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PUBLIC HEALTH**

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## CONFERENCE ON ECOLOGY AND FORESTS FOR PUBLIC HEALTH 18-20 September 2009, Oslo, Norway



**Prof. Dr. Walter Kofler**



**Prof. Dr. Gunnar Tellnes**



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## Awarding Ceremony

As a highlight of the conference the International Academy of Science H&E has awarded Prof. Dr. Ian LOWE (President of the Australian Conservation Foundation, Prof. em. Griffith University, Brisbane) for his Contribution: "Partnership Initiatives Toward Sustaining our Atmosphere" presented at the 14<sup>th</sup> IUAPPA (International Union of Air Pollution Prevention and Environmental Protection Associations – <http://www.iuappa.com/about.htm>) World Congress in Brisbane 2007 with the



### Konrad Lorenz Hope for the Future for a Sustainable World Award

The International Academy of Science H&E offers in collaboration with IUAPPA awards to outstanding individuals for contributions which can help promote the transition to a sustainable world. The awards may be given for work undertaken within any theoretical framework, intellectual discipline, or cultural context. The award process, which takes place every three years in association with IUAPPA World Congresses, is uniquely forward-looking in its aim to give increased momentum and support to successful work in progress as well as recognising its achievements to date. All papers submitted to World Clean Air Congresses, Regional Conferences, and other recognised events are eligible for consideration.

Award winners' achievements are recognised by the award of a gold medal or other commemorative items and certificates at a ceremony during an international event.

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## **ECOLOGY AND FORESTS FOR PUBLIC HEALTH – AN INTRODUCTION**

This issue of Michael focus on environmental, climatic and cultural changes that threaten the Public's Health today, and some of the papers address the importance of forests for the environment and human health on our planet. Other papers present research and knowledge on recreation, physical activity, well-being and out-door life farming for health. The papers presented are scientific as well as presentations related to policy and practical projects in this field.

Environmental change and biodiversity degradation have a big impact on human diseases as well as health problems. In an ecological extended view, also the environment of animals and plants impact the Public's Health. At the same time forest environment and contact with plants and animals can be a future asset in improving the health conditions of human communities and their culture.

In parts of the world it is generally accepted within the forest management sector that there are health benefits to be gained from work and recreation in nature and in the forests. It seems somewhat different in the health sector: There is still a long way to go before the active use of nature – and culture – is integrated into health strategies at all levels: local, regional, national and international. What can we do to achieve increased awareness and understanding of these benefits among health personnel?

Interdisciplinary collaboration, especially between forest and health professionals, is aspired to work on two priority areas: 1) How to maximize health benefits of forests? 2) How to manage health risks connected with forests? Ecology and the natural environment play a role in health and well-being of all living beings. The challenge is to build a research base to more clearly signpost the mutually beneficial links between forest and woodland ecosystems and human health and well-being, creating new and better pathways to a healthy future. The frame of this work must be within ecological sustainability.

A healthy life includes mental, physical and social well-being. Importance for health are also exposure to natural environments, such as stress reduction and rehabilitation. Other health benefits involve forest derived pharmaceuticals, nutraceuticals, forest food and herbs, and possibilities to improve healthy environments (clean water, climatic improvement, etc.). Health risks include vector-borne diseases which dispersion is connected with deforestation and forest ecosystem degradation as well as hazards linked with forests.

The papers published in this issue of Michael can only describe a limited area of this important field of public health in the future, though it can help the reader to be aware of the connection between ecology, forest and public health – an health issue we Are forced to emphasize more in the future.

**Gunnar Tellnes**

**Merete Furuberg**

## **ALTERNATIVE MEDICINE**

### **HEALTH CARE OF THE RURAL POOR THROUGH MEDICINAL PLANTS HOME HERBAL GARDENS IN SOUTH INDIA**

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#### **Abstract**

In the absence of modern medical facilities in remote rural areas of India, the medicinal plants meet about 70% of the health care needs of the rural poor in such areas. Raising of home herbal gardens (HHGs) proved useful in meeting the primary health care needs of the rural poor, resulting in savings on medical expenses, thus contributing towards poverty alleviation as loans taken for medical treatment are a major portion of debt burden on the poor.

#### **Introduction**

India hosts about 8 per cent of the flowering plant species of the world and of the 19,000 plant species recorded in India, nearly 8,000 species have been identified to be of medicinal value in traditional systems of medicine. These medicinal plants are used by more than 4,000 ethnic communities accounting for about 70 per cent of the rural health care, especially in the interior areas depending on folk tradition. The forests constitute the main source of medicinal plants (Ved and Goraya 2008).

Medicinal plants home herbal gardens (HHGs) can help in popularising the use of medicinal plants for home remedies of common ailments. The HHG programme was accordingly tried during the period from 1998 to 2002 under DANIDA supported project "Strengthening the Medicinal Plants Resource Base in Southern India in the Context of Primary Health Care" implemented by the Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore in three southern states of India, viz., Karnataka, Kerala and Tamil Nadu (Anon. 1992). The author studied the effectiveness of HHGs in meeting primary health care needs of the rural population and this paper presents the results.

## **Home Herbal Garden Programme**

Strengthening the indigenous health systems based on medicinal plants and having cultural roots in the communities is necessary in India where the existing health care systems cover less than half of the rural population and in remote areas this coverage is even low (Singh *et al.* 2008). The HHGs offer the resources in making poor rural communities grow and provide the know how to use medicinal plants required for home remedies of common ailments. The HHG programme was, therefore undertaken as a part of DANIDA supported project on medicinal plants conservation in the context of primary health care.

### **The programme envisaged growing of medicinal plants in HHGs by as many households as possible.**

The HHG programme constituted an important part of the outreach programme of medicinal plants conservation parks (MPCPs) component of the project implemented by 18 NGOs working in different parts of the states covered under the project. The villages where HHGs were to be established were identified by NGOs ensuring that the disadvantaged and weaker sections of the society were targeted and helped under this programme. The women self help groups (SHGs) formed the main channel for delivery of HHG programme and handled selection of the village resource person (VRP), motivation of women to establish HHGs, arranging training of women for raising HHGs and in using medicinal plants for primary health care, arrangements for medicinal plants seedlings and collection of advance money from the beneficiaries for purchase of seedlings (FRLHT 2006). About 72% of the women who established HHGs were members of SHGs. The programme was promoted through village resource persons (VRPs) who were identified from amongst SHG members. After receiving training, the VRP established a HHG near her house to serve as demonstration in that village. The VRP undertook awareness programme and trained the women desirous of raising HHG in selection of site for HHG, fencing of HHG, planting of medicinal plants seedlings and their aftercare. The household undertaking establishment of HHG was responsible for selection and preparation of site, digging pits and planting, watering and protection of seedlings planted.

The HHG programme targeted the poorer sections of the society. Majority (about 91%) of the HHG owners thus belonged to the disadvantaged sections of the society based on the size of their land holdings and caste affiliations; the landless, marginal farmers and small farmers accounted for about 33%, 37% and 21%, respectively (FHDSF 2004). Further, about 86% of the HHG owners were from traditionally socially deprived communities such as scheduled castes/scheduled tribes (27%), most backward communities (24%) and backward communities (35%).

Each HHG covered about 5-10 m<sup>2</sup> area which was fenced using locally available material such as thorny bushes or branches of trees. A package of about 20 medicinal plants, including a few that could be used as vegetable, was prescribed for each HHG depending on common ailments in the locality and the agro-climatic conditions of the village where HHG was to be established (FRLHT 2006). Such a package of medicinal plants for each HHG was prescribed to make each household self-sufficient in respect of medicinal plants required for home remedies of common ailments.

About two-thirds of the households in each village identified for the programme raised HHGs and the remaining one-third did not. Reasons for not raising HHGs included (FHDSF 2004) non-availability of space (22%), water scarcity (33%), browsing by livestock (22%), disinterested in raising HHG (11%) and other reasons (12%). About 0.15 million HHGs were raised in the project area from 1998 to 2002 by women in as many families. About 39% of the HHGs adjoined the houses where kitchen wastewater could be used and the remaining were raised in agricultural fields.

Besides establishment and maintenance of HHGs, the women beneficiaries were trained in the use of medicinal plants for home remedies of common ailments which were identified through participatory rural appraisal (PRA). The SHGs played an important role in organising such training for their women members.

### **The Study**

The HHG programme was successful and the use of HHG-grown medicinal plants for home remedies was found to be a wise and economic proposition. Some aspects, however, remained to be investigated at the time of closure of DANIDA supported project in 2004. The author undertook a study of these outstanding issues as a part of the team (Singh *et al.* 2008). The study was undertaken during August – September, 2007. The HHGs studied were located in 21 villages (6, 12 and 3 villages in Karnataka, Tamil Nadu and Kerala, respectively). The HHGs in these villages were visited and detailed discussions were held with women who raised them and all relevant data regarding performance of medicinal plants, use of medicinal plants for home remedies, problems in raising and maintaining them and sustainability of institutional arrangements for HHG programme were collected. Suggestions about improvement in the design of HHGs were also solicited from the women who maintained them. Main results of the study are presented.

### **Results and Discussion**

#### **Usefulness of HHGs in Primary Health Care**

The households having HHGs reported that they used the HHG-grown medicinal plants to treat common ailments and they were happy that they could treat such ailments themselves without rushing to the doctors which was very costly for them. The women beneficiaries were told during training that for serious type of diseases they will be

required to consult the doctor and they acted accordingly. The women who raised HHGs and had received training for use of medicinal plants for common ailments made available the medicinal plants and the home remedies to their neighbours whenever required.

Use of HHG- grown medicinal plants for home remedies resulted in reduced medical expenses because of reduced frequency of travelling to nearby towns for treatment. A comparison of the expenditure incurred on treatments of common ailments by HHG owning households and households not having HHG showed a saving of about Rs 130 per month for the former category (FHDSF 2004) which means an annual saving of about Rs 1,600 (about 34 US dollars) which was quite substantial for the poor, particularly those living below the poverty line (income < \$1 / day). In addition, some of the HHG owners could sell the material collected from medicinal plants grown in HHGs to folk healers and could earn about Rs 30-40 per month (FHDSF 2004).

### **HHGs Benefited the Poor**

Raising of HHGs benefited the poor as most of the HHG owners belonged to the disadvantaged sections of the society (FHDSF 2004). Thus the HHGs not only met the primary health care needs of such people, but also contributed towards poverty alleviation as loans taken for medical treatment are major debt burden on the poor.

Making available HHG-grown medicinal plants for primary health care has been of special significance for the women of poor households living in remote villages. Such women are shy and hesitate to consult the male doctors. Secondly, the women from poor households give priority to meeting other requirements of the family and thus normally avoid or cannot afford to spend money for their own treatment. The HHG programme not only helped the women from poor families in treating their ailments, but also significantly contributed towards empowering them. The HHGs also helped in better child care as the children suffer the most from common ailments like common cold; cough and fever that could be cured through medicinal plants based home remedies.

### **Constraints in Maintenance of HHGs**

The households raising HHGs reported in majority of the cases that waste water available from kitchen or bath rooms was inadequate to irrigate HHGs in view of the fact that about 82% of the households carried water for domestic consumption from public taps and, therefore, separate arrangement for watering the plants was necessary (FHDSF 2004). As a result, about 43% HHGs were watered from bath and/or kitchen wastewater.

Main causes for mortality of medicinal plants planted in HHGs included scarcity of water, difficulty in protecting the plants from livestock, strong competition between plants as a result of very close spacing adopted, shading of light demanding herbs by

tree species planted in HHGs, inadequate or unsuitable space available in house compounds for HHGs, neglect of HHGs by households in some cases, etc.

A package of 18-20 medicinal plants for each HHG resulted in problems such as providing sufficient space for planting; very close spacing resulting in competition and mortality, silviculture incompatibility between tree species and herbs and shrubs, and planting of species already existing in the villages.

### **Suitability of Institutional Arrangements**

The institutional arrangements made for the implementation of HHG programme lacked sustainability. The factors impacting adversely on the sustainability included the following: i) Most of the NGOs who promoted the HHGs during implementation of the programme have shifted their interest to other programmes and are no longer interested in providing support to HHGs; ii) The policy of providing medicinal plants seedlings at subsidised rates is not sustainable because of the experience that beneficiaries who paid for medicinal plants seedlings planted in the HHGs cared for the plants more and made greater use of medicinal plants than those who got the seedlings free of cost (FHDSF 2004); iii) Absence of technical support required for raising of medicinal plants and their use after the project period because capacity of women could not be built to the required level during the project period; iv) Lack of support to the SHGs to enable them to handle production and supply of medicinal plants seedlings and the training for use of medicinal plants for home remedies.

### **Main Conclusions of the Study**

The main conclusions of the study include the following:

- i) Greater emphasis needs be placed on creating awareness about the advantages of using medicinal plants for home remedies. It should lead to creating a strong urge among the target groups for raising HHGs and should result in medicinal plants seedlings being demanded by households rather than being pushed by an outside agency.
- ii) Greater emphasis needs to be placed on training of women in use of medicinal plants for home remedies as they took more interest in HHGs than men. Training may be decentralised and imparted in the villages with the help of SHGs.
- iii) Package of fixed number of medicinal plants need not be advocated and the number of species to be planted and the number of seedlings to be planted by each of them may be left to be decided by the participating women. The medicinal plants growing wild in and around the village need not be grown in HHGs.
- iv) A village may be treated as a unit to achieve self-sufficiency in terms of availability of medicinal plants for home remedies, instead of attempting to make individual households self-sufficient in this respect; households not having HHGs may get medicinal plants from HHG owners in the village.

- v) The cost of producing seedlings should be reduced to bring it within affordable limits of poor households. Decentralised nurseries at SHG level may reduce cost of transportation and may be more cost-effective.
- vi) The utilisation of wastewater from the kitchen should not be the deciding factor in locating the HHG because of the experience that such water was not sufficient to sustain the HHG, particularly in dry areas where water was very economically used in the kitchen; HHG should be located at a place where water can be available for irrigation.
- vii) SHGs are the best implementers in terms of medicinal plants based community outreach activities, involving women in particular.
- viii) Growing of nutritional plants may be combined with medicinal plants to take care of malnutrition among the poor families.

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## ARTS

### COMMUNICATION VIA VISUAL ARTS

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### A WORKSHOP FOR HEALTH PROFESSIONALS

#### Relevance

The research explores whether a Visual Arts Intervention programme (VAI) that includes works of art objects and paintings placed in a redecorated ward could have an effect on psychological and physiological outcomes of clinical significance. The research project will investigate a different angle. It will produce quantitative and qualitative evidence whether there is a therapeutic effect by the integration of the VAI programme into the health care environment. The integration of this extensive arts programme into hospital environment will provide the ideal setting for answering the question of whether the VAI programme can play a meaningful role in healthcare. The need for a scientific evaluation has long been recognized.

The European Charter on Environment and Health declares that good health and well-being require a harmonious environment in which aesthetic, social, physical and psychological factors are important. Similar points of views are expressed by Theorell (1995; 2000). The integration of the VAI programme into healthcare environments can play a crucial role in achieving these objectives. Evidence is needed to demonstrate that this integration could include beneficial psychological, physiological and biological patient outcomes, support staff and visitors and produce cost-effective benefits.

## **Background and state of the art: The meaning of aesthetics**

The meaning of aesthetics has been formulated by ancient philosophers who saw a natural link between art and life. Painting, drama, dance and music were obvious parts of every day life, and they were regarded as a cure of body and mind. The meaning of aesthetics for physical and psychological health as it has been described by ancient philosophers like Aristoteles, (1988) is to be found in the research of today. (Croze, 1912/63; Bell, 1914/39; Bullough, 1957; Gardner, 1973; Hirn, 1902; Langer, 1957; Nightingale, 1959/92) For instance, aesthetic forms of expression for elderly individuals can mean discovering, preserving, or developing possibilities for a meaningful life. In several controlled intervention studies, (Wikström, 2000, 2002) reported paintings elicited beneficial effects in elderly individuals. Dialogues generated by reproductions of works of well-known artists had a positive impact on elderly individuals' perceptions of their life situation and social interaction compared to a control group in which dialogues were about events of the day and the elderly individuals' hobbies and interests. In a survey of living conditions, Bygren, Konlaan and Johansson (1996) interviewed 12,675 people and then conducted follow up with respect to survival. The results showed attendance at cultural events, which included visiting museums, art exhibitions, theatres or concerts, reading books, and singing in a choir, had a positive influence on survival rates.

Maslow like Dewey, dealt with human experience. Both viewed aesthetic experiences and peak experiences as particular kinds of experience. Dewey argues it is an interaction between a human being and some aspects of the environment. Reflecting on an experience after its occurrence, according to Dewey is neither emotional nor intellectual alone. Rather, an aesthetic experience is an intensified form of an ordinary experience that belongs not only to the museums but also to general experiences that culminate in aesthetic experience. (Dewey, 1934/58) Maslow (1970) spoke of aesthetic peak experiences as moments of joy and temporary loss of time and self-awareness. For instance, individuals could feel a day passing as if it were only a few minutes. In such moments, reality is perceived as good and desirable, and the experience could be so valuable as to make life worthwhile. There are many beneficial after-effects of aesthetic peak experiences; individuals' views of themselves, others, and the world might be changed in a healthy direction.

### **Aim**

The aim of the present study is to increase the understanding of communication via visual arts and its effects on physical and psychological health parameters in elderly care. Visual art was used as a medium which can help the elderly to communicate their own intentions as well as to communicate with the creator of the visual art and his or her intentions. Visual art objects in hospital settings must advance from decorative to include health promoting aspects.

## **Theoretical framework**

Research on the effects of different factors such as design, colour, music and visual art indicate a link between poor architectural design and patients' increased levels of blood pressure and anxiety (Fridell, 2002; Dilani 2001). A controlled study showed that exposure to visual stimulation including views of nature, in intensive care units promotes positive outcomes on patients recovering from open-heart surgery (Ulrich, 1982). Architects and designers recognize that buildings should promote wellness by creating physical surroundings that are psychologically supportive (Ruga, 1989; Fridell, 2002). The literature also presents the findings of experimental and controlled studies designed to explore the use of visual art dialogues as a way to influence psychological and psychological well-being. (Wikström, 1992; 1993; 1994; 2000; 2002)

New studies in the context of basic research within the field of caring science support new approaches to mental health. One example is the thesis of Erna Lassenius (Lassenius, 2005) where the aim is to develop a theoretical model of space from the caring science point of view.

The approach might especially be used in an analysis in the way visual arts and music are integrated in a health program.

New results can be achieved within health and the arts, as several new, collaborative art practices have emerged. The aim is to combine art and life, in opposition to the traditional, modernist ideal of art; art for art's sake. (Bourriaud, 2002; Bishop, 2006; Mazanti, 2006; Bull, 2007) Collaborative art projects can develop identity both on an individual level, by the user and on a collective level, in the institution. Identity and function is relevant in the Swedish Research project, HumanTechnology. New objects have been developed for mental health services. These are different assistive devices, enabling the users to gain power of their own lives by becoming more secure, independent and more active in every day life (Eskel Grönberg, 2004). The project can contribute to this knowledge.

Collaborative research in practice is based on a humanistic, psychological ground, pointing towards the local community as a target, and where goals and values are defined in an interactive process. (Hummelvoll 2003, p.24)

## **Method**

To take into consideration the aim in the present study, focus was on qualitative methods. To reach understanding of a complex and intersect border area triangulation between and within qualitative methods was practiced. To improve the validity of the study there were different data sources and methods of a single phenomenon, the meaning of art. (Denzin, 1970)

Visual art are varied in both techniques and content, we must investigate if the art we are proposing for sheltered ward units are in fact producing the results we intend. We searched for visual art objects that took into consideration that one heals better in an

atmosphere that reflects respect for the patient. In this context, the arts, as the way the patients can express their feelings and stories.

A visual art object can stimulate almost any experience and skill in a person and help recalling memories from the past. In addition it is important to remember that a visual art object functions as part of a wider phenomenon. A person has two realities, a psychological reality consisting of dreams, feelings, thoughts, experiences and wishes, and an external reality consisting of things and living creatures. To contemplate a visual art object is to be between these two realities. The visual art object is a connection between the spectator's psychological reality and his or her external reality. The onlooker is secluded from reality and free to express and develop his or her imagination and associations without consequences for his or her daily life. The effects of visual art object stimulation are full of nuances compared to those of stimulating specific social or psychological functions.

### **Visual art objects implementation in the wards**

An artist's visual arts objects were used. The placement of the visual art objects will consider the possibility to make the environment harmonious. Therefore parts of the ward might have to be repainted and redecorated. The changes are done in a dialogue with the users of the department. They will influence the choice and environment of the art works. Visual art objects for the wall will be developed. These are images with different levels of abstraction, made by porcelain. The placement will be in dialogue with the architecture, and in relation to analysis of movement flows in the space. Other art works will be sculptural seating objects made by concrete and porcelain tiles. They are designed to create communication and social interplay. There are words, images and colours on the objects, and in use the objects can reflect identity. The objects can function as a statement in accordance to what text or object the user choose to sit on, or interact with. The seating objects will be put in places in such a way that it might increase social interplay.

### **Project Plan**

#### **Visual Art Intervention Programme**

The visual art intervention (VAI) programme constitutes of three parts: a workshop for health professionals, a pedagogical model for visual art communication, and degree of complexity in the chosen art works. The VAI programme has an aim to develop communication in the department:

#### **A workshop for Health Professionals**

Before implementing the VAI programme as a strategy for conversations, health professionals, nurses, and nurses assistants took part in a residential workshop. They was informed of the result of a study in which health professionals used visual art as a

communication tool with elderly. (Wikström, 2000) They was also be informed about different art forms such as music, dance visual arts and their connection to physical and psychological health. During the workshop, the participants discussed elderly persons' visual art preferences, formal aspects of paintings, and the meaning of representation in paintings. Finally they practiceed how to use visual art as a communication tool.

### **Visual art intervention**

During the intervention period each patient had visual art dialogues with a special trained health professional. The art conversations took place once a week and last for 15 to 20 minutes. However, some of the patients to took part in a five minutes dialogue. Relatives to the patients have the possibility to contemplate the visual art objects, alone or together. In a similar way staff members can contemplate the visual art object.

### **A pedagogical model for visual arts communication**

When health professionals use visual art as a conversation instrument in the contact with elderly persons the elderly person's fantasy, experience, and knowledge will be decisive. The role of the health professional will be to support and encourage the elderly person to combine earlier memories and experiences with new impressions from the visual art object. It must be the elderly person who decides how to interpret the painting and the direction of the conversation. The conversation will last for approximately 15 to 30 minutes. Health professionals gave the following four instructions to the elderly persons:

- I am interested in showing you some of the visual arts objects at our ward that you and I can have as a topic of conversation
- Which of these visual art objects capture your interest?
- Describe the visual art object, what it represents!
- Pretend you are the artist and know all about it, what it brings to your mind!

The visual art object is intended to provide the elderly person a scene for a mental walk. Decisive for this adventure is the elderly person's knowledge, fantasy and experiences. The role of the health professional is to support and encourage the elderly person to get closer to the visual art object and combine earlier memories and experiences with new impressions from the visual art object. During the conversation the elderly persons' own resources will be in focus and the conversation will be conducted in a free and independent form. This model has been tested in several studies as well as practiced by health professionals. (Wikström, 1992; 1994; 2000; 2002) In addition; the model has been practiced by health professionals. Their experiences of visual art as a conversation tool with elderly persons are that this form of dialogue is helpful in order find topics to be discussed. Recommendations on how health professionals could practice conversations to stimulate elderly persons to take an active part in conversations are

presented in a study by Wikström (2003). In the present study some aspects of this pedagogical tool will be used.

### **Degree of complexity in the chosen art works.**

Visual art objects will be chosen for the programme on the basis of reactions to and perceptions of works of art as described in the history of art. (Barron, 1951/52; Child, 1962; Berlyne, 1971; Sandström, 1977; Wikström et al., 1993) It will be based on the premise that pattern are judged to be interesting if they contain information that could not be absorbed immediately, but seemed likely to be absorbed relatively quickly both perceptually and intellectually. It will be important that the level of uncertainty, which included complexity, ambiguity and variability, was neither too high nor too low, i.e. in balance with the viewer's ability to perceive it. (Berlyne, 1971; Wikström, 1992) An important aspect reported by Smith, Carlsson and Sandström (1985) and Wikström (2001; 2004) and complementary to Berlyne's research. The degree of realism, the lack of sharply outlined forms and the angular structure will vary. In addition the quality of the subject matter, active/passive colour effects and the degree of dramatic action will vary as well. Three of the chosen visual art objects will be selected to suite the spectator's taste. The remaining visual art objects will have an increased degree of difficulty. In addition, art is not always peaceful and tolerant in attitude. On the contrary, some art is expressly designed to convey emotions of hatred and prejudice. Therefore the selection of visual art objects must be made with care, in collaboration with the onlooker.

### **The following data collection sources will be used in the staff group:**

Personal background, art interests, The Wheel Questionnaire (Shalit, 1978, 1979; 2001), Focus group interviews (Wibeck 20.).

### **The Wheel Questionnaire**

The Wheel Questionnaire, a semi-structured questionnaire. The Wheel Questionnaire instrument measures aspects of perception such as structure, motivation and degree of emotional investment indicating a feeling of control (Shalit, 1978, 1979). It will be used to collect qualitative as well as quantitative data.

### **Focus group interviews**

Focus group interviews were used in the staff group to discover subjects' beliefs, perceptions and expectations of the art intervention program. Sessions was audio taped and transcribed, and themes identified through an immersion- and crystallisation process. Concept maps were prepared to aid understanding (Wibeck, 2000, Thomsson, 2000).

## **Health and environment**

There is little documentation in psycho geriatric ward, and in particular not in the mental health for elderly people. This is in spite of that empowerment has been a major area of focus the last years. Norwegian government foundation for architecture, design and urban planning (Norsk Form) has a program for design and environment, with a specific focus on mental health for elderly people. They found that experimental research designs should to a greater extent be applied in this field of health and environment. (Hammerstrom, 2007).

### **A Nordic perspective - network building**

A Nordic cross disciplinary perspective is established in the research group. The team members are Britt-Maj Wikstrom, PhD, from Karolinska University in Stockholm Sweden and Full Professor at Akershus University College, Mette Holme Ingeberg, associate professor in mental health at Nursing Education at Akershus University College, and Arild Berg, Doctor of Arts Student at School of Visual Culture, University of Art & Design Helsinki, and Akershus University College. This collaboration enables a cultural exchange between countries, both in art and nursing care. The research project can contribute to develop networks on a national level with Norwegian Form.

### **Strategic basis: arts and empowerment**

Empowerment is a research focus at the Faculty of Nursing at Akershus University College. In the communication with the elderly person the present study will focus on how the elderly persons interact together with other persons and with him or herself. It could create a feeling of healing and recovery (Vatne, 2008).

Arts for the sake of empowerment are not new. Art therapy has been used extensively since the 1940s. The Arts have potential to empower us and become agents towards the healing and empowerment of others. Arts provide a person to master the complex tasks, challenges and issues that are integral to membership in society in our complex world. Studies show that visual art can be used as a way to empower marginalized confidence, optimism and self-esteem and the lifelong skill of self expression. The arts can empower young people to test themselves as individuals and provide them with opportunities for self expression. Studies have shown that arts programmes can develop young people's awareness of and ability to plan for their own future and increase self esteem (Rappaport, 1987).

Through the arts a individuals can explore their world, express themselves creatively, and learn new talents they did not know they had.

## **Ethical considerations**

The Ethics Committees of NSD and RER were contacted. Participants received the usual assurances about anonymity, confidentiality and right to withdraw at any point without

prejudice. (Hermerèn, 1978) The purpose and procedure of the visual art dialogues was carefully explained to health professionals before their use. An ethical issue that could arise from elderly persons participating in the present study could be that the elderly persons are in a state of dependence in relation to relatives and health professionals. In addition, some of the participating patients could have a diagnosis that makes it difficult for them to understand the meaning of the visual art programme.

When visual art objects was chosen for the present study it have to be considered that some visual objects, more than others, could cause emotions of anxiety and dislike. This aspect was well thought-out and important and therefore was built into the pedagogical structure of the visual art programme. The programme took into consideration that some of the visual art objects could convey emotions of dislike and anxiety. In order to have a conversation it was important to carefully and respectfully take into consideration the elderly persons' cultural background and personal values and meet the elderly persons recognition and insult appreciative communication not to tell another person about a feeling of (Kirkevold, 2008).

### **Communication with the users: Health, environment and empowerment**

The user influence in a health program can be enhanced by the use of art and design. Art objects might initiate activity on both a psychological and physiological level. If the users are too ill to take part in planning a program, someone can be their representatives. The users can be represented by staff, family or people who have recovered from their illness. The arts can even help people who are not ill, to stay healthy. To enable people to life quality which prevents illness is an aspect of empowerment. Empowerment can generally refer to people's possibility to acquire understanding and control of their own personal, social, economical and political abilities. These abilities can be used to actions which develop their own life situation (Israel: 1994, p.152). The nurses and family can enhance the ability to communicate in an accepting and confirming way, about older patients views of who they are, and would like to be (Vatne, 2006). "Empowerment for a community" is when people, both as individuals and as a part of their organisation, in interaction give each other the possibility to solve their needs (Israel: 1994, p.153). The knowledge about the interplay of art practice and health care can be transferrable to other local communities.

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# DEFORESTATION AND HEALTH

## DEFORESTATION, MINERAL NUTRIENT DEPLETION IN THE SOIL AND HIV DISEASE

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### Abstract

Forest trees are of vital importance for efficient recycling and retention of all such mineral nutrient elements that are highly biophile in plants, and also for vertical pumping of nutrient elements from deep layers of soil (where chemical weathering is less complete) up to the land surface. Deforestation leads to enhanced loss of plant-biophile elements both by leaching and soil erosion, and also to strong reduction or abolishment of plant nutrient pumping from deep layers of soil. This leads to depletion of the nutrient elements concerned in the topsoil, which can in turn cause reduction of plant protein and sulphur amino acid production and deficiency of several important micronutrients, such as zinc, iodine, bromine and selenium, in the diets of animal and human populations. This can in turn lead to developmental disturbances and severe impairment of immunological functions at the same time as dietary deficiency of sulphur amino acids is associated with more rapid HIV viral replication and faster growth of mycobacteria. Selenium and sulphur amino acid deficiencies will probably interact synergistically as causes of more aggressive behaviour of HIV. It is therefore a direct connection between environmental problems in poor countries and more aggressive behaviour both of tubercle and lepra bacilli and HIV. To solve these problems, it is necessary to find good integrated solutions involving both agriculture and the health sector. It is of vital importance that not only scientists, but also governments and the local populations involved have a clear understanding of the chain of causality from

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environmental degradation via poor diet to enhanced prevalence, morbidity and mortality for HIV disease and tuberculosis.

### **Deforestation leads to depletion of plant-biophile nutrient elements in topsoil and plants**

The Norwegian geochemist V.M. Goldschmidt (1888-1947) (1) classified the elements according to their geochemical partition behaviour in four groups called siderophile, chalcophile, lithophile and atmophile (2). He also coined the term biophile elements for such elements that are found at high absolute or relative concentrations in living organisms. Table 1 gives a crude estimate of the rank order of different elements as more or less biophile in edible plant organs. It shows the ratio between estimated daily intakes of different elements from plant foods in Finland and the average geochemical abundances of the same elements in the Earth's continental crust (3). This ratio varies by almost a factor of  $10^8$  from nitrogen, as the most biophile, to aluminium as the least biophile among the elements shown in the table, as measured by relative abundance in edible plant tissues compared to common igneous rocks.

Many of the nutrient elements needed by plants and humans come mainly from the bedrock (or from alluvial deposits), but some come mainly from the atmosphere (especially N and C) or from seawater by transport through the atmosphere. Seawater is the main source for all halogens except F, and in many districts also for sulphur (S) and selenium (Se). Sulphur and chloride are transported from seawater into the atmosphere mainly as a result of seaspray particle formation, but Se and I are mainly transported into the atmosphere by evaporation of biomethylated volatile compounds from the sea surface.

Several of those metals that come mainly from the bedrock and are needed as nutrients for plants or animals (*e.g.* Ca, Mg, Zn, Cu and Mo) are found in minerals that have little resistance to chemical weathering, especially in humid tropical environments. Many of the metals concerned can, however, be retained for a while in the topsoil by adsorption to clay minerals or organic matter. But prolonged chemical weathering in humid tropical environments is associated with loss of clay minerals from the topsoil and hence also loss of its capacity for adsorption of cations (4).

Trees can transport nutrient elements up to their crown from deep layers of soil where chemical weathering is not complete (4), and they can also intercept and take up mobile elements (such as S, Br or I) on their way downwards before they reach the groundwater table. By active uptake in their roots, plants plus associated mycorrhiza help to recycle and retain several nutrient elements as parts of living matter or in the topsoil. This is most important for those elements that are most strongly biophile in the plants (see the table), such as Cl, Br, I, S, P, Se, Zn, K, B and Mo.

When trees are cut down or burnt, this will very frequently be associated with enhancement of the rate of topsoil erosion. This means enhanced loss of such plant-biophile elements that are relatively insoluble or well adsorbed to soil minerals and

therefore tend to accumulate in the topsoil, such as phosphorus. But it means also less efficient retention of all such plant-biophile elements that are highly soluble, such as S, Cl and Br (and in hot climates most likely also I), with enhancement of the rate constant for removal of those elements by vertical and horizontal leaching processes. Finally, it means also that the vertical pumping capacity that is associated with deep tree roots for elements such as P, Ca, Mg, K, Mo and Zn will be lost.

### **Medical consequences of soil sulphur and selenium deficiencies**

In humid tropical environments, sulphur is one of the most vulnerable among the nutrient elements mentioned above. Sulphur deficiency in the soil is probably very widespread in humid parts of Sub-Saharan Africa. It can occur also as a consequence of anthropogenic fires, especially on the savannah (5). Soil S deficiency can lead to impairment of the capacity of protein synthesis in plants similarly as happens because of N limitation (6), but those plant proteins that contain much S amino acids are most strongly affected, which can lead to changes in the amino acid composition of seed protein with S amino acids becoming depleted (6). The intake of S amino acids can, however, also be much lower than is common in Europe when the total dietary intake of protein is low, as in those parts of West Africa where cassava roots are the main staple food (7, 8).

Deficiency of S amino acids in the diet is associated with tissue depletion of glutathione, being very common in kwashiorkor patients (9). Glutathione (GSH) and S-nitrosoglutathione are toxic to mycobacteria, with GSH inhibiting the growth of tubercle bacilli and S-nitrosoglutathione being bactericidal (10). GSH depletion can therefore lead to enhancement of the rate of mycobacterial growth. GSH depletion can, moreover, also lead to reduction of the rate of leukocyte proliferation, perhaps because DNA synthesis is inhibited (11), and change the pattern of cytokine secretion with reduced secretion of Th1-associated cytokines (such as interleukin-12 and interferon-*gamma*) and enhanced secretion of Th2-associated cytokines (11,12). As an example can be mentioned that NK cells normally will secrete interferon-*gamma* (that enhances antibacterial and antiviral immune responses) following simultaneous stimulation with interleukin-12 and interleukin-2, but if they are GSH-depleted, they will instead secrete interleukin-10 that has an opposite effect (12).

GSH depletion (13) and selenium deficiency (14) can lead to enhanced oxidative activation (11) of the transcription factor NF-*kappa*B, which in turn stimulates the expression of the HIV provirus or "viral gene" (15), thus leading to enhancement of the rate of HIV replication. But the regulatory effects of changes in GSH status are not simple, and paradoxical effects (going in the opposite direction) on the expression of NF-*kappa*B-regulated genes have also been described. The H<sub>2</sub>O<sub>2</sub>-scavenging Se-dependent enzyme glutathione peroxidase displays tert-uni ping pong kinetics (16), which means that the rate of H<sub>2</sub>O<sub>2</sub> scavenging at a given H<sub>2</sub>O<sub>2</sub> concentration is determined by the product of the

concentration of the enzyme itself (depending on the Se intake) and the second power of the concentration of its reducing substrate GSH. Since  $\text{H}_2\text{O}_2$  can activate NF- $\kappa$ B (17), it is reasonable to believe that Se deficiency and GSH depletion may interact synergistically as causes of enhanced NF- $\kappa$ B activation and enhanced replication of HIV. But HIV disease itself has been reported to lead to strongly enhanced catabolism of S amino acids (18); it may thus be an important contributory cause of GSH depletion, leading to a vicious circle that also will increase the risk of activation of latent tuberculosis.

HIV replication is negatively controlled (inhibited) by proviral DNA methylation (19,20). Replication of herpesvirus (19), Epstein-Barr virus (19), human papillomavirus (19) and cytomegalovirus (21) are also inhibited by viral DNA methylation. When viral or proviral DNA is methylated, S-adenosylmethionine (SAME) functions as donor of the methyl group (19), while the reaction product S-adenosylhomocysteine is an inhibitor of transmethylation reactions (22). S-adenosylmethionine can be depleted or the level of S-adenosylhomocysteine enhanced because of vitamin B<sub>12</sub>, folate or vitamin B<sub>6</sub> deficiencies (19), but there is every reason to expect that SAME may be depleted also when the intake of the S amino acid methionine is too low. A synergistic interaction between S amino acid deficiency and deficiencies of vitamin B<sub>12</sub> (which is very common when the intake of animal foods is too low), folate or vitamin B<sub>6</sub> as causes of impaired viral DNA methylation (which potentially could lead to enhanced replication of all the viruses mentioned above) can therefore be expected.

### **Roles of bromide and iodide as bactericidal, parasitocidal and viricidal weapons**

Iodide and bromide are good reducing substrates (23, 24) for haloperoxidases with bactericidal (23), viricidal (25) or parasitocidal (26) effects, such as myeloperoxidase, lactoperoxidase, eosinophil peroxidase (26) and estrogen-inducible (27) female reproductive tract peroxidase. Chloride is also used as substrate for myeloperoxidase, but it is not a good substrate for lactoperoxidase (23) and eosinophil peroxidase (24), except at low pH. Bromide is normally much more abundant than I<sup>-</sup> in the blood, but the Br<sup>-</sup> concentration of blood plasma is most likely strongly dependent on the average Br/Cl ratio of the diet. During precipitation of NaCl from evaporating seawater, there is a strong fractionation of Br<sup>-</sup> relative to Cl<sup>-</sup> because of the larger ionic radius of Br<sup>-</sup> (28) compared to Cl<sup>-</sup>. This may explain why the Br/Cl ratio of table salt analysed in Finland (29) was only 1/27 of the Br/Cl ratio found in seawater (28).

In marine aerosols, the Br/Cl ratio is higher than in seawater because of evaporation of biologically formed CH<sub>3</sub>Br from the sea surface (30). The average Br/Cl ratio of rain falling over the continents is therefore higher than in seawater, leading to fairly high Br concentrations in terrestrial plants (29). But there is reason to expect that a large intake of Br-poor table salt may lead to strong reduction of the average Br/Cl ratio of the total diet and most likely also a corresponding reduction of the Br<sup>-</sup> concentration of blood plasma and other body fluids. It must be expected that depletion of soil Br (and I) as a consequence of deforestation will lead to further exacerbation of this problem.

There is strong reason to expect that blood plasma  $\text{Br}^-$  depletion will lead to impaired killing efficiency for all of the microbicidal peroxidases, but more so for lactoperoxidase and eosinophil peroxidase than for myeloperoxidase. Possible consequences might be enhanced risk of mastitis in lactating women (which will enhance the risk of vertical transmission of HIV from mother to child) as well as in dairy cows and goats, impaired killing of tubercle bacilli and impaired killing of HIV in the vagina before the virus has managed to infect dendritic cells or other leukocytes. However, the kinetic properties of female reproductive tract peroxidase with different halide substrates have apparently never been adequately studied.

### **Zinc deficiency**

The total abundance of zinc in animal organisms is higher than for any other essential trace element except iron and perhaps silicon: the total amount of zinc in a human organism is normally about 60% of the total amount of iron. Zinc is a necessary cofactor in hundreds of enzymes and also in a large number of transcription factors; it is needed for synthesis of DNA, RNA and protein molecules and is therefore needed for all growth processes both at the cellular and organism level, as well as being very important for immunological functions and resistance against infectious diseases (31, 32). Zinc deficiency is one of the common causes of impaired growth (stunting) in children; in severe cases it can lead to dwarfism (31). Zinc deficiency in pregnant women can lead to foetal damage (all degrees from very mild to grotesquely severe) with the brain apparently being especially vulnerable (31).

Zinc is always associated with protein in the diet and is found both in animal and plant protein foods (29). But intestinal absorption of zinc from plant foods, such as cereal grains or legume seeds, is often inhibited by high levels of phytate in all kinds of seeds unless phytate has been removed either by germination or thorough fermentation (31). Zinc deficiency in the soil (which can develop as a direct consequence of deforestation and enhancement of the rate of topsoil erosion) can lead to reduction of the zinc concentration of plant foods (33) and may therefore lead to exacerbation of these problems.

### **Conclusion**

It can be concluded that there is a direct connection between deforestation in poor countries and important health problems, including developmental disturbances (such as brain damage resulting either from zinc or iodine deficiency), enhanced morbidity and mortality from common childhood infections (such as diarrhoea and lower respiratory tract infections), and more aggressive behaviour both of tubercle bacilli and HIV, leading most likely not only to aggravation of the course of the disease in individual patients, but also to faster spread of both diseases in the entire affected population, since the chance for a patient to infect somebody else depends on the number of tubercle bacilli or viruses that the patient himself carries. It must also be expected that

environmental degradation, poverty and the infectious diseases themselves (18,34) will interact synergistically as causes of malnutrition, leading in turn to worsening of morbidity and mortality (10-12,34) for nearly all infectious diseases, including HIV disease and tuberculosis.

**Table 1.**

**Ratio between average daily intake of elements from plant foods in Finland and average concentration of the same elements in the Earth's continental crust.<sup>4</sup>**

| Element | Cereals<br>mg/day | "Vegetable foods"<br>mg/day | Sum cereals<br>+ "vegetable<br>foods"<br>mg/day | Continental crust<br>average concen-<br>tion<br>mg/kg | Ratio daily intake<br>to continental crust<br>concentration<br>g/day |
|---------|-------------------|-----------------------------|---|---|--|
| N       | 4000              | 1000                        | 5000  | 20  | 250 000  |
| Br      | 1                 | 0.32                        | 1.32  | 0.5   | 2 640  |
| S       | 270               | 95                          | 365   | 300   | 1 220  |
| I       | 0.0252            | 0.0028                      | 0.028   | 0.2 (<0.05)   | 140 (>560)   |
| P       | 440               | 140                         | 580   | 1100  | 530  |
| B       | 0.16              | 1.0                         | 1.16  | 10  | 120  |
| K       | 550               | 1400                        | 1950  | 21000   | 93   |
| Zn      | 4.1               | 1.1                         | 5.2   | 70  | 74   |
| Se      | 0.0028            | 0.0005                      | 0.0033  | 0.05  | 66   |
| Cd      | 0.0047            | 0.0038                      | 0.0085  | 0.15  | 57   |
| Hg      | 0.0004            | 0.0003                      | 0.0007  | 0.02  | 35   |
| Mo      | 0.030             | 0.015                       | 0.045   | 1.5   | 30   |
| Cu      | 0.74              | 0.37                        | 1.11  | 50  | 22   |
| Rb      | 0.68              | 0.86                        | 1.54  | 90  | 17   |
| As      | 0.0072            | 0.012                       | 0.0192  | 1.8   | 11   |
| Mg      | 130               | 81                          | 211   | 23000   | 9.2  |
| Mn      | 4.0               | 1.3                         | 5.3   | 1000  | 5.3  |
| Ca      | 41                | 80                          | 121   | 41000   | 3.0  |
| Sr      | 0.22              | 0.60                        | 0.82  | 375   | 2.2  |
| Pb      | 0.005             | 0.022                       | 0.027   | 12.5  | 2.2  |
| Ni      | 0.061             | 0.044                       | 0.105   | 75  | 1.4  |
| Co      | 0.0043            | 0.0036                      | 0.0079  | 22  | 0.36   |
| F       | 0.095             | 0.057                       | 0.152   | 650   | 0.23   |
| Fe      | 9.5               | 2.5                         | 12.0  | 54000   | 0.22   |
| Cr      | 0.0037            | 0.0068                      | 0.0105  | 100   | 0.11   |
| Si      | 11                | 3.7                         | 14.7  | 282000  | 0.052  |
| Al      | 1.7               | 1.4                         | 3.1   | 81000   | 0.038  |

<sup>4</sup> From Christophersen (3), using data from Koivistoinen, ed. (30) and Krauskopf (29). For more detailed information and discussion, see Christophersen (3).

To solve these problems, it is necessary to find good integrated practical solutions involving both agriculture and the health sector. It is of vital importance that not only scientists, but also governments and the local populations involved can have a clear understanding of the chain of causality from environmental degradation via poor diet to enhanced prevalence, morbidity and mortality for HIV disease and tuberculosis. Feared medical scourges such as HIV disease should be used to motivate local populations to do things that will be good not only for their own health (or for the health of their children), but also for the local and global environment. Frank McDougall's slogan "to marry health and agriculture" may never have been as relevant and important as it is today. But following this slogan may not be possible in Sub-Saharan Africa or elsewhere unless not only agricultural, but also medical scientists can become Goldschmidt's (1,2) disciples and learn from his way of thinking - or scientific worldview - at least some of the most basic principles, especially as regards the geochemical cycling properties of all important nutrient elements and the relevance both for agricultural and medical scientists of his concept "biophile elements" - if we want to understand the health consequences of deforestation for the human population.

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# DESIGN AND HEALTH

## EVIDENCE-BASED BIOPHILIC DESIGN

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### Summary

*The psychological aspects of the relationship between the physical environment and human health and well-being are a major concern of the field of study known as environmental psychology. Within this field one of those factors that are thought to enhance psychological well-being is the presence of non-threatening elements of nature. In recent years new design strategies have emerged which seeks to integrate knowledge about people's psychological, physical, and behavioural needs in built settings. One of these - biophilic design - do not only seek to eliminate what is potential harmful to humans and ecological systems, but also to make the most of what is potentially good for people, such as contact with nature. Also within evidence-based design the main issue has been to create built contexts for healing by focusing on elements in the environment that can enhance the healing process, such as elements of nature. In this paper some results from an ongoing study which investigate on possible beneficial effects of elements of nature in a Norwegian hospital will be presented.*

### Introduction

Which physical environments are good for humans, and how can the physical environment be designed to promote physical and mental health and well-being? These are obviously complex issues that include a large number of different factors, some of which are physical and other of which are psychological. The psychological aspect of the

relationship between the physical environment and human health and well-being are a major concern of the field of study known as environmental psychology (1-3). Within environmental psychology, much emphasis has been placed on factors in the environment that can contribute to stressful experiences, such as noise, crowding, and extreme temperatures (4). However, research has not only focused on negative factors in the physical environment, but also on more salutogenic factors that can enhance psychological well-being. One of these factors is thought to be the presence of non-threatening elements of nature (5-7).

Over the past decades, an increasing number of solid empirical studies have documented that experience of nature can be beneficial for human health and well-being (8). One set of psychological benefits of nature that has received much attention in research involves aesthetic or affective responses. According to Ulrich (9), viewing a setting with natural elements can elicit a response of aesthetic liking, which in turn leads to more positive feelings. Several studies have indicated that people in general prefer natural scenes dominated by vegetation to urban scenes lacking vegetation (10-12). Indoor settings containing natural elements have also been more positively evaluated (13).

Findings from several studies suggest that simply looking at nature, as compared to built scenes that lack nature, is significantly more effective in promoting restoration from stress, as reflected in outcomes such as reduced blood pressure and heart rate. Stress-reducing influences have been found when viewing videotapes of nature versus urban scenes (6, 14, 15) and by looking at trees and vegetation out of a window versus not having a window view (16). With regard to indoor settings, several studies have reported a decrease in stress responses when indoor plants were present versus absent (13).

Psychophysiological stress-reduction benefits may also mediate a variety of short- and long-term health benefits. Some studies suggest that viewing nature from a window can lead to a reduction in the use of healthcare facilities in a prison (17) and faster recovery from surgery in a hospital (18). In the indoor context, plants have been associated with an increase in pain tolerance (19, 20), decrease in self-reported health and discomfort symptoms (21), and a decrease in self-reported sick leave among office employees (22).

### **Biophilic design**

Thus, there exists some evidence that simply looking at nature, both in outdoor and indoor settings, can be beneficial for human health and well-being. Currently new design strategies are emerging which focus on implementing the psychological beneficial effects of nature to the built environment. One of these - biophilic design - emphasizes the necessity of transferring the beneficial experience of nature to the built environment (23-25). It further builds on the biophilia hypothesis which states that since humans have evolved in natural environments, we have an innate affinity towards nature and other living entities (26, 27). According to Kellert (24) both direct experiences with natural features in the built context (e.g., natural materials and window views to nature), indirect experiences (e.g., potted plants and water fountains), and symbolic representations of nature through images and pictures can all appeal to this innate affinity which can evoke positive experiences in built environments.

It should be noted that the biophilia hypothesis is a general theoretical approach, and it does not explain the psychological processes involved in human responses toward nature. Biophilia is further seen as a 'weak' biological tendency which depends on cultural learning for its full development (23). Within environmental psychology two

major theories have been developed which describes the more specific psychological processes involved in humans reactions toward nature, and especially why nature has restorative or stress-reducing effects. These are Kaplan and Kaplan's (5) attention restoration theory which focus on cognitive processes for restoration, and Ulrich's (9) psycho-evolutionary theory which has a more affective approach. However, both of them assign importance to natural features in the environment for stress-reduction or restoration.

To take humans psychological, physiological and behavioural needs into consideration when designing buildings are important in all kinds of built settings (28). Even in people's daily life it is important to go beyond mere survival to also consider life quality and more salutogenic factors in the built environment that can possible improve people's health and well-being. However, implementing features in the built context that can enhance stress-reduction or restoration might be especially important in settings made for healing such as hospitals.

### **Evidence-based design**

Whereas evidence-based medicine is concerned with the quality of treatments (29), evidence-based design focuses on the quality of the built environment (30). However, both approaches aim to apply the best available evidence gained from empirical research in decision-making. Even though evidence-based design is applicable to many types of building projects, it has mainly focused on hospitals and healthcare settings (31). Much of the work in evidence-based design is concentrated around physical factors that can lead to less stress or restore stressful experiences for patients, family and staff. Thus, the main issue is to design healthcare environments that can amplify the healing process for patients, and that also might lead to less stressful experiences for hospital employees.

According to Ulrich (32) there exist today more than 50 rigorous studies related to the influence of nature elements in healthcare settings on patients, staff, and visitors. These studies include different experiences with natural elements such as physical activities in gardens or horticulture therapy, but most of the studies concern passive interaction with biophilic elements such as window views to nature, pictures of nature or having other elements of nature indoors. Beneficial outcomes from evidence-based biophilic design have been reduced stress-responses, improved emotional well-being, and pain alleviation.

The use of evidence-based design has not gone without critics, and healthcare decision makers have questioned the quality of available evidence for health impacts of healing environments. However, other review studies have shown the possible healing effects of the quality of the physical environment in healthcare settings (33).

### **Ongoing study on possible beneficial effects of natural elements in hospitals**

The authors of the present paper are working on an ongoing study investigating possible beneficial outcomes of natural elements in hospitals. The main objective of the study is to examine how elements of nature such as wood, pictures of nature and window views to nature possible might affect Norwegian patients. As part of the larger study we have first conducted a study on preferences for wood in patient rooms using employees at a hospital as an expert group.

The main objective of this first part of the study was to investigate on preferences for different degrees of wood in patient rooms. Thus, the research questions were whether

patient rooms with the inclusion of wood was more preferred than patient rooms without wood, and whether there would be a linear relationship between preferences and the degree of wood in the rooms. We used data-manipulated pictures of a patient room with different degrees of wood on a continuum from no wood to all wood (see Pic. 1 and 2). The room with no wood represents a regular patient room. An anonymous e-mail questionnaire was sent out to 437 employees at one department at a Norwegian hospital, where 98 employees returned their answers. The employees were nurses (54.9%), physicians (13.7%), people working in the administration (11.8%), auxiliary nurses (8.8%), and employees having other duties than the above mentioned.

The e-mail questionnaire was adjusted so that all the pictures were shown in a random fashion. That is, the employees answering the questionnaire were shown the pictures in different sequences. On a scale from 1 to 7 the participants were asked to rate the pictures on twelve adjectives describing the room. These were Pleasant, Nice, Boring, Pure Style, Airy, Masculine, Expensive, Modern, Ordinary, Natural, Calming, and Secure. All the items in the questionnaire were taken from standardised measures related to preferences for both exterior and interior settings (34). In addition to the preference adjectives the participants were asked on a 7-point Likert scale whether they liked the room or not ("I like the interior in this patient room"), whether they thought the interior was suited for a patient room ("The interior is well suited for a patient room"), and whether they would like to work on the room ("I would like to work in this room").

The results indicated that it was the room with an intermediate level of wood that was the most preferred (see Pic. 3). This room had the highest score on the preference item "I like the interior in this patient room" ( $M=4.18$ ,  $SD=1.81$ ), and also on the items "The interior is well suited for a patient room" ( $M=4.19$ ,  $SD=1.86$ ) and "I would like to work in this room" ( $M=4.11$ ,  $SD=1.88$ ). This room was also seen as most Pleasant, Natural, Calming, and Secure, and was rated as the least Boring room. It was also interesting to note that the rooms on both end of the continuum were the least and second least preferred rooms. The second least preferred room was the regular hospital room with no inclusion of wood (see Pic. 1). The least preferred room was the room with all wood (see Pic. 2). It was rated lowest on the items "I like the interior in this patient room" ( $M=2.72$ ,  $SD=1.78$ ), "The interior is well suited for a patient room" ( $M=2.69$ ,  $SD=1.71$ ), and "I would like to work in this room" ( $M=2.97$ ,  $SD=1.84$ ). The all wood room was also rated as least Pleasant, Nice, Modern, Ordinary, Natural, Calming, and Secure, and as most Masculine and Expensive. Descriptives for all rooms are reported in Table 1.



**Pic. 1. Standard patient room with no wood. The second least preferred room ( $M=3.29$ ,  $SD=1.87$ ).**



**Pic. 2. Patient room with all wood. The least preferred room ( $M=2.72$ ,  $SD=1.78$ ).**

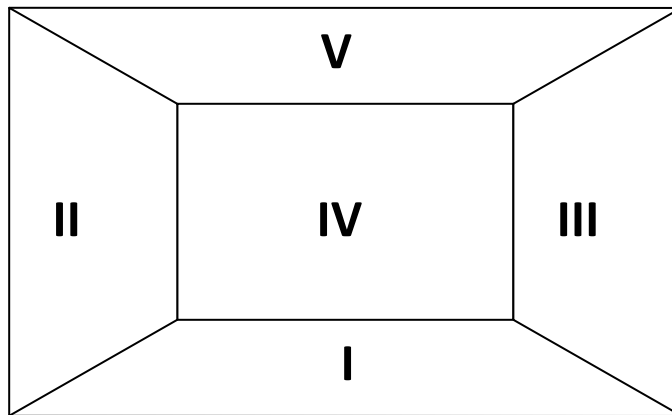


**Pic.3. Intermediate level of wood. The most preferred room ( $M=4.18$ ,  $SD=1.81$ ).**

**Table 1.**

**Descriptives for preferences for the inclusion of wood in patient rooms on a continuum from no wood to all wood (identification of visual surfaces according to Pic. 4)**

| Room description |               |               |               |               |           | Preference |      |
|------------------|---------------|---------------|---------------|---------------|-----------|------------|------|
| Surface I        | Surface II    | Surface III   | Surface IV    | Surface V     | Furniture | Preference | SD   |
| Linoleum         | Painted white | Painted white | Painted white | Painted white | Steel     | 3,43       | 1,83 |
| Linoleum         | Painted white | Oak           | Painted white | Painted white | Steel     | 3,51       | 1,69 |
| Linoleum         | Painted white | Pine          | Painted white | Painted white | Steel     | 3,62       | 1,71 |
| Oak              | Painted white | Painted white | Painted white | Painted white | Steel     | 3,88       | 1,90 |
| Oak              | Painted white | Pine          | Painted white | Painted white | Steel     | 3,83       | 1,74 |
| Oak              | Painted white | Pine          | Painted white | Painted white | Wood      | 4,16       | 1,85 |
| Oak              | Painted white | Pine          | Painted white | Pine          | Steel     | 3,39       | 1,83 |
| Oak              | Painted white | Pine          | Painted white | Pine          | Wood      | 3,67       | 1,81 |
| Oak              | Pine          | Pine          | Pine          | Painted white | Wood      | 3,42       | 1,92 |
| Oak              | Pine          | Pine          | Pine          | Pine          | Wood      | 2,76       | 1,78 |



**Pic. 4. Sketch of room and identification of visual surfaces**

### **Conclusion**

The present paper has presented some preliminary results from a larger study investigating on possible health benefits from natural elements in hospitals. As we have seen hospital employees tend to prefer patient rooms with an intermediate level of wood. The results also indicated that regular patient rooms with no inclusion of wood was the second least preferred, whereas there are limitations to how much wood is preferred. In this case, the more was not the better. Investigating on preferences are important because it gives some guidelines to what people like, and it can also give some indications on possible psychological or health related outcomes since preferences are affective responses. Further research within this project will evaluate more directly the possible beneficial health effects of nature elements in hospitals.

However, hospitals are very complex buildings which are required to fulfil a host of different functions. Implementing biophilic elements is just one of many ways to better the physical environment in hospitals. In addition, earlier studies have mostly found only weak relationships between natural elements in built settings and health outcomes. Nevertheless, even small associations can have great practical significance when aggregated over a large number of people over time.

It is important to continue research on the psychological benefits of nature elements in built settings. With increasing urbanization, people have less access to nature in their daily life. In general, people in the Western societies spend most of their time in indoor settings. Integrating features of natural contents into the built environment can give people access to nature, to a greater degree. Research on this topic has the potential for helping planners and other environmental designers to influence properties of the built environment that can promote health and well-being both in hospitals and in other built environments.

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## ECOLOGY AND HEALTH

### AIR TOXICS FROM MOTOR VEHICLES: ECOLOGY AND HEALTH IMPACTS

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#### Introduction

In spite of pollutant emission limits from automobiles established by many countries, among them Brazil, such as total hydrocarbons, non-methane hydrocarbons, particulate matter, nitrogen oxides, carbon monoxide, sulfur dioxide and aldehydes, vehicles also are responsible for other pollutants that, due their toxicities, can alter the population's morbidity and mortality rates and can also cause ecological impacts like greenhouse effects from carbon dioxide. Several pollutants emitted by vehicles have the potential to cause serious damage to human health, like dioxins, furans, benzene and polycyclic aromatic hydrocarbons. Some of these pollutants are carcinogenic to mammals, even in very low concentrations (WHO 1989; Kogevinas 2001).

An example of the action of vehicles on environment is the information that topsoil in public parks in São Paulo, Latin America's largest metropolis, contains heavy metals and other toxic substances at levels higher than recommended for residential areas, according to a two-year study done in 14 of the city's 23 parks. Traffic related elements such as Cu, Pb and Zn presented high concentrations in parks located near avenues of highly dense traffic and may be associated to vehicular sources. (Figueiredo et al 2009). Trees can also absorb metals emitted by vehicles as shown by Martins (2009) and can be used as a biomonitor of the impact of vehicles traffic near city parks. Forests and vegetation in general are important consumers of carbon dioxide in the photosynthesis process producing oxygen. But an excess of carbon dioxide in the atmosphere can increase greenhouse effect.

#### Levels of Toxic Substances in Sao Paulo - Brazil

Organic toxic substances also are related to automobile emissions and are present in the atmosphere of urban center. Measurements of dioxins, furans and polycyclic aromatic hydrocarbons (PAH) done by Abrantes, De Assuncao, Pesquero, Bruns and Nóbrega (2009) in gasoline-powered Brazilian vehicle as well as in ethanol-powered Brazilian vehicle, showed that these pollutants are present in the exhaust of vehicles.

A study on dioxins and furans done by Nóbrega, De Assuncao, Pesquero and Abrantes (2009), in the exhaust of Brazilian diesel engines has showed an average emission factor higher than the emission factor recommended by UNEP in the Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases 2005. The same group also has studied polycyclic aromatic hydrocarbons in the same heavy-duty diesel engines and concluded that they can be considered important sources of these compounds and are comparable to the levels from Brazilian gasoline-powered cars but much higher than Brazilian in-use ethanol-powered vehicles equipped with catalyst.

In a study done by De Assuncao, Pesquero, Carvalho, Nóbrega, Abrantes e Sant'Ana (2008) in the city of Sao Paulo, the average dioxin and furan concentrations observed ( $104.9 \text{ fg TEQ.m}^3$ ) was lower than the average of the 2000/2001 study ( $160 \text{ fg TEQ.m}^3$ ), a decrease of 34.4%. Also, the highest concentration found in this study was much smaller than in the previous study ( $225 \text{ fg TEQ.m}^3$  against  $751 \text{ fg TEQ.m}^3$ ). The decrease can be attributed partially to the decrease in PM<sub>10</sub> levels in the city of Sao Paulo in the same period, which was about 24% due to enforcement and also to replacement of old vehicles, not equipped with catalyst converter, by vehicles with improved technology and or equipped with emission control devices, specially Otto vehicles. Even so, the present concentrations still represents a condition that deserves attention and continuation of preventive and corrective actions.

### Conclusion

The world production of so many motor vehicles and its on road use mean the consumption of extensive amount of natural resources, and consequently the release of huge amounts of toxic substances in the air, even with after-treatment devices and use of biofuels. So, something should be done in the near future in relation to present motor vehicle technology and use; it is necessary to change to a less impacting type of transport. Air Toxics from motor vehicles are not only a health challenge but also an ecological challenge to our environment.

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## PHYSICAL ACTIVITY

### HOW GREEN ENVIRONMENTS AFFORD PLAY HABITATS AND PROMOTE HEALTHY CHILD DEVELOPMENT. A MUTUAL APPROACH FROM TWO DIFFERENT CULTURES: NORWAY AND JAPAN

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#### ***Introduction***

In Norway the natural environment has traditionally been a site for play and physical activity for many children, but modern societies seem to have neglected the value of such environments for the development of children and adolescents. A generation ago, children had access to wild lands and used them for exploring, challenging and exercising the skills needed to master a challenging landscape and unforeseen situations. Today, children's physical play environments and facilities for play are changing and the opportunities for free play in stimulating environments seems to be declining. Early studies by Hart (1979), Moore (1986), More and Wong (1997), Rivkin (1990; 1995), Titman (1994) and others described the value of complex environments and wild lands for children, and how children perceive and experience wild lands as places of their own domain. Focus has been directed on learning effects from the natural environment and its impact on children's development. For example, some Scandinavian studies have described and analyzed how natural environments affect learning qualities in children such as play behavior and motor skills (Fjortoft 2000, Fjortoft & Sageie 2000, Fjortoft 2004; Grahn et al. 1997). Being outdoors is the strongest correlate of physical activity in preschool children (Baranowski et al., 2000; Faber Taylor et al., 2001; Ridgers et al. 2007). Given the opportunity, children have a natural drive to be active and play freely. Physical activity is the number one recommendation for a healthy lifestyle throughout the lifespan and giving children healthy habits in early years may give a positive pay off in adulthood (Baranowski et al., 1993; Frost Andersen et al., 2005; Fulton et al., 2001; Strong et al., 2005). It is generally accepted that diversity increases activity. The better equipped schoolyards and playgrounds offer a variety of play forms

that challenge physical activity. Lindholm (1995) has documented how activities in schoolyards increased with the presence of green structures. Stratton (2000) reports that simple initiatives such as marking the schoolyard with colours have a positive effect on children's physical activity and Zask et al. (2001) found potentials (such as marking hopscotch areas or ball game fields) for increasing physical activity in the schoolyard, particularly for self-organized activities. In urban areas and in Japan in particular, there has been a rapid decrease in the amount of open or natural space in recent years, in particular in urban areas due to the development of housing. Preserving these areas as wildlife habitats and spaces where children can play is a very important issue nowadays as "Children's Play" is an important experience in learning about the structure of nature whilst "Environmental Education" has been afforded much greater importance in primary and secondary school education in Japan since 2002. Forman (1995) discussed habitat fragmentation and how it occurs naturally as well as being a result of human activity. At this study site, habitat fragmentation has already been caused by the development of housing projects. If we create a green space such as a school biotope in an urban area, it will serve as a stepping stone for species dispersal (Forman, 1995). And even if the site is not so large, it will contribute to ecological education in the urban area. Fjortoft and Sageie (2000) have discussed the natural environment as a playground and learning arena as a way of rediscovering nature's way of teaching or "learning from nature". They also mentioned that landscape diversity was related to different structures in the topography and the vegetation, which were important for children's spontaneous play and activities. It is thus becoming very important to preserve open spaces as biotopes these days (Ito et al. 2009).

### **Learning from nature: a Norwegian approach**

An ecological approach to development and learning is the perception-action perspective introduced by Gibson (1979) as the Theory of Affordances. In this theory, Gibson proposed that a close interrelationship exists between the perceptual and motor systems. To be ecologically valid, i.e., applicable to the real world, perception cannot be studied independently of movement, and the individual has to be studied in relation to its surrounding environment. The term "affordances" describes the functions environmental objects can provide to an individual. For example, if a rock has a smooth and horizontal surface, it affords a person a place to sit. If a tree is properly branched, it affords a person the opportunity to climb it. This exemplifies an intertwined relationship between individuals and the environment and implies that people assess environmental properties in relation to themselves, not in relation to an objective standard (Konczak 1990). Based on this theory the following study focused on two issues related to children's play and development. Firstly, the value of the natural environment as a playground for children, and the ability of such landscapes to afford challenging and stimulating play environments for children and secondly, how these environments promoted motor development and learning in pre-school children (Fjortoft 2000).

## The Affordance for Play

Landscape ecology analyses (Fjortoft & Sageie 2000) showed the relations between landscape characters and the children's play and different play habitats were identified (Table 1). The variety of woodland vegetation and the physiognomy of trees and shrubs in the area afforded multiple choices for play. The shrubs constituted a mixture of scattered species, which afforded shelter and hiding, as well as social play and construction play. Very special was the flexible juniper bush, which motivated functional play (getting in and out) and social play (playing house) as well (Fig. 1). Some trees were suitable for climbing depending on the branching pattern, the stem diameter, and the flexibility of the tree. The young deciduous trees were easily accessible for climbing. The spruces were more suitable for hiding than for climbing due to the dense branches. The more open areas in the pine and low-herb woodland afforded running, chase and catch, leapfrog, tag and other games. The shrubs afforded hide-and seek, building dens and shelters and role playing games like house-and-home or pirates, and fantasy and function play (Table 1).

**Table 1.**

**Landscape characters as affordances for play activities**

| <b>Landscape characteristics</b> | <b>Characters</b>          | <b>Play activities</b>   |
|----------------------------------|----------------------------|--|
| <b>Vegetation</b>                |                            |  |
| Trees                            | Deciduous, Conifer         | Climbing, construction play, building dens   |
| Shrubs                           | Open<br>Scattered<br>Dense | Running, play tag, catch & seek<br>Construction play, fantasy & role play<br>Hiding, hide & seek |
| Meadows                          | Open, flat, even           | Running, play tag, catch & seek, acrobatics, skiing, building & playing with snow (winter)       |
| <b>Topography</b>                |                            |  |
| Slope                            | slope < 30 degrees         | Rolling, crawling, sliding, downhill skiing, ski-jump (winter)                                   |
| Roughness                        | Rocks, cliffs, boulders    | Climbing & bouldering  |

The children's favourite places were named "The Cone War," located at a patch of pine forest affording cones to throw at each other; "The Space Ship," located at a big rock affording different forms of fantasy play; and "The Cliff," located at a steep rocky wall affording jumping off, sliding and climbing. It is clear from the place names that different play activities corresponded with different landscape features, relating to the affordances of the vegetation and the topography. Sliding slopes and climbing rocks

were naturally found in areas with a slope of 15–30 degrees. Table 1 shows different slope values in areas for climbing and sliding than in areas for construction play. The same effects were found in the values of roughness. Characteristically, areas for symbol play and construction play also differ in vegetation physiognomy from areas for running, sliding and skiing (Table 1).



**Fig. 1. Playing in the Juniper bush (Photo: I. Fjortoft 2000)**

### **Environments for development and learning**

The second approach in this study was to describe how playing in natural environments afforded motor development in pre-school children. A quasi-experimental study was carried out with five- to seven-year-old children in kindergartens in Telemark, Norway, using a quasi-experimental approach (Robson 1993; Thomas and Nelson 1985). The groups were selected from three kindergartens with comparable age groups. The experimental group of 46 children from one kindergarten was offered free play and versatile activities in the nearby forest. This group used the forest every day for one to two hours throughout the year. 29 children of the same age groups from two kindergartens in the neighbouring district were chosen to be a comparison group. Using multiple regression analysis, with parents' educational and professional background as variables, the two groups' socio-economic living conditions were found to be comparable. The comparison (control) group used the traditional outdoor playground for one to two hours a day and visited natural sites only occasionally. Both control groups had the same standard playground equipment, such as sandpit, a swing, a seesaw, a slide and a climbing house in their outdoor playground. The study started with

a pre-test in September. The observation period lasted for nine months, and was terminated with a post-test in June the following year.

The experimental and control groups were both tested with the European Test of Physical Fitness (EUROFIT) Motor Fitness Test (Adam et al. 1988).

The results showed a significant better improvement in all test items in the experimental group from pre- to post test compared with the control group (Table 2).

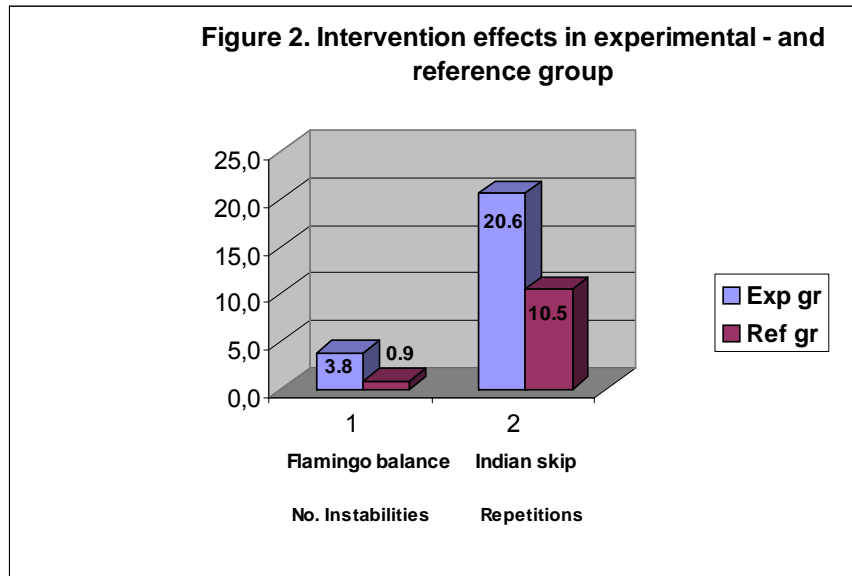
**Table 2.**

**The impact from playing in different environments on motor development in primary school children. EUROPEAN test of Motor Fitness**

| Results  |                 |                    |
|--|-----------------|--------------------|
| Improvement within the groups. Pre-post-test: SPSS T-test for paired samples |                 |                    |
| Tests  | Exp. group<br>p | Control group<br>p |
| General balance  | ***             | ns                 |
| Speed of limb  | ***             | ns                 |
| Flexibility  | ns              | ns                 |
| Explosive strength   | ***             | **                 |
| Trunk strength   | **              | ns                 |
| Functional strength  | ***             | ***                |
| Dynamic balance  | **              | ns                 |
| Co-ordinasjon  | ***             | ***                |
| Agility  | **              | ns                 |
| ** = p<.01      *** = p<.001      ns = not significant                       |                 |                    |

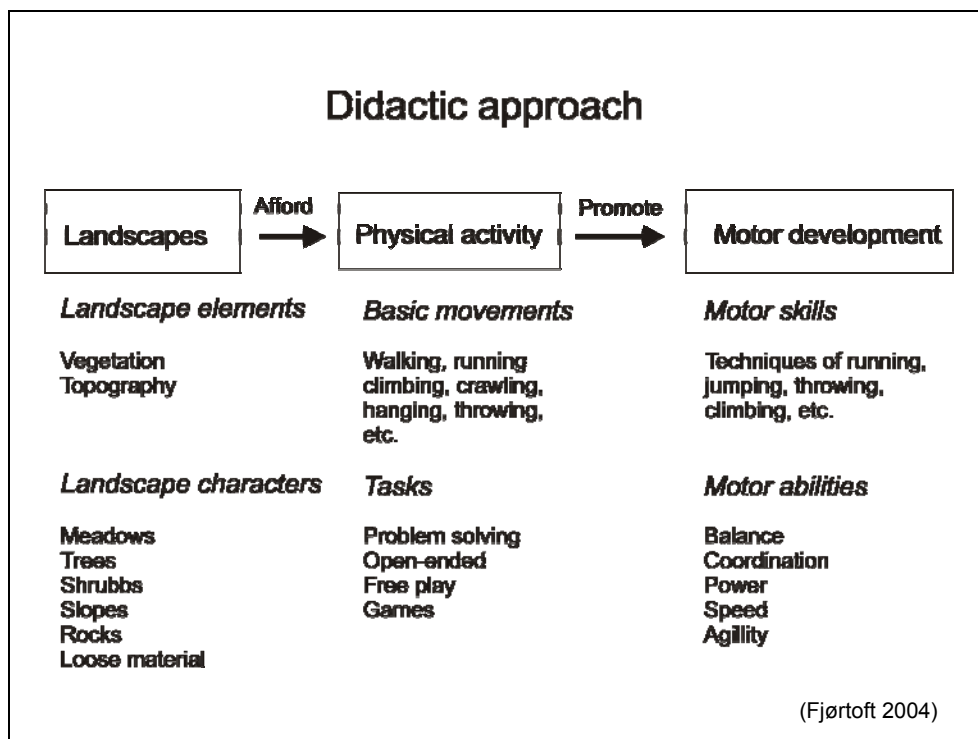
The impact of the environment on the children's motor ability was documented in the motor fitness tests. Table 2 and Fig. 2 show the main test results of motor development in both groups. Specifically, the experimental group showed significant intervention effects in the flamingo balance test ( $p < .001$ ) and the Indian skip co-ordination test ( $p < .01$ ) (Fig. 2).

The intervention effect from playing in a complex environment was seen as improvement in motor fitness in the experimental group more than in the comparison group. Our research found significant differences between the experimental group and comparison group were found in balance and coordination abilities (Table 2, Fig. 2). These abilities are components of all basic movements and will be improved with diverse movement patterns. These findings confirm that playing in a complex physical environment, where the landscape structures afforded diverse functions for play, caused this intervention effects.



**Fig. 2. Main group differences in physical activity tests (General Balance measured as no. of instabilities, Indian skip coordination test measured as no. of repetitions).**

In this study, the natural environment of a woodland area proved to be a suitable playground for children. Landscape ecology analysis confirmed a high diversity of topography and vegetation in the area. The complexity of the landscape afforded a variety of play activities. Particular forms of play were linked to special landscape elements. The didactic model below shows how landscapes afford different forms of activities that may promote learning (Fig.3).



**Fig. 3. The didactic approach to play and learning through landscapes**

Experiences and approaches from this project especially with the focus on the theory of affordances and the didactic approach to learning from landscapes have inspired exceptional planning and development of green areas and habitats for play and learning in Japan. This will be explained in the next part of this article.

### **The Japanese approach**

There has been a rapid decrease in the amount of open or natural space in Japan in recent years, in particular in urban areas due to the development of housing. Preserving these areas as wildlife habitats and spaces where children can play is a very important issue nowadays. This project to design a garden in the grounds of a primary school in Fukuoka City in the south of Japan started in 2002. The aim of this project is to create an area for children's play and ecological education that can simultaneously form part of an ecological network in an urban area.

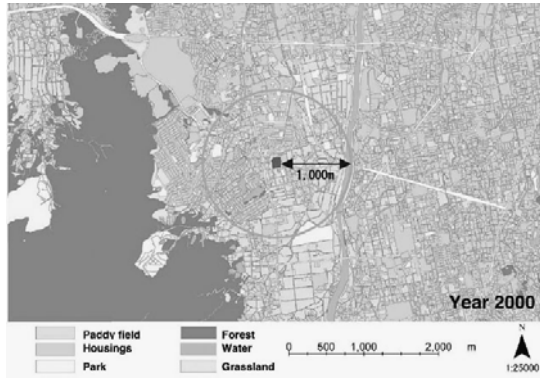
### **The problems of the school biotope**

In Japan, many school biotopes have been created using a number of different methods. Some of them have been successful whilst many have failed and been abandoned. The main reasons for this include the following:

- 1) The children are not allowed to approach the biotope because of the emphasis on the protection of the ecosystem.
- 2) Failure by the planners to consider the regional ecosystem, which has led to the destruction of that ecosystem
- 3) The biotope is too small to have an ecological function.
- 4) The children and teachers of a school do not use the biotope because it was planned and constructed by the local council without their participation.

### **Planning site**

The planning site is surrounded by a residential area and paddy fields. This area of the city has been developed mainly as a residential area with about 50 % of its original green spaces (paddy fields, forests and grassland) have been lost over the last 40 years. There are, however, still a number of streams, ponds and other green spaces remaining within a radius of 1 km of the planning site (Fig. 4). Planning site was courtyard in Ikiminami-primary school in Japan (Fig. 5).



**Fig. 4. Land use around the planning site site**



**Fig. 5. The planning site in the primary school (Photo: K.Ito, June 2002).**

### ***Children and teacher's participation***

Children at the school, their teachers and a number of university students participated in the planning and construction phases of the project and in making improvements to the school biotope.

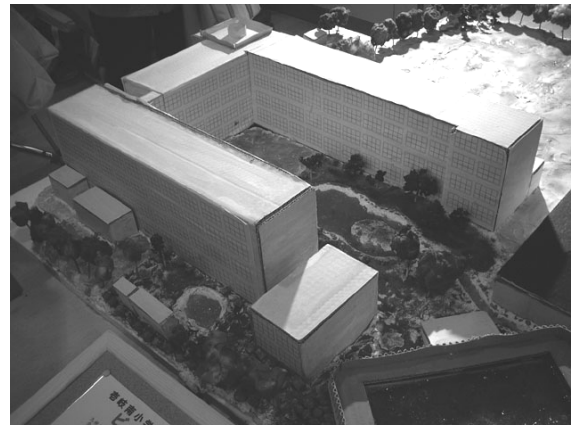
#### **[Planning workshop]**

Between June 2002 and December 2002, 8 planning workshops were held involving 83 children and 20 teachers from the school and 12 students from the environmental planning course at Kyushu Institute of technology.

At first, each group was asked to make a 1/100 scale model of their ideal garden (Fig. 6) as we wanted to discover how the children envisaged the garden and what they wanted from it. In workshops 2 to 4 the children were surveyed the kind of insects and plant life they hoped to find in the school garden. Finally, during workshops 5 to 8, they were asked to make final presentations about their image of the school garden based on everything that had been talked about in the previous workshops. The children made a number of suggestions for the water biotope, in particular regarding the shape of the bridge and the depth of the water. They also came out in favour of planting fruiting trees to attract birds and evergreen and deciduous trees to attract small animals and insects. In this way, they were thus able to gain a basic knowledge of the regional ecosystem and its flora and fauna.

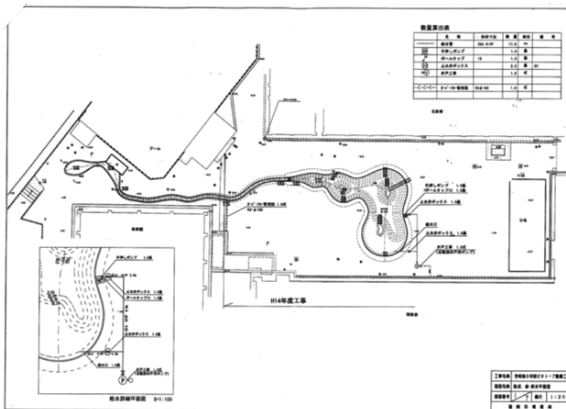


**Fig. 6. Child's image of the ideal garden boitope by the children (Photo: K. Ito 2002)**

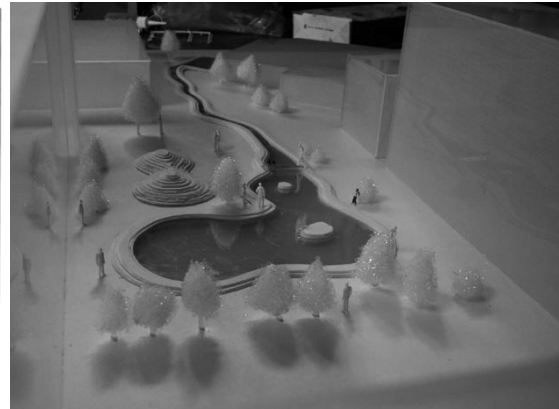


**Fig. 7. Completed model of the school (Photo: K. Ito 2002)**

Following this, they compared their ideas and decided on their final model for the school biotope (Fig. 7), the final drawing and model of which was completed by Keitaro ITO's Laboratory (Fig. 8, 9).



**Fig. 8. Drawing based on children's model**



**Fig. 9. The model of the school biotope**

### [Construction workshop]

From January 2003 to March 2003, we visited the school four times to give classes and oversee the construction of the biotope. A pond and well were dug by a landscape gardening company and additional features (water proofing using soil from local paddy fields, bridges and other landscape elements) were added by the children, teachers, university students and local residents. The process of the construction was really enjoyable time for children, teachers and university students, because their ideas had realised every workshop.

### [Use and Improvement workshop]

Between April 2003 and the time of writing, July 2008, 80 workshops have subsequently been held to make improvements to the biotope. These included the construction of a new bridge, a water purification project and further discussions on which species in particular the children wanted to attract to the biotope (Fig. 10). Through these workshops, we have fulfilled our original goal of enabling the children to experience directly the life cycle of plants and changes in the local fauna (Fig. 11).



**Fig. 10. Children's participation in construction with biotope. Finding university students (Photo: K. Ito, June 2003).**



**Fig. 11. Children's activity in the school small insects and herbs (Photo: K. Hidaka, July 2005).**

## Results

### Process Planning

"Process planning" (Isozaki, 1970) was used in the planning and design phases of this project. This does not place emphasis on the finished object but allows changes to be made during the actual process and is thus a very flexible method of design. The children have learned about the existence of various ecosystems when playing in the biotope and through their participation in the various workshops. Children and teachers at the school, along with a number of local residents, have participated in the planning of the biotope, and their interest in it continues due to the fact that they have actively participated in the development of an accessible environment whilst at the same time being active in proposing ideas for its future management (Figure 12). "Process Planning" would thus appear to be well suited for a long-term project such as a school biotope.

### **MFLP (Multi-Functional Landscape Planning)**

MFLP provides a variety of activities for the children as they are able to learn more about nature when they play in the biotope. (Fig.12). MFLP is thus considered suitable for the planning of a project such as a children's playground and biotope, which takes a long time to become established (Fig. 13).



**Fig. 12. Children actively participated to make the additional involved in various activities in the school features of the landscape elements (Photo: K.Ito, 2006).**



**Fig. 13. Children biotope such as running, jumping, sitting and talking, trying to catch insects and playing physical games (Photo: K.Ito, 2007).**

It was noticeable that children involved themselves in a number of activities in the biotope. Some children enjoyed running around, jumping from one side of the stream to the other side or just sitting there and talking whilst others were observed trying to catch insects or just looking at the grass and flowers. 186 kinds of plays were found in this site in this biotope.

Fjortoft and Sageie (2000) have discussed the concept of affordances, and in this school biotope the children interpreted the affordances and adopted them into functions for play. The children's activities corresponded with Gibson's theory of affordances (1979), according to which the composition of the environment as function for use. According to his theory, perception of the environment inevitably leads to some course of action. Affordances, or clues in the environment that indicate possibilities for action, are perceived in a direct, immediate way with no sensory processing. Examples include: buttons for pushing, knobs for turning, handles for pulling, levers for sliding, etc.

In this biotope, an example of this can be seen in the children's idea to make a small safety island in the water, which subsequently succeeded in attracting a grey heron (*Ardeas cinerea*) to the site on numerous occasions (Fig. 14). As a result, it was suggested that the biotope could become one of a number of habitats for birdlife in this urban area. In a survey conducted in 2004, 42 species of terrestrial insects, 10 species of

aquatic insects and 10 species of birds were observed in the biotope. It is envisaged that the biotope will establish itself as one of a network of biotopes in this urban area. In short, this biotope not only provides the children with a place to play in a variety of ways but has also become a habitat for a number of living creatures such as birds, insects and fish.



**Fig. 14. Gray Heron (*Ardea cinerea*) visited the biotope frequently.  
(Photo: K. Shibata, Nov. 2003)**

### **Problems and future issues**

The children have learned about the existence of various ecosystems (Fig. 11) by playing in the biotope and through their participation in the workshops during the planning of it. Their teachers and a number of local residents have also been active in this process with the result that their interest in the biotope remains strong due to the fact that they have actively participated in the development of an accessible environment and been able to propose ideas for its future management (Fig. 12).

Nevertheless, the following problems were encountered during the planning of the school biotope.

- 1) It needs a great deal of time to plan and manage the project.
- 2) The cooperative framework in which the biotope is managed changes every year as the teachers are transferred to other schools every 3 to 5 years. This creates added difficulties in attempting to maintain continuity in the planning process each year.

The school garden has gradually changed into a biotope over the past five years and the ecosystem contained in it has become more complex every year. (Fig. 15) It is important that this type of school biotope can contribute to the ecological network in the city.

This project won the gold prize at the KIDS DESIGN AWARDS 2007 and has thus been designated an important case study in Japan. However, this biotope is still an area of nature artificially created in an urban area and it remains to be seen whether the

popularity of the school biotope will just be a passing phase or whether it will become established as a means of returning a degree of nature to urban areas in Japan.



**Fig. 15. Changes of the school biotope over 5 years.**

### **Discussions and conclusions**

*In this article we have focused on how the affordances of different landscapes may promote play and learning. From the Norwegian approach we have stressed the value of nature in children's play and motor development and how specific structures in nature habitats invite different play forms. As demonstrated by several studies (Baranowski et al., 2000; Faber Taylor et al., 2001; Fjortoft, 2000, 2004, and others) being outdoors is the strongest correlate of physical activity in preschool children. Children have a natural drive to be active and play freely if they have the proper opportunity. Most of children's free play includes a high amount of physical activity and consequently children in free play will be moving. Physical activity is the number one recommendation for a healthy lifestyle throughout the lifespan and giving children healthy habits in early years may give a positive effect.*

Landscapes and nature environments afford the habitats for play and learning. In the Norwegian approach this has been demonstrated through habitats in the forest that

afforded different forms of play. In the Japanese approach we have demonstrated that when natural biotopes do not exist it is possible to plan and develop green habitats from a barren schoolyard. Normally, a lack of outdoor space to play in, fear of violence in public spaces, the longer working hours of parents and the artificial nature of most playgrounds have helped create the present-day situation in which young children have gradually lost contact with nature (Herrington and Studtmann, 1998). It is thus vital that present-day planners and landscape designers consider "landscape" as an "Omniscape" (Numata 1996, Arakawa, 1999) in which it is much more important to think of landscape planning as a learnscape, embracing not only the joy of seeing, but exciting a more holistic way of using body and senses for learning. The present projects have illustrated the importance of introducing natural environments into urban schoolyards and thus enrich the learning environment for the children. Hopefully, the two projects mutually will serve as examples for future planning and development of children's environments.

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# NATURE, CULTURE AND HEALTH

## THE NATURE-CULTURE-HEALTH CONCEPT

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This paper presents a new concept called “The NatureCultureHealth Interplay (NaCuHeal)”. The main aim of the concept is to promote health, environment and quality of life among all (1). The purpose is also to create a common arena and forum for wholeness thinking and creativity among participants. What is offered at this “agora”, is nature-culture-health activities among people in the local community (2). One of the challenges is, however, to get various interest groups, i.e. public agencies, private businesses, voluntary organisations and pioneers to co-operate in order to develop the idea to be realised in health promoting settings (3).

During the last 15 years, partnerships for health promotion and new and diverse networks have been created to achieve intersectoral collaboration in a local community (1,4). A center described below is now one of the official partners of public health in the county of Akershus as well as the municipality of Asker, 20 kilometers west of Oslo in Norway.

### **Urbanisation and the need for public health**

There is both a strong political and economic rationale for governments to invest more in community based public health research and practice. Urbanisation seems to lead to greater inequalities among population groups both within the urban areas as well as due to rural-urban differences (5). The shaping of health promoting settings at work, in hospitals, in schools and in local communities, therefore has been significantly supported by the World Health Organisation. Health promotion requires partnerships for health and social development between the different sectors at all levels of the community (6). New health challenges mean that new and diverse networks need to be created to achieve intersectoral collaboration. Such networks should provide mutual assistance within and between countries and facilitate exchange of information on which strategies are effective in which settings. Health promoting community building

and participation through Nature-Culture-Health activities to increase peoples functional ability should be studied in future research.

Illness, disease and sickness have a major impact on the economic situation and well-being of an individual in any society. This is particularly true in the lower income regions of countries and big cities. Improvements in health may boost productivity and the individual's level of income, capacity to acquire an education, and psychological wellbeing. There is therefore a strong both political and economic rationale for governments to invest more in public health research and practice (7). The Commission on Macroeconomics and Health, chaired by Professor Jeffrey Sachs of Harvard University, showed that disease is a drain on societies, and that investments in health can be a concrete input to economic development (8).

### **Inequalities and public health**

Nowadays, people in Europe live longer and lead healthier lifestyles than ever before. However this does not give grounds for complacency. One in five citizens still dies at early age, often due to preventable disease, and there are disturbing inequalities in health status between social classes and across geographical areas. Urbanisation is an on-going process, having a profound impact on people's livelihood and health status. The globalisation of markets, increased use of communication and new information technologies are the driving forces behind this process. The urbanisation process has marked effects on the natural and cultural environment, on housing arrangements and social networks, as well as on work and employment patterns, not only in cities, but also in rural areas. Urbanisation seems to lead to greater inequalities among population groups in regard to distribution of risk factors to health, both within the urban areas as well as due to rural-urban differences. Access to health care, social services and cultural activities are generally often better in the cities, but usually access is not evenly distributed among the population.

### **Salutogenesis as a supplement to pathogenesis**

These rapid processes of change represent a challenge to public health policy. Public health research and practice should focus not only on factors causing disease and injuries (pathogenesis), but also factors promoting health (salutogenesis) in the perspective of health promotion and prevention in different settings. Tomorrow's society will most probably focus more on that which strengthens health, namely the salutogenic (health causing) factors as described by Antonovsky (9,10). The shaping of health promoting settings at work, in hospitals, in schools and in local communities, therefore has been significantly supported by the World Health Organisation (WHO).

## **Partnership, community capacity and empowerment to the individuals**

Health promotion requires partnerships for health and social development between the different sectors at all levels of the community (6). Existing partnerships need to be strengthened and the potential for new partnerships must be explored and evaluated. Partnerships are now used as a public health tool in some European countries.

Health promotion is carried out *by* and *with* people, not *on* or *to* people (6). It improves both the ability of individuals to take action, and the capacity of groups, organisations or communities to influence the determinants of health.

“Settings for health” represent the organisational base of the infrastructure required for health promotion (6). New health challenges mean that new and diverse networks need to be created to achieve intersectoral collaboration. Such networks should provide mutual assistance within and between countries and facilitate exchange of information on which strategies are effective in which settings.

### ***Experience with “community building” based health promotion***

*At the Centre for NatureCultureHealth (NaCuHeal) in Asker there have since 1994 been several experiments where individuals from the local population have been helped to find their own talents and capacity for work to maintain function and pleasure in work (4, 11). At the NatureCultureHealth centre it is desirable with participation and positive interactions between persons of all ages, health status, philosophies and social positions. The idea is that such a meeting place between practitioners and theorists, between the presently well and the presently not so well, will be stimulating and enlightening to most people. Through participation in NatureCultureHealth groups the individual will find the opportunity to bring to life his or her own ideas by emphasizing positive and creative activities outside one self. At the same time, NaCuHeal-activities may nourish other sides of one’s personality that may also need development, attention and strengthening, to prepare for community and new social networks.*

*Persons with different health problems may forget their health related and social problems for a while.*

*A study interviewing 46 participants report that around 2/3 had improved their health status, quality of life and function, particularly when given opportunity to utilise their own abilities and creativity. Belonging to a themed group seems to play a significant role in increasing their self-efficacy and self-esteem. A majority of the participants reported improved health, quality of life and function to return- to-work due to their experiences in the NaCuHeal-groups (4).*

The NaCuHeal concept

The concept of NatureCultureHealth is based on the idea of stimulating to wholeness thinking and by emphasizing (11):

- Nature, out-door life, and environmental activities
- Culture, art, physical activity and sustainable nutrition
- Health promotion, prevention and rehabilitation

The intention was to:

- Increase participants' own empowerment and participation in activities in relation to strengthening their own health, quality of life and function
- Create growth in social networks that are encouraging and stimulating
- Motivate to work ability and to explore ways of coping in day-to-day activities.

The activities seem to strengthen the ability to cope, improve quality of life and enable us to meet everyday life in a positive manner. To encourage Nature-Culture-Health activities among other things means emphasizing the positive factors leading to health (salutogenesis). *Health* may in this context be defined as having as little illness as possible while having the energy to cope with the tasks and challenges of everyday life.

Many individuals have through different Nature-Culture-Health activities experienced that e.g. dance, music, art, physical activity, nature walks, hiking, gardening or contact with pets give an indirect effect with feelings of zest for life, inspiration and desire for rehabilitation. For many persons certified sick, this has been a method for return-to-work. The direct route through vocational rehabilitation may be of help to some people. For others, however, it may be necessary to take a more indirect and creative route to succeed in their rehabilitation, i.e. to practice and participate in NaCuHeal-activities for later to achieve a more useful and active existence. The way through such creative activities may give each individual a feeling of meaning and desire to act.

There is reason to believe that there is an untapped potential for improving public health by employing health-promoting nature and cultural activities. This is also a great challenge to our new multicultural and urban society. The goal is increased ability to cope, productivity and prosperity to *all* people, i.e. not only the affluent members of society, but also the ones who are in danger of becoming permanently incapable of working.

### **New challenges for public health and safe community building**

Since new health challenges mean that new and diverse networks - *community building* - need to be created to achieve intersectoral collaboration, new methods of public health research have to be developed. Synthetic research methods probably have to be applied in order to evaluate the community approach to public health used at NaCuHeal-centers. The environment, culture and global health are in fast transition today. The question is how to cope in a changing world for all of us. Our experience is that NatureCultureHealth activities to some extent can help us to promote the Public's health, environment and quality of life (4, 12, 13). But there is also still a great challenge to go on developing "Safe communities" worldwide (14).

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## NATURE AND HEALTH – A LOVE STORY

*Per Fugelli*

Sincere congratulations with the innovation Ecology and Forests for Public Health. It provides an opportunity for health to escape from the prison of medicine. This concept offers health a home where it belongs, in nature – in Schwarzwald, among the wild swines as the taxi driver in Stockholm stated some months ago. He was originally from rural Germany. Now it was morning rush, red lights in chain reaction, traffic jam, hooting, tooting, – suddenly his sighed from his boots: “Half of my life I have spent staring at red lights. This is stress, stress, stress. I should have been out in the woods together with the wild swines, looking at the sky. You can be evil and ill of this city life”.

Rousseau urged man to go back to nature. Freud proclaimed: “Das Mensch ist ein Tier”. So man has a basic instinct drawing life and health in direction nature.

### Why?

Because man and nature are one. Man is pure nature. We are bones, muscles, organs, cells, molecules, electrons, kvarks, mesons. We are carbon, nitrogen, hydrogen, oxygen. So we are nature, we are ecological bodies as finally stated in the funerals service: From earth to earth. But health is more than nature because man is more than body. Man is also spirit. Therefore health is molded by culture. And man is a social creature, therefore health is shaped by politics. I have formulated this understanding in an equation:

$$h = n \times c \times p^2$$

claiming that health is a product of nature and culture and politics squared, stating that health is wholeness.

The very word health, helse in my mother tounge, originates from old English hal and old Norwegian heill which means the whole. So health is interconnected with the whole life, the whole society, the whole nature.

My mission in this lecture is to dissect the nerves and vessels between nature and health. The exchange between nature and human health, between what Claude Bernard called milieu interieur and milieu exterieur, is intense. It may be salutogenic or pathogenic. Some keywords may open doors to the potential perils of nature:

**Table 1**

#### **Pathogenic potentials in nature**

- natural disasters (tsunamis, earthquakes, lightening)
- micro-organisms (clostridium tetani)
- climate (global warming, the ozone layer)
- food supply (mad cow disease)
- water resources (drought in Sahel)

- environmental pollution (dioxins)

Nature can destroy human health. Tennessee Williams states: "A vacuum is a hell of a lot better than some of the stuff that nature replaces it with".

## **PLOT AND STRUCTURE**

In this lecture I choose to give light to the bright sides of nature. I will explore the vital question: How can nature contribute to human health?

My answer is inspired by poetry, research literature, personal experiences and empirical findings from two recent studies. Benedicte Ingstad and I have performed qualitative studies of the notion and experience of health among people in Norway and in Botswana (1, 2, 3). In the last study Robert Selato has participated as well. The Botswana study focuses on the San people who have lived as hunter-gatherers in the Kalahari dessert for 30 000 years. They are now, partly by structural violence, removed from their natural habitat and live in impoverished settlements and as semislaves on farms. We have interviewed 56 San and 80 Norwegians. The Norwegian informants live in five different municipalities: north and south, coast and inland, urban and rural. I will use some reflections and statements from these field studies to spice this lecture.

## **NATURE AS A CONTRIBUTOR TO HUMAN HEALTH**

In science-dominated western mentality nature is often conceived as a conglomerate of elements, molecules, atoms. But nature is much more than biology, chemistry and physics. Nature is poetry, drama and seduction. Nature is not only a periodic system of elements but also a powerful system of signs, symbols and values (4). Nature dances with our souls. Nature sculptures culture. Nature rules politics.

As seen from table 2, I will try to understand nature's contribution to health in this broad bio- psycho- social perspective.

**Table 2**

### **Salutogenic potentials in nature**

The molecules  
Sense of belonging  
Identity  
Peace of mind  
Natural beauty  
God  
Humility  
Wisdom  
Courage  
Playground  
Freedom

## **The molecules**

Embedded in nature, in particular in the forests, is a huge reservoir of healing substances and principles. A lot of potent modern drugs against cancer, heart disease and infections stem from nature. But again, nature provides more than molecules:

## **Sense of belonging**

Nature provides man with an essential health requirement: Sense of belonging. Marcel Proust jokes with Shakespeare in his great novel *In search of lost time*. He states: "The question is not as for Hamlet to be or not to be, but to belong or not to belong." Nature as a place where you belong, a landscape with a cultural heritage that you recognize as "yourself" is a vital health resource. Sense of belonging is close to Erikson's basic trust (5), Antonovsky's sense of coherence (6) and Giddens ontological security (7) – three basic prerequisites for health. Sense of belonging is also related to Appleton's controversial hypothesis presented in his book *The experience of landscape* (8). Appleton claims that humans are genetically adapted to certain landscapes. We are born with pictures in mind of the nature/landscape we are best suited to master and feel secure in. This health value is appreciated in the Arctic ocean as well in the Kalahari desert. A Norwegian whale hunter returning from distant waters depicts his homecoming like this: "When you see those mountains, it is just like green velvet. The most beautiful you can come back to. And you know when you approach the island, it is a hell of rocks and hazards. But you are determined: In you shall, in any case. In you shall! Then it is so good to arrive home and when you have passed the rocks, you know: Here is peace".

A San man in Kalahari has been removed from his original habitat. The government has promised him a better life in the new settlement: "That I won't understand. It has been said that when an elephant crosses the river to the other side, it is no more a big elephant as it used to be, but now it is a small elephant. That means that our dignity has been left behind where we come from. Now, here, we are small elephants".

For some, the sense of belonging transcends location and embraces nature in extenso, or even the universe. This feeling of I and nature being one, is the foundation of Arne Naess' deep ecology as well as James Lovelock's Gaia hypothesis (9, 10).

## **Identity**

An experience of a recognizable self is a *conditio sine qua non* for good health. Nature may contribute to a proud and stable identity. Basso (11) describes from the Apache Indians how identity and history sits in places. He calls this "place making", a transformation of landscape as nature into a social construction which gives identity.

In Norway the closeness between nature, home place and identity is reflected in our surnames. They are mostly composed of phenomena, structures and creatures in nature. A young man in Kalahari constructs his self picture with elements from nature. Proudly with shining eyes, he tells: "I have killed an eland. Felt very happy. I have killed a very big, famous antelope, from horseback, with spear".

An amusing Norwegian example on attempted identity design is confided by a young mother: "I myself do not enjoy outdoor life, but my husband does. He loves being out in nature. So I try to put on all these clothes and have a good time outdoor. Yes, indeed I try. Gapahuker and ... No, then we sleep under open sky, and it is a lot of terrible things I have to participate in. Summertime it is okay, but not autumn and winter. Out, out and grill hot dogs! Such is our life. This I have to attend and it is not my greatest dream, no, but for the sake of the child, there is a lot I want her to experience out in nature. It means a lot for me, therefore I do it".

### **Peace of mind**

The fourth essential drug offered by nature is a tranquilizer, the Norwegian valium called "fred og ro". That does not mean standstill or braindeath. On the contrary the peace in nature may invite you on a mindwalk to the interior of yourself. This requires that you sometimes call on nature in solitude. Fridtjof Nansen in his speech *Friluftsliv* says (12): That is to me the greatest aspect of *friluftsliv*: To be able to get away from the crowd, away from the perpetual race, the confusing clamour in which we conduct our lives to far too great an extent – to get out into nature, into the open".

Karen Blixen was once visited by a Dane, whose aim was to experience as much as possible of Kenya in two weeks (13). He got a native guide and started a frenetic tour. One day the Kenyan man suddenly sat down and refused to go on. The Dane tried to persuade him to continue. But the African stated: I have to wait here, until my soul has caught up with me." Nature is a refectory where haunted, modern man can recover equilibrium. In our exploration of the Norwegian health concept, a female world champion in cross country skiing says: "If you can imagine there is such a harmony inside you... There is such harmony and connection. In a way you unify with the terrain. If more people could feel the same, it must be like it is peace in the whole world – total harmony, nothing that disrupts".

### **Natural beauty**

"Can man get sick of the ugly?" an architect asked some time ago. Perhaps. We do know that man can get health from the beautiful. A man from the north suffered from advanced cancer in his mouth and throat. He had undergone surgery and hard cures with radiation and chemotherapy at the National Hospital in Oslo. He thought he would die when he discovered the swallows: "Yes, those swallows under the hospital roof. They were seventeen. I used to count them and watch them fly. So, I started to long for home". He recovered gradually and was allowed to go home. Immediately he looks up nature:

“When I was able to walk out there, on the islets, quite for myself and listen to what is really nice, then I flourished. I mean such things that your body needs: piece and calm for itself, both for thoughts and senses. If it was only the wind and clouds, it was fine music.”

### **God**

The word nature derives from latin natura which means: What is being born. For many people nature represents The Creation. Nature brings them close to God. Nature becomes supra natural. A young Norwegian Olympic athlete in winter sports states: “Who I believe is The Creator, I meet out in nature. There is Power out there. Not like God, an old man with a beard, but I believe there is a Force in nature and I get energy from nature. I do. Enormously. The mountain is absolute raw”.

Ten thousand kilometers away the San have their holy mountain Tsodilo Hill, a UNICEF world heritage. For thousands of years San people have engraved their believes, dreads and dreams on the mountain. In local San language the name of Tsodilo Hill is NXUM, which means soul, life, potency, vital power.

### **Humility/moderation**

According to Aristotle man has to strive for four virtues to approach health and happiness: moderation, wisdom, courage and justice. The three first cardinal virtues nature can contribute to, - justice not.

“I, not science, not medicine is the ruler of life and death”, says nature to haughty man. “There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy”, proclaims Hamlet. “I am these more things”, declare nature. Nature is mighty, dangerous, mysterious, beyond scientific comprehension, beyond human control. Befriending nature can help us realize how small, vulnerable and mortal we are. In order to obtain health and peace of mind we have to surrender and accept nature’s superiority. Terrible, unpredictable, uncontrollable things do happen in life, in society, in nature. “You must learn to live good with that reality”, commands nature. Humility and modesty in expectations, prescribes Doctor nature, in opposition to Doctor medicine who prescribes the zero vision (14): You shall strive for 0 risk, 0 pain, 0 disease, 0 death. Nature demands respect for life as mixed state. The natural body is not a clone of superman. The natural soul is not a clone of the arch angel. Nature advices us to accept ourselves as creations of imperfection with stains, sins, fat cells, fragile wills and even a cigarette or two.

### **Wisdom**

The San Genesis represents an admirable example of man’s humility towards nature. According to the San, in the beginning, all creatures on earth were humans. From this original, primitive mass of men some started to specialize and evolved into animals.

Some refined their muscles and became antelopes. Some improved man's eye and became eagles. Some increased man's courage and became lions. So as Darwin appoints man as the final jewel of evolution, the San places man at the very beginning as a primitive stem cell. Imagine what this inversion of Darwin's the origin of species (15) does with man's relation to nature and respect for other creatures.

Man can achieve wisdom by reading The Book of Nature. The logics, the ingenuity of design, the conundrums of nature is an eternal growth factor for the human brain.

### **Courage**

Nature is a training ground for the third Aristotelian health virtue: courage. To feel alive, to be healthy man need to challenge himself, push limits, confront dangers. Nature represents The good enemy, a sparring partner for man who wants to increase in bodily strength, in sharpness of senses, in speed of reaction, in will power, in endurance and in courage. An old River San in the Okavango delta in Botswana reported how he as a young man killed hippos with spear from mokorro (hollow tree canoe). That was not only for food, but as much for the existential urge to refine and test your extreme capacities.

One of the major health threats of modern times is the hysterical avoidance of risk. To confront "hippos" is mandatory to human growth and survival. Frank Furedi, the author of Culture of fear (16), reports a memory from childhood. He is nine years old and lives in Budapest. Every Sunday he and his family wander in a nearby forest. Every now and then his father stops and says: "Frank, there is a good risk, go and take it". This is still a good advice.

### **Playground**

According to Max Weber (17) modern man has imprisoned himself in the iron cage of rationality. Our lives are colonized by effectiveness, cost-benefit analysis, long term planning, seriousness, cleverness. We are high achievers in a world of Das Schema and The Duty. Nature calls: "Come and play in me, with me. Fish a salmon in me, hunt a deer in me, walk a mountain in me, take a bath in me, play hide and seek with your grandchildren in me". "Come", lures nature, "here is joie de vivre". Nature sings the song of relaxation: Que sera sera, whatever will be, will be, the future is not ours to see. Nature is recreation also in the meaning restoring man's creativity. Many among us will recognize Soren Kierkegaards experience: I walk myself to my best thoughts.

### **Freedom**

The ultimate vitamin nature supplies man with, is freedom. A group of San was removed from their free lives in Central Kalahari Game Reserve and placed, supposedly by force, in a new governmental settlement. An old man describes the claustrophobic feeling

among the relocated San: "Here they are just in a squeezed, tight place. They are in a place which is very small. They are not free to go around, like what it used to be in Central Kalahari. They feel like they are in a prison camp". Another informant standing nearby, confirms this aspect of lost freedom, the deep feeling of being restrained and controlled: "They say it affects them just like they are in hand cuffs, as she demonstrates (another bystander wearing great bracelets brings her arms strongly together and pretends trying to brake lose from the illusory handcuffs with all her powers, but in vain). It is as if you have tied a donkey around its front legs in order to control its movements. So how will they survive in such a situation?".

For the relocated San the feeling of imprisonment is a harsh reality. They see only one escape route: back to nature. In metaphorical terms the San and modern urbanized man share destiny, frustration, and hopes. Modern man may feel locked up in abstract systems, handcuffed by bureaucracies, restrained by urban architecture, chained by debt and parkometers, invaded by the media, tied up by the internet. Then, as for the San, we long for freedom in nature, in what we call Guds frie natur.

## THE END

I have now demonstrated the health potentials in nature. Nature's health promoting values are more needed than ever. Globally we experience an accelerating urbanization (18). Megapolitan lifestyle offers health delights. But at the same time the urbanization imposes great stress to human life. Nature may counteract the hazards of urbanization, as demonstrated in this table of health contrasts.

**Table 3**

| <b>Urban pathogenesis versus nature's salutogenesis</b> |                             |
|---|-----------------------------|
| Health strains of urban life                            | Health potentials of nature |
| Iron cage of rationality                                | Playground                  |
| Noise   | Silence                     |
| Action  | Reflection                  |
| Body atrophy  | Physical activity           |
| Fragmentation   | Wholeness                   |
| Alienation  | Sense of coherence          |

Now, finally let us return to the Equation of health:

$$h = n \times c \times p^2$$

I have tried in this lecture to bring evidence for factor n, nature's contribution to human health. Let there be no doubt, nature is a powerful remedy in health promotion, therapy and rehabilitation.

But then, allow me a final warning: We must not devalue nature to a health remedy. Medicalization is a big concern world wide (19,20). More and more of life's own trouble and variation are transformed to diagnosis. More and more of cultural and spiritual activities are transformed to therapy. "Is religion good for your health?" was the title of a best seller published in The United States some years ago (21). Art, paintings, music, poems are examined with respect to effect on blood pressure and adrenaline excretion. Habermas (22) warns us against imperialistic professions colonizing people's life world. We must not colonize nature with a utilitarian health ideology. I believe that nature's health potential is dependent on a naïve relationship between man and nature. We must take care not to make a medical park of the Norwegian jungle. Instead of making a pill of nature, we should concentrate on factor p in the health equation: Promote politics that preserve nature and forests and makes nature and forests - and thereby health available to all.

So that we can sing our love song to Nature with Jim Reeves: I love you 'cause you're you!

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## **VISIONS FOR NATURE-CULTURE-HEALTH IN SIGDAL**

***Kari Ask***

Sigdal is an in-land valley in south-east of Norway. Sigdal covers an area of 842 square km and has a population about 3500 people. The distance to the capital Oslo is about 120 km or two hours.

Agriculture and foresting have earlier been the main livings for people in Sigdal. The nature is still very important, for foresting, food production and for recreation.

There are more than 4000 cabins / "second homes" in the forests and mountains, and wooden materials are mostly used for building them. Sigdal is known for its beautiful nature, and many artists have found great inspirations from the nature in this valley, and that made the name "Kunstnerdalen" / "The valley of artists".

The nature, who some places seem almost untouched, led to the reserve of Trillemarka Rollagsfjell, a 148 square km area forest reserve.

There is a great diversity of animal and plant species in the nature reserve. The proposal of protection opened a more than ten years long conflict. The forest owners and the local county councils didn't want that large area reserved, and meant the red listed species and their habitats could be secured against encroachment with a smaller area reserve.

## **The Nature-Culture-Health Visions for Sigdal, “The valley og artist” and Trillemarka reserve:**

I know that we here in Sigdal have got an unique possibility to give people what they need today - to experience, to live close to and in the nature. Here you can meet wilderness and peace, challenges and strength for body and soul.

Sigdal has resources and qualifications to develop further the main NaCuHeal values. NaCuHeal can be an inspiration to people in Sigdal, and, and people in Sigdal with their history, culture and traditional way of life represent something that is important for NaCuHeal.

**The NaCuHeal vision can be difficult to explain.** Some consider it as a new culture, a new way of living. Others consider it as a value, a wholeness of nature-culture-health.

I consider it as a re-discovery of our culture, a re-discovery of a way of living that many people have forgotten today – the simple values of the agricultural way of life, bound to the earth, the forests, the mountain areas and mutual dependency between people.

### **The goal is life quality**

My vision for people in Sigdal is life quality, to experience a life with meaning and values, to feel you are important for other people.

Therefore the nacuheal-vision for me represent life quality our whole life:

– in kindergarden, in school, for the grown ups, in your working life and holidays, and for the seniors!

Life quality ca be hiking in nature, to be used to and manage to stay out in all kind of weather, it is to get to know and love the place you live and your envirement.

Good examples is:

– a get-together for young people from 15–30 where they wore new T-shirts where it was written “I love Sigdal”

– a garden experience, “a sence-garden”, where you can smell and touch the plants and flowers, even if you cannot see or hear or walk, and have to use a wheelchair.

– a meeting place in a “Gapahuk” in the forest, built by the local 4H, the young people and their leaders anf parents.

### **The Coordination Reform.**

Norway is among the countries spending most money on health and social services in the world. How can we get more health for the money we spend? There is a lack of coordination in all segments of the health care services.

The population is getting older, and it is a positive thing that we are living longer. High life expectancy implies that we have good health and a well-functioning welfare system.

And it implies more focus on own health, welfare and life quality. Prevention is better than cure, therefore I hope we in future also will get more money to public health, and my vision is that Sigdal will be a good place to live for everyone and a good example.

## **THE NEED FOR NATURE - FROM AN EVOLUTIONARY PERSPECTIVE**

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A number of studies confirm the overall positive physical and mental stimulus experiencing nature. Certain visual images of nature have more appeal than others and typically savanna-like landscapes have been seen as the archetype of nature where our aesthetic preferences have been attributed evolutionary traits. Cultural landscapes often mimic these aesthetic qualities. The “wilderness” nature may have other qualities, but in both cases biodiversity per se is a core value both of the cultural landscape as well as the wilderness. Interestingly in the wilderness, where much of the more charismatic biodiversity (e.g. large fauna) rarely is encountered, simply the awareness of their very existence in nature may support positive emotions and thus well-being. This paper address the positive attitudes towards biodiversity, sometimes collectively labeled as *biophilia*, and discuss these health-promoting values of biodiversity both from a cultural and evolutionary perspective.

### ***The problem***

... is twofold. First there is a decreasing trend not only for wilderness areas, but also for green spots and biodiversity in the everyday landscape. There has been a dramatic degradation of nature on all scales, and this development continues at an alarmingly high rate. As an example, most of Norwegian wilderness (by definition areas with > 3 km to the nearest “significant” impact (e.g. larger buildings, road-constructions, dams etc) has vanished within the last 100 years, and there are just fragments left of wilderness according to these criteria (there are lots of forest left, though, but most of this is managed forests). Also in the urban areas of Oslo there has been a dramatic reduction of green areas over the past couple of decades, in spite of political declarations aimed at preserving exactly these green spots. Second, the daily life for most people involves little of nature. We face artificial landscapes, indoor as well as outdoor, and many people feel and express an unfulfilled demand for more interactions with nature.

One might (and should) question why there is such a dramatic degradation of ecosystems and green habitats despite their widespread recognitions as valuable not

only for nature or species per se, but also for humans. The answer is partly that this reflects the conflict between strong short-term political and commercial forces (i.e. “the tyranny of the moment”) and the weaker, long-term forces aiming at sustainable development. This conflict is well known, it is rather obvious and will not be further pursued here. The other part of the answer is, however, that the *real* value of nature, either on the form of wilderness or as urban green areas is far from recognized. The fact that nature are directly life-supporting by providing all sorts of goods (“natures services,” cf. Constanza et al. 1997) from directly physical or monetary value by materials, pollination, water purification or carbon sequestration to more aesthetic, recreational and health oriented services, has yet to be fully recognized. Hence the common (mis)conception still prevails that while certainly biodiversity and green areas are nice to have around, they do not represent any *real* value, at least not compared to the commercial market price of the ground. So, there is a job to do in arguing for the value of nature in a wider context.

### ***Arguments for conservation of biodiversity***

The two classical categories of arguments for nature (or species) conservation are the *anthropocentric* and the *biocentric*. The first argues for the need for nature for human ends. Eg. there clearly are valuable resources “out there” to be discovered and used, and hence habitats and species should be preserved for this reason. The classical examples being bioprospecting, the search for new consumable species, new drugs, new antibiotics, new genes etc. Much of the “natures-services” related arguments clearly belong to the anthropocentric category, including aesthetic or health-promoting attributes of nature. The biocentric arguments focus on the intrinsic value of nature and the ethical or moral obligations towards species. This is a key aspect of “Deep Ecology” (cf. Næss 1973, 1968), and is also a core principle in biodiversity acts like the Rio-declaration. There need of course not to be any conflict between the anthropocentric and the biocentric perspective, rather they are mutual, and in fact also Næss himself argued that the ultimate motives for deep ecology is human well-being.

An important aspect of our relations with nature is *feelings*. Feelings are quite often dismissed as irrational and illegitimate arguments in favor of nature. Somewhat paradoxically the conservation (somewhat of a problematic term, since we really not aim at preserving it in a strict sense...) of nature is justified by reference to the well-being of any endangered species, while arguments based on human well being and feelings are downplayed. But feelings are not irrational, rather the opposite. In fact feelings are precursors of acts (Damasio 1994), and should be seen as rational guidelines for “right” or “wrong” behavior in an evolutionary context (but not necessarily in an ethical context). Good feelings are good because they promotes good acts, just like disgust and other “bad” feelings tell that you should stay away. Most important: the feel-good value is both legitimate and relevant because it promotes a good life in a broad sense

Now, since most people feel relaxed and happy when experiencing nature in general, or nice flowers or charismatic animals, this should be taken seriously. So, is there any hardcore evidence for the health-promoting aspects of nature? Yes, plenty.

### ***The health-promoting aspects***

A number of studies, pioneered by Roger Ulrich (cf. Ulrich 1986), demonstrated the importance of visual contact with trees rather than e.g. concrete buildings walls. Post-operative patients reported less pain, less fear and were healed earlier when viewing trees rather than walls. An interesting case-study of 166 post-operative cardiac patients at the university hospital of Uppsala, Sweden, correspondingly demonstrated the role not only of nature per se, but specific types of nature. Those exposed to sceneries of open landscapes with water experienced reduced blood pressure, reduced need for painkillers and more comfort than those exposed to either white surfaces, dense forest or abstract art. In fact exposure to abstract art yielded negative effects – something to consider for those in charge of the aesthetic aspects of hospitals (Ulrich 1984).

A number of other studies confirm the positive health-related effects of nature, animals and certain landscapes, not only for patients, but for people in general (see Kaplan and Kaplan 1989, Kellert and Wilson 1993, Kellert 1997, Laumann 2004 for an overview). The evolutionary route to these positive emotions and psycho-somatic benefits of nature are not always straight-forward, but there are reasons to believe that we have in-built preferences for nature. This has been explored in studies where people from various cultures have been exposed to images or pictures of open landscapes, shore-sides, open forest, and cities (see Kellert and Wilson 1993 and chapters herein), and the general outcome is a genuine preference for open landscapes with water and some trees, the savannah-like landscapes (and the model of most parks). The evolutionary explanation for this seems plausible, this is the type of landscape that has provided food and shelter for humans in most of our ancient history (Appleton 1975). This also holds a lesson for forests (and forestry). A forest is not a forest when it comes to aesthetic preferences. We clearly prefer open forest to the dark, dense and uni-aged stands of industrialized, coniferous forests.

There clearly is a cultural component to preferences for nature and landscapes as well. We enjoy “classical” cultural landscapes, and we like certain man-made constructions and buildings. The joy for picturesque and wooden buildings has strong appeal to urban people, less so in rural areas. Also the relations to the wilderness have changed dramatically over the years, and still differ between different cultures. Mountains and big carnivores were depicted with quite a different “evilness” in former centuries compared with the present. We can safely conclude that the feelings for nature both have an evolutionary and a cultural aspect, but key issue in this context is that whatever the reason, the health-promoting effects are beyond doubt (Pretty 2006).

This has relevance for city-planning as well, where the role of access to green spots and nature for human well-being has been grossly underestimated (Kellert 2005). As psychologist Judith Heerwagen states: “[Human] performance and well being ... depend not only on absence of significant [environmental problems, but also the *presence* of particular kinds of features and attributes in buildings ... The challenge of green design is ... to integrate into buildings the positive biophilic features of our evolved relationship with nature and to avoid biophobic conditions” (as cited in Kellert, 2005, p. 124).

### ***Biophilia***

So what then about species as such or biodiversity? From an evolutionary point of view, biophobia is perhaps easier explained, like the fear of spiders, snakes and wolves. The love of animals is less straight forward, but again there are several studies confirming the positive effects of various animals (from fish to dogs) on human well being. This holds for people in general and well as for those with certain psychological disorders like ADHD. The newspaper *Aftenposten* reports (04.10.09) about (unpublished) prisoners reacting uniformly positive on contact with dogs, stimulating the sense of empathy and with reduced risk of a further criminal record. Given such findings, and the minimum of resources needed to follow up such positive results, it is again reason to conclude that the health-related benefits of nature and animals is grossly under-communicated.

The role of biodiversity per se is less obvious, but the perception of what Darwin labeled “the tangled bank of life” with its multitude of forms, song, color and perceived beauty is something acknowledged by most people. Interestingly, as Edward Wilson emphasize in his book *The Creation. An appeal to save life on earth* (2006), simply the *knowledge* of the hidden diversity or the presence of intact ecosystems with its flora and fauna may be highly appreciated. “I have never seen a wild wolverine” Wilson writes, and continues that this is OK as long as he knows its existence out there: “The reason is that I find the wolverine the embodiment of wildness, and I know there will still be untrammelled habitats on Earth if wolverines still roam there”.

This feeling of the very existence of unspoiled wilderness is the other end of the scale, demonstrating that health promoting aspects of nature range from the neighbourhood park to the unseen properties of the wilderness.

### ***Nature or nurture – Culturally derived passion for nature***

“Natural” is often seen as “right”, not in a moral sense, but in the sense that natural is better than artificial or cultural. To some extent this is true, as we have seen when it comes to feelings or passions serving as evolutionary guidelines for making the right decision. To deduce from this that evolutionary emotions for nature should have priority to culturally derived feelings is dubious, however, for several reasons. First of all feelings for nature is generally a mix of deeply rooted, evolutionary feelings and various cultural

aspects, and secondly much of morally derived concern and love for nature has a recent, and thus cultural flavor.

The notion that there is a deep passion and respect for nature among natives is quite common, but not well supported. Recent studies have not given support to the idea of “the noble savage”. Rather many aboriginal people may have a quite rough attitude towards animals and nature with few signs of a deeply rooted nature ethics, and there is strong evidence for massive species loss following ancient human colonization (cf. Leakey and Levine 1995). Several hunter communities have clearly seen the need of regulating harvesting, but then based more on pragmatic or practical reasoning than ethical or emotional judgments. Much of our passion for species and biodiversity is a modern, cultural phenomenon, originating from the recent realization that nature is shrinking and humans footprints increasing, causing an alarmingly rate of irreversible biodiversity loss. Much of human, cultural evolution has been about creating distance to nature, the physical struggle for life and the immoral animals, which should be seen as a legitimate goal. The flipside of this project have been a complete desolation from nature for many urban people and hence a strong feeling that *something is missing*. The point is, however, that whether human well being related to nature has an evolutionary or cultural origin, the arguments for preserving allowing access to nature in some form are similarly legitimate and have the same positive influence on human health. The fact that most basic cultural attributes have been modified from, and developed, from evolutionary responses (Barkow et al. 1992) further argues against a strict separation between natural and cultural affinities for nature.

### ***Conclusions***

We have a mix of natural and culturally derived feelings for nature and species, and close contact with nature and species have deep emotional implications with positive psychological and physiological effects. We need more awareness about these aspects of nature and biodiversity, and this is not only about “preserving the wilderness”, but perhaps even about management of urban areas or daily-life landscapes where the green spots are rapidly diminishing because their market value, but not their real value in terms of human well being and life quality aspects are recognized.

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## **FUTURE DESIGNERS' ECOLOGICAL COMPETENCE FORMATION**

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*"Nature gives the rule to the Art.  
That rule is beyond of verbal expression,  
it is organic as laws of nature"*  
*E. Kant*

### **INTRODUCTION**

TECO Center (Ecological Culture Center) is a special unit in M.A. Sholokhov Moscow State Humanitarian University and takes part in future designers' ecological culture formation in higher professional education system. For many years TECO Center is making research about pedagogical technologies of ecological culture values into society and personality transition. We proceed from the fact that the modern ecological crisis cannot be overcome only with technical means (U.Katton, A.Laslow and others). Modern technocratic culture finished performing an adaptive function between human and nature. Scientific world outlook and absolute rationalism turned out not to be able to harmonize man and nature relations. Such contradictions inevitably affect public health, brings devastating effects to the environment. It is necessary to correct our world view – to extend it (1), our consciousness must become ecological. Therefore new ecological dimension of any activity and its results occurs. It is no coincidence that we choose Kant's words for the epigraph of this paper.

### **ECOLOGICAL CULTURE: NATURE- HUMAN HEALTH CORRELATES**

In 1998 in Russia during the World Environment Day spent under UNEP and UNESCO aegis Moscow International Ecological Culture Declaration was accepted. It's written there: *"Ecological culture implies such way of life support with which the society forms its needs and means of their realization which do not menace life on the Earth due to a system of spiritual values, ethical principles, legal regulations and social institutions"*(2).

Keeping of natural ecosystems is the necessary condition of human existence and development. It is declared in the special document accepted on Rio de Janeiro International Summit that social health depends on forests ecosystems health. Russia plays an important part in this process. About 20% of World's forests and 50% of coniferous forests belong to Russia. Russia is the planet biosphere donor. 40% of all European countries greenhouse gas emissions in case of Western winds are cleared in Russian forests. Forests are keepers of the biodiversity. For example: native coniferous forests in Karelia contains about 200 butterfly species, but the area of reforestation near Saint-Petersburg (equal square) – only 20.

And with it, research of the young people relation to nature and its protection is showing personality's separation from natural environment. Urban teenager could name more than 100 brands and car logotypes etc., but it is a difficult for him to identify just 10 plants or birds. We share an emotional anxiety about children' moral and physical isolation from nature shown in Richard Louv's book "Last Child in The Woods", which could be harmful for their mental and moral development, individual and public health level. Ecological design will help to reduce level of such isolation of man from natural environment and should be a new instrument for harmonization of human-nature relations not only in aesthetic, emotional, cultural aspects, but also promoting psychosomatic human health state.

### **ENVIRONMENT DESIGN AND DESIGNER'S ECOLOGICAL CULTURE**

It is no doubt that design as the XX century art culture phenomenon in its best examples created new aesthetically rich object world. But we have a lot to do for human demands and nature possibilities harmonization and an integral object and spiritual environment creation. When we cultivate nature with technology we turn nature's balance into the technosphere chaos and increase the entropy level (disorder degree).

More and more often in theorist's ant practitioner's statements we can hear self-critical assessments and admission of guilt for aggressive to man and nature material and object environment creation. Disappointment in extreme rationalism and in fact that only things can determine environment's appearance is coming. Consumerism crisis ripens.

In the last years more and more world' specialists call Design – the third culture which organically consolidate art-humanitarian and scientific-technical culture. English specialists usually call this third culture – Design from the capital letter and define it as material culture, understanding and skills total experience embodied in art of planning, inventing, creation and realization (a total experience) (3).

So as any project is connected to environment reconstruction and makes an influence on natural ecosystems it must satisfy ecological requirements. But if in technology we have clear standards and guidelines, in design it's partly possible. Art-design project art is impossible to limit. The only possibility is to do the opposite – to form designer's ecological culture which will help not to make a threat to nature in creation. Ecological culture, realized in creation – this is designer' ecological competence.

In our time there are two opposite tendencies in design. First comes from the practical and utilitarian design interpretation. Its aim is the average man needs satisfaction, it is an ordinary daily subculture which offers things for sale in correspondence with taste level and suggestibility level. It doesn't require aesthetics, nature's laws knowledge and art skill. It is nature destroying permissive tendency.

Another tendency is focused on integral object environment formation and design projects included into the nature. It requires designer's ecological competence, his ecological culture.

So competence approach forming in Europe organically combined with design necessity.

And new area – eco-design has occurred. Modern eco-design – is not applied design area connected with making design products from natural materials and industrial or everyday waste; it's not packaging design but theoretic-methodological principle of all project activity ecologization based on material and spiritual integrity understanding, nature- and culture-conformity, idea of integral object environment design (4, 5).

### **DESIGNER'S ECOLOGICAL COMPETENCE: EDUCATIONAL APPROACH**

Realizing the design activity ecologization principle in designer's training we inevitably come to the ecological competence. Designer's ecological competence – is an ability and readiness to realize ecological purposes and guidelines in professional activity and to design integral object environment.

2 models of designer ecological competence formation:

- 1) Whole designer's training program contents ecological potential exposure.
- 2) Inclusion of the additive ecological subject into the teaching curriculum.

We propose the third – mixed model. Designer's teaching curriculum consists of 3 basic blocks: general artistic, general cultural and special training. Each of these blocks contains ecological competence formation potential. Diagnostics, based on specially elaborated test (6), allows to reveal contribution degree of each block into designer's ecological training, appraise and make necessary corrections, creates perfect designer ecological competence pedagogical technology.

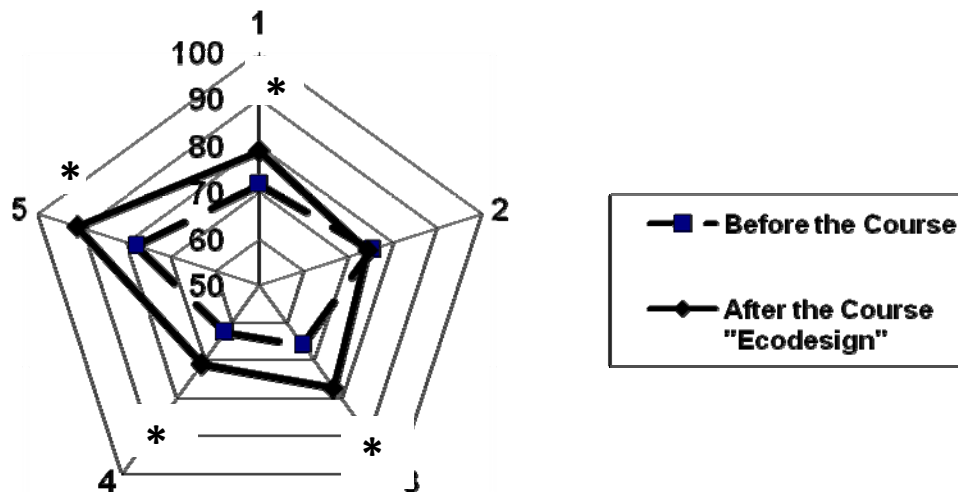
We developed a special course "Eco-design" which has high integrative potential level and helps to form future specialists' ecological competence structural components formation (6). These 5 components are:

- Cognitive – knowledge size, solidity and awareness, ability to protect nature.
- Self-actualization - spiritual aspiration to self- education and development.
- Active-practical – readiness to change an environment, to realize nature conformity ideas in design and creative solution of real ecological problems.
- Value-motivational – steady interest in ecological problems, motivation to ecology-oriented activity, value ecological focus.
- Reflexive – relation to changing natural and technogenic world self-examination, self eco-design ideas realization readiness assessment.

Innovational pedagogical methods – portfolio, creative works, essays – were used during this special eco-design course creation. Elaborated diagnostics test was used to assess the level of integral ecological competence in average and separately in each from 5 blocks (reflecting 5 components of ecological competence) among 42 4<sup>th</sup> year students in dynamics of "Eco-design" course mastering (Fig.1).

Analysis of the experimental data has shown the effectiveness of the special course in all components of designers' ecological competence formation (42 students, Fig.1). So students enriched themselves with ecological and sustainable development knowledge (axis 1), use it in their projects and examinations. Level of the active-practical component has increased (axis 3), students have used ecological knowledge in design

projects and degree works actively. Tremendous correction has happened in students' eco-design motivation (axis 4), self-appraisal of the design profession has risen as social and global important (axis 5). Component connected with a spiritual development and self-actualization (axis 2) remained unchanged because it is the highest and the most complicated design competence degree and needs a lot of time to increase on.



**Fig. 1. Integral «image» of design students' ecological competence (42 students) basic components dynamics before (dashed line) and after (firm line) «Ecodesign» experimental course mastering.**

*Note.* Pentagon axes identify with ecological competence formation components (5 test blocks): 1 – ecology in life spheres priorities (cognitive component), 2 – ecological culture (self-actualization component), 3 – social competence (active-practical component), 4 – ecological values orientations (value-motivational component), 5 – ecological competence (reflexive component). Data in each axis is expressed for each block in % in relation to the “ideal” diagnostic matrix as maximum possible value in points\* - difference significance  $p < 0,05$ .

Therefore, created course of ecological competence formation founds itself effective and useful. We create “human-environment” relationships optimization prerequisites on both individual and social levels through the ecological culture formation that brings not only nature and biodiversity protecting cultural reasons, but it is also the precondition of future generations' mental and somatic health keeping and improvement. We would like to finish the article with famous design theorist's Karl Kantor (7) words which illustrate part of the ecological competence in designer's or any modern specialist's professional training: *“The integral object and spiritual environment projection is the real alternative to the modern ecological crisis”*.

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# HUMAN DEVELOPMENT

## THE IMPORTANCE OF NATURE EXPERIENCE FOR HUMAN DEVELOPMENT TO ECO-SOCIO-CULTURAL BEINGS AN ONTOLOGICAL APPROACH

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### Abstract

Different disciplines of nature research have made fundamental progress within the last decades. Nevertheless lots of these advances were not considered by adjoining scientific disciplines, even though outstanding experts did present comprehensible publications. Other restrictions of science relevant for health and ecology are based on the gaps between different scientific disciplines. Most of them can be understood as consequences of different ontological positions and therefore as artificial. They should be bridgeable with more appropriate ontological and epistemological tools – as Einstein has demonstrated.

In this context and particularly when considering the responsibility everyone of us, but especially the decision makers in politics, economy and science have to face, the demand for comprehensive sustainability, well expressed by the Japanese term ‘Mottainai’, gets priority (KOFLER and SCHNAITER 2008). If we give up the false pretension of science as a tool to provide objective statements independently from the observer and accept that scientific terms are inventions to describe phenomena in a usable and not contradictory way – like Einstein, Kant and the physiological Neo-Kantianists did – a possibility opens up to assess human kind and its environmental relations in a more appropriate way. In consequence we should be able to bridge these former gaps with an “extended view” on evolution which integrates the co-evolution of material and immaterial aspects. Relevant aspects of this model (autopoiesis of live by the use of catalysts, the creation of DNA as a

“library” for realisations, the self organisation of permanent multi cellular by a “Matrix-world” by the brain, the roots for creativity, learning etc and plasticity of the brain) are presented very briefly.

Doing so it gets obvious that besides the autopoiesis of life, the creation of meaning-oriented relations is to be considered as fundamental symmetry break in evolutionary development. This evolutionary gain has been enabled by individual meaning assignment to natural objects. Within this paper it shall be demonstrated why particularly in our modern times – for the first time in history of evolution – an appropriate functional (= sustainable) handling of and with nature integrating an appropriate meaning-oriented approach (‘Mottainai’) is essential. Early contact to natures seems to be indispensable for that, if we desire the epigenetic processes taking place especially intrauterine and learning processes especially post-partial, which are so decisive for the brain’s final alignment and the expected consequences on social, cultural, economic etc. systems, to contribute to a responsible further development. Without such contacts we have to expect relevant negative consequences for health and environment. (LOUV 2005).

### Introduction

In 2009 the scientific world celebrated Darwin’s fundamental alteration of our world view. But 150 years ago the scientific community did not (want to) even recognize its paradigmatic relevance: The president of the Linné Society concluded in 1859 that there has not been any “fundamental relevant discovery” in the year 1858 – even though Darwin and Wallace presented their theories on evolution at the annual assembly of the Linné Society itself. Paradigmatic discussions within the scientific community started years later aroused by public discussion *Scientific restrictions “type one”: Is there a need to readjust given ontological positions in natural sciences?*

Are we in a similar situation now? Recent relevant papers are killing sacred cows and raise fundamental questions: E.g. the commonly accepted theory of an inflationary universe and the theory that our brain is draining resources from our body up to an extent that it gets unable to accomplish its functions (PETERS, SCHWEIGER and others 2004), still wait for explanations how to be brought into accordance with the preservation laws. Unnoticed from many scientific disciplines the view on the deterministic influence of classical genetics on the phenotype has been to a very large extend altered by the acceptance of epigenetics and proteomics (KELLER 2002). Further epigenetic results confirm the passing on of features from parents to offspring without changing the genetic code. Numerous paradigms of brain research like the hierarchical structure or the fixation of once assigned neuronal cross-linkages had to yield ideas of modular networks and a so far not explainable but unchallenged plasticity of the brain (HUETHER, DOERING and others 1996). Nowadays, brain features are discussed more and more as social organ functions and not only as an organ for thinking and remembering functions (HEINTEL and BROER 2005, EDELMANN and TONONI 2000).

Today we know that (even) the mature brain is more comparable with a permanent construction-site than with a fixed presetting (HUETHER 1996).

There is hardly no scientific discipline dealing with reality, images of reality or the increasing relevance of virtual reality (think of our given economic system) that should not be disputing extended views and changes in paradigms (JABLONKA and LAMB 2005). But in fact there is hardly any “official” paradigmatic discussion about its integration into the self-understanding of science.

*Scientific restrictions “type two”: Is there a need to readjust given ontological positions in other sciences: Inborn or acquired laws?*

Can we really expect that there is an inborn, genetically based guarantee that human kind is able to deal adequately with future problems in health and ecology in the next generation just because there is ought to be an inborn law? Everybody knows about Immanuel Kant’s position of the moral law within (KANT and VALENTINER 1913) as such an a priori. But looking at e.g. killer machines “trained” by *Securitate* (Rumanian secret service under Ceausescu regime; children recruited as babies in orphanages) we get to know that there is no genetically “law within”. It seems to be more conclusive to understand this as an acquired output.

*Scientific restrictions “type three”: How can we handle the relevant gaps between scientific disciplines (especially “body and soul”, “person and society”)?*

Following the arguments of Einstein the gaps between the scientific disciplines dealing with our world are based on incompatibilities between different world views and not on the different nature of the research objects. For a scientifically deduced solution we have to link the gaps between meaning and matter (“body and soul”) and “individual and society”. But the commonly used given epistemological tools give little hope to bridge these gaps (SCHNAITER 2009). Therefore we should look for more appropriate approaches.

### **Unifying epistemological approaches**

Our problems are not new. Einstein had similar ones. He solved them with his natural philosophical technique which seems to be helpful for us too. According to Einstein empirical natural scientists focus on generalizable processes (PYENSON 2006, EINSTEIN 1949). Consequently non-generalizable phenomena (and quite some generalizable ones too) are frequently skipped if they seem not relevant with regards to the respective research field. Given aspects get excluded. Therefore Einstein came to the conclusion that any scientific term (and any natural law) is a free invention of the human mind. Terms like “movement” can cover different contents (e.g. in Newton’s physics and in the physics of Maxwell): Both select different aspects of “reality”. Every discipline creates its own problem-oriented terminology and skips other aspects. In this way artificial incompatibilities between disciplines are created by different terminologies that do not really exist within the given world. Normally these incompatibilities are relevant only in

such cases where different disciplines are handling the same process – in most of the other standard-cases there are no problems to expect.

Many topics dealing with health and ecology in modern times are such “complex processes”. Therefore we have to expect artificial incompatibilities because of the use of epistemological and ontological tools which are inadequate for interdisciplinary approaches.

Scientists have the right and the duty to create adequate tools: Consequently we should modify the content of terms in such a way that the old definitions can be understood as subsets within the newly created ground set. This is the principle of the so called *real theories* – like Einstein’s *theory of relativity*. According to Einstein we can expect that scientific gaps should disappear if we could invent one model for one evolutionary process of matter and information from the very early beginning up to now – always in agreement with the related sectoral disciplines. Our *Extended View* tries to offer such a proposal.

### **SIMPLIFIED SPOTLIGHTS ON THE EXTENDED VIEW**

#### **Potentia with two aspects: energy and discrimination ability**

Within the *Extended View* we attribute to objects one potential with two aspects which complement each other following the potentia’ of Heisenberg as the two sides of one coin. One is the ability to realize, (e.g. movement, Euclidian space-time-grid) and is called “energy” – the other one we call “discrimination ability” making the capacity to construct and modify conclusive (grid of meaning, choice), e.g. the meaning attributed to matter. We have characterized this aspect to allow predictions and their experimental proving. Following the conservational laws any energy is limited. Following the *Extended View* we have to deduce: That all entities are limited in their ability to realize and to construct and that this is the reason why not all theoretically given possibilities can be realized.

### **Evolution by WIN WIN WIN**

Consequently there must be a selection, a choice. But who or what is choosing? We exclude solutions like machine models, intelligent design or the prerequisite of an outside decider. But there is a need to give an answer: We conclude that the actually given actors made/make the selection with respect to their intentions (with regards to consent and the environmental conditions). Then the evolutionary process can be understood as the general “not intended consequence” of autopoiesis-oriented intentions. [To see, what everybody can see – to recognize what nobody before has recognized, and make (emergent) WIN from that. But we can observe just such creations which persist the inventor: Because of the WIN was shared with others (WINWIN) with respect to a relevant win for all sharing the emergent (WINWINWIN). Darwin’s evolutionary view can be understood as a special case.

## **Symbolintentions**

We had to solve the epistemological problem to integrate sufficiently “self-intention” into the process. Nobody can know the intentions of such ancient actors. But there is no need to know them in detail on the individual level. We need just a generalizable assumption to integrate just the principle as a necessary reason. We use an epistemological trick and attribute the decision to the actually available actors by implying them very general “symbol-intentions” on the basis of the observable outcome within the evolutionary process – following the principles of multidimensional logics (to choose between choices, intentions with respect to self, consent and environmental aspects and intensities of realisations) additional to Aristotelian bivalent logics (to act or not to act.). There are only two abstract symbol-intentions to assume:

- ▶ To increase the complexity of self-guided movement
- ▶ To intend (additional to purpose-orientation) meaning full relations to outside given ones (this symbol-intention is differentiated in persons to final-oriented intentions too).

The intention to extend self-guided movement is sufficient to make conclusive the self-creation/autopoiesis of more and more complex entities from quanta up to living entities. Just for the understanding of relatively high evolved animals (with orientation on purpose AND meaning) e.g. vertebrates or a person we need the second type of symbol intention.

When focussing on the autopoiesis of actors we always have to keep in mind that the emergent new must be deducible by modification of the former given. Trailing this basic principle the self-creation of actors from quanta to atoms, early life, multi-cellular, up to vertebrates and persons and social structures can be reconstructed:

### **Autopoiesis of simple life thanks stimulation by catalysts**

A basic assumption of the model is an (extended) conservational law for the potential to realise as well as for the potential to construct more and more complex effects: Therefore there have to be levels of use which seems to be “quasi-ideal” as long as the available capacity to realise or to construct is not fully used. The model predicts that additional creations are only possible with restrictions of the former given, if the borderline of this capacity is reached. This is in agreement with the quasi-ideal movement of electrons within molecules with the consequences, then further types of realisations are only possible with the restriction which is expressed in the 1<sup>st</sup> sentence of thermodynamics (more complex movements between molecules). It is obvious that – within the extended view – we have to attribute to the physico/chemical entities the selection between different combinations: The easiest choice to select between given offers can be predicted on probability on the basis of Guldberg und Waage. But an other situation is caused in presence of a catalysts. Its effect can be understood as a reminder that there is alternative “of special interest” possible. If an actor has “recognized” the effect of a catalyst then he can extend its own capacity to define self guided movement in

the way to stimulate other molecules to move themselves. This actor can bring the catalyst closer to start a realisation and to move it back to stop the process – depending on its intention. But there is no reason to attribute to the so motivated actors the assumption, why they are moving or stopping. We have to attribute to them that they follow their own priorities. The use of the catalyst to organize other molecules can be seen as the fundamental principle of living entities.

### **To cope with restricted capacity of discrimination ability: DNA as library**

But the use of so many catalysts, which are needed within a single cell, needs more capacity to deal with information as it is available for the “helmsman within” of the cell. Therefore there is a need to cope with that limitation. For that it is conclusive – within the presented model - to apply the principle again, which is understood as the basis of the principle of catalyst: That form can be linked with information. Now this principle is used by a crystal with an extremely variable: the DNA. Molecules in crystals conserve their outside form (and realise their self oriented movements within the crystal) Therefore the outside form can be used as memory. So DNA can be understood as the library to store the “cooking recipes” for more and more complex “creative dances”. DNA is a special “cooking book” which covers recipes to motivate not living molecules to modify themselves with the help of proteomics to the intended dish. If we attribute that the dish is the realisation which is intended by the “helmsmen within”, then the organic molecules create them without – from the position of these organic molecules - any respect to the “helmsmen within” but with respect to their own symbol intentions. Using this model it is sufficient to attribute to single-cellular the symbol intention to “keep the more and more complex moving processes **within** the cell running within creative self-guided modifications”. The **outside** actions are used just to fulfil “purposes” for that.

### **The autopoiesis of permanent multi-cellular – the Matrix-world**

With the increase of the complexity inside the prerequisites used from the outside increased too – and created the need for more appropriate solutions. The autopoiesis of temporary and – later on – permanent multi-cellular – understood as tool for that. This model would not allow to attribute to the actors choices with an overall loss which is higher then the expectable win. So it was to explain why physiologically “immortal” single-cellular paid the prize of the physiological death to be multi-cellular. This is conclusive (e.g.) if we attribute to omnipotent single cellular the intention to solve “environmental daily life problems” more efficient in the way of a (temporary) co-operative with distribution of functions between the members of the cooperative. The modification in the form without changing of the DNA which is needed for the specialisation can be understood with epigenetics. The shift from temporary multi-

cellular to permanent multi-cellular would be conclusive if we attribute to members within the cooperative which deals just with information from outside and its valuation for possible changing in realisation the intention to keep the cooperative longer in persistence as it would be needed from the reason to build the cooperative. This would be possible if “information oriented staff functionaries” would separate the “function oriented members of the cooperative” from the “real outside situation” so that they would be informed just by the messages from the “staff functionaries”. This is possible by an information resistant skin. Skin, sense organs, neurons (and chorion) are descendents from ectoplasm. This deduced biological principle is in good agreement with many phenomena, e.g. the self-creation of temporary (and permanent) multi-cellular with different cell structures by amoeba as omnipotent single cellular, which communicate with other single cellular by ancient transmitters (cAMP). Even on this level nature observation is the prerequisite for the (epigenetically based) modification of given (genetical) possibilities. The solution based on adequate consents in WINWINWIN. The surplus on potential to realize can be used for intentions of the “staff functionaries” (represented by the brain). With the increase of efficiency of the “bodily members of the cooperative” by the creation of tissues and organs the need to create a more and more complex use of the surplus by “brain”. This process allows to understand the autopoiesis of distinct but interlinked structures of the brain as an interdependent process between the somatic systems and the brain to deal with the environment like in the movie Matrix. The “brain” cheats the body!

**Different functions of “Outsiders” and “Insiders” cause different intentions:  
“Outsiders cheat the cheating Insiders”: emotion, cognition, intellect**

But we have to take in consideration the interdependence between the descendants of the “outside oriented staff functionaries” (which are represented primarily as sensoric cells and later on eg. as individual and person) and the descendants of the “inside oriented staff functionaries”, too. The “Insiders” evaluate the information from the “Outsiders” and translate them into ancient messages to organise the bodily cell so creative, that the organism survives and the intentions of the “brain-structures” can be realized with the surplus on resources. The model predicts different intentions of the Outsiders and the Insiders about the use of the available resources including the use of the body. The “Outsider” should be oriented in outside oriented activities, and therefore – after the creation of meaning and finality by the “Outsiders” on actions related on meaning and finality. But there is no reason to attribute this high evolutionary level to the “Insider”: There symbol intentions should base further on just on “information” which can be valuated a) as cause to act for the bodily cells, or as denotation that there is no need to act in the interest to support the bodily system. Such a denotation can be starting point to create a matrix-world to improve purpose oriented possibilities for activities of the brain. Or the denotation can be the stimulus for a special

electromagnetic process constellation between a module of neurons, used for self intended modification to link with other “constellations”. If you follow this argumentation then it will be conclusive, in which way the “Outsider” can use the “Insider” for outsider intentions: The Outsider can modify the information /denotation passed to the Insider. The Insider can not control its correctness. The Outsider can create such denotations, which will be valued by the “Insiders” to initiate a special realisation. But this realisation makes just sense from the intention of the Outsider – the Insider don’t know. This model makes the voluntary activities e.g. of our arms conclusive. But the Outsider can create also the other type of denotations, which are a stimulus for “constellations” of neuronal module processes according to the symbol intentions of the Insider. These processes are running inside the brain without bodily activities: Such processes make conclusive creativity, memory, learning etc. A combination of both types makes conclusive the transfer from cognitive processes to bodily activity. Both processes should have relevance for the linkages between neurons in the brain. They help as to understand (especially the neocortex of) the brain as “permanent worksite. But we have to expect consequences on the use of the bodily systems too: This seems to be obvious in connection with training of e.g. muscles. But we should expect a cascade of processes up to the level of epigenetics to the single cell.

This model allows making conclusive up to now not sufficiently explainable pathophysiological phenomena, like the placebo-phenomenon (and white coat phenomenon, and toxicopy reactions too): The brain creates the Matrix-world according to the assumed outside reality. But this model makes it conclusive too, why Herbert von Karajan is able to use his hand – biologically evolved more for fighting and eating – for such a brand new application as to move the baton to conduct the Viennese philharmonics – and why there musicians – and bees – are able to understand the meaning of the movement, are able to transfer the message and modify their playing in a way, that all speak from a unique musical evening.

### **The creation of meaning - the individual**

The Matrix-model cannot explain the fundamental break of symmetry which is linked with the discovery/creation of meaningful relations to an outside autonomous object. This can be deduced from another principle, which is in good agreement with different sciences and the principle of “extended conservational laws”: The principle of active enforcement (introduced by Pavlov) and of active inhibition [introduced by Sechenov (SECHENOV I.M. 1863)]. The intended target is overestimated and not intended ones are underestimated. So the sexual partner who is chosen just for purpose can be valued as unique and to reach and to persist within the relationship can be graded up to a new type of self-oriented intention and not only as a purpose. So the individual is born! But just by the “Outsiders” within the brain! Such an individual has to distinct now different aspects in the surrounding environment: Purpose related aspects and meaning oriented

ones. Both aspects have to be fitted together – and result in an individual view of the outside world.

Interactions between living beings without meaning-related intentions can be quite well predicted if you know enough about their purposes. But this assumption is in principle wrong when dealing with processes of individuals. Meaning-oriented motives may lead to unexpected behaviour not explainable sufficiently by purpose-related reasons alone.

The win of meaning had relevant consequences on the structure of the brain: As more aspects of life are integrated into meaning, as more relevant will be the “new brain structures” and the differentiation of two cortices and their linkages especially by corpus callosum. This is impressively described by McLean and his “Triune brain” (MACLEAN 1985, MACLEAN 1977) as well as by newer publications on brain development (LLINAS 2002, PETERS, SCHWEIGER and others 2004)

### **The extension of meaning to finality: From Homo sapiens Linné to Homo sapiens finalis**

As described above it is conclusive that the “Outsiders” have to cheat the “Insiders” about the given outside situation to motivate them for the creation of a Matrix-World, which is in the interest of the “Outsiders”. Therefore the “real decision maker” within the body is not observable – even not for the Insiders and obviously not for an outside observer. The outside observer is only observing a moving body – which allows more or less adequate the intentions of the “invisible decision maker”. The step from Homo sapiens as a monkey to Homo sapiens finalis can be attributed to the recognition, that not only the decision maker of his organism can not be observed but maybe other decision makers too. And the assumption that there is a decision maker which is in principle not to observe but effective e.g. to create day and night, the weather etc. is just one step. This step can be done just with the given brain of a “naked monkey”. This discovery/creation/invention of **finality** is just a modification of “meaning” but of fundamental relevance: Now the intended relationship can never be expressed with matter, time, space etc. So we can deduce not only religion as the most basic final orientation, but the creation of different social structures too – in good agreement with different social scientists e.g. Durkheim (DURKHEIM E. 1984).

### **NATURE EXPERIENCE FOR FURTHER HUMAN DEVELOPMENT The Four Unite brain and the need of contact with nature**

The self-creation of Homo sapiens finalis was many ten-thousand years ago. Maybe no relevant biological change has taken place up to now. But the endless evolutionary process did not stop: It progresses with a post-biological evolutionary process, which is running now too. With the creation of meaning relevant aspects of ontogenesis-analogue processes takes part after birth (e.g. binding). But with the stage of finality “learning” is

the dominating form to influence the possibilities to use the brain for new outside oriented intentions and modify it with respect to emotional, cognitive and intellectual needs. Therefore we should speak of a “Four-Unite brain”: the changing based on the modifications which are possible by the given structure and the use of the given neuronal offers. (We skip here other offers e.g. by computers). As more relevant the final aspects are, as more relevant will be learning and as less dominating will be the biological aspects. But we have to take in consideration that - on the basis of the proposed model – any bodily reaction must be based on a stimulation within a matrix world. Therefore not only the emotional, cognitive and intellectual changing within life are impressive, the morphological changing in ontogenesis (and because of analogue processes) are obviously relevant too: The highest number of neurons is given before birth. Neurons which are not used go lost. The relevance of used neuronal networks is increasing. But the structure of the brain must be seen in interdependence with the morphological structures and both in interdependence with the surroundings and therefore with nature too. So we can compare the brain with a permanent working place, but with a complex structured building too: If there is no concrete basement, it is not possible to built e.g. a wooden balcony on it: As we have to expect that a missing limp in embryogenesis has the consequence that the related brain structure will not be built, so we should not expect that the basement, which was built over the last hundred thousand years because of the traditional activities of youngsters in nature , will be available after just some generations without such experiences. We have not enough knowledge about that and neither about relevant epigenetic aspects during embryogenesis and early childhood. But the consequences could be of great relevance. We have to expect an additional and increasing relevance of learning for the use of the brain, too. Therefore scientists should take care on these topics to give better answers as soon as possible.

Therefore preventive activities to empower persons to establish contacts to natural environments, to experience ecology and to develop empathy for natural processes and relationships with natural subjects are also from a theoretical point of view essential for a sustainable future of the real world besides financial markets, video games and other virtual worlds. Otherwise relevant negative effects on health and ecology are to be expected. There is an obvious need in mankind for solutions to deal better with very complex processes. Several scientific disciplines try to emphasize the importance of relationships as fundament of social activity: neurobiologists, social psychologists and learning experts call for precautions if the prerequisites for the development of mind structures are not given any more. We need similar preventive activities to establish ecological relationships in the sense of Mottanai-sation (KOFLER and SCHNAITER 2008) and close affinity to nature. Otherwise virtual and psychosocial arguments will be overestimated “logically” concerning their relevance for sustainability. R. Louv reveals in his bestseller “Last Child in the Woods” (LOUV 2005) which health consequences we may face without nature-stimulated meaningfulness: We should think over with respect

to all these aspects: Maybe the following sentence characterizes the relationship between nature, emotion and intellectual potential and "psycho-socio-cultural ontogenesis" adequate: "Who is 12 years and does not have an emotional linkage to nature has no heart. Who is 30 years old and does not accept eco-socio-cultural sustainability, has no clever mind. But we should not expect that such a person with 30 would be able to for adequate comprehension of ecological processes with regards to culture if he/she did not learn to love nature with 12".

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## MENS SANA IN NATURAL SANA

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*Deeper into the forest, deeper into my Self. Trees at all ages tell about life, from the tender sprout to the fallen moulding log in the heather. Each with its own expressions, corresponding with human feelings and sentiments.*

*The pulse beats with a different rhythm; the gaze gets sharper and the colours brighter. As I walk into the land, the land walks into me. The lines and features of the landscape get in harmony with the movements of my body. Sitting down at an open glade, picking a handful of sun-warm blueberries, I can feel how life tastes without being artificially sweetened.*

Many Norwegians witness experiences of this kind. Research claims that 89 % of all adults practice *friluftsliv* in one form or another. In a survey<sup>5</sup>, eight out of ten respondents declare that *friluftsliv* is an important leisure activity in their lives, to more than a fourth the most important. We have every reason to believe that thousands have experienced some of the richest moments in their lives when meeting with nature.

In a major meta-study, health sociologist Ingemar Norling<sup>6</sup> concludes that *lifestyle* is of greater importance for psychological health than both genetic factors and efforts from the health care system, each or together. Furthermore, leisure has two to three times more impact on psychological health than work. And behold: Nature-based leisure activities have the pronounced most positive effect on psychological health! In interplay with nature, the individual learns strategies to cope with strain and stress, preventing psychological illness from appearing: *buffering*. And if one experience life-crises and traumas, once again nature-related activities are proved to be the best to deal with the strains: *coping*.

Compared to the man-made urban surroundings with their embedded socio-material expectations and demands, nature gives an *open address*<sup>7</sup> where we are free to embark on simple projects, providing the individual with experiences of autonomy, competence

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<sup>5</sup> Vorkin, Marit, Joar Wittersjo og Hanne Riese: (2000): *Friluftsliv – på randen av modernisering?* OF-rapport nr 02/2000. Ostlandsforskning, Lillehammer.

<sup>6</sup> Norling, Ingemar (2001): *Rekreation och psykisk hälsa. Dokumentation om hur rekreationens inriktning och kvalitet kan förbättra psykisk hälsa och behandlingen av psykisk ohälsa.* (Göteborg: Sahlgrenska Universitetssjukhuset, sektionen för vårdforskning)

<sup>7</sup> Tordsson, Bjorn (2003): *Å svare på naturens åpne tiltale. En undersøkelse av meningsdimensjoner i norsk friluftsliv på 1900-tallet og en droftelse av friluftsliv som sosiokulturelt fenomen.* Dr.scient-avhandling (Oslo: Norges Idrettshogskole)

and control. These experiences can counterweight those of the modern life, where we are charged with anomic and contradicting demands not chosen by ourselves, and seldom can see immediate results of our own deeds.

Despite of a process of secularisation and demystification of the nature, the opposite tendencies can also be found. Nature offers a richness of symbols expressing existential dimensions, well known in mythology and in our time analysed by psychologists within the Jungian tradition.<sup>8</sup> The mountain represents the vertical dimension and offers oversight and perspectives to the lowland-existence of everyday life. The river is the image of the stream of time; the connection between the momentary “now” and the everlasting continuum. To walk into the forest means, symbolically speaking, to enter one’s own self. At the level of emotion and agency, rather than an analytic, meeting with nature also means relating to what elements in nature stand for.

According to investigations<sup>9</sup>, these *meditative values* dominate as motive for *friluftsliv*; to experience the “stillness and greatness of nature”. This is considered to be inherent features of the nature, which can bring about the same qualities as a state of mind. Thus, the *friluftsliv* tradition in our part of the world can be understood as a distinctive way to maintain physical and psychological health. Not through introspection or emptying the consciousness from sensuous impressions – as in other forms of meditation and therapy – but contrarily: Through *opening up all senses* and to act all-sided and integrated in the interplay with nature, people take part of the stillness and harmony of the free nature.

Unfortunately, the insight that meeting with nature is of significance for health has not played an important role in the debate on health politics in Norway. Instead, sports – extremely well organized and strongly exposed in media – dominate the discourse on the importance of physical activity. Although Sports Physiology has given us some insights relevant also for *friluftsliv*, the main focus is upon measurable connections between biological entities, and its methodology neglects such aspects as context, meaning and motivation. On the imaginary dissection table of the Sports Physiological analysis, the living and experiencing body is in danger of being disconnected into separate organs and mechanisms.

To fully understand the significance that meeting with nature has for our health we must question the borders between man and the environment. This is in accordance with the important approaches within philosophy and psychology, named Phenomenology, Deep Ecology and Ecopsychology.

The philosopher Maurice Merleau-Ponty (d. 1965) presents a radical reinterpretation of the mind/body and subject/object dichotomies.<sup>10</sup> Being human means *being a body* which means *being-to-the-world*. Our senses are in constant report with our surroundings that, reversely, gives our consciousness its concrete contents. The *prereflective consciousness* receives every moment a multitude of information, but our

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<sup>8</sup> Stoknes, Per Espen (1996): *Sjelens landskap. Refleksjoner over natur og myter*. (Oslo: Cappelen)

<sup>9</sup> Vaagbo, Ola (1993): *Den norske turkulturen*. Rapport utarbeidet for Friluftslivets Fellesorganisasjon. Markeds- og mediainstituttet. (Oslo: MMI)

<sup>10</sup> Merleau-Ponty, Maurice (1962): *Phenomenology of Perception* (New York: Humanities Press, 1962.)

reflective consciousness can only grasp a fraction. The rest is not wasted, but stored and organized in patterns of meaning and preparedness for action. Hence, our sensuousness is the fundament for a meaningful relation with the world we exist in. But if our senses get numb, the qualities in the world fade away. This can occur when living in surroundings that, at the same time, are sensuously debilitated and overloaded. The result is physical, psychological and existential illness.

Reversely, thinkers like David Abram<sup>11</sup> and Erazim Kohak<sup>12</sup> claim that a main reason behind our difficulties in solving ecological problems is that people of today have lost their bodily and sensuous relation to natural surroundings. The environmental issues are hence presented in an abstract and objectivised form, which alienates rather than involves. Thus, the ecological crisis and the psychological and existential challenges in modern society, are two sides of the same coin, and must be addressed together.

This strive for a relationistic understanding, regarding the individual as a node in a network of relations, is also to be found in disciplines like Ecopsychology and Deep Ecology. Already thinkers like G.H. Mead<sup>13</sup> emphasized that the identity of a person – the experience of *being* somebody – is created by *relations*, mainly to other human beings. Eco-Psychology<sup>14</sup> claims that even non-personal relations – the homestead, the landscape with its animals and plants – contribute to a person's identity through the process of *identification*. This concept plays an important role in Arne Næss' Deep Ecology and in his theory of Self-Realization<sup>15</sup>: Spontaneously we identify ourselves with other living beings, causing our Self – not to be confused with the narrower ego – to mature and expand.

To sum up: In our search for new approaches to promote physical and psychological health, we neither have to start by inventing new forms of therapy or treatment programs nor by conducting complicated research experiments. We may instead examine the already existing *friluftsliv* tradition empirically, looking for its intrinsic values and unveil the ways in which the individuals themselves make meeting with nature meaningful in their lives. And vice versa: In our strives to solve the environmental challenges of our time, it is essential to let people experience nature not through a one-sided intellectual, scientific and political approach, but as something that interplays with all our senses and builds our identity. Thus, the struggle for nature's quality becomes more like a joyful Self-defence than a heavy duty.

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<sup>11</sup> Abram, David, 1996. *The Spell of the Sensuous*. New York: Vintage.

<sup>12</sup> Kohak, Erazim, 1984. *The Embers and the Stars*. ( Chicago and London: University of Chicago Press.)

<sup>13</sup> Mead, George Herbert (1934): *Mind, Self, and Society* (Chicago: University of Chicago Press.)

<sup>14</sup> T. Roszak, M.E. Gomes, A.D. Kanner (eds) (1995): *Ecopsychology, Restoring the Earth, Healing the Mind*. San Fransico: Sierra Club Books)

<sup>15</sup> Næss, Arne (1995): "Self-Realization: An Ecological Approach to Being in the world". In Sessions, George (ed) *Deep Ecoogy for the 21st Century. Readings on the Philosophy and Practice of the New Environmentalism*. (Boston & London: Shambhala)

## THE BENEFITS OF AN HOLISTIC AND SALUTOGENIC APPROACH TO REHABILITATION AND RECREATION

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### Abstract

**Background.** Previous research has shown huge benefits on health by using energy psychology and thought field therapy in rehabilitation. Recent research also shows benefits on health and rehabilitation through participation in health promoting cultural and physical activities. Eastern Norway Research Institute [ENRI] conducted a qualitative evaluation study at Fron Rehabilitation Centre, Norway in 2008-2009.

**Objectives:** (i): to evaluate subjective health and wellbeing among participant's during four weeks in relation to processes and changes. (ii): to increase Fron Rehabilitation centre's own knowledge on how and why various rehabilitation programme seemingly contributes to perceived benefits for the participants. (iii): to evaluate subjective health and wellbeing among participants who joined the follow-up week two months later.

**Methods.** This study was divided into two parts and includes 38 participants, aged 23-60 years, and their subjective opinions, beliefs and life experiences of being at Fron Rehabilitation (part I). Part two includes an in-depth interview with 19 participants' exploring their subjective experiences and outcomes of joining the follow-up week two months later. In both parts a semi-structured interview guide was used. This study had no control group.

**Results.** Three main factors seemed to contribute to participants' perceived rehabilitation and better health: (a) Physical activities and nature experience (a); The social environment and sense of coherence (c) Learning to adopt a new lifestyle.

**Conclusion.** Fron Rehabilitation Centre holistic and salutogenic approach including the nature-culture-health activities would be worth to implement in practice in the future. Additionally, the majority of those who joined the follow-up week two months later reported to have improved their health and well-being. Successful mood promoting rehabilitation programs may have an impact of the participants total life situation.

Key words: rehabilitation, holistic, participation, salutogenic, nature experience, follow-up

### Introduction

Previous research has shown benefits on health for people with long term illness, diffuse symptoms and life complications by using the EDxTM- method (1-3). This method is based on cognitive and thought field therapy (4), and focuses directly on the emotional and cognitive data that is embedded within the person's subjective feeling of being ill and its symptoms. Recent research shows how working conditions and private life

burdens seems to have an impact on the development of illness and sickness absence, reinforcing the perception of a total life burden situation (5). Previous research also shows benefits on health and rehabilitation through participation in health promoting nature-, cultural-, and physical activities (6). In an evaluation study of people partaking in Nature-Culture-Health activities in a local community in Norway, the majority of the participants reported having improved their health status, quality of life and function, particularly when given the opportunity to utilise their own abilities and creativity, thus increasing their self-efficacy and self-esteem. The participants could choose themselves which activity they wanted to be engaged in, and sometimes individuals participated in several activities during a week, for example painting, nature walks and choir practice (7). We still have little research on subjective health and wellbeing among participants at different rehabilitation centers in Scandinavian countries, particularly mood promoting rehabilitation programs. Additionally, we lack knowledge on the various processes and changes through the rehabilitation weeks and how the different programmes may contribute to perceived benefits for the participants (8-13). Moreover, we lack knowledge of the subjective health and wellbeing among participants who may join any follow-up week at a rehabilitation center (14). These issues begin to highlight the importance of people's subjective experiences as a determinant of their health and wellbeing, a topic recently recognized in the World Health Organization (15) definition of health. The subjective dimension provides, as it were, a mediator of health strategies and coping mechanisms at individual and group level. Debates centering on this theme have emphasized social and personal resources, as well as physical capacities. They conceptualize health as a social as well as an individual product (15) and as the condition of having as little illness as possible while having the energy to cope with the tasks and challenges of everyday life (16).

### **Aims**

There were three main aims of the present study:

1. To evaluate subjective health and wellbeing among participant's at Fron Rehabilitation Centre<sup>16</sup> during four weeks in relation to processes and changes.
2. To increase Fron Rehabilitation centre's own knowledge on how and why various rehabilitation programme seemingly contributes to perceived benefits for the participants.
3. To evaluate subjective health and wellbeing among participants who joined the follow-up week at Fron Rehabilitation Centre two months later.

### **Methods**

**This paper present result from an evaluation study conducted by Eastern Norway Research Institute [ENRI] in collaboration with Fron Rehabilitation Centre, Norway in 2008-2009.**

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<sup>16</sup> See [www.fronrehab.no](http://www.fronrehab.no)

### ***Rehabilitation methodology***

Fron Rehabilitation centre provides a salutogenic<sup>17</sup> and holistic view on health that emphasis physical activity, psychological methods and nature experiences as pathways to treatment and rehabilitation programme. Their main objective is to help people to return to work and regain strength, vitality and energy. During a four week long stay at Fron Rehabilitation Centre the participants are offered two sessions of physical activity<sup>18</sup> and nature<sup>19</sup> experiences daily combined with sessions on energy psychology (4), and tutorials on lifestyle changes, both individually and in group. The specific pschycological method based on "Energy Diagnostic and Treatment Method-EDxTM" (1-3) is a vital and unique part of the their programme. The rehabilitation process through four weeks focuses on learning how thoughts, beliefs, actions, relationships, and social network and environment may influence our energy levels, function and capacity for work or not, grounded in the life experiences and current life situation of the participants.

### ***Evaluation methodology***

Eastern Norway Research Institute [ENRI] conducted a qualitative (part I and part II) evaluation study in collaboration with Fron Rehabilitation Centre, Norway in 2008-2009. The first part of the present study includes 38 participants and their subjective opinions, beliefs and life experiences of being at Fron Rehabilitation Centre during four weeks. Each participant was interviewed twice: First week- and fourth [last] week. Part two included an in-depth interview with 19 participants' exploring their subjective experiences and outcomes of joining the follow-up week two months later. These participants were selected<sup>20</sup> through a raffle on the last day of the fourth week, i.e. randomly chosen to have the opportunity to participate at the follow - up week. Both parts of the study were using a semi-structured interview guide. Age groups for all participants were 23 - 60. The participants' were suffering from long term illness; e.g. muscular disease, burn-out or mental problems, and represent low- socio economic background. The interviewer audio taped the interviews and transcribed them verbatim directly after the dialogue. The participants were asked to sign an informed consent document.

Grounded theory was chosen as the qualitative methodological approach, since the research questions attempted to explore and describe social processes of illness and health as they emerged from the ethnographic data. This method involves a process of coding, categorization, and comparison of the interview data (17).

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<sup>17</sup> A salutogenic perspective means to emphasis factors contributing to health and well-being and what predicts a good outcome (Antonovsky, 1987, 1979; Suominen & Lindstrom, 2008).

<sup>18</sup> Physical activities at Fron Rehabilitation Centre: Walking, swimming, gym and dance.

<sup>19</sup> Outdoor activities: walking in the forest, mountains or through cultural landscapes.

<sup>20</sup> Fron Rehabilitation Centre at Hundorp, North of Lillehammer, had been given financial support by then Ministry of health to try out one follow-up week for the first time in 2008.

## Results

### *The rehabilitation process*

The majority of the participants felt that the Fron Rehabilitation Centre had given them a new platform, a renewed way of thinking and reasoning, having a repertoire of new skills and a different way of handling their own actions and behavior, as one participant expressed; *"I would recommend this centre to other people whom I know would benefit from staying here. It's fantastic in so many ways and I have learned a lot."* Typical descriptions were related to stress, mental and physical burdens in everyday life, including pressure to tackle the burdens from both an active working career. The majority of the participants had struggled with lack of control over several dimensions in life; i.e. work, caring responsibilities, bad economy, divorce and lack of opportunities and life chances in general. Several participants describe how they experience lack of energy and power, often referring to a dysfunctional life situation; *"it's just no life and all is terrible right now, and I am feeling I can't do anything to control my life situation, and I feel I am in a sorrow state...I hope this place can help me to turn the wheel in the right direction"...* or *"it looks as if everything is tied together, my pain gets worse and worse, and then I get more and more depressed, and then I feel sorry for myself, and life gets very heavy"*. Three main factors seemed to contribute to participants' perceived recovery and wellbeing.

#### *(1) Physical activities and nature experience*

It seems that physical activity along with outdoor experiences: i.e. walking in the forest or in the mountains tracks or to sit calmly and look at the countryside after a brisk walk, clearly demonstrates that an active lifestyle has a substantial positive effect on their well being. Furthermore, being physically active has a positive effect on self-esteem and self-perceptions such as body image: *"I feel much better when I am physically active every day. It gives me energy and vitality, and I don't get so depressed"*.

#### *(2) The social environment and Sense of Coherence*

An important factor which contributes to participants' sense of being in the process of recovery, might be how the social environment served as a type significant other, supporting a sense of coherence and predictability (18), hence giving the participants vitality and energy through meaningful interactions. In this respect, difficult or adverse life circumstances and negative emotions may be modified via social strategies and transformed to positive emotions by achieving a readjustment of self over time: *"Being here has made me rethink how I live my life, and how I can change my behavior and live a different life onwards. I will focus on the daily routines I have learned here"*.

### *(3) Learning to adopt a new lifestyle.*

The participants had increased their self-awareness and consciousness towards the importance of physical activity contributed to feelings of well-being and vitality. Through learning new techniques and tips, the participants' energy is channelled into action and lifestyle changes; maintaining health-performance: *"I have learned so many new ways of thinking and acting, but it is also important to have the opportunity to come back and repeat what we have learned, since it is so easy to forget or even get back to old habits again when your're home"*.

### **The follow-up week two months later**

Most participants perceived a further improvement on their and health and wellbeing after they joined the follow-up week. Through re-learning and repeating new techniques and tips, the participants' adopted lifestyle became a coping strategy and a way of performing physical and mental healing and maintaining health-performance. Typical descriptions from the follow-up week was: *"totally speaking, I feel much better now"* or *"the follow-up week has made me rethink my life situation, and they have guided me in the right direction"* or *"it is good to know that you are working with yourself rightly, you know, and this week has only confirmed I am on the right path"*.

## **Discussion**

### **Methodological considerations and limitations**

A methodological implication is that we do not know how the participants health and quality of life would have been if they had not been attached to the group activities and programme at the rehabilitation centre. Also we do not know how their quality of life and sense of being on the road to recovery would have been if they had partaken in similar activities in the local communities or other voluntary organizations or rehabilitation centres elsewhere. However the interviews in part one was conducted twice, i.e. first week and fourth week, and we do have data on participants' processes and changes over a longer period of time at the centre. Moreover, we have an impression that the participant's beliefs and opinions are genuine and real, although the observer effect might have influenced their positive opinions and behaviour and ought to be taken into account (19, 20). A limitation may be that important patterns and tendencies belong to this population from a socio-cultural context in the south-east region of Norway anno 2008-2009. Another factor is that this study has no control group.

Another limitation is that the sample represented in the qualitative study is too small for genuine, let alone significant, comparisons to be made. For example, the different views and opinions do not represent every person who has ever participated in the rehabilitations programme at the Fron Rehabilitation Centre. However, it gives us patterns and tendencies to build for future studies, and methodologically this study can be described as an exploratory study and experimental design (21), since the

participants were randomly chosen to be included in the follow-up week. The reader ought to take these considerations into account.

### **Holistic approach and a salutogenic perspective**

An holistic approach to rehabilitation raises the importance of how one may reach new and better constructions of meaning to attain ontological security and the processes by which this is achieved, are both unconscious and conscious (22). To promote healthy lifestyle holistic practices have shown positive results, particularly encouraging physical activity, recreation employment advice and social support (11, 12). The findings in the present study support recent studies which conclude that active participation in cultural, physical and recreational activities reduces pain, anxiety, promotes health (6) and increases longevity (23, 24). Illness is a disruption not only of structures of explanation and meaning, but also of the sustaining of normal relationships and the mobilization of resources (25), thus illness monitoring through an holistic approach may increase self-knowledge and awareness, which in turn might give individuals a sense of coping with changes and challenges that might help them to move on in their processes towards recovery. Health problems are connected to the whole person, and it may be difficult to decide the contribution of different parts. Social problems in private life may influence our health situation, and the social situation on our work place may improve or worsen the situation. As Sewell (26) argues part of what it means to conceive of human beings as agents is to conceive of them empowered by access to resources of one kind or another. Fron Rehabilitation Centre seems to support and help those agents who are capable of putting their structurally formed capacities to work in creative or innovative ways.

A holistic approach that considers the whole life situation could be considered in order to understand the complexities in sickness absence (5). This study shows in line with recent research how a holistic (11, 12) and salutogenic approach (10, 18) is beneficial in rehabilitation and recreation, including nature-culture interplay (6, 7) and energy psychology (4). Through daily routines, engaging in different activities at the centre several participants experience a sense of coherence (10, 18) which may have direct physiological and psychological consequences, affecting our health status (27, 4), particularly in coping with stressors in the rehabilitation process (13). Previous studies also show correlations between sense of coherence and mental health and well-being (28, 29). This sense of coherence perspective at Fron Rehabilitation Centre seems to strengthen resilience and develop a positive subjective state of health.

### **The importance of the follow-up week**

It seems that the follow-up week, part two of the study, improved the participants health and well being subjectively, possibly substantiated in learning how to sustain their newly adopted life style changes, or as a way of framing and measuring their own

progress and sense of coping. This is line with previous research showing how individuals sense of coping coincides with their ability to develop a stronger self, sustaining control over everyday problems (30), hence their own progress. In this perspective, Fron Rehabilitation Centres' follow – up week contributes to strengthen the participants' resources and means of self-help, increasing their self-efficacy and sense of coherence. Learning to accept their illnesses or disease may itself support the ability to comprehend their life situation as opposed to individuals who do not accept their situation, often blaming others for their illness or disease (31). It might be argued that the sense of knowing that they were selected to join the follow-up week two months ahead, actually influenced their health behavior and actions during their weeks at home. The security of knowing they were going to stay at Fron Rehabilitation Centre for a follow- up week may construct ontological security (22) in their everyday life, hence itself being beneficial for subjective health and wellbeing. Furthermore, a follow-up week might be beneficial for participants with long-term illnesses, in the sense that they may have better odds for sustaining life style changes and regain a better wellbeing.

### **Future challenges**

There are quite a few challenges for future evaluation studies, for example we ought to know more about the participants' life situation when they return home again both after the regular weeks and after the follow- up week and how this may affect their sense of coherence, processes and positive changes in daily life. Furthermore, it would also be interesting to know if an increase in subjective health and wellbeing as a result of mood promoting rehabilitation programs would contribute to returning participants to working life, hence further research is needed to establish such facts.

A follow-up study after six months or possibly a year could be worthwhile. Furthermore, we need to know more about the daily life and work situation of the participants who did not have the opportunity to join the follow-up week. It would be of great interest to investigate qualitatively the participants' health and wellbeing among those who did not join the follow-up week. For example, did the notion of not being able to join the follow-up week influence their motivation to continue their lifestyle changes and daily routine? On the other hand, it is quite likely that an increase in the participants' health and wellbeing will make better promises for a future work situation. Successful mood promoting rehabilitation programs may have an impact of the participants total life situation, since, as recent research shows, working conditions and private life burdens seems to have an impact on the development of illness and sickness absence, reinforcing the perception of a total life burden situation (5).

### **Final comments**

Fron Rehabilitation Centres' salutogenic and holistic approach to health and rehabilitation including the benefits of exercise, energy psychology and walking improved their mood (32, 33), hence nature experiences may help the participants to

construct a meaning, identify coping mechanisms and revitalizing the energetic and resourceful parts of self. Moreover, the salutogenic approach could create a solid theoretical framework for health promotion (9, 10, 27), and may counteract events leading to sickness absence (29). For example, according to these authors (9, 10, 27, 29) burnout might be understood as a process of emotional deprivation, where the individual is gradually emptied of the life-giving emotional energy that is expressed as joy, commitment, and empathy. Salutogenesis as well as nature-culture-health activities is a valuable, holistic approach for health promotion and would be worth to implement in practice much more than today (6,7). Additionally, future mood promoting should include a follow-up of their participants.

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## TOWARD THE FUTURE OF HUMAN BODY

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In ancient times future was seen as something dangerous and the aim of societies was to orientate themselves according to the past times.

The beginning of a positive meaning of the future became important for the first time with the antique Jewish and Christianity religions. Judaism and early Christianity developed a trust in the realisation of one's own life, leading into the future. Fortune telling practices and prophesies with which people try to gain knowledge about the future emphasise a linear time concept and overlie the earlier cyclical time concepts based on an older form of a paradise.

The correct execution of the cult and following the religious commandments is being replaced by an orientation toward the future.<sup>21</sup>

In the course of the Enlightenment concepts of the future were separated from their religious origin.

Instead of God, humans (now also nature) increasingly became the reference point. From this point on, the future is seen as linear and irreversible, with one direction.

In modernity the notion of future developed into a future dualism:

- 1. Future as improvement**
- 2. Future as decline**

The idea of the *future as improvement* is especially emphasised in the Utopias of Thomas Morus, Tommaso Campanella and Francis Bacon.

Thomas Morus introduced his "Utopia" (first in 1516) as an alternative to the existing world. With his "City of the Sun" (first in 1602) Tommaso Campanella drafted his ideal, classless society, characterised by sexual constraint. Francis Bacon created his ideal society of reason and science in his "New Atlantis" (first in 1622), in which genetic

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21 Uerz, Gereon, UeberMorgen. Zukunftsvorstellungen als Elemente der gesellschaftlichen Konstruktion der Wirklichkeit (Engl.: *The Day after Tomorrow / About Tomorrow: Concepts of Future as Elements of the Social Construction of Reality*), Muenchen 2006

alteration, the development of new and different species and the creation of visual pictures had a place<sup>22</sup>.

Numerous Utopias were produced particularly in the Renaissance where future was linked with advancement and improvement.

In the 19<sup>th</sup> century these advancement Utopias were also rediscovered in Marxism. Karl Marx developed the idea that the "Kingdom of Necessity" would become the "Kingdom of Freedom".

Along with these notions of progress philosophers and others in the 19<sup>th</sup> century drew upon the old idea of the *development of history* (Geschichtsentwicklung) *as decline and demise*.

In Friedrich Nietzsche's doctrine we find the omnipresent idea of decline.<sup>23</sup> An orientation toward a cyclical time concept and the course of life can also be found with Oswald Spengler, in which a culture is born, grows, flourishes and then dies.<sup>24</sup>

The body is involved in these discussions of future in various ways. As followers of the "orgiastic Chiliasm",<sup>25</sup> the religious doctrine that states a 1000 year reign of Jesus will end the world, the Anabaptists, the prophetic social movement of the later middle ages, called for heaven on earth and in 1534 the satisfaction of all physical and sexual wants.

In contrast, Campanella believed that the control of sexuality to be the foundation for the procurement of a class-less society.<sup>26</sup>

These future conceptions influence also the images of the human being about his body.

Nowadays a growing number of men and women visit fitness studios and beauty clinics to perfect their bodies. Sexual advertising behaviour is especially determined by the sexually active population groups and their intensified emphasis on fitness training. Physical fitness and beauty are used as means of distinction<sup>27</sup> in order to be successful.

Medical and surgical procedures shall create attractive bodies; potency pills have to increase sexual potency; anti-aging-products have to suggest youth and increase beauty – these and other methods of altering the body have led to a new form of biological politics, or *biopolitics*, how Michel Foucault designates it.

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22 Heinisch, Klaus J. (Ed.), *Der utopische Staat (engl.: The Utopian State)*, Reinbek 2008. There you find 'Utopia' by Thomas Morus, 'City of the Sun' by Tommaso Campanella, and 'New Atlantis' by Francis Bacon.

This is viewed as an improvement by the authors named, but not by many others, who see rather negative utopias, for example, Aldous Huxley, *Brave New World*, London 1932 and George Orwell, 1984, Berlin 2008 (Original engl. 1948).

23 Nietzsche, Friedrich, *The Will to Power*, New York 1968 (Original 1906)

24 Spengler, Oswald, *The Decline of the West*, New York 1991 (Original 1922)

25 Talcott Parsons views the Anabaptists as a utopian representation of the 'orgiastic Chilialism', in accordance with Karl Mannheim: Parsons, Talcott, *The Sociology of Knowledge and the History of Ideas*, in: Staubmann, Helmut (Ed.), *Action Theory. Methodological Studies*, Wien 2006, p. 72

26 Like Plato who wanted to reserve the process of procreation for a select few.

27 Bourdieu, Pierre, *Distinction. A Social Critique of the Judgment of Taste*, Harvard 1984

Biopolitics focus on government technologies, which cater to the population of their cities, in particular their health, birth rate, life span and hygiene.<sup>28</sup>

The *first step* of modern governmental intervention began around 1650 when the governments in Europe initiated a population growth, to make the permanent wars in Europe possible as well as the conquest of nearly the rest of the world.

The *second step* of modern biopolitics was begun after the French Revolution to make it possible to continue those politics with newer methods of biopolitics, i.e. 'the proliferation of political technologies that invested the body, health, modest of subsistence and lodging'<sup>29</sup> and other areas.

The *third step* of biopolitics started during the 1960s and applied itself more directly to the medicinal and technological changes of humans than the earlier societal interventions had.

This can also be observed in the increasing separation of sexuality and reproduction. How the increasing separation of sexuality and sexual reproduction in the age of technical reproducibility<sup>30</sup> of people (artificial insemination (IUI), in vitro fertilization (IVF) and cloning) will effect modern day life remains to be seen. Thousands of couples have used these technologies (IUI and IVF). Next it will be possible to replace the uterus because the embryo can be grown in a test tube. Then people will be able to determine the genetic components of their unborn child. Medical and social reasoning will support this because it would be in the child's best interests, and the parents claim a right to have their own child even if not by natural means.

The commonly wide spread use of condoms will decrease the danger of unwanted pregnancies, while fewer and fewer babies will be conceived naturally due to the advancement and development of biological technology.<sup>31</sup> Genetic alteration possibilities which have something to do with human beings will also be discussed. New humans would be created in the absence of sexual reproduction (human clones). Today it is already possible to create new life: cloning was tested in the early 1960s on frogs, and with the cloning of the sheep Dolly it reached a certain maturity.

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<sup>28</sup> Foucault, Michel, *Geschichte der Gouvernementalität. Die Geburt der Biopolitik (Engl. History of Governmentality. The Birth of Biopolitics.)*, Frankfurt am Main 2006 (first french lectures 1978-79), p. 435 and p. 437

<sup>29</sup> Hewitt, Martin, *Bio-Politics and Social Policy: Foucault's Account of Welfare*, in Featherstone, Mike, Mike Hepworth and Bryan S. Turner (Ed.), *The Body. Social Process and Cultural Theory*, London/Thousand Oaks/New Delhi 1995, p 225: Sage Publications

<sup>30</sup> Walter Benjamin still saw a problem at the beginning of the 20<sup>th</sup> century with the reproducibility of *works of art*, see Benjamin, Walter, *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit (Engl.: The Work of Art in the Age of Mechanical Reproducibility)*, 24. Ed., Frankfurt am Main 1999: Suhrkamp

<sup>31</sup> New possibilities and dangers arise in the area of genetic engineering and reproductive medicine, see Sloterdijk, Peter, *Regeln für den Menschenpark (Engl.: Rules for the Human Park)*, Frankfurt am Main 1999.

Habermas, Jürgen, *Die Zukunft der menschlichen Natur. Auf dem Weg zu einer liberalen Eugenik? (Engl.: The Future of Human Nature – Toward a liberal Eugenics?)*, Frankfurt am Main 2005

Sandel, Michael J., *Plädoyer gegen die Perfektion. Ethik im Zeitalter der genetischen Technik, (Engl.: A Plea against Perfection – Ethic in the Age of Genetic Engineering)* Berlin 2008

Harris, John, *Enhancing Evolution. The Ethical Case for Making Better People*, Princeton, New Jersey 2007 (with a critique in Chapt. 7 and 8 on the position of Sandel and Habermas).

The ethnical differences between humans are decreasing due to increasing genetic mixing.<sup>32</sup> There are new differences, for example, between those humans whose DNA was changed and those whose DNA was not changed.<sup>33</sup> This will produce two groups of humans, according to Silver, whose genetic distinction will continually grow apart and who will increasingly be unable to create mutual offspring due to the respective incompatibility of their chromosome sets.

The goal of these ever increasing eugenic measures<sup>34</sup> is, among other things, to develop intelligent, athletic, disease-resistant and longer-living humans.<sup>35</sup> This happens by combining 'genetic optimisation' and 'cloning'. 'Sex-less reproduction' has produced around 150,000 children since the mid 1990s using in vitro fertilization (IVF). With these eugenic technologies, made possible through PID (pre-implantation diagnostic) and PND (prenatal diagnostic), there is even a 'test pregnancy' procedure which will be carried out more often in the future.

Human chimaeras will be created, being able to have two same-gender parents.<sup>36</sup> Cloning will create children with confusing family trees who are simultaneously siblings and parents. The danger with cloning is that genetically cloned identical organisms are susceptible to one specific pathogen, whereas in sexual reproduction the host organism is protected by genetic exchange.<sup>37</sup> The increasing separation of sexuality and producing offspring demands that parenthood become a profession<sup>38</sup> with genetically tested parents. Parenthood will become a highly qualified career, and carrying a child to term will be encouraged by powerful financial incentives.

This intensified individualisation subtracts from the meaning of family and will also lead to a decrease in the birthrate. Mobile, unattached and all-purpose individuals are a result of the new capitalism.<sup>39</sup>

The future of human beings can be conceived as an extension of the process begun in modern times of the development toward self-reference. This process has increased the number of one-parent families in parts of Europe and with it the problems that arise

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32 Silver, Lee M., Das geklonte Paradies. Kuenstliche Zeugung und Lebensdesign im neuen Jahrtausend (Engl.: *Remaking Eden: Cloning and Beyond in a Brave New World*), Muenchen 1998, p. 14

Hahn, Alois, Fuehrt die Globalisierung zur Tilgung von Differenzen? (Engl.: *Does Globalisation lead to Acquittance of Differences?*), in: Runkel, Gunter und Guenter Burkart (Hg.), Funktionssysteme der Gesellschaft. Beitrage zur Systemtheorie von Niklas Luhmann (Engl.: *Functional Systems in Society. Essays on the System Theory of Niklas Luhmann*), Wiesbaden 2005, Verlag für Sozialwissenschaften

33 Silver, l.c., p. 14-18

34 Puritscher, Michael, Bewusst Sein (Engl.: *Being Conscious / Consciousness*), Wien. Koeln. Weimar 2008, p. 395

35 Robertson, Caroline Y., Der perfekte Mensch. Genforschung zwischen Wahn und Wirklichkeit (Engl.: *The Perfect Human: Genetic Engineering between Illusion and Reality*), Baden-Baden 2003, p. 240; Silver, l.c., p. 14-18; Harris, l.c., p. 5

36 Silver, l.c., pp. 219, p. 243-253

37 Vogel, Christian und Volker Sommer, Mann und Frau (Engl.: *Man and Woman*), in: Schievenhoevel, Wulf (a.o.), Zwischen Natur und Kultur (Engl.: *Between Nature and Culture*), Stuttgart 1994, p. 17

38 Burkart, Guenter, Familiensoziologie (Engl.: *Family Sociology*), Konstanz 2008, esp. Chapt. 10 'Die Zukunft der Familie' (Engl.: *The Future of Family*): UVK

39 Boltanski, Luc und Eve Chiapello, Der neue Geist des Kapitalismus (Engl.: *The New Spirit of Capitalism*), Konstanz 2006, p. 169: UVK

from this family situation: for example, the childrens' socialisation and economical security. In modernity alterations and changes to the body are increasing – in the form of biotechnological surgical procedures, such as plastic surgery, performance enhancing drugs and growth hormones, which, in turn, influence the human body.

Biological compounds between humans and animals are being created: for example, with animal organ transplants in humans or animal grown hormones derived from breeding. Furthermore, human-machine hybrids already exist, for example, with artificial organs. These are being upgraded by coupling human and artificial intelligence and optimising the human body with computers and machines, all of which have respective effects on human beings. The applications of new biological methods have a direct influence on the human body: various expectations of the future, for example future as improvement or future as decline can also cause injury to the future of the human body.

## ENVIRONMENT

### EFFECTS OF CLIMATE CHANGE ON NORTH CYPRUS FORESTS

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#### Abstract

Climate change is a significant and emerging threat for living things, either by direct or indirect ways. Climate variability and change cause death and disease, through natural disasters, such as heat waves, floods and droughts. Climate change has shown its effects on the forest ecosystems in Cyprus and many trees died during 2008. These results could be predicted much earlier by evaluating the climatic data and ground water levels alterations for the last 30 years. According to the cumulative departure from the average annual precipitation (mm), the amount of rainfall is decreasing continuously resulting in the decrease at ground water levels. Also, the duration of drought period is increasing according to Emberger's summer drought indices. The most important indicator of the changes in climate is obtained from the decrease in the yield of forest products in the last 30 years. Cyprus is predicted to face very serious drought problems in the future and the main objective of this study is to assess the vulnerability of forest ecosystems by means of impacts of changes in air temperature and precipitation.

Key words: Climate change, Forests, Public health

#### Introduction

A healthy planet needs healthy forests. Forests regulate the water cycle and stabilize soils and also help moderate climate by soaking up and storing carbon dioxide. In addition to these ecosystem services, forests provide habitat for diverse flora and fauna, offer cultural, spiritual, and recreational opportunities, and provide a variety of food, medicines and wood (Ahmad, 2008).

Nearly 4 billion hectares of forest cover the earth's surface, roughly 30 percent of its total land area. Though extensive, the world's forests have shrunk by some 40 percent

since agriculture began 11,000 years ago (FAO, 1993). Three quarters of this loss occurred in the last two centuries as land was cleared to make way for farms and to meet demand for wood. Over the last five years, the world suffered a net loss of some 37 million hectares of forest, according to data from the United Nations Food and Agriculture Organization. Forests are cleared to grow food and energy crops, graze cattle, and meet demand for wood products (Ozturk et al., 2002; IUCN, 2006; Kirnak, 2006). Cyprus (9250 km<sup>2</sup>) is the third biggest island in the Mediterranean after Sicily and Sardinia. Cyprus is situated just outside İskendurun Bay, 70 km from Turkey, and 100 km to the west of Syria, and lies between the latitudes of 30.33-35.41 and longitudes of 32.23-34.55 (Yildiz et al., 2006) (Fig. 1).



**Fig. 1. Location Map**

Kyrenia range s formed during the Permian (250 mya) to Middle Miocene (15 mya). The Kyrenia range is generally characterized as karst topography (Necdet 2003), and its geologic history has involved episodic rift, passive-margin, active-margin, strike-slip and uplift phases (Robertson and Woodcock 1996). The calcareous formation tilts to the north, and directs the majority of drainage to the coast. Interestingly, the range is considered part of Alpine belt connecting the Pyrenees to Himalayan ranges (FAO 1995). Geographic boundaries of the Kyrenia Range was explored with Shuttle Ranging Topography Mission (SRTM) data, a relatively new product derived from an international, 11-day, interferometer mission in early 2000 (Rabus, Eineder et al. 2003). SRTM data, processed in ArcGIS (ESRI 2005), identified the ground-observed multiple ridges along the East to West extent, and estimated the highest peak at 1013 m, 7 m below 1:25,000 map estimates (Theodore, 2009). Rainfall, evapotranspiration, and net recharge is estimated at the Kyrenia Range and ephemeral runoff is observed below

250m contour elevation and above the boundary most water either evapotranspirates or recharges.

The forms the northern boundary of the Mesaoria plain, which during the Tertiary period was the Athalas Sea and accumulated clayey impervious to slightly pervious deposits. The region was formed by a succession of Upper Cretaceous (70 mya) to Pleistocene (c 1 mya) sedimentation (FAO 1995) and has many schist formed hills bounding the plain. The Yialias and Pedhieos Rivers flow ephemerally east into Famagusta Bay and the Serraghis River flows ephemerally west into Morphou. South of the Mesaoria is the Troodos Mountain Massif, occupying the southern third of the island. It was formed in the Triassic period from volcanic activity and subsequent upthrusting of oceanic crust when Africa and Europe converged. These igneous rocks consist of ophiolite, pillow lavas, diabase, gabro, peridotite, dunite, and serpentine (FAO 1995), and while they are rich in copper, they make for a poor drinking water supply.

Cyprus' climate is intense Mediterranean with a cool wet winter extending from November to mid-March and hot dry summers from May to mid-September separated by rapid seasonal change in Spring and Autumn. Kyrenia range mean daily temperature for the high peaks is 7°C in January and 25°C in July, respectively, and by comparison January and July temperatures along the north coast are 13°C and 28°C, and on the Mesaoria plain are 10°C and 29°C. Analysis of temperature at gages in the Mesaoria plane and south coast revealed a 1°C rise the past 100 years (Price, S. et al. 1999), based largely due to the increase in daily minimum values at both gages (Yildiz et al. 2006).

According to Eratosthenes (B.C. 275-195) (Pantelas et al. 2003), Cyprus, including Mesarya, was covered by dense forests, and the remainders of these forests lived on Trodos and Kand lower parts (Table 1). However, a severe destruction of vegetation has taken place during the last few decades. An overgrazing and over-exploitation of the plant cover, drainage of marshes, estuaries and deltas has led to a disappearance of many ecosystems. A retrogressive succession is visible in the *Pinus nigra* and *P.brutia* forests. The transformation of phrygana, maquis and remnants of forests in to agricultural lands or urbanization on fertile soils are adding to these processes.

**Table 1.**

**Main Forest Tree Species**

| Species                       | Area (Ha) | % Whole forest area |
|-------------------------------|-----------|---------------------|
| <i>Pinus brutia</i>           | 30613     | 46.79               |
| <i>Pinus pinea</i>            | 338,2     | 0.52                |
| <i>Pinus halepensis</i>       | 85,7      | 0.13                |
| <i>Cupressus sempervirens</i> | 1626,4    | 2.49                |
| <i>Juniperus</i> sp.          | 9533,2    | 14.57               |

In places where the forest was destroyed, the bush forms of whose height never exceeds 4 meters and which are known as maquis became dominant. Most important elements of these forms are *Quercus coccifera*, *Arbutus andrachne* and *Styrax officinalis*. When maquis is destroyed, thorny shrubs settle in the environment. Also in this formation, *Thymus capitatus*, *Rosmarinus officinalis*, *Thymra spicata* and *Asphodelus aestivus* are dominant. Natural vegetation of Mesarya plain disappeared and agriculture is practised nearly on the whole of the plain (Yildiz et al. 2006).

### Forest diversity

In North Cyprus, forest lands constitute 65426 ha or 19.69% of the area of the country. Of these forests, 25711.7 ha are considered to be productive while the remaining 39714.3 ha of forests are unproductive or highly degraded due to excessive exploitation (Statistical Yearbook 2008). The forestation of these areas is very important for economy because of the increasing demand for forest raw materials and country's development.

North Cyprus Forests are included in the temperate forests group. Nearly 25% of the forest areas in North Cyprus are composed of broad-leaved species and 75 % coniferous species.

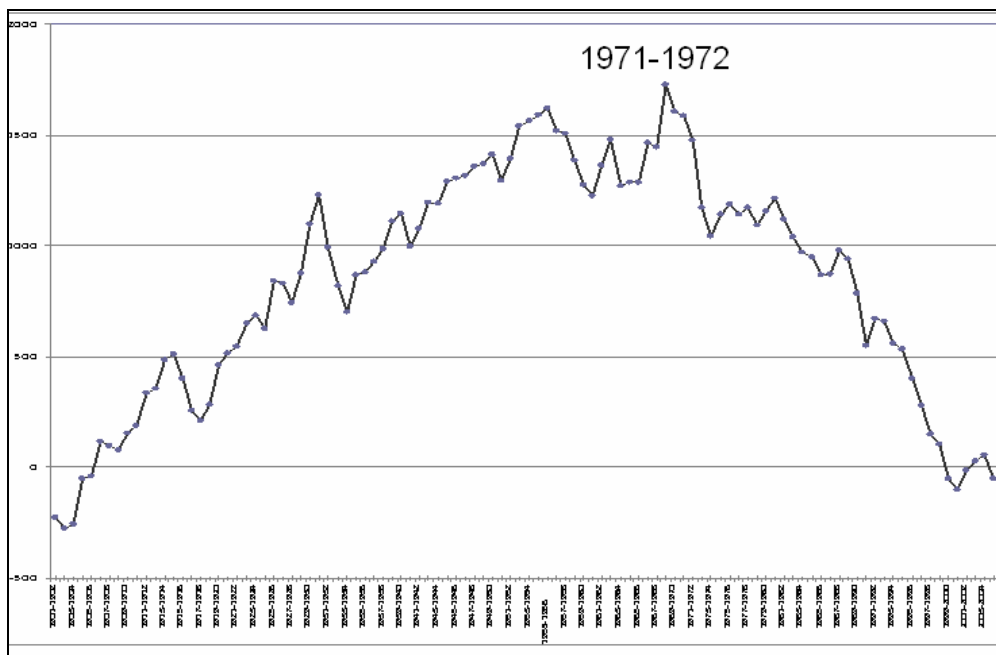
The primary vegetation formations of forest ecosystems of the North Cyprus are Shrub (maquis and garrigue) formation, Lower (Eu- or Thermo) Mediterranean belt forests, Characteritic plants of this floristic region are; *Acer obtusifolium* Sibth., *Arbutus andrachne* L., *Calycotome villosa* Poir., *Celtis australis* L., *Ceratonia siliqua* L., *Cercis siliquastrum* L., *Crataegus azarolus* L., *Crataegus monogyna* Jacq., *Cupressus sempervirens* L., *Erica manipuliflora* Salisb., *Erica sicula* Guss., *Genista sphacelata* Decne., *Hedera helix* L., *Juniperus phoenicea* L., *Laurus nobilis* L., *Myrtus communis* L., *Nerium oleander* L., *Olea europaea* L., *Phillyrea latifolia* L., *Pinus brutia* Ten., *Pinus halepensis* Mill., *Pinus pinea* L., *Pistacia atlantica* Desf., *Pistacia lentiscus* L., *Pistacia terebinthus* L., *Quercus coccifera* L., *Quercus infectoria* Olivier., *Rhamnus alaternus* L., *Rhamnus oleoides* L., *Styrax officinalis* L., *Ulmus canescens* Melville., *Vitex agnus-castus* L., *Zelkova abelicea* (Lam.) Boiss., *Ziziphus lotus* Lam., *Ziziphus zizyphus* Meikle.

### Climate Change

Climate change is arguably the greatest challenge to humanity and one of the utmost international concerns emerging as a major problem for modern society (Niyazi 2004; Ahmad, 2008, Kalem et al. 2009). The national governments at the United Nations Conference on Environment and Development (UNCED) in Rio in 1992 stressed that human beings are at the heart of the desertification problem, either as actors or victims and have accordingly adopted a number of appropriate resolutions, guiding principles and action programmes for all relevant institutions and actors. Chapter 11 of Agenda 21 concluded that "The impacts of loss of forests are in the form of soil erosion, loss of

biological biodiversity, damage to wildlife habitats and degradation of watershed areas, deterioration of the quality of life and the reduction of options for development".

A major assessment of the state of dry land area undertaken for the UN Conference on Desertification held in 1977 had revealed that more than 80 per cent of rangelands, about 77 per cent of rain-fed crop lands and 21 per cent of irrigated land were affected by degradation (Dregne, 1986). A follow up-date published by UNEP in 1984 showed that the dry sub-humid zone was also affected by degradation, there by increasing the size of the threatened area to 4500 million hectares. A recent assessment of world state of desertification (World Bank, 2004) has shown that the dry lands cover more than 6.1 billion ha, over one third of the earth's surface, out of which 1 billion ha are hyper arid with limited human activity. In the period 1995 – 2005, there has been a net loss of 3% in forest cover all over the world.



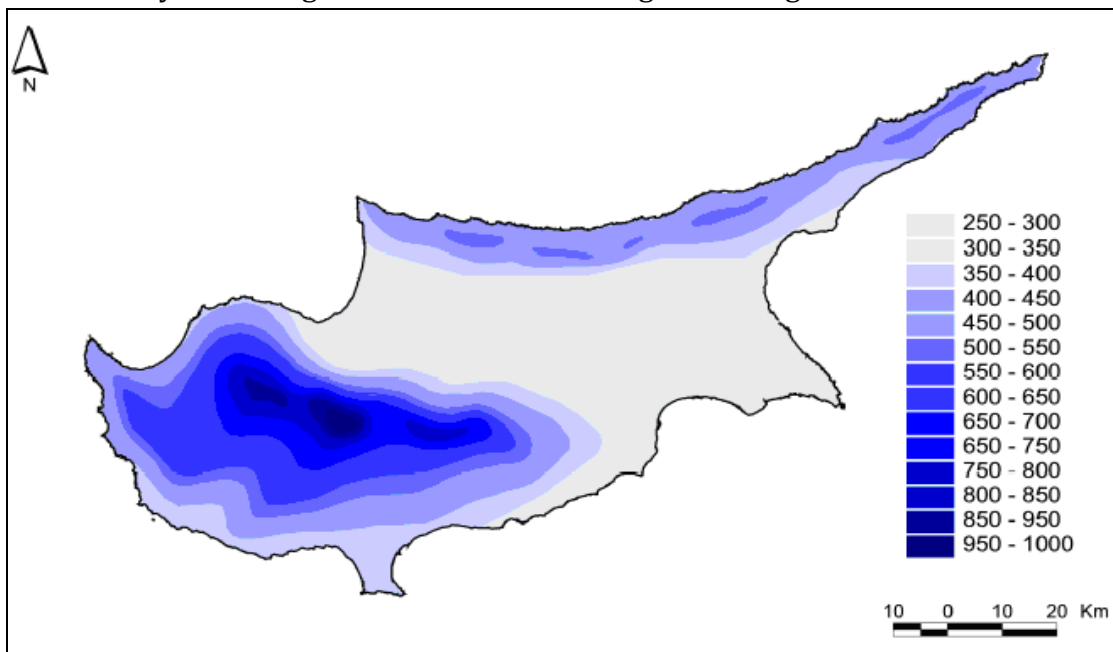
**Fig.2. Cumulative departure from the average annual precipitation in Cyprus (mm).**

Cyprus experiences a typical Mediterranean climate with dry hot summers and mild rainy winters. There are 4 types of climate observed in the country. The most outstanding feature of the changes experienced in the climate of Cyprus is increase in summer temperatures. The rainfall has decreased significantly during the last four decades (Fig. 2). Work on ground waters revealed serious losses. Thus the problems of water shortage, land use and land cover in the region will get seriously affected by climate change.

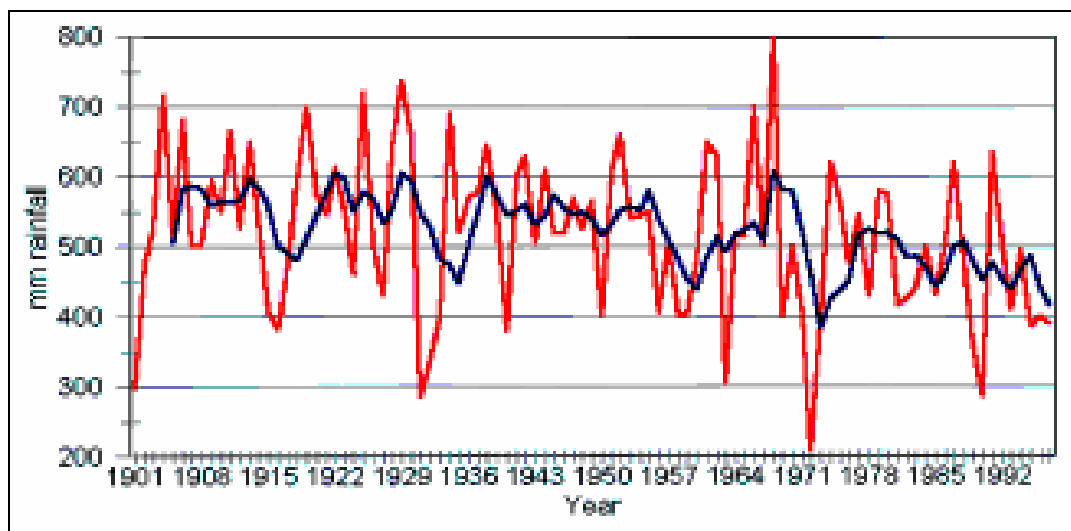
### Precipitation Analysis

Kyrenia Range may include snow rarely during the winter at higher altitudes, and cloud deposition, stratiform drizzle and intense cumuliform rain. The coastal proximity of the

range creates an orographic convective precipitation cycle, where the relatively warm and moist on-shore winds are lifted up the Mountain to cool, condense, and precipitate. According to FAO reports (1995), rainfall on the coast is 450 mm and increases to 550 mm in the Kyrenia Range ridges at about 1000 m elevation, and then decreases to between 300 and 350 in the Mesaoria Plain. Research summarized by Biyikoglu (1995) reports that average northern Cyprus annual rainfall depths have declined from an average of 402 mm during 1941 to 1972 to an average of 382 mm during 1975 to 1993. These values are rough averages for the region (Fig. 3). The vegetative-soil complex and surrounding rocks and barren soil at the area provide the surface cover for intercepting precipitation into the aquifer of the Kyrenia Range as a main water recharge at the region.

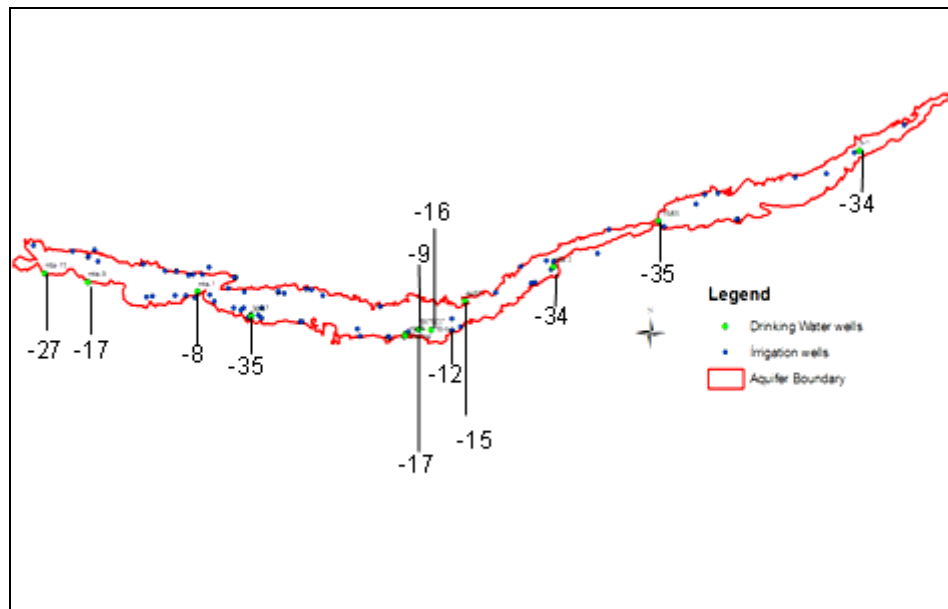


**Fig. 3. The average precipitation distribution of Cyprus in mm**

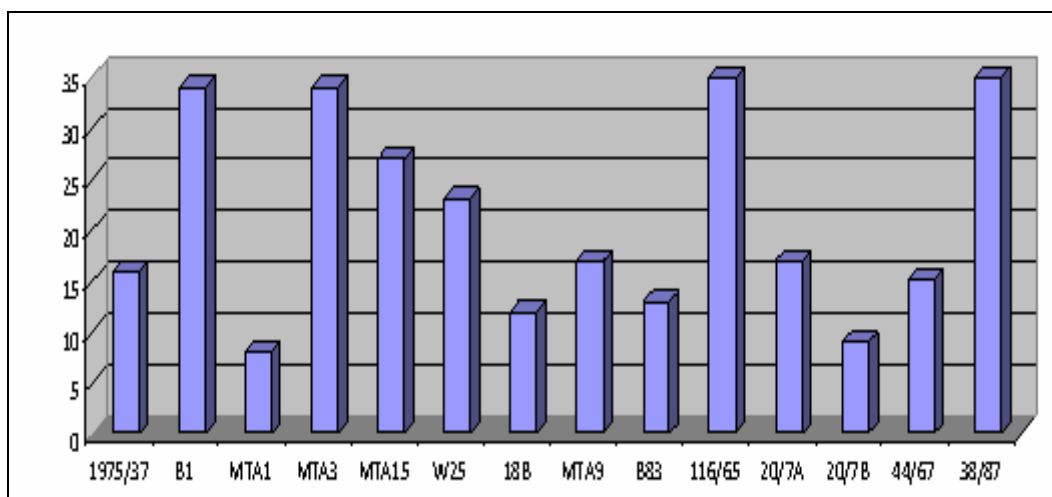


**Fig. 4. The precipitation between October and April of each year in 20<sup>th</sup> Century and 5 year moving average. ([http://www.protonique.com/cyprus\\_water/files/natres.htm](http://www.protonique.com/cyprus_water/files/natres.htm))**

Fig. 4 shows the rainfall between October and April of each year in 20<sup>th</sup> century (red line) and the 5 year moving average (dark blue line). It can be seen that the rainfall is quite variable, ranging from just over 200mm to just under 800mm in extreme years. It is interesting to note that the 5-year average rainfall is consistently falling over time and has dropped by about 100 mm since the beginning of the century. It is impossible to draw conclusions as to the cause or causes, but it seems likely that climate change is a major contributory factor. Along the north coast and within the Mountains, annual precipitation averages by gage observations is 531.4 mm. The decrease in precipitation rates and increase in pumping rates from the boreholes (Fig. 5a) has dramatically declined the groundwater levels within the last 15 years (Fig. 5b).



**Fig. 5a.**The drawdown distribution of main wells at the Kyrenia Range.



**Fig. 5b.** Change in the GWL of the main pumping wells at Kyrenia Range between 1993-2008.

### Evapotranspiration Analysis

Actual evaporation for the Kyrenia Range was estimated by Theodor and Gokcekus, 2009 using the robust and globally tested complementary relationship areal evapotranspiration (CRAE) model of Morton (Morton 1983). Unlike many models that only estimate potential evapotranspiration, CRAE focuses on establishing actual outputs to the atmosphere. Results from the CRAE model are shown in Figure 3 for three gages along a transect cutting through the Kyrenia Range. The figure reports precipitation (PPT) and pan evaporation (PAN). The results has shown that on the north coast, station Evapotranspiration is 55% of precipitation, the mountain station has Evapotranspiration at 30% of precipitation. The average ET depth for the entire gage area was 255 mm, which compares well with the 280 mm island average ET rate estimated by the Cyprus Water Development Department (Cyprus WDD 2002). For the Kyrenia region, average annual evapotranspiration is 222.6 mm.

### Water Budget

Annual average surface water recharge into the Kyrenia region is taken as the residual of areal precipitation and evapotranspiration. For the Kyrenia Range, this is 308.6 mm. Together with the 85 km<sup>2</sup> areal extent of the Kyrenia region and one third infiltration rate of the area, annual recharge volume is computed at 8.7 Mm<sup>3</sup>. In a late 1960s study of the 30 to 60 m thick coastal plain aquifer north of the Mountain Range, annual rainfall recharge was estimated at 12 Mm<sup>3</sup>, with non extracted recharge quickly discharging as sub-marine springs (MOANR, 1971). The today's estimates has shown that the annual recharging of the aquifer has fallen third fold in the last 25 years.

### Threats to the Forest Vegetation of North Cyprus

The most important threats to the forests of North Cyprus include the following; Conversion of natural forests into monoculture plantations of species of commercial value is widespread. Monoculture management reduces habitat diversity, especially in forestlands where microhabitat differences are much needed for wildlife. Further, monoculture plantations having narrow genetic diversity may be sensitive to insect and disease epidemics. In the period 1975-2008, a total of 492 fires burned a total of 13461.6 hectares of forest land (Fig. 6).

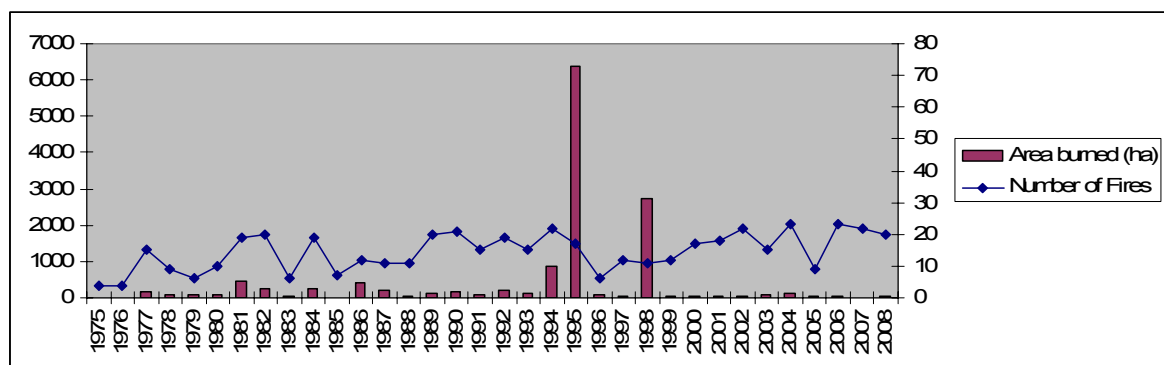


Fig. 6. Number of forest fires and area burned in between 1975-2008.

This represents 15 fires annually with an average area burned of 27 hectares per fire. In recent years, there has been a gradual decrease in the area burned due to the increased and effective use of technology in transportation, communication and fire suppression. There isn't any relevant data to show the real effect of harmful insects and fungi, wind, illegal tree cuttings and agricultural land development, unsuccessful forestation attempts. Expansion of agriculture particularly into woodlands, coupled with use of inappropriate technologies is one of the most devastating causes of deforestation. Overgrazing is another important factor itself through reduction of the vegetative cover and occurs when livestock density becomes excessive and too many animals are grazed on the same area and/or the wrong types are used.

### **Conclusions and Recommendations**

Forests will play an important and crucial role in the sustainable development of North Cyprus. The key is to make links in unexpected places. They have a lot to offer; in the mobilization, encouragement, and use of scientific knowledge-technology to help achieve sustainability goals and to support the implementation of sustainability practices, conservation and sustainable use of bioresources; in-situ conservation of forests. They offer an insurance policy for the future, the wild plants found in the forests safeguard vanishing native habitats, help in the implementation of adaptive management strategies in vulnerable ecosystems, sustainable management of existing natural vegetation to maintain carbon stocks and the monitoring of new plantings intended to offset carbon emissions, to ensure their ecological suitability. The survival and quality of forests in most developing countries depend on the strength of community forestry organizations formed by the people traditionally involved in forest use. These organizations, with assistance—rather than control—from the government, are essential for promote forest development and limiting forest extraction.

White it is on the rise, community-controlled forestry is still unconventional in most developing countries. However, unconventional approaches are necessary because both governmental and private control over natural forests have led to the rapid disappearance of these forests. The overall statistics—that the world's forests shrunk at a rate of 1.8% between die late 1970s and the late 1980s—obscure even more dramatic deforestation in many developing countries and even greater declines in the availability of marketable timber, fuel wood, and foods. Demand for timber, agricultural land, and pastures have put enormous pressure on the forests. The apparent alternative of state or private plantations has failed in many countries, for both economic and physical reasons. At the same time, government efforts to induce people to plant trees often fail because government incentives are not sufficient to prevent inappropriate deforestation or to fulfill expectations of government-sponsored replanting. New approaches that address people's motivations to develop and nurture forests responsibly are clearly needed.

Local people are often the most appropriate managers and regulators of forest uses for four reasons. First, limiting the number of users can reduce the pressure on the forest resource.

Traditional forest users are typically few in number compared to the total number of potential forest users, and the intensity of traditional forest uses is usually modest or moderate. "Community forestry" should mean the control over forest uses by a more-or-less well-defined group of people claiming customary use rights, not that everyone in a particular geographical area has access to the forest resources. Second, traditional forest users living in or near the forest site have an interest in the long-term sustainability of the forest's, as long as they know that they will be able continue to enjoy the benefits of the forest. Given that traditional users depend on the forest for at least a portion of their income, they will be more likely to guard the long-term future of the resources. Third, if the government permits local forest users to police the forest, then effective regulation has a real chance. The government can rarely do so itself, due to chronic shortages in funding and staff. With government regulation, people intent on encroaching into the forest know that they run the risk of facing only a few government forest guards; with community forestry, invaders run the risk of facing a whole community mobilized to protect its forest-use rights.

Finally, traditional forest users are generally more likely to have developed practices that are compatible with the long-term survival of the forest. Other groups, less familiar with the forest, are more likely to engage in short-sighted practices.

Forest fires have a major impact on the sustainability of forests. The pressures brought about by certain realities of ecology and economics, and our increased demands for multiple resources require the development of new policies and attitudes towards fire. At the same time, increasing complexity and sustainable forestry will require a deeper understanding of fire and the development of more effective management systems. Effective management systems will not prove successful unless they include the demands and acknowledge the role of the society on forests.

Depending on the effectiveness of policy and institutional frameworks, there is also an opportunity for countries to promote sustainable development through bioenergy expansion. Bio-energy offers the opportunity of reducing carbon dioxide emissions per unit energy production, reducing dependence on energy imports and, together with other alternative fuels, creating a cap on soaring oil prices.

This serious situation has started gradually attracting public awareness, so education and conservation regarding the plant world has gained a vital importance. The answer to all these questions lies in the sustainable development by meeting the needs of the present without compromising the ability of future generations to meet their own needs. The uses of trees, forests and associated benefits many direct and indirect values to the people in the form of food resources; medicinal preparations and drugs for people and their livestock; fodder and browse, wood and fibers for building, making tool handles, means for earning cash, and provision of religious and other sacred needs; maintaining and improving the soil conditions and the hydrological systems; while assuring self renewal processes of the land base and its sustainability.

Tree planting in various forms can constitute an affective means of combating desertification and, more particularly, desertification; while providing material needs of the society and supporting environmental functions.

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## **CO-BENEFITS STRATEGIES FOR AIR POLLUTION AND CLIMATE CHANGE THE ROLE OF BIOMASS**

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### **Abstract**

Air pollution is conventionally related to substances which may cause harmful effects to human health, acid deposition, eutrophication of ecosystems or photochemical ozone creation, while climate change depends on gases which cause global warming and/or stratospheric ozone depletion. All those adverse effects became matter of concern in different time, with more or less evidence and care, so that air pollution and climate change up to now have been faced with distinct approaches and distinct directives in the European and International arena.

Very recently the scientific community realised that they are strictly related each other in a quite complex phenomenon and agreed on the opportunity and the urgency to look for a systematic and integrated approach able to identify co-benefits strategies and not-regret solutions.

Air pollution and climate change are primarily related to energy sources, productions and consumptions, issues which are in the agenda of the policy makers following the

Climate and Energy package, adopted last December 2008 by the European Parliament, and in consideration of the Resolution, approved in February 2009 by the same Parliament, on "2050 The future begins today-Recommendations for the EU's future integrated policy on climate change", which recommends to cut off 80% the greenhouse emissions by 2050, as well as in view of a new global agreement which is expected to be reached within the Kyoto Protocol at the next 14<sup>th</sup> Conference of the Parties in Copenhagen in December 2009.

Whatever the ambition of the energy and climate policy will be the consequent practical actions may not be irrespective of other pressing issues as public health, water supply, biodiversity, deforestation, desertification, etc., together with social implications.

In this context forests are going to have a crucial role in that, on one side, they share with public health the damaging effects due to some air pollutants (NO<sub>x</sub>, SO<sub>x</sub>, NH<sub>3</sub>, O<sub>3</sub>), while, on the other side, they are involved in climate change as the major carbon dioxide sinks and potential sources of biomass for renewable energy production. However, the last is a win-lose solution in that it almost closes the carbon circle, but is also a source of emissions of VOC, PM and CH<sub>4</sub>, at least with the current technologies.

The paper looks through all the mentioned technical and political aspects of the environmental problem in its whole to figure out the role that biomass may play in the next decades within a global strategy for a sustainable development.

## Introduction

Air pollution is conventionally related to substances which may affect human health, or bring to acid deposition, eutrophication of ecosystems or tropospheric photochemical ozone formation, while climate change is claimed to be directly depending on gases which cause global warming and/or stratospheric ozone depletion. The two issues became matter of concern in different time, with more or less evidence and care, and consequently had distinct histories, approaches and policies both at European and International level.

Quite recently the scientific community has been emphasizing that air pollution and climate change are strictly intertwined each other, and therefore they need to be addressed with a unique, integrated, and effective environmental policy to find out the last of which sponsored by EFCA in November 2008 [1].

Forests and biomasses are a well-rendered example of environmental issue strongly requiring an integrated approach to face air pollution, climate change and several other aspects involved.

To this end, it is useful to mention some of the declarations of the European Parliament resolution adopted in February 2009 [2]. First of all, it recognises to forests "*... three-dimensional roles in climate change mitigation: as carbon stocks through sustainable use and protection of forests, as carbon sinks through forestation and as a substitute for fossil fuels and fossil products as a renewable raw material...*". However, for the EU Parliament

the possibility of exploitation of biomass from forests must hold to the definition, at EU level, of suitable criteria for their sustainable use. Furthermore, in the same resolution it is underlined that “...forest destruction lies in related socio-economic factors such as poverty and under-development...”.

This paper looks through some technical and political aspects of the environmental problem in its whole to figure out the role that biomass, somehow related to forests, may play in the next decades within a global strategy for a sustainable development.

### **Distinct histories for air pollution and climate change**

Air pollution problems emerged in the sixties of the last century, either in several European countries or in USA, in a context of evident harmful effects on public health. It soon became evident also the transboundary character of some air pollutants when damages to forests in Germany and Scandinavian due to acidification were observed.

On its turn, the climate change issue has been raised some time later, in terms of probability that our civilisation in a more or less long term could have affect somehow the climate through polluting emissions, causing a downward or an upward of the Earth's surface average temperature.

The differences between air pollution and climate change came out in several more aspects. To this day AP is conventionally referred to easily reactive substances with short lifetime, is blamed for adverse local short-term effects, is commonly associated to urban or industrialized areas for which urgent local measures are claimed by citizens, is on the agenda of any local and national recognizable and recognised authority.

Conversely, CC is due to greenhouse gases which are, with few exceptions, hardly reactive substances with long lifetime, is expected could raise difficult situations at global level sometimes in future, is perceived as primarily linked to remote desert or deforested areas, far from our backyard, and in need of questionable global commitments (the GHG's concept is not yet completely understood even if the public opinion is getting more aware of the phenomenon); furthermore, public opinion can hardly figure out a worldwide authority with power and ability to manage the climate change phenomenon. Tough at the beginning of the seventies the need of an integrated approach to face environmental problems appeared soon evident, the huge amount of legislations and regulations adopted in the following decades, ever more and more specific and detailed in each sector, had cause a fragmentation of the environmental objectives, but also of competences, education, policies, and stakeholders with diverging interests that today may hardly made up into a reasonable integrated approach.

In other words, air pollution and climate change had two different histories from phenomenological, technical, administrative and political point of view.

Once again, all the more so for the forests. Different perception of different aspects of the problem, and consequent sector-based actions, sometimes ineffective: air pollutants ( $\text{NO}_x$ ,  $\text{SO}_x$ ,  $\text{NH}_3$ ,  $\text{O}_3$ ) causing damages to forests; direct combustion of forests while is

neutral for CO<sub>2</sub> it releases air pollutants (mainly CO, COV, PM, PAH); forests involved in climate change as the major carbon sinks; forests as potential sources of biomass for renewable energy production somehow with consequent deforestation, etc.

### **The climate change**

Climate change is primarily related to energy sources, productions and consumptions. Those issues are in the agenda of the policy makers following the Climate and Energy package, adopted last December 2008 by the European Parliament: it is recommended to achieve a 80% cut off of the greenhouse emissions by 2050. The effective percentage of greenhouse emission reduction will be matter of a global agreement expected to be reached, according to Kyoto Protocol, at the next 14<sup>th</sup> Conference of the Parties to the United Nations Framework Convention on Climate Change in Copenhagen in December 2009.

The main EU and worldwide objective is to keep the increase of the Earth mean surface temperature within 2°C, compared with pre-industrial levels. The target is based on the outcome of the 4<sup>th</sup> Assessment Report of the IPCC [3] which address causes (long-lived greenhouse gases) and drivers of climate change.

The 20-20-20 target for 2020, regarding GHG emissions, or whatever will be agreed in Copenhagen, will be, firstly, a political act with an economical leitmotiv, largely depending on the agreement with developing countries such as China or India and on the level of commitment of USA in the field. It may give a new heading to the global economy, not necessarily produce the best heading from the environmental point of view or be sure that the agreed objective will be reached in due time, since it actually lacks an adequate integrated approach.

To give an example, consider a 10% biofuels target, assigned to transport and sufficient for an adequate level of blending, and included in the mandatory EU target of 20% renewable energy [4]. This was a “political” choice based on key principles such as cost-effectiveness, flexibility, internal market, subsidiarity, fairness, competitiveness and innovation, but not to possible environmental implications related to massive biofuel production, whose analysis has been admittedly postponed to a second step. The low-priority given to environmental aspects is not the best way for a straight integrated approach.

The point is that AP and CC, as well as problems related to energy sources and demand, water resource and waste water, soil management and urbanisation, transport and mobility, agriculture and biodiversity, forests and desertification, etc., are matters linked each others, that should be faced in a unique and coherent vision of sustainable development, together with social and economical implications. This demand is widely recognised and wished in many international studies and reports (see for example [2, 5, 6]), but hardly performed in practice.

## The role of biomass

The Impact Assessment accompanying the EU document on the “Renewable Energy Road Map” [7], evaluates the benefits from the use of biomass in terms of greenhouse gas emissions, security of supply, employment, export opportunities, biodiversity impact, regional development and rural economy. However, the document recognises that *“replacing conventional heating with biomass heating can have an adverse air quality effect if poor quality equipment is used”* but do not suggest possible solutions to prevent that effect.

The European Council, on its turn, looking at the link between biodiversity and climate change [8] emphasises the need of a better understanding of the issue. It recognises a *“...risk that the expansion of crops dedicated to the production of biomass and biofuels, although with the aim of replacing fossil fuels and thus potentially reducing global greenhouse gas emissions, will, in the absence of proper evaluation and adequate environmental safeguards, have a negative impact on biodiversity and food security, and possibly increase climate impacts”*.

Also the European Parliament [2] is aware that *“... issues of sustainability, environmental impact and the availability of arable land in competition with food production have still not been satisfactorily resolved”*.

In short, the use of biomass, wherever it is obtained from, is already commonly practiced, is generally perceived as a safe renewable source of energy, most likely it will be propel after next Copenhagen Conference, but without a real in-depth environment impact assessment yet.

It is not a negligible circumstance that 2.5 billion people, mainly in developing or undeveloped countries, depends on biomass, signally on wood and charcoal, as primary source of energy [5] for household uses (cooking and heating). This practice, in principle, closes the natural cycle of CO<sub>2</sub>, with a relatively low loss account, and consequently should be welcomed; unfortunately the biomass combustion, signally in smaller and old inefficient wood stoves, is source of conventional air pollutants like nitrogen oxides, volatile organic compounds, and particulate matters, with harmful consequences to public health (indoor and outdoor) and to climate change. Furthermore, that practice commonly leads up to a soil impoverishment and depletion of forest areas.

Nothing to say that to face the environment problem in that case means to look after the social problem first. A road-map cannot be burden, asking for drastic change against tradition, habits and culture; more conveniently, those people should be helped with local targeted projects in order to make easy their sustainable development in a reasonable medium term.

To bring electricity may be a first step, avoiding the massive use of conventional fossil fuels.

Replacing coal with biomass to produce electricity or conventional fuels with biofuels in transport, air quality may be favoured. However, the massive production of crops as a renewable source of energy bring a risk to affect food prices if the quantity of available arable land assigned to grow crops for biofuels is not under control somehow, especially in poor countries where the perspective of a big sudden business may induce the conversion of any kind of arable land and/or a dramatic deforestation, with consequences on climate change and biodiversity.

This means that the amount of bioenergy has to be locally maximized together with land-use efficiency [9], selecting at the same time the more appropriate technology, among those available, each of them having different environmental, economic and social impacts [10]. There should be also concern for the invasiveness of bioenergy crops which seems to be 2 to 4 times larger than for other crops [11].

One further not-negligible aspect to be concerned with bioenergy crops is the water footprints (WFs), different for each of them. The availability of water is a crucial aspect, in some vulnerable regions, where the hydrological cycle is already compromised or is expected to be affected just as a consequence of the dreaded climate change.

The WF of crops assigned to electricity or heat is smaller than that of crops assigned to biofuels because the biomass used in the first case is total, while in the last case only a fraction is utilized. For example, crops as sugar beet, maize, or sugar cane, assigned to electricity production, have a WF of 50 m<sup>3</sup>/Gigajoule (GJ), more favourable than the WF for crops assigned to biofuels; even within this family there is a difference (smaller for bioethanol than for biodiesel) [12].

The last problem, but absolutely not the least, is fire of wildland, forest, brush, prairie, etc.; it may be due to practices to burn crop residues, or to arson for land clearance, or to natural events. However, fire is often consequence of abandoned lands due to migration toward large cities. While at the beginning of the twentieth-century almost 97% of population used to leave in rural areas, today it is around 50%. This phenomenon has been encouraging through the policy that, after the 2<sup>nd</sup> world war, has been greatly oriented to the industrial development leaving behind agriculture and forests.

In fact, desertification, abandoned areas, forest fires, degraded lands, reduced biodiversity have been experienced in the last century, before attention were put to climate change.

Furthermore, that kind of migration transfers poverty from rural areas to the outskirts of large cities and generates damaging consequences to the environment in both the abandoned and occupied areas; it causes desertification and biodiversity loss on one side, while, on the other hand, in large cities, it increases demand for potable water, energy, chemical products, land for urbanization, roads, mobility, with a subsequent increasing production of solid wastes, waste water, air pollution, environmental impact. Both the rural poverty and the degraded life in the outskirts are exacerbated. The migration process is threatening social life, economy, and the environment as a whole.

As said before, to bring electricity may encourage to remain in own lands, but it is impossible to cover with national electricity grids wide areas with low population density. In those cases a great effort by developed countries should be done to supply renewable sources of energy. For example, a wind power generator of, say, 3MW installed in a poor village could help a community of several thousand inhabitants, whit a benefit to the global environment much higher than it is obtained by installing it in Europe, where it would simply cover the annual energy consumption of few hundred people.

## Conclusions

It is common convincement now, even if not yet put in practice, than air pollution and climate change need to be faced with a coherent and integrated approach.

However, when this exercise is made, it is immediately realised that public health, sustainable development, energy, water resources and waste water, urbanisation and solid wastes, soil management and biodiversity, forests and biomass, etc., must be involved as well, together with economical and social aspects.

Mass media often use to stress that climate change is going to affect all aspects of the social life, but misses to say the contrary, that a disordered selfish manage in a wide number of sectors of the social life has been affecting climate change.

The difference between the two approaches is preeminent, since not solution for climate change may be irrespective of the local social-economical contest. Forest and biomass may greatly contribute to control air pollution and climate change, as well as economical and social local problems if an in-depth environment impact assessment is made congruent with the *polluter pays* principle, principle worldwide accepted as a guideline.

In the Kyoto protocol contest Clean Development Mechanism (CDM) and Joint Implementation (JI) have the potential of providing a suitable, valuable and efficient framework, much more than any Emission Trading Scheme among developed countries; many more and much stronger initiatives should be addressed to qualify poor geographical areas and allow villages and communities all over the world to survive in their own geographical areas, preventing any disordered and out of control migration phenomena.

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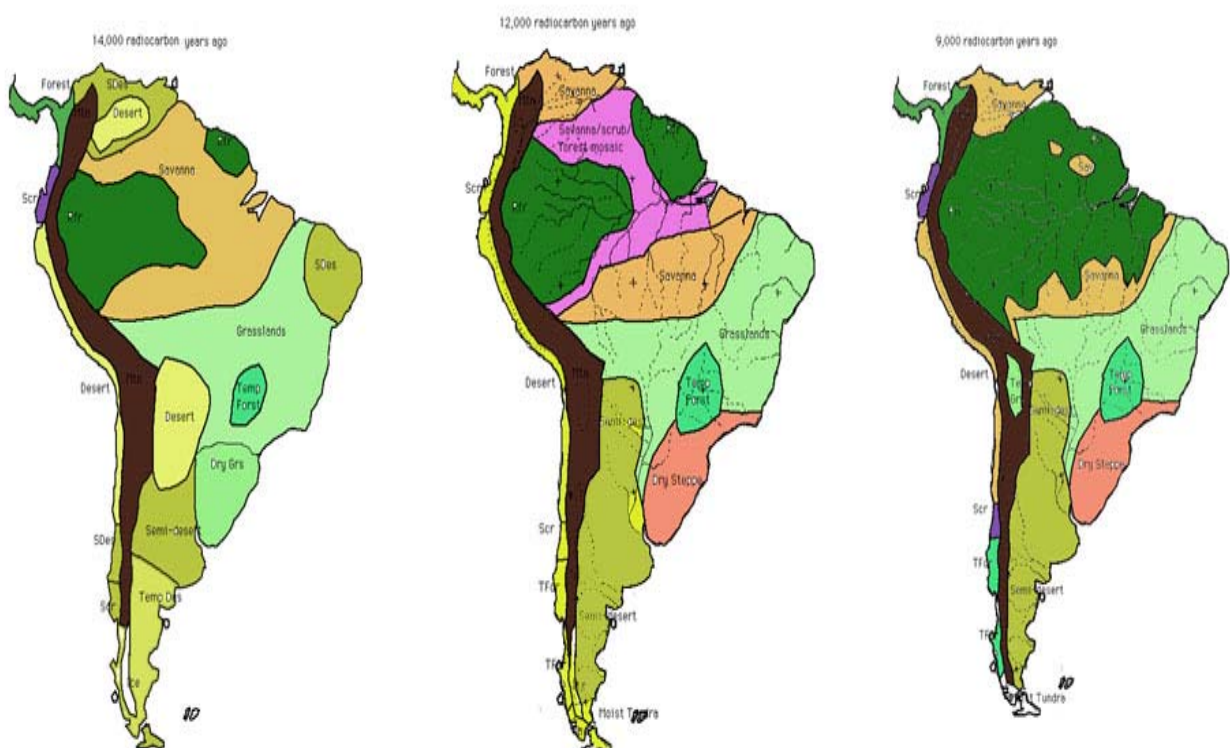
## ECOLOGY AND FORESTS FOR PUBLIC HEALTH

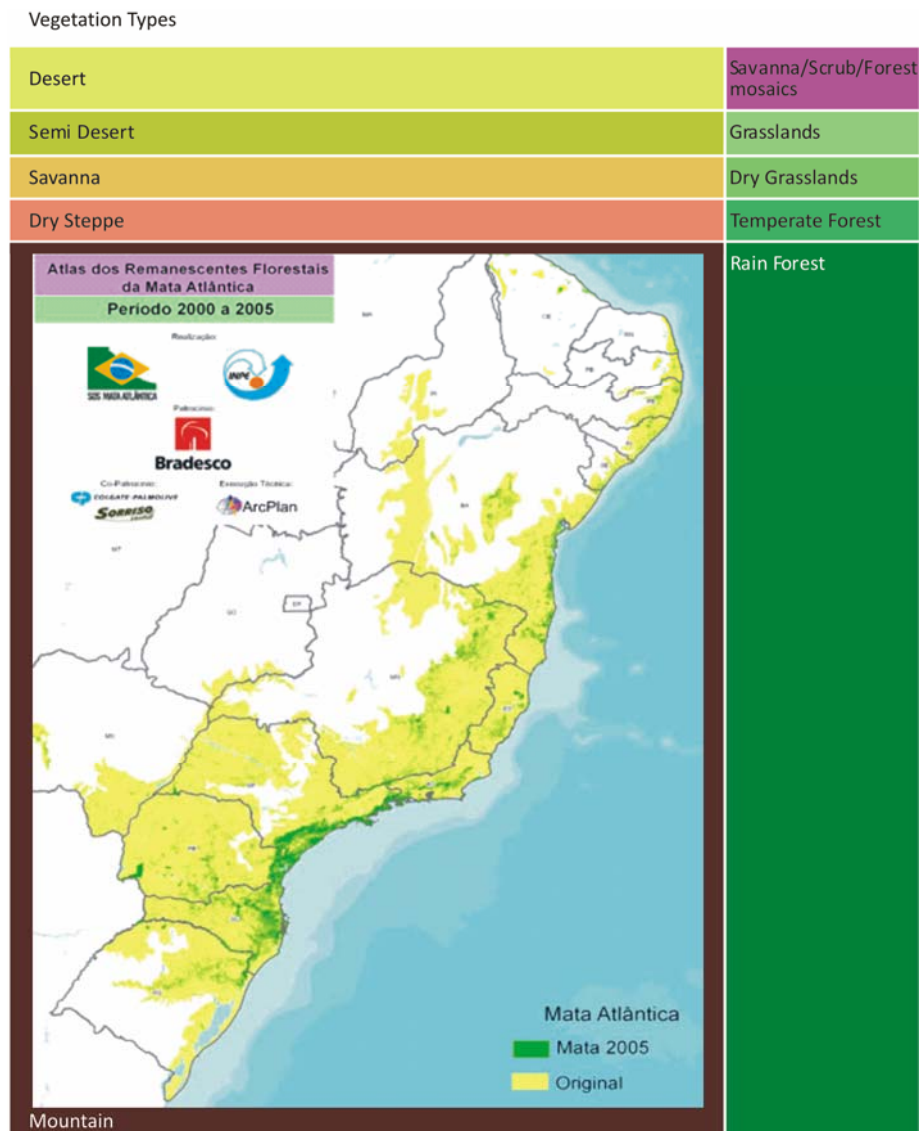
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Rain Forests spread out or shrank during past ages according to climate changes on Earth. The end of the last big glacier, the Würm Ice Age, occurred around 12.000 years before present (ybp) and we entered the actual interglacial period, with many dry and wet seasons driving the growth or decrease of forests all around the world.

In Brazil, the Amazon Forest only reached its current size 9.000 years from now and the Atlantic Forest even later than that – by that time it was some type of temperate forest, as seen on maps below.





**Fig. 1. PALEOVEGETATION OF SOUTH AMERICA**

In present days, the Amazon Forest covers only 80% of its original area (the year of 1500 DC is the reference year and corresponds to the arrival of the Spanish and the Portuguese to the South American continent), with an average rate of 15 thousand km<sup>2</sup> of deforestation per year. The Atlantic Rain Forest is in worse condition, for its remains correspond only to 7% of its original area. Many conservation units<sup>40</sup> were created to protect these remaining areas.

A large number of environmental acts were issued since the portuguese arrived in Brazil. Although the first acts for the protection of nature intended to regulate the

<sup>40</sup> In Brazil, the term conservation unit signifies “the territorial area and its resources, including jurisdictional waters, of relevant natural characteristics, legally instituted by the Public Administration, its objective being conservation and well defined limits, under a special administrative system, to which are applied adequate guarantees of protection” and nature conservation is “the management of the human use of nature, comprehending preservation, maintenance, sustainable usage, restauration and recuperation of the natural environment, in order that it should offer the most benefit, on sustainable basis, to current generations, keeping it potentially capable of satisfying the needs and aspirations of future generations, and ensuring the survival of living beings in general” (National System of Conservation Units – SNUC, Law 9985 of 2000)

extraction of Brazil wood and other timber strategically important to the construction of buildings and vessels, whose prices were falling in Europe due to the large amount sent over, what went against the interests of the Portuguese Crown<sup>41</sup>, the first relevant ecological act dates only from 1861 when Emperor D. Pedro II pronounced the recovery of Tijuca Forest, almost destroyed by sugarcane and coffee cultivation. The recovery aimed to restore the wellsprings that supplied the city of Rio de Janeiro that was going through a severe water shortage. It was the first known act for the restoration (not recuperation) of an ecosystem, for the decree determined the utilization of seedlings of native species of the region. Twelve years were spent by Major Archer and 6 slaves to plant 72 thousand seedlings and the success was surprising: 80% of survival rate. Today it is the biggest forest totally within an urban area, the Tijuca National Park, surrounded by the city of Rio de Janeiro, Brazil, with many positive impacts on air quality, lower temperatures of its vicinity and natural leisure for the stressed inhabitants of that big city. It shelters the Christ, The Redeemer, one of the New Wonders of the World.

The next important act was the creation in 1896 of the City of São Paulo Park, now called Alberto Loeffgren State Park, after its first director, being the first park created in South America. It houses the Octavio Vecchi Museum with its large collection of wooden planks with carvings representing the original trees, its flowers, leaves, etc. The park occupies an area of 174 hectares inside the city of São Paulo, with fragments of the ombrotrophic semi-deciduous and dense forest. It offers several attractions such as the grove of Brazil wood, wild animals, library, theater, recycling workshop for adults and children, the Garbage Museum and many others, all related to Environmental Education, contributing to the better lives of its visitors and neighbors.

Another attempt to create a conservation unit in Brazil took place in the beginning of the 20th century, to be precise in 1911. A decree of President Hermes da Fonseca created a Forest Reserve in the State of Acre, in the Amazon region. It was a daring initiative at the time, forgotten until definitely delimited and established in the 80s.

The protection of the “beauties of nature” was defined, in the 1934 Constitution, as the responsibility of the Union and the States, when the Forest Code (Decree 23793/34) was instituted. It described the types of Brazilian forests: protective forests – of integral and inalienable conservation for the protection of waters, fixation of dunes, prevention of erosion, to guarantee public health as well as the protection of frontiers. The reminiscent forests or parks and woods, necessary for the preservation of the landscape and of the fauna and flora, also of integral and inalienable protection; the yielding forests and model forests, accessible to economic exploration. In the same year were proclaimed the Water Code (Decree 24643/3), the Hunting and Fishing Code (Decree 23672/34) and the Law for the Protection of Animals (Decree 24645/34), which considered maltreatment, among other things, to neglect the milking of cows for more

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<sup>41</sup> *The Brazil Wood Statute* (1605), by order of King D. Felipe II of Portugal and Spain, limited the embarkation of Brazil wood for Europe to a maximum 600 tons

than 24 hours and the mechanical fattening of fowl, thus eliminating any possibility of Brazil competing with France in the production of *patê de foie gras*.

Those legal instruments founded the Parks for the Breeding and Sheltering of Animals, consolidating the following categories of conservation units: National, State or Municipal Park, National Forest, Protective Reserve (biological or esthetic), Reserve Park, Shelter and Breeding of Wild Animals. Up to the end of the 50s, there were 7 of these conservation units in Brazilian territory, among them Itatiaia (1937), Iguaçu and Serra dos Órgãos National Parks (1939).

Several years later, in 1965, the Forest Code was reviewed (Law 4771/65), the existing categories obliterated and new ones established: National, State and Municipal Park and Biological Reserves, offering integral protection, but which should “conciliate integral protection of fauna and beauties of nature with educational, recreational and scientific objectives”; National, State and Municipal Forest of sustainable usage. The Areas of Permanent Protection (APP) were instituted along the banks of rivers and lakes, including artificial ones, surround springs, occupy steep slopes (declivity superior to 45°), and summit of hills, mountain ranges and mountains, edges of barren tableland and plateaus, mangroves and sandbanks, altitudes over 1800 meters and still pronounced by the Public Authority, when important to diminish erosion, secure dunes, protect sites of remarkable beauty or scientific or historical value, protect roadways and railways, ensure public well being, shelter endangered species and situated in indigenous territory. It finally created the Legal Reserves (RL), which protects areas of primitive forest found inside private rural property and occupying 20 to 50% of the property (in the Amazon region 50%, in other regions 20%), irrespective of its size. Enforced for the last 44 years, the Forest Code is currently being discussed by society: farmers want to lower the percentages, especially in the Amazon region, which environmentalists want to raise. It promises to be a long debate caused by the demand from society for the attention of the inspecting organizations that have never treated these percentages as a priority.

In 1967, the new law for Protection of Animals (Law 5197/1967) made official de right “to protection of animal species in their native habitats by the creation of specific sites for their preservation, the National Biological Reserves, where only activities related to Environmental Education or to science research were allowed. The Federal Hunting Parks were also founded for hunting, recreation and leisure, and open permanently or during certain parts of the year.

From 1981, the Special Secretariat for the Environment, created in 1973, proposed four new types of Conservation Units: the Ecological Stations (ESEC) and the Areas of Environment Protection (APA) – Law 6902/1981, the Ecological Reserves (RESEC) and the Areas of Relevant Ecological Interest (ARIE) – Law 89336/1984.

These conservation units were different from the previous ones. The Ecological Station was created imposing a series of restrictions, eliminating leisure and recreation, allowing only public visitation of an educational and scientific nature. Three years later

the Ecological Reserve was even more restrictive: while the Ecological Station, differing exclusively on the emphasis on its prospective role as places for research and allowed bolder more scientific research, which could cause alterations in ecosystems to as much as 10% of its extension to the limit of 1,500 ha, the Ecological Reserve allowed only Environmental Education and research involving restricted observation or collecting of specimens.

**Table 1.**

**Conservation Units in Brazil, Source: IBAMA 2006/CNRPPN 2009**

|                        | CATEGORY                            | FEDERALS   |                      | STATE / MUNICIPALS |                      |
|------------------------|-------------------------------------|------------|----------------------|--------------------|----------------------|
|                        |                                     | Qt         | Area (hectares)      | Qt                 | Area (hectares)      |
| <b>FULL PROTECTION</b> | Ecological Station                  | 31         | 7.167.830,53         | 136                | 724.127,00           |
|                        | Natural Monument                    | 0          | 0                    | 3                  | 36.907,00            |
|                        | Park                                | 59         | 19.166.819,00        | 180                | 7.697.662,00         |
|                        | Wild Life Refuge                    | 1          | 128.521,00           | 3                  | 102.543,00           |
|                        | Biological Reserve                  | 27         | 3.806.340,00         | 46                 | 217.453,00           |
|                        | Subtotal                            | 118        | 30.269.510,53        | 368                | 8.778.692,00         |
| <b>SUSTAINABLE USE</b> | Environment Protection Area         | 30         | 9.612.043,00         | 181                | 30.711.192,00        |
|                        | Areas of Natural Relevant Interest  | 17         | 43.591,49            | 19                 | 12.612,00            |
|                        | Forest                              | 74         | 16.927.703,00        | 58                 | 2.515.950,00         |
|                        | Extrativist Reserve                 | 43         | 8.438.451,00         | 28                 | 2.880.921,00         |
|                        | Fauna Reserve                       | 0          | 0                    | 0                  | 0                    |
|                        | Sustainable Development Reserve     | 1          | 64.735,00            | 9                  | 8.277.032,00         |
|                        | Private Reserve of Natural Heritage | 472        | 468.992,66           | 386                | 258.724,60           |
|                        | Subtotal                            | 637        | 35.555.516,15        | 681                | 44.656.431,60        |
| <b>TOTAL</b>           |                                     | <b>755</b> | <b>65.825.026,68</b> | <b>1.049</b>       | <b>53.435.123,60</b> |

Another type of conservation unit created, the Areas of Environmental Protection, are big areas that may even contain whole towns (like the city of Petropolis, in the mountains of Rio de Janeiro State). In this type of Conservation Unit of sustainable usage, human activity are liberated but remain under the control of a Managing Organ that can impose some restrictive conditions, as the implantation of industries of high risk.

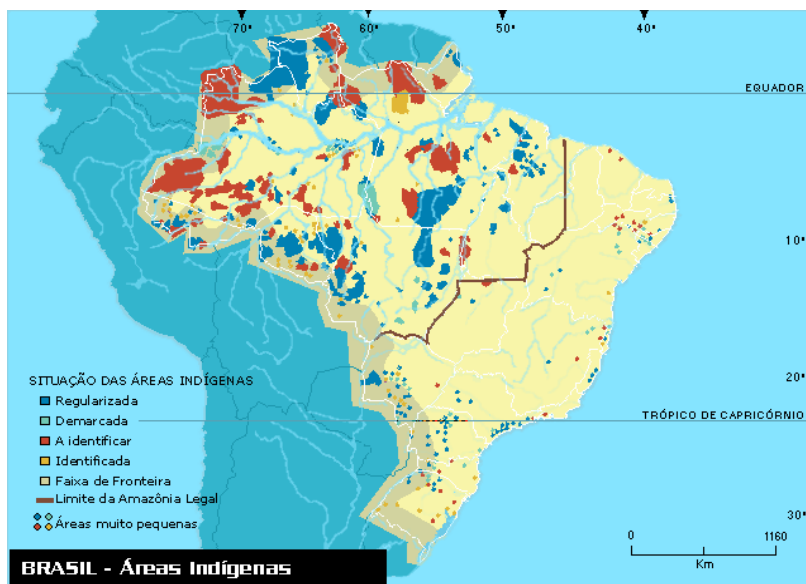
The Areas of Relevant Ecological Interest are usually small public or private areas, unoccupied by humans, which have extraordinary natural characteristics or shelter rare local species. They are also units of sustainable usage, but which, for their small size, are only viable as touristic attractions.

These categories of Conservation Units remain valid and were consolidated by the National System of Conservation Units (SNUC – Federal Law 9985 issued in 2000), except the Hunting Parks, whose activity has been very limited by the law concerning Crimes Against the Environment (of 1998) and nowadays is practically prohibited in all of Brazil. By 1996, the Ministry of the Environment, created in 1992, consolidated the Private Reserves of Natural Heritage(RPPNs), that are a strategic point in conservation of nature. Since 1988, the new Constitution established that both the government and society share the responsibilities on conserving nature. The RPPNs are playing a very important role in connecting the preserved areas into ecological corridors, in order to increase the living areas for the big mammals. Today there are about 1.88 federal, state, municipal and privates conservation units covering 119.260.150,28 hectares, 14% of the national territory, as shown in Table.

### **Indian reserves are another type of Protected Area**

Since 1967, after the founding of the National Foundation of the Indian (FUNAI), the Indian Reserves began to be established, based on the Indian Statute, Federal Law 6.001 from 1973. One of the most recent ones, The Raposa do Sol Reserve, with its 1.7 million hectares, was on the world media because of its size and transfrontier situation: it's a huge area situated in Brazil, Guiana and Venezuela, bringing up the discussion on national security. It was finally confirmed as a reserve through a Supreme Court decision.

Indian Territories are mostly in the Amazon, as shown in the Map below:



Color legend

|  |                        |
|--|------------------------|
|  | Officially established |
|  | Demarcated             |
|  | To be identified       |
|  | Already identified     |

**Map 2. Indian Territories (Source:**

**Funai – 2997)**

There are approximately 600 officially established Indian Territories covering 109.6 million hectares, 13% of the total Brazilian territory, sheltering 227 different ethnic groups with a total of 480,000 people.

Together, the Indian Territories and the Conservation Units sum up to 27% of Brazilian Territory, but are they really effective in their utmost purpose, protecting Nature?

The first big difficulty about the creation of Conservation Units is the need to expropriate the owners established within the area of the unit to be created, but there's never enough financial resources for that, so the new Conservation Unit coexist with private properties, causing a huge conflict, farming and stockbreeding are forbidden in full protection conservation units.

A striking example is the Chapada dos Veadeiros National Park. It was created in 1961 with 625 thousand hectares, with no money to expropriate the original farmers, who continued farming. After many years of conflicts and discussion, the solution was to resize the park with the exclusion of these conflicting areas. This was done twice, reducing its size to 10% of the original area (down to 65.514 hectares). This Park received the recognition as World Natural Heritage by UNESCO, but as the problems persist, it may become a National Forest, a type of conservation unit of sustainable use so they don't need to expropriate the farmers anymore – problem solved!

The effectiveness of conservation units is a much discussed theme by academics.

A survey by IUCN, in 1984, showed that three out of five problems of conservation units throughout the world are concerning management policies: inappropriate legislation, improper management practices and lack of resources and trained people.

In 2007, World Wildlife Fund (WWF) used the tool RAPPAM (Rapid Assessment and Prioritization of Protected Area Management) to study 246 conservation units in Brazil, of all categories. The results showed that the element Management had deficiencies in human and financial resources, in the element Planning, human resources was again the main problem. In 2002 the Ministry of Environment made a different attempt to improve the effectiveness of national parks. It tried to implement an Environmental Management System based on ISO 14001. Three important parks took part in this process, with similar results: the EMS was implemented - processes analyzed and control actions taken, but people had enormous difficulties to cope with continuous improvement philosophy. A non conformity with an internal cause was impossible to admit.



**Fig. 2. Settlement by Jau River shore**

This is related to public service management policies and work performance evaluation, a non conformity could be related to someone's mistake and no one would take that risk. The aimed certification was not obtained, also for another important reason: the paradox of not taking care of its own rejects – only one of the three parks partially treated the sewer water. These were three of the most important and equipped parks of the federal system, certainly the others less important conservation units don't treat their effluent waters as well.

Another example of attempt to eliminate protected areas is happening in the Jau National Park, created in 1980 and declared World Natural Heritage by UNESCO in 2000, with 2.4 million hectares and a very peculiar detail: it's the only park that covers an entire basin of a big long river, the Jau river.

By 1907, a family migrated from Sergipe, one of the Northeast States, and settled in the region to tap rubber from the forest, as thousands of other families as well. A little village was set, based on the river resources: decorative fishes and turtles. That was a major trouble with the park's administration for these activities are forbidden in protected areas.

Now the descendants of this family are claiming to be a "quilombo"<sup>42</sup> community and are asking for 719 thousand hectares to be taken from the park area. The discussion is getting old, and it seems that the Supreme Court will make a decision on that.

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<sup>42</sup> Quilombo is a self-recognized community formed by the reminiscent of ethnics groups that were assumed resistant to historically slavery oppression, as defined by Palmares Cultural Foundation, the responsible organization for this kind of social relation;

Meanwhile, people keep collecting fishes and turtles against the established conservation rules.



**Fig 3. Environment agents apprehension of an illegal cargo of turtles**

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# INTERACTION IN THE NATURE

## CLINOPTILOLITE TUFF – THE CARRIER OF AMINO ACIDS

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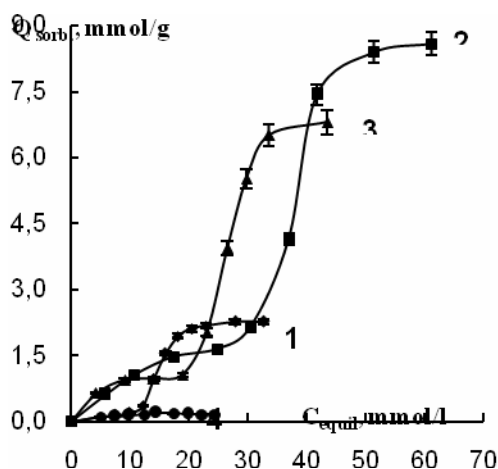
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Clinoptilolite tuffs are minerals which belongs to the group of the aqueous aluminosilicates of alkali and alkaline earth elements with tetrahedral framework structure that includes a cavity (cavities), occupied by cations and water molecules, which are widely studied by equilibrium and sorption kinetics of mineral ions [1-3]. The published data on the sorption of biologically active substances, particularly amino acids from aqueous solutions on zeolite tuffs scrappy and contradictory [4-7]. Currently zeolite tuffs are used in the pharmaceutical industry as carriers that allow receiving double benefit: increasing the duration of drug action and prevent its premature deducing [8]. In the given work the results of studying of equilibrium properties of sorption from solutions containing individual amino acids (glycine (Gly),  $\alpha$ -alanine ( $\alpha$ -Ala) and valine (Val) and phenylalanine (Phe)) and binary solutions containing glycine and phenylalanine on clinoptilolite tuff are presented. Influence of acid activation of natural sorbent on its sorption capacity for phenylalanine is revealed.

The observable clinoptilolite tuff located in Lyulin known as the enterosorbent "Klimont". X-ray analytical data represents that this type of zeolite is a multiphase mixture, the main rock-forming material is clinoptilolite –  $\text{KNa}_2\text{Ca}_2(\text{Si}_{29}\text{Al}_7) \text{O}_{72} \cdot 24\text{H}_2\text{O}$  (68%) [9]. The ratio of  $\text{Si}/\text{Al} \approx 4$ , which allows to assign it to high-silicon and sufficiently highly resistant to temperature and acids. The ion exchange capacity of clinoptilolite tuff was determined by the amount of displaced cations by ion  $\text{NH}_4^+$ , which is 1,90 mmol/g [10].

The experiments were conducted with aliphatic amino acids: glycine (Gly),  $\alpha$ -alanine ( $\alpha$ -Ala) and valine (Val) which was supplied by "PRS Panreac", and aromatic amino acid phenylalanine (Phe) - "Reanal" (Hungary), the classification of "p.f.a".

Sorption equilibrium in the system clinoptilolite tuff (fraction 0,02 - 0,06 mm) - aqueous solution of amino acids was studied at 295 K under static conditions using variable concentrations [11]. Sorption of amino acids was carried out from solutions with  $\text{pH } 5,8 \pm 0,2$ , in which glycine,  $\alpha$ -alanine, valine and phenylalanine were present mainly in the form of zwitterions. Interfacial distribution of amino acids in the sorption process on clinoptilolite tuff evaluated on the basis of sorption isotherms (Fig. 1).



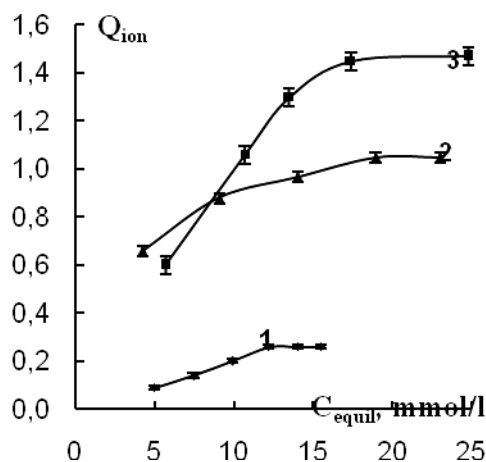
**Fig.1. Sorption isotherms of amino acids on clinoptilolite tuff: 1) Gly<sup>±</sup>, 2) α-Ala<sup>±</sup>, 3) Val<sup>±</sup> and 4) Phe<sup>±</sup> at 295K**

Sorption parameters of natural sorbent in relation to amino acid changes in the following order:  $Q_{\alpha\text{-Ala}} > Q_{\text{Val}} > Q_{\text{Gly}} > Q_{\text{Phe}}$ . Maximum sorption capacity of α-alanine, valine, glycine and phenylalanine is 8,58, 6,80, 2,26 and 0,16 mmol/g respectively. In the same order, hydrophobic of amino acids is increase, with the exception of glycine: Gly – α-Ala – Val – Phe [12].

The authors in [5] noted that the strong hydrophobic zeolite NaZSM-5 (Si/Al = 80) absorbs only phenylalanine and tyrosine, but not absorbs the α-alanine, because of its lower hydrophobicity compared with aromatic amino acids. According to [4], the decrease in the ratio Si/Al of zeolite is manifested in its greater hydrophobicity. Taking this fact into consideration, it becomes clear how to change the sorption parameter of clinoptilolite tuff with respect to the α-Ala, Val and Phe. The exclusive position of glycine in this row may be caused by, firstly, the greater hydrophilic of glycine in comparison with natural sorbent, secondly, larger hydration the shell due to its specific structure (the small size of the molecule and as a side radical containing mobile hydrogen atom).

Analysis of the spectrograms of source clinoptilolite tuff and containing amino acid indicates the appearance of additional bands in the 3200 - 2900 cm<sup>-1</sup> and 1800 - 1400 cm<sup>-1</sup> for the sorbent saturated with an amino acid. The absorption in the range 2930 - 2850 cm<sup>-1</sup> associated with the asymmetric and symmetric stretching vibrations of C-H groups of the sorbate. Deformation vibrations of this group appear in the interval 1460 - 1430 cm<sup>-1</sup>. The absorption bands in the 1590 - 1570 cm<sup>-1</sup> belong to the asymmetric stretching vibrations of COO<sup>-</sup> group. Deformation vibrations of NH<sub>3</sub><sup>+</sup> - group observed in the range 1540 - 1520 cm<sup>-1</sup> [13-15].

The sorption isotherms of amino acids on clinoptilolite tuff present the characteristic S-shaped curve, which indicates that different types of interaction in the system clinoptilolite tuff - water - amino acid. There was established that the sorption of amino acids from dilute solutions ( $C_{AA} < 15$  mmol/l) occurs mainly on the mechanism of ion exchange due to electrostatic interactions. The amount of displaced in the filtrate of K<sup>+</sup>, Na<sup>+</sup>, Ca<sup>2+</sup>, serves a measure of the ion exchange component of sorption (Fig. 2).



**Fig.2. Changing the amount of amino acids: 1) Gly<sup>±</sup>, 2) α-Ala<sup>±</sup> and 3) Val<sup>±</sup>, sorbed by ion-exchange mechanism**

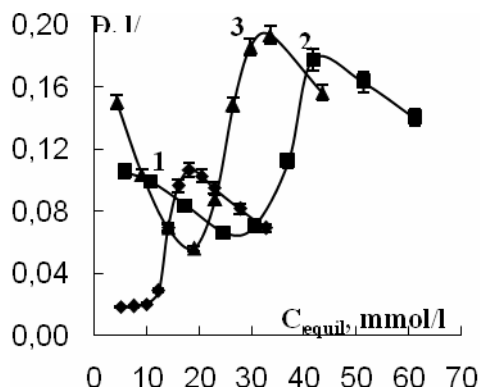
It is noted that the ion-exchange capacity of natural sorbent for amino acids from aqueous solutions does not reach full size, determined by the ammonium ions, because of the steric factor. In the sorption of phenylalanine on clinoptilolite tuff displacement of exchangeable cations from the matrix of the sorbent into the solution is not observed. As mentioned in [4], the observed small value of the sorption parameters for phenylalanine are explained by the weak physical interaction between the sorbent and sorbate.

It has been revealed that the sorption of zwitterions of the aliphatic amino acid from more concentrated solutions (concentration range is determined by the nature of amino acids) (Fig. 1) is accompanied by the increasing the sorption parameter, thus the quantity of the amino acid adsorbed on ion-exchange mechanism has been not changed (Fig. 2). The sharp rise in the sorption capacity clinoptilolite tuff may be specified by the formation of associates of amino acids in the structural matrix of the sorbent, formed by the dipole-dipole interaction of zwitterion groups and the formation of complexes between aluminum framework and amino nitrogen of amino acids.

The associative nature of the sorption of aliphatic amino acids on the clinoptilolite tuff confirmed by a large sorption capacity of natural sorbent in the relation to the zwitterions of amino acids, compared with cations. At the equilibrium, the maximum sorption capacity of zwitterions of amino acids approximately 2,5 times exceeds the capacity of cations corresponding amino acids, and the amount of sorbed cations, amino acids corresponds to the amount of displaced ions K<sup>+</sup>, Na<sup>+</sup>, Ca<sup>2+</sup>. Adsorption band at 2700-2500 cm<sup>-1</sup> and peaks at 3120 cm<sup>-1</sup>, 3110 cm<sup>-1</sup>, 3116 cm<sup>-1</sup> for glycine, α-alanine and valine, respectively, characterizing the vibrations of the COO...NH<sub>3</sub><sup>+</sup>, indicate the formation of associates in the structural matrix of the sorbent.

The equilibrium distribution coefficient for investigated amino acids at the sorption from concentrated solutions has a maximum (Fig. 3). This type of dependence is due to the intense absorption of amino acids on natural sorbent when there is strong

effects of association and a decrease in intensity with the further increase of concentration when there is a saturation of the associates of the sorbate.

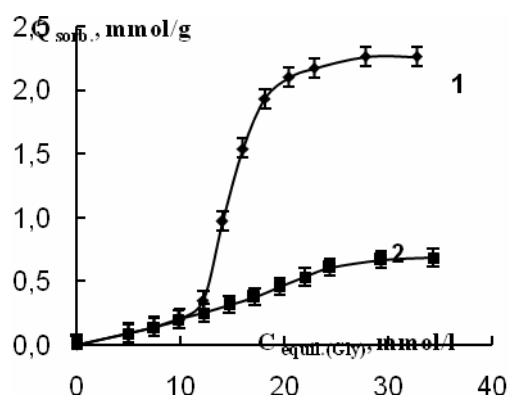


**Fig.3. Dependence of distribution coefficient of amino acids from the equilibrium concentration of Gly<sup>±</sup> (1),  $\alpha$ -Ala<sup>±</sup> (2) и Val<sup>±</sup>**

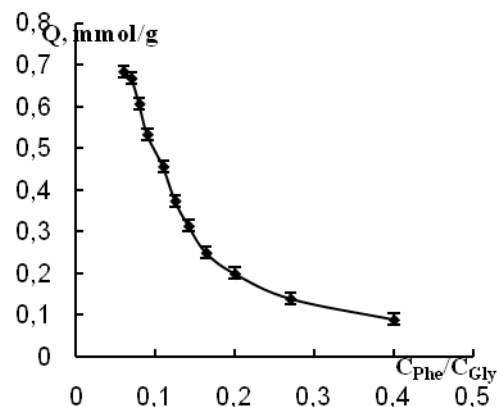
According to the data obtained by electron and scanning probe microscopy the average size of cavities and channels of natural mineral ranges from 5 to 200 nm, whereas after the sorption of glycine,  $\alpha$ -alanine and valine – 1 to 90 nm. The absence of cavities and channels of large size in the samples containing amino acid indicates that the amino acid is absorbed in the data field in the form of associates.

The great interest is represented with experimental data on studying mutual influence of glycine and phenylalanine in the equilibrium sorption characteristics of individual ions from their respective mixtures. The concentration of glycine in the initial solution was varied from 5,0 to 30,0 mmol/l at the constant concentration of phenylalanine, equal to 2,0 mmol/l. The choice of investigated amino acids is due to the differences in the structure of the side radical (and hydrophobicity, respectively), the hydration characteristics and mechanism of the association.

It has been found that the transition from individual to binary mixtures of amino acids changes the distribution of components between the sorbent and solution. In the sorption from binary solutions with increasing concentration of the aliphatic amino acids the sorption capacity of clinoptilolite tuff to ions Gly<sup>±</sup> increases and in relation to Phe<sup>±</sup> slightly decreases (Fig. 4).



**Fig. 4. Sorption isotherms of amino acids on clinoptilolite tuff: 1 – Gly<sup>±</sup>, 2 – Gly<sup>±</sup> in the presence of Phe<sup>±</sup>**

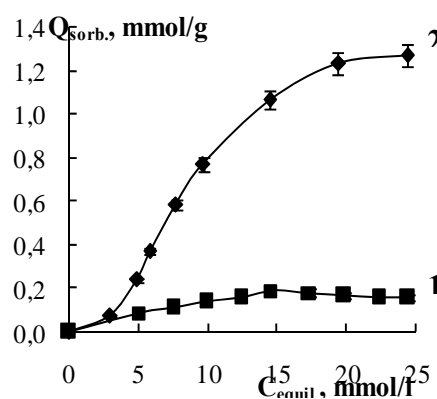


**Fig. 5. Dependence of separation factor Gly<sup>±</sup> and Phe<sup>±</sup> the ratio of  $C_{Phe}/C_{Gly}$  in aqueous solution**

The presence of aromatic amino acid leads to the change in the form of the sorption isotherm of glycine and a decrease in sorption parameters for the aliphatic amino acid in 3,3 times, while the amount of Gly, adsorbed on ion-exchange mechanism, as compared with the individual amino acid has been not changed. The decrease in the selectivity of sorption Gly on clinoptilolite tuff in the presence of Phe, probably is due to the formation of associates of Phe-Gly in solution. Revealed that with decreasing ratio  $C_{Phe}/C_{Gly}$ , reduces the possibility of association of amino acids, which is manifested in a sharp increase in their partition coefficient (Fig. 5).

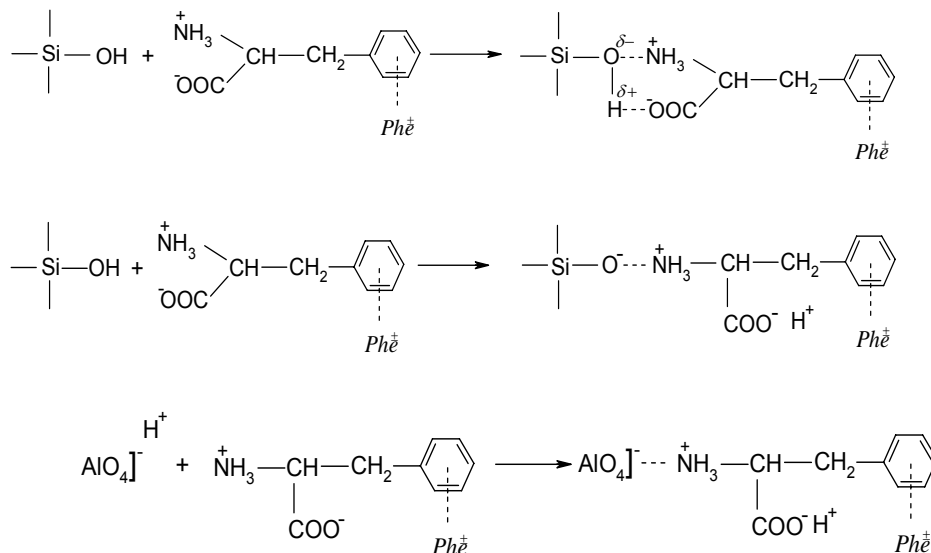
To improve the sorption capacity of clinoptilolite tuff to the hydrophobic aromatic amino acids Phe, the acid activation by 5M HCl has been carried out. According to the literature [19], acid activation of zeolite tuffs consists of three phases: decationation, dealumination of the sorbent and the formation of the silicon phase. As the result of treatment the clinoptilolite tuff by 5,0 M HCl, removal of exchangeable cations ( $K^+$ ,  $Na^+$ ,  $Ca^{2+}$ ) and dealumination is observed. There is an increase in the ratio Si/Al, which is reflected in the IR spectrum in the shift of the absorption bands characteristic of tetrahedra  $SiO_4$  and  $AlO_4$  to higher frequencies [20]:  $453 \rightarrow 459 \text{ cm}^{-1}$ ,  $569 \rightarrow 579 \text{ cm}^{-1}$ ,  $777 \rightarrow 793 \text{ cm}^{-1}$ ,  $1032 \rightarrow 1072 \text{ cm}^{-1}$ .

The experimental data indicate a significant difference in the sorption properties of the original and the activated sorbent to phenylalanine (Fig. 6). Apparently this result is explained by, on the one hand, an increase in hydrophobicity of natural sorbent by increasing Si/Al ratio in unmodified crystallinity of its structure (according to X-ray analysis), and on the other hand, the expansion of input boxes and channels and channels of the sorbent, change the chemical nature of adsorption sites and the specific surface area of the sorbent in the process of dealumination.



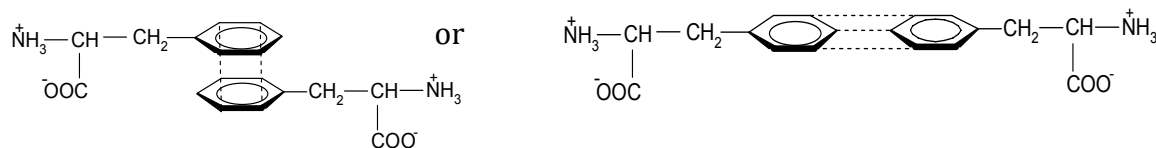
**Fig. 6. Sorption isotherms of Phe<sup>±</sup> on the original (1) and activated 5M HCl (2) clinoptilolite tuff**

This condition is caused by the change in the relative position of tetrahedrons  $\text{SiO}_4$  and  $\text{AlO}_4$  of the core [19] and the formation of new silanol groups [21] are able to interact with zwitterionics phenylalanine by different mechanisms of binding (Fig. 7).



**Fig.7. The mechanism of interaction of phenylalanine zwitterions with active centers of protonated clinoptilolite tuff**

Where  $^+\text{NH}_3-\text{CH}(\text{COO}^-)-\text{CH}_2-\text{Ph}^{\delta+}$  is a simplified representation of associates of the aromatic amino acids formed by  $\pi - \pi$  - interactions (stacking effect):

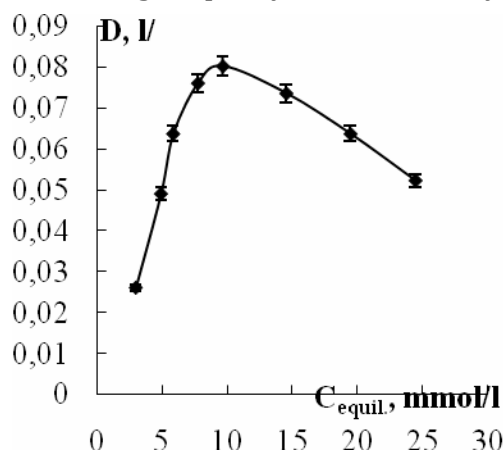


On the consolidation of phenylalanine in the matrix of the activated sorbent the additional absorption bands indicate. Intense bands at  $1200\text{-}1420\text{ cm}^{-1}$  can be attributed to deformation vibrations of the O-H and stretching vibrations of the C-O carbonyl group [15], which is a confirmation of the proposed mechanism. The peak at  $1760\text{ cm}^{-1}$  characterizes the fluctuations of C = O group.

The absorption band of  $1576\text{ cm}^{-1}$  belongs to the deformation vibrations of  $\text{NH}_3^+$  group. In the  $1100\text{-}1190\text{ cm}^{-1}$  appear stretching vibrations of C-N group. Pendulum vibrations of the  $\text{CH}_2$  - group corresponds to a maximum at  $770\text{ cm}^{-1}$ . Fluctuations of the benzene ring are marked on the spectrum at  $1606, 1580, 1492\text{ cm}^{-1}$ . The formation of associates of phenylalanine due to stacking interactions manifested in the IR spectra in the shift of the absorption band maximum, characteristic for the vibrations of benzene ring at shorter wavelengths (from  $3070 - 3050\text{ cm}^{-1}$  to  $3050\text{-}3040\text{ cm}^{-1}$ ).

In the sorption of aromatic amino acid on acid activated clinoptilolite tuff also observed decrease in the number of large pores (according to electron microscopy).

These results suggest that consolidation of amino acids occurs at the surface and in the pores acid activated sorbent. Zwitterion phenylalanine enhanced acid penetrating into the pores of activated, replace the available exchangeable cations, which leads to a slight increase in the acidity of the equilibrium solution in comparison with the original. The maximum value of ion exchange capacity of ions of phenylalanine is low (0.10 mmol/g) and is only 5,2% of the total exchange capacity, determined by ammonium ions.



**Fig.8. Dependence of the distribution coefficient of phenylalanine from the equilibrium concentration of the solution**

In Figure 8 shows the distribution coefficient of the aromatic amino acids from the equilibrium concentration of the solution. The observed maximum is also characteristic for the sorption of aliphatic amino acids on the clinoptilolite tuff.

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## URBAN

### SYMBIOTIC EFFECTIVENESS BETWEEN GREENERY AND PEOPLE – CASE STUDY OF KYOTO WITH ITS SEMI-CIRCULAR GREENERY

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#### Abstract

Kyoto, an inland city in Japan, is surrounded on three sides by low verdant mountains. It displays fascinating expressions in each of the four seasons and is called a place of “purple hills and crystal streams.”

Greenery in Kyoto has not only supplied people with firewood, charcoal, mushrooms and nuts, but has also created Kyoto’s magnificent scenery with the low range of mountains and the Kamo river running from north to south, which has been preserved in Japanese and Western paintings. Some temples in Kyoto utilize the method of ‘shakkei’ to incorporate views of the surrounding distant mountains and greenery as a backdrop to the composition of their gardens.

Changing delicately in each season, the greenery in Kyoto has been depicted in Japanese poems such as Waka (thirty-one syllable verse) and Haiku (seventeen syllable verse). Also, human dramas, unfolding along with such changing seasons, have been passed down in the form of Japanese classical novels and essays, and have had a great influence on modern literature.

This study, selecting Kyoto as its study area, aims to analyze the diverse historical relationships between greenery and humans, and to verify that the greenery-centered natural and cultural phenomena in Kyoto have assumed the role of the main nurturing source for Japanese culture and provided people with such health benefits as peace of mind, joy and healing and the creation of a culture, and to consider desirable future relationships between greenery in cities and their people.

#### 1. Introduction

With more than 60% of its landmass being forest, Japan has been described as a country with a ‘wood’ culture. The reason for this is that its people have lived since ancient times by making intelligent use of the forest, while nurturing it to protect their land and livelihood, thus giving birth to a culture peculiar to Japan.

Firstly, the forest is a renewable resource, which, if managed properly, will grow back in the same place, so that wood can be repeatedly harvested and used in a cyclical pattern.

Secondly, forests send water forth in constant streams, protecting its source and thereby providing a steady supply of the water needed for domestic life and industry. Forests are also known to protect against damage from natural disasters such as flooding and landslides, as well as seasonally strong wind and snow.

Thirdly, the Japanese have valued forests not only as practical but also as aesthetic assets. For instance, as Japan enjoys four distinct seasons, the colors of forests change constantly throughout the year. Japanese Waka and Haiku poetry and other literary works have served as a way of recording these natural colors that are appreciated by the people.

Based on the above background, this case study aims to demonstrate the effects of symbiosis between natural greenery and humankind by studying the case of Kyoto, the cradle of Japanese culture, and to explore the future direction of this symbiosis in our cities by considering the potential of both forests and the environment.

## **2. Overview of Kyoto**

Situated in a basin surrounded on three sides by gently rising low mountains, Kyoto has a relatively mild climate, with a range of temperatures that give rise to four distinct seasons.

The annual rainfall in Kyoto was 1,200mm in 2007, less than the Japanese average of 1,700mm. The rain that falls on the mountains on three sides forms two major rivers, the Kamo River and the Katsura River, which bound the central area of Kyoto on either side, flowing north to south along the foot of Higashiyama and Nishiyama (the eastern and western mountain ranges).

Its nurturing temperatures and plentiful water resources provide a natural environment conducive to the growth and development of vegetation, and the area of mountain forest within the Kyoto city area is around 210km<sup>2</sup> or some 64% of the total.

Blessed with such a rich natural environment and its distinct seasons, this historic city has as of 2008, 1,826 important cultural assets, 211 national treasures, and a total of 17 UNESCO World Heritage Sites, of which 15 are in the city, and two outside.

Kyoto thus has one of the richest natural and cultural environments of any city in Japan and is a historic tourist city. Citizens and tourists from in and outside Japan can admire the greenery and landscape of the surrounding mountains from the streets of the city and can easily reach and enjoy the cultural assets.

## **3. Mountain forests – historic foundation of life in Kyoto**

Nowadays, Kyoto has a population of 1,470,000, but in the Edo and Meiji Periods (1603-1912), it was around 400,000. In those days, coal and oil were not used at all, and

the firewood, charcoal and brushwood needed as energy sources for daily living, the timber needed for building, and other materials were supplied from the forests located on the city outskirts and in the surrounding areas. One can even say that the reason why Kyoto continued to flourish as a city for over 1200 years is that its forests were well cared for and conserved.

The mountains surrounding Kyoto on three sides are called Higashiyama, Kitayama and Nishiyama (the eastern, northern and western mountain ranges respectively), with the names of the mountains thus denoting the points of the compass. Beyond these mountains, there are extensive ranges of low mountains, from the depths of which rivers flow toward Kyoto. The brushwood, firewood and charcoal that citizens used for everyday fuel, as well as building materials for dwellings, shrines and temples, were transported from the neighboring villages and the mountainous back country. In particular, the forest products of brushwood, firewood and charcoal were daily necessities used in cooking, heating and so on, and, judging from the size of Kyoto's population, the amounts consumed must have been vast.



**Photo 1 Brushwood vendors from Ohara**

**\*Ref. 1)**

As the citizens' demand for such forest products as daily necessities increased, women vendors began to bring brushwood and firewood from Yase, Ohara, and Kurama, which are mountain villages on Kyoto's outskirts, to sell on the streets of the city. An example of this can be seen in Photo 1.

Apart from people living in the city, farmers also used the forest as a source of fertilizer, by collecting undergrowth and fallen leaves. This was at the same time, an operation essential for maintaining the trees in good condition and ensuring their healthy growth and was thus a means of forest management that killed two birds with one stone.

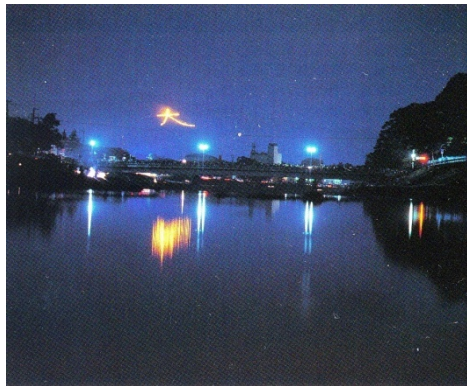
The forest was a rich source of seasonal food including bamboo shoots, mushrooms such as matsutake and shiitake, and nuts such as chestnuts and chinquapins. This was the pattern of daily life in Kyoto until as recently as 60 years ago.

#### **4. Scenery of the old capital, combining greenery, mountain and river**

The great cities of the world always have distinctive scenery arising from their particular natural features. Kyoto likewise has a number of scenic views that typify the city, consisting of a background of gracefully curving mountain ranges and greenery and a foreground of a fast-flowing river. The scenic character of Kyoto produced by this natural environment is described in 'sanshi-suimei (purple hills and crystal streams).'



**Photo 2. Cherry trees by the Takano River**  
\*Photographed by the author



**Photo 3. Fire lit on Mt. Daimonji**  
\*Public relations magazine of Kyoto city

There are two kinds of typical Kyoto scenery, the natural and the culturally determined. First, I will begin by looking at the natural scenery. The natural environment of Kyoto is small in scale and tranquil in character, and depending on the brightness of the sunlight, the movement of the clouds, the strength of the rain, and other changing natural conditions, offers truly diverse expressions. The spring brings a lustrous brilliance of tone while the autumn offers a dazzling display of flaming color. Photo 2 shows spring scenery in Kyoto. The changing natural scenery of Kyoto delights not only its citizens but also visiting tourists. However, the natural setting which is the origin of typical Kyoto scenery is managed by human hands and is far from representing nature in its wild state.

The city's cultural scenery, likewise, has many connections with the natural landscape. Typical Kyoto scenery refers to its cultural scenery with palaces, shrines and temples as a backdrop. In the planning of the building of Heian-kyo, together with its temples and shrines, in order to produce a landscape that successfully incorporated the

natural environment of Kyoto, it is estimated that careful thought was given, when laying out palaces and villas, to the relative positions of the manmade city and the natural environment. Typical Kyoto cultural scenes almost invariably contain machiya (merchant houses), other dwelling houses, and people coming and going. The cultural landscape typical of Kyoto can be said to arise from the presence of manmade elements.

Cultural scenes typical of Kyoto include many containing a garden, some of which employ a distinctive method of scenic creativity known as shakkei (borrowed landscape), a skillful method of creating cultural scenery. This technique was used when gardens were laid out in shrines and temples or outside the living rooms or guest rooms of villas, and refers to a clever arrangement of cultural scenery in which the garden served as the foreground scenery, while rivers and mountain greenery and ridges visible on three sides served as the backdrop, forming a whole that could be appreciated like a painting.

This technique can be said to represent the wisdom to draw in the sweeping expanses of nature into the small space of a garden and to appreciate the changing scenery. Photo 4 shows the garden scenery of Entsuji temple, one of the most famous examples of shakkei.

Much of this celebrated natural and cultural scenery of Kyoto is for viewing during the daytime, but there is also scenery created for night-time viewing. In Kyoto, there is a nighttime spectacle called 'Gozan no Okuribi' ('farewell bonfires on the five-mountains'), which is shown in Photo 3.

Kyoto was once a sea of tiled roofs, so that one could look across from anywhere in the city to the mountains on three sides. Nowadays, however, the high-rise structures of office buildings, hotels and apartment blocks line the streets of the city center, and apartment blocks have also made inroads into the residential areas of the city, which makes it difficult for citizens and tourists to see the mountains on three sides, leading to the gradual loss of the outstanding natural and cultural scenery of Kyoto. In order to protect such scenic value, the municipality of Kyoto has responded by enacting a Kyoto City scenic landscape ordinance.



Photo 4. Shakkei scenery at Entsuji temple \*Ref. 4)

## 5. Kyoto's scenery and the creation of a culture

Kyoto's elegant scenic character has since olden times captivated not only the common people but also many people of culture. Such people have depicted scenes in paintings and described them colorfully in literature and poetry. These numerous artworks and literary works left to posterity have become the classics of Japanese culture, serving as the repository and origin of the Japanese soul and retaining a vivid emotional resonance for the Japanese of today with the mental images their content reproduces.

As mentioned above, the scenery of Kyoto reflects subtle change, so that painters who try to faithfully reproduce on canvas an exquisite scene of a moment's duration have struggled to achieve the right color balance. Landscape paintings created in this way have become works of art that have moved many people and form a cultural asset of which Japan can be proud at the world level.



Fig. 1. Evening Sky Over the Old Capital by Soryu Tamura \*Ref. 5)

A corresponding example is "Evening Sky over the Old Capital" by Soryu Tamura which is shown in Figure 1.

Writers meanwhile have expressed the scenic character of Kyoto in words. The essay “Makura no Soshi (Pillow Book)” which begins with ‘Haru wa akebono...’(‘Spring is the dawn...’), is a literary work by Sei Shonagon famous for its convincing description of the changing face of Kyoto in the four seasons, seen through the eyes of a woman, and is a major work among Japanese classics. Apart from essays countless other literary works have been passed down to us, and every year large numbers of tourists come in a quest to experience the scenery and romance of Kyoto.

In Japan, there is a form of poetry called Waka which depicts landscape and human empathy consisting of 31 syllables (17 in the first part and 14 in the second). Many Waka poems have been composed based on the themes of nature and landscapes of Kyoto. For example, a famous female poet Ono no Komachi composed the following poem interpreting the cherry blossom as a symbol of youth.

A life in vain.  
My looks, talents faded  
like these cherry blossoms  
paling in the endless rains  
that I gaze out upon, alone. (Ogura Hyakunin Isshu 9)

Fujiwara no Ietaka of Ju-Nii (Junior second rank) composed the following Waka in the evening, depicting the changing seasons over a shrine and stream running through it.

Twilight. A chill wind rustles  
over the little river  
lined with oak trees.  
End of season cleansing rites  
are the only sign  
we’re still in summer. (Ogura Hyakunin Isshu 98)

The shortest Japanese poem consisting of 17 syllables, the first part of a Waka, is called Haiku. The following is by Yosa Buson depicting the Kamo River, the icon of Kyoto City.

How cool!  
A river flows north to south,  
spearing this capital city.

As shown in these verses, the landscape interwoven with green, mountains and rivers of the old capital Kyoto has inspired the sensitivity of people of culture to create numerous artworks and works of literature, thereby refining the mind of the Japanese people.

## **6. Effects of Symbiosis between Natural Greenery and Humankind**

In this study, I have discussed the beneficial interaction between humans and nature which has been lost, using the example of Japan's ancient capital, Kyoto. This case study analysis focuses on natural phenomena observed and cultural phenomena created in one Japanese city, Kyoto, but these phenomena seem to be manifest worldwide.

I would like to summarize the effects of symbiosis between natural greenery and humans that have been discussed in this case study of Kyoto.

### **(1) Greenery as a recyclable resource**

Greenery is a recyclable resource and a source of everyday commodities. The growth of greenery provides humans with the opportunity to gather timber, fuel, foodstuffs and other items needed for everyday life. Moreover, if greenery is properly managed, the various resources it provides can be tapped in a recyclable fashion. These resources derived from greenery improve in quality under appropriate husbandry and also increase in amount.

In Kyoto, people have continuously intervened with forests to ensure that both nature and humans could flourish, without depleting natural resources. In recent times, however, people have neglected to maintain greenery, and its conservation as a recyclable resource has become a major issue.

### **(2) Greenery as a scenic asset**

Kyoto is a city surrounded on three sides by mountains. Its citizens have many opportunities in their daily lives to admire views of greenery and mountains. However, they have gone further than simply admiring greenery and mountains by actively intervening with them and, while even incorporating rivers, have created many examples of outstanding cultural scenery. Kyoto's natural and cultural scenery is rich in seasonal character and some examples are integrated in the yearly calendar of events.

This rich store of natural scenery and cultural resources has been used as a recreational resource by the citizens. For instance, in the humid Kyoto summer, citizens have dined out by coming down to the Kamo River to keep cool and admire the view of greenery and mountains. This is called 'Kawa-doko' and is still part of the Kyoto summer tradition.

Greenery in Kyoto serves as a scenic asset with recreational benefits.

### **(3) Greenery as a stimulus to cultural creativity**

Greenery is the source of inspiration for many notable works of art and literature. In particular, the greenery of Kyoto creates a profound natural beauty. It has struck chords in the hearts of painters and writers, who have taken the scenery of a captivating moment and fashioned from it masterly visual or literary works to leave to posterity.

Sentiments evoked by communion with greenery have inspired poetry, many collections of which have been handed down to the Japanese, and like the “Ogura Hyakunin Isshu” anthology, used in the game of karuta (playing cards), where they raise the general level of learning and help refine language and character.

## **7. Conclusion**

Greenery and humans are inseparable. Through this case study of the natural and cultural phenomena of Kyoto city, it became evident that, if greenery and humans are involved in a rich and diverse mutual relationship and beneficial interaction is at an appropriate level, a further increase in the well being of both will result. Moreover, greenery not only brings renewable material prosperity, but also stimulates humans spiritually, inspiring them to a range of forms of expression.

Despite the fact that humans, as we have seen, derive a great number of tangible and intangible benefits from greenery, they are inclined to forget its utility and function. We have reached a point where the rehabilitation of greenery is an important issue. We need to establish a strong awareness that the magnificent natural phenomenon of greenery is not one we should fight, but live with in symbiosis.

Even in the present age, it seems important to provide environmental education in order to teach each generation the wisdom of valuing greenery, which is a life form that humans will never be able to originate no matter how advanced the science and technology they use.

Integrating this perspective too, there is a need for further studies in the future to examine the effects of symbiosis between natural greenery and humankind.

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