degrees of mental developmental disorders and special needs, such as Down syndrome; in this context, farming and handicrafts are daily therapeutic activities for its residents. The first special needs resident arrived on 17 May 2000, and the farm presently provides a permanent residence to 12 young people (up to 26 years old) with special needs. All told, there are currently 20 people living in the community, including two social therapists, two voluntary aides, a rehabilitator, and two farmhands.

The total area of the community is 43 hectares, 40 of which are manageable land and three of which house the two family homes of Rozkalni: one a thoroughly renovated country log building for eight, and the other a newly constructed building for eleven completed in 2002. This new building is an eco-building made of straw, wood and clay. The main activities of the farm include biodynamic agriculture and the breeding of hens, ducks, geese, goats, and cows.

Contact: www.camphillrozkalni.lv

Stories from this ecovillage:
· Constructed wetland and flowforms for sewage treatment

Ecovillage “Dziesmas” (Songs)

“Dziesmas” ecovillage is located in the Indras parish of Kraslavas County, near the border to Belarus. It lies some 35 km from the county centre Kraslava and about 300 km from Riga.

The development of the village started in 2007 with the purchase of 300 hectares of land. The plan was to divide the area into 1.5-ha plots and to provide an opportunity for new inhabitants to buy the plots of land.

In year 2011 three plots of land were bought. One family lives in the ecovillage permanently; they have completed the construction of their house. A second family is building their house and has prepared temporary accommodation in the ecovillage common area. The third land owners have started constructing a sauna from straw and clay. These two families live in the ecovillage in the summer periods.

There is one common house in the "Dziesmas" ecovillage, which was renovated with the help of all the ecovillage members. The house is a place for common meetings, activities, cooking etc. During the summer period, the ecovillage members generally spend the nights in tents around the common house, but there is also a possibility to sleep inside. The ecovillage members celebrate birthdays, name days and calendar festivals together and also organize joint work. In the future it is planned to set up a camp for young mothers with children.

Contact: Marks Leidmans – e-mail: mark@cra.lv

Stories originating from this ecovillage:
· Designing a sustainable single-family household

Ecovillage Zakis un Citi Zveri

The ecovillage of Zakis un Citi Zveri is located in Sece Parish of Jaunjelgava County 111 km from Riga. It was registered as an association in 2009 and is a cooperation partner of the association "The Green Order – House of Fairy Tales "Undine" in Jurmala. The aim of Zakis un Citi Zveri is to preserve and reinvigorate fairy tales, ethical values, national customs, healthy ways of life, respect for life, and fair and creative work for its country and people. The ecovillage of the association covers an area of 65 hectares, 13 of which are agricultural land that has been gradually freed from bushes and shrubs. The remaining land is woods, swamp and a bosky clearing. At present there is one farmstead (that of the founders) on the land, with a residential house, a greenhouse and a pottery workshop. In the near future, a craft centre will be constructed, and later a community building and around 10 individually located farmsteads are planned. Though additional farmsteads will be built by newcomers, all property will remain property of the association. Currently, two families live permanently in the ecovillage.

The association also has plans related to the improvement of the land for farming, fishing and forestry, as well as the organization of a nature park within the bounds of the ecovillage.

Contact: Inguss Zalitis – e-mail: undine@undine.lv

Stories from this ecovillage:
· "Sketch and Match" - a spatial planning method used for ecovillage and eco-area planning

Jaunpiebalga eco community

This eco community involves a widely dispersed number of individual farmsteads whose unifying factor is their members' desire to live closer to nature. The community area covers two parishes – Zoseni and Jaunpiebalga – and is located 140 km from Riga and 60 km from Cesis on the picturesque and hilly Vidzeme Upland. The river Gauja with its many creeks meanders for 15 km, dividing the parish.

The most active residents of the territory have developed the Jaunpiebalga eco community, consisting of six isolated rural farmsteads located in both parishes. Members are mostly newcomers to the area who relocated from cities. Some of them already started to farm 20 years ago and bought farmsteads with old residential and farm buildings and a mix of arable land with forest. The buildings were reconstructed and life was organized for permanent residence with a

strong integration in local society and organization of joint activities. The participants of the eco community hold meetings, practice the old trades and handicrafts, organize various events in the territory of the parish, and practice giveaways or barter on a regular basis.

It is characteristic of the Jaunpiebalga eco community for its residents to share or exchange goods, food, crafts, ideas, services and activities within the community and with others. For example, the residents of the community helped with construction of a dome house and constructed a stove for the house's owner.

Educational enthusiasts in the eco community have established the School of Environment, which provides home education to children and lifelong education for everyone. In the future it is planned to establish premises for the School of Environment in the territory of "Silini", near the dome house.

Contact: Alvis Zukovskis – e-mail: vabolnieks@gmail.com

Stories from this ecovillage:
· "Sketch and Match" – a spatial planning method used for ecovillage and eco-area planning
· Dome Houses – Example of the benefits of a dome shape
· Storage and preservation of foodstuff

LITHUANIA

Ecovillage close to Vepriai

An as-of-yet unnamed ecovillage is situated in Ukmergė district, near the village called Vepriai, 20 km away from the town of Ukmergė. Ecovillage residents have been practising natural farming methods in their own fields in this area for six or seven years. The experimental kitchen gardens are intended to satisfy the needs of residents and also to further develop the principles of natural farming. Two small straw houses of approximately 20 sq. m. in size are situated in the village, which is 4 hectares and includes land, forest and two ponds. The ecovillage is small, occupied only by two young families who own their homesteads and live according to the 'kin's domain' concept. Almost all inhabitants are highly educated in various fields, though the professions they have obtained are not used in their daily life. One of the ecovillage residents earns his living by organising and leading seminars on natural farming. The inhabitants are all former city dwellers who have moved to the countryside seeking a good, joyful, rich, free and happy life. Since the village is based around individual homesteads there is a possibility for several more families to settle down nearby in the future.

Contact: Laimis Žmuida– e-mail: zmuida@gmail.com

Stories from this ecovillage:
· Green moss roof
· Natural farming

Ecovillage Šventasodis

Ecovillage Šventasodis began development just recently. In February 2012, 48 hectares of agricultural land was bought in the district of Trakai, 25 km from the capital Vilnius. The name Šventasodis was given by the residents themselves, who envision the establishment of 17 homesteads of 1-5 hectares each. The creation of Šventasodis Ecovillage was initiated by a few residents of Krunai Ecovillage who had a wish to pursue more strict ecological living requirements—one example of which is the lack of access to the public electricity grid.

At the moment, five families are building parkways and planting orchards and vegetables as the days go by quietly and unrushed. Each family is managing its own business according to their

own cycles, financial capabilities, and so forth. Most works are performed during a "working bee": a session of organised communal work where the residents help each other.

The village is comprised of a diversity of ages, educations, religions and experience. It has been developed as a settlement of individual 'kin's domains', where each family tries to maintain their land as a self-sustainable ecosystem, construct houses from natural materials, produce food using permaculture principles, preserve natural heritage and follow strict ecological living requirements.

Contact: Ingrida Žitkauskas (initiator of Šventasodis) – e-mail: zitkauskas@yahoo.de

Stories from this ecovillage:
· Life without electricity

Voskonys eco-settlement

Voskonys eco-settlement is located in Vilnius district, near Voskonys village, 35 km away from the capital. Three young families spend all year here and seven more live there for the summer period, since they have not built houses for the winter yet. There are three finished houses in the territory, of which two are built of straw. The settlement site is 20 ha; each family has 1-2 ha of their own. Almost all of the residents have higher education; the majority of them were town dwellers but moved to the countryside to look for better living conditions. The settlement was established in 2005 when current residents commonly bought a land plot and later divided it into smaller units. They are willing to host several more families wishing to live according to the pulse of nature and create their individual kin's domain.

Contact: Jonas Kačerauskas – e-mail: jonas@siaudinukas.lt

Stories from this ecovillage:
· Straw houses

POLAND

Ecovillage "L.A.S." – Local Alternative Society

Ecovillage "L.A.S."—Local Alternative Society—near Lublin, Poland, was founded in the 1980s and in 1996 joined the Global Ecovillage Network (also known as GEN). L.A.S. is not strictly an ecovillage, in that it has no formal character. It is rather an artistic, ecological federation of settlers who have escaped from the cities with the desire to live closer to nature. Summers are spent outdoors caring for the garden, cultivating food and stocking up the pantry for winter. During autumn, firewood is gathered, and winters are spent at home sitting by the fireplace. Life at L.A.S. is conditioned by the rhythms of nature and its changing seasons—it is not defined by the rush and frustration of urban life. The cost of living is also proportionately lower, as at least a portion of the members' food is self-produced.

The society constitutes over 20 families spread across 20 km of the Kozlowieckie Forests, which are located in the district Lubartów near Lublin. Families live in their homes, interspersed amongst the local population. Although there is no special place for visitors to stay, it is estimated that the village receives over 100 guests per year (from both Poland and many foreign countries) who stay as guests in private houses. Several hundred participants arrive for an annual festival "Peace Days" in Dabrowka. Local inhabitants are willing to join the common activities and they also take part in workshops or meetings. L.A.S has a good working relationship with the local community, with whom goods (e.g. seeds) and assistance are exchanged. Locals are also welcome to participate in the festivals, activities, workshops, and meetings of the ecovillage.

For instance, the village has founded an association, "For Earth," that arranges meetings concerning local ecological problems and environmental protection and organises educational actions that raise

the ecological awareness of the inhabitants and local residents. The village also hosts many guests and volunteers who take part in different workshops such as: ecological construction basics, permaculture, music, making musical instruments, and building simple devices for solar water heating.

Contact: www.dlaziemi.org

Stories from this ecovillage:
· Rotunda outbuilding made of straw bales
· Garden solar shower
· Natural biological waste water purification system for one household

RUSSIA

Big Stone ecovillage

The ecovillage was named Big Stone in summer 2005 but its history had already begun in 1992. Sociology researchers Antonina and Ivan Kulasov decided to live in the countryside and moved into their patrimonial house located in the Vologda region (90 km from Vologda city). They were inspired by the idea of ecological lifestyles and since then they have been experimenting with beekeeping and organic farming, including cereals, vegetables and berries.

Big Stone represents a trial of a particular concept of an ecovillage: a kind of transitional step from city life to country life. There is only one family in permanent residence there with about 20 'seasonal residents' who love country life, share environmental ideas, and regularly come to Big Stone to take part in seminar programs. The events organised by Big Stone ecovillagers include celebrations of Solstice and Equinox in traditional Slavic style (with a lot of dances and singing) and training courses on edible and medicinal wild herbs. The seminars are conducted both in Big Stone and in other ecovillages. The Kulyasov family also conducts environmental and ethnocultural research on environmentally friendly lifestyles in Russian traditional culture, reviving traditional practices and technologies used by our ancestors in everyday life and promoting them for using in ecovillages, villages and even in cities.

Contact: www.ecobs.ru

Stories from this ecovillage:
· Natural eco-friendly detergent: Lye made from ash

Ecovillage Grishino

Ecovillage Grishino.
Photo by Ansa Palojärvi.

Ecovillage Grishino was established in 1993 by a group of enthusiasts in the old village of the same name in Podporozhie district in the northern part of Leningrad region. Located 320 km from St. Petersburg, the nearest town is Podporozhe. About 5-6 families live in Grishino permanently. Since its founding, the ecovillage has also operated a seminar and training centre. Dozens of seminars and courses on topics such as culture, environment and personal development have been held, alongside festivals, workshops, celebrations and informal meetings with the "Friends of Grishino". This all contributes greatly to promoting the ideas of ecovillages and eco-friendly countryside lifestyles. The ecovillage has developed infrastructure for hosting seminars and other guests.

Grishino has been a member of GEN Europe since 2005. In the same year the ecovillage initiated the Russian network of ecovillages, which remained informal until 2011 and then

formalised itself as an NGO. Grishino is very active protecting the surrounding forests from being felled. It has also developed its eco-ethno path: Grishino inhabitants strive to learn and revive the cultural heritage of their ancestors, crafts and timber-based construction skills, methods to maintain a balance with the environment and the harvesting, cultivation and usage of herbs. Most of the ecovillagers grow organic vegetables for their own use and to feed seminar guests.

Contact: www.grishino.org

Stories from this ecovillage:
· Growing potatoes under hay
· Ivan Chai – A fermented herbal tea made with wild willowherb

Nevoecoville ecovillage

The Nevoecoville ecovillage was created in 1994 as part of the "first wave" of Russian ecovillages during the period of Perestroika. It is located in the Republic of Karelia, 20 km from the Karelian city Sortavala (not far from the Finnish border). About 10 families live there: 23 adults and 17 children. Of these, only 17 people live in the ecovillage all year. The ecovillage exists in the form of a union of individual households. Community life is formed by the neighbourhood, common projects and celebrations. The ecovillage is open for rural tourism and has ambitious plans of developing further, including the establishment of a centre for educational and cultural eco-tourism. All the houses in the village were built by their owners. They have one common house which they built for hosting events. Two architects living in Nevoecoville built a small Christian chapel. Many of the Nevoecoville houses are painted with the natural red-earth paint we have described in this manual.

Contact: http://nevo-ecoville.narod.ru

Stories from this ecovillage:
· Traditional natural paint
· Production of humus with vermicompost

SWEDEN

Charlottendal farm and ecovillage

Charlottendal farm and ecovillage is located just outside Järna, a small satellite town of Stockholm. The 35 hectares of land was bought 15 years ago by one of the families now living there, and today the village consists of six apartments, one kindergarten and three tourist apartments. Permanent residents of the village include twelve adults and three children, where most adults are fifty years or older. The housing cooperative has built four of the village's apartments, as well as some of the commonly owned structures (e.g. the toilet, washing room, sauna etc.). The ecologically conscious infrastructure of the village fosters a more sustainable lifestyle for its inhabitants, but no specific rules of conduct are set by the housing cooperative. The social organisation is fairly loose, though some common tasks are divided among the villagers.

Charlottendal residents are generally outgoing, and they make an effort to involve the wider community in the village and its different transitional activities—the village kindergarten and the oft-used seminar room are evidence of this ambition.

Contact: www.charlottendal.se/charlottendals-gard

Stories from this ecovillage:
· Producing and selling solar power to the grid

Kampetorp Ecovillage

Kampetorp was established about 15 years ago by a group of 10 or so friends from Gothenburg. The village is located on 10 hectares of land in the west of Sweden, near Strömstad and the Norwegian border. Today the village consists of five large households, a few community buildings and several temporary construction trailers. The land is owned by an economic cooperative, which then rents land to its members. Kampetorp has seen a high resident turnover over the years mainly due to the difficulty of finding work in an area so far from a major city, and few of the original members remain. Kampetorp strives to create a more socially and environmentally conscious alternative to mainstream society, while also trying to influence others to follow its path. To live in the village, one is required to take part in meetings and work-weekends that are arranged a few times a year to address communal issues and common property maintenance. Recently a permaculture garden was started by one of the participants and several other small projects are being worked on. There is also an annual summer festival at Kampetorp that attracts hundreds of people every year.

Contact: http://kampetorp.se/

Stories from this ecovillage:
· Solar power off grid electricity system

Suderbyn Permaculture Ecovillage

Suderbyn Permaculture Ecovillage.
Photo by Mia Saloranta.

Suderbyn ecovillage is situated on Sweden's biggest island, Gotland, 8 km south of its major town Visby with a population of approximately 30 000 inhabitants. One family bought the property and the land of about 5 ha in 2008, and a further 5 ha are rented. Two associations are based in the village, one economic association which now owns the land and the property and one NGO promoting Suderbyn and its ideas externally.

Suderbyn aims to apply permaculture principles in all its activities, spanning from the purchase and planning of the property to the forest and annual gardens and the practices of daily life. Since the beginning the population has slowly grown and at the moment there are about 15 inhabitants. The majority of the inhabitants are young; around half are Swedish and half from other European countries. Many are long-term volunteers, organised via European Voluntary Service (EVS); there are 8 employees working part-time in different international projects. The village has been strongly involved in the revival of the Swedish Ecovillage Association (ERO) and is also an active member of GEN Europe. The ongoing ambition is to create a living and working space with a minimal ecological footprint and to be an active advocate of sustainable lifestyles on Gotland, nationally and internationally.

Contact: www.suderbyn.se

Stories from this ecovillage:
· Planning an ecovillage according to permaculture principles
· Biochar urinal
· The early phase of a permaculture forest garden
· Mulching
· Car-pooling

PLANNING AND DESIGN OF THE ECOVILLAGE AREA

Establishing a new ecovillage often begins by planning the village area together. How much and what kind of planning is needed depends, among other things, on how vulnerable the nature and the landscape is, how much new infrastructure has to be constructed, and the official planning regulations in the region. Of course, residents-to-be should conceive their village together, but some help from outside experts can also be very helpful.

In planning the ecovillage area there are plenty of things that should be considered when the goal is to establish harmony with nature and the best possible habitat for humans. It is important to examine the topography, soil, vegetation and fauna, ground and surface water, the sunny and shady places, and the winds of the area. Next it is essential to clarify construction needs: where is a new building necessary and which existing structures could be utilized. In addition to the placement of the dwelling houses and common buildings it is also important to plan aspects such as: requirements for roads and paths, access to clean water and treatment of wastewater, sites for common infrastructure such as heating or power plants, and situating of gardens, farming land and livestock.

The aim of the planning is to create a milieu in which people enjoy living and where the buildings and cultures are placed appropriately according to the natural conditions, with a minimal damage to the terrain and nature.

In addition to these basic principles mentioned above, permaculture doctrines are sometimes used in planning ecovillage areas and their popularity is growing. In some places some other principles have been used to place the buildings, for example the energy lines of the Earth. In the “Kin’s Domains” settlements built according to ideas in the Anastasia books, there is a kind of loose village structure based on self-sustaining 1-hectare plots of land for each household.

Overall, the physical structures of ecovillages vary a lot. Many factors play a role: how the village was born; how the land is owned; whether infrastructure is centralised or not; whether the residents want to live close to each other or have their own peace and quiet; does the community aim to produce its food self-sufficiently; and so on. Large communities may even consist of smaller units which all have their own character.

A jointly implemented planning process is an essential part of establishing a new community. It helps to engage the community members in their common project. When the plan is on paper it helps when applying for official permits and forms the guidelines for the development of the village. in the future.

”SKETCH AND MATCH” – A SPATIAL PLANNING METHOD USED FOR ECOVILLAGE AND ECO-AREA PLANNING

Ecovillages Zakis un Citi Zveri and Jaunpiebalga, Latvia

Eco society work-group for development of self-subsistent eco-region Jaunpiebalga. Photo by Lasma Grišāne.

The Latvian ecovillages are mainly in the process of development or even planning, meaning that the ecovillagers must take many important decisions regarding the development of their ecovillages and their purpose of operation, the social and economic viability, the directions of regional and environmental development, the lifestyle of their inhabitants, the location of infrastructure, the sources of income generation, the principles for management of land and buildings, and more.

Ecovillages being developed in Latvia can be divided into two types. One type is the ecovillages which are or will be developed in a compact territory as densely populated villages on one large site. The second type is made up of ecovillages which are or will be developed as “eco areas” combining several farmsteads or households located separately in a wide area, perhaps spread through a parish or even a region. This second type could also involve villages as an important part of the eco area: as service providers, markets, cultural and educational infrastructure centres, etc.

In order to study the economic and social viability and plan the activities of the residents during any further development of the eco area and ecovillage, the “Sketch and Match” method was used in both types of Latvian ecovillages. It is an intensive method of work for planning the territory’s resources and development directions, events, projects, tasks and functions to be completed together with the inhabitants of the territory. The authors of the method are the lead specialists of the Government Service for Land and Water Management of the Netherlands, who have founded an academy for implementation of the method’s application (Sketch and Match Academy).

Characteristics of the planning method “Sketch and Match”

The method was initially applied in the ecovillage Zakis un Citi Zveri, which is a “compact site” type of ecovillage and then in the ecovillage Jaunpiebalga, which belongs to the “eco-area” category.

Work in the ecovillage Zakis un Citi Zveri

Work with the residents of the ecovillage took place during a one-day visit.

1. During the first part of the day, the residents of the ecovillage and the method experts expressed their wishes, possibilities, own skills, available resources, the future visions, the history of use of the compact territory, cooperation with their neighbours, the self-government, etc.
2. As a result of these discussions the strengths of this ecovillage were listed. For example: it can provide itself with agricultural products; residents have experience with dome house construction: there are timber materials for construction and for other needs like fences, heating and household needs; there is clay for ceramics and construction; they have activities for children – drawing and ceramics classes.
3. After some conversations, the residents of the ecovillage indicated the locations of all the named places and objects on the territory’s map.

4. Then the visual inspection of the territory took place, visiting all the locations and discussing how and if the planned ideas and needs can be implemented.
5. After the visual inspection of the territory, the list of options for the ecovillage was developed. For example, development of the natural farms in cooperation with the Nature Foundation (breeding of wild agricultural animals, growing of agricultural products, development of trails / paths / gardens, observation of wild land and river animals, fishing, etc.); development of observation platforms for the wildlife in marshy areas.
6. The work results from the whole day were summarized and visually put on the sketches, including site maps and photographs, taking the subsequent development directions of the ecovillage Zakis un Citi Zveri further.

At the end of the joint work on planning the development of the ecovillage, all materials, including the sketches, were given to the residents of the ecovillage for further work on implementation and supplementation of the ideas, project development and attracting financing for implementation in the coming years.

Work in the ecovillage Jaunpiebalga eco-area

Work with the method took a complete day in Jaunpiebalga. It was implemented similarly to the day in the ecovillage Zakis un Citi Zveri. Ecovillage activists invited the area's main stakeholders, including employees and management of the local government. Everyone took part in a working group to discuss and come to an agreement on the potential options of development and needs of the county's territory and the activities of the eco-area within it. The main emphasis was placed on cooperation and defining the common idea and projects for the development of the whole territory. The key idea was that the eco-area can develop only along with development of the whole county and only if the ideas are implemented in cooperation with all inhabitants.

During the process of work, the working group identified the positive and negative matters of their territory, marking their location on the maps. Then the inhabitants shared their ideas and envisioned the ideal situation in the territory, coming to a common agreement that the operational territory of the ecovillage or eco area should be economically, socially and culturally self-sufficient. The eco area should achieve national recognition as an Eco County with all its eco products, eco services and eco environment.

At the end of the joint work on planning the development of the Eco County, all materials, including the maps and sketches, were given to the management of the eco-area and county for further work with the implementation and supplementation of the ideas, project development and attracting investment for implementation in the coming years. Using the list of tasks developed in the working group, the participants of the eco area took an active part in searching for funding. It is mainly the Latvian Rural Development Program co-financed by the European Union (especially the LEADER initiative), which supports the project ideas for development of such areas and provides finances to the NGO operating projects in areas. Some examples of the list of works created in the working group are:

1. Foundation of the cooperative society of organic farming with the joint processing unit of the local agricultural products, cold stores, kilns and catering (kitchen) in one of the old buildings of the parish, including reconstruction and the mobile equipment for various processing and food production activities;
2. Management of organic or ecological product shops or stands in existing local shops;
3. Organisation of lectures, seminars and demonstrations on the topic of "Landscape Design for a Courtyard and the Centre" to improve the landscape of a courtyard provided for the interested parties;
4. Creation of some stork nests and other bird houses along the streets and highways to Jaunpiebalga.

User experiences

The feedback obtained from the people involved provided a very positive overview of the method application and results obtained. The especially positively minded people were the inhabitants of Jaunpiebalga eco area. During a short time, approx. 4 hours, they gained a new perspective on a large area, established eco thinking as the development direction and had lots of ideas for its development in a way where the whole society cooperates together. People came to agreements about common problems, necessary changes, a list of projects and a way of acting together. The potential results could be evaluated within the next 3 years, when some ideas should be implemented and people will be able to better assess the usefulness of the method.

The best conclusion made by the working group participants was that the working process did not allow domination by high-ranked people such as the municipality management staff or managers of NGOs, etc. The method pushed everyone to be in similar positions with similar rights for open opinions. Everyone involved discovered there were many development possibilities in their own area that they did not know about. In particular, the municipality management staff were especially surprised, benefiting from a lot of ideas, clearer ideas of available human resources, and lists of tasks with deadlines for their area development and the application of eco ideas for a better life in the whole municipality.

Author: Daina Saktiņa

Further information:
· Information on the results of the application of the method: www.lvan.lv
· Consultations on the application of the "Sketch and Match" method: Daina Saktina, Dr.oec, Latvian State Institute of Agrarian Economics, e-mail: daina@lvaei.lv

PLANNING AN ECOVILLAGE ACCORDING TO PERMACULTURE PRINCIPLES

Suderbyn Permaculture Ecovillage, Sweden

Permaculture is a branch of environmental planning that takes a holistic approach to designing systems for agriculture and human settlements. At Suderbyn, a permaculture approach was used throughout the planning process. First a year-long careful study of the property was made to understand its natural features and behaviour over the course of the seasons. After that, a zone and sector analysis was made, which is a permaculture practice for dividing the property into areas to be utilised in different ways, depending on their distance from the house as well as characteristics such as soil quality and biodiversity. Based on this analysis, a vision map was drawn where features of the property are described in a long-term perspective.

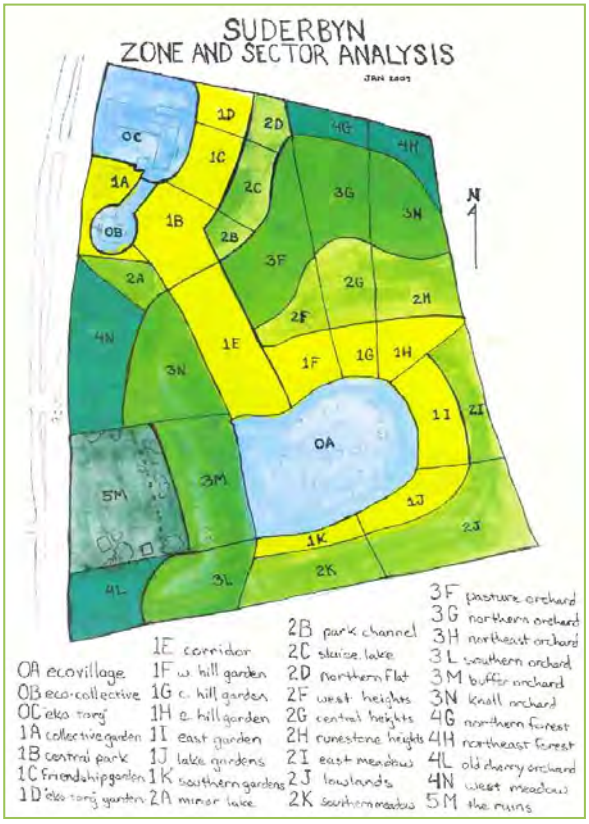
The planning of Suderbyn Permaculture Ecovillage

According to permaculture principles, when coming to a new site with the intention to start any kind of activity, one should study the site carefully before making significant decisions. The property of Suderbyn was bought in the summer of 2008 with the intention to create a permaculture-inspired ecovillage. The decision to buy the chosen property can also be traced back to permaculture system thinking where several aspects were taken into account, including access to school and work and the natural assets to be found on the property. The 5-hectare property is located in a rural area just 8 km outside Visby, the only major town on the island of Gotland. Being within bicycle distance from Visby was an important factor in the decision making, since it enables easy access both to and from Visby and limits the need for car driving. The property is rich in wind, sun, good soil and pastures. The windy conditions are both a problem and an

advantage that was taken into account. Overall the property was considered to be suitable for the development of an ecovillage. Since a forest was lacking on the property, a 5-ha parcel close to the property was later leased to get access to wood.

After buying the property the attributes of the land were investigated more closely. Characteristics of the wind (directions, strength, temperature etc.), water (the water supply depending on season, movement of water etc.), wild animal life (which animals, quantity, behaviour, natural habitats etc.) and soil features (quality of soil, depth of soil layer etc.) were all carefully examined over the first year to get a thorough understanding of the land. Historical maps of the property noting soil quality and settlement patterns also added to the picture.

After getting a better understanding for the natural fluctuations and characteristics of the land, the next step was to make a zone and sector analysis of the anticipated ecovillage. When using the zone and sector analysis the property is first divided into sectors going out from the house. Then the zones are specified based on topography, soil quality, other natural features and buildings. This is an iterative process and the sectors and zones usually have to be re-drawn several times so that the areas correspond to the natural characteristics of the land.

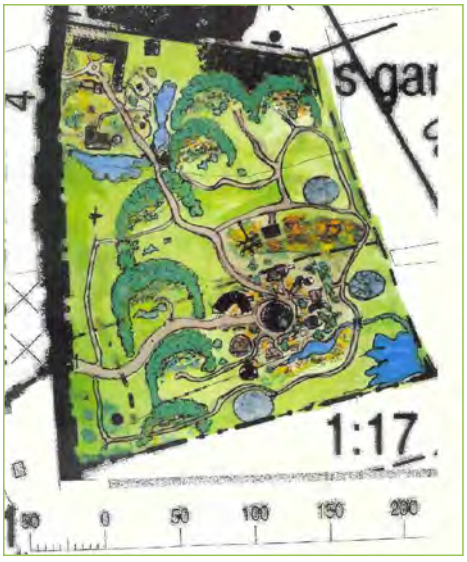


The zone and sector analysis results in a map that divides the land into different areas depending on their characteristics, from zone 0 to 5. Source: Suderbyn Ecovillage, drawn by Robert Hall.

On the sector and zone analysis map of Suderbyn the three living areas are indicated with 0A, 0B and 0C. A is the planned ecovillage area today still covered by a thin layer of grass, wildflowers and trees on an almost soil-free limestone sheet, but where an extensive building project is being planned. B is a fairly large farmhouse from 1834 and C is a big barn, both originally found on the property. “1” indicates zones very easy to access from the living area and which are imagined to be accessed daily. On the map, zone 1 includes paths between the living areas and the road, and dictates the logical placement of kitchen gardens that require a lot of attention. “2” indicate areas almost as accessible as “1” zones but where less activity is planned. On the map “2” indicate areas for pasturing, ponds and leisure activities. Today the zone 2 areas are also used for animal keeping that requires daily attention. “3” indicate zones less accessible but still near the living area. These areas are meant to be where the basic crops are being grown. In Suderbyn’s case these zones are where the forest garden was planned and later installed. “4” indicates areas less accessible and less appropriate for food production. These areas are partly wild and partly managed. On the map “4N” has fairly poor soil conditions, is adjacent to a main roadway and is the windiest area on the property. Therefore it was planned to be the location of wind power production and is still untouched for that purpose. In a permaculture settlement at least one area should be kept wild and free from human intervention. In the zone and sector analysis these

areas are indicated by 5. They don't necessarily have to be remote but should be a place for meditation and reconnecting with nature, as well as for learning from natural ecosystems.

Later, based on the results of the zone and sector analysis, a vision map visualising the future ecovillage was made in January 2009. On the map it is shown that the imagined ecovillage is the focal point where all human activity is centred. It is closely embedded by the kitchen gardens, with the pathways beaming out from it. The future ecovillage is still in its planning stage, but the intended building location on the map has not changed. Meanwhile, all the inhabitants are living in the northwest residential area, which today hosts two additional houses. The ponds and the horseshoe-shaped walls that are framing the forest gardens were built in the late spring of 2009, almost one year after that the property was bought. The small circles on the map are dome-shaped green houses. Today the village possesses one of those, located not far from the point where the northernmost of them is found on the map.



The vision map is based on the zone and sector analysis. The gardens are placed in close proximity to the housing areas and the forest gardens around the anticipated ecovillage. Ponds for animals and irrigation are also marked out. Source: Suderbyn Ecovillage, drawn by Robert Hall.

Permaculture values

- Care for the earth
- Care for the people
- Return the surplus

Permaculture design principles

- Observe and interact
- Catch and store energy
- Obtain a yield
- Apply self-regulation and accept feedback
- Use and value renewable resources and services
- Produce no waste
- Design from patterns to details
- Integrate rather than segregate
- Use small and slow solutions
- Use and value diversity
- Use edges and value the marginal
- Creatively use and respond to change

Suderbyn's historical context

Interviewee is Robert Hall, one of the founders of Suderbyn and an active member of GEN-Europe.

The idea of starting an ecovillage project had been a dream since the end of the eighties. From that time we've visited many different ecovillages and done a lot of research in the fields of ecovillages and permaculture. One of the main inspirations for Suderbyn is the permaculture forest garden Holma in the south of Sweden that we visited several times. In Holma forest garden, which started in 2004, they've built 60 cm high horseshoe-shaped walls to create a beneficial microclimate for the plants. Our idea was to replicate these sun traps and expand the idea at Suderbyn with a growing area ten times larger and with 2 m high walls, as well as to integrate the forest garden with a permanent living area.

Along with the planning of the ecovillage, which started long before the property was acquired, we sensibly created connections to the permaculture movement. For instance we attended a work camp in July 2007, which with its strong connections to the permaculture movement in the south of Sweden renewed our relationship with Esbjörn Wandt, the main initiator of Holma forest garden. Later, in September 2008 we attended the Nordic permaculture meeting where we presented the vision of the ecovillage. At the meeting we raised awareness of ecovillages in permaculture circles and here it was also decided that Esbjörn Wandt and three other well-known permaculturists from Sweden and Denmark were going to organize a course at Suderbyn later that autumn with the theme "What is permaculture and how should it be applied at Suderbyn?" Through the course, with a total of 16 participants, we got expert inputs as well as more people involved in the planning process. We offered the participants to either pay with cash or with our own invented currency "kufiska grivna". Some chose to pay with "kufiska grivna" which they could convert to other goods and services we needed which was a way to get people further involved in the ecovillage. This aspect to involve is important for us, both ideologically and practically, since we want the development of the ecovillage to be an open public process and it also creates useful connections outside the inhabitant group of the village.

For anyone planning to start a permaculture ecovillage I would recommend to acquire some knowledge in permaculture beforehand and also to meet and talk with experienced permaculturists and to share your ideas with them. In the case of Suderbyn, the development of the ecovillage was funded by the EU LEADER programme to a large extent. It's certainly possible to start a project with less financial means but it's a good idea to investigate the possibilities for getting your project funded. I would also recommend using the same procedures as we did. The zone and sector analysis is a great tool for planning the area. Another advice is to not be too impatient to start, but to begin with thorough observations of the place during different seasons. To design the project well initially is a great advantage in the later stages of the project.

Author: Kalle Randau

Further information

· E-mail: info@suderbyn.se

· Book about permaculture: Mollison, Bill. (1988). Permaculture. A designer's manual. Tagari Publications.

References:

· Holmgren, David (2002). Permaculture: Principles and Pathways beyond Sustainability. Holmgren Design Services, 2002.

· http://en.wikipedia.org/wiki/Permaculture [accessed at 27 June 2013]

· http://deepgreenpermaculture.com/permaculture/permaculture-design-principles/4-zones-and-sectors-efficient-energy-planning/ [accessed at 27 June 2013]

BUILDING

When building new houses in ecovillages the aspiration is to use renewable, healthy materials and to create practical, comfortable, long-living buildings which use as little energy as possible. Aesthetics has an important role in the buildings, not only for an enjoyable living environment but also because people take better care of beautiful buildings.

Using natural building materials such as wood, clay, straw, reed, green roofs and flax or wood fibre has many benefits: some of them can possibly be sourced near the building site; the ecological footprint of the house will be minimal; the indoor air quality is excellent (when structures are correctly implemented!); repair is easy; and in the end the materials biodegrade. Using recycled materials reduces the amount of waste and saves non-renewable resources. Non-breathable materials like plastic and synthetic paints should not be used in eco-buildings.

In our climate, heating is the factor with the highest contribution to a building's energy consumption. The size and the shape of the building as well as the insulation, windows and technical devices in the house all have an impact on its energy consumption. Retrofitting is important to save heating energy in old buildings. In all constructions the structural details have to be designed and carried out carefully in order to avoid heat losses. It is useful to apply passive solar energy by incorporating large windows in conservatories and south-facing rooms. Modern ventilation technology with heat recovery can save energy but it may also bring some problems. The equipment requires regular maintenance, otherwise it can pose a health risk if the indoor air becomes contaminated. Last but not least, energy source used for heating (renewable or non-renewable) also makes a big difference when estimating the total ecological footprint of the building.

Eco-builders often want to use natural building materials combined with traditional, proven constructions and "low-tech" solutions, which is wise. Nowadays increasingly stringent energy regulations for buildings make the implementation of natural buildings, even traditional log houses, very difficult or sometimes even impossible. This is unfortunate because both the eco-builders and the regulators have the same target: saving natural resources and reducing CO_2 emissions.

Could ecovillages be forerunners in fulfilling this aim by showing how we can make high-quality, ecologically sustainable and healthy houses by building ourselves and using alternative solutions?

STRAW HOUSES

Voskonys eco-settlement, Lithuania

Straw bale building is an old, wantonly forgotten construction technique that can contribute solutions to many modern-day problems: environmental pollution is diminished, natural resources are not wasted, and microclimates remain free of chemical pollution since straw bales allow houses to breathe naturally. Beyond that, straw bale houses comply with all modern requirements for residential buildings and are made of exclusively natural materials - straw, wood, and clay. All these reasons make straw, a completely natural and renewable resource, an excellent building material that is woefully underutilized in modern contexts.

Straw bale house at Domantas Surkys ecovillage. Photo by Živilė Gedminaitė-Raudonė.

Straw-bale building methods

Straw houses may be constructed by using several different techniques: load bearing, frameless post-and-beam, timber framed, and straw bale panels. Though straw is used as the main construction material in all the above methods, each has its own advantages and disadvantages, and requires a different level of professional knowledge and skill. Thus, before deciding which building technique to use, it is necessary to consider them all carefully.

Load bearing, also called "Nebraska"

This technique is named after the place where it was invented and developed. Using straw bales for building frameless houses means that the weight of the entire roof is borne by the bales themselves - there is no other structural framework. In this method, straw bales are tacked down to a base and bound together with hazel twigs. The roof is then constructed directly on top of this base of straw bales. Windows and doors are simply framed and mounted during the process of building by embedding them into the straw bale walls in wooden frames: in other words, when the wall being built reaches the appropriate height for a window, the frame is put in place and construction continues around these frames. The walls are then plastered with clay, as is the requirement for all straw bale houses. Though the height of the walls may slightly change over time, the better your straw bales are compressed at the start, the less likely this is to happen. The load the roof can bear should be determined beforehand by performing the necessary calculations: in areas with heavy snowfall this can be an important factor.

This building method is considered the simplest since it does not require too much know-how or time. Much of the work involved can be performed communally.

Advantages:

- simple, easily implemented method;
- easy to draw a design, even without a strong background in construction;
- easy to obtain arched forms of the house;
- well-suited for people who are building a house themselves; the most inexpensive version of straw-bale building;
- building is carried out quickly.

Disadvantages:

- straw must be kept dry during the entirety of the building process;
- area of windows and door should not exceed 50% of the total area of any wall;
- maximum unsupported (unbraced) length of the wall is 6 meters.

Building a straw house.
Photo by Domantas Surkys.

Basically, this building method requires: a) a certain knowledge of how to work with straw; b) a dry, well-protected storage area for the bales; and c) a lot of hard manual labour.

Lightweight frame and load bearing

This technique was developed by Barbara Jones, an English architect of straw houses. It has almost all the advantages of frameless building while supplementing them with a basic frame that allows the roof to be mounted before starting construction on the straw bale walls; this protects the straw against moisture. The timber frame used for the building is too light to hold its own weight during the building process: for this reason, additional temporary braces are needed to help hold the frame in place until the walls are filled with straw. In the final construction the straw and the wooden frame complement each other to reliably bear roof loads, making for a durable construction.

Advantages:
- the roof is constructed before starting work with the straw bales: this protects the straw against moisture;
- the wooden frame and temporary load-bearing supports can be constructed in advance;
- a higher stability of windows and doors than in frameless buildings is ensured;
- significantly less timber is used than in traditional frame houses.

Disadvantages:
- more complex building when compared to Nebraska technology;
- more technical knowledge is required for the building of wooden roof-retaining supports.

This building method requires: a) a certain experience working with wooden frames and straw bales; b) a dry, well-protected storage area for the bales, and c) a lot of hard manual labour.

Infill building (also called post-and-beam or timber frame)

This technology is, in principle, similar to traditionally constructed houses, the difference being that here the wooden frame is filled with straw bales instead of other materials (the straw bales are pressed directly to the frame). This technique is especially favoured by architects since it relies on established construction methods. In this case, the entire weight of the roof is supported by the wooden framework. This option requires a high level of technological expertise and calculations; experimenting is restricted by strict structural requirements.

This is a technique is best suited to building modern versions of ecological houses, mainly due to the fact that natural materials are used for building, while the finished house complies with modern-day construction criteria.

Advantages:
- the roof is constructed before starting to work with the straw: therefore, straw bales are protected against moisture;
- the frame can be made in advance;
- guaranteed stability of windows and doors;
- verified technology.

Disadvantages:
- complex building process;
- technological expertise needed;
- utilizes more wood than the other methods;

- straw compression can be uneven if compressing straws by hand;
- utilizes more daub when plastering this type of walls.

This type of building requires: a) professional calculations and measurements of the supporting frame; b) long-term experience in building of straw houses; and c) a higher level of expense and technical resources than other straw-bale housing.

Straw panel building

Straw panels are a relatively new technique: they allow for the uncomplicated and quick building of straw houses. Straw panels can either be self-made or purchased from several manufacturers. Here we describe the use of ready-made commercial straw panel products. This technique maximizes the advantages of straw building while minimizing its disadvantages by facilitating a fast building speed with simple weather protection; the technique also guarantees the equal distribution of thermal insulation to every corner of the house.

Plastering the walls of a straw house. Photo by Domantas Surkys.

By placing straw into the panel in a commercial setting, the compression of straw is unified and amounts to roughly 120 kg/m^3 on each 40-cm thick panel—this compression ratio is preset by the manufacturer, ensuring consistent quality in the end-product. The surplus straw is then cut by special mechanisms so evenly that when plastering the panels, only half as much daub is used compared to plastering other straw surfaces. Afterwards, the prefab product is transported directly to the building site and mounted onto a prepared base. The panels themselves are not very heavy (their maximum weight is 200 kg), so they may be raised manually without costly hoists. Panel building is also special in that no additional frame is required beyond the wooden panel frame that supports the roof construction; this saves precious timber resources.

This type of building also complies with the standards of a modern ecological house; mainly natural materials are used for the actual construction (straw, wood, and clay) and finishing allows for the same aesthetic options found in the construction of typical houses.

Advantages:

- straw panels are made in advance;
- fast mounting at the building site: ca. 100 m^2 wall area may be mounted in 1-2 days;
- the special building structure allows panels to be conjoined without any special mechanisms or tools other than a drill;
- formation of cold bridges is avoided and houses are remarkably warm: during the process of conjoining panels, the edge of one straw panel is compacted with the edge of another one, which provides an exceptionally leakless seal that maintains the integrity of the building;
- solves the issue of filling up hard-to-access spaces with straw (i.e. spaces around windows and above doors, at house corners and at the top rows of the wall);
- easy plastering due to the even surface of the panels;
- stable building.

Disadvantages:

- the straw panels must be kept dry throughout the whole building process until plastering has taken place.

When constructing from high quality products such as prefab straw panels, the risk that straw may be incorrectly placed or packed within the house is nearly null; therefore workers do not require long-term experience in straw building.

General characteristics of straw houses

Thermal resistance. Straw houses are characterized by especially high thermal resistance. Research results show that the heat transmittance coefficient of the wall that is filled with compresses straw bales and plastered with daub from both sides is 43-54 percent less than the standard set for walls of residential houses.

Durability of buildings. Time and again it has been shown that duly built and maintained buildings of compressed straw bales stand for 100 years or more. There are many examples of this, especially in the USA.

Fire safety. Tests have proven that buildings with walls made of compressed straw bales and plastered with daub or other non-flammable materials comply with all fire safety requirements for residential housing.

Sound insulation. External walls made of compressed straw bales insulate very well against sound; they meet the highest acoustic comfort requirements (sound absorption class A).

Hygiene and health. Straw bales must be compressed during the dry season and stored in a well-ventilated area free from humidity and dampness to avoid fungi spores and rot. For the same reason, when installing plumbing and water pipes, use only high quality supplies and accurate, professional installation. Also be sure to seal all walls well with daub during finishing for maximum protection; internal layers especially should be impermeable to smoke or vapours to avoid both noxious smoke in case of fire and the build-up of condensation. In order to protect straw bales from rodent infestation, be sure to cover all exposed straw with reinforced daub and/or panels on both sides; straw from winter crops, especially rye, may be less susceptible to infestation. Always use well-threshed straw.

Finally, to comply with regulations for ecological building materials, straw cannot be taken from crops that were sprayed with herbicides or other chemicals before harvesting.

Experiences from building and living in a straw bale house

The interviewee is Jonas Kačerauskas, who moved into a self-built straw bale house with his family in 2007.

There is a place near Vilnius that is becoming well known for its straw bale house; people come here out of a sense of curiosity to see it and chat with the owners. The building is unique, not only because it is constructed of straw and daubed with clay, but also because of its round shape. Jonas Kačerauskas, the owner of this ecologically-minded house, has said that the inspiration to build this house came to him when his son was born, as he and his young family yearned for an independent life. He had first heard of the straw bale house as a participant in a book club where they read books by V. Megre. Though his first project was a square house on wheels, thoughts about its shape kept haunting him. He had read somewhere about of the energy different shapes engendered—at one end of the spectrum, squares engender a neutral energy, while the more round something is, the more positive it is. He liked the idea of roundness, of the feeling of everything existing in one place. Then he found the ideal location, a message whispered by nature itself: a circle of clovers demarcated the boundaries of where the house now stands.

With these plans in mind and pressed into action by the birth of his son, Jonas began the construction by researching on straw and cutting timber at the sawmill. He began alone but was soon joined by others in order to raise the frame. Straw was harvested from a three-hectare plot and transported 100 km to the building site, where it was manually baled and pressed. However, the bales from the press were 1.1 m bales and the designs had been based on 1.3 m bales, so everything had to be adjusted manually. After the bales had been conjoined to form the wall, there were initially a lot of gaps resulting in poor insulation and an unsatisfactory appearance.

After this initial summer-time construction phase, the family moved into the house for its first winter but had to put up with frost penetrating the gaps in the walls, floor, and roof. They searched

incessantly for a solution but, as Jonas says, finally God told them to stop and come back the following year. They made plans to repair the home in the spring. Since the floor had been made from loose straw rather than bales, it was necessary to redo and seal it—walls, too, were plastered with clay daub to solidify the home, and the roof was laid with laths chips. Future plans include an additional layer of rye straw. J. Kačerauskas plans to grow the straw for the roof himself. He also knows an old man who knows how to thatch roofs with straw. He hopes to learn the technique in order to preserve it; he believes that becoming a specialist in these matters is something of great value.

Jonas says that despite these setbacks, the straw house has many advantages. In the first place, the home is ecological—if straw from the roof is replaced, for example, the "waste" simply decays. Second, such a house is inexpensive. Since the straw is a light-weight material, the walls of such a house can be set up within a day and the frame within weeks, all by fewer than five workers (though if you are using your own design, you will need to use intuition and logic to problem-solve any issues that may arise). Straw houses are also very warm, breathe easy, and are fire resistant and rodent-free. Beyond these basics, it's important to cultivate a totally different view toward house and home when building a straw house. As Jonas says, "I cannot imagine someone else building my house for me. It's like saying that someone else would plant my trees, or give birth to and raise my children. A man sleeping in a straw house feels as if he's sleeping in nature: there's no better place to sleep than my house."

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· The national association of building with straw bales in Germany: http://fasba.de/

Other links: www.strawbalefutures.org.uk/wp-content/uploads/sites/8/2013/02/strawbaleguide.pdf; www.buildingwithawareness.com/house1.html; www.greenhomebuilding.com/strawbale.htm; www.balewatch.com/; www.strawbalefutures.org.uk/; www.strawbale.com/; http://thelaststraw.org/

ROTUNDA OUTBUILDING MADE OF STRAW BALES

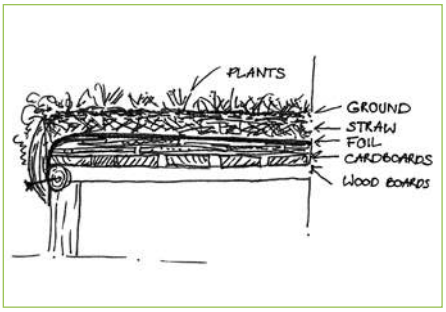
Ecovillage "L.A.S." (Local Alternative Society), Poland

One of the most important elements of creating ecovillages is the possibility to build simple, healthy and cheap houses for the inhabitants. All around the world, more and more houses are being built out of straw bales, often plastered with clay inside and outside. These houses do not need any additional insulation; they are perfect for both cold and hot climates. This article presents a small rotunda house "à la yurt", made of recyclable materials: some old wooden boards, oak pillars, a little clay, stones – and straw bales, of course.

Rotunda house.
Photo by Monika Podsiadła.

Technical description

The form of this rotunda straw house resembles a traditional round yurt. This house does not need foundations – it is built on bricks and clay, which constitute an insulation layer separating it from the ground. The area of the house is 18 m^2. Construction of the roof is based on oak posts of cross section 15 cm, which are fixed directly in the ground. 1.5-m spaces between the posts are filled with straw bales to a height of 2 m. Inside the house there is a central post with horizontal wooden poles of cross section 10-15 cm which branch off and hold the roof. The roof is built from



Rotunda straw house: green roof.
Figure by Monika Podsiadła.

a layer of wooden boards, cardboard, thick foil, and straw in form of a "mattress" on the top. You can scatter the soil over the straw roof and seed the grass or rock plants there – this way we create a "green roof".

The floor inside the house can be made of straw, clay or wooden boards. The door is made of wood, and windows are made of recycled glass placed in wooden frames.

To build a house like this with 3 people we needed around 2 weeks. Only 1 person with previous building experience was required, the other 2 did not have to have any specific qualifications.

User experiences

The rotunda straw bale outbuilding was built in 2009. It is situated in the village Pryszczowa Gora, where it arouses interest among our inhabitants, neighbours and visitors.

This rotunda building with its round (or more precisely, polygonal) shape is a place for meetings during workshops and a place for the guests; in the winter it is used as a storeroom. In the summer it is a place where volunteers sleep and when it's hot it is a great shelter from the sun. In the evenings it's so nice to come here with friends to have a cup of tea, to talk, or to meditate.

This house is also a perfect place for children playing, especially when it rains. The straw walls "breathe"; they create a cosy mood. Everybody can smell the straw inside and that evokes sound memories of comfortable sleep.

Rotunda from inside.
Photo by Mia Saloranta.

A straw yurt such as this one may also be built on a larger scale; plastered with clay it could also constitute a real, year-round house. A group of connected straw houses could be built for many different functions in ecovillages. The dream of every gardener is to have at least a small, cheap house in the garden, so this possibility may be perfect to make that dream come true.

Using the same construction basis you can also build a small house for children, a workshop, a storeroom, a sauna, or even a garage.

Constructor of the house - Andrzej Młynarczyk.
Photo by Monika Podsiadła.

The idea of building a straw house came a few years ago. In 2001 I had the opportunity to participate in a three-month course on permaculture and alternative design in the eco-centre, "Folkecenter – Thy" in Denmark. That is when I became interested in this technology and together with my friends I now propagate it in Poland. Initially, the straw house was supposed to be the place for permaculture plants as well as for people to take a rest and to meditate there. However, soon we realized that it is a wonderful workshop and meeting spot. It perfectly harmonizes with its surroundings, and at the same time it draws

attention, it "invites" us to come in. The rotunda has attracted the attention of our visitors and many of them have asked about its technical details in order to build one for themselves.

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DOME HOUSES – EXAMPLE OF THE BENEFITS OF A DOME SHAPE

Jaunpiebalga Eco Community, Latvia

The dome shape (or the shape of a full or partial sphere) has many benefits when used in the construction of buildings, either for residential or other purposes (houses, summer cottages, terraces, greenhouses etc.). The benefits of the dome shape include great strength and robustness. Dome houses offer quick construction, efficient heating and good air circulation. The dome shape provides a possibility to maximize the amount of incoming light, which can be utilized for a greenhouse, for example. Additionally, buildings with a dome shape have a smaller area of external walls than conventional buildings, which translates into lower construction costs. The dome shape is also a sacral shape; it focuses the energy onto the people in the centre of the house.

Foundation for dome house in Jaunpiebalga. Photo by Daina Saktiņa.

Example: Residential dome house in Jaunpiebalga

The example presented here is a residential dome house constructed in Jaunpiebalga community. The house is called "Silini" and is not typical for the Latvian architecture, environment or way of life. The construction tasks were carried out by the inhabitants of the house, without involvement of any professional construction companies. In the future it is planned to build some more dome houses in the territory.

This type of dome house was developed by studying environmental geometry, leading to a strong construction that can withstand variable weather conditions and serve its users for many years. These houses enable savings on heating and electricity costs and open up a wide range of design possibilities. Construction of dome houses is a sophisticated construction process. It takes three months to install a roof on the house, followed by some external work and then interior work requiring a longer period of time. The estimated cost is 12 000 LVL (c. 17 000 EUR) per 120 m² of usable area.

Dome shaped building as a greenhouse at Suderbyn Ecovillage, Sweden. Photo by Mia Saloranta.

Construction of the house "Silini" was started at the end of June, 2011. The diameter of the dome house is 10 m, its height is 5.60 m, the height of the ground floor is approximately 2.80 m and the living space is 78.5 m², the living space on the first floor is 40 m².

It is recommended to plan the construction operations for spring and summer. Beforehand, the location for the house needs to be selected and the construction plan and assembly scheme need to be

developed. The assembly scheme can be developed using a special calculator available at http://desertdomes.com/dome5calc.html.

Environmentally friendly materials are used in the construction and insulation of the walls as well as in the interior design. Typical popular materials include stone (for cellar), clay, wood, cellulose, wool, and glass, depending on the available materials in the vicinity and their suitability for the climate conditions.

Author: Lāsma Grišāne

Sources: Information for description from www.smucspainava.lv and publishing house "Dienas žurnāli" March 2012 magazine "Dari pats".

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Other links: www.domehome.com/; www.hortondome.com/dome/; www.naturalspacesdomes.com/; http://sfera-grifona.com/; http://solaleya.com/; www.domespace.com/; www.i-domehouse.com/; www.domes.com/; www.domesnorthwest.com/

CLAY FLOORING

Lithuania

Clay is a natural construction material. It is easy to work with and no hazardous chemicals (such as glues, varnish, or solvents) are needed for working or coating. Clay flooring is an energy-efficient, antiseptic and antistatic solution. It supports an optimum humidity balance, neutralizes odours and has an excellent ability to store heat. During the daytime, the floor can heat up due to the sun and during the night it then gradually gives off heat into the house. As clay is a good heat conductor, a clay floor is a very suitable solution for constructions incorporating floor heating. The flooring does not require any special maintenance and is easily repaired if necessary. What is more, by using different methods of finishing, clay flooring can become an original component of interior decoration. After consultation with a specialist, even someone without specialist construction training can tamp down a clay floor. There are merely a few finer points that need to be known.

How to make a clay floor

Clay floor and walls in a living room at Domantas Surkys eco-homestead.
Photo by Živilė Gedminaitė-Raudonė.

Clay flooring is made from clay into which gravel and different fractions of sand are added. Usage of other additives is also possible, such as straw, manure, particular plants, reed fluff and similar. Clay floor can be made on any base – the choice of the base depends mainly on the building traditions characteristic of each country. For example, granulated shells in the Netherlands or granules of recycled glass in Slovakia are used as a base for a clay floor. Everyone laying a clay floor should discover the best final recipe for the mixture themselves, since every locality is characterized by different raw materials. The clay local to any area also has its own particular characteristics that affect the type and amount of supplementary additives necessary in order to produce a stable and attractive floor.

The stages involved in producing the mixture for a clay floor are as follows:

- Dig clay soil and start tests. There are no specific requirements for the clay soil that should be used.

- Add the desired additives to the clay and prepare an approx. 1 sq m area of floor. Wait for the area to dry and monitor the results. If the dried clay cracks, the mixture is too rich; this type of mixture needs to be thinned down by adding gravel (the gravel used should have a grain size of 2 mm or less). If the mixture crumbles then there is too much gravel added. Repeat this step with trial areas, monitoring the results after drying with each new mixture.
- Generally it is enough to perform 5-6 tests in order to find the optimum amounts of additives for clay mixtures leading to a dried product that does not crack or crumble. Note the proportions used for each test area so that the mixture can be reproduced when the optimal mixture is found. Then follow this recipe during all further production of clay mixtures.

If there is no possibility to dig up clay in your locality or if you do not like to experiment, you can buy ready-to-mix clay mixtures in building supplies stores or similar outlets.

The stages of the procedure for setting up and finishing a clay floor are as follows, according to an expert from Lithuania, Domantas Surkys:

- Lay a layer with a depth of approx. 2 cm of clay mixture on a standard concrete base or another base that is preferred.
- Level the clay mixture.
- Wait for the mixture to dry. The drying period depends on the temperature inside the premises. On average it dries in 2-3 days; in humid premises it may dry in a week; if floor heating is installed it may dry in one day.
- Spread white clay plaster as a finishing layer. (Prepared white clay plaster finishing can be bought in every European country). The thickness of this layer should be about 2 mm and it is important to spread it evenly on the floor. The floor becomes white. Let this dry.
- Spread a very thin third layer, consisting of glossy clay putty, which can also be bought as a prepared mixture. It contains very fine-grain sand.
- Grind the floor with a stone or other grinding device. Polish the floor. Then wait for this third layer to dry.
- Lubricate the floor with flaxseed (linseed) oil (you may also use other flooring oil). To do this: Heat up the oil to 70˚C. Saturate the floor with oil. Let it soak in and saturate the floor again (but do not wait so long that the oil solidifies).
- Use cotton cloths to clean up the surplus oil. The floor needs to be cleaned in this way while it is still wet, i.e. before the oil solidifies. After cleaning off the surplus oil, the floor is still solidifying for about 2 weeks. During this time it can be walked on but care should be taken to ensure that no liquids are poured or spilt on it.
- Wax the floor. After waxing, the floor is smoother and more pleasant to walk on. Bee wax or another natural wax is used for waxing the floor.
- If the floor is to be decorated (e.g. with a drawing or painting), this should be done before the oiling stage.
- A clay floor is maintained in a similar way to a hardwood floor: you should wax it several times per year.

Applications of clay floor constructions in residential buildings

Clay flooring is most often used in straw houses as this is a natural continuation of plastering straw walls with clay. However, there is nothing to stop a clay floor being laid in a house built from other materials. This idea is even useful for residents of city dwellings. Clay flooring also lends itself to situations where the floor has an unusual shape.

Some people improve the old revived technology of tamping down the floor by saturating it with flaxseed oil and polishing it with natural wax. Others colour their floors with natural pigments. Afterwards they grind the floor to obtain a smooth surface similar to marble and then decorate it with patterns. In fact, there are unlimited possibilities to express fantasy and art skills.

It is also possible to give a clay floor a waterproof surface; one method is to use a special ‘Tadelakt’ plastering method. This needs a special lime plaster that is used in Tadelakt technology,

Mandala painting on a clay floor.
Photo by Živilė Gedminaitė-Raudonė.

a special soap which comes from Morocco and special stones for grinding (for more information on the Tadelakt technology, see the weblinks in the Further information section below).

Impressions of a clay floor house

The authors visited and interviewed Domantas Surkys, developer and user of this technique:

We are visiting the straw house of Domantas Surkys and his family. As soon as you open the wooden external door, your eye turns to the floor – it seems to be made from an unfamiliar material and also appears painted. The owner, noticing our enquiring look, answers: "It is a clay floor." He claims that he was the first to lay a modern clay floor in Lithuania. It is true that this type of floor does not look wavy or dark like those you can still find in some old houses. This modern floor is light brown, solid, and reminds us of marble. In Domantas' house not only the floor but also the walls and ceiling are plastered with clay.

The floor in a hallway is decorated with gouache painting, applied before oiling. "My wife is a painter, so she and our children painted this mandala-like carpet. The paints soak into the clay so after oiling they do not rub off."

Materials for building a clay floor are cheap, but the process is very work- and time-consuming. For instance, five people ground the floor with stones. The whole process took a few weeks. The tamped-down and dried floor initially has a white clay colour. After oiling, it turns brown. Domantas claims that it is possible to create any colour of floor by using paint pigments.

View in a bathroom – clay floor, walls and a bath.
Photo by Živilė Gedminaitė-Raudonė.

Clay flooring is also used in the bathroom. This room is decorated with stones for foot massage. Although the technology of clay flooring is ancient knowledge, it does not mean that it has to be cold, as it used to be: in this house there is heating under the whole floor.

Clay plaster is not a novelty in Lithuania. In the past, Lithuanians often used clay mixed with sheaves of flax and straw for finishing walls. However, the tradition of using clay in construction had died out for some time. Domantas Surkys acquired knowledge in England and arranged a seminar with Estonian specialists and friends to gain practical skills. His search for the ideal recipe for clay mixtures lasted for two years. Now this knowledge has become a crucial element of his business and has been adapted for the construction of many houses in Lithuania.

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Further information
· Domantas Surkys, email: domas@ecococon.lt
· Website of the company specializing in clay and straw techniques: www.ecococon.lt

Other links: http://housealive.org/clay/; http://ilovecob.com/archive/earthen-floor-start-to-finish; www.dancingrabbit.org/about-dancing-rabbit-ecovillage/eco-living/building/natural-building/earthen-floor/; http://en.wikipedia.org/wiki/Tadelakt; www.boudaouchtravaux.com/tadellakt-technology-tadelakt-marrakech.htm

A special plaster that is used in Tadelakt technology can be bought here: www.kreidezeit.de/EnglischeVersion/FramesetENG/indexENG.htm

GREEN MOSS ROOF

Ecovillage close to Vepriai, Ukmergė district, Lithuania

One type of green roof is a moss roof, although this article does not present a traditional green roof but a modified version invented by an ecovillage resident in Lithuania. Green roofs are helpful in adapting buildings to their natural landscapes, insulating them from heat, offering insects and other small animals living space, and transforming solar energy and carbon dioxide into organic matter and clean air. Though a green moss roof does require thermo and hydro insulation and a rather low pitched roof, it is still easy to set up and does not require a lot of maintenance, while being light, cheap, and suitable for shady areas.

Green moss roof at Laimis Ecovillage. Photo by Živilė Gedminaitė-Raudonė.

Characteristics, installation and maintenance

Green moss roofs are planted with special live mosses, so the main criteria when selecting a live moss is having conditions conducive to its growth. Commonly, a moss is selected that can grow in sunny areas without moisture, such as those that grow on asphalt or stones. These special types of mosses, like some stone crops, are resistant to heat and shortages of water, so this type of roof requires no attention.

Advantages of a green moss roof

Other types of green roofs require more maintenance than a moss roof, such as additional watering, grass trimming, fertilizing and annual replanting of grasses. They are also more difficult to set up since they require a more rigid roof structure in order to bear the necessary amounts of earth, reinforcing nets are needed to keep the soil from sliding off and special watering systems need to be installed.

Moss, like other plants, cleans the air, generates oxygen, and serves as an environment for the reproduction of different micro and macro fauna while insulating the roof from heat and noise. As a spongy material, moss also catches harmful particles of dust while serving as a decorative addition to the natural landscape. A green moss roof is also cheap and easily installed and repaired: there's no need for specialists or a specialist's knowledge to set it up.]

Disadvantages of a green moss roof

Moss roofs, unlike other green roofs, do not have the necessary mass to act as a layer of thermo-insulation in the winters. The rain run-off from a moss roof is significantly less than other green roofs, and any water that is collected has to be filtered, since it will contain particles of organic matter and earth. Another serious disadvantage is that moss roofs require hydro-insulation, which generally utilizes non-ecological materials such as polyethylene film. These materials are more easily damaged than tin or clay tile roofing, so more care will need to be taken for such roofs, or additional layers of rigid hydro-insulation will need to be added.

Resources required in the setting up, construction and usage of green moss roofs

- First, you'll need to set up a low-pitched roof with a grade of around 20-30% - the lower the angle, the better. On the roof surface, joists are topped, then planches or planks are hammered down. Lastly, some kind of textile needs to be installed (carpet, for example).

- Next, you'll need to add the hydro-insulation. This consists of two layers of strong polyethylene sheeting. Pond liner is a good choice.
- Then a layer of sand one centimetre thick is laid atop the polyethylene sheets. This will protect the polyethylene sheets from harmful UV radiation and act as a substratum for the moss to attach to.
- Finally, cover the sand with the special moss. Simply place the chunks of moss side by side, one next to the other, without leaving any empty spaces since moss grows very slowly and rain or wind may sweep away unanchored sand.

Selection of moss

It's important to select an appropriate moss for your green moss roof. For example, a moss that grows in the forest is unsuitable because forest moss grows in the shade with a high level of humidity, so it would simply not grow on an exposed roof. Besides that, national laws that protect Lithuanian forests forbid activities such as removing moss. Other types of moss grow well in conditions similar to those of a rooftop, that is, in heat and wind. Some do not even need a layer of earth, growing directly on the stone or other surfaces that receive direct sun. These types of moss can be found in nature, on dry sands, gravel, or stones, although these also cannot be taken from protected areas. Instead, look for these sorts of mosses growing on abandoned asphalt car parking lots, on old asphalt paths, at abandoned former farms or industrial yards, and similar sites.

General tips for moss rooftops

Construct the roof so that there's easy access from the attic—this way, you'll be able to climb up and see whether there's been any frost penetration, or which areas need repair. Use two layers of hydro-insulation (i.e., pond liners) to be safe. Old carpets or other thick textile materials can be used to protect the hydro-insulation from the roof boards and to prevent condensate from accumulating between the roof boards and the liners. This will allow an equilibrium of air and condensate and help avoid decomposition of the wood in the roof. Don't heat the roof. The interior of the home and the walls may be heated, but leaving the attic wind-blown will allow the roof to breathe easier, and you won't have to worry about condensate build-up or roof maintenance; also, any repairs needed will be easier.

Rough cost estimate

In our case, setting up the roof (excluding the joists and boards) cost approximately 9 litas (2.60 EUR) per square metre. This was just the cost of two hydro-insulation films and the wood screws used in their fastening. Labour and the transportation of moss were also not included.

User experiences

Here, the user experience is described by a founder of the Vepriai Ecovillage, Laimis Žmuida.

I invented the green moss roof while constructing my own house. The initial plan called for a verdant grass roof, but after some time I realized it may not be the most appropriate option. First, for grass to grow on the roof, a great amount of soil is required. After doing some structural calculations, it seemed that constructing the roof and walls as planned would not bear the load. I also tried digging up a square meter of turf and carrying it up onto the roof. It was humid and heavy. It was then that I also realized that a lot of strength would be required to set up a grass roof. I decided that I had to figure out some other solution for the roof, as it was becoming clearer and clearer that a grass roof simply would not work out and winter was fast approaching. Since I have some knowledge of plants, it wasn't difficult to decide upon an alternative to grass which wouldn't need as much soil. That's how the idea of a moss roof was born.

During that first year, we only covered half of the roof. Since we had no examples to follow, we had to wait and see how it worked out. The wind and rain did not wash away the moss or the

earth underneath it, which was well anchored by the moss. The roof also withstood snow and ice. The following year was devoted to testing the roof's resiliency to heat: it passed this test with flying colours. To this day, our roof has served us well, requiring no maintenance whatsoever for three years of operation; as it awaits its third summer, no damages have yet been seen.

A friend of mine, inspired by this experiment, has also set up such a roof. Although he had not seen my roof nor I his, I was able to explain it to him by phone. Afterwards, he rejoiced in the results. So experiences of green moss roofs have only been positive.

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Further information
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· www.tombender.org/sustdesignarticles/mossroofs.html

TRADITIONAL NATURAL PAINT

Nevoecoville Ecovillage, Karelia Republic, Russia

Natural red earth paint is prepared by boiling the red earth according to a very old recipe which presumably originates from Finland. The use of boiled red earth paints for painting houses started in Sweden and Finland in the 16th century and became popular in 19th century Russia under the name "the paint of red village houses". The advantages of the paint include:

- It's a 100% natural, almost completely biodegradable paint that, as opposed to modern synthetic paints, does no harm to the environment or human health when applied, and produces no toxic fumes when burnt.
- It can be easily made by one person in any ecovillage.
- It is very durable: the paint can last up to 30 years and doesn't crack. In fact, it darkens and looks even better with age. As a comparison: typical modern synthetic paints applied to houses may crack, age and need to be renewed once every 15 years or so.
- It is cheaper than common commercial paints.
- It has antiseptic properties, protecting wood against decay.
- After the paint has worn out, the surface is easily re-painted.

Making natural paint in Finland. Photo source: www.luomura.com.

Basic principles of production and usage

There are many traditional recipes for this kind of "Red Ochre" paint. This is one of them. For making of approx. 100 litres of paint you will need:

A 200-litre thermally insulated barrel with cover; a hoe, rake, or similar with which to mix the paint; and a scale with buckets for weighing the ingredients.

Ingredients: 4 litres of green vitriol or copperas, 3 litres of drying oil, 16 kg of colouring pigment (red or yellow earth), 9 kg of rye flour, 100 litres of water

How to make the paint: Bring 100 litres of water to boil in the 200 litre barrel. Add copper-as (green vitriol) while constantly stirring. Then add the rye flour (it is better first to mix the flour with a small quantity of water in a bucket, to avoid clumping). Add the drying oil and keep the

mixture at a boil for about 2 hours, stirring continually. Then add the pigment; reduce the fire and boil one more hour, stirring continually. The paint should be used within 3-4 days. If you have to store it longer, add 3 kilograms of salt. This will allow the paint to keep for about 10-11 days.

Coverage: 100 litres of paint will be enough for 300-500 square metres of surface (depending on the surface).

Restrictions: The paint is not suitable for timber that is planed, pre-painted or otherwise processed. For best results, paint boards no earlier than one year after they are cut.

Experiences from producing and applying natural paint

The interviewee is Ivan Goncharov, the founder and leader of Nevoecoville Ecovillage. He has lived in Nevoecoville since its establishment in 1994.

Painting with natural paint in Finland.
Photo source: www.luomura.com.

This natural paint is used extensively in the Nevoecoville Ecovillage, as well as in other construction works supervised by their leader Ivan Goncharov, who is an architect and constructor by profession. Ivan Goncharov has made this paint by himself many times on the open fire, and his house and buildings have all been painted with it. Ivan and his colleagues from the ecovillage first familiarized themselves with this recipe at a training course given by Finnish restorers in the early 1990s. Later, he found the same recipe in an old book entitled *Russian Homestead*, published at the beginning of the 20th century. Here are some of Ivan's observations and advice.

I've noticed that the older the wood, the better the paint application and the longer it lasts. The consistency of the paint should be similar to flour paste. The paint is ready when the rake (used to stir the mixture) starts sliding easily across the bottom of the barrel. When making the paint, it is very important to first to mix the flour with a small quantity of water in a separate bucket, to avoid clumping. I usually use an electric mixer for this purpose, but it's also possible to mix this with a stick or directly with your hands.

It is important to protect painted surfaces from excessive wetness because the paint can be washed away little by little and lose its colour. So any house you paint should have good drainpipes and guttering as well.

When I need a small amount of the paint, I make it with cellulose wallpaper paste instead of flour. Then you can simply mix all the ingredients together without boiling.

For white paint, I can also recommend the following recipe: Add 250 g of Portland cement and 2 kg of titanium or white zinc to 5 litres of skimmed milk, stirring continually. After mixing well, use it at once.

House painted with natural paint.
Photo by Ivan Goncharov.

Author: L. Mirzagitova

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RETROFITTING TECHNOLOGY: FOAM GLASS PERIMETER INSULATION AND CELLULOSE FIBRES FOR WALLS AND ROOF

ZEGG Ecovillage, Germany

Here, an example of retrofitting technology is presented wherein sustainable materials have been utilized to insulate an existing building; the solution has proved to be an efficient method of energy conservation. In this case, a one-storey building of 400 m² with an energy consumption of 100 kW was completely insulated from the outside. This reduced consumption to 15 kW: an 85% reduction. This will accumulate for as long as the building exists: many years of 85% energy savings compared to the uninsulated original.

Cork insulation.
Photo by Achim Ecker.

Most of the work was done by skilled, but not professional, workers. The materials used were natural recyclables, such as glass and newspaper that had been turned into foam glass and cellulose fibres respectively. Outside we used larch timber panelling, which has the extra advantage of shielding the building from all kinds of artificial radiation. This was one benefit of many to the building's users.

How it was done?

The insulated building is used as an office building at the ecovillage. Laying east to west, the southern side of the building's roof was an eyesore and inside it was freezing during the winter and like an oven in the summer. Before the improvements, its 5-cm thick walls of compressed fibreboard with air cavities held no heat, resulting in high wastage regarding winter-time heating. For these reasons, it was an obvious choice for priority insulation improvements in the ecovillage.

The first step was replacing the "Eternit" fibre cement roofing, which contained asbestos. Then 200 m² of photovoltaics were also installed on the roof: these produce 24 kW p. The roof was insulated with 25-30 cm of cellulose fibres that were blown on to the 400m² ceiling. A couple of years later, we started replacing the old windows and aluminium/steel doors with new double-glazed pine windows and doors that were treated with linseed oil, which had been produced in the local carpentry shop.

Insulation (foam glass and cellulose fibres).
Photo by Achim Ecker.

Since we did not have the money to insulate the whole building wall at once, we started work on the northern half of the building in 2007. The old façade was removed but its carrying structure left in place: the latticework support for the new insulating layers was added over this. The vertical supports (studs) were screwed directly into the old carrying structure, which also served to balance out the unevenness of the old construction without creating "cold bridges" (where construction materials that conduct heat well pierce the thermal insulation). This approach can be used anywhere the existing wall is strong enough to hold the new facade and it is unimportant if there is old plaster falling off or old paint peeling away, for example. Windows are not framed because this could also result in cold bridges. Instead, they are screwed onto the ends of the studs. The last vertical stud of the lattice is placed before reaching the corner of the

Reed insulation on green roof.
Photo by Achim Ecker.

building since the corners are where insulation is most critical and having a stud there would exacerbate the cold bridge effect. Stability is ensured by screwing the ends of the horizontal laths together where they meet at the corner.

A breathable membrane was then placed onto the wooden studs and sealed around the edges of the windows. Later, holes were cut into the membrane and celluloses fibres were blown into the cavity (18 cm wide) between the old wall and the membrane by an expert. The holes were sealed again after the insulation was inserted. The horizontal laths of the lattice were then added over the membrane and the actual façade of larch panels are screwed into these laths.

The cellulose fibre insulation, which is made of recycled newspaper, used to need 8% borate salt added to protect it from animal infestation. This was then impossible to compost after use. Fortunately, there are now borate-free, compostable cellulose fibres available.

To insulate the floor of the building, the existing concrete foundation was surrounded by a 30-cm "perimeter insulation" using compressed foam glass gravel that extended 80 cm deep into the ground. The ecological advantage of foam glass gravel is that it's a recycled product made of used glass that does not rot or chemically react with the environment. Though it takes a lot of energy to produce, it forms a capillary-breaking layer between the soil and the foundations, so no extra plastic or tar paper is needed for damp-proofing.

Work and user experiences with the construction

After planning time, the majority of the work could be done by 3 to 4 people with normal, 'layman' construction skills: only one skilled expert instructor was needed. The insulation process is quite labour intensive but relatively low in terms of the cost of construction materials.

Green insulated roof.
Photo by Achim Ecker.

The building is currently used by close to 20 office workers and as a meeting place for ZEGG's management body and others. As a result of the insulation, the working conditions of the office environment have improved drastically.

Since there are plenty of pre-existing buildings in the world, in many cases retrofitting and insulation techniques could prove to be a more efficient and thus higher priority way of reducing energy use than the construction of new, ecologically sound buildings.

Author: Achim Ecker

Further information
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· The webpages of the ZEGG Ecovillage: www.zegg.de

Other links: www.misapor.ch (foam glass gravel); www.isocell.at/en/main-menu/products.html (cellulose insulation)

UTILIZATION OF RECYCLED BUILDING MATERIALS

Kangasala communal village, Finland

All new construction can be considered as more or less unecological because it necessarily consumes natural resources. It is therefore preferable to make use of recycled materials and building components and reused household appliances as well as natural materials when implementing ecological construction projects. This way we also reduce the amount of waste that ends up in landfill dumps. Additionally, used building materials and devices are considerably cheaper for the builder than new ones.

When designing the Kangasala communal village, a mutual agreement was made to strive to utilize recycled materials. Recycling took much more work than buying new, due to the collecting, storage, repair and adaptation of components, but the residents are pleased with the result. Houses were built at a reasonable cost and old materials give a special character to the aesthetics of the buildings.

Examples of using recycled materials: an old door and a wall made of re-used bricks. Photo by Outi Palttala.

Description of the practice

Some background knowledge about the village

Construction of the Kangasala communal village started in 1997. Almost all of the 9 dwelling houses and the common heating plant were built at the same time over a period of approximately five years. The residents had all accepted the plan of the village and the instructions for building methods. Among other things they agreed that the main material of the houses would be wood and all building materials would be chosen with respect to nature and health. Each family was in charge of the construction of their own house, whether they built it themselves or not, and since all the families were building concurrently, this made it easier to make use of recycled materials.

There is an old barn on the property which served as a good storage place for building materials after it had first been cleaned and its roof had been repaired. Generous storage space such as this is needed because recycled materials are generally collected little by little, so they have to be systematically stored and protected from the weather.

Collection and storage of the materials

Collecting the building materials needs to start before the construction work begins so they are available when you need them. In turn, it is difficult to find all the recycled materials and accessories just when you need them so the construction schedule should be flexible. It is recommended to store only the materials you know to be useful, although it is also good to collect more of some items than are needed, for example, water fittings, radiators and electronics, because this makes it possible to choose the best appliances where quality varies. Any surplus is then recycled to electronics or metal recycling yards, which may even generate a little money income.

Transportation is needed during the collection phase. One of the founding families in Kangasala communal village had a delivery van and a trailer; these were widely used. At that time, a lot of old, red-brick factory buildings were being torn down in a nearby city and apartment buildings were being renovated. This made it easy to find bricks, windows, doors and bathroom equipment from construction and demolition sites without too much searching. Mixed timber was not collected because removing the nails takes too much time. Generally it is advisable to speak with the site foreman in advance: while tearing down the building they might be willing to pile undamaged,

Fireplace made of recycled bricks.
Photo by Mia Saloranta.

intact doors and windows neatly instead of throwing them into dumpsters, which makes them easy to pick up. In most cases this is all available for free. In addition to demolition and renovation sites, you can profitably find used materials in recycling centres and at flea markets specialised in building materials.

It is practical to store the building materials according to the predicted time they will be needed. Bricks should be placed near to the site where they will be used as moving them is difficult. In Kangasala the bricks were piled outdoors; in fact, letting them become damp then made the removal of mortar easier. However, the bricks have to be cleaned and used during the same summer or sheltered from the rain: if the bricks get wet they have to be protected from freezing. Windows, doors, furniture and devices were stored in the barn. Glass needs to be stored loosely so that mould does not grow between the pieces.

The storehouse was divided between the families and each family took care of their own space. In order to maintain general order, communal 'cleaning bee' sessions were organised. The jointly owned tractor, which was especially useful in the construction phase, is also stored in the barn.

Exploitation of the materials

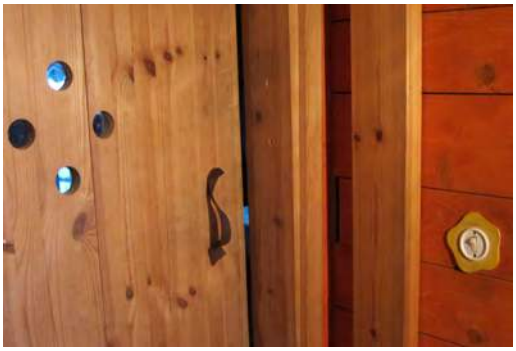
Old, cleaned bricks were used to build ovens, chimneys and partition walls in many of the houses. Jari, the village carpenter, prepared windows from recycled glass for three houses. Where useless window frames are made of impregnated wood, they have to be properly disposed of as hazardous waste. Old windows from a factory were left intact and used in the village heating plant. Furthermore, there are recycled internal and front doors, floorboards, kitchen cabinets, sinks, showers, faucets, circulating water heaters, household appliances, water- and heating meters and heat exchangers. Handles, electric switches and other small items were purchased cheaply from the flea markets.

Installation of old water fittings and equipment requires expertise and experience. Used components have to be evaluated, repaired and combined. Practically it only makes sense to use recycled components if you can install them by yourself, since then you have time to fit the components and to demolish and re-install if needed. In contrast, if a plumber has to be hired to make old components fit, economic benefits will be lost.

Used household appliances (for example stove, refrigerator, radiators) help inhabitants of a new home get off to a good start and save money during the construction phase. However, old appliances are usually not of the best energy class so it is advisable to change them later once the major construction expenses have been paid off.

User experiences

The couple Anu Pellinen and Jari Hämäläinen were among the first to build their house in Kangasala communal village. They look back with joy on the construction phase of their house and the collection of materials. Jari and his neighbour collected most of the materials because they had a van and a big trailer at their disposal. They found enough supplies to deliver them to the others too, sometimes for free and sometimes on the basis of expenses paid. Jari preferred to collect window glass, because he was able to use it in preparing windows for the houses of the village. Anu wandered around second-hand shops and recycling centres.



Recycled glass, leather strap and a light switch. Photo by Mia Saloranta.

In their own house Anu and Jari used recycled materials in a variety of inventive ways. The fireplace and some of the interior walls are built of old, variegated bricks. The kitchen cabinets were rescued from an acquaintance's renovation. The circulating water heaters, the steel kitchen sinks, the ceramic sinks and the bathtub, and the front door are from renovation sites. They also found a large amount of strong leather straps in a shutdown bag factory and used them for door handles and on drawers and cupboards. Old-fashioned light switches were bought cheaply from a flea market. The electric stove and the refrigerator were purchased second-hand. The windows are, of course, self-made, and the window glass and fittings are recycled.

The couple still thinks that the recycling was worth it even though it was sometimes laborious and some small appliance parts then had to be changed for new ones afterwards. All in all, the extra work is worth doing if you are building for yourself and if your schedule is flexible, since changing the plans has to be possible during the building process. In addition to saving money aesthetics is an important advantage: old bricks, glass, window fittings and furniture are beautiful and create a warm atmosphere. Later on, they eventually became tired of collecting and storing things, so mostly they now prefer to select and buy a new device, which is easier to install and more reliable.

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· The Kangasala Communal Village web-page in English: www.yhteiskyla.net/index_en.htm

GARDEN SOLAR SHOWER

L.A.S. Local Alternative Society, Poland

Passive devices using solar energy are cheap and efficient. They solve part of the problem of water heating (especially in the summer) and can be used for cooking meals or heating buildings. In summer, a free-standing shower using solar energy for water heating can be made cheaply using recycled materials and is easy to use. Solar showers correspond to the ecological principles of permaculture and ecovillages. With a tank capacity of 80 litres, the hot water allows you and your family to have a shower every day when the weather is sunny while saving both electricity and money. Warm shower cubicles with transparent walls standing among the greenery are enjoyable to use and bring people closer to Nature.

View inside.
Photo by Monika Podsiadła.

Construction and use

The shower referred to in this case study has been installed in the permaculture garden in Pryszczowa Gora. Several families in L.A.S. Ecovillage already use similar solutions, and others are about to install them. When constructing the shower, the guiding idea has been to recycle and re-use gas tanks from ordinary cars. In my solution I have used 2 tanks of 40 litres joined parallel to each other. You could also use one different, bigger tank of 80 litres. The original inlet valves were welded and transverse openings along the axis of the tanks were drilled to allow the water to flow through.

The tanks are connected to the home water installation by means of PEX water piping. The shower has a showerhead and a mixer tap. The tanks are placed in an insulated chest, which is tilted at an angle of 45 degrees on the wooden scaffolding to ensure that at noon the sun's rays strike the tanks at 90 degrees. Directly under the tanks there is a mirror made of polished stainless steel which additionally concentrates the sun's rays. The shower cubicle also has a "vestibule" where you can change, so you stand in a warm place before you go back into the garden.

The construction of the base of the chest makes use of recycled oil barrels which can be bought at scrap yards. They are then cut longitudinally into 4 pieces. The chest is covered with pieces of glass that are joined together, serving two functions: to accumulate the solar energy during the day and prevent its loss at night time. The whole shower cubicle is covered with pieces of glass joined together and attached to the wooden posts of the construction. Glass for this can also be recovered from recycling processes.

Cold water is delivered to the shower by means of PEX pipe from the home installation. The pipe is buried in the ground about 30 cm deep. To take a shower we just turn on the main valve on this pipe. Cold water then flows into the system, forcing the hot water already in the system to flow out through the showerhead. The new, cold water enters the tank and is warmed. The hot water tap on the hot water tank is always open to allow the decompression of hot water (or steam) in the tanks and its outflow. A cold water tap branching off from the main pipe allows us to regulate the temperature of the water reaching the showerhead. After a shower, we need to turn off the main valve and the cold water tap. Whilst taking a shower the tanks are filled with water automatically.

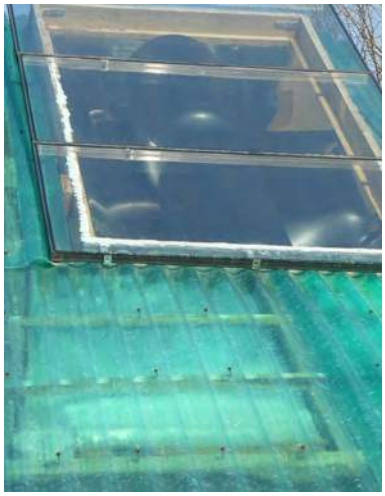
View outside.
Photo by Mia Saloranta.

Used water flows through the flooring (a simple wooden pallet is used here) and then it seeps into the ground through a bed of small stones and gravel. In fact, most of the water evaporates.

Before the first frost we empty the water from the tanks by means of a valve which is placed in the lowest point of the pipe dug in the ground. This water can be used for example for watering plants in the garden.

A garden shower like this can be built during a workshop lasting a few days if the materials are prepared in advance. Building it does not

require any special qualifications. However, a person with plumbing experience would be helpful. Material costs should not exceed 1500 PLN (c.360 EUR) if the tanks, glass, chest and other parts come from recycling processes.



Roof of the solar garden shower. Photo by Monika Podsiadła.

Experiences from the ecovillage

During the spring and summer seasons we have many visitors who usually stay for a few days or longer, and the water heating system in the house is not intended for so many people. If an ecovillage has volunteers, organizes meetings, festivals and provides courses on ecological education, for example, an additional solar shower such as this is essential. The idea for project to install an outside shower was implemented with the help of a friend from Germany. It perfectly meets our needs in spring and summer. Even on cloudy and colder days, the water is usually warm thanks to the good insulation of the tanks. Everybody who has already used such shower is delighted by its functionality and originality. Many of our guests, as well as our neighbours, are interested in garden solar showers and have begun to collect the materials they need and prepare to install it.

"Your shower among the trees and greenery is an excellent idea. It is so nice and unique that there are plants inside the cubicle. After a long day it is great to take a shower in the water warmed by the sun and under the blue sky": feedback from one of our volunteers from Canada.

Authors: Andrzej Młynarczyk, Monika Podsiadła

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FINNISH SAUNA

Katajamäki Community. Photo by Mia Saloranta.

The Finnish sauna is a place for enjoyment, socialising and relaxing, as well as for cleansing yourself thoroughly. A common sauna in an ecovillage might replace bathrooms in private dwellings, but above all it forms a warm heart for the community.

There are many traditions involved in the building of saunas and also a number of very practical construction details to be performed correctly in order to have an ideally functioning and long-lasting sauna. A traditional sauna is built of carved logs and is heated with wood. Some people consider the "smoke sauna" to provide the softest heat and steam: here there is no chimney, so the stove is fired up beforehand and the smoke ventilated out before use.

A sauna may be located in a residential building or it can be in a separate 'cottage'. Usually it includes two or three small rooms: the steam room itself, a washing room, and a dressing room, although often the steam room is used for washing, too. The water for washing can be heated

Livonsaari Communal Village.
Photo by Mia Saloranta.

in a tank connected to the sauna's stove or in a separate pot.

In a good sauna the steam room is spacious enough for at least one family to sit there together comfortably. The interior height of the steam room should be at least two metres. The most important issues in the technical design of saunas are proper damp-proofing (not needed in the traditional log construction), the right kind of wooden material for the inner surfaces, correctly functioning ventilation, and the size of the stove.

In order to have enjoyable conditions in the sauna it is necessary to have an even temperature and enough humidity in the whole steam room, with a lot of stones on the stove to ensure enough heat. The heat is at its best when the temperature of the steam room is below 70 degrees Celsius. Water is thrown on the stones frequently to maintain a high humidity. If you want to make your sauna experience perfect you should have a 'bath whisk' with you – a bundle of birch twigs – to whip yourself in the heat. After this and a subsequent cold shower you will feel as if you have been re-born.

Keuruu Ecovillage.
Photo by Mia Saloranta.

Author: Mia Saloranta

Source: www.suomirakentaa.fi/tyoohjeet/sauna/saunan-rakentamisen-perusteet

Further information
· www.sauna.fi/in-english/sauna-information/

ENERGY SOLUTIONS FOR HOUSEHOLDS AND SETTLEMENTS

Energy saving and the use of renewable energy from local sources instead of fossil fuels are the key goals of all ecovillages. It is an important way to contribute to the reduction of CO_2 emissions and climate changes. In addition, there is also a significant economic advantage for the ecovillages. In our region's climatic conditions, about half of the total energy consumption of households goes towards heating buildings. Heating of household water accounts for another 20% and the rest is the electricity we use.

Individual choices and habits can have a tremendous impact on total energy consumption: optimising the size and temperature of the living space in homes; lighting solutions (e.g. LED bulbs); or changes in our use of warm water. Renewable energy sources can be used to minimize the need for hydrocarbon fossil fuels. Even then it is important to minimize the possible disadvantages, such as fine-particle emissions from incomplete combustion in traditional wood stoves. Decentralized systems can help ecovillages to become self-sufficient in both heating and electricity. Typical sources for renewable energy are biomass, wind and solar power.

Ecovillages have often been pioneers in testing and creating innovative energy solutions for both individual houses and whole settlements.

A HEAT-STORING LOW-EMISSION FIREPLACE SYSTEM

Vihti Ecovillage, Vihti, Finland

This fireplace combines three ecologically significant solutions: a low-emission firebox; a traditional and energy-efficient heat-storage fireplace construction; and modern water-heating and circulation technology. The fireplace system serves as an ecological and efficient, yet cosy and traditional way to organise space and water heating for a single-family household. There are a number of ecological and environmental-friendly aspects. The low-emission firebox component enables an effective burning process with minimal burning emissions, guaranteeing that the emissions remain within regulations (which is often not the case for a traditional brick fireplace construction). The heat-storing, brick-built outer layer is a traditional energy-efficient technique;

its efficiency is further enhanced by combining it with a water heating and circulation system that circulates the generated heat throughout the house.

Technical description of the system

The heat storage fireplace construction and the low-emission firebox.
Photo by Ella Suhonen.

This fireplace solution is located on the ground floor of a single-family household, close to the main entrance, where it separates the kitchen from the living room. In this way there is enough room around the fireplace and the heat can radiate freely to most parts of the house on this floor. The fireplace construction covers an area of c.3 m^2 (including the conduits for water circulation, a stove and a baking oven) and stretches from the floor to the ceiling. The main part of the water circulation system is located in the cellar, underneath the fireplace. Heated water is circulated through pipes that connect the water heater (integrated into the fireplace) and the accumulator (located in the cellar) to each other and circulate the heated water throughout the house, including the upper floor. It is also possible to build the water heating and accumulator components around the firebox.

In this household approximately half of the space and water heating requirements are met by the fireplace system. The remaining heat energy needed will come mainly from solar energy collectors (under installation), leaving only a marginal proportion to be met with conventional electric heating.

The main components of this heat-storing, low-emission fireplace system:

The vents that direct secondary air to the flames.
Photo by Ella Suhonen.

- ***A low-emission fire box component.*** The ecologically innovative fire box channels part of the oxygen (the 'secondary air') through vents to the upper part of the fire box, where it is directed towards the flames at the point where emissions from the burning wood are generated. At this point the surplus air causes a secondary combustion process, burning up the emissions. The air that is needed for the primary and secondary burning process is taken in through the grating on the floor of the fireplace, and part of this air is channelled through the vents to the upper part of the fire box. This model was initially planned and designed by Finnish architect Heikki Hyytiäinen; it is currently available as a commercial product from the Finnish company Narvi.
- ***A system for accumulating, heating up and circulating water throughout the house.*** This system includes: the water heater, which is a particular kind of radiator built into the fireplace construction, close to the fire box; and the water accumulator that collects the water and channels it to the pipes that run underneath the floors.
- ***A heat storage fireplace construction.*** The fireplace construction was built on the spot with traditional brick-and-mortar masonry techniques. The fireplace construction collects the generated heat and releases it gradually to the surroundings.

Essential resources and skills required in the construction and installation of the fireplace system:

- Masonry skills and traditional brickbuilding
- Plumbing
- Electric engineering

Masoning the heat storage fireplace. The water heater component located in the middle. Photo by Ella Suhonen.

Building and use of the system

This fireplace solution is actively used in a two-floor semi-detached house, with a household of two adults and three children. In Vihti Ecovillage there is a similar fireplace system in another household as well. The fireplace system is used during the winter season (from September/October until March/April), when it is running almost daily. The family makes sure that there is always an adult present in the house when the fire is on.

Firewood for the fireplace is currently available in the immediately surrounding yard area, since many trees had to be cut down before the construction of the house. The firewood is first carried to the woodshed located in the backyard, where the wood is dried properly before it is carried to the house. Properly dried wood is crucial for the effective operation and clean burning in the fire box.

The fireplace system itself was built on the spot. Some of the components, however, were bought-in commercial products. The planning of the fireplace system was done in collaboration between the customer (i.e. the family) and the hired and voluntary experts who participated in the construction process. The actual construction and masonry for the fireplace system were realized in the form of a "masonry training camp", where experienced masons and trainees collaborated with the customer, both for the purposes of the customer's order and for training. The construction process also involved the work of hired experts focusing on the construction, tailoring and integration of the fireplace/firebox and the water circulation and heating system.

User experiences: The story of the ecotechnology

The interviewees are Marko Lehtamo, the chair of the local ecovillage cooperative, and her wife Reetta. They moved to the ecovillage in 2010, when the construction of their house was almost finished. They had already been actively involved in the Vihti Ecovillage project since the establishment of the cooperative in 2006.

We originally became interested in this kind of fireplace system based on our personal discussions with the developer of the low-emission firebox component, Finnish architect Heikki Hyytiäinen, who we got to know during the planning phase of Vihti ecovillage. We wanted to implement heating solutions in our house in a way that was ecological, traditional and efficient. This low-emission fireplace system seemed to satisfy most of these wishes. We were especially fond of the idea of having a real fire in a traditional-style fireplace construction in our house. So it was great to hear of a fireplace solution enabling us to minimize the burning emissions and also the amount of ash generated. As a matter of fact, the installation of a low-emission fire box proved to be one of the few means with which to guarantee in advance that the emissions of a traditional style fireplace remain within the current regulations. We were also happy to be actively involved in preserving the art of traditional fireplace masonry and in spreading and transferring this traditional knowledge.

When our neighbours also showed interest in the idea of building and installing a similar solution, we began to chart the possibilities and requirements needed in the construction. As a result of the active interest shown by the Finnish Fireplace Association towards the project, we started to cooperate with them. Together we organized a "masonry training camp" at the

The water accumulator located in the cellar, underneath the fireplace. Photo by Ella Suhonen.

construction sites in our houses in the Vihti Ecovillage. It involved masonry experts, masonry trainees, fireplace specialists and laypersons collaborating. The camp served both as a valuable training and knowledge transfer opportunity and as a construction site, resulting in the building and installation of two fireplace systems.

This fireplace system has pretty much fulfilled the wishes we had. With minor modifications it could even satisfy the total heat energy needs of the household. According to our experience, one of the crucial things is to take good care of the proper storage and drying of the firewood that is fed to the fireplace. A rather large challenge in fireplace solutions like this is to manage the planning and execution of the overall system, since it involves significant fitting and integration of different components and the associated expertise. It helps if you can find a neutral expert who could assist in evaluating and commenting on alternative fireplace combinations and solutions, with their pros and cons. Such experts may be hard to find but in our case all the crucial pieces of the puzzle clicked into place nicely.

Author: Jarkko Pyysiäinen

Further information

· Barden A. A., H. Hyytiäinen & A. Rapeli (1993). Finnish fireplaces: Heart of the home. Helsinki: Finnish Building Centre. (A book on Finnish fireplaces, their characteristics and construction.)

THE EMISSIONS OF FIREPLACES AND LIGHTING THE FIREWOOD

In small-scale scenarios such as the use of firewood in household stoves and fireplaces, combustion is typically incomplete. Whereas complete combustion leads to clean emissions consisting mainly of carbon dioxide and water vapour, the smoke from incomplete combustion contains high levels of fine particles, carbon monoxide, hydrocarbons and some other compounds, which are all hazardous to human health.

Emissions are higher if the firewood is damp or if any other materials not suitable for burning are used. Other conditions have an important impact as well. Hazardous emissions are lower if the combustion temperature is high enough, the air flow in the fire place is appropriate, and the combustion is controlled.

The best way to light the firewood is to light it from the top of the wood pile. This way the compounds which are easily gasified burn and give off heat efficiently. When the wood is burning well you can see the smoke becoming pale soon after lighting the fire.

The ecodesign directive of the EU (2009/125/EC) deals with the emissions of fire places. Check the regulations in your country!

Sources:
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LIFE WITHOUT ELECTRICITY

Ecovillage Krunai & Šventasodis, Lithuania

Can life without electricity be imagined within the context of modernity? Though electricity was invented more than a hundred years ago, around half of the world's population still lives without it - and although we realize the imminent threat that current modes of power production pose to our planet and our health, we're at a loss when it comes to finding an alternative.

Practicing life without electricity

Here, Ingrida Žitkauskas describes her experiences of practicing a life without electricity—she founded the Krunai Ecovillage in 2004.

At present, we've only lived without electricity during those times of year which are warm enough. Preparatory construction of houses, their insulation, and finishing touches are still underway at the Krunai Ecovillage. Though some families live in sauna buildings and tents without electricity from spring to autumn, in winter they have to return to the city. However, once the residential houses are built and properly equipped, permanent residence will be possible. At the moment, the necessity of driving to and from the city for various reasons creates undue stress as well; our hope is that once construction is completed, people will be able to relax into their own natural cycle of daily life.

Place to keep food cold.
Photo by Živilė Gedminaitė-Raudonė.

We also believe that individual freedom is important: for example, we don't believe in restricting someone's opportunity to communicate via the internet, if they so choose. As a community, Ecovillage Krunai decided that every family shall have the right to decide for themselves whether to introduce electricity from the power grid, to use alternative power generation methods, or to live without electricity. Most families chose to connect to the grid. Since there's a power line laid in Krunai, it's the simplest and cheapest way to power one's home. However, in Ecovillage Šventasodis, no such power grid exists: future residents of the village will therefore be forced to choose between alternative power and a life without electricity, which will attract only those committed to such a lifestyle.

Where to begin? First, free your mind of the thought that living without electricity is an impossibility. Afterwards, explore what is absolutely necessary for ensuring personal comfort. For instance, for me, it was important to have access to both hot and cold running water from the taps in both the bathroom and in the kitchen. Giving up electricity should not be done as a penance: it is thus necessary to develop solutions so that one's quality of life will not suffer. Here, several suggestions are offered on how to create a comfortable household without electricity.

1. Simple brick-clay ovens serve for **food preparation and house heating**. Some fuel sources include: cheap low-quality firewood and waste-wood from the wood processing and forest clearing industries. These resources are supplemented by fast growing trees and bushes; for instance, common willows grow well even on poor plots of land. In 20-50 years, fast growing trees should also be suitable sources of biofuel. With a little planning, reckless cutting of forest resources is preventable.
2. **Water** from a well is piped to the house via manual pump, which is located inside the house. One may also establish a shallow borehole or even a well inside the house. To be reachable by manual pump, the water source shouldn't lie deeper than nine meters below the surface. Water may then be pumped up into a water tank located on the second

Pond near the house as a water source. Photo by Živilė Gedminaitė-Raudonė.

floor or in the attic by a pipe installed inside the house. From the storage tank, water passes to the boiler on the stove and the other plumbing units. The capacity and size of the boiler, which functions upon the lighting of the stove, may be selected based on one's personal needs. From there, hot water then passes to whatever plumbing units are deemed necessary (i.e. shower or bath taps, kitchen sink, etc.). Additional water resources, such as man-made ponds and nearby saunas, may be used for washing, bathing, and other activities—this is the common practice of homesteads in our ecovillage.

3. Earlier, paraffin lamps or candles were used for **lighting the premises**. The modern solution is to utilize lamps with solar batteries which, after charging in the daylight, emit light during the night-time—these can be found readily in various types of store, in different shapes, designs, and capacities. Lighting needs also decrease as we adapt our lifestyle to the day's natural rhythms.

4. **Refrigeration** may be required for perishable meat and fish products. However, almost all ecovillage residents are vegetarians: keeping vegetarian food fresh is not so complicated. Vessels containing dairy products may be submerged into well-water. Conserved products, eggs, vegetables, and fruits may be stored in semi-basements or full basements dug out of the ground. If necessary, it is also possible to build an old-time ice-house: a cold cellar under the ground which is kept at a permanently low temperature by bringing in ice blocks.

5. **Laundry -** It may be hard to imagine manual laundering in an age of washing machines and driers. Of course, almost everyone would be rather unwilling to give up this modern aid, so it is important to carefully consider what might be an attractive alternative. Running stream-water may serve as a washing machine; the stronger the stream gushes and the deeper the bed, the better. Prepare the laundering area by deepening the stream bed where the water falls; line the stream bed with sand and build a stone dam downriver to protect the laundry from mud, leaves, and other debris. Laundry may then be submersed in the stream-water within a basket that's tied to a rope that stretches up above the stream. Laundering may take several hours, depending on the condition of laundry: however, even carpets were laundered in mountain rivers using this technique. Another method of laundering is to hang the dirty laundry on a line while it is raining. The rain washes and then the wind whips up and dries the laundry together with the sun. Natural detergents, such as Indian soapnuts (*Sapindus mukorossi*) or lye made from alder ashes can be used to improve the laundering effects of these natural phenomena.

6. **Other household devices** may be substituted by simple, natural methods: water for tea may be boiled on the stove and hair may be dried outside, for instance. Instead of sitting in front of the television or at the computer, children can participate in creative activities in the community, play outdoors, or go out for sports. Grass may be cut with scythes after fledglings have left the meadows and uncommon plants have already blossomed. Modest, naturally built structures do not require special attention: natural ventilation solutions keep the level of dustiness low enough that the use of a wet cloth, instead of a vacuum cleaner, is more than ample. Carpets in need of cleaning may be simply shaken or beaten outside. In cases where the use of modern devices cannot be avoided, alternative energy sources, such as solar batteries, may be used. Residents of ecovillages may already use solar batteries to recharge mobile phones and in the near future it should be possible to acquire computers which utilize the same technology.

Life without electricity is not a return to the Stone Age but the beginning of a new era: one where we are once again in tune with natural light cycles. Observing what has happened

since Edison's invention in 1880, and based upon our own experiences, we may reach some conclusions on suitable alternatives to a lifestyle dependent upon, and driven by, a reliance upon electricity. Until safe, reliable, and ecological methods for power generation are discovered, it is important to diminish the long-term energy needs of humanity. It is not enough to talk about environmentally friendly, green energy: it is also necessary to cease excessive consumption and propagate the rational use of energy.

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SOLAR POWER OFF-GRID ELECTRICITY SYSTEM

Kampetorp ecovillage, Sweden

Kampetorp is a small rural ecovillage far from any urban settlement. Since there is no electricity grid connected to the village, an off-grid electricity production system has been deployed. Using off-grid electricity production from solar power is one way to achieve energy and economic independence, and to assure that the energy is sustainably produced. Off-grid energy production also implies a closer involvement with energy cycles and creates incentives to minimize one's own electricity usage. Many small separate off-grid systems are used in the village: the one described here is the one with most capacity by far, powering two houses, one a private home and the other the common house, with washing machine, showers and lighting.

Technical description

The system involves two power sources: solar panels and a diesel-powered generator (see diagram below). The generator is used when there is insufficient power from the solar panels. The solar panels produce 12V electricity and a charge controller directs the electricity either to a battery bank that is charged or to an inverter that converts it to 230V, the voltage power commonly used in households and by most household appliances. From the 12V batteries, the current goes either to the inverter (which converts it to 230V) or into the house, where 12V sockets are installed. Where equipment is available in 12V versions, these are used due to the loss of electricity during conversion, but this is not suitable for all needs, so both 12V and 230V sockets have been installed inside the house.

Electricity storage system (12V battery bank). Photo by Karl Gunnar Randau.

When it is needed, which is mainly during the three darkest months of the year, the generator is used. The generator produces 230V current, sent to the inverter that either directs it to the house or charges the batteries. Batteries are only charged with the generator when absolutely necessary since it is very inefficient. The overall use of diesel has decreased year by year, and today the yearly consumption is around 100 litres for the whole system. Both batteries and diesel have their own environmental problems, which are being carefully weighed up by the inhabitants, but their use still seems justified considering that the batteries were bought second-hand, and diesel consumption has rapidly decreased. To further reduce diesel consumption, a complementary wind power system was considered; however, it was deemed inefficient due to unfavourable conditions.

The first issue that needs to be addressed before setting up the system is finding the right equipment. There are ready-made whole systems available, but these are very expensive. Instead,

Solar panel system installed on the household roof. Photo by Karl Gunnar Randau.

time could be spent on finding good components at relatively cheap prices. Since the business is small and constantly evolving, there is no way around the necessity of doing research on the technology and what particular features will be needed. It's therefore necessary to have someone with a genuine interest in the technology. By law, an electrician is needed when setting up the system; however, finding one who is familiar with low voltage systems can be difficult. Even low voltages, such as those found in this system, can be dangerous to work with. So although a lot of the work can be done by oneself (and it's not very difficult), it's important to be aware of the dangers, to use safety fuses and to be careful. The maintenance of the system mainly consists of checking that the batteries are working and filling the generator when needed.

The components described in this system cost roughly 5-6,000 EUR with a lot of bargaining for cheap second-hand batteries. Many of the components were also originally used for other purposes. 12V equipment is used in boats, for example, and suitable batteries are widely used in the computer storage business. In general, the market is unpredictable and components could be sourced from a range of different sectors.

The social impact of going off-grid

The system described here is being used by one household and a community building with a washing machine and shower room (every other house has their own similar smaller system). The system is run by two people, Christer and Björn, though Björn takes most of the responsibility. He puts in a day or two per month on the system, although most of that time is spent on extra research, conducted out of his own interest. The basic maintenance of the system consists of checking the status of the batteries every second month or so and running the generator whenever necessary; altogether, very little work. On occasion, the batteries also have to be replaced, which requires some work and caution.

The off-grid system has a large impact on social life in Kampetorp. Certain household machines, like freezers and electric stoves, cannot be used. Additionally, everything in the household is used with caution, and nothing is used when it isn't actually needed. With the off-grid system, electricity cannot be taken for granted, and the gap between production and usage becomes a tangible reality (just as one begins to see and value food in a different way if growing it for oneself). In Kampetorp, the off-grid electricity system fosters a lifestyle of simplicity. The inhabitants even admit that their lifestyle of low energy consumption would be difficult to maintain if the village were connected to the grid, which is evidence of the system's social impact.

User experiences of off-grid electricity production

The interviewees are Christer Karlsson, one of the founders and driving forces behind Kampetorp and Björn Macke, his father-in-law, who visits often and has been very involved in the village's affairs for the last seven years, despite not permanently living there.

When we first bought the property, it wasn't connected to the power grid. Our options were then to either connect the property to the grid, to live without electricity altogether *or* to build an off-grid system. Since connecting to the grid was a very expensive prospect, that option was rejected by the community. Instead, the community lived without electricity for some time, in very simple living conditions. About two years later, one of the inhabitants managed to light a light bulb with a small solar cell panel; the system has slowly evolved from those humble beginnings to what it is today. At first, the generator was used quite frequently, but as more solar panels and

better equipment was added, the usage of the generator is now almost exclusively relegated to the three darkest months of the year, when the solar panels produce very little power.

A big change was the purchase of the first inverter, which made it possible to convert electricity from the batteries into 230V current (the voltage needed for many household appliances and machines). A lot of energy has been put into finding good equipment and electricians with the right knowledge while developing the system. A few unfortunate expenditures have also been made along the way. For instance, the inverters and regulators were bought from China; although considerably cheaper, these are also riskier due to the variation in quality.

Since there is sufficient electricity during most of the year, there are currently no plans for improvements. Wind power has been considered as an alternative for the winter months, but local conditions don't seem to favour this option. Perhaps new techniques for harnessing wind power will be developed suitable to the wind conditions in Kampetorp, or perhaps there are other, not yet thought about techniques to generate power; however, at the moment such improvements seem farfetched. At the same time, technology in these fields is evolving rapidly, and improvements being made in the long run aren't out of the question.

The strengths and the weaknesses of the system depend, to a great extent, on one's ideology and personal point of view. The system promotes a low-budget lifestyle with low energy consumption. Another strength is the growing awareness of where the electricity comes from and how much electricity different gadgets each consume. Others might consider these weaknesses, since the system has a lower capacity than if connected to the grid, and other adjustments have to be made for the system to function sufficiently. However you look at it, it's indisputable that the off-grid system is much cheaper than buying power from the power utilities. Once the initial costs have been covered, the running costs are very low, and being unattached to societal systems in terms of food, electricity and bank loans is a freedom to cherish. Also, using the off-grid system guarantees that energy comes from renewable resources, which is an impossibility when one is connected to the grid.

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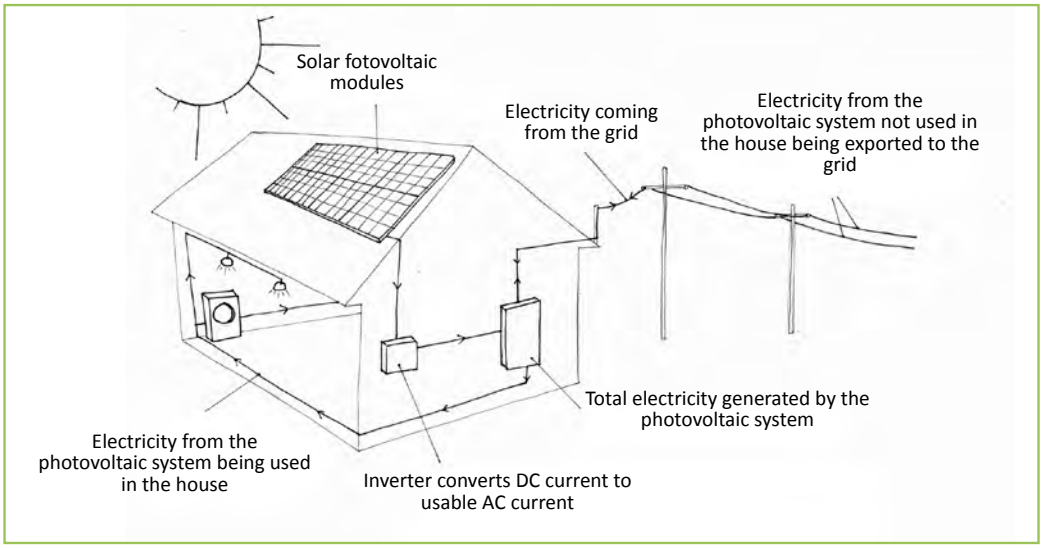
PRODUCING AND SELLING SOLAR POWER TO THE GRID

Charlottendal ecovillage, Sweden

Feed-in tariffs (FIT) are political mechanisms designed to accelerate investment in renewable technologies. Charlottendal is producing solar power and selling the surplus for a fixed price to Telge Energi, the local power-producing company. The agreement is one of the first of its kind in Sweden, and it makes it possible for all the electricity generated to be put to use, while also generating income for the ecovillage. The arrangement is a modern way for an ecovillage to be more self-sufficient in energy while increasing the use of renewable energy sources. More and more countries are using feed-in tariffs, which makes Charlottendal an example that could be followed by other ecovillages.

Technical description of the practice

The system is a standard solution for solar panel electricity production which includes solar panels, inverters, safety fuses and a fused control unit with electricity meters installed by Telge Energi (the local electrical utility) to monitor production and consumption. The system is divided into two sub-systems because of the inverters' limited capacity; the solar panels, in turn, are accordingly separated in two sections and arranged in such a way that they are never shaded at the same time. The system powers the whole village, along with the kindergarten, and its maximum capacity is 20 kW.



Solar panel electricity production.
Drawing by Jesús Pacheco Justo.

Through an agreement with the local power company, Charlottendal is technically selling everything it produces to the company. Nonetheless, it can be considered to be using the electricity it produces, only feeding electricity into the grid when production exceeds need. Overall, this over-production is equivalent to about 40% of the village's yearly consumption, yielding a net profit of 2,500 EUR/year.

Government funding was necessary to make implementation possible. Applying for the funding through the village kindergarten, which is a public enterprise, meant that subsidies of 70% of the total costs were granted (for private purposes the Swedish government subsidizes 50-60% of the expenditure). The total system cost is estimated to be 100,000 EUR for the whole system, with 25,000-30,000 EUR being the private investment share. Compared to the off-grid system at Kampetorp, this system is many times more expensive, mainly due to its larger size and capacity, its purchase at retail prices (as opposed to tracking down second-hand parts) and the need to hire a contractor for installation.

The social and human context

Since the system is completely self-maintaining, it could be viewed as an isolated technical component without social implications. However, because it's a highly visible part of the kindergarten, the children are all aware of the solar panels and the fact that they provide electricity to the village. It therefore has an effect on self-identity and education, and is a visible expression of the village's general ideology. It could also be argued that they benefit several other activities, such as eco-tourism, apartments for rent and seminars, etc., by adding to the village's value as ecological attraction or role model.

Telge Energi was the first power utility company to set up feed-in agreements for private producers in Sweden. Since then, other companies have created similar offers, and the general trend is toward a greater demand for solar electricity and more decentralized power production.

User experiences

The interviewee is Peter Hagerrot, one of the founders of Charlottendal ecovillage. He works as a psychotherapist and a freelance journalist, and is involved in transition projects in Järna as well.

We've had ideas of implementing solar electricity ever since our founding 15 years ago. Focusing on solar was necessary since the conditions for wind power were insufficient. Since financial support was also necessary for launching the project, we had to wait for the government to introduce subsidies. A few years after they were introduced, we applied, and when our application was granted, the system was built (this was in 2006). The system was set up by the company Switchpower, who also bought the excess electricity we produced for a fair price. Two years later, they became bankrupt and we were left without a buyer. We then used the electricity ourselves, which resulted in a slightly cheaper electricity bill. After that, I made an agreement with the power utility company Bixia to buy the electricity, but for a fairly low price. It wasn't until about a year ago that I negotiated the agreement with Telge Energi. As a result of that contract, they made a decision to introduce feed-in tariffs for private producers, thus becoming a leader in opening up new opportunities for private solar power producers in Sweden.

The fluctuations in prices and difficulties in establishing beneficial long term agreements with the electricity companies have been a bit troublesome, but hopefully all this will be easier as the market matures. The great benefit of the system is that the electricity produced comes from a renewable source and is clean. That also goes well along with the general idea of the ecovillage and its other practices. Economically, the investment seems to be a zero-sum game at worst, but hopefully it will generate some income, even though the reason for implementing the system was never purely economical.

The Swedish energy market is rather rigid and inflexible, compared to, say, in Germany or the Netherlands, where there has been an immense increase in private energy production. Though the situation is different in every country, there is an apparent trend toward decentralization and support and subsides for solar solutions. Anyone interested in starting their own solar power production should therefore first investigate the circumstances in their country, especially when it comes to subsidises and solar power tariffs.

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ENERGY EFFICIENT HEATING OF WARM WATER AND HOUSES AND ELECTRICITY FROM RENEWABLE RESOURCES

ZEGG Ecovillage, Germany

A new energy plan is being implemented by ZEGG after it decommissioned the previous biomass heating system, which had served the community well for its first 20 years on the site in Bad Belzig near Berlin. The new plan is based around a new solar-assisted biomass heating plant with the following components:

- 250m² thermal solar plant
- a new woodchip-fired boiler with 500kW heat output
- a log-fired boiler with 350kW heat output
- 3 combined heat and power (cogeneration) plants, delivering 45kW heat and 15kW electricity, running on renewable "wind-gas" (gas generated by Greenpeace as storage for surplus peak electricity from wind turbines)
- heat recovery from a walk-in refrigerator and freezer unit under the central kitchen

Finished solar thermal roof from above. Photo by Achim Ecker.

Solar thermal panels of a separate house with greenhouse near our organic garden. Photo by Achim Ecker.

This energy mix means that 100% of ZEGG's thermal energy requirements are now met from regenerative sources.

As far as electricity requirements are concerned, the existing 23 kWp photovoltaic plant has been supplemented by a new 29 kWp plant financed by a group of ZEGG residents. The combined heat and power plants also produce electrical energy in a CO_2-friendly way, since the excess thermal energy produced by the power generation is used directly for heating water and buildings. This leads to CO_2 savings of more than 66,000 kg per year. This combination of co-generation plants and PV panels meets about 90% of ZEGG's electricity demand. The rest is bought in from Greenpeace Energy to ensure that the electricity used in ZEGG is 100% regenerative.

ZEGG is also completely renewing its underground site heating network. The deteriorating condition of the pipes had led to heat losses of up to 15% (c. 150kW), which will now be reduced to around 4%. Reducing energy losses through insulation and renewal is as important as building new plants and converting to regional regenerative sources. For this reason, the existing buildings on the ZEGG site are also being insulated. At the rate of one building every couple of years, full thermal installation is applied, including work on the facades, windows, roofs and floors. During the first 20 years of ZEGG's existence, the total heat energy demand dropped by more than 30% due to the various insulation applications around the site, even though additional buildings were connected to the heating grid.

New well-insulated pipes (black) replace the old system (white). Photo by Achim Ecker.

These investments ensure that ZEGG continues to be a role model when it comes to the use of renewable and regional energy sources. The previous woodchip-fired boiler had been visited by some 1000 people from universities and other institutes of higher education as well as politicians since it was a pioneering example of its kind – the first woodchip boiler in its output class (over 100kW) to be installed in the German federal state of Brandenburg.

Of course all this energy generation needs to be combined with more energy efficiency: as well as the insulation of buildings, measures such as LED lighting and energy-efficient household devices will play a role here.

Author: Achim Ecker

COGENERATION OR COMBINED HEAT AND POWER (CHP)

Cogeneration or combined heat and power (CHP) refers to the use of a heat engine or power station to simultaneously generate electricity and useful heat. Cogeneration is a thermodynamically efficient use of fuel. During the production of electricity some energy is lost as waste heat; cogeneration puts this thermal energy to use. In fact, in most heat engines more than half the energy is lost whereas capturing this excess heat in CHP leads to potential efficiency ratings of up to 80% in the best conventional plants. This means that less fuel needs to be consumed to produce the same amount of useful energy.

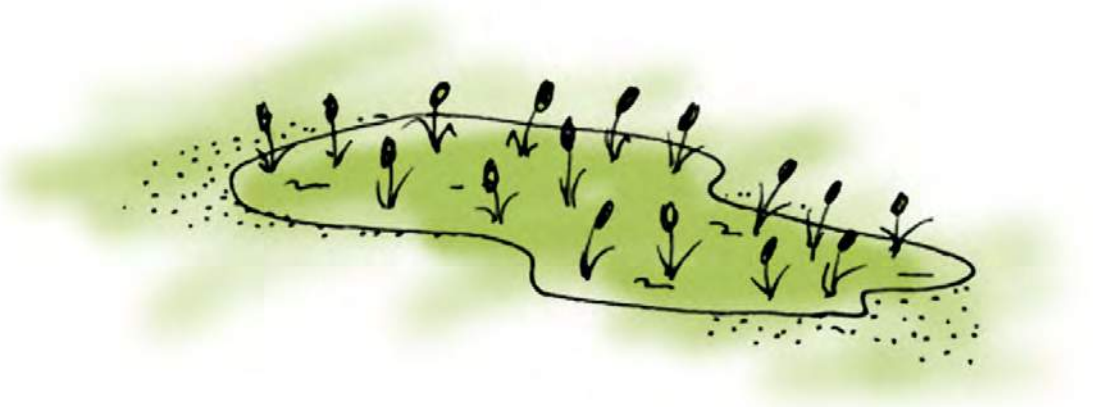
CHP captures some or all of the by-product thermal energy either for direct heating use close to the plant or to heat water or steam for district heating. The latter option is also called **combined heat and power district heating (CHPDH)**. Small CHP plants are an example of decentralized energy supply.

CHP is one of the most cost-efficient methods of reducing the carbon dioxide emitted by heating systems in cold climates.

TYPES OF CHP PLANTS

There are several different types of CHP plants. Biofuel engine CHP plants use an adapted reciprocating gas engine or diesel engine, depending upon which biofuel is being used. The advantage of using a biofuel is reduced hydrocarbon fuel consumption and thus reduced carbon emissions. Another variant is the wood gasifier CHP plant whereby a wood pellet or wood chip biofuel is gasified in a zero-oxygen high-temperature environment; the resulting gas is then used to power the gas engine. Smaller cogeneration units may use a reciprocating engine or Stirling engine. The heat is removed from the exhaust and radiator. Some cogeneration plants combine gas and solar photovoltaic generation to further improve technical and environmental performance.

Source: www.wikipedia.fi



WASTEWATER MANAGEMENT

In the Baltic Sea Region we are lucky to have plentiful and clean freshwater supplies. There is hardly ever a problem to find clean water for an ecovillage to use. Instead, we have problems with our sea: the most serious concern is the eutrophication occurring as result of the nitrogen and phosphorus loads, which come partly from sewage. Inadequately treated wastewater can also be detrimental to the hygiene of small inland waters and can contaminate groundwater. So the issue of how we purify our wastewater is not only important for our immediate environment but also for the Baltic Sea.

In ecovillages the aim is most often to treat the wastewater onsite. The idea is to recycle and utilize the nutrients from the wastewater and sludge locally, instead of carrying them somewhere far away through the public drainage system. There are many possibilities to arrange the treatment of wastewater locally. You can buy and install a prefabricated factory-built treatment system or you can build a more natural purification plant. Before choosing the kind of wastewater treatment system to build, an ecovillage also has to check the local statutes.

A wastewater treatment system can be arranged for a village, for a couple of households jointly, or for one house on its own. Generally speaking, it is possible to use simpler treatment techniques if toilet waste (“black water”) and washing water (“grey water”) are kept separate. Ecovillages generally use natural purification systems, which are often combined with the use of dry toilets.

In most cases, the solid material first has to be removed from the wastewater in septic (settling) tanks. The next phase can then be, for example: a leach field (possible only if the soil is appropriately permeable and the groundwater level is not too high), a buried sand filter, or a constructed wetland, reed bed or willow evaporation system (especially for black water). The treatment can be continued by leading the effluent to a pond planted with various water plants. These treatment ponds add biodiversity and can even enhance the beauty of the ecovillage when they are well adapted to the landscape.

REED-BED WASTEWATER PURIFICATION SYSTEM FOR AN ECOVILLAGE

ZEGG Ecovillage, Germany

Since 1992, all of ZEGG's wastewater (including blackwater from flush toilets) has been purified by a planted soil filter that uses natural processes and minimal technical effort. The system takes up only 900m² and has the capacity to clean wastewater from 300 inhabitants. This reed-bed wastewater treatment system provides low-cost and low-maintenance biological treatment of domestic or industrial wastewater by filtration, bacterial metabolism, percolation and plant absorption.

Technical description of the purification system

The system can cope with both greywater, such as wastewater from sinks and showers, and blackwater, a.k.a. raw sewage from sources such as flush toilet systems. First, wastewater is pre-treated mechanically in a composter, which works like a big sieve to filter out the solid components of the sewage for compost. The second step is the plant bed, where all the liquids are cleaned by filtering through a planted soil filter. The principle aspect of this technology is the activation of microbial processes that stimulate the natural breakdown of otherwise polluting compounds.

The system in summer – willows and reeds. Photo by Mia Saloranta.

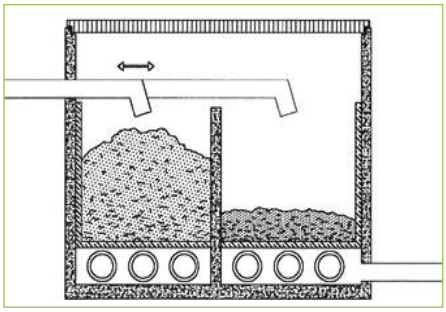
Composter for mechanical pre-treatment

The first step is one of mechanical purification and takes place in a composter. In our case, the composting takes place in a septic tank three meters deep and six meters in diameter; the tank itself has been modified to contain three internal chambers that act like large stainless steel sieves to filter solid matter from the wastewater. This alternative to a traditional septic tank differs from other three-chamber pits in that it does not turn the waste into a faecal sludge. Instead, the solid waste is mechanically separated, then straw or wood chips (in a ratio of 1:10) are added in order to accelerate aeration and the composting process. After about two years, these composted solids may be used as fertilizer, thus closing the nutrient cycle and improving the soil it is applied to. In this way, the nutrients from the solid waste are retained within a cycle of natural elements at a sustainable, local level. (Some nutrients from the next step are retained, too, when the treated wastewater is reused for irrigation.)

Functioning principles of the plant bed

In the second step, the pre-treated wastewater from the septic tank is channelled into a collection tank. From there it is pumped to the surface of the reed beds by a single pump operating for 10-minute periods several times a day. On the surface it spreads out along the filter beds, which are divided in half in order to facilitate bi-monthly alternation between active and resting portions of the beds.

Purification takes place in a vertical planted-soil filter. It is about 1.2 m deep and filled with coarse, washed sand containing iron flakes, which remove phosphates. The inflow at the top of the system is aerobic. Drainage pipes at the bottom lead a portion of the outflow back to the duct, where it joins the new inflow and is pumped through the system again. Though soil filters generally require an area of 3m² per person, this feature increases the purification performance



Black water enters on top, solids are filtered out and wastewater then runs off through the bottom. Drawing by Dirk Fiedler.

of the system and has reduced this requirement to only 2m² per person. During the entire process, the wastewater remains oxygen-rich (4-6mg/lO²). This aerobic environment enhances the cleaning power of the plant and ensures nearly odourless functioning.

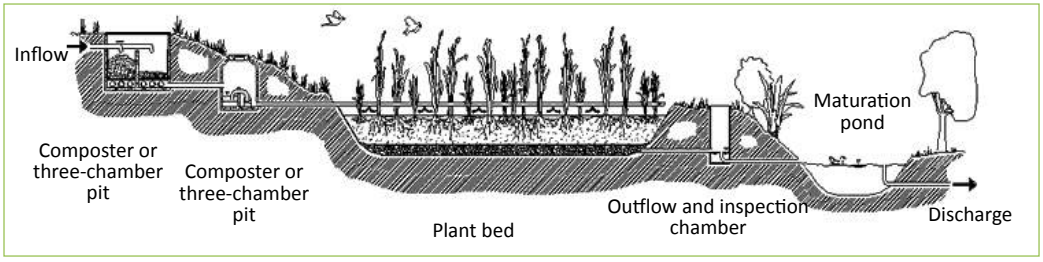
The sand filters out solid particles, some remain on top, forming a humus layer. Smaller particles are broken down among the grains of sand, which provide a surface for the growth of the micro-organisms who do all the decomposition work. Almost all the ammonium in the wastewater is transformed into nitrate by an effective distribution of the water, removing odours and guaranteeing an optimal oxygen supply for the decomposing micro-organisms and a vertical flow through the body of the filter.

Some of the organic nutrients removed from the wastewater in the planted beds are taken up by the plants and become biomass; the rest are broken down into gases by the micro-organisms. These extract oxygen from the nitrates in order to break down the organic substances in the fresh wastewater, thereby producing atmospheric nitrogen which is released into the air. The plant bed is also dammed, increasing the retention time and making it possible to break down difficult compounds. With an extra de-nitrification pond, the nitrogen concentration in the effluent could be stabilised and reduced as low as 13 mg/litre or even less. In the humus layer that builds up on top of the system, persistent substances are adsorbed and decomposed through ultraviolet radiation and further micro-organisms.

A range of different plants grow in the sand of these reed beds. In turn, these provide shade for the filter surface so it does not bake hard in the sun and dry out or close up due to the growth of algae. The plants' root excretions also stabilize the micro-flora. In the treatment plant at ZEGG, we have mainly used plants that produce a lot of biomass and can be harvested regularly, such as Japanese silver grass or Eulalia (Miscanthus sinesis), a local type of common reed (Phragmites pseudodonax), and a local type of willow (Salix viminalis "Mötzow"). Every one to two years we cut the willows, which helps keep the roots small so they will not grow through the clay sealing. The biomass of these cuttings can be used for mulching, composting, or as wooden biomass for wood-fired burners.

After professional planning and layout of the system, construction and installation work can be done by many unskilled labourers, as long as they are supervised by an expert. The main labour consists of setting the clay sealing into place, spreading the sand, and planting. We used clay which was compacted into a 20-cm thick layer to seal the system; alternatively, rubber EPDM sheeting makes a good liner. The maintenance, material, and energy involved in creating such a system are all quite low.

The outflowing water quality is tested at regular intervals, and we have discovered that a very high quality of outflow is achieved throughout the year, even during the coldest period when temperatures fall below -15°C for more than a month. The system reduces concentrations



Wastewater runs in on left through the composter, is pumped onto the surface of the reed bed, and runs out at the bottom to a pond where it seeps back into the groundwater or to a stream. Source: www.bio-system.de.

of pollutants to levels consistently below German statutory limits. In short, the unit at ZEGG is a model for small communities and for households which are outside of towns and off the grid. It exemplifies the regenerative powers of nature by harnessing them in a wastewater purification process. Beyond this, the system also enriches and beautifies the environment by adding a wetland biotope, offering valuable living space to many species of plants and animals.

During harvest of willows. Photo by Achim Ecker.

An essential ecological value: Sustainable water management

It is our goal to develop ecologically sound ways of dealing with water resources, by understanding both regional and global issues, thereby providing future generations with a solid foundation strongly based on a sense of personal responsibility for those resources.

A prerequisite for regional water management is to have access to technologies that, among other things:

- can also be used on a small scale;
- are inexpensive;
- have a high yield;
- tolerate load fluctuations;
- can produce hygienic, recycled water;
- require hardly any energy;
- enrich the landscape.

The efficiency of soil filter technology has already been proven and we are continuously improving it through various research programs. The risks inherent in central wastewater disposal are also largely avoided, since:

- no further waste water transportation is needed;
- the use of resources is reduced;
- the burden on groundwater is reduced;
- rainfall is retained in the area, which is valuable in areas with low precipitation ;
- consumer awareness around water is promoted;
- the outflow can be used for irrigation.

User experiences

Users of the system usually do not even notice the reed beds, and beyond the additional request that inhabitants utilize biodegradable soaps, its use imposes no requirements other than those for any normal wastewater cleaning process. In addition, people are proud to live in a community that utilizes a clean and efficient natural cycle to purify water.

Wastewater purification plant after harvesting the willow wood. Photo by Achim Ecker.

We chose this solution because we had used reed bed systems before on previous sites, and also because it was both an obligation in the sales contract for the land and one of the founding premises of ZEGG to build our own system (at the time of purchase in 1991, there was no central solution available from the municipality). We have come to love a system that makes us feel closer to nature and gives us a sense of responsibility for our own “waste”. This natural closed cycle is a very visible demonstration that one person’s

trash is another's treasure, or that each organic by-product is another organism's resource: as they say, "shit makes flowers grow" and this can be directly observed in a system where there is no waste.

We have always been proud of this system, and we do not want to lose it. Unfortunately, European and German legislation have made it difficult or nearly impossible for individuals to make their own decisions concerning both water supply coming in and wastewater going out of their property. ZEGG is currently under pressure from the local municipality, who wishes to force us to connect to the public grids, and against which we have no legal recourse. It seems that sooner rather than later we will be forcefully connected to the public grid. Though we will be able to continue to operate the plant-based system, the purified water will then have to flow into the public sewage pipe. Most bitter of all, we will lose the right to draw our drinking water from our own wells. We therefore recommend that you check your local legislation regarding water rights and usage before embarking on your ecological wastewater project.

Author: Achim Ecker

Further information
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· www.oekotec-gmbh.com/download_en/frames/index.htm; www.blumberg-engineers.com/; www.constructedwetlands.net/index.html
· In German: www.dwornitzak.de/Kurzbauanleitung.pdf; www.naturbauhof.de/lad_pka_funktion.php; www.baufachinformation.de/artikel.jsp?v=223825

NATURAL BIOLOGICAL WASTE WATER PURIFICATION SYSTEM FOR ONE HOUSEHOLD

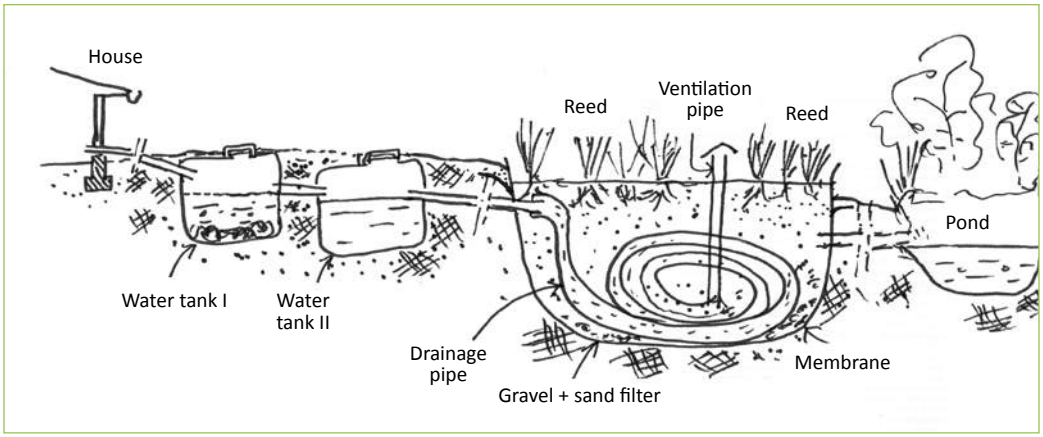
Ecovillage "L.A.S." (Local Alternative Society), Poland

Building a natural waste water purification system. Photo by Monika Podsiadła.

Finding a solution to the problem of waste water treatment is among the top priorities of a sustainable lifestyle: how can we recirculate the used water back into nature's cycles as good clean water. Root waste water treatment is introduced here as an effective and cheap technology that can even be built utilising recycled materials. A purification plant such as this may finish with a pond and the water can flow from the pond straight into the meadow, garden or back into a household's water system (e.g. as flushing water for the toilet). Utilising natural waste water treatment systems like this could enable ecovillages and village societies to abandon expensive concrete cesspits, which often poison the subterranean water and natural surroundings of the settlements – gardens, meadows, and farmland. Similarly, commercial biological, bacterial filters and water purification plants are often expensive and require the use of heavy machinery.

Technical description

Basically, this waste water treatment consists of two tanks, each 1m³ (1000 litre) and protected by a steel grate. This capacity can purify grey and black water for a family of three. These recyclable tanks can be bought in larger petrol stations and should be carefully cleaned inside before use.



Picture of the wastewater system with EM.
Figure by Monika Podsiadła.

The tanks and the drainage channel are connected by PVC pipes of cross-section 10 cm. The pipes lead to the filter pit, which is 1.5 m deep and filled with gravel and sand. At the bottom of the pit we place the drain. The water can then be drained away to the outside pond. The filter pit, after being filled in with gravel and sand, should be planted with reeds. Willows can be planted around the pond. They provide additional suction for the filtered water and shade the pond, which prevents rapid evaporation of water during summer.

The first tank serves as a settling tank and is buried in the ground at least 5 m away from the house. It should have a tight cover. This tank should be emptied every 2-3 years (depending on the system load). Material from the tank can be stored in a separate compost pile and scattered under trees and shrubs after composting. Directly behind the first tank we place the second tank, which is connected to the first one. This connection should be sealed tightly. When burying these tanks, they should be filled with water before covering them with soil, otherwise the weight of the soil can deform them. The outside surfaces of the tanks should be strengthened with OSB board or planks.

Grey water from the first tank drains into the second tank. From the second tank it drains into the filter pit (minimum 6 m^2). The waste pipes should have an incline of around 10-15 degrees. At the bottom of the filter pit, a water outlet pipe is connected with the drain so that there is an even distribution of water and the gravel does not get into the outlet. The pit is lined with plastic sheeting so that the waste water does not go into the ground.

The roots of the plants are covered with various sorts of bacteria which clean the water, including nitrogen-fixing bacteria. Cleaned water then flows from the filter pit to the meadow. At the end of the system, purified water can be found in the pond at the lower area in which we enter the local flora and fauna. In the winter you can cover the filter pit with straw in order to prevent it from being frozen and to keep the system working also during frost. We haven't tested the water purity, but the biological viability of organisms which live around this water proves that it is sufficiently purified.

Additionally, we add Effective Microorganisms (EM) into the first tank. Their role is to break down the organic material. This type of pre-cleaned waste water is not dangerous for the environment anymore. EM can be also added directly to the toilet, sink, shower or bathtub.

Building this type of waste water treatment does not require any special qualifications. One person with building experience is required: with two assistants the building time would then take a few days. Material costs in Poland do not exceed 1500 zloty (around 360 euro). Our purification plant has worked for two years, so we haven't harvested the reeds yet. Willow canes can be used for weaving fences, sheds and summer kitchen.

User experiences

"My root waste water treatment meets our needs and costs one third of the price of a system ordered from a commercial company. After few weeks, when the EM started to work, the bad smell disappeared, the reeds took root, and in the spring it will surely grow well. We were a bit afraid of the frost but the system still worked as it should. We would like to add some different plants, for instance irises. We are really satisfied with this solution and we truly recommend it to our friends. A few of them already told us they want to start using it." – Maciek.

Author: Andrzej Młynarczyk, Monika Podsiadła

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CONSTRUCTED WETLAND AND FLOWFORMS FOR SEWAGE TREATMENT

Camphill village Rozkalni, Latvia

The constructed wetland sewage treatment system in Camphill Village, Rozkalni (Latvia), is a biological purification system incorporating ponds and flowforms which was designed and developed for a community of 40 people. Built due to the previous lack of a communal option, the system requires very little maintenance. The system's output after purifying grey and black water has been certified by specialists from the state environmental service as being of very high quality. The layout of its cascades and waterways has also provided the opportunity to develop a beautiful landscape and a functioning, holistic ecosystem in the Rozkalni ecovillage.

Technical description of the system

Construction and operation

The system consists of a large area of approximately one hectare comprised of two ponds and two gravel filters. After the settling basin, the purifiable water flows to the first pond in the pre-purification process—the aeration lagoon. Partly purified, the water then flows down through a vertical filter: this consists of gravel, broken stones, and small pebbles of different size and shape, which have also been planted with river reeds and irises. From there, it then heads to a second pond, its banks also planted with reeds and irises; finally, before returning to nature, the water crosses a horizontal filter of granite chips.

Water cascade in Camphill village Rozkalni. Photo by Daina Saktiņa.

Selection of the location

First, a location to install the system was selected. It was important to find a place convenient for both the inflowing sewage and outflowing purified water.

Materials and construction

The next step was to find the necessary liners to ensure that the treatment area was kept separate from the groundwater, and to select a supplier (we already had construction workers lined up for the project). Sourcing the granite chips required for the filters and the banks of both ponds was a complicated issue in Latvia.

Sewage treatment area in Camphill village Rozkalni. Photo by Daina Saktiņa.

The easily available dolomite chips were not suitable since a dolomite filter clogs easily. It was also necessary to seek approval in Latvia for the project equipment developed in Norway. However, we managed to do this fairly easily thanks to a Latvian architect who agreed to submit the project for approval under her license.

Construction of the system

A professional construction company was involved in the actual construction of the system. Due to the lack of experience with the construction of such systems in Latvia, an expert from Norway was invited for the duration of the construction. It took four people and several vehicles—excavators, bulldozers and trucks—working at the same time to complete the system in three and a half months. Constructed in 2002, the system cost 30,000 LVL. Since operations ceased in autumn, the planting of reeds and irises and other water plants had to wait until the next spring.

Maintaining the system

The system is very simple and requires hardly any maintenance. In summer, it's necessary to clean the pond's water blooms biweekly (depending on the temperature). Once every four years it's necessary to pump out the settling basin. According to the project description, it's necessary to clean the bottom of the first pond once per decade. We tried to do it once, but found out that it isn't yet necessary. Cleaning the bottom of the pond is done via the inlet pipe by simply pumping out the sediment, which can be used as fertilizer.

It's also possible that in the course of time it will become necessary to clean the filters, or replace the sand and gravel in the filters, or the granite chips. All of these processes are time-consuming work, although we've found that during 10 years of continuous operation, it has not yet been necessary to perform this. Part of the reason for this infrequent maintenance is due to the fact that the system is designed for up to 40 people but only used by half that number. In autumn, before winter arrives, we mow down all the reeds in the filters and cover them with straw so that the water can continue to flow underneath without freezing. Before the first frost and snow, we also mow down the dry reeds in the ponds so that no unnecessary biomass accumulates: the mown reeds are composted or burnt.

Monitoring the system's operation

Once a year the inlet and outlet water have to be tested and the results determine the level of the "natural resources tax" we have to pay. So far this has been approximately 3 LVL per year: the low sum indicates how little hazardous waste is released into nature by our system.

Flowform in Camphill village Rozkalni. Photo by Daina Saktina.

User experiences

Motivation for the system's selection and its history

Vilnis Neimanis, one of the main implementers who helped to establish the system, says that this treatment system was selected not only because it was possible to solve the complicated issue of communal sewage treatment, but also to develop a beautiful park and new ecosystem in the village Rozkalni.

The system is one which was adapted from a similar installation in the Camphill community of Vidaraasen, Norway, where he lived for 5 years. It's also where he met the architect who had designed that system, who was also interested in designing a similar one for Rozkalni. There's also a concrete workshop in Vidaraasen fabricating the concrete flowforms—water cascades, an invention of John Wilkes—used in this system and others.

Conclusions from the residents of Rozkalni

The residents of Rozkalni think that the sewage system is a great addition to the community: not only have they obtained a great purification plant, but also a nice park and newly developed ecosystem, fed by the purified water that enters the landscape. They hope that the system will serve them well for a long time to come. They are therefore working to maintain the landscape of the system by making sure no trees or bushes grow in the filters.

The residents would recommend the installation of similar purification systems to others. It's definitely not suited to small families and households, but it's a great solution for larger ecovillages and communities. It's also very important that the system is used by people who are careful about what enters the sewage system; for example, residents should be prepared to use biodegradable detergents and soaps.

Author: Vilnis Neimanis

Further information
· www.camphillrozkalni.lv/en/; contact person: Vilnis Neimanis

DRY TOILETS

Nowadays, when people think of a toilet they automatically think of a water closet – reflected in the synonymous use of the terms "WC" and "toilet". So new buildings generally incorporate water closets, even in rural areas, and dry toilets are considered as old-fashioned, uncomfortable, odorous and troublesome. However, it is not as obvious as it seems: water is not always necessary to have modern and hygienic toilet facilities. Dry toilet technology offers a variety of choices, from simple out-door toilets in the backyard to stylish bathrooms. Dry toilets have been used for a long time in many ecovillages and their experience has led toilet models to be developed for different kinds of needs. This includes simpler solutions for public events when more toilet capacity is needed.

Dry toilets have many ecological benefits. They save pure drinking water, they make waste water management easier, they can generally be installed and maintained without external services, they work reliably even during long periods of freezing weather, and they collect nutrients for local use. The toilet waste does need to be treated properly, but this just involves composting it so is easy to implement. Urine can be collected separately. Both end products (composted solid waste and urine) are valuable organic fertilizers worth utilizing in the garden.

Maintaining dry toilets and the management of toilet waste need some effort, of course, but it is worth it. And when sitting in a dry toilet you can easily feel how you are part of nature's nutrient cycles.

DRY TOILETS INDOORS – A COMMON SYSTEM IN THE VILLAGE

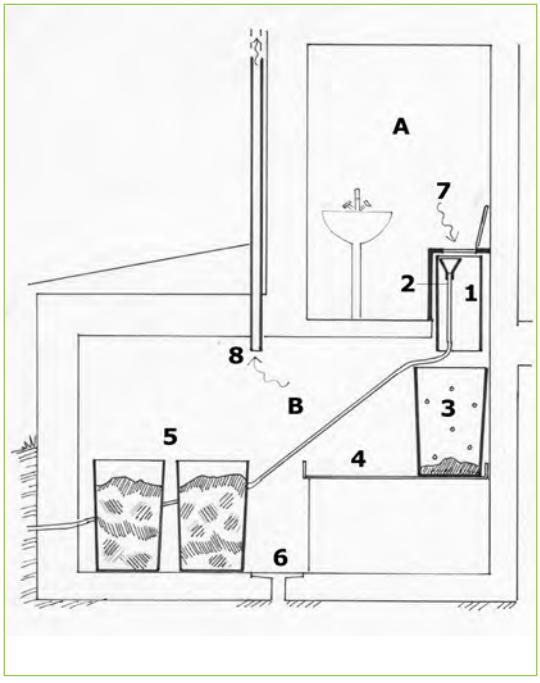
Kangasala Communal Village, Finland

An agreement was already made during the planning of Kangasala Communal Village that there will be no water toilets in the village: the residents wanted to respect ecological principles by saving water and recycling nutrients. Nine detached houses were built in the village and each household made their own dry toilet solutions. There are many types of dry toilets but they are all situated indoors, connected to the living spaces. Almost all of the toilets were built by the villagers themselves, some of them are also self-designed. The toilets separate the urine, collecting it in common chambers. There is also a common space in the village for ongoing composting of the solid toilet wastes. The dry toilets have now been functioning for about 13 years and all of the inhabitants are satisfied with them.

Dry toilet system

It is important to know which kind of dry toilet is wanted already in the early stage of planning a residential building. The choice of the toilet is made according to how much time, effort, and money the builders are prepared to commit: the main decision here is whether to build the toilet oneself or buy a ready-made product. The choice of the toilet affects the building's space solutions and vice versa. Most of the Communal Village's dry toilets are of the type where the composting chamber is underneath the toilet. This means the house needs a downstairs or a basement (with an exit) where the composting chamber can be placed. The toilet room itself does not require any special structures, as long as there is enough space if a large factory-made dry toilet is chosen.

Structure and principle of dry toilets in the Communal Village



A diagram of Anu and Jari´s dry toilet.
A) Toilet room. B) Composting room.
1) Chute from the toilet seat to the composting barrel (made of drainpipe).
2) Urine separation.
3) Barrel, perforated to allow air in.
4) Basin for runoff liquids (just in case of spillage or leakage).
5) A storage place for full barrels before carrying them out.
6) Floor drain (just in case of spillage or leakage).
7) Ventilation sucks air from the toilet room towards the composting room.
8) Exhaust ventilation, a small conduit to the roof.
Drawing by Anu Pellinen & Mia Saloranta.

Most of the residential houses of the Communal Village have self-made toilet seats. A large tube section (25-30 cm in diameter) leads straight to the composting chamber underneath the toilet. The seat incorporates a unit to separate off the urine; this can be adapted from an oil funnel, for example. Swedish-made separating dry toilets have also been used. The urine is piped to communal containers buried in a field. One of the containers (9 m^3) is made from an old oil container and the other one is an industrially manufactured plastic container (5 m^3).

The solid toilet waste piles up in the collection chamber underneath the toilet. There are three kinds of chamber in the different houses in the Communal Village: a room-like container with a sloping bottom; a large vertical tank built on-site; or replaceable containers such as barrels. The first two can be accessed to remove part of the contents at intervals; with the third option at least two containers are needed so when one is full it can be replaced with the empty one. The size of these containers is chosen so it is possible to move them easily when they are full.

The room used for the collecting chamber has to have an unobstructed exit to make it easy to carry out the barrels or the partially composted waste. The room's shape and size will determine the size of the interchangeable barrels which can be used (or vice versa if the chamber is built new). In addition, this space should not freeze during the winter.

All the toilets in the Communal Village have mechanical exhaust ventilation. The exhaust valve is situated on the side of the seat or in the upper part of the compost chamber. Air goes out of the toilet through the compost chamber so the odours are not directed into the toilet room. The outlet channel then leads above the roof, where an exhaust air fan with low power consumption is installed.

Many kinds of dry toilets with greatly varying functional principles are available as commercial products. In Kangasala Communal Village there are commercial dry toilets in three houses. There is a small composting container in the toilet itself so there is no need to build a separate space underneath the toilet – they are mounted directly on the floor. This makes them suitable for both ground and upper floors. The liquids are separated also in this model. The composting container is light and easy to empty.

Sawdust is added to the compost toilet after use. In the photo you can see the urine separating unit in the toilet hole, adapted from a plastic funnel. Photo by Mia Saloranta.

Use and maintenance of dry toilets

The most important thing in the daily use of the dry toilet is to add an extra composting supplement to the toilet after every bowel movement. This helps to regulate the moisture content, prevents insects laying eggs, and makes the waste more pleasant to handle. Raking waste, dry leaves, sawdust, peat, chopped straw and mixtures of these kinds of biodegradable materials are suitable as composting substances. Ash is not suitable since it is alkaline and prevents composting.

How often and how the composting chamber is emptied depends on its size and type and usage. When using barrels, these are changed when full and the full barrel is left indoors to compost. There can be several barrels, in which case the waste is already well-composted and easy to handle when the barrel is carried outside for continued composting. The composting time depends on the humidity of the mass, but generally the compost should stay inside about eight months before taking it outside. The larger chambers are emptied with a shovel or pitchfork: the intervals between emptying vary from one to four years. The chambers are not emptied completely, leaving the most recent waste in the chamber to compost further. The small containers of the commercial dry toilets are emptied every two weeks. This means the waste is not ready to be taken outside for continued composting. Instead, it is matured first in warm composting bins adapted from old chest freezers.

All toilet waste is taken for further composting to an open shelter built for the whole village to use for this purpose. The shelter has a concrete base and sides to prevent any leakage to the environment or groundwater reservoirs and a roof protects it from the rain. The compost is kept in the shelter for at least a year or two so that the winter cold can disinfect it. Sterilization by freezing is a good alternative for the Finnish climate, where the compost does not heat up to over 60 degrees Celsius for a period long enough to have the same effect. The finished compost is then used as fertilizer in the kitchen gardens and flower beds of the village.

The urine containers are emptied with a submersible pump. The urine is used as a lawn, pasture and garden fertilizer, directly or diluted with water. The appropriate amount of fertilizer is about one litre of urine per one square metre per growing season.

An important point to remember is that national legislation may restrict the use of human-derived urine and compost manure as fertilizers.

Depending on usage habits and the model of toilet chosen, the total time needed for dealing with toilet compost varies. In the households of the Communal Village it is about one hour per month.

User experiences

When Anu Pellinen and Jari Hämäläinen were planning their house, which was among the first ones to be built in Kangasala Communal Village, they wanted a simple, inexpensive and entirely self-constructed toilet. They came up with a system where the waste is collected in replaceable

A beautiful self-constructed dry toilet interior. Photo by Outi Palttala.

plastic barrels in a small room underneath the toilet. The toilet base is like a bench with a hole in it and a lid to cover the hole. The urine is separated off by means of a plastic funnel installed in this hole at the front.

When building their house they discovered solid rock under the proposed site of the chamber room. The rock had to be blown away in order to construct a room under the house even though the bathroom was placed half a storey above the ground. They wanted to minimize the explosives used as it was agreed in the building principles of the village that the terrain is to be modified as little as possible. Afterwards, experience has shown that the chamber they created is actually too small for optimum functioning, but the toilet system works nonetheless.

At the moment the toilet is used by a family of six. The barrels chosen are a bit too small because they fill up too quickly and have to be changed often, before the waste has had enough time to compost sufficiently. Properly composted content would be more pleasant to handle. The composting process could be accelerated if the moisture spread more evenly in the waste pulp but this would require occasional stirring of the barrel's content and the residents acknowledge that they usually fail to do so. Ergonomics should have been considered better when planning the chamber room. Moving three barrels in a small space is difficult, especially when they are full.

Anu and Jari also say their own user experience shows they need to remember to add more additional composting supplement than they do now. They recommend wood chips from deciduous trees. Used litter from a gerbil cage, which contains sawdust and shredded paper, has also proved to be an excellent supplement. Taking care of the toilet in total occupies less than one hour per month.

Their practical hint for the construction of a communal dry toilet system concerns the tube which is used to pipe the urine into the common chamber. This tube easily becomes blocked at the user end so it would be wise to install the system in a manner where it is simpler to clean or change this component.

Kangasala Communal Village has taken part in a follow-up study where ecobalances in two ecovillages were assessed in comparison with normal village settlements (*Erat & Palttala: Sustainable communities in a northern climate, 2009*). The material was gathered by a resident survey over the course of two years. According to the results, the Communal Village's water consumption is about 60 litres per person per day, which is considerably lower than in a normal residential area, thanks to factors such as the dry toilets. According to statistics, typical water consumption in Finland is 90-270 litres per resident per day. The average water consumption is 155 litres per day, of which the water closet accounts for 40 litres.

Handling the village's grey water is easier because the urine is separated from the wastewater, and according to the report, the cleaning performance of the Village's own biological sewage treatment plant is clearly better than the performance of central sewage treatment plants. Residents of the village use only nature-friendly detergents, which has a substantial effect on the result. It is noted in the study that composting toilets, urine collection and natural treatment of grey water are all realizable with simple methods. The study also states that this combination of features functions effectively in waste water purification and allows recycling of nutrients locally.

Author: Mia Saloranta (Thanks to the architect Outi Palttala for expert assistance!)

Further information

· Kangasala Communal Village: www.yhteiskyla.net/index_en.htm, contact person: Outi Palttala, e-mail: op@arkinor.fi

· www.drytoilet.org; Humanurehandbook.com

· Commercial dry toilet: www.biolan.fi/english > Dry toilets > Naturum

BIOCHAR URINAL

Suderbyn Permaculture Ecovillage, Sweden

Biochar is wood or any other organic material that has been turned into charcoal through pyrolysis – the heating of biomass with low or zero oxygen levels. This biochar sequesters carbon and thus mitigates the effects of climate change; it's also a valuable soil supplement which improves water quality and increases soil fertility by fixing nutrients in the soil.

Using biochar in a urinal enriches it with the nutrients found in the waste while also absorbing unpleasant odours. This simple technology has several positive effects stemming from this use of what would otherwise be waste products, such as leftover wood and urine, so it is a good fit for permaculture settlement design.

Characteristics, production and use of biochar

Biochar production

Containers used for making biochar exist in many designs, but the one used at Suderbyn consists of one small oil barrel upside down inside a bigger oil barrel. It's one of the simplest designs out there, and apart from simply cutting open one end if the barrels are sealed when purchased and making holes for air inflow at the bottom of the larger barrel, it doesn't require any welding or other technology. The smaller oil barrel is filled with wood or other residual organic matter and placed upside down inside the bigger barrel. Enough firewood to burn for 30-45 minutes is then placed in the gap between the two barrels. The biomass in the smaller barrel will get hot, but due to the absence of oxygen it will not burn, instead emitting gases that escape out the bottom and are burnt off. Meanwhile, the intense heat on top of the barrels can be used to cook beans or anything else that needs a good, hot fire. Once the barrels have cooled, the charred biomass can be removed for use in the urinal. Afterward, it can be composted or added directly to the crop land. The system can be set up virtually cost-free if barrels can be found without charge at the recycling station, and its implementation requires no special skills.

Detail of openings for air inflow, at the bottom of the big oil barrel. Photo by Jesús Pacheco Justo.

Using biochar in a urinal is very simple. In Suderbyn, for instance, a bucket was filled with biochar and placed outdoors in a field: straw bales were piled around to hide it from sight.

The permaculture of biochar use

Preparing the pyrolysis process to produce biochar from residual wood. Photo by Jesús Pacheco Justo.

The biochar urinal (while in use) is a part of everyday life at Suderbyn that affects the entire food cycle, from human waste to new food. The production of biochar and toilet visits are daily activities, while the end product (the charged biochar) is used while gardening, which benefits and involves most of the inhabitants.

Biochar fits well with permaculture ideals. Urinating, normally nothing more than discharging waste, is transformed into an act of charging waste wood with nutrients—thus waste becomes a resource. The simplicity of its use and clarity of its purpose helps in transitioning one's mind toward a more earth-conscious lifestyle.

User experiences from an ecovillage context

Biochar, product of pryrolysis.
Photo by Jesús Pacheco Justo.

The interviewee is Henrik Haller, a former resident of Suderbyn with long-term experience in biochar practices, who's graduating in bio-remediation.

The idea of installing a biochar urinal originated during the preparations for an international meeting that was to be held at Suderbyn. An alternative outdoor toilet solution was needed for the numerous visitors—one that combined practicality and hygienic solutions with prominent eco-technology. So we developed a prototype to be used at the first meeting. The design has subsequently evolved into a more permanent model that is used by the residents in their everyday life in summer.

The benefits of the biochar urinal include odour absorption, carbon sequestration, and the end product, which can be used as a fertilizer. The simplicity of the system and its educational value are also big pluses. One drawback is that it has to be frequently emptied if the receptacle isn't large enough. Since the pyrolysis is somewhat difficult to optimize in the lowest-tech version of the system, an inefficient use of fuel can be expected from these simpler models. However, with a few rather small modifications these devices can be upgraded to also recover other by-products, such as pyroligneous acid or wood vinegar. Wood vinegar can then be used as a wood preserving agent, for pest and weed control, or as a plant growth stimulant. The biochar urinal also requires some work to maintain. If it's not going to be used as a permanent toilet and fertilizer producer, it's still a good option for meetings, festivals, or other gatherings that require additional toilet capacity.

Authors: Henrik Haller and Kalle Randau

Further information
· www.biochar.org/joomla/; www.biochar-international.org; www.biochar.info/

COMPOSTING, RECYCLING, CONSUMING ECOLOGICALLY

A basic principle of sustainable life in ecovillages is the efficient recycling of nutrients and all materials. All organic biomass and biowaste can be decomposed in a composting process to be used in soil improvement and plant production, which improves nutrient recycling and creates high quality soils.

With careful sorting, valuable raw materials such as metals, glass and paper can be recycled again and again. Sometimes it is more ecological to reuse items instead of recycling the materials. Clothes, dishes, books and other things can find their new owners at flea markets and at exchange events. High-quality products have a long life.

Consuming ecologically means consuming less, treating things well, repairing, fixing and remaking. It also means paying attention to the origin of the raw materials, as well as to the production conditions and methods. Environmentally friendly and organic products can be found in most shops. But not everything needs to be bought from shops; we can learn a lot from our local traditions and make a lot ourselves!

HEALTHY SOIL RESTORATION

ZEGG Ecovillage, Germany

"The best thing that humans can do is build topsoil."

Healthy Soil = Healthy Plants = Healthy Food = Healthy People

The first 30 cm of soil are vitally important for the development and sustainment of life on Earth. This level, the humus-rich top layer, feeds plants, animals and humans with all the necessary nutrients. Since the beginning of industrial agriculture, however, we have witnessed an alarming loss of this vital topsoil. Worldwide, 24 billion tons of fertile soil annually are washed or blown away, or are simply destroyed. This is why the key to sustainability is to begin with soil restoration. It sounds so simple yet can be quite profound: Ultimately, soil is our only source for healthy food/nutrition. In addition to air and water, it is one of the essential environmental

Author in front of municipal leaf pile with finished humus in his hand.
Photo by Ina Meyer-Stoll

systems which together make up the basis of life for humans, the flora and the fauna. Only healthy soils are capable of sustaining biodiversity, holding genetic and natural resources, and storing water and energy. Healthy soils also have active microbial life forms capable of breaking down and utilizing many pollutants.

Members of soil biota are the managers, or underground stewards of the Earth. Worms, in particular, break down organic material into smaller pieces that can be digested by microbial beings such as bacteria and fungi. These in turn further digest the organic matter in order that minerals can be more easily assimilated by plants. The amount of soil organisms is unimaginably large. On average, one gram of healthy soil contains approximately 600 million bacteria, 400,000 fungi and 100,000 algae. On one hectare of soil this amounts to more than 20,000 kg of microorganisms within the upper 15 cm. In addition there are 4500 kg of higher organisms at work in and on the soil.

Leaf mulch being applied on ZEGG orchard.
Photo by Achim Ecker.

Decomposition by micro-organisms within the soil is the reverse of the process represented by plant growth above the soil. Recent studies show that the conviction that plants live on nitrogen salts, as industrial agriculture claims, is wrong. Even though plants are able to survive on salts (as offered by chemical fertilizers), they only do this when there is no living humus layer. They seem to prefer to absorb whole macro-molecules and cells from the soil's living matter, such as bacteria. So what they really need is a soil with a high content of living matter to choose from. Growing plants use the energy of the sun to synthesize carbon, nitrogen and all other elements into complex compounds. The energy stored in these compounds is then used more or less completely by the microorganisms whose activity within the soil makes nutrients available for a new generation of plants. Organic matter thus feeds the "life of the soil".

Soil restoration

Coming from these considerations, the protection and improvement of the soil layer are key concerns of the ecological work done at ZEGG. Situated in the German state of Brandenburg with its deep post-glacial sands, the site's soil is well aerated but water quickly drains right through, taking precious nutrients with it. In the surrounding forests, the average humus layer is no more than 2 cm deep and on open terrain a thin grassy sod covers pure sand. Rainfall is also very low, amounting to only 550 mm per year; this is further exacerbated by the soil's poor capacity to store water.

Author probing soil after years of mulching and adding green manure to sand.
Photo by Ina Meyer-Stoll.

Our two main strategies of soil quality restoration at ZEGG are: improving organic matter content; and re-establishment of soil dwelling populations (microbes, fungi, worms, insects, etc.) by creating good conditions for them. We have steadily increased the humus layer by mulching with old straw, leaves and hay from the parks and public gardens of the

Belzig municipality, and with cardboard. Mulching creates a habitat for a multitude of organisms and fungi, which make nutrients available to other plants.

Fresh organic matter is characterized as a rule by a large amount of carbon in relation to nitrogen. In building up the organic content of the soil itself, it will often be desirable to use legumes and grasses rather than simply to add organic matter, such as straw and compost, directly. Legumes draw nitrogen from the air and deposit it in the soil when they decompose.

We also add clay to the soil so a healthy clay-humus complex can be build. This increases the capacity to store nutrients and water.

ZEGG gardener in organic vegetable garden. Photo by Achim Ecker.

"Shit makes flowers grow!" Together with urine, faeces contain high amounts of nitrogen and phosphate. There is a growing phosphate crisis in the world. With known resources receding it seems mad to flush away what we have with valuable water and destroy the nutrients we otherwise need. Instead we can use it, directly fermented with charcoal and micro-organisms. Urine itself is nearly sterile.

We started experimenting with making Terra Preta, the black fertile soil first found in the Amazon basin and later also in Iran, Iraq, Scandinavia and other regions of the world. It is fertile due to its unique composition: about 10-15% charcoal, organic material, ground minerals, microorganisms, fungi and faeces. First, ground biochar is charged with lactic acid bacteria and urine for some weeks and then mixed with the other materials to be laid out in a shallow heap on the ground. This is then digested by earthworms to become black soil.

Terra Preta soils preserve and bind moisture, nutrients and carbon in the soil for probably hundreds of years. This is making it the most promising method and tool in efforts to combat global warming by carbon sequestration. Charcoal can be made from organic waste products. At the same time it is the answer to the global destruction of soil humus content and fertility due to industrial agriculture and chemical fertilizers. "Modern" agricultural soils have a humus and living matter content of less than 2% whereas fertile soils contain up to 60% living matter! Promoting small farms, organic agriculture, terra preta and humus agriculture could counter global warming in an effective way, preserve and cleanse water in the humus layer, stop erosion and depletion of soils, create lasting and permanent soil fertility, bind carbon etc.

Another valuable method of soil restoration is the use of green manures. These include peas, beans, lentils, clover, alfalfa (*Medicago sativa*), lupines (*Lupinus polyphyllos*), broom and black locust (*Robinia pseudo-acacia*) – all members of the pea family (*Fabaceae*). Over a period of several years, we have sown a large variety of green manure plants, which now freely propagate themselves.

User experiences at ZEGG

For about 15 years now, our local town of Belzig has been supplying us with profuse amounts of autumn leaves. Before this, they would drive them to the garbage dump about 10 km away and actually had to pay to deposit this "waste." Ever since they have been bringing it to us, which means they have been paying less, driving less, and wasting less energy. We let these leaves sit for a while and then spread them under trees and bushes, or cover and consequently feed entire areas of grassland with the intention of cultivating them with vegetables afterwards.

When neighbours and guests enter ZEGG, they instantly notice many more birds and a much lusher vegetation than just a hundred metres away. Birds thrive on this richly set table

of a healthier food chain. Every year a greater variety of birds come to enjoy this and help us with our gardening. A herbalist discovered more than 80 healing herbs growing wild here. The enriched soil life has given us a "paradise" and has provided natural ground to support a higher diversity of plants, insects, birds and animals – and higher diversity means higher resilience in extreme times. Please remember: The basis of all this is a healthy soil – it is the Mother of health for all that live upon it.

Teaching children at harvest time in ZEGG's organic garden. Photo by Achim Ecker.

Author: Achim Ecker

Further information
· www.zegg.de/zegg-community/ecology.html
· "Sustainability and Ecology at the ZEGG Community" by Achim Ecker

English books:
· Reed, Matthew. (2010). Rebels for the Soil: The Rise of the Global Organic Food and Farming Movement. Earthscan Ltd, London.
· Bates, Albert & Vandana Shiva (2012). The Biochar Solution: Carbon Farming and Climate Change (Sustainable Agriculture). New society publishers.

PRODUCTION OF HUMUS WITH VERMICOMPOST

Nevoecoville Ecovillage, Karelia Republic, Russia

Earthworms for the vermicompost in Finland. Photo by Outi Tuomela.

Making vermicompost, i.e. using a composting bin with earthworms inside, is a natural way of producing 100% environmentally friendly fertilizer and soil-improving humus from cow or horse manure and/or organic bio-waste and food scraps. It can be done indoors and all year. The humus produced is ideal for fertilization of all kinds of plants, even in places with poor or exhausted soil, and is better than manure in that it doesn't give an excess of nitrates, which can happen if manure isn't used at the correct time.

The composting method described here is useful for cold northern countries with poor soils and short summers, where there would otherwise only be a small window of worm activity and hence a slow natural production of humus, since worms are slow at low temperatures. This method of vermicomposting makes it possible to produce humus all year and indoors. It is ideal for individual household use and doesn't necessitate the production of a large quantity of humus for commercial purposes. However, there are ecovillages where the same technique is used for large-scale production; this requires keeping worms in a separate, heated location.

Description of vermicomposting

What is required:
Worms, 2 bins with tray, manure food waste, or other food for the worms, water.

Worms. The family who shared this story uses common earthworms, which can be found in large quantities and dug out around their farm. These worms are better adapted to their specific climatic conditions than the famously super-productive Californian red worms (*Eissenia fetida*),

which lose their productivity in temperatures lower than 16 degrees Celsius. You can also buy worms or dig them from compost areas (especially if you are going to feed worms with food waste). You will need at least a few thousand worms to begin with.

Bins. In this case, two cubic wooden bins were used. As we are describing the production of vermicompost for a family's own sustainable farming needs, the worm bins should have a compact, easy-to-use design. You may design it as you would a small table or chest of drawers that can be located in the kitchen or in the hall of your house, or any other suitable area. Although it could be either horizontal or vertical, the construction described here is a vertical worm bin. The bin consists of two stacked cubic modules that rest on a tray which collects the drainage of excess moisture.

Each module of the vertical worm bin is 35-40 cubic centimetres, without a top. The walls of the cube are made of a thin wood, whereas the bottom is made of either metallic mesh or square plates of plastic with holes 2 cm in diameter drilled every 4-6 cm. Two handles are screwed to either side (e.g. two wooden sticks about 10 centimetres in length with a cross-section of approximately 4x4 cm). The walls of the module are attached by square or rectangular rails in each corner, while the bottom is also fastened to the walls with screws or, in the case of mesh, with metal clips. Even without using a special means of protection against rot, such a module may serve for up to four years before needing to be replaced.

Making vermicompost in Finland. Photo by Outi Tuomela.

The bin should sit on a waterproof metal tray with 2-3 cm sides, as there will be a continual build-up of moisture draining into the tray.

As is evident from this description, such a worm bin is easily produced by just about anyone.

The use of the worm bin

You should fill both bins with a substrate of raw animal (cow or horse) manure mixed with a few thousand worms. Fill the bin slowly, lightly tamping with your hands while adding a little water. If you start with a few thousand worms, in a couple of years the population will stabilize at the maximum possible for the volume of the bin. One of the most important things for your worms is moisture content. Worms like a lot of moisture, and they feel most at home when the humidity is around 80-90%. You can determine the proper moisture level by taking the substrate in hand; the water should not drip until you start to squeeze your hand into a fist, whereupon the matter should immediately start to ooze. If the substrate becomes too wet, the excess water will simply seep through the bottom of the bin into the tray. If there is a lack of moisture, just add water to the tray, and it will be absorbed inside the bin. In this way, vertical worm bins tend to maintain the appropriate amount of humidity.

For the worms the top layer within the bin is the "toilet"—and the content of this "toilet" is nothing other than the precious humus which we are producing. Their "canteen" and "living space" is the bottom of the bin. After some time, there is a build-up of humus: this can then be removed. It looks very different from the initial substrate: it is dryer and looks like black soil. When the humus is ready, you have to remove the dry upper layer; you will easily know when to stop because the moisture and the quantity of worms will increase considerably in the lower layers you'll be leaving behind.

The speed of humus production depends on many things: the number of worms, the temperature and humidity, and the season. Even if the temperature in the room is normal and more or less constant year round, the productivity of worms decreases in winter.

Take the extracted humus and put it on a pan. Set the pan on a warm (but not hot) stove. The worms will come to the surface to escape the heat, forming a ball which can be easily removed and returned to the bin.

After several extractions of humus, you will reach the bottom of the first bin. Once this happens, you'll fill it in with a new portion of manure or other worm food and then rotate the bins: the former bottom bin then becomes the upper one. When your worm bin reaches its optimal performance, you will be swapping modules after every second or third week.

After two years or so, the population of worms exceeds their living space. When this happens, you may leave them as they are since they self-regulate their numbers. Alternatively, you may remove excess worms from the bin and use them to populate a second set of worm bins; you can place these in your composting space, sell them (or give them away) to fishermen (especially in winter), or give them to neighbours for their sustainable gardening.

It is necessary to keep a steady source of whatever food you have chosen for your worms readily available. They are very finicky eaters and need to be fed whatever they were eating from the day they were born. If, for example, their food is manure, it is important to have enough of it stored for the whole winter. It should be noted that in other places the author has seen bins where the worms were fed with simple organic waste from the kitchen. However, worms for such a bin should be taken from your usual composting spot. Usually worms like semi-rotten waste; before achieving optimal humus production, you will need to carefully experiment with their rations.

User experiences

The interviewee is Andrey Obruch, a resident of Nevoecoville Ecovillage. He has lived in Nevoecoville with his family since 1997.

Nevoecoville is located in a place with a very poor soil and a unique climate of short and rather cold summers and long severe winters. These factors, in turn, create unique conditions for agriculture, which is why the year-round production of worm humus in the house is so useful. You should know that if you start this in your household, there will certainly be questions and challenges in the beginning. You will have to adapt the process to the conditions of your particular environs. This requires patience and a kind of curious spirit. But, if your intentions are serious, you will certainly succeed.

I would also like to say a few words about the choice of worms. In our country, the Californian red worm is said by many to be the most productive. They are the same as manure worms, but have been selectively bred to work in the hot climate of California. However, at temperatures of 15 degrees and lower, they are actually much slower than our Russian manure worms, which are active down to a temperature of 6 degrees. Another consideration is that you have to pay for Californian red worms, whereas you can just dig into the nearest manure pile to find common worms. Finally, overseas hybrids such as the Californian red worm can carry all sorts of infections that can be very difficult to get rid of if they infiltrate the humus of your bed. For these reasons, I would suggest choosing simple manure worms for your worm bin.

Author: Andrey Obruch (the text was shortened and adapted by L.Mirzagitova)

Further information
· Andrey Obruch, e-mail: obruch@nwgsm.ru
· Pictures of vermibox: http://derevnyaonline.ru/community/187/1812

COMPOSTING PRINCIPLES

Composting creates optimal conditions for decomposition of all organic matter (e.g. biowaste from the kitchen, dry toilets and gardens). Decomposers are bacteria, fungi, actinomycetes, earthworms and numerous groups of other small organisms. The decomposition process releases water, carbon dioxide, nutrients and heat, and builds up humus complexes. Composting is an aerobic process, where organic waste and matter is decomposed without giving off bad odours. The end products are nutrients and organic matter: rich, dark compost, suitable for gardening and landscaping as an organic fertiliser and soil supplement.

The basic prerequisites for effective composting:

Composting equipment

A household compost bin can be any kind of self-made or bought frame or box, large enough for the amount of biowaste foreseen. It should enable an efficient composting process and heat production. Typical compost bin sizes are from 200 litres for one family up to 500-1000 litres for a larger household or group. Thermally insulated compost bins work better in low temperatures. Old chest freezers or similar closed boxes with a sealed base are useful to prevent unwanted leachate seeping into the surroundings and for keeping rats away: this is especially important for human manure compost, for example). Good ventilation has to be ensured. For continuous use, two similar compost bins are needed: one for collecting current waste and the second one for the composting process.

Enough oxygen in the compost

The decomposer organisms need oxygen for being active. Compost becomes anaerobic if it gets too wet. Adding coarse material (e.g. branches) and occasional mixing keeps the compost loose and aerated.

Carbon and nitrogen in the right ratio

The micro-organisms involved in decomposition need carbon compounds as energy sources and other nutrients as building materials for growth. If there is not enough nitrogen in the compost, the activity of the composting organisms slows down. The best combination is a mixture of nitrogen-rich compost toilet or household waste with carbon-rich garden waste.

Suitable moisture content

The decomposer organisms need enough moisture for their optimal activity. The best combination is a mixture of coarse, roughly cut materials and some moisture-absorbing compounds (e.g. grass and leaves, dry toilet waste). Mixtures that become too dry can be watered occasionally.

Amount of heat

The decomposition activity creates heat. However, the composting process slows down if there is only little new waste material added to the compost and the temperature decreases. If the compost bin is not thermally insulated, the compost may freeze during winter.

Source: www.ymparistoopas.com
Further information: HumanureHandbook.com

EFFECTIVE MICRO-ORGANISMS (EM) – MICROBIOLOGICAL PRODUCTS FOR A SUSTAINABLE LIFESTYLE

Poland, Ecovillage "L.A.S."

Effective Micro-organisms (EM) products are mixtures of bacterial cultures, including lactic acid bacteria, phototropic bacteria and yeast. The effective microbiological process is caused by the synergy of bacterial tribes which have diametrically opposite nutritional pathways. Skilful and systematic implementation can result in the restitution of the potential for natural self-regeneration of the environment. Techniques using the beneficial influence of EM on the environment have been devised by Professor Teruo Higa from Okinawa, Japan. In many countries

this method is used in farming, breeding and recycling of the organic wastes. EM technology is also used for regeneration of the soil and of water reservoirs.

Most L.A.S. members use EM technology in their everyday life. Those who have a permaculture garden usually use EM for dry compost toilets. Many people use EM in their gardens and some for cleaning houses or for rearing animals. Currently the municipal authorities of Lubartow are using EM technology to regenerate their city pond.

Natural biological wastewater treatment with the use of effective microorganisms - pond in Lubartow. Photo by Nicole Grospierre Słomińska.

EM technology is very easy to use: it does not require any special devices apart from those available in every farm. EM products are usually liquids which should be thinned with water in different concentrations before using the solution to water or spray the plants. In eco-farming you can use the same machines as for ordinary cultivation, on condition that these machines are first cleaned down.

There are two more forms of EM products. Bran processed using EM fermentation is used for compost and as a supplement to animal feed. There are also products based on burnt clay fermented with EM. These retain all the properties of living preparations and are used for soil regeneration, water treatment and as components of building materials.

EM preparations are able to replace chemical products in many applications. They are not harmful and they create life-friendly conditions. The price is adjusted to market prices so that they are not more expensive than other products of everyday use. In farming, including livestock farming, the cost of cultivation with EM does not exceed the cost of using classic fertilizers, and the price decreases with time. The more farmers we convince to use EM products the cleaner our environment will be.

Author: Nicole Grospierre Slominska

Further information

· Higa, Teruo (1996).“An Earth Saving Revolution: a means to resolve our world’s problems through effective microorganisms (EM)”. Sunmark Publishing.

· Higa, Teruo (1998). “An Earth Saving Revolution II: EM-amazing applications to agricultural, environmental, and medical problems”. Sunmark Publishing.

· www.pakissan.com/english/advisory/technology.of.beneficial.shtml; www.emrojapan.com/;

WASTE SORTING, MATERIAL RECYCLING AND THE ‘EXCHANGE ROOM’

Keuruu Ecovillage, Finland

Intensive waste sorting, recycling and reuse of old items are all key activities in Keuruu Ecovillage. They lead to better awareness of individual consumption habits and finally to reduced production of waste. Keuruu Ecovillage has prepared a detailed plan for waste sorting and recycling, and offers practical information and education on the subject for residents as well as for visitors. There are clearly signed places for different waste sorts. Some waste materials are transported to the municipal waste station; others are reused at the Ecovillage. For clothes and other ‘used but still useful’ items there is an exchange room, known as the ‘flea market’. Residents can bring anything they no longer have a use for to the room and others can take what they want. This is especially practical with children’s clothes. Having one common exchange room saves space, since there is no need to store useless stuff in individual apartments. During

events the flea market is open for visitors and also has a small café.

Waste sorting education materials. Photo by Ansa Palojärvi.

Organization of waste management

Waste sorting and recycling

Waste sorting and recycling are organized well at the Keuruu Ecovillage. Waste materials are sorted efficiently according to the jointly agreed plan (see INFO BOX: Waste sorting and recycling at Keuruu Ecovillage). Biowaste is very useful within the village: compost and other biodegradable waste is spread in the fields and garden (e.g. around apple trees and berry bushes) after first being mixed with animal manure. Wooden material is used to provide heat: it is burned either in the central heating stove or in individual fireplaces.

Most other waste categories are carefully sorted and collected to collectors in a common shelter. A waste collecting vehicle from the municipal waste station comes regularly to the ecovillage to collect recycled paper, energy waste and mixed waste. There is a small charge for disposing of energy and mixed waste.

Inside the main building, there is the 'recycling room', where problematic waste, glass, metals (small size), cardboard, bottles, cans and electrical waste are separated and collected. All these wastes are taken free of charge to the municipal collectors. There is a signposted site in the ecovillage for all large metal waste items; these are then jointly transported to the municipal recycling station.

Reuse

Waste materials are reused as much as possible; for example, empty plastic containers can be used for food in freezers.

'Used but still useful' items are brought to the 'flea market' – a room for things that can be exchanged. These are mainly children's clothes with a few smaller items such as toys, sport equipment and decorations. The idea is that residents can bring and take what they want for free. The room can be entered at all times. All stuff is sorted, for example children's clothes according to the size, which helps to keep the place in order; the goal is to keep the place comfortable so that it's nice to visit. During events, the flea market is also open for visitors and has a small café. Visitors are expected to pay something for what they take; the price can be decided by themselves, typically something between 20 cents and 5 euros. The flea market is maintained collectively on a volunteer basis. From time to time there is a need to reduce the collection by taking part of the stuff to other flea markets outside of the ecovillage or even to discard things as mixed or energy waste.

Education

There are some residents at Keuruu Ecovillage who specialize in the waste issues. They prepared the detailed waste sorting and recycling plans and can help others in waste matters. Occasionally they organise waste sorting education days for residents. The idea is as follows: Everybody brings different kinds of waste materials with them. Together, the group figures out the right category for waste examples. Some wastes are easy to categorize but others cause a lot of discussions. Some items need to be broken down into pieces since different parts belong to the different waste categories. Education days are needed for newcomers and to refresh knowledge. All visitors are advised about the waste sorting and recycling system.

There are written waste sorting instructions at places where waste is produced, for example in all kitchens and common areas. In the common dining and living room there are small boxes for each waste category with practical waste material examples, as well as written descriptions and example lists. At any time, everyone is able to check and study further the waste sorting system. It is important that places and things connected with waste are made beautiful and pleasant, since waste materials are actually very valuable!

User experiences about waste sorting, recycling and reuse

The interviewees are long-term resident Siru Kuusela and one of the ecovillage founders Ritva Elo.

Waste sorting shelter and bio waste compost at Keuruu Ecovillage.
Photo by Ansa Palojärvi.

Waste sorting and recycling has always been a fundamental issue in the ecovillage and it has also been improved with time, according to Siru Kuusela. Intensive recycling needs enough space and some work effort and motivation. For example, packages need to be washed, dried, flattened and stored. Every ecovillage should first find information about the local recycling and waste sorting possibilities in the area. It is very beneficial for the ecovillage if there is a specific person especially interested in taking care of waste management and informing others.

Motivation for everybody to recycle is increased when we know we are doing 'an eco act'. It is nice to know there are people with similar values and the recycling is organized based on this. It is sometimes a challenge to introduce the waste sorting and recycling system to new visitors, to change residents' habits, and to keep the waste room a tidy and a pleasant place.

At the moment the system works fine. Often it is especially clear that visitors are not familiar with waste sorting. It is actually surprisingly demanding: an extra work task for the ecovillage! However, it is easy to sort and recycle wastes if you have enough education and waste containers are clearly signed. Detailed waste sorting systems may even influence you to produce less waste than before. Joint purchases and large packages are one way to reduce the amount of waste. Maybe we could concentrate even more on reuse and become more conscious about it.

Ritva Elo says that the exchange room or 'flea market' was already established when the first residents moved to the ecovillage. They brought some extra stuff they wanted to get rid of. At the beginning the exchange room functioned as a payable flea market, with earnings being given to the Keuruu Ecovillage Co-op. At another point there was a system where the money went to the people who put the items there. Then all payments were given up since it was considered more important to reuse the stuff efficiently: so it now operates according to the principle of an exchange room rather than a real flea market, but the name stuck!

At the beginning there was a person nominated to take care of the flea market with fixed opening hours. Later on this was seen to hinder the activity too much and the open-all-hours, self-service system was introduced.

Siru Kuusela explains that at times there are so many donations the room fills up and part of the stuff has to be removed. The first priority is now for clothes made out of natural materials. Most donations are from residents and regular visitors, but they sometimes even come from outsiders. It is also convenient when

Flea market and the 'exchange room' at Keuruu Ecovillage.
Photo by Ansa Palojärvi.

children grow out of their clothes and shoes and can exchange them for larger sizes. Sports equipment is also popular, with children's cycling apparel having an especially quick turnover. "I like to bring my own clothes to the flea market and search for something else in return," says Siru. "It makes a big saving and I change clothes more often. And it is fun to see others wearing your own clothes! Another great benefit is the space saved in your apartment."

It would be great to have a large recycling hall at the Ecovillage. Then the residents would need even less space of their own. In a bigger space it would be easier to keep the place in order. It is important that the room is easy to enter and in a clear order, e.g. separate compartments for children's clothes, adults' clothes etc. It is important the stuff cycles efficiently and that the residents find significant benefit from the place. In a small ecovillage it might be difficult to get things to cycle well. The flea market or exchange room could be run jointly with several ecovillages or with the surrounding village. There could be a repair workshop in the place. Why not organise cooperation with surrounding villagers, such as "stuff collecting" events? Charity associations working with developing countries might also be interested.

Author: Ansa Palojärvi

WASTE SORTING AND RECYCLING AT KEURUU ECOVILLAGE

Waste materials are carefully sorted at Keuruu Ecovillage and then either reused on-site or taken to the municipal recycling station. There is a waste charge for energy waste and mixed waste, but well-sorted waste materials can be delivered for free.

Waste sorting categories at Keuruu:

Biowaste
- food scraps, coffee and tea with filter papers, tissue incl. paper handkerchiefs (to the biowaste compost)
- plant material and soil (to the animal manure compost heap)
- brushwood, other wood waste (used for heating/ fireplaces)

Glass
- rinsed glass jars and bottles

Metals (small)
- aluminium tins and foil; metal cans and lids

Metals (large)
- collected separately and transported to the municipal recycling station

Recycling paper
- all paper arriving with the post; books without cover

Cardboard
- board, carton

Electrical waste
- electrical equipment; mobile phones without batteries

Problem waste
- aerosols, batteries, energy saving bulbs; chemicals (acids, solvent etc.); medicines (can be returned to pharmacist)

Construction and demolition waste
- sorted waste should be taken or delivered for reuse; impregnated wood is a problem waste

Energy waste
- plastic (rinsed; except PVC); other papers than recycling paper and cardboard

Mixed waste
- everything else, such as packages containing aluminium, dirty plastic and paper, unidentified plastic, porcelain, PVC plastic, used nappies and sanitary towels

Further information
See e.g. http://www.recycling-guide.org.uk/

Check your local recycling possibilities!

NATURAL ECO-FRIENDLY DETERGENT: LYE MADE FROM ASH

Ecovillage Big Stone, Russia

Contemporary chemical detergents are far from being safe for their users or nature. Most detergents contain phosphates, lauryl sulphates and other aggressive ingredients. Phosphates pollute bodies of water by provoking excessive reproduction of algae, which in turn poison the water when they decompose. Laurel sulphates and other chemical compositions are aggressive toward the human organism. Previous human generations did not have many alternatives available for washing – only soap. However, they had their own solutions and lye was one of them. They used lye for washing their clothes, hair and body. Lye is an absolutely natural substance and it is neutral toward both the human body and the environment. It has no smell and does not provoke any allergies. It can be easily produced using only water and ash – itself a natural by-product of wood-fired heating.

Ash in the stove.
Photo by Ivan Kulyasov.

Characteristics and production of lye

To make lye you will need: a bucket or a big pot, ash, water, a stick with which to mix the ingredients, and a warm place. In addition, it is good to have a bulb syringe to strain off the lye when it is ready, and bottles to store the product. In Big Stone ecovillage the following procedure is used to make lye:

1. Take ash from your stove. Put it into the bucket (approximately half full) and add the same volume of water. It does not matter if the ash contains charcoal pieces or other impurities: in the course of making lye they will first come to surface and then fall to the bottom. Important: If impurities or charcoal pieces come to the surface you should not remove them at first. Wait 3 days and if there is still something left on the surface, then you can skim this off just before straining off the lye.
2. Put the bucket in a warm place for approximately 3 days. The temperature influences the time it takes to prepare lye: in a very warm place the lye is ready much more quickly – even in one or two days. The mixture should be stirred at least 2-3 times a day (the more often the better). If you did not sift the ash, a small amount of foam and suspended matter will settle on the surface. Do not remove this: it participates in the reactions. Little by little the liquid will become transparent. After 3 days the liquid will have enough alkalinity to be a good detergent.
3. Now strain off the transparent liquid using a bulb syringe. Do this very carefully so as to avoid drawing off sediment with the lye: with sediment in it, the lye is not fit for use.

The colour of the lye can vary from colourless and transparent through to yellowish or yellow (if the ash is from pine, for example). The strength of the lye can vary as well. You can estimate the concentration by touch. The more lathery it is, the stronger the lye. Finally, pour the strained lye into bottles: it can be stored for any period of time.

Quick preparation of lye

Instead of keeping the mixture in a warm place for 3 days, an alternative is to boil the above-mentioned mixture of ash and water for 3 hours. After boiling, when the mixture has cooled down, settled and become clear, it can be strained off and used.

Use

Lye can be used for washing our hair, body and clothes. When using lye for washing our hair and body, water should be added (1:1) if the lye is strong. Mild lye can be used as it is.

To wash clothes and other laundry you need approximately 1 glass of lye for 6-7 litres of hot water. The laundry should stay in this alkaline solution for 3-4 hours (not longer), then it can be washed by hand or in a washing machine. To wash it in the machine, you should simply take the laundry without rinsing it and put it in the machine, switching it on without adding any other detergent.

In old villages and in the ecovillage Big Stone, a wooden 'beetle' is used for washing after the pre-soaking detailed above, and then the laundry is rinsed by hand in a river.

If the laundry is very dirty you can rub simple soap onto the dirty stains before pre-soaking. Alternatively, laundry can also be boiled in this alkaline solution.

Once the lye is finished and has been strained off, the remaining ash/sediment can be used in the garden as a natural, eco-friendly fertilizer.

Experiences from making and using lye

The interviewee is Antonina Kulyasova, resident of the Big Stone ecovillage located in Vologda region (North-West of Russia). She has lived in the ecovillage more or less permanently from the year 1998 and has been using lye for more than 10 years.

Ash mixed with water.
Photo by Ivan Kulyasov.

When we decided to live in the ecovillage, my husband, children and I thought that we did not want to spoil our soils with any chemicals – synthetic detergents, fertilizers, pesticides etc. We started to use only very simple soap, but we did not even want to use this soap too much. Then we decided to make lye. I remembered how my grandmother used to prepare and use it, so we made it our usual practice. For the last 10 years we have not been using anything else except lye and a little bit of simple soap. In our ecovillage we conduct seminars and have a lot of participants, guests and volunteers; we have a rule that participants should not use washing powder or shampoo. So our visitors, too, are asked to use only lye or other natural means.

If you decide to follow our example I have some advice for you. You have to experiment when producing lye – with different types of ash (from various woods) for the production and similarly when using the lye as well. You have to find your own favourite way to use it. The concentration of the finished product depends on many things – particularly the wood and the water, which are both different in different places. For example, with the ash from the edges of the body of the tree, the lye will be very mild or weak. You have to monitor this over time and build on your own experience.

Lye in the bottle.
Photo by Ivan Kulyasov.

In the beginning it was a bit strange using the lye instead of other detergents and shampoos. For example, it does not foam up. Although it does sometimes foam when washing very dirty hair. On relatively clean hair it does not make foam. I usually wash my hair twice when using lye; my hair is very good after this – shiny and voluminous.

And one more thing – if you like snow-white cloths and sheets, lye is not for you. But somehow I think that snow-white things were not really a feature of traditional village life.

Author: Antonina Kulyasova

Further information
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· www.soap-made-easy.com/make-lye.html

FOOD PRODUCTION

Many ecovillages have gardens and produce vegetables, herbs, fruits and berries for their own consumption, and sometimes even for sale or barter. A vegetarian diet is common, but animal husbandry is carried out in many ecovillages; bees are the most numerous production animals in ecovillages! Ecological farming principles are widely respected in food production. There are several doctrines for ecological farming giving instructions on issues such as crop rotation, fertilizers and plant protection. At the EU level there are guidelines for organic farming, but many other criteria are stricter, such as biodynamic farming based on the philosophy of Rudolf Steiner, or natural farming, common in Lithuania. Permaculture is a holistic design method which also has many applications for food production.

A widespread idea is to minimize the use of non-renewable natural resources and to strive for as much self sufficiency in food production as possible. Even city ecovillages are able to produce vegetables in gardens or balcony growbags, or even fish and lettuce with indoor aquaponics. Food production can also be a very social and communal activity; many ecovillages arrange volunteer weeks in their gardens as an opportunity for guests to visit. Community supported agriculture (CSA) systems also offer an interesting alternative, bringing together labour for the ecovillages, income for the gardeners, healthy produce for the consumers and a shared yield risk. Picking and using wild berries is an important dietary supplement, especially in those Baltic Sea countries with “everyman’s right”. Other wild plants may also increase the nutritious value of food greatly and many wild herbs can be used as excellent teas.

Long, cold winters and a short growing season make it crucial to store and preserve foodstuffs for winter. Traditional cellar constructions are healthy and cheap solutions for food storage, if they function properly. Ecovillages often process foods to conserve them even better. It is very important for the ecological footprint not to waste food. Ecovillages often have a communal kitchen and dining, which makes cooking and purchasing more ecologically and economically sound, as well as helping to avoid and/or utilize leftovers.

So now let us gather together to prepare and enjoy a delicious, healthy meal!

NATURAL FARMING

Ecovillage close to Vepriai, Ukmergė district, Lithuania

Laimis is increasing his garden by pond using bulrush for mulch.
Photo by Živilė Gedminaitė-Raudonė.

Natural farming is a farming approach based on imitating nature. Several approaches to natural farming have been developed. One kind of philosophy was created by Japanese farmer Masanobu Fukuoka, another by a group of Russian farmers led by Alexander Kuznecov. In Lithuania a unique type of natural farming was established by Saulius Jasionis and Laimis Žmuida and is now being further developed by a large group of independent farmers and gardeners. The Lithuanian type of natural farming is putting equal emphasis on three major philosophical notions: the way of living, the soil formation and the relations within ecosystems. The main purposes and benefits of natural farming are: a) growing food without doing harm to the environment; b) growing food that is more than just organic and non-toxic – it should be nutritious and have more vitamins and microelements than food grown on organic or industrial farms; c) preserving natural landscapes; d) creating lifestyle models for independent, free and self-sufficient human beings.

In natural farming, the idea of "local" has top priority – all the materials necessary for natural farming should be taken or produced within your farm. This means the soil of the farm should be preserved and also that the whole environment around the farm has to be sustained by using local resources produced within the farm.

Only two components are needed for the implementation of natural farming technology – knowledge and manual work. Other general inputs essential for the farming are:

- Land for gardening and for keeping animals;
- Seeds for gardening and some livestock for the beginning (later you will produce your own seeds and breed further livestock);
- Tools: scythe, rake (for preparing mulch), shovel (for planting trees).

Natural farming steps

1. Sowing or planting;
2. Mulching;
3. If weeds start to block the sunlight necessary for cultures, they need to be cut down and mulched nearby;
4. Continuous conversion of weeds to mulch should be followed until a harvest can be taken.

Mulching avoids the necessity of watering and it makes removing weeds simpler. It also activates the soil and constantly improves its condition.

Natural farming at Laimis ecovillage.
Photo by Zivile Gedminaite-Raudone.

Additional notes that need to be taken into consideration when practising natural farming:

- Do not grow one culture but mix plants as much as possible; cultured plants should be intensively diversified by natural plants (10% of cultured plants and the rest wild);
- Harvest three times per season from the same place (plant and harvest different cultures in rotation);
- Keep the ground covered with leaves during the whole farming period;
- Have trees growing close to the garden for the eco system to function;
- Plants that attract insects should blossom continuously.

Advantages and disadvantages

Advantages of natural farming: Natural farming is based on manual work and doing work by hand allows attention to be paid to every single plant. As well as producing and eating healthy products, the farmer can also experience aesthetic feelings. Working in and with nature is actually a sort of mind and body therapy. Natural farming incurs relatively low costs because it does not use resources from outside the farm and these do not need to be transported to the site. The price of the natural farmer's products depends mainly on the cost of the human labour involved. Natural farming does not cause exploitation of resources, pollution or soil impoverishment.

Disadvantages of natural farming: Natural farming can only be done on a small scale because by using manual work you cannot generate high levels of production. Handmade products are relatively expensive and as a result financial profit will be smaller than generated on a conventional farm.

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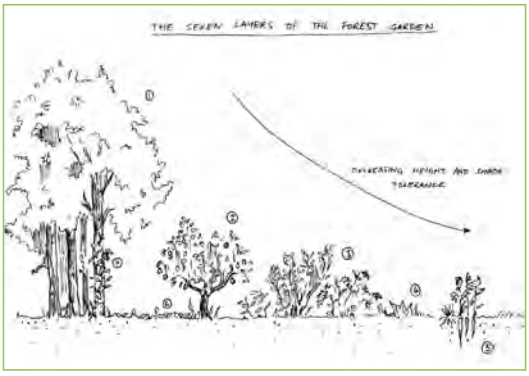
THE EARLY PHASE OF A PERMACULTURE FOREST GARDEN

Suderbyn Permaculture Ecovillage, Sweden



1. Canopy (large fruit and nuts trees).
2. Low trees layer (dwarf fruit layer).
3. Shrub layer (currants and berries).
4. Herbaceous layer (comfreys, bets, herbs).
5. Rhizosphere, root layer (root vegetables, incl. annual vegetables).
6. Soil surface (ground cover, strawberry, etc.).
7. Vertical layer (climbers, vines).
Figure by Steven Porter.

The idea of a permaculture forest garden is to create a forest where most plants are edible or useful in other ways. The ideal forest garden is superior to conventional farming since it produces around the same amount of food but requires less maintenance and uses no pesticides or other chemicals. However, it takes time for a forest garden to reach its maximum potential, and the best case scenario can be hard to achieve. In Suderbyn, a big forest garden project was started in 2009. The garden has taken a lot of inspiration from the forest garden of Holma, in Skåne, which was started in 2004 and is one of the most developed forest garden projects in the Baltic Sea region. The garden serves as a demonstration installation and research ground where plants are tested in a northern climate and where the public can learn the basics of forest gardening through tours and workshops.

Description of the forest garden system

The general idea of a forest garden

The idea of a forest garden is to mimic a natural deciduous forest, with the difference that all of the trees, shrubs and ground plants are species that are useful or produce food, e.g. nuts, fruits, berries, leafy greens or root vegetables. Species are also planted which have a use within the system, such as those which help fertilize the soil by fixing nitrogen or by pulling up nutrients from deeper layers. In a forest

Permaculture forest garden in the making: planting trees.
Photo by Jesús Pacheco Justo.

garden there is a large variety of species: tall trees, shrubs and climbing plants grow beside low-growing or creeping plants; some of the species thrive in the sun, others in the shade; some have shallow roots, others deep; some grow in the spring, others grow in the summer, and so on. This diversity allows one to use the land more efficiently and also provides protection against pests and diseases. In a northern climate, the general design goal is to try and limit the wind as well as to maximize the sun intake and to create warm microclimates.

Permaculture forest garden in the making: covering the ground with straw for mulching. Photo by Jesús Pacheco Justo.

The implementation of the system at Suderbyn

In Suderbyn, the aim is to create a forest garden of around two hectares in area. Seven horseshoe-shaped walls, with their openings directed to the south, were built in 2009. The horseshoes function as sun traps and protect against the wind, creating warm micro-climates that will hopefully allow for the growth of species that normally don't fruit well in northern climates. The northern sides of the horseshoes were planted with large trees, while smaller trees and bushes lie on the southern edges. The forest garden then consists of forest edges, rather than a truly dense forest, thus utilizing more of the sunlight. Altogether, several hundred trees (common fruit and nut trees like apple and hazel, but also species usually found in warmer countries like peach, walnut, and almond) and bushes (common berry bushes like currents and raspberries, but also rarer species such as sea buckthorn and jostaberries) have been planted in the seven horseshoes.

The forest garden area is fairly big and hasn't been thoroughly designed; instead, trees and shrubs have been planted out in large quantity to get the garden growing. In the summer of 2012, a workshop was held on forest garden design, where one of the horseshoes was taken as an example with which to teach inhabitants, and then designed more carefully. Many trees and bushes were moved from other parts of the forest garden and replanted in the horseshoe. A lot of mulching was used to kill weeds around the plants, which were then carefully watered to keep them from dying. The next step will be getting rid of the weeds and replacing them with plants that act as ground covers.

Building the forest garden is part of an EU LEADER project at Suderbyn. Digging out the horseshoe walls cost 22,000 EUR and there's been an addition 6,000 EUR spent on plants and soil improvement. A lot of voluntary work has also been put into the forest garden: some of this labour comes from the European Voluntary Service programme, the rest from the permanent inhabitants. The forest garden at Suderbyn is quite a large-scale effort; it would indeed be possible to reduce the costs, either by making it smaller or by leaving out the walls.

Current everyday usage

Since the forest garden is still very young, the trees are still quite small and don't yet produce fruit. Berries are the only things the forest garden produces now, which are a part of the communal food supply shared by the inhabitants. Making jam, juice, and wine from the berries are also activities of many people in the community.

Some of the horseshoes are seldom visited these days, and they thus only serve the purpose of growing trees, while others now have new temporary functions. For example, one has been used as a sports field, while another acts as an annual garden while the forest garden continues to grow.

The long-term hope for the forest garden is to make it an integrated part of the village. Indicative of this aspiration is the fact that the new outdoor toilet has been placed in one of the

horseshoes, while the sauna is being built in another. Visiting the garden has both practical and pleasurable aspects: the daily maintenance and harvest has become easier, while the garden also serves as a beautiful, calm area, suitable for recreation. Benches and tables have been installed to help in this regard. Part of the forest garden will also be available to the public as part of an educational tour that will inform the visitors about the ecovillage and its practices.

Permaculture forest garden in the making: a low-maintenance sustainable system formed by fruit and nut trees, shrubs, herbs, vines and perennial vegetables. Photo by Jesús Pacheco Justo.

User experiences: the story of the practice

The interviewee is Oskar Kullingsjö, who has lived in the ecovillage since 2009 and is one of the main figures involved in planning and growing the forest garden.

Since there are a lot of different tasks in a new ecovillage, it has been hard to maintain the management of all of the planned forest garden area. Trees need a lot of care for their first few years. For a while they were not watered regularly, which was a problem during dry summers; they had a hard time competing with the grass and some have even died. Two unusually harsh winters, meanwhile, have claimed some of the chestnut trees. Though there are still living trees in most of the garden that will grow big and eventually produce fruit, it will take a lot more time than with proper management.

From 2012 onward, the work has been concentrated in a smaller part of the forest garden (one horseshoe) in order to ease planning and maintenance, which should help the trees and bushes there thrive. Later on, when the plants there are well established, the other horseshoes will be planned and planted more carefully. One could say that perhaps we should have started with only one horseshoe from the beginning; on the other hand, it's good to get the trees established and growing as soon as possible. As long as they don't die, they can always be replanted later if needed, even if that also involves the risk of them dying.

When starting a forest garden, it's preferable to start on a small scale and plan the area carefully before planting. One should also consider how one will keep the area free of weeds, which is a difficult task that needs a lot of care in the beginning. Depending on the budget, it may be worth planting many trees and shrubs at the start, even if you'll lose some while replanting them in the future. Marking everything carefully is also very important, especially if many people will be working on the forest garden. In the end, creating a forest garden takes a lot of trial and error to see what works. A good plan is very important, but it should also be re-evaluated and open to change.

Authors: Oskar Kullingsjö and Kalle Randau

Further information

· *E-mail: info@suderbyn.se*
· *www.pfaf.org; www.agroforestry.uk.co; www.blomqvistintaimisto.com*
· *Jacke, D. & Toensmeier, E. (2005). Edible forest gardens. Chelsea Green Publishing .*
· *Crawford, M. (2010). Creating a forest garden. Green Books.*

MULCHING

Suderbyn Permaculture Ecovillage, Sweden

Mulch is a ground layer put on the soil when cultivating crops or plants, and is often used in permaculture. It can be permanent, like bark chips or stone, or temporary, like cardboard or hay. Mulching is an easy practice that has a range of benefits, such as conserving moisture, improving fertility and health of the soil and reducing weed growth. In Suderbyn, different kinds of mulching are practiced.

Description of mulching principles and practices

Mulching principles

Organic mulch made with straw in Suderbyn's dome. Photo by Jesús Pacheco Justo.

There are many different ways of mulching and the purposes can be different depending on the situation. Mulch can be both organic, e.g. leaves, hay, straw, manure, compost, wool and cardboard, or non-organic, e.g. stone, plastic and rubber. If the only aim is to prevent weeds from spreading in the soil, mulch that takes a long time to decompose works better, such as plastic. If the purpose is to keep water in the soil, hay or straw is a good option. Often a mixture is desired and there are several combinations that can be used. In case of using non-organic materials one should be cautious and avoid materials that contain harmful chemical substances.

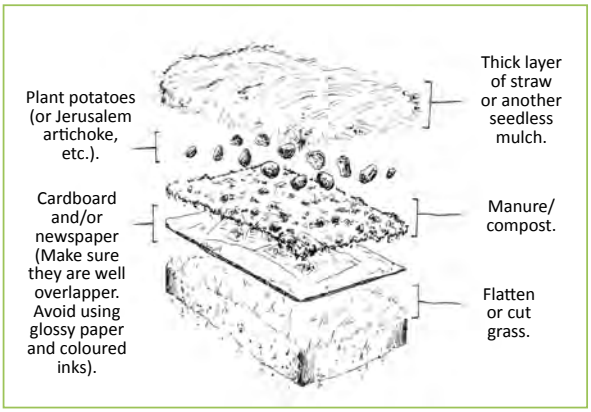
The forest garden

Mulching in Suderbyn has been used for both the annual gardens and the permaculture forest garden. Depending on the situation, the mulch has served different purposes. The initial phase of the forest garden was to change the typography into several u-shaped walls that would serve as sun traps and wind breaks for the trees, bushes and plants inside. Then the ground was bare and white clover was planted to avoid intrusion of grass and other weeds. The clover thrived but couldn't keep away the grass, which spread quickly. A lot of trees and bushes were planted in the forest garden and the grass was cut around the plants to improve their growing conditions. Last summer, when one of the sun traps was focused on more attentively, many trees and bushes were moved and mulching was used extensively. Stones were used around the plants for stability and as weed breaks, cardboard was put in the bottom to suppress weeds, and straw was put on for extra weed cover and to make the cardboard stay in place.

The annual garden

For the annual gardens mulching has been used in different ways. For the new potato field the ground was hard-baked clay and it was also covered with grass. Cardboard was put directly on the ground to kill off the grass. On the cardboard a layer of horse manure was scattered and this was covered with hay and straw. The potatoes were then planted through holes in the cardboard, but they could also be planted into the mixture of manure and hay. While the potatoes thrive better if planted in the soil, weeds will also come up through the holes in the cardboard. An

Organic mulching with cardboard. Photo by Jesús Pacheco Justo.



Planting with sheet mulch. Drawing by Steven Porter.

advantage of mulching in this case is that the soil doesn't have to be prepared (digging or tilling) beforehand, which saves a lot of work. On the other hand the harvest is lower compared to preparing the soil conventionally. The mulching also works to increase the humus content in the soil and to make it less compact. To create a desired top layer takes more than one year and the quality of the soil increases every year this method is used. In the first year the potato field gave a descent harvest, but many of the potatoes were green due to exposure to light. So we realised it is important to have a proper covering of hay or straw: around 25-30 cm. For the potato field hay was used more since it was accessible in larger quantities; unfortunately hay contains weed seeds and quite a lot of weeds started growing in the field. So straw is preferable if available.

For the vegetable beds mulching was used in a slightly different way. After the harvest the beds were covered with a mix of hay, straw and cut grass. When spring came, the biomass cover was pulled aside, the soil loosened and some horse manure spread out on the beds. Then the seeds were planted directly into the soil. When the plants had grown a little, the mulch cover was put back around the plants. This helped to prevent weeds from growing, keep the moisture in the soil and supply nutrients for the plants.

Mulching as part of permaculture

To practice mulching requires basic knowledge but it is mainly about trying out different methods and compositions to see what works. It also requires access to the different mulching materials, but since many different materials can be used, this encourages the use of local resources. Suderbyn acquires its mulch ingredients from several places. The compost and some of the hay is acquired on the property, as well as other minor resources such as algae. Straw is bought from the neighbouring farmer and costs around 50 cents for one bale. The rest of the hay is brought from the hay-making on Kuse änge (a few kilometres away), where the inhabitants of Suderbyn help out every year and in return get the low-quality hay that is not used for animal food. Horse manure is sourced from another neighbour. Cardboard is received for free from the furniture and food stores in town. Altogether the mulch for one year costs around 10 euros, excluding transport.

The use of mulch generally transforms the mindset into permaculture ways of thinking since it represents an everyday handling, economizing and storing of local resources in systems where most resources are deemed valuable if they are just put in the right place.

The use of mulch also encourages small-scale trade relations and the local economy, which accords with permaculture ideals. In the case of Suderbyn, the need to find cheap local resources has forced Suderbyn to create a more active relationship with its neighbours.

User experiences: The story of the eco-practice

The interviewee is Kalle Haller, the work leader at Suderbyn and the main responsible person for the garden practices for the last 2-3 years.

The mulching procedure spans over the whole year, even though the most active period is during the growing season. During my work time at Suderbyn, basically everyone in the village has been involved to some extent, since mulching is a vital component of all cultivation. The compost partly

comes from the kitchen wastes and everyone is informed about the recycling, where bio-waste is separated as chicken food or compost. Also the chicken manure and compost are used for mulching.

Mulching has been used from the start in Suderbyn since it's a common practice in permaculture. For the first small garden, broadlooms (woven carpets) from a renovated house were used as mulch. It worked well against weeds since the mats are thick and took a long time to decompose. Since then the overall garden area has increased from around 50 to 500 square meters and many different mulches have been tried out, often simply taking what was available. For instance, at one time the village received a large amount of wool, which also worked well as mulch, since it decomposes slowly. Overall the mulching could have been done in a more organized and attentive way, especially for the purpose of getting rid of the weeds. In many cases there was no long-term thinking about the procedures and then a lack of maintenance led to the weeds encroaching back again. Often the cardboard blows away, allowing the weeds to spread. The mulching process needs to be monitored better in general; a layer of straw and hay must be applied and the cardboard checked regularly to ensure full coverage of the ground. For combating weeds, weed breaks around the growing area should also be considered: for example, two rows of comfrey. If we were to repeat the procedure with our potato field, we would not make holes in the cardboard but instead let the potatoes grow directly in the mix of hay, straw and manure on the cardboard.

Mulching is not the most enjoyable part of the growing process but it is definitely worth the effort. It is easy and saves a lot of time. When starting mulching, our suggestion is to look around you and see what kind of material is accessible. If you decide in advance on a specific material, it might turn out to be hard to find. We had problems finding enough cardboard. Most large stores in Sweden are recycling the cardboard themselves and won't let anyone take it. First we got cardboard from the neighbouring food store but those were small pieces and therefore not suitable as mulching material. Later we managed to make an agreement with a furniture firm in Visby who sympathized with our project and let us take the cardboard on specific days when they had big deliveries. In general though, one should be flexible in the use of materials. For instance, if there is no cardboard, maybe newspaper could work. The general rule is to try it out and see. Another recommendation is to start small and concentrated so the procedure can be evaluated. And of course, be aware that keeping the weeds away is very difficult!

Author: Kalle Randau

Further information
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· http://en.wikipedia.org/wiki/Mulch; www.treesaregood.com/treecare/mulching.aspx

GROWING POTATOES UNDER HAY

Grishino Ecovillage, Leningrad Region, Russia

Growing potatoes under hay is an environmentally friendly and attractive option—the results from this "lazy" method of growing potatoes rival (or exceed) those of traditional planting. It's more efficient because the potatoes are grown without having to:

- dig the soil before planting;
- "plant" in the usual sense of the word;
- till the soil;
- dig the potatoes up to harvest them.

On the other hand, you will need hay or hay mulch, but this is commonly harvested by many villagers anyway.

Hay harvesting.
Photo by Vladislav Kirbiatiev.

Description of the practice

There are several methods which can be used to grow potatoes under hay. Here is one of them.

Potatoes under hay.
Photo by Vladislav Kirbiatiev.

The bed is made directly on the ground, with the potato (or potato-seeds) placed directly on the soil. They are then covered with a 25-30 cm layer of hay mulch (hay mulch is year-old hay that's been gathered, without having been dried, into little stacks right after the harvest so that it is partly dried and partly rotted through). You can use fresh or simple dried hay for a covering as well. You may also use little piles over the individual potato tubers instead of an even layer of hay; in this case, you will not need to add extra layers later on during the summer. After the potato plant finishes blossoming and starts to dry, it's ready to be harvested. This simply involves opening the hay and taking the potatoes out.

In other places, people make beds for vegetables by covering them with paper mulch; holes are then made in the mulch where they place the potatoes. The entire bed is again covered by about 20 cm of last year's hay. When the potato plant has sprouted several centimetres, a new portion of hay is placed on the bed (twice or more during the season) to prevent the potatoes from greening. This method is necessary for regions with strong sun. In Grishino, one 25-30 cm layer is enough to prevent the potato from greening. It's also important to find the right time to plant to avoid disease; if planted too late, for instance, there's danger of potato blight. In Grishino, we plant in the middle of May.

Story of the practice in Grishino

The interviewees are Oleg Kovalenko and Marina and Vladislav, who have been living in Grishino Ecovillage since around the time of its establishment in the late 1990s.

We first learned about this potato-planting technique from the books of N.I. Kurdiumov, the Russian permaculture developer. The practice is commonly used in many places, but not always with the same results. One expert's opinion is that people ought not to give up after one or two unhappy trials—the technique has to be adapted to a specific locality and sometimes it requires several trials and experiments before you understand the optimal method for your region. The practice is also beneficial for the soil, as it minimizes digging; this conserves the biodiversity of the soil since the hay serves as the fertilizer. Growing potatoes under hay is also a convenient "lazy" man's technique to develop virgin soil: you just grow potatoes on the soil you want to develop, and after harvesting you have a wonderfully soft, pliable soil that's ready for planting. The hay keeps the soil from exhausting itself, which often happens when growing potatoes.

Oleg and Marina started experimenting and developed their own version of the practice, which is much easier than the method described in Kurdiumov's books. They later learned that older generations living in the villages had also grown potatoes the same way long ago. At first the younger villagers were very sceptical toward the method. One of Oleg's neighbours laughed at him when he saw him placing potato tubers on the ground without digging or making holes. He asked Oleg to invite him again for the harvest. When autumn came, he returned and was shocked to see Oleg simply take hold of the semi-dried plant and pull it up by its roots, ripe potatoes and all, without any digging or effort. The neighbour asked again and again, "You didn't dig at all?" and, "You didn't weed at all?"—"Oh man! Why did I do all that hard work?!"

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STORAGE AND PRESERVATION OF FOODSTUFF

A vegetable garden at the subsistence farm. Photo by Daina Saktiņa.

Jaunpiebalga eco community, Latvia

Storage of fresh vegetables and fruit

Not all fruits and vegetables can be stored fresh. Some of them spoil quickly and can only be stored for a few days, so they are processed in some way for winter: for example, all berries, tomatoes, cucumbers, and cauliflower. Cabbages can be stored either fresh or pickled (i.e. sauerkraut). Fresh storage generally needs a dry place in the cellars; this is suitable for carrots, cabbages, potatoes and beetroot. Apples can also be stored fresh by sorting them into boxes; they can then either be consumed fresh or baked in pastry during the winter. Potatoes are sorted according to use (seed, food, fodder). Onions and garlic are also sorted, air-dried, plaited and stored in a warm and dry place, along with leguminous plants, which are dried and threshed—they'll later be used as side dishes, soups and porridges.

Preserving vegetables and fruit

Most fruits and vegetables can be preserved so that they keep all year—they may be pickled, preserved, cooked into jam or juiced. This provides the farm with diverse food stores that last until the following harvests. In order to diversify the menu, the ways in which fruits and vegetables are processed may also be varied. The following preservation methods may be used, depending on their suitability to the produce:

- Desiccation/drying
- Refrigeration or freezing
- Corning
- Fermentation pickling
- Chemical pickling
- Sousing
- Preservation with some sugar
- Heating/blanching

Products ready for winter storage. Photo by Daina Saktiņa.

Storage of animal products

Fresh milk can only be stored for a short period of time. Milk may be used to produce cream, butter, cottage cheese, yogurt, etc. Whey and buttermilk, obtained as by-products, may be used to feed livestock or for daily cosmetics (i.e., for face masks). As a rule, farms that produce milk generally make butter and cheese as well, which can then be stored in a cellar or storeroom for a longer period of time.

Eggs may be stored in a dry and cold place, and usually last about a month. Raw meat and fish can be stored on ice in cellars or in the fridge for a period of time. Meat may also be cured by corning (salting) or smoking—when smoked, meat is generally hung on hooks in the storeroom,

where it may last quite a long time. Like fruits and vegetables, meat may also be preserved and stored in cans in the cellar. Fish is either soused and dried or smoked. Soused and dried fish can be stored for a longer period of time, but smoked fish should be consumed within a few days.

Author: Lasma Grisane

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IVAN CHAI – A FERMENTED HERBAL TEA MADE FROM WILD WILLOWHERB

Ecovillage Grishino, Russia

Willowherb at Ecovillage Grishino. Photo by Maria Altusar.

Fermented willowherb (Epilobium angustifolium) tea was a traditional Russian hot beverage for hundreds of years before it was nearly universally replaced by Indian and Chinese black and green teas. With its rich composition of minerals and vitamins, willowherb makes for a healthy, caffeine-free tea that does not contain harmful uric acid or oxalate. Willowherb tea is also a mild sedative.

The plant is abundant in large areas of the Baltic Sea region, and can be fairly easily collected in large quantities from the wild. The fermented herbal tea can be produced in ecovillages with simple devices. As a clean and local product, "Ivan Chai" is an excellent replacement for imported teas.

History

The Russian name "Ivan Chai" was supposedly coined by foreigners following its export to England and other European countries: "Ivan" is a traditional Russian name, while "Chai" means tea, a word of Indian origin. There was a time when Ivan Chai was the second-most exported Russian item, ahead of even linen and fur! It had three names at the time—Ivan Chai, Russian Chai and Kaporie Chai, named after the place where it was produced in huge quantities. Toward the end of the 19th century it began losing ground to the Indian and Chinese teas of the East India Company. After the October Revolution of 1917 in Russia, the commercial production of Ivan Chai ceased. Today, the preparation of Ivan Chai has regained some of its popularity, and has attracted the attention of many producers.

Characteristics of the plant

Willowherb contains micronutrients—trace minerals that are good for the blood—such as iron, titanium, nickel, copper, manganese, lithium, molybdenum, as well as boron, potassium, calcium, sodium, and more. It contains bioflavonoids, glutinous substances, pectin and tannins and it is also rich in both vitamin C (containing more than is found in citruses) and vitamin B. Interestingly, the willowherb growing in the northern regions of the world contains much more vitamin C than that growing in southern regions. The greens of the willowherb also contain

Preparing fermented herbal tea. Photo by Maria Altusar.

protein that is easily and quickly absorbed by the body.

Willowherb grows easily and in abundance all over Russia, including the Northwest region, as well as in all neighbouring Baltic Sea countries. Willowherb has many names, and in some places it is called fireweed, since it is the first plant to appear after the land is scorched by fire. It blossoms from June to August, reproducing quickly by wind-dispersed seeds. In wet, moderate climates, it is better to gather the herb in July, before the leaves are too thick—this will considerably decrease the time it takes to dry. The drying of willowherb becomes more difficult after July due to the fact that one must then remove the flowers and seeds, which will otherwise ripen during drying and fly about, coating everything around with willowherb 'cotton' and ruining the drying tea leaves (which must then be discarded).

Preparing fermented herbal tea. Photo by Maria Altusar.

Production instructions

There are dozens of recipes to prepare Ivan Chai. We will describe two main ways Ivan Chai is made in the Grishino Ecovillage (which is located in the region historically known for the production of Ivan Chai).

I Medium-fermented Ivan Chai

1. **Gathering the plants:** In Grishino, we use wheelbarrows to bring the whole plants in from the field. The plant should be harvested approximately 20 cm from the ground, where the leaves are regular.
2. **Removing the leaves/first fermentation**: Pick the leaves off by hand and place them in a barrel or some other large container or pan where they will be left for some time during the initial fermentation period. The time this process takes depends upon the temperature of the place where the containers are stored, and varies from several hours to one day. You can check the progress by placing your hand inside the container of leaves to ensure that the temperature hasn't become too high. Also check the colour of the leaves, which should remain green: if they begin to yellow, the temperature is too high. You must also stir the leaves at this stage to keep them from getting too hot, since heat radiates from the centre of the mass. Fermentation occurs as the natural enzymes in the leaves start to process the material, which leads to the formation of new aromatic compounds. These natural enzymes are proteins that are deactivated when the temperature is above 60 degrees—if the temperature is too high, the leaves burn and turn yellow, resulting in a tea that smells and tastes sour.
3. **Grinding:** For grinding, Grishino uses mincing machines. Some producers believe that the tea tastes better if the leaves don't touch any metal—they therefore use specially made wooden rubbing boards for grinding.
4. For a stronger fermentation, the ground leaves can be formed into small piles and left for a couple of hours (optional).
5. **Drying (second fermentation).** The mass of ground leaves should now be spread on a sheet or screen tray and dried at a temperature no higher than 60 degrees. How long this takes depends on where you dry the tea and on how wet and hot the weather is. In Grishino there are electric driers and a special drying house with a wood-heated iron stove where it usually takes no less than twelve hours to dry the tea. In some places (for example in the Big Stone Ecovillage) people dry the tea in a Russian stove, and it tastes even better. The finished tea should be really dry, but not so dry as to crumble into powder. When finished, it should be

put into sacks, which are then carefully closed and baled in a dry place. Be cautious in wet places, since the tea may absorb water from the air and decay.

II Rapidly dried Ivan Chai

Steps 1 and 2 are as above.

Step 3. The leaves are heated on a pan atop a small fire, stirring constantly until dry. After this "pan roasting", the leaves should be further dried at a lower temperature on a stove, with an electric drier or by some other special means (as described above).

In some places, people twist the leaves up into little "sausages" by hand before drying and then put them under a light press for several hours. After this, they cut the "sausages" into pieces, and dry them in pans on low heat.

Producing willowherb tea in Grishino Ecovillage

In Grishino, we prepare Ivan Chai for both personal and commercial use. This herbal tea sells for about 50-100 euros per kg in retail. This small-scale business project uses the labour of helpers and volunteers every July to produce the required quantity of tea. The helpers earn some money from the production of Ivan Chai, while the volunteers receive free accommodation and food, as well as a quantity of tea for themselves. The most valuable part of the process, however, is the good company, the fresh air, the naturally healthy, beautiful environment with the river and forests, and the wonderful smell of Ivan Chai that permeates the air of Grishino in July. One person working 5-6 hours can produce about 5-6 kg of dry tea daily.

The story of willowherb tea at Grishino

The interviewee is Vladislav Kirbiatiev, the leader and one of the first inhabitants of Grishino. He has been at Grishino since 1993, permanently settling there in 1998.

I learnt the technology of preparing of Ivan Chai from the locals when I came here my first year. They invited me for tea and when I tasted the Ivan Chai I really liked it. Since I don't drink black tea at all and only a very little green tea, I started preparing it for myself. A few years ago, we started making it for other people as well.

Grishino is a very beautiful place, and big part of its beauty is this huge rose field of wild willowherb—so the place itself gave me this idea.

By the way, making tea is not the only way to use willowherb. It is also a very good honey plant. The sticks can be dried and used to make an infusion to throw on the stones in the Russian sauna: they give the softest steam. This infusion can also be used as a shampoo or an excellent hair conditioner. In May-June, the first tender top leaves of the herb can be used in salads and soups because they are rich in protein and have a nice taste.

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DANDELIONS – RECIPES FOR A FORGOTTEN YET NUTRITIOUS LOCAL GRASSLAND PLANT

Lithuania

Throughout the whole Baltic region, residents of ecovillages use nutritious plants such as the dandelion. Picked in and around the settlements, these are a highly valued local resource with

varied culinary and medicinal uses. While many gardeners and lawn owners consider it a weed, we will present the dandelion's nutritional and edible qualities, a range of recipes which utilize the dandelion, and examples of how these are applied in the context of Lithuanian ecovillages.

Dandelion fields in Lithuania. Photo by Gintaras Rumsas.

General information

The common dandelion (*Taraxacum officinale*) is a perennial herbaceous plant found widely throughout the world. Its yellow flower heads turn into round balls of silver tufted fruits that disperse its seeds wide and far, aided by the wind. Indeed, this feature makes the dandelion one of the most easily recognizable plants in our countryside.

Dandelions can be found growing on lawns, roadsides, banks and shores of waterways, and many other areas that have moist soil. In some countries, such as France, Austria, Germany, Netherlands, India, Japan or the USA, dandelions are no longer solely viewed as a noxious weed; they are now grown for their medicinal, herbal, and nutritional properties.

Nutritional qualities: The nutritional qualities of dandelions were discovered many years ago. They have a unique and rich composition of various chemicals and vitamins. Dandelion leaves are high in pro-vitamin A and carry more carotene than carrots, while also being richer in iron and calcium than spinach. Vitamins B, C, E, biotin, inositol, potassium, phosphorus, magnesium, and zinc are also a part of dandelion's chemical composition. The root contains the sugar inulin, vitamin C, organic acids and mineral nutrients. This tasty, free vegetable that grows naturally on virtually every lawn even contains free radical absorbing antioxidants.

Picking: Every part of the dandelion is edible: leaves, flowers and taproots.

Dandelion leaves are at their best when they've just emerged; young leaves have almost no bitterness to them. Leaves should thus be collected in early spring before the flowers appear: this is when they are the tastiest. Alternatively, they may be harvested again in late fall after a frost has destroyed their protective bitterness. The best dandelions are those which grow in a rich, moist soil and have the broadest leaves and largest roots. It's best to pick them from shady places: the sunnier the spot the more bitter the leaves.

Though the taproot is edible all year, they're at their best from late fall to early spring. If harvested in the early spring, they should be dug up when the leaves have just appeared and the plant has not yet blossomed. In late autumn dig them up after the leaves have fallen off. They need to be carefully cleaned by rinsing them in cold water.

There are also several different ways to prepare dandelion flowers. Collect them from a sunny meadow, just before the middle of spring, when the most flowers are in bloom. Use only the yellow portion of the flower, as the green sepals at the flower's base are bitter.

Recipes

There are many variations on different recipes in which dandelions are used as the main ingredient. In the following paragraphs, some of the most popular ones will be presented.

Dandelion taproot coffee

Roasted dandelion roots may be used to make dandelion coffee. Harvest dandelion roots in the late autumn for coffee making. After harvesting, the dandelion roots are dried, chopped, and roasted. First, take your dandelion roots and wash them as clean as possible. Then, chop

the dandelion roots into chip-like pieces and spread thinly on a pan. Dry in an oven or on the stove at 40 degrees C for an hour. After drying, chop the dried root into even smaller pieces and return them to the pan or tray for roasting. Roast the dandelion roots on medium heat until they are fragrant and have changed from off-white to light or dark brown (the colour of coffee-beans). Control the heat to insure the pieces aren't blackened. Coarsely grind the roasted roots immediately: after cooling, they will become too hard. Store the roasted dandelion granules in an airtight container or glass jar.

Prepare dandelion coffee by putting the dandelion granules through a coffee mill so that they are nearly powdered; alternatively, you may use the roasted granules as is.

For one cup of water use one tablespoon of the roasted root. Simmer the dandelion grounds as tea, or place in boiling water and leave to steep for 30 minutes, then strain into a saucepan and reheat. Serve hot with milk or honey.

Salads

Dandelion leaves (more often called dandelion greens) can also be a great addition, or even the main ingredient, in a salad. The leaves should always be torn, rather than cut, in order to retain their flavour. If you dislike the bitter flavour of dandelion greens, you may soak the leaves in warm salty water; however, this will also leech nutrients from the leaves.

2 handfuls of dandelion greens
1 big tomato
1 portion of leek
2 cloves of garlic
Olive oil
A pinch of salt
A pinch of sugar
Freshly milled pepper
Lemon juice

Place dandelion greens into warm, salted water for half an hour. Chop the garlic into small pieces and roast slightly in olive oil. Mix olive oil, salt, sugar, pepper, and lemon juice to make a dressing. Tear dandelion leaves into pieces and place on a plate, adding the chopped tomato and leek. Finally, add the roasted garlic and pour on the dressing.

Author: Simona Griškutė

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TRANSPORT AND COMMUTING

The transport sector makes up a remarkable part of our total energy consumption: in Finland it is about 16%. A large part of this is still met with fossil fuels. Since ecovillages in rural areas can be located far from working places, shops, schools and other services, long-distance commuting with private vehicles then represents a significant increase in the otherwise small ecological footprint of an ecovillage resident.

The best way to reduce the use of fossil fuels and energy for transport is simply to travel less! Modern IT technology enables remote working, for example, and another alternative is to start working at the ecovillage, either in your own enterprise or for the ecovillage. Additionally, if you live in a beautiful place with diverse activities on offer and interesting companions, there is no need to travel far away for hobbies or holidays: your ecovillage is an excellent place to spend your vacation!

If you are not in a hurry, travelling in non-motorised vehicles might be a good alternative. Try cycling, walking, rowing, or horses, perhaps, and you might even improve your physical fitness. Public transport and car pooling are excellent ways to reduce the amount of energy consumed by the individual traveller. Shared vehicles, even if used alone, save natural resources since fewer vehicles need to be manufactured.

And if you have to use a motorised vehicle, there are more and more possibilities to choose biofuels produced from different biowaste fractions and renewable energy sources, decreasing emissions and the dependence on oil. Just make sure your choice of biofuel is produced locally in a sustainable way and does not compete with and thus threaten the sustainable production of raw materials and availability of fertile arable land for food production.

CAR-POOLING

Suderbyn Ecovillage, Sweden

Car-pooling refers to any kind of arrangement which involves sharing cars and car journeys. It is a practice that has several benefits, both economic and ecological. In Suderbyn one car is shared by the community. This reduces costs for everyone, limits car usage and increases the efficiency when it is used. The ecovillage's car-pooling arrangement is made possible by a simple administration performed by one of the inhabitants.

The car-pool in an ecovillage context

In Suderbyn the car "pool" consists of just one car. This car can be used by anyone in the village for private or work-related purposes. A notebook is kept in the car as a logbook for users to record the distance of travel and duration of use. In the notebook it can also be specified if the travel is private or work-related or if it is related to one of the two organizations that constitute the administrative body in the village. One of these, an economic cooperative, owns the car. Every month, the person responsible for the car-pooling administration processes the notebook and sends invoices by email to the private users as well as to the administrators of the organizations. The payments are made to the economic cooperative.

So far no advance-booking system has been established since demand for the car has been fairly low and the close communication in the community has made it superfluous. Nonetheless, since the number of inhabitants and car usage is increasing, a booking system has been considered and will probably be implemented in the future. The maintenance of the car is regarded as one of many communal tasks but in practice it has been performed until now by one of the inhabitants who is employed by the village and carries out this car maintenance during his paid time. This arrangement could change, since many tasks in the village are done on a voluntary basis and it should not pose a problem for the car maintenance to be done in the same manner.

The car itself is not an environmentally friendly vehicle but an SUV with rather high fuel consumption; a cleaner car would be preferable. However, the high fuel consumption is balanced to a great extent by the reduction in car usage which the car-pooling system leads to.

A significant proportion of the normal costs for car usage are the initial purchase (a large one-off investment) and maintenance costs. A car-pooling arrangement means that each user only has to bear these costs in relation to their actual current usage. In Suderbyn the prices for using the car are 30 SEK / 10 km plus 20 SEK / hour (*10 SEK = 1.16 EUR at time of writing*); these rates are set to cover gasoline, maintenance and a contribution to the initial costs. Using the car privately is fairly expensive and is therefore avoided to a great extent. The car is still used in many work-related situations, such as buying building material, or for the general running of the village, such as buying food or recycling. Activities can often be combined, which also reduces the use of the car.

It is also common to combine work-related and private travel. For instance, communal shopping has been combined with dancing sessions in town. This is convenient and functional but can also create ambiguities about who should pay for the travel. At present these costs are declared as work- or ecovillage-related and it is left to the inhabitants' conscience not to stretch this too far and abuse the system. This arrangement is economically sustainable, so stricter regulations have not been deemed necessary by the cooperative.

This car-pool system enjoys many advantages due to it being part of a community. Since there is a daily basis of dialogue between the inhabitants there is seldom a problem that the car is being used when someone else needs it. In fact, when a person needs the car he or she always tells the others, which often results in combined travels or performing tasks for each other, such as buying goods or posting letters. Another advantage for the car-pool in Suderbyn is the fact that there is generally only one travel destination, Visby, which is the only major town on the island. This makes it very easy to combine efforts and to offer free rides for the inhabitants, i.e. to optimise the use of the car.

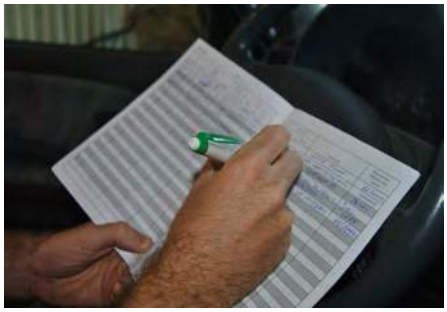
It is interesting to examine the car-pool in terms of sustainability. Environmentally, the car-pool should clearly be used as little as possible. However, economically it should be used as much as possible: a necessary condition for the system to be economically sustainable is a level of car usage sufficient to pay the bills. It is then a matter of debate whether this state of affairs should be deemed environmentally sustainable. Additionally, the social aspect should also be considered. The use of the car creates new possibilities for social life as well as more convenience. But if the price rates are set too high, the car would rarely be used, reducing the range and number of social

activities available to the inhabitants. This situation would, on the other hand, be better from an environmental point of view. Economically, the price should be set neither too high nor too low so the car is used enough and generates a good income. This example shows how one factor (the price) has big implications for balancing the sustainability in the system. It is important to keep in mind that this model for sustainability can only cover part of the complexity. For instance, part of ecovillage life and a sustainable lifestyle in general is to renounce some conveniences and choose more sustainable alternatives. These changes in turn have the potential to deliver a higher quality of life. Bearing all this in mind, the model is too rigid in some aspects, especially in accounting for the dynamics of the social component.

Car-pooling is gaining popularity all around Sweden for environmental, economic, comfort and other reasons. There are many internet sites mapping car-pools and offering car-pooling services. For instance there are sites with booking systems where individual rides can be offered and applied for. These arrangements do not involve shared ownership of the car but only the "car-pooling" service (also known as lift-sharing or ride-sharing). They have significant potential since they are part of mainstream society and rapidly growing. For anyone looking for both short- and long-distance travel options these car-pooling services are viable choices. In the established eco-centre and aspiring ecovillage Ängsbacka in Värmland a similar but smaller scale car-pooling service is offered on their webpage for journeys to and from Ängsbacka. For ecovillages with many visitors, eco-oriented educational institutes and similar bodies, this is a good solution since these places are often remote. With the car-pooling service the environmental footprint per capita of the travel involved in visiting their sites can be reduced; otherwise this can be considered a problem leading to dissonance in their practices.

User experiences from the car-pool

The interviewee is Ingrid Gustafsson, one of the founders of Suderbyn who has permanently lived in the village from its start.



Car-pool booking book.
Photo by Jesús Pacheco Justo.

At the beginning the family owned the car privately. When new members arrived it was the only car in the village and it ended up being used by everyone, so a car-pool was decided on as a better option. The car was bought by the economic organisation in the village (which is still paying off this debt to the family). Before organizing the car-pool inspiration was sought from other places and then the community decided on the rules together. It was decided that the costs should be calculated both according to distance and time. Since there was only one car in the pool, adding in the factor of time would make the car available more often by limiting journeys with a long duration (which could create problems for the community because the car would not be available for those longer periods). Priority was supposed to be given to use by the organizations and for the good of the village and the arrangements have indeed had the desired effect: the car is seldom used for private long-duration journeys because these soon become prohibitively expensive.

In the beginning people were not used to the car-pool and forgot to fill in the logbook, but gradually that changed. Another problem was that no one was responsible for the car, which had the consequence that no one repaired it or carried out the necessary maintenance. After some time we appointed a responsible person and since then there have been few problems with the car-pool.

The effects of the car-pool have undoubtedly been mainly positive. It is unnecessary for everyone to have their own car; this would also be undesirable since this would be more expensive. Also, the price structure ensures that the car is used much less, which is important.

On the negative side, the car-pool requires an organisation that takes care of the car and it leads to more administration.

If the community grows the car-pool will have to grow accordingly. The biggest problem would be that new cars would have to be purchased by the organization. The administration of the car-pool would also grow but the same system would still apply. A booking list would probably have to be introduced so inhabitants can know in advance when the cars are free. With a bigger car-pool an instalment plan for the cars should also be made and included in their running price as well as a better monitoring of the car-pool's economic aspects. Therefore a bigger car-pool would need slightly more administration (labour time and people) and also be more expensive; on the other hand, it would be conducted in a more professional way.

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Further information
· Ingrid Gustafsson, ingrid.gustafsson@suderbyn.se
· International car-pooling links: www.carpoolworld.com; www.ridefinder.eu/; www.shareyourride.net

RENEWABLE BIOFUELS FOR CARS AND TRANSPORT

First, second and third generation biofuels

Biofuel is fuel produced by processing biomass (organic matter). Biofuels can be used to replace fossil fuels, reducing our dependence on oil and diminishing the negative environmental impacts of fuel use. In many cases, biofuels can be sourced from local biomass.

Biofuels are typically categorized into different generations: the *first generation* biofuels are made out of raw materials which are also useable for food production, such as maize or sugar cane. Sustainability of such biofuels can be questioned. The raw materials for *second generation* biofuels are mainly wastes with a high lignocellulose content, such as forest waste or other woody materials. Food industry wastes can be utilized, too. The *third generation* biofuels are under development: they will be produced from completely new raw materials such as algae.

Bioethanol

Bioethanol can be used as petrol. Sugar cane, cereals, cellulose or bio wastes are the raw materials for its production. The use of pure bioethanol is limited due to technical issues: it leads to cold-start problems for combustion engines, for instance. For this reason, bioethanol is commonly mixed in with petrol.

Biodiesel

The quality of biodiesel is comparable with diesel oil. It can be produced from oil plants such as rapeseed and palm oil, but also from waste oils of various sources. One hectare of oilseed rape yields about 1000 litres of biodiesel. Biodiesel can be used pure instead of regular diesel in vehicles if the engine is fitted with suitable gaskets.

Esterification of biodiesel needs methanol or ethanol and some lye. The end products are biodiesel and glycerol. Biodiesel can be produced by very simple equipment on site by farms or households. A new production method is being applied in the forest industry to make it out of wooden biomass, utilizing the pine oil which is a by-product of cellulose production.

Biogas

Biogas is able to replace natural gas for heating and vehicle use. Biogas is produced from gases arising in wastewater treatment plants and landfill waste dumps. It can also be produced from organic wastes on farms and other green biomass. The sustainability of the use of intensively

farmed maize on biogas production is dubious. The biogas is produced in large thermally insulated reactors with the help of anaerobic methane-producing bacteria.

In some hybrid vehicles, biogas can be used parallel to traditional petrol or diesel.

Wood gas

Gasification of woody material produces this gas. Wood gasifiers are able to utilize waste wood and other sawmill by-products that are not otherwise usable by the wood processing industry. Wood gas generators can be connected to internal combustion engines in vehicles, with a high energy efficiency (65-80 percent) compared to other biofuels.

EU targets and environmental impacts

In year 2007, European Union agreed the "20-20-20 targets", which included the goal to increase the share of renewable energy in the transport sector to 10 percent by the year 2020. Biofuels sold in the EU area have to fulfil a series of sustainability criteria before they can be taken into account in this calculation. When studying the environmental impacts of biofuels, the whole lifecycle must be taken into account, including indirect impacts such as competition for raw materials or production areas.

Source: www.motiva.fi, www.wikipedia.fi

SUMMING UP: TWO EXAMPLES OF HOLISTIC ECOVILLAGE DESIGN

An ecovillage is a holistic system where ecological sustainability is considered in all of its dimensions. Two ways of approaching this question are described in the next examples. The first case deals with a single household still in the design stage, and the second case reports on an ecovillage that has existed already for 16 years and which has been the subject of several studies.

DESIGNING A SUSTAINABLE SINGLE-FAMILY HOUSEHOLD

Ecovillage Dziesmas, Latvia

This case documents how central aspects of eco-friendly living have been planned and designed for installation in a single-family household within an ecovillage context. The idea was to develop a compact, largely self-sufficient and ecologically sound residence for a family. By way of its design, the inhabitants' goal was economic independence from industrial energy and commercial products and services conventionally used in modernity in order to achieve personal freedom. Developing a system similar to the one described here should be affordable for just about any family of average income, without the need to turn to loans or other means of financial assistance. According to the author, meeting the project's goals is not possible without overcoming your own unsustainable habits, such as consuming inordinate amounts of energy, or dependence on the products, practices and services which characterize a normal, consumer-based urban lifestyle in an industrialized society.

Solar panel system for one family house. Photo by Daina Saktiņa.

Main elements of the design

Location and construction of the house

The house is located on a plot of land approximately 1.3 hectares in area, which includes a pond and a well. The location and orientation of the house were

chosen in order to maximize the capture of solar energy: the house is positioned west to east, with the southern slope of the roof at such an angle as to obtain the most sunlight possible for the solar panels, which generate electrical power, and for the collectors, which provide hot water to the house. Everything on the premises was carefully planned with regard to its function, using a minimum size, which helped to reduce construction costs while also providing the house with sufficient heating and electrical power.

The dimensions of the house are 5 x 5.6 meters, and its living spaces require approximately 2 kW of energy to heat. At a storey and a half high, the house is the optimum height for the installation of a small wind generator: 300 W, 7-8 meters high and attached to the main chimney / ventilation pipe. Meanwhile, the interior of the house was designed taking such factors as the retention heat, good ventilation, use of sunlight as a natural source of lighting, the changes of temperature during the day, and personal preferences into consideration.

Efficient use of energy

In order to create the most efficient system of energy production and consumption, each aspect of energy use was considered on a case-by-case basis depending on its type: central heating, electricity (lighting, household electronics, short-term, energy-intensive operation of powerful electrical tools and equipment), cooking energy, and hot water supply.

Central heating

The central heating system is a solid-fuel furnace with a built-in boiler. The heating system is liquid, and based on an open-loop thermosiphon system, which uses natural convection to circulate the heated liquid. This system efficiently distributes the energy generated by the furnace between the hot water boiler and the house. In order to cut energy-input costs, such as the purchase of commercial firewood for the furnace, rapidly growing bushes found on the plot are used instead.

Electricity

Since there is a limited amount of sun, wind, and water energy in Latvia, stability of the energy system is achieved from the combination of various small sources of power that supplement one another. The energy system of the house consists of: solar panels (PV), a wind generator, a thermogenerator (current is produced from the furnace heat), and a petrol generator. The energy coming from all these sources first passes through the controller, which charges the accumulator's battery and provides the house with electricity. The amount of power produced depends on the weather conditions and season, with the total maximum power ranging from around 0.7–0.9 kW.

Electricity distribution system in family house. Photo by Daina Saktiņa.

There is also a backup system in case this primary system is damaged, which consists of a separate backup battery that's operated by the same controller while in the buffer mode.

The house, meanwhile, is wired for direct current (DC 12V). This avoids the cost of expensive AC 220V converters and the loss of energy they cause. It also provides some measure of safety for the lighting system against the threat of fire, as well as negating the need for expensive protection measures that are often used to protect against damages from current. Besides these benefits, it should also be noted that there are a large number of household devices available which have been designed for use in vehicles, caravans, and ships that utilize DC 12V current.

Lighting

The lighting system uses only light emitting diodes (LED) and is divided into two types: general and target lighting. The general lighting consists of lines of self-made, suspended lamps, which provide the background lighting for rooms. The brightness of these lights is adjustable via a dimmer switch.

The target lighting consists of separate lamps placed over various work areas, such as the kitchen table, sink, lounge, etc. Some areas of the house's interior and exterior are also equipped with decorative lighting, which is triggered via motion sensors.

Room lighting system in family house. Photo by Daina Saktiņa.

Though the lighting system has a maximum consumption of 50–80W, it only averages between 10–20W, even during the darkest times of the day.

Energy for household appliances

Household electronics include notebooks, e-books, mobile phones and loudspeakers, which all have individual DC 12V power adapters that plug directly into the power network of the house. We also have an electronic safety system consisting of fire and security alarms, with optional video recording operated through the GSM network; this also plugs in in the same manner.

These connected devices consume a maximum of 200-250W, with an average of 80–100 W. This allows us to do research, watch interesting films, or communicate over the internet via computer and provides us with power for mobile phones. However, we did have to forget about electric tea pots, electric coffee machines, toasters, dish washers, etc. But how much are they really needed? Coffee can be even more delicious if it is home-made without the use of electrical appliances.

Energy–intensive equipment (such as power tools etc)

A petrol generator (3kW) is used to power equipment that requires large quantities of electricity. The generator is also used as backup system to charge the accumulator's batteries and supply the house with cold and hot water.

Energy for cooking

The house is equipped with a standard gas cooker with oven which uses liquefied petroleum gas. There are several measures in place to reduce gas consumption: the hot water for cooking meals and making hot drinks is taken from or pre-heated by a solar collector and the mobile wood-fired cooker in the summer kitchen is also used. (This is customised with a supply of extra air to the furnace to increase the combustion process of burning and enable leftover wood to be used with a high efficiency.) We're also planning to install a solar pot at the base of the vacuum tube of the solar collector, which will be used to make hot drinks during sunny weather, heat food, or keep food warm.

Hot water supply

The components of the hot water supply—the vacuum solar collector (1.5 kW), the heating-pipe technology, the insulated, indirect heating boiler (with a capacity of 110 litres), the automated control, and the circulation pump—all operate from a low-power solar panel.

During the winter months, when the solar collector doesn't receive sufficient sunlight, the water in the boiler is heated through the central heating system. As a backup, the water may also be heated by the operation of the petrol generator's electric heater.

The hot water generated in this way is generally enough hot water for taking a morning wash, shaving, doing the dishes, taking an evening shower, and doing some laundry. Of course, it is also necessary to use the hot water economically.

Water supply

A well supplies water to the house via a solar pump, which is powered by an autonomous solar panel; the backup pump is operated by the petrol generator. Cold water tanks (with a capacity of 200-400 litres) are located in the thermally insulated attic of the house to protect them from freezing during the winter. Water is automatically pumped to the tanks, provided that there is enough solar energy for the operation of the solar pump. The water supply is gravity fed, and uses a minimum of hydraulic resistance. Although the water pressure is weaker than in an average city apartment, it is still strong enough for comfortable use. When full, the water tanks supply enough water for several days to a week. Since the pump can replenish the supply within a day or two, there's no need to worry about the weather.

Ventilation

The ventilation system requires no electricity. Air supply valves provide an adjustable supply of fresh air via wind turbines, which are controlled by an autonomous valve that changes the amount of air depending on the room's humidity. Beyond ventilation of the living space, the system also serves the winter bio-toilet, and the exhaust pipe of the kitchen stove is equipped with an additional exhaust fan.

Sewage

The greywater coming from the sink, shower and kitchen flows out of the house one metre underground; it is filtered by the soil and a garden bed full of flowering plants is able to make use of the waste by extracting its nutrients. There are two types of toilets in use: the outdoor toilet, which is used during warm weather, and the indoor toilet, which is used during the night or during bad weather. Both toilets are dry, composting type toilets which use polythene bags. These bags contain some peat, chippings, and cut grass that help to suppress odours as they collect both urine and faeces. Once filled, bacterial supplements are added, and the composting process continues outdoors for a couple of years. In this way, the nutrients found in human waste are completely processed by the bacteria and returned to the soil as fertilizer.

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THE ECO-CONCEPT OF KANGASALA COMMUNAL VILLAGE

Finland

When a small group of young families were planning the Kangasala Communal Village in 1996 their aim was to build an ecovillage that would satisfy high ecological standards. All the residents, altogether nine families in the end, participated in the planning and building of the village area. Jointly they defined the goals for the ecovillage regarding issues such as: construction of the houses, heating, dry toilets, grey water treatment and waste sorting, nature-friendly solutions and communal work and activities. The private houses were constructed by the families and the common buildings and areas as well as the infrastructure were built together – according to their aims. In their everyday life the residents are committed to many ecological practices, but nevertheless they live quite an ordinary life with the facilities normally expected today.

In 2007-2008, two architects, Outi Palttala and Bruno Erat, conducted a study of two Finnish ecovillages and compared them with two normal housing areas. Kangasala Communal Village was one of the research objects. The study was published by the Ministry of the Environment (only in Finnish) under the title "Sustainable communities in a northern climate". The facts in this article are mainly based on that study.

Infrastructure and technologies

The location and the structure of the ecovillage

The heating plant with recycled windows. Behind the building you can see a pile of wood waiting to be chipped. Photo by Outi Palttala.

The founders of the community wanted to find a piece of agricultural land a few hectares in size, with a southern slope suitable for building and located near an existing village centre and public transport connections. They also wanted to have a child-friendly environment close to nature. A suitable plot was found in Kangasala municipality, some 4 kilometres away from the municipal centre where the main services are.

In the area that was rented for the ecovillage there was only one old building, a former cow shed which then became an important storage area for the community. The new buildings in the village were placed close to each other on the wooded slope. This compact village structure enables a common infrastructure, for example the heating network. The garden plots and waste water treatment system are in the field south of the slope. North of the village there is a forest which offers protection from cold winds. From the yards of the houses there is a view to the fields. There is a lake less than one kilometre away and a small public road with a bus stop is next to the ecovillage.

Minimising disruption to the ground

The commonly agreed goals of the village included a principle of working the earth as little as possible. The buildings and the roads as well as the underground channels were built in a manner that minimised digging and tree-felling. This required accurate planning: houses were sited carefully on the terrain and the sewer and water pipes were placed together with underground electricity and data cables in the same channels as the heating network.

Construction of the houses

In addition to the nine private dwelling houses (average size ca. 157 m^2) the residents also built some small outbuildings and one common building in the village. The common building contains a heating plant and a hobby room. (A common sauna is planned but not yet built.) In all the buildings the main windows face south for maximum sunlight and heating. –The passive solar energy is (or will be) captured even more by means of a conservatory in some of the houses. There are also workshops connected to most of the dwellings because many of the residents are entrepreneurs who work at home. In some of the houses there is a wood-fired sauna.

The guidelines for building methods were drawn up jointly by the residents-to-be. The directions included some ecological principles such as the use of healthy and natural or recycled materials. There were also some guidelines about the shapes of the houses but these were formulated in a way that did not prevent individual solutions. The building plans of all the houses

were approved jointly. The result is a multifaceted but harmonious village appearance. The construction made use of traditional, well-proven solutions and modern ecological ones, too. Special attention was paid to the material and construction life cycles: maintenance should be easy, as should their recycling at the end of their lives. In some of the buildings timber cut from the nearby forest was used.

Untreated or oil-waxed wood is used in the interiors of the houses. Photo by Outi Palttala.

The most traditional construction is a hand-carved log house. The other buildings have wooden frames. The walls, the roofs and the base floors of the houses have good thermal insulation with cellulose fiber (made from recycled paper). Paper was used as an air seal and there is no plastic in the walls or ceilings. The windows mainly have triple glazing and some of them are filled with gas or have selective membranes. Some of the windows are self-made of recycled glass. In these cases the handiwork and reuse of old materials was a higher priority than saving energy. (There is a description of the utilization of recycled materials in Kangasala Communal Village elsewhere in this manual.) The ventilation in the houses is mostly natural but in the dry toilets there are mechanical exhaust fans (which have a low energy consumption).

All the facades are painted with natural paints. Inside the houses they have used a lot of wood, treated for example with natural oil wax, and recycled bricks.

Heating system

The energy for the heating of the houses and the household water is produced from wood chips in a common heating plant. The wood is purchased from neighbouring regions and chipped on site in the village. The heating plant is highly automated. The wood-chip boiler heats water that circulates to the houses in thermally insulated pipes in underground channels. The heat distribution network is based on a closed-circuit from which the heat is transferred to the use of the households through heat exchangers. The maintenance of the heating plant requires only a little work. It is organised together by weekly rotating “janitor shifts”.

In addition to the centralized heating system all the houses have at least one heat-storing fireplace. One house has solar collectors.

Dry toilets and waste-water treatment

Not having water closets was an important ecological principle when the village was founded. So every household has a dry toilet, in which the urine is separated off. The composted toilet waste and the urine are used as fertilizers in the gardens. This makes purification of waste water easy and the dry toilets also reduce the use of clean water significantly. (The working principle of the dry toilets and the treatment and the utilization of the toilet waste in Kangasala Communal Village are explained elsewhere in this manual.)

The waste water is so-called “grey water”, consisting only of water that has been used for washing (not toilet flushing). The residents have an agreement to use only environment-friendly detergents so the waste water is already fairly clean, even before purification. The grey water passes from the houses to the common treatment system which is located in the field. The waste water passes through three septic tanks before it goes to the rock-fibre filters. In this case these filters are actually unnecessary. They hardly purify the water at all because the waste water is

Buildings in Kangasala Communal Village.
Photo by Outi Palttala.

"too clean": there are not enough nutrients for the bacteria that should be at work in the filter. After the filters the water is discharged to an evaporation pond planted with aquatic plants. The plants absorb the last nutrients and clean the water efficiently. Water from the pond is used for watering the vegetable gardens.

Samples are taken from the waste water regularly to ensure the treatment system is working very well.

Electricity

The households make use of various means to save electricity: wood-fired stoves and ovens; a cool cellar or pantry for food storage; energy-saving lamps; and motion detectors to switch lights on and off automatically. In Kangasala Communal Village they do not produce electricity themselves. They jointly buy in electricity from a utility company where it is produced from wind power.

Eco-practices

The families in the village have different kinds of habits and practices related to their ecological goals. In addition to those already described above, a few more are particularly worth mentioning here.

Most of the households grow part of their food in small organic vegetable gardens, located in the common field area. Kitchen and garden waste is composted in their yards and the compost used in the gardens.

The sorting and recycling of household waste is well organised. For example they have a common shed with collection containers for paper, cardboard, glass, small metal items and mixed waste. In the shed there is also a place where they can leave anything that is no longer needed but still usable; these can then be taken by others who need them. In particular, children's clothes and sports equipment are recycled among the families via this "flea market". Reading material such as magazines is also passed from one mailbox to another.

One way to make purchases more reasonable is to buy things together in larger amounts. In Kangasala Communal Village, organic bread, vegetables and ecological detergents are among the items bought in bulk. They have also purchased some machines and equipment and one tractor for common use.

The question of using private cars is often discussed when estimating the ecological foot print of living in rural areas, where most ecovillages are situated. In Kangasala Communal Village every family has a car; some of them even have two. They try to reduce the use of cars by ridesharing, for example when taking children to their hobbies in the nearby city. Buses are used a lot, too, especially by the women and children. Many of the residents work at home, which also reduces car usage. And residents of this ecovillage often spend their holidays at home, so they do not fly abroad as often as people do on average.

Ecological footprint

According to the academic study mentioned above, the ecovillages have a measurably smaller ecological footprint than normal housing areas, but also they have room for improvement. In Kangasala Communal Village they use less heating energy, electricity and water than in the other housing areas researched. There was no CO_2 emissions for the houses' energy consumption because only renewable energy was used for heating and electricity. In this respect, the type of energy used is more important than the quantity. Test results for the waste water purified in their own system were better than similar results from the centralised municipal treatment plant nearby. The recycling of all kinds of waste was also more efficient. The amount of mixed waste carried to the dump from Kangasala Communal Village was half of the average disposed of by city households.

It is estimated that in order to stop global warming reaching the critical level of two degrees, greenhouse gas emissions have to be reduced below the limit of 1000 kg per person per year. Even Kangasala Communal Village is still far above this limit. Nonetheless, the researchers note in the study that it will be possible to achieve this goal in ecovillages. It is a question of lifestyle choices and consumption habits, which have a remarkable relevance when measuring the sustainability of housing and living.

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Further information
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Reference:
Palttala, O. & B. Erat (2009). Kestävä kylä pohjoisissa olosuhteissa. Ympäristöministeriö, Suomen ympäristö 32/2009. Helsinki: Edita Prima Oy. Available at: <http://www.ymparisto.fi/download.asp?contentid=110713&lan=fi> [Accessed 20 June 2013].

FORMAL NATIONAL AND REGIONAL ECOVILLAGE NETWORKS IN THE BALTIC SEA REGION

NATIONAL NETWORKS

DENMARK: Landsforening for Økosamfund (LØS) – web-page: http://okosamfund.dk

ESTONIA: Eesti Ökokogukondade Ühendus (MTÜ, Network of Estonian Eco-Communities) – web-page: www.kogukonnad.ee, e-mail: juhatus@kogukonnad.ee

FINLAND: Suomen kestävän elämäntavan yhteisöt ry (SKEY, GEN-Finland) – web-page: http://rihmasto.fi/skey, e-mail: skey@rihmasto.fi

LATVIA: Latvian Ecocommunity and Initiatives Association – web-page: http://ekociemati.lv/lv/

LITHUANIA (informal national network): Network of Lithuanian Eco-settlements – web-page: www.ekogyvenvietes.lt

RUSSIA: Russian Ecovillage and Eco-initiative Network – web-page: www.gen-russia.ru

SWEDEN: Ekobyarnas Riksorganisation (ERO) – web-page: http://ekobyar.se/

At the time of publishing this manual, the process had started to create formal national ecovillage networks in GERMANY, LITHUANIA, and POLAND. Please search updated information from the internet!

REGIONAL NETWORKS

BALTIC SEA REGION: Baltic Ecovillage Network (BEN) – e-mail: robert.hall@suderbyn.se

https://www.facebook.com/pages/BEN-Baltic-Ecovillage-Network

http://balticecovillagenetwork.wordpress.com/

EUROPE: Global Ecovillage Network Europe (GEN Europe) – web-page: www.gen-europe.org/

GLOBE: Global Ecovillage Network (GEN) – web-page: http://gen.ecovillage.org/

Lead partner

Lithuanian Institute of Agrarian Economics, www.laei.lt

Project partners

MTT Agrifood Research Finland, www.mtt.fi

Latvian State Institute of Agrarian Economics, www.lvaei.lv

Suderbyn cooperative society, www.suderbyn.se

The West Pomeranian Business School, www.zpsb.szczecin.pl

Associated project partners

www.zegg.de

www.gen-europe.org

www.ecohome-ngo.by

www.ekobyar.se

www.cisr.ru

www.ftacademy.ru

www.slu.se

www.permaculture.se

www.cbss.org

BEN (Baltic Ecovillage Network)

GEN-Finland
(www.rihmasto.fi/skey)

www.balticecovillages.eu **www.ecovillageroad.eu**

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All over the globe, we are witnessing multiple forms of exhaustion. Societies are suffering from the consequences of unsustainable consumption of natural resources, energy, and food. We are thus faced with a quest to regain the balance between the ecological, socio-cultural and economic dimensions of sustainable living.

In this quest we can learn and benefit a lot from the experiences and practices developed in ecovillages. Ecovillages are intentional communities and 'living laboratories' that seek to reduce the ecological harm generated by human living practices and 'technologies'.

This book presents a selection of inspiring stories about solutions for ecological living, told by the inhabitants of ecovillages around the Baltic Sea region. The stories present solutions to issues concerning planning, construction, energy solutions, waste and waste water management, composting and recycling, food production, and transport and commuting. We hope to provide inspiration to readers already familiar with ecovillages and anyone willing to learn more about a variety of ecological living solutions.

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