LEARNING FROM

Environmental History

IN THE BALTIC COUNTRIES

The Baltic Sea Project

Learners' Guide No. 6

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THIS BOOK HAS BEEN PRODUCED WITHIN THE FRAMEWORK OF THE BALTIC SEA PROJECT AS PART OF THE UNESCO ASSOCIATED SCHOOLS PROJECT

Key words: The Baltic Sea, environmental history, learning, environmental education, education for sustainable development.

Abstract: The book contains articles from researchers and schools about environmental history and its use in education. They deal with water and land use and examples are given on local school projects.

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Preface

We often say in the UNESCO Associated Schools Project Network that 'learning about the past enables us to better understand the present and to build together a brighter future'. Hence, I should like to congratulate the Baltic Sea Project coordinators, principals, teachers, students and stakeholders for deciding to embark on another new initiative to enhance learning about our environment by devoting the sixth BSP Learners Guide to *Learning from Environmental History in the Baltic Countries.*

Environmental history surely goes back to the origin of humanity. Action, or the lack of appropriate action, taken by people over the millennia, throughout centuries and particularly during these past few decades has had an enormous impact on our environment and eco-systems. It is therefore vital to recall some of the main phases and turning points in our efforts to take action to reverse, on the one hand, negative damage caused, and on the other, to take preventive action to preserve our environment in support of sustainable development.

If we are to succeed in mobilizing young people to contribute to reversing the damage already caused to our environment and to preserve it, through practicing and promoting sustainable development, for present and future generations, we, as educators, must intensify our action to develop innovative and effective approaches across the curriculum.

By preparing and publishing *Learning from Environmental History in the Baltic Countries*, the BSP continues its pioneering work in enhancing the learning process in this vital field. It will serve as a valuable contribution to help us to learn to live together in peace and in harmony both with each other and with our environment.

Elizabeth Khawajkie
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Associated Schools Project Network
Division for the Promotion of Quality Education
UNESCO, Paris


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LATVIA
DENMARK
LITHUANIA
Mastaiciai
Sönderborg
Gelsenkirchen
POLAND
GERMANY
Katowice

To the reader

Environmental History has been a programme in the Baltic Sea Project since 1995. We have developed a special approach to investigations of peoples' relationship to nature in the past. Words such as "conflicts", "chronology" and "actors" have been used frequently. Our main goal is not better historical knowledge per se. It is rather that the students are able to develop an "action-competence" by discovering that their present environmental situation is the result of what real, once living, people have done in the past. We can summarise and generalise what these people did in processes such as "industrialisation" or "urbanisation". However it is still a matter of what real people, of flesh and blood, did in our own home-town. When they made decisions about the future, they decided over our present situation. And this is just what we do today. We are the history for the people coming after us. In this sense we are created by history and we ourselves create history. When we talk about our common environment this is quite obvious.

Using this concept, we have had several courses and meetings around the Baltic Sea with teachers and researchers. We first met in Visby, Sweden, in 1996 when the concept was introduced in different workshops. Then courses followed in S:t Petersburg, Russia and Norrköping, Sweden in 1999. During the BSP summer conference in Sönderborg, Denmark 2000 several workshops were occupied with environmental history. In 2002 a new conference was held in Skjerne, Denmark and in 2003 in Jurmala, Latvia. During these meetings and workshops, we have shared experiences, met researchers and practised our methodological skills in real investigations. Teachers who have participated in this work contribute with their experiences in this book. The Environmental History Programme in the Baltic Sea Project has been coordinated by the School of Teacher Education, Malmö University in Sweden.

From the outset, work with environmental history in education has involved cooperation between schools and researchers. This approach has been very fruitful and made it possible to introduce a new concept of history teaching without support from traditional textbooks and teacher education, though environmental history is a fairly new subject, even for many professional historians. This means that both the methods and objects for research are not very well-known. It is also a subject that encourages interdisciplinary work between historians and natural scientists. In schools, the studies require the participation of teachers from different subjects. In this book, researchers contribute with articles in order to introduce certain fields of environmental history and their own research. This is made in the first two sections of the book.

In the first section, *Introducing environmental his-*

tory, three articles discuss what a historical perspective can contribute to environmental education.

Per Eliasson introduces the concept of the Environmental History Programme in the Baltic Sea Project.

Sverker Sörlin points to the fact that we are both path-dependent, caught in the structures of the past, and free to act in relation to another kind of future. This is the focal point where a meeting takes place between environmental history research and working with environmental history in education.

Joachim Radkau starts from man's relation to water as a paradigm for environmental history education. In five theses, he elaborates the opportunities that may arise.

The following two articles discuss methods and sources for environmental history projects in schools.

Lars Berggren introduces in a methodological article the use of oral history in environmental history investigations. The method is very useful for local schools working in this field.

Per Eliasson provides a short overview of useful general literature on environmental history and of possible sources for local investigations.

Since our joint project concerns the Baltic Sea, its water and drainage area, we have focused on the sea itself and the waters of the Baltic area in the second section *Environmental history as a field of research*. Poul Holm and Brian R. MacKenzie start with an overview of what is known about the historical variations in the fish stock in the Baltic Sea. There are natural variations due to ecological reasons that have to be understood over a long time scale. During the last century however, eutrophication and pollution have influenced the stocks.

The role of cities in this pollution of the Baltic Sea has been examined in an international project led by Simo Laakkonen. He presents the project`s results and how they can be found on the Internet and used by schools.

The introduction of the water closet in the growing cities around the Baltic Sea in the 19th century brought about a new kind of pollution created by the emission of sewage into rivers and the sea. There are numerous similarities here in relation to developments in other European cities. Consequently Jonas Hallström's article deals with a detailed case-study of Norrköping, one of the first cities that introduced the WC.

Erland Mårald continues with this eutrophication theme in his article about the history of artificial fertilisers in the Baltic Sea region. After 1945, the breakthrough for artificial fertilisers increased the eutrophication of the Baltic sea.

The school examples are grouped in two sections, *Learning from environmental history*. The first concerns landuse and landscape change in more urbanised areas such as Gelsenkirchen and Kohtla-Järve, where the impact of the mining industry is marked. Beata Węgrzynek, Monika Jędrzejczyk and Reet Kristian deals with the impact of landscape change on a special species – orchids. Landscape changes in more rural areas are treated in the examples from Vecpiebalga, Sönderborg and Mastaiciai, all concerning woods.

In the second section comprising school examples, contributions from Sönderborg, Katowice and Pedersöre also concern the use of water in an environmental history perspective, dealing with conflicts about local moors or rivers. The urban water questions of local streams, industrial areas, health and sanitation are dealt with in the last three articles from Norrköping, S:t Petersburg and Stockholm.

We hope that these articles by researchers, teachers and students will increase our knowledge about how and what to study in the field of environmental history. We would like to express our most sincere thanks to them for their work and contributions. Hopefully, this book will inspire students and teachers to develop their own environmental history investigations in order to be better prepared to meet the future. It has been produced at the School of Teacher Education in Malmö University, Sweden.

The editorial committée

Per Eliasson, Sweden; Jolanta Mol, Poland; Christian Bo Bojesen, Denmark; Mirdza Zommere, Latvia

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What can We Learn from Environmental History?

Per Eliasson, School of Teacher Education, Malmö University, Sweden

Changing view of nature

Until the end of the 19th century, almost everyone in Sweden thought that it wasn't a crime to cut down a tree in another man's forest. The tree was a creation of nature but was of no use for anyone as long as it was standing in the forest. But when you started to cut the wood, it became useful. Thereby you added value to the tree and made it an object of ownership. Before, as a creation of nature, it had no owner. In a way, this mentality is still part of the view of nature held by some people in the Northern Baltic area. What changed it in Sweden a hundred years ago was that the industrialised use of the forest, characterised by steam-driven sawmills and the export of timber, added a new form of value to the trees – namely market value. In this way our view of nature changes as our use of nature changes.

From threat to threatened

At the beginning of the 20th century, many people recognized nature as a *threat* to man. At the beginning of the 21st century, our dominant view of nature is nature *threatened* by man. In between lies a hundred years of rapidly growing domination of nature, a development that is without precedent in the history of mankind. It is obvious for historians that this change during the last hundred years is one of the most important factors in history. Therefore environmental history today is one of the fastest growing new research fields of history. International environmental history conferences are arranged, environmental history societies are founded and new environmental history journals are being edited. This can easily be discovered by anyone searching the Internet for the phrase *environmental history*.

Environmental history

What does this growing awareness of the historical roots of our present environmental crises mean for education in schools? Do we need just one more chapter in our history text books called Environmental History added to the chapters of the Napoleonic wars or the Cold war?

In the 1970s, environmental history was first used to name the interaction between people and nature in a time dimension.

In the United States, the colonisation of America and especially the concepts of wilderness, conservation and preservation were an early research field for environmental historians. Later on, urban studies and international subjects also became important fields of research.

In Europe, environmental history research had many different sources but often came from studies in landscape ecology, history of technology and history of ideas. Studies were published of forest history, pollution problems during industrialisation, sanitation and urban health, the history of the environmental movement and policy making.

Interaction people, society, nature

There was- and still is – no exact definition of what can be called environmental history. The studies concern the relationship between people and nature in a time-dimension. This means that environmental history is often described as a field of research that consists of three parts: firstly society and its values, different social groups, their power relations and views of nature, secondly, the ecological conditions in nature and its changes caused by man, thirdly the ways in which nature is used by people in society and the conditions that govern this use. In general the studies are concentrated in one or two parts of this field.

During the last few years, several attempts have been made to write overviews of world history from an environmental history perspective. One such perspective, which is frequently used, is the relationship between population growth and resource use. This development has been seen as a sort of co-evolution where new resources allow the population to grow, while population growth on the other hand spurs a more effective resource use. At the same time however, new limits to growth have evolved on a global scale. Crucial factors in this development have been the control of epidemics, technologies to collect, store and transfer information and the introduction of the fossil fuel regime during the last two hundred years.

New fields of environmental history

Some new fields of research in Europe have developed during the 1990s, that are highly relevant for the future and for sustainable development. With the growing interest in the depletion of marine resources, the environmental history of the sea has become important. Earlier research concentrated on the fish resources of California and other parts of the Pacific Ocean. The fate of the cod stock outside Newfoundland was also examined. Now attention has turned to European waters such as the North Sea and the Baltic Sea.

A second field of new research has been directed towards “old sins” in the shape of toxic waste or heavy metal deposits on old factory grounds, city dumps and gas works.

Since changes in the natural environment constitute an important factor for the history of society, the approach of environmental history is interdisciplinary and involves the natural sciences as well. This has been obvious in the third new field for European environmental history, the development and future of biodiversity. Here landscape history and landscape ecology works together, trying to understand the conditions for different plant and animal species in a changing landscape.

History as artifacts

It is easy to understand the relevance of these three new fields of environmental history research. However another theme may be of even greater relevance. We now live in a society physically built for certain systems of energy-use, production and distribution of food and other goods. These systems are a part of our history as artifacts from earlier generations. Many of these systems have however to be changed in the future in order to secure sustainable development. When we know more about how systems for the distribution and use of, for example, energy, were once built, we will be better prepared, mentally and scientifically, to change them.

The Öresund bridge. An artifact of the communication system of the 20th century.

Learning from environmental history

This is probably the crucial point where scientific environmental history research and the use of environmental history in school education come together. When students raise contemporary questions and then go on to work with the history of the physical artifacts in their own local society, they can understand how and why they were built. When students work with the creation of industrial landscapes in Norrköping and Gelsenkirchen, they can understand the changes that industrialisation brought to real people a hundred years ago. But these changes were of different kinds for different groups. This was discovered by the students at Kungsholmen who studied the building of the sanitation system in Stockholm in the late 1800s and its impact on water borne diseases and mortality. Some groups benefited from the changes brought about by industrialisation, others did not. Consequently conflicts arose. How can we see the traces of these conflicts between different groups in our society today? When students work with the oil shale industry in Kohtla-Järve or the changing natural environment in the coal-mining area of Katowice, they can understand that the use of our natural resources gives rise to conflicts. But conflicts may also evolve out of the way in which we use our natural heritage as a source of history, a typical conflict between cultural conservation and environmental protection. This conflict was investigated in the famous Nydam moor outside Sönderborg.

When studying these changes and conflicts, it is important to use chronology. An explanation of the causes and effects of different changes has to be accompanied by an analysis of the impact of political and economic events outside our own local society. When students studied the changing use of the natu-

ral environment in a local farm in Vecpiebalga chronologically over a period of 120 years, they understood the connections to the major political changes that took place during the same period in this area. It is evident from the landscape that these political changes impacted on the natural environment. This was also understood by the young children in Mastaiciai who discovered that there was only one old oak in their forest, surrounded by younger trees. They also used their knowledge outside school when they carried out an inventory of similar old trees in other forests in the neighbourhood, in order to push for their protection.

Networking is the basic principle in the Baltic Sea Project. The argument here is that by studying similar things in different places and then comparing the results you can discover new features and draw new conclusions. This is also the most important challenge for the Environmental History Programme in the BSP. A good example of this approach is the study of the fresh water pearl mussel in Pedersöre and their coop-

Learning from Environmental History

What?
Students working with environmental history **start from current environmental questions**
– they don't study the past independent from the present

Students working with environmental history **start from conflicts about the environment**
– they are thereby able to avoid both a one sided natural science, as well as a moralistic, perspective

Students working with environmental history **start with studies of the local environment in order to draw conclusions about other areas** from their results
– they don't start with the great trends in world history in order to illustrate them on a local scale

How?
Students working with environmental history **can accomplish practical results**
– they don't only use their results inside the school but present them to the community in order to change the situation

Students working with environmental history **use chronology as an important tool** both in explanations and in narratives
– they are consequently able to avoid treating questions as "eternal" and without any historical context

Why?
Students working with environmental history **have a perspective of the future** that allows them to develop a competence for future action
– they are not just satisfied with a better understanding of the present situation

eration with students in Hudiksvall. When they compared their results, they were able to draw new conclusions about their own situation.

Why environmental history?

When we try to understand our present environmental problems, we interpret what has happened in the past. Today we are aware that these problems are not only accidents caused by lack of knowledge or disregard. They are structural and built into the systems and are therefore a product of our history. We must interpret the past, to understand the present in order to develop a competence for future action. This is usually called historical consciousness. That is why we work with environmental history in education.

This book contains examples taken from school projects concerning environment and history carried out in the nine countries around the Baltic Sea. They are very different and mirror the complexities inherent in our perceptions of environment and history. Some of them lean towards existential values, working with local history and environment as a part of the students' identity. Some of them are more directed towards natural science, starting with investigations of pollution and the biology of certain species. Some have a very clear social history perspective while others adopt a political or economic historical perspective. Each of the different projects starts with a short introduction, offering suggestions as to how the article in question could be related to the concept of environmental history. These short introductions are written by the editor and not by the authors of the article.

Our ambition in the Environmental History Programme in the Baltic Sea Project has never been to force schools to carry out uniform projects, but to encourage networking and diversity. At the same time however, we have tried to draw attention to certain concepts of environmental history in practical use. This is because we are convinced that this concept, used in different ways, will help our students to achieve our goal – to develop a competence for future action.

The Globalisation of Environmental Policy – a Perspective of the Future from an Environmental Historical Point of View

Sverker Sörlin, Office for History of Science and Technology, Royal Institute of Technology, Sweden

Challenges of the future

Someone looking out upon the world in the very early 21st century will have no difficulty in becoming aware of great problems. Many of these are connected with the environment and sustainable development in a wider sense. A rapid population growth, albeit slowly decreasing, is drawing on the resources of the earth. Even more demanding is the continuously increasing concentration of people in certain regions and cities.

Contributing to the problems is, however, above all, the growth in production per capita. Although each new increase in productivity may become "cleaner", especially in regard to the discharge of poisonous and polluting substances, the growth of production is itself outstripping so-called eco-efficiency.

This is why the ecological footprint of mankind is growing. So far, the main reason for this growth has been the production of the industrialised world. If rapidly increasing production can be achieved in the developing countries – a truly justifiable goal that is seemingly within our reach – a growing proportion of the world's population will contribute to the ecological footprint. The rapid economic growth in China gives us a hint of the scale of the processes that we are discussing.

Unique difficulties – unique possibilities

In certain respects this development is historically new and unique. Never before has our earth housed so many inhabitants. Nor has the economic activity of the world ever been greater, its technology more sophisticated and the activities of man more destructive, from the climate surrounding the whole planet to the smallest of individual species. The uniqueness of this situation is also borne out by the fact that the rate of change has never been more rapid.

A century ago, at the beginning of the 20th century, the population of the world had just reached two billion – less than one third of today's level – and the size of the economy was only five per cent of its current level. The growth of the ecological footprint during the last century has been exponential. This cannot continue forever. Even if the pressure on the

environment should become more linear during the 21st century, this growth will nevertheless imply an unprecedented change in the prerequisites for human life on this planet, both in terms of living conditions and political opportunities.

This change applies to the whole world. More than ever before, different parts of the world have become interdependent. Nor is it possible to consider these effects solely in terms of their impact on the environment. Social conditions, health, culture, democracy, security – the problems of environment and survival are interwoven in a great panorama of regional and world-wide dependencies. This indicates that our efforts to solve future environmental problems will become even more profoundly integrated into other political areas.

Three phases of environmental policy

In a way, this should not be surprising. Issues concerning the interaction of human beings with their surroundings are old, in fact almost certainly eternal. Not until the second half of the 20th century did, however, environmental problems appear on a large scale upon the political agenda. The word used was: *environment*, *ambiente*, *Umwelt*, most languages stressing precisely the fact that the environment consisted of surroundings, an externality, perhaps an ultimate condition of humanity. An omen of future events was the 1955 conference *Man's Role in Changing the Face of the Earth*, published in book form with the same title in the following year.

Another characteristic trait of this first phase of environmental policy was the fact that the environ-

Globalisation as McDonaldisation.

ment was treated as an individual question. In most countries, it acquired ministries and authorities of its own, and thereby achieved acknowledgement.

In the 1990s, environmental policy entered a new phase. The password was "ecological modernisation", a term put into circulation with a book by Maarten Hajer, called *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (1995). This was a time when the environment became linked to economic development, thereby approaching the main stream of politics. Another keyword was accountability. The results of environmental policy were to be assessed in terms of indicators, and the antagonism between growth and environment was played down. The intellectual and political framework of this development had been laid down in the 1980s, by the work of the Brundtland commission and its concept of sustainable development.

Although put to the test in many countries, the project of ecological modernisation remained, essentially, a national project. The third step in the development of environmental policy, which will in all probability emerge within the next few years and decades, will have to reflect the global character of the ecological footprint and will require an entirely different form of international political cooperation. A much more complete integration of environmental problems into other political fields, affecting the security, freedom and living conditions of Man all over the world will also be necessary.

Syntheses of environmental history

This brief perspective – barely fifty years of the recent past – bears witness to the importance of an historical point of view in relation to the creation of connections and structures in our work to achieve sustainable development.

Naturally, the historical patterns are, however, much older, accompanying mankind through its entire development.

After a fumbling start in the 1970s – in itself a result of the breakthrough in environmental policy during the preceding decade – research in environmental history has, at a rapidly increasing pace, begun to establish a coherent picture of development, which has brought us to the position where we are today. This has been achieved using knowledge developed within a great number of specialist disciplines within science, social science and the humanities, including the various historical disciplines.

Among these specialists are the environmental historians themselves who are also very active as interdisciplinary creators of syntheses. As a rule, historians are usually curious about as well as completely dependent on progress within disciplines such as anthropology, archaeology, ecology, demography and a large number of other areas of knowledge that provide plenty of the raw material which makes it possible to draw the complex picture of the relationship between past cultures and the natural environment.

The limitations of the old myths

Already after a few decades of this kind of historical research – focusing on the environment – it is possible to maintain the following: our image of the past has been completely transformed. We might claim that fifty years ago, two great myths about the relationship between Man and the environment prevailed. They were also, more or less, mutually exclusive.

The predominant myth, related to the progress of the western world, was rooted in the needs of Paradise and Adam. Through his labour and the 17th century scientific revolution, a capitalist economy would be established on an industrial basis that would allow Man to break away from his dependence on nature. In this version, the environmental history of Man was a triumphal procession leaving Nature defeated along the way, either devastated or, probably more commonly, transformed into a garden, filled with thriving riches.

The other, contrapuntal, myth was the one about a happy, ecological primeval state. This happy state had been destroyed by modern societies, in fact already by the agrarian cultures. Man was headed for disaster.

In the decades after the Second World War, this dark vision seemed valid to many people in a world where the nuclear sword of Damocles hung over our heads and environmental pollution was accelerating as a result of rapid economic growth. One of the leading authors of this international apocalypse reaching the media, publishing companies and university lecture halls during these years was that of the Swedish food chemist and resource economist Georg Borgström, whose neo-Malthusian preaching became the top of an iceberg of mistrust of the logic of growth.

New historical images

Neither of these historical images are currently valid. Thanks to the collective achievements of research and social analysis, the images of the past now belong to history themself. Traditional cultures were by no means immune to pollution. On the contrary. Pleistocene extinctions (extinctions of species during the Stone Age), are now well supported by empirical data. All over the world, archaeological research shows early cultures, all of which have developed their more or less sophisticated methods for using natural resources, while showing striking shortcomings in their ability to adapt to the conditions of their surroundings.

This is why the current image of historical cultures shows us societies that are able to deal with a certain set of framework conditions. However there is also evidence to indicate that they are unable to deal with large-scale changes in these basic parameters. A growing population, a sudden change of climate, or, perhaps most commonly, a self-inflicted destruction of the resource base by using up too much game and vegetation, have led to a breakdown of sparse Pleistocene groups of hunters as well as of agrarian civilisations in all parts of the world.

Environmental history has also been able to show, however, the illusory character of the modernistic myth of progress. To begin with, and for a long time, this myth rested on more or less institutionalised hypocrisy as well as on a systematic forgetfulness of and indifference to the sacrifices, which were demanded. During recent decades, historical research has been able to show in much greater detail how epidemics, weeds, vermin and domestic animals originating in Europe, spread across the world, from the 15th century onwards, causing large-scale ecological change and deformation. At times, complete societies were wiped out on the new continents.

During the period up to the mid-20th century, colonisation and imperialism continued to establish unequal exchange relations, thereby creating economies dependent on export of raw materials and bringing about new environmental problems, unknown in the traditional cultures.

Environmental history of cities – a key to the future

In recent years, considerable interest among environmental historians has been directed at the role played by large cities. The environmental history of cities has been bleak since they were the locations of diseases and misery and have long served as the black holes of ecological economy, swallowing up resources and producing nothing but waste, smoke and wretched living conditions in return. On the other hand, the allure of their brilliant wealth has always attracted new crowds to these dense, rich and dangerous environments.

The cities were, in all respects, the hypocritical confirmation of the modernistic myth. This is true in our own time as well, something we can observe not least in recent surveys of motorised cities such as Los Angeles and Las Vegas. A sudden and rapid expansion of car ownership in the large cities of Asia, which seems to have begun in China as well, combined with the development already established in Europe and America, could all at once create a complete global archipelago of ecologically bizarre mega cities.

However, there is an opposite trend, also Asian, which views the possible future role of the city as an eco-efficient survival device. The old and young cities of Asia are often models of ecological density and an intelligent use of resources. The citizens of Hong Kong use only a fraction of the per capita energy consumed by the citizens of Houston, Texas.

With great conviction, globalisation research seems to show the way. Here the growth of the cities is closely linked with progress in the global economy, whenever this develops towards an ever larger content of knowledge, ideas, design and capital – i. e., becomes less dependent on raw materials and more inspired by human cooperation. This change should not be exaggerated, the "dematerialisation" of the economy being in itself a myth, cherished by many as the impediment of the unrepentant to a necessary adaptation to the limitations of their surroundings.

But it is also a reality. One of its more obvious effects is the relocation of the production process to a number of global and regional centres. In the process, other places lose people and power, a pattern of development which has gone far in Europe and North America, while in other parts of the world it has only just begun. If this transformation could be linked to technological and political innovations, making these cities sustainable – something, which seems quite possible – this could imply a great and important opportunity. Making the cities of the world more "Asian" would help the century of big cities lying ahead of us become a sustainable century.

But the transformation has similarities with earlier changes in the phases of environmental history as well, i. e. it is challenging the current order, exposing it to great risks. If the global archipelago of big cities becomes a world full of black ecological holes, the world will be subjected to plenty of tension – within countries as well as internationally.

The replacement of fossil fuels is an urgent task in many cities.

The moment between path-dependence and freedom

Thus the history of the environment is a project of the future. Researching the Man-environment relation in the past – in innumerable small, empirically well founded projects – provides us with contemporary material for general descriptions of problems and macro historical images. These images contribute to the creation of comprehensive sets of ideas, on which political action can be modelled.

This does not imply that, left to itself, research in environmental history would be more successful. It is true that we need plenty of historians, working quietly and industriously in archives, libraries and on field investigations all over the world. The dialogue with politics and society is just as important, however. Environmental historians need to participate in discussions with decision makers, industry, politicians and popular movements, as well as with local opinions and citizens.

Considerable pleasure and joy can be derived from providing historical accounts from increasingly new points of view. They help satisfy the need for new and more valid descriptions. This account would be impossible without continuously having access to new data and new work assignments, compiled by a large number of researchers. The understanding of the relationship with Nature of past cultures demands teamwork. This work is important not only because it gives us a better image of history, which is in itself unalterably rich, offering us a purposeful study in order to acquire more knowledge. Another reason for its importance – the main one, perhaps – is the fact that this knowledge offers direction and consistency to future environmental policy.

The most fundamental lesson of environmental history may be the fact that nothing is preordained. Man and his surroundings are profoundly and eternally interconnected. The road, which has brought us this far, has created limits to our scope of action. In the words of social historian Charles Tilly, we may use the concept of path-dependence. “Social processes are path-dependent. That is why history matters.” And the processes of the environment are, essentially, processes of society. In society, we perform the acts, which affect our surroundings. In society, we plan and carry out the teamwork, which constitutes the environmental conditions of the future. In this sense, people are always co-creators.

Path-dependence is a guiding principle. To describe this dependence on the past as a necessary basis for decisions is the task of environmental history. At each individual point of history, however, there is also a possibility for us to act. The situation where we will always find ourselves is at the moment between path-dependence and freedom. This is why environmental history is about a realistic definition of the limits, as well as about formulating freedom.

Global history, Sustainable Development and Philanthropy – On the Possibilities of Integrating History and Environmental Education

Joachim Radkau, Faculty for History, University of Bielefeld, Germany

Water and the interaction between Man and Nature

Using the topic of water might be the best way to begin an educational programme on the integration of environment and history. The disastrous floods of August 2002 have served to remind us of the fact, that today, as always, the interaction between Man and Nature forms an elementary condition of human life and that "progress" in certain respects increases the fragility of human civilization in relation to the unpredictability of Nature. For example, floods may become "natural disasters" only in areas where rivers have been straightened out, dykes have been built and the river basins become densely populated. Political reactions differ, as usual. Some people demand an even more radical control of the rivers, more dredging and higher dykes, whereas others want the opposite i.e. high water that allows the rivers to flow into nature preserving river basins.

Water myth

The tension between these contrary philosophies of water development – which contain, simply, conflicting ideas of our relations with Nature – is ancient and can be traced through millennia in China. The foundation myth of the Chinese empire tells us about the time of the great flood when the legendary engineer-emperor Yü opened canals to led away the volumes of water, thus saving the Chinese from becoming fish. This old "water wisdom", the necessity to allow space to the power of water, in order to remove its destructive strength, remained influential down through the millennia and developed into the Chinese wisdom of life. Things have to be allowed to take their course. However, the closer to the rivers the settlements advanced, under the pressure of an ever growing population, the stronger the assertions of another aggressive water development philosophy became. It claimed

that it was necessary to use force to break the power of the water by building huge dykes. Through the interminable flood disasters in Chinese history, this philosophy experienced defeat over and over again. Due to population pressure there was, however, hardly any alternative, even though the old philosophy of the liberation of the rivers, a nostalgic reminiscence, still lived on.

As we can see, there are a few simple fundamental problems, that run in the relationship between Man and water through the entire history of the world. Johann Esaias Silberschlag, an 18th century leading Prussian hydrologist, used to teach entirely in the spirit of old Chinese wisdom: "Rivers are not the very best of neighbours. Just like wilful friends, they are obliging only as long as you treat them with respect; step just a little too close to their river-beds, and there will be no end to their vengeance". The idea that rivers are live beings has also been familiar to many people for a long time. To conclude: Water is fundamental to the existence of humanity, a topic that runs through the entire history of our world, where, despite innumerable ramifications, we are able to find a few major themes.

Theses about environmental history and education

Mention the word "water", and environmental history automatically becomes world history as well as the history of economy, culture and power. It is no coincidence that the oldest cultures were river and irrigation civilisations. However, the fate of many later civilisations also depended upon the management of water. All over the world, industrialisation has given a new explosive power, to the problems of water supply and pollution which will probably increase in the future. At the 2002 "World Summit Meeting for Sustainable Development" in Johannesburg, global water supply had top priority. Thus a wide arch stretches from antiquity to the present and into the future. The topic of water can serve as a paradigm for the didactic possibilities of environmental history.

What are these possibilities? I will present a few theses.

Regaining a universal historical dimension

1.The environmental approach offers to historical education unique possibilities of regaining a universal historical dimension and obtaining an integrated picture of world history with a limited number of major themes and fundamental problems.

Today, even more than before, the lack of global perspective must be considered to be one of the most fragile needs in history education: and in no other field has this (i.e. history education) suffered more from the ever growing specialization of this science. For quite a while, we have witnessed a new trend towards global history, This is also evident also within the educational system. It would appear to come from the US and at least in its programmes and postulates, it would seem to be in accordance with the slogans in favour of globalisation. So far, however, this trend does not seem to have had any convincing success in practical teaching. This is hardly surprising. In today's ocean of historical knowledge, achieving the global approach is impossible if your claim is entirety, i. e. if you aim to provide an overview of entire history. History teaching which constantly threatens to drown in the abundance of matter would become irretrievably submerged. Today global history is achievable only from certain rather than from all aspects. It is thus highly doubtful, whether the teaching of history with cultural overtones could be successful. Culture is the most complicated aspect of history and not everybody is Max Weber, who surveyed the cultures of the world in a superbly and critical manner (failing however to simplify his survey didactically). Teaching the cultural history of the world would be asking far too much of most history teachers – not to mention their students! The relationship between Man and Nature, on the other hand, offers many more simple fundamental structures, embracing cultures and times – something we have seen already where water is concerned – simply because the laws of Nature, independent of room and eras, are set into motion.

Globalisation changes life for the old inhabitants. In this village of Lanzarote, the old beach, replaced by a tourist resort, is now history.

Global history and learning in our neighbourhood

2. The environmental approach offers a new opportunity for global history, as well as a great number of opportunities to discover and learn in our own immediate neighbourhood.

The global outlook should not delude us into paying attention to fashionable globalisation rhetoric; a widening of our intellectual horizon could rather, eventually, lead to a rediscovery of our own native district. Only by comparison do we recognise the peculiarities of our own region. To the average tourist, intent on swimming, the German "Wattenmeer" (the sea bed when the tide is out) would seem rather boring; only by comparison between countries do we recognise our ecological uniqueness. An environmental historical approach gives us a wonderful opportunity to walk through history and to find history everywhere in the landscape, instead of just standing in front of historical buildings, a guidebook to works of art in our hand. Hence, compared to traditional historical subjects, environmental history can make our outdoor travels so much more enjoyable!

The typical historian, from talent and training a bookworm, would not notice much history in the open landscape – particularly not so long as he lacks a trained eye. These days, fortunately, an increasing number of guidebooks for walkers and bikers are being published, describing the connection between "Nature and Culture". An increasing number of ecologists do understand that Nature, as we see it today – and the "beautiful scenery" as well – is, more or less, a product of human economy, past and present. Particularly in nature reserves, people have become ever more aware of the necessity to continue using the land in traditional ways, in order to preserve the variety of species that we would like to keep.

Environmental and historical excursions do not just lead to discovering traditional forms of using land and forest, they also teach us about things we cannot find in books, such as the real substance of the beautiful words describing local environment protection policy. If you wish to find out whether a town is environment friendly or not, walking or going by bike, waiting at traffic lights and bus stops, generally gives you a clearer picture than the one you get by studying the glossy brochures of the department of the environment. Nor do you learn the real meaning of "environment protection" by just studying visually enchanting pictures from famous national parks, but rather by being outdoors, walking through and carefully observing these (i. e. the national parks) and the smaller protected areas as well.

Encourage students

3. To be able to teach environmental history we need materials which give us incentives, start processes of thought based one upon the other, and encourage students to activities on their own.

This is an area, where so far we seem to have the greatest deficiencies when it comes to environmental history. There is certainly no lack of interesting material; the way they are presented, however, often fails to provide much food for thought and even less of a foundation for a continuous learning process. Up to now, the most accessible ones are, in general, the hard-luck stories, all the current complaints about the destruction of forests and land, the pollution of water and air. The teacher usually ends up with these kinds of texts, whenever he wants to introduce aspects of environment into history lessons. On the other hand: where do we find the positive, encouraging challenges, the incitement to thought and learning and the incentive to student activity? Actually, the only part left to her (the student) is that of the choir in antique Greek tragedy, responding in sad monotony: "Oh, how awful, how could they?" The greatest danger facing environmental education in schools today is that of degenerating into an exchange of maxims.

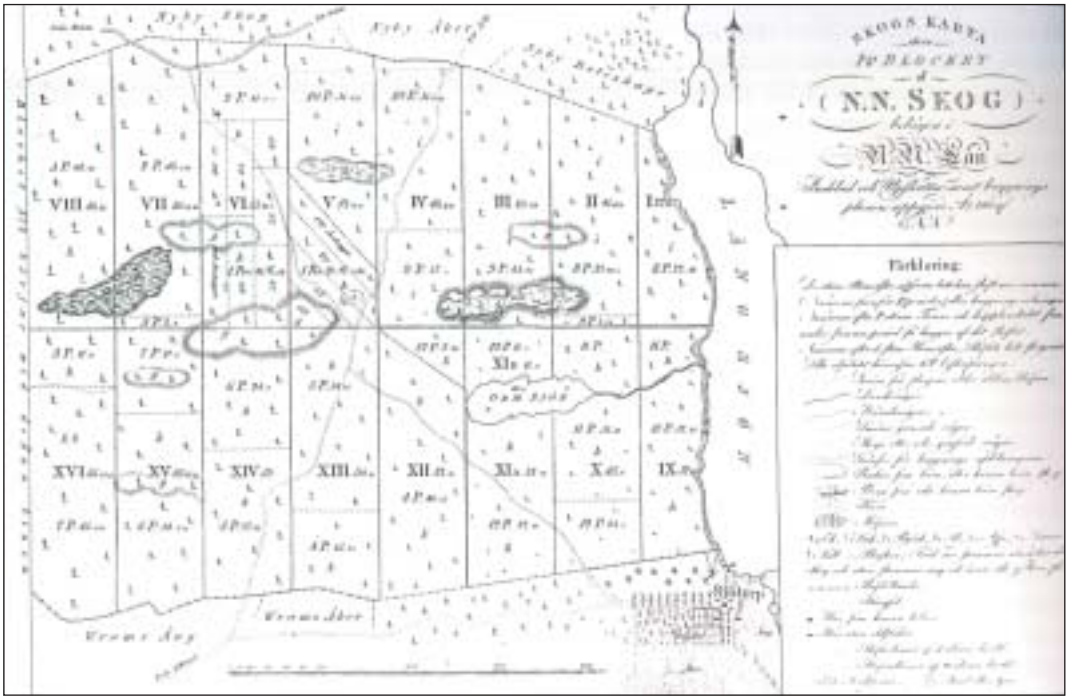
I asked the politically experienced environmental lawyer – at present a judge in the federal German constitutional court – Gertrude Lübbe-Wolff – for advice on the integration of environment and history in education, an education which would open perspectives for political action. Among other things, she advised me not to seduce the students into using the kind of rhetorical style which consists of nothing but empty words and totally devoid of political relevance. This approach belongs to shadow-boxing, popular at panel debates: "bio-centric as opposed to an anthropocentric relationship to Nature", the rhetoric of animal rights – which no animal could ever claim – and of the rights of Nature, which no one could ever define in terms of legal entities. After all, the popular slugan "ecology versus economy" is also misleading, from an historical point of view. Environmental consciousness has always originated in people's interest in survival and it leads environmental protection into a politically hopeless situation.

Sustainability

4. The historical approach can provide real substance to the aim of "sustainability". It become a topic for discussion instead of degenerating into an empty formula as is often the case on environment policy and education.

Thus we also achieve a most essential contribution to environmental education that is outside the subject of history. Ever since the 1992 World Summit meeting on Environment in Rio, "sustainable development" has evolved worldwide, in environment policy as well as in the guiding principles of environment education for schools, into a symbol, almost a magic formula. In terms of quantity, there is plenty of material. Nevertheless, the concept of "sustainable development" all too often functions more or less as an empty formula, i. e. as a label for everything that is felt to be eco(logical) or in some other way desirable. Even students committed to ecology often lack any clear conception of "sustainable development". This is certainly true of the often quoted "Agenda 21". As early as the Rio conference, a doubtful link was established between "sustainability" and "development". Hence environment policy courtesy of the resources of development aid became a not insignificant accessory to substantial environmental damage in the Third World. It is hardly surprising that numerous supporters of nature and environmental protection, who are only acquainted with the word "Nachhaltigkeit" as a German loan translation of the "sustainable development" of the Rio conference, have a poor opinion of this concept.

Not even the author of an "introduction into Environmental history" – the first book of its kind in Germany! – seems to know that far from being a fashionable Americanism, this idea has been part of German forestry for at least three hundred years! Ever since the 18th century the criterion of "sustainability" ("Nachhaltigkeit") has functioned, generally, as a



This map of a Swedish forester 1830 shows the early method for sustainability in forestry. The forest was divided into 160 parcels and one of them, but only one, was clear-cut each year.

battle concept used by the major wood consumers and the forestry commissions associated with these interests against other users of the forest, who were accused of destroying the forests. The forestry commissions of the "Alpensalinen" used the principle "forest must stay forest!" to fight against the mountain farmers, who endeavoured to extend their pastures at the expense of the forest. "Sustainability" could also help to force through clear-cut areas – which allow for an exact calculation of the permanent deforestation – on the "careless" farmer "Plenterwirtschaft" (the felling of single trees according to requirements). However the much derided "Plenterwirtschaft", where ground protection is concerned, tends to have been more sustainable than the clear-cut areas, especially in the mountains.

All in all, a discussion of efficiency and the usual whims surrounding the idea of "sustainability" can be fairly readily found in middle European forest history. What is decisive in this context are the questions of *who* defines what is meant by "sustainable development", *what* is the concept to which it bears reference and *which* methods are used to define it. The forest scientist Wiebke Peters managed to find more than a dozen different definitions of "sustainability" ("Nachhaltigkeit") in modern German federal forestry alone! Be that as it may: from an historical point of view, "sustainability" is certainly not an empty formula without practical value. On the contrary, we are talking about a concept that displays plenty of tricks as well as consequences! Its origins which are still evident are certainly economic rather than ecological. Funda-

mentally, the connection with economics is a strength rather than an imperfection.

There is, however, one thing we can adhere to from an environmental historical point of view: Over and over again we are told that, unfortunately, history proves that all through the history of evolution, Man has never been programmed for sustainability. Moreover in the struggle for survival, those who asserted themselves were, in general, those who did not care about sustainability. This stereotyped notion is, from an environmental point of view, an inappropriate idea. To decide to what extent it might or might not be correct, would require a thorough discussion, that would be much more important than many other controversies among historians.

Love of Nature and Man

5. An integration of history and environment in education reminds us of the original unity: the love of Nature and Man. It is also a good antidote against a latent misanthropic protection of Nature and environment.

The societies for the conservation of Nature, especially those in northern Germany, complain today about the lack of involvement shown by the young generation. They even fear that soon no one will join the societies.

A certain type of environmental protection seems to have become out of date. This may even be a good thing; among old fashioned conservation ideas we can often find what could be called the attitude of the dogmatic eccentric, leading to the squandering of large amounts of energy on tearing one's own flesh – as a most experienced conservationist politician groaned the other day. No wonder this kind of conservation policy fails to attract young people! Even worse: When you hear certain complaints from conservationists about today's "have fun society", you are reminded of Peachum's "instead of that" song from the "*Dreigroschenoper*" by Berthold Brecht: "Instead of doing something purposeful, they want to have fun and, naturally, they kick the bucket in the dirt". We will never be able to prevent young people from wanting to have fun; this does not, however, automatically make youngsters enemies of the environment. "Protect the environment, earn money and have fun": this "win-win" slogan – using today's jargon – which certainly contains some purposeful optimism, is the motto of Amory Lovins, one of the most creative brains, worldwide, in the field of environment protection. At a symposium of the Lennart Bernadotte Foundation for Environment Education on Mainau, the island of flowers, in 1999, we were told more than once that young people today perceive "eco" as the opposite of fun. This may, however, be largely due to the way in which the importance of the environment is introduced to them. One fact that was also emphasized was the following: Whenever real environmental problems that affect youngsters are the issue, many of them become interested. If, on the other hand, we try – which has happened – to test the environmental consciousness of young people by asking them whether they would be prepared to dispense with the only lake in the vicinity, suitable for swimming, for the sake of breeding birds, we should not be surprised at the sobering results – assuming that the answers are honest, of course. However, it is typical of youngsters to enjoy paddling in lakes to their hearts' content, is it not? When Nature is described as being in opposition to pleasure-loving human beings, we forget the Nature of Man and thereby a vital and original essence of the idea of Nature. The conception of human rights has its roots, historically as well as logically, in a belief in natural rights, even though experts on human rights are no longer aware of this. The presentation of a dichotomy between "non anthropocentric and anthropocentric relationships with Nature" would have been quite an alien thought for Goethe or Rousseau. In their cult of nature, the love of Nature and Man were inseparable. The same thing was true of the hippies, who are today one of the more or less forgotten origins of the modern ecological movement. So far, one of the most captivating texts dealing with the early protection of Nature, is the essay "*Man and Earth*", in 1913 delivered as a message to the meeting of the youth movement at the "Hohen Meissner" by the philosopher

Ludwig Klages. Here he strikes the recurrent theme of Rachel Carson's *"Silent Spring"*(1962), which became the bible of the American environmental movement: the fear of a spring without birdsong: "Who fails to notice with a secret fear, the annually decreasing number of sweet singers, the birds of passage! …It has become terribly quiet, even in the countryside…" He continues: "Extinct species, be it animals or plants, do not renew themselves, the secret warm heart of Man has been emptied." His final hope is that rescue will come from "the creative force of love, connecting everything by weaving everything together". It is necessary to read and reread such texts in order to remind ourselves of our purpose in trying to protect nature and the environment. As I myself have found, these texts also have an impact on modern students.

Modern scientific ecology, with its lists of endangered species and eco systematic calculations, gives us no idea of what this is all about. Hubert Weinzierl, however, who has for a long time been one of the leading thinkers, within Bavarian environmental protection, was honest enough to end his plea for the "Wilderness" model with this confession: "Environmental protection is, when all is said and done, a question of love". Of course he is right! An environmental education which knows nothing of this love will be in vain!

References

Jäger, Helmut 1994: *Einführung in die Umweltgeschichte*. Darmstadt.

Klages, Ludwig: *Mensch und Erde*. 4. Aufl. Jena 1933.

Küchli, Christians 1997: *Wälder der Hoffnung*. Zürich.

Peters, Wiebke 1984: *Die Nachhaltigkeit als Grundsatz der Forstwirtschaft*. Diss. Universität Hamburg.

Radkau, Joachim 2002: *Mensch und Natur in der Geschichte.* (Historisch-Politische Weltkunde des Klett-Verlags) Leipzig/Stuttgart.

Radkau, Joachim 2000: *Natur und Macht. Eine Weltgeschichte der Umwelt*. Beck.

Radkau, Joachim 1986: Vorsorge und Entsorgung. Geschichte und historischer Augenblick in der Mensch-Umwelt-Beziehung. *Geschichtsdidaktik 11/.*

Radkau, Joachim/Schäfer, Ingrid 1987: *Holz. Ein Naturstoff in der Technikgeschichte*. Reinbek.

Sachs, Wolfgang (hrsg.) 1994: *Der Planet als Patient. Über die Widerspruche globaler Umweltpolitik*. Berlin.

Weinzierl, Hubert 1999: Leitbild Wildnis. In: Bayerische Akademie fur Naturschutz und Landschaftspflege. (Hrsg.): *Schön wild sollte es sein…Wertschätzung und Ökonomische Bedeutung von Wildnis*. Laufen.

Oral History – Pitfalls and Possibilities. Narrative as a Source in Environmental History

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Oral history in environmental history investigation

In a school in the village of Arlöv in Southern Sweden, pupils and teachers initiated a project in which they investigated the location of former industries within the municipality. Land on which industrial activities had been situated could be polluted. The project lasted for a year, and the pupils (in their teens) acted as "environmental detectives" in their search for closed-down industrial establishments. In order to collect knowledge about industrial locations, the pupils used written source material from the municipal archives, maps and so on. However, this material had its limitations. Information on environmental issues is not always written down in documents, but has instead to be collected through the use of oral sources. Therefore they interviewed elderly people, for example, workers from former industries. This was a valuable experience for the pupils involved in this project.

Oral history as a source for discovering old waste deposits

In the nearby city of Malmö, the third largest town in Sweden, the authorities dealing with environmental issues have systematically investigated the urban landscape in order to track down former industrial activities. One of the inspectors, Karl-Gustav Möller found it necessary to use oral sources as a valuable complement to written documents. In this way, Möller has been able to get information about the exact locations where industrial establishments dumped poison, oil, batteries and so on. It is mostly impossible to gain information of this kind from written sources. There are several reasons for this problem. Firstly, the activities might be illegal. Secondly, the activities undertaken were sometimes regarded as trivial and therefore remained unrecorded in the documents. However, Möller found that former employees did have a lot of information that no one ever wrote down.

A narrative on working conditions

Another example could be taken from the field of work environment. An old shipyard worker remembered what he had experienced during several decades:

> "It is well known that the riveters suffered from impaired hearing or became entirely deaf because of the noise, We did not know about ear protection. When welding replaced riveting, other environmental problems occurred. When the temperature fell below a certain level, you had to cancel work as there was a risk of tension fissures in the material. Previously, you welded outdoors. This was probably not because the workers ought to have better working conditions, but to avoid stops and disruptions to the production flow when the weather was cold…
>
> Then they started to build welding halls. This caused problems with dust and gases from the welding process. Workers said they made them feel sick whereas the company considered them to be safe. But when they started to use sheet metal that was treated with anti-corrosives, the paint gave off poisonous gases when the temperature was high. They had to use extractors, but it was probably unavoidable that workers were exposed to poisons that did not appear until long afterwards.
>
> The old machine workshop was a large hall with big doors that were often opened for hours when a lot of goods were transported in and out. It was draughty and cold for a lot of people, especially since the heating system was old. In this large hall, there were numerous machines all of which had in common a capacity to produce a more or less high pitched noise, depending on the material that was being treated. It was here that the diesel motors were built and tested, a process that produced substantial noise and exhaust fumes.
>
> When the diesel motors were built, a substantial amounts of cast iron used, which gave rise to a lot of dust everywhere, even in the changing room. Cast iron dust has a bad smell and it was said that when workers took the tram home, the female passengers did not want to sit near them. It is very difficult to depict working conditions in a large enterprise. However in the old days, there was almost certainly more hard and heavy work but also a greater sense of fellowship. Today, there are more technical devices and vibrating tools, gases and stress."

I have quoted this at length, from a book about working conditions for metal workers in Sweden, because I think it is a very interesting and illuminating account. The narrator reports about changes in working condition in a way that is difficult to find elsewhere. He puts environmental changes into perspective. Advances in technology have improved conditions but new problems have arisen as the old ones

Old tanneries had usually poor working conditions. Dangerous chemicals, were often left behind in the ground when the factory closed. An important field for environmental history investigations.

disappear. I think this could be said about all kinds of environmental issues, not only those related to the work environment. His story about workers taking the tram, smelling so badly that the women did not want to sit near them, is of course not written down in any kind of document. You have to get this kind of information by using oral sources. However, the narrator states that the story was told. We cannot be absolutely sure that it is a true story.

Pitfalls in oral history

There are other uses of oral history than those mentioned above. If you are trying to gain information on what has actually happened, for instance studying a movement for environmental protection, you may then have to rely on oral sources. Or you may be conducting an interview with a person in an authority about what happened in your home town a couple of years ago, when a specific decision were made. There are of course numerous instances when the use of oral sources could highlight specific events.

However, when applying oral history methods there are some important things that must be borne in mind. You must always have a critical approach to sources. However you must be particularly careful when you are using interviews or statements from oral sources.

Memory is weak

Firstly, people do forget. As years pass by, the memories that we have left diminish. However, it would be a mistake to think that we forget everything. A researcher called Ebbinghaus showed in the 19th century that people do remember about 20–25% of what they once knew. Some researchers have shown that you forget as much during the first 9 months after an event as you forget during the subsequent 47 years.

The reasons for forgetting are probably that we mix things. If you have experienced similar events, then you might mix them up. This is what psychologists call positive or negative interference. There are however other reasons for forgetfulness. Old age could be one of them. The main rule is to be very careful when using sources that describe events that happened a long time ago since people tend to forget exactly how it happened. However, there is a difference between remembering an event and remembering what conditions were like in the old days. It is extremely difficult to remember exactly what happened on a specific day or week many years ago. However, if people are asked to remember what things were like in school or in the part of town where they grew up, it is different. If you ask a factory worker about working conditions in the factory where he or she worked twenty years ago, you will probably get a reliable statement. The worker in question has been there for months and years. That is why he or she remembers what it was like to work under those conditions.

A better story

Secondly, there might be other reasons not to rely on oral sources. People tend to tell you the stories they want to tell. They may have some political, ideological or other reason not to give you the correct information. Sometimes people try to exaggerate what has happened or maybe the part they have played in the chain of events. Sometimes, they are silent about some things that they do not want to be known. There might of course be several reasons for this silence.

There is also a problem concerning which stories are actually told. Some people think that it was better in the old days. According to them, everything is getting worse. This may lead them to exaggerate what happened in the "good old days". Other people think that everything is getting better. Well, this may lead them to exaggerate the badness in the old days. So, you have to be careful.

You may think that I contradict myself, as I first argued that we must use oral sources and that at the same time they may be unreliable. My point is that we should use them, but in a careful, critical fashion with respect to the source materials. Sometimes it may be possible to use them together with written

sources. In that way, we will be able to examine if they are correct. They may be used to complement our knowledge about something. But if there are no written sources available, then we may have to compare different oral sources. In that way, we could make several interviews.

Interpretations of the past

Thirdly, there is a difference between trying to get information about the past as opposed to information about how people in the present view the past. Sometimes, it could be interesting to investigate how people interpret the past. For instance, how do politicians today look upon decisions about the environment that they made years previously. They may have – or may not have – changed their views about what happened. Let us take an example. Politicians in the city of Malmö in southern Sweden decided to demolish several blocks in the city in the 1970s. There were a lot of protests since the houses had a considerable cultural and historical value. Today, most of the politicians involved regret what they did. However, it would be equally interesting to find politicians who defend or belittle their actions.

Interviewing people

There are several ways of conducting interviews and many different aspects which deserve consideration. In his book *The Voice of the Past*, Paul Thompson outlines some of the important factors to be kept in mind when conducting interviews.

First of all, it is necessary to be well prepared. Before you carry out an interview you must know quite a lot about the issues involved. Sometimes you have to conduct one or two interviews before continuing the rest of the interviews. Most of the time it is sufficient to read papers, books or documents before you start interviewing. For instance, it is probably especially important to know something about environmental issues before conducting interviews in this field.

An interview guide

You will need what is called an interview guide, which is a set of questions that you have written down on a paper. You do not have to ask those questions in a specific order, as interviewees frequently mention them all the same. Nevertheless it is advisable to have this check list written down, as you may forget which questions to ask. It is quite easy to drop the concept if the informer is a good narrator.

Sometimes it is better to write down specific questions, depending on the aim of the interview. There are, however, certain things that should be taken into consideration. Construct simple and unambiguous questions. It must not be possible to interpret the questions in different ways. Remember not to ask two questions in one. It is also very important not to ask leading questions, such as: – You surely did not want to destroy the housing area, did you? However, Paul Thompson states that it in certain circumstances, it could be necessary to gain sympathy from the narrator by showing that you share his/her view. This must, however, be used with great precaution.

Sometimes it is better to ask open questions, in order to get a narrative account from the interviewee. You may ask: – Tell me about what happened back in 1972 when you were involved in the environmental

The owner of the forest with a single old oak. He was later interviewed about its history by the children in Mastaiciai.

Interviews have to be prepared well before performed.

movement. Then, if you are lucky, the narrator will tell you all about it. Sometimes you may have to interrupt by saying: – Tell me more, about that, or – Who was that person?

Where to make the interview?

The location of the interview is also of importance. This depends on the aim of the interview, but in many cases it could be advisable to conduct the interview in a place that is comfortable for the narrator, for instance in his/her own home. But if your aim is to investigate the working environment, the best place may be the work place (if possible) or at least close to it. This could recall memories from the past. In some instances, it could be helpful to bring something that triggers the memory of the narrator. It could be an old photo or an article from a paper.

Sometimes, we may gather together a group of people who could correct themselves when trying to remember what actually happened. However, there is always a danger that they adjust themselves to each others stories. I have myself worked a lot with oral sources organised in so-called research groups among retired workers. This means that the narrators form a group which I as a researcher have led. Sometimes the people involved could discuss freely while I record or write down what is said. On occasions, I interrupt and pose questions. Often enough we have had different topics, such as work environment, under discussion. Then the participants will remember, correct each other and sometimes even deliver contradictory stories. This could in fact be quite fruitful and illuminate the issues in new ways.

If it is possible, the best idea is to bring a tape recorder when conducting the interview. However, it is essential that the interviewee accepts this device. Some people are not as outspoken as they normally would be when a technical device is present. This is of course very much the case if you bring a video camera. If the interviewee does not accept a tape recorder, than you have to write down key words. This can be difficult but unfortunately it is sometimes necessary.

Concluding remark

I introduced this article by discussing why it is fruitful – and sometimes necessary – to use oral history when investigating environmental issues. But, in fact I think that, as far it is possible, oral history could be useful in all types of history. Human memories are naturally limited. You cannot use oral history if you are studying periods older that the beginning of the 20th century, as you will not find anyone to interview.

However, in my opinion oral history is valuable for a very specific reason. It is democratic and emancipatory. I will conclude the article by quoting Paul Thompson, developing this theme:

> "Oral history is a history built around people. It thrusts life into history itself and it widens its scope. It allows heroes not just from the leaders, but from the unknown majority of the people, it encourages teachers and students to become fellow-workers. It brings history into, and out of, the community. It helps the less privileged, and especially the old, towards dignity and self-confidence. It makes for contact – and thence understanding – between social classes, and between generations. And to individual historians and others, with shared meanings, it can give a sense of belonging to a place or in time. In short it makes for fuller human beings. Equally, oral history offers a challenge to the accepted myths of history, to the authoritarian judgement inherent in its tradition. It provides a means for radical transformation of the social meaning of history."

And, one might add, that makes it a perfect device when studying environmental history. Using it could also make the persons involved, the interviewer and the interviewee, conscious of environmental issues and the mechanisms of change.

References

Berggren, Lars and Olsson, Lars 1988: "Arbetsmiljö, hälsa och arbetarskydd", in *Metall 100 år – fem uppsatser*, Stockholm.

Thompson, Paul 1998: "The voice of the past: oral history", in *The Oral History Reader*, (eds.) Robert Perks and Alistair Thomson. London.

Thompson, Paul 2000: *The voice of the past: oral history*. Oxford. Oxford University Press. ISBN: 0-19-289317-3

Environmental History Resources

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Environmental history societies and journals

The growing international literature on environmental history and the local material will provide good sources for work on environmental history in school education.

To start with, there are two relatively new societies for environmental history, the *European Society for Environmental History* (ESEH) and the *American Society for Environmental History* (ASEH). Their websites can easily be reached on the Internet and have links to other interesting sites. They also provide bibliographies on environmental history literature.

There are also two main international journals for environmental history – the European *Environment and History* and the American *Environmental History* both of which may also be found on the Internet.

Environmental history literature

The literature in this field is growing rapidly. A good introduction to the subject is provided by John McNeill's *Something new under the sun* which deals with the great changes caused by industrialisation and the release of new energy sources during the past 200 years. Another good overview, written in German, Joachim Radkaus' *Natur und Macht*, covers an even longer time perspective. Here the author stresses the importance of the way in which nature is viewed and the role of power relationships. Two recent books on world history that adopt an environmental history perspective are Donald Hughes' *An environmental history of the world* and John and William McNeill's *The human web*. An early attempt to organize work on commmon themes of European environmental history was made in *The silent countdown: Essays in European environmental history* in 1990 by Peter Brimblecombe and Christian Pfister.

Concerning the sea and environmental history, a good introduction is *The exploited seas.: New directions for marine environmental history*, an anthology edited by Poul Holm, Tim D Smith and David J Starkey. A highly popular book about fishing on the Newfoundland banks is Mark Kurlansky's *Cod. A biography of the fish that changed the world*.

Energy use, air pollution and climate change are also important subjects. A good start is provided by Rolf-Peter Sieferle's *The subterranean forest : energy systems and the industrial revolution*. Vaclav Smil's *Energies* offers an interdisciplinary overview. The

story of global warming is described in narrative form in Gale Christiansons *Greenhouse*, connecting the histories of sciences and technology. The discovery in the late 1960s of large-scale air pollution caused by sulphur dioxide is analysed in Lars J Lundgren's *Acid rain on the agenda*.

Concerning urban environmental history, there are already two classical books on air and water pollution in London, the first modern European city with over one million inhabitants: Peter Brimblecombe's *The big smoke* and Bill Luckin's *Pollution and control*. A similar history of industry and air pollution is to find in Franz-Josef Brüggemeiers and Thomas Rommelspachers *Blauer Himmel über der Ruhr*.

The European history of landscapes is presented in *European woods and forests* edited by the English historian Charles Watkins.

Local environmental history resources

The best way to start searching for general Environmental History resources is through the bibliographies on the web. However local studies require local material and resources. These resources are of three different kinds. Firstly there is written material at the national and local level such as statistics, local history literature and local maps. It is easy to forget that newspapers are a good source to use when investigating a local environmental problem. Local archives containing official minutes, correspondence, pictures and old films are extremely useful. These types of documents along with accounts, diaries, letters etc, could also be found in private hands.

Secondly oral history is a very important source in local studies in environmental history. As can be seen in this book, interviews with elderly people about their lives and the changes that have taken place in the local environment are regularly used by schools working with environmental history. Although there are some methodological problems with this approach, it provides us with source material that would otherwise be very difficult to obtain. Oral history as a method is discussed in a special article in this book.

Thirdly we have the landscape or the natural environment itself. Reading a landscape in the right way can tell us about its history. The pollarded trees, hedges, old fruit trees and the overgrown stones from an old house tells us about former land use structures. Old industrial ruins and mine shafts filled with water tell us about the industrial past of our neighbourhood. As is described in one of our articles, the concrete on the bottom of a small Polish river tells us about once ambitious but now long forgotten urban plans.

There is much more in nature than meets the eye. Chemical waste, acid soils and heavy metals tell us about the environmental history of an area. But then we need to examine this area using natural scientific methods to analyse its contamination by substances such as sulphur, lead and mercury. The industry or gas works which were once situated here use processes that produced this contamination. This means that we often need to use natural science in environmental history research for two purposes: to analyse our sources and to understand the processes that created an environmental problem. On the other hand, natural scientists need social science and history in order to understand why people once let this happen.

Environmental history resources are multifaceted and their usefulness is judged in relation to the questions that we pose to the past. Although sources are fairly similar in natural science investigations, they tend to differ from country to country and between different local communities in the same country for environmental history. This means that it will be more difficult to offer general advice on the methodology to be employed in a local environmental history study. At the same time, it will still be more exciting to try to find new sources and methods to explore the past of your own local environment. This book will hopefully give you the inspiration to try.

References

http://www.eseh.org/
http://www.h-net.org/~environ/ASEH
http://www.erica.demon.co.uk/EH.html
http://www.lib.duke.edu/forest/ehmain.html
Brimblecombe, Peter 1988: *The big smoke: a history*

of air pollution in London since medieval times. London. Routledge. ISBN: 0-415-03001-3

Brüggemeier, Franz-Josef/Rommelspacher, Thomas 1992: *Blauer Himmel über der Ruhr: Geschichte der Umwelt im Ruhrgebiet 1840–1990*. Essen: Klartext. ISBN:3-88474-364-3

Christianson, Gale E. 1999: *Greenhouse: the 200-year story of global warming*. London. Constable. ISBN 0-09-480030-8

European woods and forests: studies in cultural history. 1998. Ed. Charles Watkins. Wallingford: CAB International. ISBN 0-85199-257-9

The Exploited Seas: New directions for marine Environmental History. 2001 Eds. Poul Holm, Tim D. Smith and David J. Starkey. International Maritime Economic History Association/Census of Marine Life. St. Johns, Newfoundland. ISBN 0-9730073-1-1.

Hughes, Donald 2001: *An environmental history of the world: humankind's changing role in the community of life*. Routledge. ISBN 0-415-13619-9

Kurlansky, Mark 1999: *Cod: a biography of the fish that changed the world*. Vintage. ISBN 0099268701.

Luckin, Bill 1986: *Pollution and control: a social history of the Thames in the nineteenth Century*. Bristol. A. Hilger. ISBN 0-85274-472-2

Lundgren, Lars J. 1998: *Acid rain on the agenda: a picture of a chain of events in Sweden, 1966–1968*. Lund. Lund Univ. Press. ISBN 91-7966-511-X

McNeill, John 2001: *Something new under the sun: an environmental history of the twentieth-century world*. Penguin. ISBN: 0-14-029509-7

McNeill, John, McNeill, William 2003: *The human web: a bird's-eye view of world history*. W.W. Norton. ISBN: 0-393-05179-X.

Radkau, Joachim 2000: *Natur und Macht: eine Weltgeschichte der Umwelt. Beck*. ISBN: 3-406-46044-5

Sieferle, Rolf Peter 2001: *The subterranean forest: energy systems and the Industrial Revolution*. Cambridge. The White Horse Press. ISBN 1-874267-47-2.

The silent countdown: essays in European environmental history. 1990. Eds. Peter Brimblecombe, Christian Pfister. Berlin; New York. Springer. ISBN: 3-540-51790-1

Smil, Vaclav 1998: *Energies: an illustrated guide to the biosphere and civilization*. Cambridge, Mass. MIT Press. ISBN 0-262-19410-4.

Environmental History and Historical Fish Populations in the Baltic

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Human interference or natural causes?

From one year to the next, there are large variations in the quantities of new young cod, herring and other kinds of fish that are produced in the Baltic. This variability makes it difficult to predict future fish stocks and accordingly diminishes the value of recommendations for fishery quotas. Gradually we have acquired considerable knowledge about the different mechanisms, which can partly explain some of the variability. Whenever we try to make prognoses for the next two or three years, however, uncertainty predominates. History may help us to understand the reasons for these fluctuations.

The two main explanations of fish stock dynamics are well-known in the public debate. Violent changes are attributed either to human interference (through fishing, eutrophication, pollution, and so on) or to Nature itself. Should we look for an explanation of decreasing populations in previous overfishing, or could shifting temperatures be the reason? Might a growing fish population be explained by an increasing inflow of saltwater into the Baltic or by human discharge of nutritive substances? Accordingly the debate surges back and forward. One reason why we are unable to come up with any clear answers to these questions is that the factors governing fish populations are very complicated and interdependent (for example, the fishery itself, differences in growth and survival rates, migration patterns). Another reason is the relatively short time-scales of most biological and environmental data series concerning fisheries. Usually the data cover relatively short periods of around 20–30 years, which makes the statistical calculations less valuable. Even worse, some of the natural and human effects are detectable only during a medium to long time-scale of 10 to 100 years. While the scientific data are only available on a decadal time-scale, we need information on a centennial scale.

A possible solution to this problem might be to try to lengthen our time-scales, using less perfect but on the other hand much longer time-scales, stretching back to a time when fishing activities were less intense

or the fish populations were larger. For this purpose we can use historical records, offering us a possibility to estimate the stock sizes and levels of variability in the past. There are written sources dating from the Middle Ages up to the present day, consisting of tax and tithe lists, fishery sales fees and reports from the inspections of certain fisheries. The archives of Nature consist of innumerable fish scales from the dead fish of ancient times. Under some circumstances (e.g., along the Californian coast) they have been preserved in the bottom of the sea and are accordingly available for examination whenever samples are collected from the seabed. Both sources have turned out to be very helpful in the reconstruction of reliable long time-scales, showing the existence of both fish and marine mammals. Marine environmental historians and historical ecologists have worked together on these types of information and demonstrated that fish populations are exposed to moderate to large variations. Once these historical changes have been established, they may be examined against human and climatic indicators to test our theories of anthropogenic and natural causes of change.

The hydrography of the Baltic

The Baltic is a semi-enclosed brackish sea, consisting of fresh upper layers of water and more saline ones further down. The condition of these layers is determined by the inflow of salt water from the North Sea, particularly during winter storms, and the continuous discharge from the large rivers. The extent of this inflow to the Baltic is determined by the climate. In between the large inflows, a lack of oxygen may occur at the bottom of the sea. At other times, violent storms can add well oxygenated salt water from the North Sea and the Skagerrak, which, for a short time, will provide good breeding conditions for animals and plants living at the bottom. Compared to the North Sea, for example, there are relatively few species in

The Baltic Sea is affected by both natural and human causes.

the Baltic, many species being exposed to permanent physiological stress due to the strong spatial gradient in salinity throughout the Baltic. In addition to this strain, species in the Baltic become stressed due to temporal variations in concentrations of salt and oxygen.

The climatic influences in the Baltic are partly related to the so-called North Atlantic Oscillation (NAO), an index of the difference in atmospheric pressure between Iceland and the Azores. A high NAO index is related to heavy, relatively warm winter storms from the west, while a low NAO index brings very cold air masses from Siberia. NAO- positive winters are mild and stormy, while the cold NAO-negative winters bring a strong coating of ice to the inner, brackish parts of the Baltic. The climatic changes affect the entire ecosystem, such as the development of plankton and the survival possibilities of young stages of fish.

Another essential influence on the ecological system of the Baltic is eutrophication. In the 20th century, an increasing discharge of nitrogen, caused by, among other things, the use of fertilizers in farming, led to reduced water transparency and fewer large algae in deep waters, as well as an increase in the occurrence of oxygen depletion. Eutrophication probably affected the fish as well (for example, the population of herring and sprat increased concurrently with increasing eutrophication), although it is difficult to prove causal connections.

Historical fisheries in the Baltic

In the Middle Ages, herring was the basis of substantial fisheries in the Baltic and in the Sound, attracting fishermen and tradesmen as well as tax collectors, who were to exact fishing dues on behalf of the king. This is why, as early as the 15th century, we have access to some information about the extent of the fisheries. The tradesmen of the German Hanseatic League played a decisive role in developing the marketing of the fish, herring becoming one of the most important commodities of medieval trade. The actual fishing was carried out with thousands of small drift-net dinghies with crews of four or five men, in the Sound and in the Baltic between the island of Bornholm and the province of Skåne. There were two sub-species of herring, *Clupea harengus harengus L.* and *Clupea harengus membras L.* The proportion between those two is not known, however. Herring fishing was developed already before the rise of the Hanseatic League in the 12th century. It became the most important merchandise of the Hanseatic tradesmen. It is worth noting that decline of the League in the 16th century more or less coincided with the decline of the herring fishing.

The fishing season lasted from August to late October. The fish was split and put into brine and packed in barrels, where it would keep for a year, to be transported all over northern and Central Europe, in particular to the large German market. In medieval Europe, the fisheries in the Sound were the most substantial. It was not until the 16th century that they were surpassed in size by the Dutch North Sea fisheries. Tens of thousands of people from the entire Danish area took part in fishing. To be allowed to go fishing, a fisherman had to buy a small leaden marker. In the 1520s, according to customs registers, as many as 37,000 such markers were sold. In the 1540s, however, a severe decrease in fishing occurred. This low level prevailed throughout the century, resulting in dire social consequences for the coastal villagers, whose income had been largely dependent on the herring. There was a short revival in 1620, but nothing similar ever occurred again. Even though the fishermen of the Sound and of Bornholm maintained a less extensive fishing, the herring population in the Sound seems to have been greatly and permanently reduced.

But how large was the decrease, actually? Around 1200, Saxo writes that in the Sound, herring was so densely packed that a lance could stand upright among them, making it possible to catch the fish with one's bare hands. Around 1400, the estimated annual haul was close to 40,000–50,000 tons, according to Holm and Bager (2002). In the beginning of the 20th century, Danish landings fluctuated between 100 and 10,000 tons. The Swedish catch would probably

have had similar dimensions. Thus, the best years of the medieval fishery may have been two to three times larger than those around 1900. The technology remained probably more or less the same throughout the centuries since drift-net fishing seems to have been completely developed at an early stage. Nevertheless, the fishing pressure as represented by number of men and boats was probably much larger in the Middle Ages than in later years since the fish price was relatively much higher in the Middle Ages than at the beginning of the 20th century. Hence, while the herring population may have been larger in the Middle Ages, it is unlikely that it was much larger than in the early twentieth century.

Cod in the eastern Baltic

Since the early 1950s, cod has been intensively fished in the Baltic, reaching a maximum yield of about 400,000 tons in the 1980s. (Diagram) By far the largest part of the catches was taken from the area east of Bornholm. Before the 1950s, the exploitation was small, less than 10,000 tons a year. The catches do not necessarily reflect fluctuations in the true size of the population, however. Instead biologists believe that the eastern population of spawning cod varied quite strongly after the mid-1960s, reaching a peak of ~800,000 tons of spawning biomass in the early 1980s, while today it amounts to approximately 90,000 tons.

On the other hand, due partly to the fact that fishing was simply not very well developed earlier, little is known about the size of the cod population before 1950. Polish fishermen complained about bad hauls in the 1930s, as compared to the 1880s and 1890s. A more recent analysis by Thurow in 1999 shows that between 1900 and 1930, the historical biomass in all of the Baltic may have been no more than 20,000–50,000 tons, or less than half of the lowest estimate of biomass since 1966. This analysis corresponds with more widely spread contemporary observations, seemingly pointing to a small population, which grew in the 1930s and 1940s.

This analysis raises the important question whether, in previous centuries, the population has experienced similar increases and decreases, and, if that is the case, what the reason for these variations might be. The answer to this question will be of obvious importance to future guidance on fishing in the Baltic, since it will show whether the low population of today is historically unique or an expression of natural fluctuations in population (MacKenzie et al. 2002).

Tax accounts show that cod has been fished since at least the 15th century. Archaeological finds of cod bones in excavations of settlements on Bornholm as well as on the east coast of Sweden show that cod was being fished as early as the 6th–7th and 12th centuries, according to Enghoff (1999). More exact information can only be had from the early 17th century,

There are still some big fish left in the Baltic Sea.

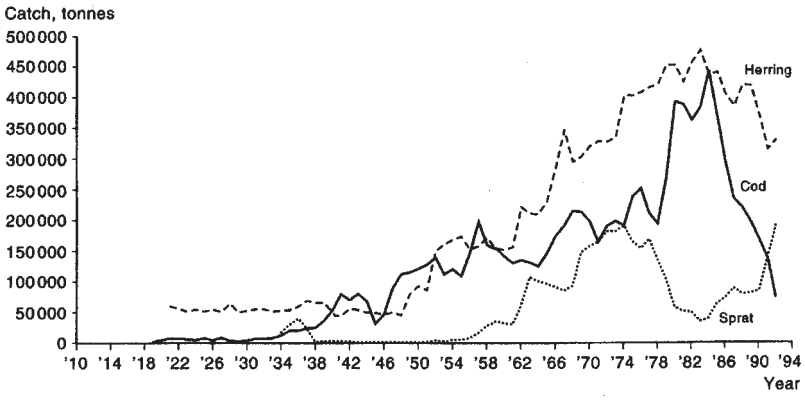

Diagram: Commercial landing of cod, herring and sprat in The Baltic Sea, 1910–1994.

however. Hence a current study of original sources by the historian Maibritt Bager shows the existence of considerable cod fishing in the waters between Bornholm and the province of Blekinge during the first half of the 17th century. Political and military conflicts between Sweden and Denmark after 1658 may have destroyed or jeopardized the fishing, which did not redevelop in earnest until the mid-18th century. In the years between 1760 and 1830, an intensive trade in live cod was carried on from Bornholm. In specially-designed well smacks, the fish were brought live to the fish market in Copenhagen. After 1830, however, the fishing off Bornholm seems to have decreased. Instead the smack skippers of Bornholm started buying cod from other Danish waters. The historical material makes it possible to imagine two earlier periods with good populations of cod occurring before the large populations during the second half of the 20th century, namely during the first half of the 17th century and the second half of the 18th century, i.e. in periods of 100–150 years between the eras of greatness. The material is still too scant, however, for us to be able to draw reliable conclusions. Above all there is a need for a complete survey of the preserved historical data dealing with Bornholm as well as with Sweden, and, preferably, with other parts of the Baltic. Formerly, the spread of cod into the Baltic would , from a general point of view, have been an indication of a larger population. Once there is more material available, it will be necessary to interpret these data together with environmental (e.g. NAO) and socio-economical factors.

To be able to follow these and other tracks in order to reconstruct the ancient ecosystems, a group of historians, biologists and natural historians (palaeo-ecologists) have begun working together on the project called History of Marine Animal Populations. This project is being carried out under the global research programme Census of Marine Life and is supported financially by, among others, the American A.P. Sloan Foundation. The aim of this cooperation is to procure, within the next five years, completely new historical knowledge in order to be able to reconstruct past ecosystems and the history of interaction between humans and the Baltic Sea.

Conclusion

Throughout history, during decades and centuries, there have been very large fluctuations in the populations of cod and herring in the Baltic and in the Sound. Little is known, however, about the exact course of events and the reasons for these fluctuations. To enable us to predict future variations in populations and find out more about the relations between effects caused by Nature and those caused by society,

the acquisition of more knowledge about ancient times is essential. The cooperation between historians, palaeoecologists and biologists, which has now been initiated around the Baltic, makes it possible for us to hope that the next few years will bring substantial new knowledge.

References

www.hmapcoml.org

www.conwoy.ku.dk

Enghoff IB 1999: Fishing in the Baltic region from the 5th century BC to the 16th century AD: evidence from fish bones. *Archaeofauna 8*, 41–85.

Holm P & Bager M 2002: The Danish fisheries c.1450–1800. Medieval and early modern sources and their potential for marine environmental history. Holm, P & Smith, T. *Exploited Seas: Directions for Marine Environmental History*. St. John's, Newfoundland.

MacKenzie BR, Alheit J, Conley DJ, Holm P, & Kinze CC 2002: Ecological hypotheses for a historical reconstruction of upper trophic level biomass in the Baltic Sea and Skagerrak. *Can J Fish Aquat Sci 59*, 173–190.

Thurow F 1999: On the biomass of cod in the Baltic Sea during the 20th century. *ICES CM 1999/Y: 03*.

The Sea and the Cities
Towards the Environmental History of the Baltic Sea

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The Baltic Sea…

The Baltic Sea is a unifying element for the nine countries surrounding the sea and for about 90 million people living in its catchment area. The importance of the Baltic Sea will grow due to the new states of the European Union. It is a sea of great political, social, economic and cultural importance for all of the people in Baltic Europe. All these advantages provided by the sea have, however, been endangered by the degradation of this unique ecological system.

The Baltic Sea is one of the largest brackish bodies of water in the world. It is an especially sensitive sea because it is a shallow, and semi-enclosed body of water that receives a considerable load of pollutants from surrounding countries. The pollution of the Baltic Sea has been a major problem for people and governments. It may be claimed that the state of the sea is one of the most important common environmental problems for countries in Northern Europe.

Environmental questions are dialectical because they often involve both degradation and attempts to protect nature. Coastal societies of the Baltic Sea have struggled to protect the sea by trying to decrease the discharges from industries, municipalities, and shipping. The Helsinki Convention signed in 1974 was a historic event because it was one of the first agreements in the world aimed to protect a whole sea area from different pollutants. Today new forms of co-operation and networks are being created in the region. Local Agenda 21 have been adopted in all coastal states to improve democratic environmental policy-making and protection.

…and its environmental history

There is a vast amount of research literature on environmental themes concerning the Baltic Sea. The major part of this research is of a natural scientific or technical nature focusing on present day problems. Contemporary environmental problems are, however, the results of political decisions made in the past. Hence there is an evident need to understand the current environmental changes of the Baltic Sea from historical and social perspectives as well. The Baltic

Sea region has naturally been studied from a social and historical perspective although the ecological approach and environmental problems have been neglected so far in historical research. The environmental history of pollution and protection of the seas and oceans is in general an unexplored theme despite the fact that they cover roughly two-thirds of the surface of the globe.

The environmental history of the Baltic Sea is unknown. It is only recently that this new field has begun to be explored. This delay in initiating research is however understandable. The total land area of the Baltic drainage basin covers approximately 1.7 million square kilometres and includes territories from altogether 14 nations. The literature and archival sources are written in a number of different languages and they are scattered over hundreds of institutions. In addition, there are neither chairs nor established university curriculum nor research institutes of environmental history in Western not to speak of Eastern Baltic Europe.

The local approach

The studies on the environmental history of the Baltic Sea were started from the local level. A project named "*The Sea and the Cities: Pollution and protection of urban sea areas in the Baltic Rim in 1890–1990*" studied the environmental history of water pollution and protection in cities. There were several reasons for this decision. The studies were initiated at a local level, in cities, because about 80% of the population in the Baltic Sea region live in urban areas. The cities represent the highest local, and often national, economic and political power, plus large, well-educated and environmentally active segments of populations. Almost 20 million people live in the major urban centers participating in the project. These cities contain most of the people who have suffered from the pollution of the Baltic Sea. The state of the ope sea areas is a rather distant theme for ordinary people. The object of our study, the coastal waters, on the other hand, represent the most important part of the Baltic Sea for urban inhabitants.

Ten major cities of the Baltic Rim countries participated: St Petersburg, Tallinn, Riga, Vilnius, Gdansk, Kiel, Copenhagen, Oslo, Stockholm and Helsinki. Two national studies were also completed. The project included three main topics: the successes and failures of municipal environmental policies, the history of urban pollution and the long-term development of wastewater technology in cities.

A research project

The organisation of the project was a challenge because environmental history was unknown especially in the eastern part of the region. Another problem was to create cooperation between different disciplines in each city.

Accordingly a hydrohistory group of students from each discipline along with senior key persons was formed in most cities. The project organised three workshops on the environmental history of the Baltic Sea and its cities. The main aim was to support the students by improving the knowledge required in urban environmental history, integrate them into the international research project (workgroups), and develop academic abilities and skills of the students. In particular, the project provided international contacts and experience for Baltic and Russian students. Naturally the novelty of the approach, lack of time and the cultural differences of different disciplines caused difficulties as well.

Nevertheless, the project has achieved a wide participation. It created a network of over 40 students and senior scientists including students and experts from humanities, social, natural, and technical sciences. The project was supported by the Nordic Environmental Research Programme (NERP), Social Science Research on Environmental Issues, Nordic Council of Ministers. NorFA and Nordplus also contributed. In the following some of the results of this preliminary project are described in brief.

Professor Khlopin studied the currents of the Neva Bay in 1913 and pointed out the best place for a wastewater treatment plant and its outlet. Today the second largest wastewater treatment plant of St. Peterburgs is located on the same site.

What did we find?

At the end of the 19th century, the rapid growth and modernization of the towns, the rise of the "networked city" – cities with technical networks able to control the flow of energy, materia, people and water – transformed the traditional social water problems to modern environmental problems. The great cities became the first major "hot spots" of the Baltic Sea.

Even the medieval towns had pollution problems. However the modern sewage system and industrialization caused dramatic effects that were hitherto unknown. Eutrophication was recognized at an early stage as a threat, but until the 1960s and 1970s, it was a problem of secondary importance. More important were the straightforward consequences of wastewater unloaded on the nearest shore: smell, dirt, pathogens, methane gas, dead bottoms and destructed shores surrounding the cities centers. The horrifying state of the coastal waters consequently affected the recreational use of the cities, coastal economies, housing, city planning and the wellbeing of the area's citizens. No wonder that the protection of the urban watercourses became one of the first themes of modern environmental discussion. This took place as early as the turn of the 19th and 20th century.

The major cities were sources of problems but also solutions. Earlier than any other institution, the cities allocated considerable economic and intellectual resources towards the solution of environmental problems. The cities conducted the first serious natural scientific studies on pollution. Engineers tested and built the first mechanical, biological or activated sludge plants during the first decades of the 20th cen-

Environmental thinking creates new sites for ecological sightseeing as well. Here local people are visiting the central waste water treatment plant in St Petersburg, Russia. Historical knowledge is needed to provide meaning and perspective for these plants and other similar sites of urban ecotourism.

tury. As a result, the contemporary network of over 2,500 municipal waste water treatment plants in The Nordic Countries has on its own improved the state of our environment perhaps more than any other single innovation. In short: modern environmental protection was started by the cities about 100 years ago and ever since they have borne a major burden of the protection of the Baltic Sea.

This goal has only been achieved by intensive technical and natural scientific research, expensive investments, and hard-fought political battles that were sometimes lost. Clean urban and coastal waters are, however, taken for granted today by the general public and politicians in Western cities! Efficient wastewater treatment networks and the monitoring of the watercourses are considered to be normal parts of the infrastructure of every city and welfare state. Yet the state of public opinion is understandable: Environmental studies have concentrated on the development of environmental politics during the past 20 years rather than the last 100 years.

The contemporary municipal wastewater treatment network in Northern Europe constitutes the oldest, largest and most efficient sector of a complex that we now call environmental protection.

Presenting our results for wider audience

We believe that through environmental history, the inhabitants and the political decision makers will be better able to understand their opportunities and accept the amount of resources and time needed in the future to improve the state of the Baltic Sea. Yet there has been hardly any study material available on the environmental history of the Baltic Sea so far. The Sea and the Cities project has published two special issues on the urban environmental history of the Baltic Sea. In 1999 *European Water Management* – the principal journal of European professional associations of water pollution control, presented a special issue on the history of urban water technology in the Baltic Sea region. In 2001 a special issue called Man and the Baltic Sea was published in *AMBIO – A Journal on the Human Environment*. This special issue focused on the contemporary state of the sea and on the history of urban politics and scientific studies on pollution in eastern and western cities.

Multidisciplinary urban environmental history is a new interdisciplinary field that integrates different sciences. It hardly exists as a discipline or a curriculum in the universities. There is an evident need to arrange common educational programmes as all the nations share the same environmental problems. The Sea and the Cities web pages contain presentations of 10 major cities in the region. Published articles are available in pdf-form and unpublished articles in html-form. The web address of these pages is as follows: www.valt.helsinki.fi/projects/enviro The main aim is to provide concrete local studies and examples of urban socio-ecology for local needs. The www pages will be further developed in order to create an educational programme on urban environmental history available for schools and universities on the Baltic Rim.

How the website can be used in schools

Websites are needed above all to develop historical imagination concerning the urban environment. Historical imagination signifies ability to imagine how the ideas of the people concerning their own environment, society and themselves have changed over time. Historical imagination powered by website is, however, not useful only in terms of history but also in terms of present day situation and future.

To start with it should be recognised that it is a particularly challenging task to imagine the dramatic environmental changes that have taken place in our cities. For example, the urban nature of watercourses have undergone a fundamental change over a very long time period. It may be difficult to imagine today that people swum near the present day city centres for a century ago. Then pollution grew worse due to expanding industrialisation and urbanisation. Swimming became in practise impossible in most cities. Yet, during the more recent decades the urban

watercourses have become considerably cleaner and today it is again possible to swim near city centres.

Today this fundamental change of the urban environment is, however, nearly invisible and hence also unstudied and unknown. Therefore empirical historical research is needed to guide pupils towards using environmental imagination at schools. How was the situation of the environment and people in past in my own city? How the city may have looked, sounded, smelled or felt like in past? A website may provide different kind of source materials may be used at different classes for different kind of pupils. Natural scientific studies were much more descriptive in past than they are today and hence pupils interested in sciences may understand them. Those who are more interested in technology may look for technical descriptions to find interesting examples. Those interested in society may look for conflicts or opinions of different groups of people. A map can be useful to connect historical places to contemporary situation. But historical knowledge and imagination is needed also for the future.

"If you fell in dispair, take a look at history!" This was the advice of the former chairman of the Finnish Association of Nature Conservation. This guideline may be adopted also to the urban environment in order to see in what kind of situations urban inhabitants or groups acted in past. There are a number of examples of people who demanded protection for urban environments that already seemed to be doomed by "progress". Yet, the very same areas are today clean and people area delighted to use for recreation. Hence, urban environmental history proves that profound changes can take and have taken place in cities in all times and therefore nearly everything is possible also in terms of environmental politics and reforms. Such encouraging examples are of importance for people in order to continue developing new environmental visions and even utopias for the cities. Therefore, environmental history is above all fruitful raw material for creating new socially and ecologically sound ideas for future cities.

The website of the research project.

Conclusions

The main contribution of *The Sea and the Cities* project is that it created a multidisciplinary research network of environmental history in 10 cities and provided an empirical overview of the origins of water pollution and protection in the Baltic Sea region at the local level. This is, however, not enough to understand the complex socio-ecological processes that transformed the Baltic Sea from a mere natural resource into an international environmental question during the 20th century. Hence, there is an evident need to expand the studies from local issues to larger social processes.

A pioneering study initiated by The Sea and the Cities project in Lithuania may contain some important implications for future studies. The study directed by professor Anolda Cetkauskaité turned out to be the first systematic study of the development of water pollution control at the national level in a former Soviet Republic. The detailed study of the history of water pollution research, wastewater treatment and water pollution management in Lithuanian SSR in 1950–1999 suggests that water protection might

also have developed in the other socialist republics and countries much earlier and faster than has been previously indicated.

In brief, these results suggest that there is a need for further studies, in addition to the local approach, especially at the regional, national and international levels of the environmental history of the Baltic Sea. Therefore our future aim is to expand the studies from local to larger issues: when and where, how and why the Baltic Sea finally became an environmental question that we all had to face.

References:

Cetkauskaite, A. & Zarkov, D. & Stoskus, L. 2001. Water quality control, monitoring and wastewater treatment in Lithuania 1950 to 1999. In Laakkonen, S. & Laurila, S. (Eds.), 2001, pp. 297–305.

Cronström, A. 1986. *Vattenförsorjning och avlopp. Stockholmsmonografier*. Stockholms stad, Uppsala.

Engberg, J. 1999. *Det heles vel. Forureningsbekæmpelsen i Danmark fra loven om sundhedsvedtægter i 1850´erne til miljøloven 1974*. Miljøkontrollen, Københavns Kommune.

Juhna, T. & Klavins, M. 2001. Water quality changes in Latvia and Riga 1980–2000. Possibilities and problems. In Laakkonen, S. & Laurila, S. (Eds.) 2001, pp. 306–314.

Laakkonen, S. & Laurila, S. (Eds.) 1999. The history of urban water management in the Baltic Sea Region, *European Water Management, August 1999*, pp. 29–76.

Laakkonen, S. & Laurila, S. (Eds.) 2001. Man and the Baltic Sea, *AMBIO – A Journal on the Human Environment, #4–5/2001, Part II*, s. 263–326.

Lundgren, L. 1974. *Vattenförorening. Debatten i Sverige 1890–1921*. Gleerup, Lund.

Melosi, M. 2000. *The Sanitary City. Urban Infrastructures in America from Colonial Times to the Present*. Johns Hopkins University Press, Baltimore.

Primakov, I. M. & Nikolaenko, P. 2001. Plankton communities in the Neva Bay during the 20th century. In Laakkonen, S. & Laurila, S. (Eds.), 2001, pp. 292–296.

Historical Perspectives on Water Pollution in the Baltic Sea: the Case of the River Motala Ström, 1860–1910

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It is probably fair to say that large-scale water pollution in the Baltic Sea began with the introduction of a specific technological system: the water-carriage technology, with water closets, for the evacuation of urban waste. In Great Britain water closets had been in use for decades, whereas in Germany the water-carriage technology was long in coming and sewer systems were only built in the largest cities in the 1860s and 1870s. This meant that the disposal of fecal matter through underground pipes was still unusual there in the late 19th century. Cesspits and other dry toilet alternatives were frequently used.

As early as the mid-19th century there was a debate in countries such as Great Britain, France, Germany and the Netherlands about the use of sewerage with water closets *or* various forms of receptacles or pits for collection of excreta. The proponents of water closets and the water-carriage technology emphasized odorless and swift removal, both from the point of view of sanitation and transportation, whereas the opponents were of the view that water closets contaminated the water and wasted the nutrients in the sewage. The dry alternative solved both these problems.

The value of sewage for agriculture was one of the central aspects of this discussion. In the mid-19th century, the increasing waste of large cities together with higher costs for guano fertilizer prompted farmers to promote the use of sewage as fertilizer in agriculture. The scientific basis for this had been provided by the German chemist Justus von Liebig. Edwin Chadwick and other British sanitarians, inspired by the alleged success in Edinburgh, saw a potential way of paying for urban sanitary and infrastructural improvements, while at the same time promoting national food production. On the Continent and especially Great Britain engineers and social visionaries such as J. Bailey Denton, Frederick Charles Krepp, Jules Verne, and Pjotr Kropotkin came in various ways to regard the application of sewage to arable land as the road to national prosperity, health, and equality. Victor Hugo, one of the most well-known popular debaters, wrote in a famous passage in *Les Misérables*:

Panorama of Norrköping, by P. L. Andersen, 1876. Norrköping is situated on the river Motala ström, close to the Baltic Sea, which can be seen in the background. The city which was one of the foremost industrial cities in Sweden in the 19th century, was a centre of the textile industry, especially woolen.

> "This garbage heaped up beside the stone blocks, the tumbrils of mire jolting through the streets at night, the awful scavengers' carts, the fetid streams of subterranean slime that the pavement hides from you, do you know what all this is? It is the flowering meadow, it is the green grass, it is marjoram and thyme and sage, it is game, it is cattle, it is the satisfied lowing of huge oxen in the evening, it is perfumed hay, it is golden wheat, it is bread on your table, it is warm blood in your veins, it is health, it is joy, it is life."

In the latter half of the 19th century, sewage application to farmland was carried out in Great Britain in, for instance, Warwick, Rugby, and Edinburgh, and on the Continent in Paris and Berlin. The great hopes that were initially placed on this way of recycling the nutrients of sewage eventually failed in many cases. There were technical and management difficulties in getting the farms to work, which often resulted in the spread of offensive odors to nearby areas. The farms were often not financially sustainable either. There was also uncertainty among some people as to whether crops grown on sewage-irrigated land were really healthy. Toward the end of the 19th century the main focus more and more became the effective, inexpensive, and hygienic disposal of sewage, which led to the downfall of, especially, the British farms, although the one in Paris continued operating.

From Norrköping to the Baltic

In this article the origins of water pollution in the Baltic Sea will be studied by focusing on the discharge of waste into one of its tributaries, Motala ström in Norrköping, Sweden (see panorama on p. 52). The debate about and use of water closets as well as their possible effects on the river water are of special interest. The questions raised in this article are: What people and interest groups were involved in the debates about water closets, and what arguments were used? What was the actual outcome of the debates? What was the general view of water pollution, and to what extent were water closets thought to cause this? Were there other potential sources of pollution?

Water Closets as Health Improvement

The Swedish medical profession and health authorities thought that the *renhållningsfråga* – the question of keeping the city clean – could only be addressed relevantly if the defective management of excreta and other solid waste was solved. The introduction of water and wastewater systems in Sweden had been the first and rather unproblematic step in this direction, solving the excreta collection was the next, more difficult step.

The introduction to Sweden of the water closet was promoted primarily by the Swedish medical community, beginning in the 1870s. Cesspits – whether connected to sewers or not – were almost unanimously rejected by medical expertise, while water closets were instead increasingly promoted by physicians but also engineers and other advocates of public health and sanitary improvements. They consequently saw water closets as the best way to solve the *renhållningsfråga*. Thereby they also augmented the general notion of sewerage as a sanitary system.

The Early History of Water Closets in Norrköping

The WC's that were connected to the municipal sewers were not the first. The first water closets were supposedly installed in the new Holmens cotton spinning mill in 1856. This mighty industrial building, with its five stories and many modern inventions, was admired by all. Apart from the water closets, there were gas lighting, an elevator, and an internal piped water system for fire protection, which was probably used for the WC's as well.

In 1874, water closets were connected to the new sewers, but only via cesspools in the yards. The idea was that excrement sedimented in the cesspool. The sewer mains in the streets ended in the river. Before installing a water closet, the applicant had to be approved by the Waterworks Board, and it charged a water fee of six kronor per year, despite general household consumption being free of charge. At the beginning of the 1880s, however the water closets consumed more water than had been expected at first, and consequently the water fee was raised to 10 kronor for those who did not have meters. The fear that water closets would consume too much water was obvious in Norrköping, as it was in other Swedish cities at the time, for instance, Göteborg and Stockholm.

It seems as though there was an implicit consensus on the water closets in Norrköping well into the 1880s, despite the fact that there was some uncertainty about whether they were lawful or not. The Swedish Public Health Act of 1874 did not even mention water closets. In 1889, there were some 260 water closets in Norrköping, and in 1894 there were about 600, used by around 3,000 people (out of more than 30,000) in 250 yards. Consequently, 10 percent of the inhabitants of Norrköping had access to a water closet in the middle of the 1890s, which was a great deal compared to the rest of the country, where they were often still prohibited.

The first to install water closets were members of the bourgeoisie, who wanted these modern conveniences in their homes. Water closets were also installed in public facilities such as the new isolation hospital. In 1877 the Board of Health gave an account of the features of the new hospital to the National Board of Health:

> "There is in the building a water pipe with a corresponding sewer pipe, available in each and every

> one of the bigger wards and corridors. On each floor two water closets are installed with outlets in the river. The latter state of things will probably not lead to any nuisance, since the amount of water that flows in the river at the lowest water level is 31,400 liters a second. At the highest level it is at least ten times that much, and the river falls 15.4 meters during its course through the built-up area. Besides, nowadays, water from the river is not used for household consumption in the city, as almost every yard is provided with eminently good water from the city's water system . . ."

The quote indicates that the idea of dilution and self-purification was strong.

The Debates For and Against WC's in Norrköping

Up until the 1880s not many people in Norrköping had WC's, but for various reasons different indigenous and external actors began actively promoting them at this time. In the summer of 1885, the National Board of Health sent its inspector Klas Linroth to investigate into public health conditions in Norrköping. After an inquiry the year before, which had shown that the Public Health Act had not been sufficiently well implemented in Swedish cities, the National Board now inspected several of these. Linroth was not quite so positive to sewered cesspits. In his opinion, it was instead important for the decision makers in Norrköping to make excreta management a municipal matter as fast as possible, so that the Public Health Act could be fully implemented. The act approved of water closets, according to Linroth. They could very well be introduced in Norrköping, since the "volume and high speed of the water" in the river Motala ström were enough to prevent any nuisance.

Captain Henrik Holmberg.

After Linroth's inspection Captain Henrik Holmberg of the Royal Corps of Engineers was asked to draw up a plan for the solution of excreta and waste collection problems in Norrköping. Klas Linroth was also contacted for a stated opinion about Holmberg's proposal. At the end of 1889, Holmberg proposed different alternatives; water closets connected to the existing sewer system, or a system of receptacles for manual collection (decreed in the Public Health Act). In the latter case the city was to have its own poudrette factory (*renhållningsverk*). In either case the city would take care of the collection of kitchen refuse and other solid waste.

Holmberg made no secret of which system he thought was the best:

> "Few cities are as appropriate for an introduction of the water closet system as Norrköping. The large amount of water in Motala ström is quite enough to transform the wastewater from the city of Norrköping, even if its population grows significantly. The correctly built water closet . . . [is] in every respect the most perfect and satisfactory. The excreta are here tidy and odorless through the repeated flushing with water; all collection with its inconveniences is cleared away; there is no storage of putrefying excrement, and the resulting running expenses and maintenance are cheaper than for any other system."

He was of the opinion that both the water quantity and the dimensions of the existing sewer system were sufficient for a general installation of water closets. However, the sewerage would have to be complemented by intercepting sewers on both sides of the river, as well as a pumping station on the north side, in order for the sewers to discharge the contaminated wastewater far downstream from the actual city, near

the Baltic Sea. Linroth criticized details of Holmberg's proposal, but regarding water closets he agreed on the whole. They were definitely preferable, both from economic and sanitary viewpoints.

In the spring of 1893, the Board of Health thus commended the water closet in a proposal to the City Council, based on Holmberg's proposal and Linroth's comments:

> "The foremost hygienists of the day agree that where the local conditions allow it . . . there is no more splendid way of managing excreta than through the water closet. Soil and air are thereby protected from contamination. Probably few cities are better suited to water closets than Norrköping."

The board was of the opinion that in a "not too distant future" the water closets would be the most common way of managing excreta: " . . . and it is certain that the person who has once become used to this convenience will find it quite difficult to do without."

A sanitary committee was appointed by the City Council to scrutinize the board's proposal. The committee was totally against water closets, which would, in its opinion, dominate the city if they were legalized. One of the committee's arguments was that the soil and the air would not be protected from contamination, because the ground in some parts of Norrköping could subside and thereby break the sewer pipes.

The next objection to the proposal of the Board of Health had to do with the likelihood of the transmission of disease via water, which the board had not even mentioned. Holmberg had mentioned it, but did not see it as a problem. In Linroth's view this fear "was . . . mainly based upon theoretical reflections." Investigations had shown that "disease matter" (*sjukdomsämnen*) died rapidly in wastewater, and in Norrköping there was also the great effect of dilution in River Motala ström. The committee, however, thought that the disease matter would not be completely neutralized in the water, and the location of the city near the river was therefore not seen as a refuge from the threat of epidemics. Even if contamination from excreta were very small compared to everything else that was discharged via the sewer system "this would not be a reason," according to the committee, "to further increase the volume of filth that is already discharged into the river. We should rather in every way try to prevent the river from further contamination . . ."

Different forms of contamination were undoubtedly regarded as a hygienic and to a certain degree esthetic problem by most professionals of the day, but few were worried about the spread of disease in watercourses. It may seem strange that the committee was so sceptical and contradicted the prevalent view among physicians and engineers concerning this question. Never the less there was criticism of different forms of water contamination even at a national level. The committee thought that the river Motala ström was already contaminated enough, which also implies criticism of the discharge of industrial waste. Otherwise there was virtually no discussion about industrial discharge and contamination of the river in Norrköping at this time, although there was some debate on the national level.

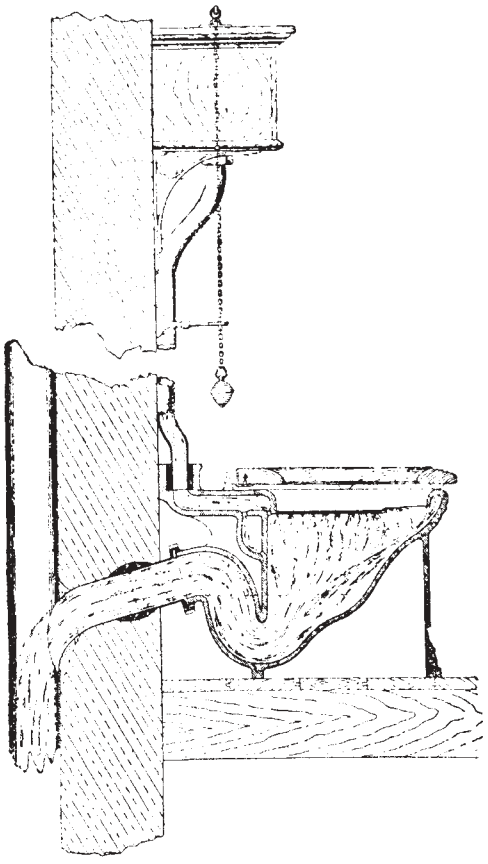
Arvid Palmgren, owner of the engineering and plumbing workshop Arvid Palmgren's Mekaniska verkstad, now emerged as a great defender of the water closets. He was a plumber who worked on the water supply, but was also a well-known manufacturer of pumps, pipes, water closets, and other equipment for bathrooms all over Scandinavia. He spoke in favour of water closets, and also proposed an investigation to find out whether the river had been contaminated by the city's sewage or not.

In a "water closet manifesto" Palmgren refuted the arguments of the sanitary committee. To begin with, the network supervisor had assured him that to his knowledge, subsidence of the soil had never broken any sewers in the city. Palmgren could also show that the sewers normally did not comtaminate the soil either; the argument that the glazed earthenware pipes were not reliable was just nonsense. Furthermore, in each yard there was a cesspool that collected solid excrement, and since it always sank to the bottom it

could by no means reach the river and contaminate the water. If the water closets were to be prohibited, argued Palmgren, then the same must be true for the kitchen sink, through which raw fish, scraps of meat, and urine went.

The likeliness of the spread of disease, should the excrement reach the river, was also addressed by Palmgren. He referred to the prevalent Swedish medical opinion of the day, for instance, to Elias Heyman and Klas Linroth, who were of the view that the danger of excrement spreading epidemics via water was exaggerated. It was the urine which was dangerous, according to Heyman. Besides, Norrköping's source of water was filtered and situated far upstream from the city, and the large river would dilute any contamination before it reached places further downstream. To Palmgren's knowledge there had not been any complaints from people downstream the city.

The debates for and against WC's, which mainly took place in the City Council, did not result in any official, municipal decisions to either ban or promote them. Yet the number of water closets continued to increase.



The first water closet described in a Swedish encyclopedia 1911.

The Water Closet at a Crossroads – Contamination or Dilution?

At this time, bacteriological theories were already spreading on the Continent. In Sweden it took until the end of the 1890s before medical experts accepted them and even longer before they were applied in practice, although there were single proponents as early as the 1880s. The views of the Board of Health, Holmberg, Linroth and Palmgren on contamination and the origin of disease were consequently to a great extent based on miasmatic theories – that is, disease was thought to breed via foul smells from putrefying matter – and preventive sanitary measures in the physical environment were emphasized.

Putrefying organic matter could contaminate the soil and air, which could lead to disease or generally unhealthy sanitary nuisances. Thus it was crucial that the excreta were swiftly removed from the city, before the putrefying processes started. Consequently the water closet was considered to be decidedly the best option. Water was seen as a transporting medium, which removed, diluted, and purified the contamination, without any risk of nuisance or disease. As regards Norrköping, the proponents of this view pointed to the city's advantageous location on Motala ström, which would easily dilute all the filth from the water closets.

Around the turn of the century, the contamination of waterways was a well-known phenomenon elsewhere in Europe, but in Sweden these kinds of problems were only beginning to be recognized. To be sure, part of the explanation for this can be found in the ample water resources of Sweden as well as the comparatively moderate urbanization and industriali-

zation. Only a few towns expressed a fear of water pollution due to WC's, for example Falun, Kristianstad, Uppsala, and Linköping. It is interesting that all these towns discharged their sewage in small recipients. Even the largest cities were hesitant, however, partly for fear of water contamination. It is likely that at least parts of Motala ström downstream from Norrköping were already grossly polluted in the mid-19th century. The dominance of the woolen industry, which was known to be a major source of pollution, makes this logical, although the substantial volume of river water diluted the pollution to a certain degree. There are also accounts by eyewitnesses who testified to the poor quality of the river water in the city as well as to the increasing amounts of sludge.

However these problems were seldom or never taken up in public discussion. Hence it is necessary to look at the interests of the actors that defined, did not define, or prevented others from defining what was considered to be contamination. Palmgren had asked for a survey of the water quality of the river, maybe because he knew that the results would turn out in his favor and would support the interests of all those who supported water closets and general discharge of filth in the river. In 1895, A. W. Cronander was commissioned by the city to analyse the quality of river water. Industries also needed information on water speed and directions for future improvement of water power utilization. This was the first official water analysis ever to examine the water downstream from the city.

Cronander examined, firstly, the amount of water per second in the river, which was regarded as important from a hygienic point of view. He realized that to make a correct estimate of the degree of contamination several different factors had to be considered, for example the number of inhabitants and factories. However he only took account of the former. The population figure was thus multiplied by the estimated maximum amount of sewage per individual and day (125 liters per day, converted into seconds, based on the water consumption), and was then related to the mean water flow (see Table 1). Norrköping was in this respect very fortunate in comparison to Swedish cities such as Stockholm and Göteborg but also larger European cities such as Munich, Berlin, Paris, and London. Norrköping was also situated close to the Baltic Sea, where, according to Cronander, the water would "purify itself." He also examined whether the current was strong enough to carry the filth out to the sea. With a few exceptions it was able to do this at least as far as a bay downstream from the city. In a few places, there was black mud at the bottom, a sign of rotting organic matter.

The year before, the factory owner C. E. Jonsson in Östra Eneby rural authority had complained to its Council about contamination of the water downstream from Norrköping, which he thought was caused by fecal matter from the water closets in the city. For him and many other people in the authority the river constituted the primary fishing grounds and contained the only available drinking water. According to §28 of the National Public Health Act for the countryside the authority was obliged to attend to such a situation. However the Östra Eneby council first wanted proof that the actual state of affairs was really dangerous for the public health of the authority. The council also questioned whether the river really was the sole source of drinking water.

The Swedish Government rebuked the council and thought that it had been nonchalant; it should have instead paid greater attention to Jonsson's complaints. In 1895 the first provincial physician was called in to investigate the matter, and he subsequently took a boat trip to visit all the places that could have been affected. Nordenström used both his eyesight and sense of smell to examine both the shoreline and the river water, and could perceive only modest contamination. But when speaking to residents and fishermen in the area he became convinced that it had increased in recent years. Nordenström concluded that Motala ström just below the city was "very contaminated," as was the water further downstream, to varying degrees related to the distance from the city. However, he did not think that the water closets were the cause of pollution, since they were so few. Most fecal matter was now collected in receptacles. Furthermore, new and better cesspools

were installed in some yards, which ought to have been able to stop most of the solid excrements from reaching the river. Nordenström's only concern was outbreak of cholera in which case he thought that the WC's should be temporarily forbidden.

Swedish physicians were on the verge of accepting the bacteriological theories of Pasteur and Koch, but evidently the same thinking and practices that they had pursued for decades were still prevalent. Nordenström and Cronander expressed the same rationale about the self-purification of abundant, running water as had been common for decades or centuries and was still promoted by leading engineers, physicians and chemists such as Pettenkofer, as well as by ordinary people. Nordenström also used sight and smell to detect filth and contaminants, which was a long established practice among medical men. Chemists and engineers were beginning to analyse bacteria, however, and the Waterworks Board started bacteriological tests of filtered piped water and the river water in several places upstream and in the city in 1897, which were carried out by Cronander.

This confirms the results of research on the impact of bacteriology on the medical profession in Sweden at this time. The transition from one paradigm to another was very slow, especially since many doctors

Table 1. Sewage contamination of rivers in Swedish and European cities, based on the ratio of sewage compared to the total amount of river water at different flows and levels, by A. W. Cronander.

City	Inhabitants	River	Water Flow m^3/s	Water Level	Quantity Sewage: River
Norrköping	34,816	Motala ström	366	High	1:7,266
"	"	"	65	Medium	1:1,290
"	"	"	31	Low	1:623
Stockholm	264,585	Stockh. ström	316	High	1:825
"	"	"	202	Medium	1:528
"	"	"	144	Low	1:376
Göteborg	111,234	Göta Älv	58	Medium	1:359
Vienna	1,365,600	Donau	7,667	High	1:3,881
"	"	"	4,360	Medium	1:2,206
"	"	"	2,040	Low	1:1,032
Frankfurt	179,985	Main	174	High	1:938
"	"	"	81	Low	1:438
Hamburg	569,260	Elbe	494	High	1:599
"	"	"	347	Low	1:421
Munich	350,594	Isar	50	High	1:144
"	"	"	30	Low	1:86
Berlin	1,579,244	Spree	43	Medium	1:18
"	"	"	13	Low	1:6
Paris	2,448,000	Seine	45	Low(?)	1:13
London	4,211,000	Thames	23	Low(?)	1:4

Source: NSA, Norrköpings stadsarkivs småskriftssamling, 28:6, Hydrografisk Undersökning af Motala ström af A. W. Cronander (Norrköping 1896), p. 3.

did not have a theoretical foundation to begin with. Furthermore, the miasmatic emphasis on the environment and preventive medicin had proved so successful in the past decades, resulting in lowered morbidity and mortality rates, that there was strictly speaking little need for a new approach to medicine. However, it is also important not to strike too great a contrast between the miasmatic and bacteriological views, for in practice many physicians combined both ideals.

Was Nordenström right about the limited contribution of the water closets? I believe that he was, for there were as yet only around 600 in a city with a population of between 30,000 and 40,000 people, although he thought that the water closets were a potential future problem. He acknowledged that the river was highly contaminated, but instead blamed the total amount of filth from kitchens, stables, yards, streets, and factories, which would increase with the city's growth. This was the second time that anyone, however carefully, criticized industrial discharges into the river, and the contaminants downstream from the city may well have been caused by industry. The sanitary committee of 1893 was the first to imply this. However, Nordenström's sensory "tools" for analyzing the water were too blunt to prove anything, which may also have been his intention. To confront Norrköping industry with its alleged contamination of the river would at best have been frowned upon, at worst professional suicide. The final outcome was that the use of water closets was prohibited only in the event of an epidemic. Otherwise Jonsson's complaints were denied, and the whole matter was submitted to the "new" sanitary committee of 1895.

The 20th Century and the Victory of the Water Closet

Installation of water closets had not been frequent in Swedish cities before 1900, and it was not until after 1910 that they mushroomed. In Stockholm, Göteborg and Malmö the three largest cities, it was only at the beginning of the 20th century that the use of water closets became legal, although there had been exceptions. Before that the fear of excessive water consumption and the contamination of waterways, together with the protection of the municipal poudrette manufacturing, had prompted the respective city governments to limit the spread of WC's. There was also uncertainty as to whether the sewers would be able to collect all the new sewage content.

Johan Gustaf Richert, a well-known Swedish water engineer, also thought that there was a deep-rooted prejudice against the water closet among the public, which was discussed at the Nordic Meeting of Engineers (*Nordiska teknikermötet*) in Stockholm in 1897. Richert asked the rhetorical question "Why are water closets not used in Sweden?" His answer was that the public was afraid of water pollution, enormous costs for rebuilding the sewers, and the loss of valuable manure for agriculture. He contradicted these arguments by claiming that most urine was discharged in the sewers already, and since it constituted 90 percent of the excreta there would be only a slight increase in contamination as a result of the excrement. As urine contained the most valuable nutrients, this meant that agriculture had already been robbed of the best fertilizer. Richert also claimed that sewers did not need much rebuilding at all; sewers should be constructed in roughly the same way whether WC's were installed or not. Interceptors might be needed, however. He also praised the achievement of the German cities Frankfurt, Altona, and Hamburg (after 1892), where water closets were used widely.

According to Richert the water closet was a "hygienic axiom," and in the early 20th century not only the medical and engineering professions but also decision makers became increasingly positive. The

During the 20th century the Holmen paper mill contributed to the water pollution in Motala ström.

importance of a rapid removal of rotting matter was reinforced by the new bacteriological theories. In the miasmatic paradigm there was a qualitative difference between water that was contaminated by excrement or putrefying organic matter, and water that was not. The former was dangerous to human health, although it was debated in what ways, how much, and whether hardness or other parameters were worse. Ironically, when in the early 20th century the existence of pathogens and their dissemination through water was known, this only facilitated the diffusion of WC's. Richert was of the view that unless the water was infected by pathogens, there was no difference at all between water with or without excreta, either bacteriologically or chemically. Consequently should an epidemic occur it could spread equally easily through other media than water.

In the early 20th century Norrköping strengthened its position as one of the forerunners in promoting water closets, and it was the magnificent river that was still believed to make this possible. The Board of Health in 1904 wanted to "most actively recommend the introduction of [the WC] system . . . and consequently that the implementation of this as far as possible is facilitated and promoted." This can be explained in two ways. First of all, the city was an example to other cities, and the attitude of the Board of Health led to a fairly rapid propagation of WC's in Norrköping. The great water flow of the river prevented the worst nuisances, and thereby also any measures taken against the closets. Secondly, Arvid Palmgren was successful in promoting the "Palmgren system" – consisting of WC's connected to a cesspool – in Norrköping and in other cities. This system was discussed and probably also introduced in yards both in Norrköping, Stockholm, and Uppsala in the late 19th century.

Conclusion

During the period of study, the water closet was thus gradually accepted by all actors, including medical and engineering expertise, with the exception of the sanitary committee. The Board of Health had been positive to water closets all along. However in the early 1900s it became an active supporter of their introduction. They were now seen as the major means of collecting excreta (but not other waste). As manufacturer and promoter of water closets, Arvid Palmgren can also be said to have been a central actor in both the local and national WC development. His factory manufactured and supplied water closets and cesspools to Norrköping, Stockholm, and Sweden. Norrköping was seen as a model city regarding WC's. Motala ström, with its rapid and abundant flow of water, flowing into the immense Baltic Sea, was enrolled as an ally by Palmgren and all the other promoters of water closets in the debates. The national sanitary engineers and physicians were also crucial promoters. Some of them operated temporarily in Norrköping, primarily Henrik Holmberg, Klas Linroth, and Johan Gustaf Richert.

A major objection on the part of the sanitary committee was a system of WC's, that is a general introduction of WCs, which would result in the need for interceptors and thereby increased taxation. This would primarily be a burden for the less wealthy building owners and workers, who could not afford water closets. But this latter group never protested against the WC's, probably because an official introduction on a grand scale was never realized, and the sewer system therefore did not require expansion. The feared WC boom did not come about, until the public had finally accepted this convenience. The Board of Health helped promote the WC's around the turn of the century, as did A. W. Cronander and Henning Nordenström. Their respective investigations confirmed the view that excreta were diluted in the enormous masses of river water.

The river was once again enlisted as a guarantor of local development and health. It was thus implied that the river would carry away, dilute, and eventually purify the city's waste. To some extent the river did serve this function, but not quite enough, as Nordenström's report shows. However, river pollution was only a minor issue before 1900 in Sweden, contrary to

the situation in France and Great Britain. The main reason was that Sweden had many large waterways, was not as highly industrialized and urbanized, and WC's had not generally been used. Norrköping was both heavily industrialized and a major promoter of water closets. The lack of recognition of river pollution there, especially that which was potentially caused by industry, was mainly due to the economic interests of that industry, which wanted to continue discharging its waste into the river.

References

Quotations and sources for this chapter can be found in my dissertation:

Hallström, Jonas 2002: *Constructing a Pipe-Bound City: A History of Water Supply, Sewerage, and Excreta Removal in Norrköping and Linköping, Sweden, 1860–1910* (diss). Linköping: Dept. of Water and Environmental Studies, Linköping University.

Selection of literature for further reading

Baldwin, Peter 1999: *Contagion and the State in Europe, 1830–1930*. Cambridge: Cambridge University Press.

Corbin, Alain 1986 (1982): *The Foul and the Fragrant: Odour and the Social Imagination*. London: Papermac.

Evans, Richard J. 1987: *Death in Hamburg: Society and Politics in the Cholera Years 1830–1910*. London: Penguin.

Goddard, Nicholas 1996: 'A Mine of Wealth?' The Victorians and the Agricultural Value of Sewage. *Journal of Historical Geography* 22 (3): 274–290.

Hamlin, Christopher 1990: *A Science of Impurity: Water Analysis in Nineteenth Century Britain*. Berkeley: University of California Press.

Melosi, Martin V 2000: *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present*. Baltimore & London: The Johns Hopkins University Press.

Mårald, Erland 2002: Everything Circulates: Agricultural Chemistry and Recycling Theories in the Second Half of the Nineteenth Century. *Environment and History* 8: 65–84.

Olsson, Göran 2001: The Struggle for a Cleaner Urban Environment: Water Pollution in Malmö 1850–1911. *Ambio: A Journal of the Human Environment* 30 (4–5): 287–291.

Reid, Donald 1991: *Paris Sewers and Sewermen: Realities and Representations*. Cambridge, MA & London: Harvard University Press.

Smedberg, Richard and Torsten Johnson 1937: Porträttgalleri 1851–1937. In *Kungliga väg- och vattenbyggnadskåren 1851–1937*, edited by R. Smedberg. Stockholm: Väg- och vattenbyggnadsklubben.

Tarr, Joel A., and Gabriel Dupuy, eds. 1988. *Technology and the Rise of the Networked City in Europe and America*. Philadelphia: Temple University Press.

Environmental History of Artificial Fertilisers in the Baltic Sea Region

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The Baltic Sea

The Baltic Sea is a shallow inland sea with only a narrow connection to the Atlantic. Through this passage, fresh salt water can enter and preserve the vital balance of the brackish water of the Baltic Sea. To a large extent, the southern part of the Baltic Sea is almost entirely surrounded by fertile agricultural landscapes, which are connected to the Baltic Sea by rivers and an abundance of fairly small watercourses. Thus, changes in agricultural practices will always involve major effects on the environment of the Baltic Sea.

One of the most fundamental transformations in agriculture during the last centuries is the introduction of artificial fertilisers. This innovation has made it possible to multiply the yields from farmland at the same time as the fertility of the soil can be maintained, or even increased. Without fertilisers, the growth of the world population from 1.6 billion people in 1900 to its current level of 6 billion would not have been possible. Estimates indicate that fertilisers allow an extra 2 billion people to eat. Moreover, fertilisers, in conjunction with mechanisation, have made it possible to transfer manpower from farming to industry and many persons have moved from the countryside to the cities. Consequently, the old and perennial question about scarcity of plant nutrients finally seems to be solved.

However, the development of artificial fertilisers is not only a success story. On the reverse side of the coin, fertilisers have also resulted in agricultural overproduction, increased energy consumption, exploitation of non-renewable resources and various environmental problems. The question is whether the current intensive methods of agricultural production based on fertilisers is sustainable in the long run. Because of the special conditions of the Baltic Sea, the large-scale use of fertilisers has made eutrophication an especially important issue.

The introduction of artificial fertilisers

The first commercial plant-nutrition substances were bone manure and Peruvian guano. Bone, as a nutrient containing phosphate, has been used in farming

Artificial fertilisers were essential for growing sugar beets.

from time immemorial but it was at the end of the eighteenth century that trading with raw bones started up in Great Britain. The problem was, however, that plants did not easily absorb the phosphate from raw bones. In the early 1840s two agricultural chemists, the German Justus von Liebig and the Englishman John Bennet Laws applied sulphuric acid on bone meal or phosphate rock, producing a concentrated 'Super-phosphate', which could be spread upon the soil.

Peruvian guano which consists of sea bird droppings, rich in nitrogen and phosphorous have formed deep deposits on islands off the Peruvian coast due to the dry climate. Trading with Europe and North America started in the 1840s and the Peruvian economy boomed for forty years. Although guano was not artificial manure, it was of great importance for the establishment of the artificial manure industry and a market for fertilisers. Guano created commercial networks and communications, which were necessary as a means of reaching out to farmers with merchandise and bringing back capital in the other direction. Other artificial manures that succeeded in expanding the market, following in the steps of Superphosphate and Peruvian guano, were for example Norwegian apatite rock, Chilean nitre, Stassfurter potassium, Estremadura Superphosphate, Baker Island Guano, Mejillones Guano and phosphate rock from Florida,

Morocco and Algeria. In the vicinity of the Baltic Sea, the USSR started mining phosphate rock on the Kola Peninsula in the 1930s. As the names of these products clearly show, the raw material originated from different localities all around the world. Thus, from the start, the trade in artificial manure was world wide and had major environmental effects in relation to both the extraction of raw materials and the application of the refined products.

An unsolved problem for agriculture in the late nineteenth century was the supply of nitrogen. Agricultural researchers formulated the so called 'Nitrogen Issue' as a critical problem to be solved for the whole Western civilisation. European agriculture almost entirely depended on natural nitre deposits in Chile, which according to forecasts would be exhausted within a couple of decades. These doomsday-prophesies mobilised resources for more research. Electrochemical methods for extracting nitrogen from the atmosphere, such as the Haber-Bosch process or the Birkeland-Eyde electric arc-method, were also developed during the first decade of the twentieth century. Since these processes were highly energy consuming, the nitrogenous fertiliser industry developed in close relation to hydroelectric power facilities or the coal industry, and later on the oil industry. Today our food is not only made of sunlight but also of oil.

The full-scale launching of artificial fertilisers in farming did not occur until after the Second World War. Around the year 1900, the total annual world consumption of fertilisers was about 2 million tons. In the mid-twentieth century the use increased to 7–8 million tons. Only twenty years later, consumption rocketed to 45 million tons and in 1990 to 150 million tons. The most revolutionary of these changes was releasing farming from its local context. It was no longer necessary to rely on local access to nutrients. The import of artificial fertilisers and the export of agricultural products opened up rural areas to the world. Modern intensive agriculture is based on a large input of resources and a large yield, but there is also a huge loss of resources during this linear process.

Eutrophication of the Baltic Sea

Eutrophication is a natural process in the Baltic Sea but the rapid economic development in the countries surrounding the Baltic during the last centuries has accelerated this process. Urbanisation, untreated sewer systems, industries and the use of fertilisers have substantially increased the influx of nutrients, such as phosphorous, nitrogen and potassium, into the Baltic Sea. For the aquatic system, this extra supply of nutrients works like fertilisers for fast growing algae and other plant life, which grow rapidly. When they die, as a part of its natural lifecycle, their decomposition consumes oxygen, which then is inaccessible for other species. The lack of oxygen suffocates fishes and disturbs the whole aquatic system. The deeper waters of the Baltic Sea have been transformed to 'dead' sea beds with only bacterial forms of life.

However, neither the problems nor the knowledge of eutrophication is new. In the second half of the nineteenth century, the rapid growth of the cities in the Baltic Sea region was accompanied by severe deterioration in urban sanitation conditions. The solution was to build sewer systems, which removed faeces and other kinds of impurities from the cities to the nearest lake or watercourse. By spreading out the dirt, the cities become healthier, but it was only a temporary solution. Soon there were complaints from people living downstream from the cities. Limnologists were quick to explain the mechanism of eutrophication. Nevertheless nothing was done, except for building longer pipes that moved the filth further away from the shores. Consequently the problem with eutrophication spread from small lakes and watercourses near the cities to coastal areas and to whole seas. It was not until the 1960s that sewage treatment works were constructed on a more massive scale in western countries. It took a further thirty years to update and introduce sewage treatment technology into the former Warsaw Pact states.

The positive effect of the development of sewage treatment works has, however, been counteracted by the growing use of artificial fertilisers. Not all of the nutrients applied by fertilisers are absorbed by the

plants or stored in the soil. Usually more than half of the fertilisers applied end up in water. In contrast to the end-of-pipe pollution from cities and industries, which is quite easy to take care of, the runoff of nutrients from arable land is non-point source pollution. The influx of nutrients to the Baltic Sea comes from almost innumerable sources and from different countries, which makes it hard to control.

It is not only the growing use of artificial fertilisers that has increased the problem of eutrophication. Structural changes in the landscape and water systems and new agricultural methods have also contributed. For example, in Sweden in the second half of the twentieth century, a lot of new land was reclaimed and as a consequence, large amounts of nutrients bound in the soil were released. Although the leakage of nutrients from arable land was high, even compared to the present levels, much of the nutrients never reached the sea. Winding brooks, wetlands, bogs and river deltas slowed down or stopped the nutrients on their way towards the coast. During the last 100 years, however, thousands of square kilometres of wetland have been drained, brooks straightened out, and millions of metres of ditches and covered drains have been dug. Thus, the water cycle has been speeded up, all the hindrances cleared, and consequently the connection between the arable land and the Baltic Sea has become much closer and direct.

Solutions

How then should the problem with eutrophication be solved? One way is to break totally with the use of intensive methods in industrial agriculture. Advocates for organic farming claim that the use of artificial fertilisers is not sustainable. Over and above the severe problems with eutrophication, the production of fertilisers is also energy consuming and mineral fertilisers contain heavy metals such as cadmium, which slowly accumulate in the soil. Furthermore, the use of fertilisers has made it possible to establish monocultures, farms without animals and similar farms without any crop production. This situation makes it difficult to use manure in agriculture and manure becomes a problem instead of a resource. On the contrary, in organic farming, the supply of plant nutrients should be solved by crop rotation, alternative technology and the integration of animal husbandry with crop production. Recycling of human waste and night soil from the cities, if they are not contaminated, are also important sources of nutrients for organic farming.

Integrated farming provides another way to deal with the problem of eutrophication and other negative effects of fertilisers. This means so-called ecological modernisation, which implies integrating environmental methods with the market economy and intensive agriculture. Advocates of this stance claim that it is not possible to reduce agricultural production and refrain from the advantages of artificial fertilisers. Today the world population depends on the extra input of fertilisers. Instead the negative environmental effects of fertilisers could be reduced by applying new sophisticated technology. The use of computers, better machinery and education allow fertilisers to be applied at exactly the right time and with a perfect dosage, thereby minimising the nutrient leakage. There are also expectations that the amount of fertilisers and runoff could be reduced further by the adoption of gene modified plants. The reconstruction of wetlands also fits into this perspective. This also applies of course to organic cultivation.

Conclusion

History shows us that artificial fertilisers have solved the age-old food supply problem but it has also created new environmental problems. On the one hand,there are famines, years of bad harvest, and depleted soils, which at least in our part of the world, are things of the past. On the other hand eutrophication, polluted soils and loss of biological diversity are increasingly urgent problems that have to be solved. How this dilemma should be resolved is both a controversial and complex issue. One conclusion

Thousands of small rivers running in to the Baltic Sea have been affected by drainage.

is, however, that there is not only one way to do this. It is also a political question, which, as in the case of the Baltic Sea region, has to be taken care of on local, national and international levels.

References

Archambault, Steven 2003: *Ecological Modernization of the Swedish Agriculture Industry: Factors Promoting and Hindering the Reduction of Emissions to the Baltic Sea,* IIIEE Reports 2003:1. Lund.

McNeill, John 2000: *Something New Under the Sun: An Environmental History of the Twentieth Century*. Penguin Books, London.

Mårald, Erland 2000: *Jordens kretslopp: Lantbruket, staden och den kemiska vetenskapen 1840–1910* [Cycles of Earth: Agriculture, the City and Chemical Science, 1840–1910], With a summary in English. Department of Historical Studies, Umeå.

Smil, Vaclav 2001: *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production*. MIT Press, Cambridge, MA.

Gelsenkirchen-Ückendorf – Yesterday and Today

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Introduction. The students and teachers in Gelsenkirchen-Ückendorf live in an old coal mining area. By examining the history of this area, the students understood why it looked as it did. The signs of the previous mining and iron industries are everywhere. This was their starting point, rather than any contemporary questions of today. The conflict lay in the past when mining and iron works caused severe environmental problems. Now the problem is how to recultivate the landscape in order to heal the wounds. By studying this historical experience, the students are able to gain an understanding of the same problem in other parts of the former, heavily industrialised Ruhrgebiet as well as other similar areas in the world.

Investigating our city

Since the school, park and playing-fields are located in a former coal mining area, we started with just two excursions:

At first we went along to the old coal mining area, part of which has been re-landscaped now and where some of the remains of the old industrial buildings are to be seen. We climbed up the old slagheaps that have also been re-landscaped and now offer a variety of leisure activities.

Virchow Street – 100-year-old buildings next to modern ones (former empty sites because of bomb attacks in World War II).

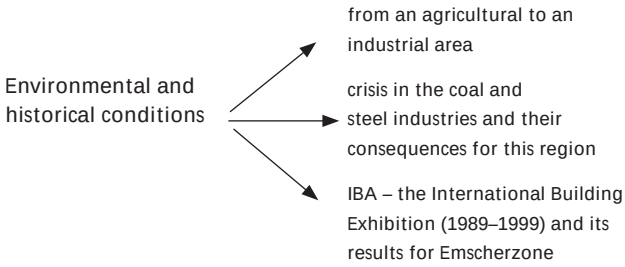
View of renovated houses in Rheinelbe Street.

Secondly we visited those streets that had buildings and houses that were typical of the coal mining period. On their way, the students took notes of what they saw. They made small drawings and wrote down the names of streets and buildings. Now they found out that what they saw and experienced could probably refer to coal mining. They wrote down all their questions and also reflected on how to get them answered.

Back at school we collected all the questions, arranged them in a particular order which allowed us to develop a lot of topics, some of which are listed below. Next the students were divided into groups that would work on the various topics.

Before the students could start working in their groups however, we had to provide some theoretical input on coal mining in general.

The students from our school live in an area that was once characterised by the montan industry. Many of their grandfathers and even fathers worked as minors or steel workers. However the students often did not know a lot about it. Hence the aim of this project was to find out in greater detail about the area's past, its current problems and the changes of recent years. The project include historical, economic and environmental aspects.



The environmental history of our area can be divided into three periods. First in the 19th century when it was altered into an industrial area through coal

Rheinelbe Pit in the 1930s.

mining and iron industry from agricultural land. Secondly in the last part of the 20th century when the crisis of coal and steel industry totally changed the environmental and economical conditions in our city. Thirdly when the rebuilding of the area started in the 1980s with the International Building Exhibition.

Some questions to start with

What happens to students like Assia, Köksal, Liridon, Isabelle, Pakize, Ayhan, Sabrina, Chris, Iman, Sema and many others if we start a project on environmental history in their school area of Gelsenkirchen-Ückendorf?

What happens to them if they try to investigate its history like detectives; searching for traces of former life, looking at old buildings, maps and present day environment, asking old people about what their life was like thirty or forty years ago?

Most of our students were born and have grown up in this area surrounded by those signs without knowing where they definitely came from. You can only understand the typical social, economical and architectural conditions of an area like Gelsenkirchen-Ückendorf if you are aware of the structural changes that have occurred in this region from the coal mining era to the new technology of today.

Hence working on this type of project might allow the students to transfer what they have experienced here to other regions and cities of Ruhrgebiet that have similar structures.

The students point of view

Right from the beginning, the students were highly motivated and interested in this project. Their grandfathers had worked in the coal mines or in the big steel companies. Accordingly they were able to more closely identify with this area and its history than with any other in Germany. Presenting "Rheinelbe Pit" and its map made them look more precisely to the area of Ückendorf, the location of the school, the recultivated parks etc.

Some of them returned to school with reports from their grandfathers, fathers or uncles, some of them already retired from work. They told them about the working and living conditions in the 1940s to 1960s, a form of oral history. The students wrote down these stories as part of their own family history and found out how different those conditions were from those that prevailed now. Those students whose grandfathers or uncles immigrated from Turkey to Germany found that these old living and working conditions are similar to those in some parts of Turkey even today.

The investigations of streets, housing, parks etc. changed the views held by the students. They looked

Former coal mine building – foreground, former shaft.

more carefully, had numerous questions many of which could not be answered immediately.

They found out that their school is partly situated on the once prohibited territory of the Rheinelbe coal mine. This territory was recovered by the IBA Emscher Park and the students make excursions through this natural and artistic space next to their school.

A group of four students carried out interviews with people living in the old pit workers' houses. Among others they met an old lady of 82 who was born in one of these houses and has never left it. She fetched her photo albums and the students had the opportunity to examine photos that were more than fifty years old. They got to know a lots of details about this old woman's biography. It provided yet another experience of oral history. Later the group wrote an article about this old lady for the school magazine and some of them even visited her after the project had finished.

One of the students lives in what was formerly the old "Knappschaft Hospital". It was converted into owner-occupied flats in the 1980s. Together with three colleagues, he investigated the history of this hospital. Later they guided us through the building and were able to tell a lot about the people now living there. The other students could hardly imagine that this once was a hospital.

Again and again, the students proudly remarked that *most of our results are not to be found in books.*

Students (Daniela and Assia) presenting posters.

Students (Ergün and Köksal) presenting posters.

They were proud and identified more with this district that shows enormous disadvantages compared to other districts in Gelsenkirchen and the Ruhr area.

Two girls carried out a study on an estate that was built solely for artists. One of those artists invited them into his house and gave them one of his woodcuts as a present showing an old view of Gelsenkirchen-Ückendorf.

At the time of the school's 20th anniversary festival, the students presented the results of their studies. The posters, collages and Black Boxes attracted many guests. The students were surprised about their reactions. Once again they were told stories from childhood and family life. One of the guests pointed out that he collects all sorts of keepsakes from this time. He later handed over some books, photos and graphics for the school library. This day really had a sustainable effect on both teachers and students. Many of the posters and collages still decorate the classrooms and the Black Boxes are displayed in showcases.

The teachers point of view

As teachers who were born and grew up in this area, we were able to tell numerous stories from our childhood and thereby draw the students' attention to the topic more than any book or film could. We are part of this history, we witnessed the changes and

the development that took place. Consequently our descriptions and stories are as authentic as any written or filmed sequence.

However the most striking feature of this project is the fact that it has changed the students´ view of historical events. Whenever a new topic is presented today the students ask *What has it to do with our district? How did it change this district? Are there any indications about its development?*

History and its interrelations are sometimes very difficult to teach; many topics are too far removed from a student's own experience. By means of environmental history, it is far easier to get into contact with students own interests. They are more willing to examine historical facts and figures that refer to the environment of which they are a part. Consequently we have to change the perspective and have to reflect to a greater extent on the question of how to transfer historical events to those of environmental history than to deal with them from a chronological point of view. On the other hand, this kind of approach is a good opportunity for working in interdisciplinary terms in relation to geographical, historical and sociological aspects.

Coal mine relicts visible all over the Ruhr-area.

contents	comments on material, methods
1st step: Background information about the beginning and the development of coal mining in the Ruhr area: • agricultural area • small villages • forests • "Pinge" – small holes dug near the surface in the Ruhr valley • deep shaft mining from south to north • construction of a colliery • development of the montan industry (coal and steel)	Working with texts, photos, drawings, graphics and maps. The students were highly motivated and had a lot of questions on the various topics because they are part of their reality and they can identify with them. Some students even started to talk about it in their families and brought back further information. For most of them it was the beginning of an experience that has not yet finished. Even in the first week, some looked for further information on the internet all by themselves.
2nd step: excursions – 2 walks through Ückendorf Walking through the area of the former Rheinelbe Pit/ passing pit workers housing in Flöz Dickebank / through the Science Park and other buildings of IBA	Students took notes, made photos and small drawings. These excursions changed the views of students about their surroundings. They looked more carefully and had a lot of questions that had to be answered later. They came into contact with people living in the settlement and were surprised about what they told them.
3rd step: working in groups on several topics Some examples from the list of topics: • Gelsenkirchen and Ückendorf in the pre- coal mining period • Rheinelbe Pit • Miners and migration • Rheinelbe Pit • The railway network • Jobs in a colliery • Leisure activities of miners • Signs of the montan industry in the names of streets, schools, clubs etc. • Pollution • Landscaping the slagheaps • Use of former industrial sites today– Science Park and new trades	The students looked for information all by themselves by going to institutions and libraries, to the town-archives, to the forest warden and to the parishes. They carried out interviews with miners and people in the settlement.

Truth and Lies and the Oil Shale Industry in Kohtla-Järve

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Introduction. As in Gelsenkirchen and Katowice, Kohtla-Järve in Estonia is an old mining area. In Kohtla-Järve, the mines were used to extract an energy raw material. However it was oil shale rather than coal. We are first told the history of oil shale mining and the environmental problems it has caused. We then go on to see how this story has been told to the people in Kohtla-Järve through the media in the second half of the 20th century. The research was carried out by students who examined the local newspaper in journalism classes. When the students compared these findings with what they knew and what old miners told them, they saw the conflict between ideology and what has really happened in their area.

Discovery and use of oil shale in 1838–1919

Kohtla-Järve is a small town in northern Estonia with population of about 55,000 inhabitants. It is an industrial town and oil shale processing has a significant part in the industry of our region.

According to historical sources, it is evident that Estonian oil shale has been discovered more than once. The first written notes about it are from the middle of the 18th century. Until 1916 notes about "burning stone" are only theoretical descriptions.

The first serious opinion is from academician Gregory Helmersen at 1838. He found out, that this burning treasure of the soil could be used as a fuel or be converted into liquid products. He said, that it's possible to mine oil shale, but its price and the cost of transport to S:t Petersburg would be more expensive than coal from England. However the local mining would be advantageous.

The lord of the Kukruse manor, Baron Toll, was an aimless man – he used oil shale, dug from a water ditch, for heating the boiler of a distillery. He registered the mine of 3,000 pods of oil shale a year. But we don't know, how much "burning stone" he really mined and used, although he obviously had large plans.

Mining of oil shale has been carried out in open shafts.

In the nineteenth century press, it was stated that the very high temperatures in a normal stove burning oil shale would simply destroy the stove after using it two or three times. Of course it was a lot of trouble to build a new stove every week. At that time, building special stoves for burning oil shale were far in the future.

Since imports of cheap English coal were stopped during World War I, Russia had to find alternative raw materials to provide Petrograd with fuel. In the autumn of 1916, a private company, "Paul Boeckel & Co" started to mine oil shale near Kukersi village. They worked there in a very simple fashion: stones, broken with the help of wedges and crowbars, were carried out using a hand-winch while 6 women pumped water away. They mined about 480 tons of oil shale until 1917 when mining stopped because of the revolution.

The method of stoping was tried out by a private company "Mutsnik & Co". They first carried 22 carriages of oil shale to Petrograd for experiments. The results were very good and they decided to establish an open (cast) pit near the Pavandu pub by Tallin – Narva road. However in 1918 German armed forces arrived in Estonia and a German company "Internationales Baukonsortium" took over the works. However this intervention was short-lived.

Dynamite and drainage

In early 1919, the government of the independent Estonian Republic founded the "State Oil Shale Industry". They established a mine in Pavandu. But there was no equipment to pump out water and in winter-time, the mine could not be operated. In 1927 this mine was liquidated.

They started mining at Kukruse in 1920. However after having sunk 13 meters, they stopped working on it because of the thin strata and low quality of oil shale. Later they found out, that only the upper layers were opened. At the same time, they started to dig a deep water ditch in order to drain the mine. They opened an industrial oil shale mine in the area, where the layers were good enough and it proved to be successful. For the first time in Estonia, dynamite was used to blast the layers of shale.

In 1923, the bureau of mining technology was established. Its purpose was to draw up mining

The ash mountains can be seen far away.

projects. They recommended the establishment of two mines in this industrial area – Kukruse and Käva. Connecting them together could create opportunities to pump water from both mines into the Kohtla river. The Bureau also gave recommendations to reduce transport expenditure in the mines. As a result of this project, the Käva mine was established in 1925.

Oil shale mining in Kiviõli was started by a joint-stock company "Eesti Kiviõli", whose shares belonged mostly to Germans. This happened in 1922. One by one, private mines were started in Küttejõu, Ubja, Viivikonna and Kohtla-Nõmme. The largest owner in the oil shale industry was the Estonian State capital. This helped some companies to start up with the aid of foreign capital. In the oil shale processing industry, the mine and the oil-factory usually belonged to one company.

During World War II, development of the oil shale industry was stopped and at the end of the war all the enterprises were destroyed. In 1944, before they escaped from Estonia, the Germans destroyed the entire energy system and mining equipment. They set fire to the Kiviõli and Käva mines; the Ahtme, Viivikonna and Ereda mines were flooded.

Rapid development of Estonian oil shale industry in Soviet time

The Soviet authorities began to re-establish and expand the Estonian oil shale industry after World War II. It was a good time for the Kiviõli and Kohtla mines, which were fairly backward in terms of their technical equipment. The most technologically backward mine at Ubja was closed in 1959.

The first plan was to provide Leningrad with oil shale gas. Oil for heating, oil for impregnation, bitumens and other chemical products were planned. Mines, which had worked before the war were re-opened and work was started on the construction of five new mines.

Since there were not enough workers for these new mines, people were resettled from Russia, Bielorussia and Ukraine to East-Virumaa, mostly to our native town – Kohtla-Järve. The oil shale towns grew very rapidly. Oil shale production increased for 10 years at an almost geometrical progression.

An experimental line in oil shale concentrates was introduced at the Ahtme mine in 1960. It was the first in the world. It provided the opportunity to mechanise all the work involved in the production

of oil shale concentrates. The most important were oil and other chemical products and the increased use of electricity. New mines – the Viru and Estonia mines and the Aidu open caste mine were established as enterprises with a high level of mechanisation and efficiency. Ground works took on an increased importance accounting for 50% of all oil shale production. Attention was at last paid to the recultivation of worked-out areas.

Todays problems

Major environmental problems in the Ida-Virumaa arose as a result of the large amounts of ash. The ash, that is formed during the oil shale processing in the industries in Kohtla-Järve, was transported by truck into ash deposits or so called ash-mountains. The ash-mountains reached a height of 100 meters from the ground. The ash from these ash-mountains could rise up to several hundred meters and be carried many kilometres away. To avoid this air pollution and because of esthetical considerations, it became necessary to convert the ash-mountains into green areas.

How has this story of oil shale mining, the ash-mountains and the environmental problems been told to people in Kohtla-Järve during the last centuries?

Truth and lies about the environmental situation in Ida-Virumaa

This part of our work was easy; the main interest in Kohtla-Järve was and is, the history of the oil shale industry and its influence on the environment in Ida-Virumaa.

Sources

The question confronting us was where we could find sources for our investigation of this story. Since the teacher tought media/journalism classes rather than history, we decided that our problem could be investigated with the use of old newspapers. In our view, it would be interesting to see how daily news could become history, especially environmental history.

There is an expression: Media is the mirror through which society gets the opportunity to see itself. Whether or not the media-mirror shows our environment, depends on the mirror. If we only have a small mirror, we may only be able to see our nose. If we have a distorting mirror, we may see a totally erroneous picture- as happened during the Soviet era. We may only be able to see clouds and sunshine or dirt under our feet if the mirror is moved up and down. Perhaps a large clean mirror, placed on a wall is an ideal situation? We found a fairly small mirror – the newspaper from our county, Ida-Virumaa. The students were able to examine these newspapers in the town library, covering the period from 1955 to 2001.

It is evident that newspapers change along with society, especially a society that is developing from a Soviet to a capitalist system. This is what happened during these 46 years and we had the opportunity to read about these development in our newspapers.

Student assignments

1. Visit the library and read all the county newspapers for one year.
2. Find all the articles that were written about oil shale mines, the oil shale industry and the environment.
3. Take notes on what happened during this year
4. Define the aims of these articles.

Our findings

Changes in the name of our local newspaper:
1949 to 1960 *Miner*
1961 to 1990 *Leninist Flag*
1991 to *Northern Coast*

The subject-matter of the newspaper articles have changed over time. For instance, environmental problems were not always of importance to journalists. At the beginning of the period, articles were written on ordinary topics such as meeting and improving planning targets.

There were also articles on new mining technology and opening new oil shale chemical enterprises. Two or three articles were written about work conditions in the mines. The idea of these stories was that it was good to be a miner and that everything in the oil shale mining industry was just marvellous. We don't know whether or not people actually believed it in the 1950s. However a student discovered something else. Kristo Koppel interviewed an ex-miner team-leader, Ants, about the year 1955. This old man said: "People worked hard, but it is questionable that they were enthusiastic, as was written in newspapers. Work-conditions were very bad and a lot of the work was carried out by hand. However now there are machines for it".

The severe working conditions were the cause of suicides and accidents such as the loss of a hand. According to Kristo: "There were no reports in the newspaper about environment pollution or accidents. If there are a lot of such problems now, then I am certain, that there were also problems 47 years ago. It was not the fault of the journalists since they were not allowed to write in any other way. At that time, journalism was under the control and protection of the Communist Party."

One example is taken from the newspaper Miner. It is a photo from First of May in 1958. A group of miners are looking at the oil shale wall and the headline of the article is:

"Workers of the Soviet Union! Rally more tightly around the Communist Party and Soviet Government, let's mobilise all your power and creative energy to build up a Communist Society!"

Anyway, workers simply did their job to get a salary, no matter what the newspapers wrote.

Our student Liina Juhkov asked the question: What was your attitude to your work in the mine? Vladimir Juhkov, ex-miner from Kukruse mine, answered: "At that time there weren't any opportunities to have an attitude, because you needed this job. I sent half of my salary to my family every month".

Here are also the opinions of two students:

Enely Lätt (research year 1975): "In the Soviet era, people were shy of the authorities and their deputies. People only worked hard to fulfil the plans and newspapers were filled with articles about it. Everything is totally different now. We can say, that the Soviet era was black and white, just like old newspaper photos."

The name of a newspaper describes an era. Clockwise above and left – Miner, Leninist Flag and Northern Coast.

Triin Kukk (research year 1988): “Journalists did not offer their own opinions. No judgements of any kind were made. There was no criticism at all.” Triin also referred to the three reasons for the success of the mines in this era put forward by the famous team-leader Vladimir Stepenko: “First. The oil shale reserves were huge. All you had to do was to dig.

Second. People were devoted to work. They felt confident that they would succeed in something big.

Third. People worked better because of the bigger salary.”

Todays problems created by the past

Serious articles about environmental problems appeared in the local newspaper quite recently. For example with an article in 1990. “The exploitation of nature – a problem or a tragedy?” Here it was said that the area of Kohtla-Järve was environmentally ill and in 2000 the Environmental Inspectorate demanded that the polluters should make substantial payments. One interesting case appeared in the newspapers during that year, where Margo Tali found an article about a serious environmental tragedy in 1967 connected with the Kukruse ash mountain, which burned for a long time and caused serious damage to the environment. However in the 1960s, the newspapers did not report this story. Margo summarised this article: “Extinct volcano in Kukruse.”

There is an ash mountain in Ida-Virumaa not too far from our school. It arose in the 1960s during the oil shale mining at the Kukruse mine. In 1965 the Kukruse mine was closed. However it wasn't long before the first signs of fire appeared and winter snow melted on the top of the mountain. In 1967 the mountain became a volcano. The inhabitants of Kukruse village remember that it was an awful time and that they had to seal their windows tightly because of the smoke. They had to shut the cellar trap-doors with carpets to avoid gas permeating into the cellars. They measured the level of gas regularly, but were told that there was nothing harmful for their health. The situation was actually so serious that it was necessary to evacuate people from the neighbourhood. However the authorities did not do this.

The mountain was a very attractive place for youngsters. Small boys sometimes burned their feet when climbing the mountain. The fire itself started from the shut mine shaft. Self-combustion within a slag heap was quite a common occurrence in shale mining due to the high pressure inside the mountain. There was another reason as well. Under this mountain there was the shaft which was used to air the mine. This shaft was not filled with materials that could not burn. It was very hard to extinguish the fire. They tried to do it with water and sand, even with the oil, but nothing helped. Nowadays Kukruse mountain is not on fire although a bad smell can still be detected near the mountain. However the extinct volcano offers a nice view from the top and is a popular place for excursions. Sportsmen take wings from the top of the mountain. The owner of Kukruse mountain is the Kohtla municipality and they have lot of ideas about how to use the mountain.

In the past, the influence of the oil shale industry on the environment was only briefly mentioned in the newspapers. In the early 1990s, there were a few items of news about student action on behalf of environmental protection.

New topics

Renate Antonov expressed surprise about the following newspaper report: In May 1998, a ONE(!) day programme of environmental protection was carried out at the Kohtla mine and Aidu open cast mine. On this day, trees were planted in the open pit area. Since there are more than 300 days in a year and in view of the fact that the oil shale industry inflicts extensive damage on the environment *every day*, one day is obviously too little.

In 1998–1999 new topics emerged:

1. Closing down the mines,
2. Firing and reducing the number of miners.

The ash mountains are still there.

At the same time, there were no longer articles on the subject of meeting and improving planning targets. These years saw the beginning of changes in the oil shale industry. What is interesting however during this process is that journalists did not start writing more about environmental problems.

As pollution and environment were certainly not popular topics for the journalists of Ida-Virumaa, the students concluded that the local newspaper reverberated events in oil shale industry with vacancies and cautiously. Additional sources were required. We needed stories of human beings. At first we had the idea of trying to find the people, who appeared in old newspaper articles. But it was almost impossible since they had moved away and we were unable to find their present jobs or addresses. We decided instead that the students would interview old people whom they knew or were their own relatives. Students found old people, who had worked in the mines and in the oil shale enterprises during the period 1950–2001 and were able to find out a lot more about working processes and work conditions in former times. You have already read some of the interesting recollections from the ex-miners.

Student experiences

Developing the skill of immersed reading;
Developing the skill of collecting statistics;
The knowledge that the newspaper is an important information source in many different ways;
An awareness that it is very hard to work quietly and undisturbed in a library;
The subject of the environment is very important from the standpoint of the development of Ida-Virumaa;
The development of the oil shale industry is inseparable from the history of our country;
An understanding of the extent of the damage inflicted on the environment by the oil shale industry every day;
Developing computer skills.

Future of environmental history research in Järve Gymnasium

We will try to go on with our investigations about the environmental history of the oil shale industry in Ida-Virumaa in different ways.

1. To build up a catalogue of newspaper articles on the oil shale industry. The catalogue will list articles year by year and will enable people to research various problems, situations or events in the environmental history of Ida-Virumaa.
2. To provide a local newspaper data base on environmental history covering the years from 1955.
3. To research other newspapers in Estonia using the same methods.
4. To find older newspapers sources in museums covering the pre-Soviet period in order to gain knowledge about the earlier period of the Estonian oil shale mines and industry.
5. To carry out interviews and edit the recollections of people who worked in mines, oil factories, chemical enterprises as well as former journalists.

Fighting to Survive – Orchids on the Waste-Tips

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Introduction. People have always changed their environment in order to improve their situation in one way or another. But nature is not easy to control and a lot of things usually happen that are unforeseen. This produces certain unexpected consequences that are described as environmental problems. It is well known that certain species expand while others decline due to environmental changes. Orchids for instance are one of the species that have expanded as other species have declined. In this article, four botanists try to explain this development with regard to the highly polluted areas in Silesia and Kohtla-Järve. The Estonian school example has partly been used in Learners Guide 5.

New ecological niches created by human activity

The environment changes as a result of human activity. The area transformed by industrialisation, urbanisation and agriculture has increased very rapidly. Lots of animals and plant species have lost their natural habitats. Some of them now are treated as extinct in their former habitats, some are endangered while others have found a new location. Moreover, their ecological niches are sometimes subject to extreme disturbance by humans habitats such as waste-tips, railway sidings, roadsides or highly toxic wasteland.

Marsh Helleborine (Epipactis palustris) growing on a glass-works waste-heap in the Silesian region (Poland).

Orchids are unique

Orchids (the *Orchidaceae* family) are probably the largest family of flowering plants in the world. Approximately 30,000 species from about 1,000 genera comprise more than 10% of all known species of angiosperm plants. Orchids are terrestrial, epiphytic or saprophytic herbs. They are considered the most evolved of the flowering plants. Their pollination mechanism is very interesting, often complicated, characterised by great variety and subject to complex morphological adaptations to the behaviour or image of the pollinators (insects, birds). Orchid flowers are very different in colour and one of the petals forms the characteristic structure called labellum. It is typically highly modified in shape and coloration. It is a "landing field" for pollinating insects. Labellum frequently try to allure pollinators. For example, this part of a flower could smell and look like an insect female. A male looking for a partner carries orchid pollen from one flower to another.

Broad-leaved Helleborine (Epipactis helleborine) growing on a smelting-works waste-heap in the Silesian region (Poland).

Orchids are also unique in their methods of seed production and germination. They produce the smallest seeds of any flowering plant. These dust-like diaspores lack an endosperm (food source for an embryo) and they need to form a relationship with the specialised fungi occurring in the soil for germination and growth. Spawn penetrates the cells of the seed then allows for the development of young orchids by supplying mineral nutrients and water. Germination and formation of a fungal association (mycorrhizae) are a very slow process and it may even take several years before a plant appears above the ground. This perhaps explains the fact that orchids produce a large amount of seeds – over a million seeds per plant. The fungus continues to supply nutrients and water during the entire plant life cycle receiving photosynthetic products (mainly sugars). from the orchid.

European orchids

The most familiar orchids are found in tropical regions and are often used as ornamental plants because of their large, ostentatious, colourful flowers. Some of them are edible plants such as vanilla. However they are also important elements in the European flora. In many countries, including those of the Baltic Sea region, the majority of them are rare nowadays and are protected by law. In Poland, for example, all of the members of the Orchidaceae family (50 species) are strictly protected. Nevertheless some orchids are able to use their unique properties to penetrate new habitats. Co-operation with fungi enables them to grow in places that are extremely difficult for other plants. Waste-tips, railway sidings or roadsides are very dry habitat since their slag soils do not retain water. They are also very poor in mineral elements. However with the help of mycorrhizae, orchids can survive and develop.

Broad-leaved Helleborine (Epipactis helleborine) growing in the railway area in the Silesian region (Poland).

Orchids on waste-tips

In Silesia, the most polluted, urbanised and industrialised region in Poland, some species of orchids are often found in the habitats mentioned above. Moreover, the presence of mycorrhizal fungi allows them to grow even in highly toxic areas such as waste-tips that contain high concentrations of heavy metals: zinc, lead or cadmium. In Kohtla-Järve region, the most polluted area in Estonia, the industrial landscapes originated in the oil shale and chemical industry. The industrial landscapes can be divided into five groups according to origin:

1. Ash mountains created by the chemical industry in Kohtla-Järve
2. Ash mountains created by the power plant station in Ahtme
3. Gangue mountains near Kohtla-Järve
4. Recultivated open pits in Kohtla-Nõmme
5. Ash mountains created by the oil factory in Kohtla-Nõmme

In this situation, the spawn of a fungus works like a filter blocking access to toxic metals to the plant. The majority of plants do not have such protection, since there is poor competition with other species and lot of space for orchids. Some of them need a certain amount of calcium in the soil (high or very high pH). Such conditions could be found in smelting and glass-work rubbish tips. A massive occurrence of the plants is especially likely when orchids form rhizome. They can multiply by vegetative means (rhizome growth) in order to avoid a very long and complicated sexual process. This group contains for example members of the genus Helleborine (*Epipactis*) like Broad-leaved Helleborine (*Epipactis helleborine*), Dark-red Helleborine (*Epipactis atrorubens*) and Marsh Helleborine (*Epipactis palustris*) as well as representatives of genera Twayblade (*Listera*) – Common Twayblade (*Listera ovata*), Butterfly-Orchid – Lesser Butterfly-Orchid (*Platanthera bifolia*) or Slipper (*Cypripedium*) – Yellow Lady's Slipper (Cypripedium calceolus). All these orchids were found not only by Polish students and

Zinc mine spoils in Bolesław (southern Poland). The total concentrations of metals (mg/kg –1) are Zn 40000, Pb 1700 and Cd < 200.

Zinc mine spoils in Tarnowskie Góry (southern Poland).

botanists in the Silesian region, but also during the summer of 2002 by Estonian students from Kohtla-Järve Gymnasium in industrial landscapes. In addition to the above-mentioned, the following species were found: Military Orchid (*Orchis militaris*) – also occurring in industry areas in Poland, Early Marsh Orchid (*Dactylorhiza incarnata*), Baltic Orchid (*Dactylorhiza baltica*), Common Spotted-Orchid (*Dactlorhiza fuchsii*) and Hardy Orchid (*Dactylorhiza maculata*). 11 orchid species out of the 36 growing in Estonia (all strictly protected) were found in different types of industrial landscapes in and around Kohtla-Järve. The lack of a natural enemy – the wild boar who eats tubers of orchids – may be one reason for the successful spread of orchids in the Kohtla –Järve area.

New habitats

We can observe how plants fight against the pressure of human activity. If they lose their natural habitats such as lime slopes, calcium-rich fens, meadows, forests etc, they try to find an alternative habitat. And they are often successful! Broad-leaved Helleborine (*Epipactis helleborine*) which is an orchid native to Europe and which is naturalised in much of the United States and Canada is now classified by some sources as an "invasive weed" in areas that have been subject to disturbance and human activity.

References

Cohn E.V.J., Rostański A., Tokarska-Guzik B., Trueman I.C., Woźniak G. 2001. The flora and vegetation of an old solvay process tip in Jaworzno (Upper Silesia, Poland). – *Acta Soc. Bot. Pol. 70*(1): 47–60.

Davies P., Davis J., Huxley A. 1988. *Wild orchids of Britain & Europe*. The Hogarth Press. London.

Jędrzejczyk M. 2003. Peculiar flora from areas transformed by zinc-lead mining in the Silesian-Cracow Upland. *Materials of International Conference Biodiversity and ecotoxicology of the industrial areas in reference to their bio-reclamation. Katowice: June 5–6:* 59.

Kull T. (ed.). 1994. *Orchid ecology and protection in Estonia*. ELF Library 1. Tartu.

Rostański A. Michalska M. 2003. Rich population of orchid (Epipactis palustris) on a zinc-colliery heap in Świętochłowice – Chropaczów. – *Archives of Environmental Protection 29(2):* 115–118 (in Polish with English summary).

Landscapes' Changes – Why do They Happen?

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Introduction. The article on land use history in Vecpiebalga parish in eastern Latvia originates from a project where students worked with geographers in order to understand the changes that had occurred. During this work however they discovered source material that also told them a lot about the people living in this area. The family on one farm had saved the book-keeping records of their ancestors since the purchase of the farm from the landlord in 1878. When they used this archive, the students were able to follow the major political changes, wars, struggle for independence, collectivization and privatisation, that took place in this area during 120 years. Both the fate of the people on this farm and today's landscape could only be understood in relation to these changes.

Course of our work

Our parish is located in the southeast part of Cesis region in the Vidzeme upland between roughly 200 and 250 metres above the sea level. The area of the parish is 110 km^2. The landscape here is hilly. Lakes cover about 10 % of the total area of the parish. There are poor podzol soils in Vecpiebalga. The climate is fairly severe here. Late frosts in spring and early frosts in autumn are frequent occurrences. The level of precipitation is from 750 to 800 mm per year.

Vecpiebalga parish in Latvia

Materials and data were gathered, working in private and state archives, studying maps and sources of

literature, and using data from the local land office. Photos were taken to record the existing situation. With the permission of the interviewed people, we recorded the conversations, preserving the local dialect of the language of old people as well.

Our questions

Working with the acquired materials, we saw the really important changes in land use that had taken place during the explored time period. We wanted to get answers to questions such as the following:

Why was the forest cleared and why did agricultural land take its place?

When and why were the former meadows overgrown by bushes and become a marsh or a forest?

What are the circumstances that cause changes in natural and cultural environment?

To answer these questions, we followed the history of one family, farming at their place since 1878 when the land was bought. At the same time we investigated the changes in land use structure in Vecpiebalga parish during the last 120 years. We will now tell you two stories at the same time, the one of Kalna Murnieki and the one of Vecpiebalga parish, both connected to each other.

The Kamara family from Kalna Murnieki

Kalna Murnieki is a typical farmstead in Vecpiebalga that differs from the other farms only in relation to the greater enterprise shown by people who have saved the documents providing evidence of their work during these years. In the corner of the largest room, there is still an ancient cupboard that contains the entire family archive covering a period of a century

A typical landscape in Vecpiebalga parish.

and more. The plan of the surveyed land still hangs on the wall as a valuable picture to illustrate ownership. Nowadays this farmstead is part of a group of protected areas in Vecpiebalga.

Who were the people who lived there a century ago?

The documents of the family have helped us to draw the family tree of the Kamara family, beginning in the 19th century. The first peasant mentioned that lived and worked in Kalna Murnieki with his family – the corvee farmstead of count Sheremetyef – was Kristaps Kamara. His eldest son, Spricis, and then Peteris, his eldest grandson, were documented farming although they were not the owners of the land. As corvee peasants, they belonged to a landlord together with a piece of land they used. They could not move from their place without the permission of the Count; they had to work hard on the fields of the Count three or more days every week. They were also required to take a large amount of their agriculture production to the manor every year.

Land became the property of peasants

Kalna Murnieki. It was not until 1868 that the corvee system was changed to money rent. Peasants became more prosperous. Janis, the eldest son of Peteris, became the first owner of the land of the farmstead.

Janis Kamara married Ede, when he was 30 years old. They had seven children, two of them dying at an early age. The family was large, father Peteris and mother Lize lived with them.

On 11 September 1878, the 43 year old corvee peasant Janis Kamara signed the agreement with Count Sergo Sheremetyef about buying a farm from the estate. The value of the corvee farmstead was 13 thalers and 30 farthings. It was sold for the price of 1510 silver roubles.

Vecpiebalga. The Vecpiebalga estate owned 424 farmsteads in 1878. There were 331 peasants who signed their agreements of buying their farms on the same day. The area of farms was evaluated from 10 to 30 thalers. 83 peasants first bought their lands in 1889, the remainder at different times.

The peasants were given credit to pay for the purchased land. It was lent by the Credit Association of Vidzeme Landlords and the money had to be paid back twice a year in April and October during approximately 20 years, starting in 1882.

Kalna Murnieki. The conditions of the agreement were very strict: the new owners of Kalna Murnieki were not allowed to hunt or fish in the purchased forest or lake: only the former landlord had such rights. The agreement said that the farm had to have at least one horse, and four cattle. The seed for spring crops had to be grown at the farm. It was written that the farm had to be insured. There was a land plan added to the agreement. It shows that the land consisted of two pieces: the largest one was around the farmstead while the smaller, a strip farm, was some distance away. There it is possible to see that the farm had a garden and a yard, arable land, a forest, a meadow and some valueless land. However no areas were mentioned, only the monetary value of the land at the time. The area was about 30 hectares.

A section of the parish map shows the present borders of the land plots. The land belonging to the Kamara family is shown gray.

Why do the farmlands have such strange borders in Vecpiebalga?

Kalna Murnieki. The configuration of the pieces of the lands was dictated by the way the groups of farmsteads had developed in our region. The name of "Murnieki" was mentioned in the documents of the revision in 1601. The two separate farmsteads, named "Murnieki" were created by dividing the larger farmstead into smaller ones to give some land to family members as an inheritance. To differentiate between the farmsteads, an additional word was added to the name of a farm, stating whether the farm was older, newer, if it was on the top of a hill or downhill. Some groups of farmsteads consisted of 7 to 10 separate farms. Subsequently, the division of land was forbidden in order to prevent the creation of farms smaller than 10 thalers. Compensation had then to be paid in money or in some other way to the family members who didn't inherit the land.

The Kamara family in life and work to the turn of the Century

Kalna Murnieki. On 30 March, 1879 Janis Kamara died suddenly of pneumonia and left his wife with 5 children: Janis – 12 years, Marija – younger than Janis, Peteris – 7 years, Minna – 2 years and Ede Konstance – 3 months old. Janis' father took up farming himself at the age of 70.

Kalna Murnieki – a view from Murnieki lake. The wet meadow around the lake was not yet overgrown with bushes.

The documents show that there were 3 horses, 8 cows, 3 calves, 4 sheep, 8 lambs and 4 pigs on the farm then. To run the farm, the hired hands were used: two men and two women during the spring, summer and autumn. They were paid in cash or in kind. Half of the total income derived from flax. The other goods sold were butter, barley, woollen fabrics. Money was used to buy flax seed, a colt and to pay back credit.

As it is possible to see from the family registers, handicrafts provided a quarter or, in some years, a third of the income in the 1890s. Spinning wheels were mastered in Kalna Murnieki, but only for some seven years, after which the market for them decreased. In the period from 1890 to 1894, the number of spinning wheels produced and sold declined from 230 to 55 wheels a year.

Vecpiebalga. The hilly and poor soils did not allow peasants to live on agriculture here. Therefore they became good craftsmen. Most people were weavers; there were as many as 5 to 7 looms in many homes. Linen towels, sheets, tablecloths and other linen fabric were woven in Vecpiebalga. Woollen goods were made as well, but they were mostly used for family needs. The second branch was woodwork. Spinning wheels were made in winters and taken to spring markets by horse carts not only in Latvia, but to Estonia and Russia as well. All the wooden items such as furniture, vessels, tools were made by men at home or by local craftsmen. Spinning wheels were made of birch wood, furniture, barrels, tubs – of oak. Lime trees, alder and aspen were used to make butter and milk vessels. The wooden shingles for roofs were made from aspen and spruce.

Another way to get money was to buy, feed and then to sell sheep. Smoked mutton was a form of production as well. Craftsmanship produced profit, but it took time. It was one of the reasons preventing the development of larger farms in Vecpiebalga.

Kalna Murnieki. In 1888 rebuilding of the dwelling house, the cattle shed and the granary started at Kalna

The dwelling house today.

Murnieki. All the wooden materials were taken from the farms own forest. Only the hiring of builders and the purchase of nails and screws gave rise to money transactions. Roofs were not covered by straw as before, but by wooden shingles.

Vecpiebalga. Specialists say that up to 70% of all the wooden buildings in the region were made from spruce logs. The first stone or brick buildings that appeared at the end of the 19th century were schools. Wealthier farmers built some cattle sheds or cellars of stone.

Kalna Murnieki. The new owner of the farm (who had the same name as his father) Janis began farming at the same time as the houses were being rebuilt. It is possible to see it from the housekeeping documents of the farm. He was then 21 years old. Rye, barley, oat, mixed crops, flax and potatoes were grown, and beginning in 1893, peas and beans were introduced. About 20 to 25% of all the fields were sown with oats which was used to feed the animals, mostly horses. The income came from craftsmanship, selling flax, butter and certain crops, barley more than others. A few domestic animals were sold every year. They were usually calves, sheep or lambs, but in some years, a cow or a horse. The forest did not produce any income, only a couple of logs that were sold at a high price in exchange for some boards.

The growth of the Kamara family

Kalna Murnieki. In 1895, at the age of 28, after profitable farming for some years, Janis celebrated his wedding with Karline Galina from the neighbour farm. However the document about the division of the inherited farm was only accepted in Riga on 3 October, 1896. It proclaimed Janis as the owner of the land and made him responsible for compensating the other family members for their part of the property:

- mother Ede – 200 roubles, accommodation, clothes and food till the end of her life
- brother Peteris – 300 roubles
- the married sister Marija (she got married in 1892) – 100 roubles
- sisters Minna and Ede Konstance – 100 roubles, a cow, two sheep and a wardrobe to each of them.

There were 4 buildings at the farmstead then: a dwelling house, a threshing barn, a cattle shed and a granary.

The wedding and the payment of the inheritances of a brother and sisters created a demand for money. Consequently the soil was cultivated using newer agriculture tools made of steel, mineral fertilizers were introduced into farming, ditches were dug round the fields. More animals were bred and sold, for example, a bull and 3 cows in 1896.

In 1897 Janis sold the equipment, which was used for making spinning wheels, and some ready-for-use wood materials.

He didn't see any profit in further craftsmanship. A new orchard was planted; money was obtained for the sale of butter and working for the Consumers` Co-operative Society and other farmers` co-operatives of the parish. Rooms were let out to single people such as the shoemaker or dressmaker or some other people. They were let to use a piece of land to grow potatoes or cabbage for their own needs. Rental payment for the rooms was made in cash or by other remuneration, such as working for the farmer's family.

Industrial production spreads to the country regions at the turn of the century

Vecpiebalga. Producing spinning wheels declined in Vecpiebalga because a large watermill was built in the centre of the region. It became possible and quite cheap to process not only grain but wool as well. Markets abroad became closer because of cheap manufactured goods.

The building and operation of the water mill changed the pattern of local small rivers and lakes: they became regulated.

It enabled the cutting of grass for hay in the former marshlands. They were turned into meadows.

Kalna Murnieki. The new family was a large one Elina was born in 1897, Paulina – in 1899, – in 1902, Peteris – in 1904, Milda – in 1907 and Arnolds – in 1915. After the birth of the first daughter there is a line in the family register about buying 2 cows just next to the line about making a cradle for the newborn baby. The water pump was built to get water from the well to the kitchen. After the birth of the second child, a bull and some lambs were sold to buy a good cow and the milk separator. Janis borrowed money and paid it back year after year. Cattle breeding became the main branch of agriculture at the farm. The year was cold and wet like in 1900 and it wasn't possible to survive without buying some fodder for the animals. The seed for crops and rye for bread was bought.

In 1901 Janis' mother died at the age of 59. The funeral was expensive. The inherited money was paid to sister Marija. In 1902 Janis paid his brother and sisters their part of the inheritance. Throughout the period, the credit for the purchased land was being repaid.

There were no major changes in the income and expenditure of the farm during the next few years. However, starting in 1908, flax was no longer grown.

Janis Kamara among his family in 1920. The girl in white is Milda, she is now 95 years old.

Trees for houses in the building boom

Vecpiebalga. The time when Janis Kamara rebuilt his farm buildings was also a very busy time for other farmers. Many of the farms that became the properties of peasants didn't have any dwelling houses at all. People used to live in a threshing barn where a room for the family was built. The forest area suffered at the hands of the farm building boom. In 1903 the forest covered 15% of the parish area. By 1929 it was only 10%.

Janis Kamara owned 4.8 hectares of forest in 1929 (it was 16% of his land), 60% of the trees were coniferous.

Kalna Murnieki. There was not enough wood material in the farm's forest. Accordingly, in 1912 and 1913 logs, ceiling boards and even some 8 m^3 of firewood were bought. Materials were used to build a veranda and to change the old window and doorframes of the dwelling house. The first two hotbeds for vegetables were built. Janis sold some aspen logs from his forest to the parish in order to rebuild a well at the local school. He also prepared aspen shingles for the roof of the school.

Daughter Elina went to the city school; her school fees and piano lessons were paid.

The main source of income was from the sale of butter. All the meadows were cut to make hay, including the wet ones. If there was insufficient grass for animals, the distant meadows were rented and cut. No bushes were allowed to take root in the grassland.

Vecpiebalga. Even forests were used as cattle pasture in that period in Vecpiebalga. Old people, 75 to 80 years old now, remember being shepherds and letting the cattle graze in the forest. They say they were even given special permission to graze the cattle in the state forest until the 1930s. Milda, the 95 years old woman, the only daughter of Janis Kamara who still lives in Kalna Murnieki doesn't remember that kind of pasture at their farm.

World War I on Kalna Murnieki

Kalna Murnieki. In 1915 the war entered the everyday life of the Kamara family. A certain amount of income came from cattle and hay sold to the Russian Tzarist army. These duties were obligatory but the supplies were paid.

Refugees from the more damaged regions of Latvia came to Vecpiebalga, and two camps were opened up for them. They bought food which helped to raise the income of that period. In August 1917 the front line was near and Russian troops trampled down spring crops on Kalna Murnieki, 30 heaps of oat, 6 cart-loads of clover and dug up 70 purs (1 purs – about 50 kilos) of potatoes. Refugees fed hay to their cattle without paying for it. Russian troops drove away 4 cows and 4 sheep.

But farming didn't stop. A new clock, a metal bath tub, a 2-year-old colt, some oats and other things were bought in 1917.

In 1918 Janis Kamara had to pay duties not to the Russian army but to German troops. The duties consisted of supplies of hay, rye flour, potatoes, horse. Grain had to be purchased since there was just not enough to meet family needs during that year. It seems strange, but during the hard years of the war the area of sown crops, especially oats, was extended. The children attended school, they learned how to play the piano. They received new clothes, almost all made from home-made fabric.

The first independence for Latvia: years 1918–1940

Kalna Murnieki. The independence of Latvia was proclaimed on 18 November 1918. In 1919 the Kamara family supplied the Latvian army with free cloth and sold them a good horse.

There were no hired hands at the farm in the 1920s. The children of the family were old enough to carry out the work of a shepherd or a field worker. More machinery was used and the water pipe was built from the well to the cattle shed. A cellar was built to cool the milk and to store apples. The principal sources of income were from butter, flax (from

1921) and apples. When there was a need to pay for medical treatment for their son Peteris and to stay at the hospital, the cow was sold.

Vecpiebalga. The government of the new country helped the peasants. It was possible to buy cheaper wood materials for rebuilding the cattle shed and adding a pigsty. Pork later became a major source of income for the farm.

The structure of agriculture was changing during the years of independence. Beginning in 1921, winter and spring wheat were grown. It was sold to the state, and peasants received a certain amount of subsidy for it. Beginning with the really very hard years of the economic depression (1933 to 1934) when the prices of butter fell to between one third and a half of its previous level, subsidies were paid to peasants for butter and pork sold to the government. It was possible to buy cheaper mineral fertilizers when milk was sold to the state milk mills. It was worth cultivating land and improving pastures for cattle. Money was then spent on building enclosures for cattle.

Kalna Murnieki. Janis Kamara started the drainage of the wet meadows in 1935. The government helped obtain cheaper credit for farms that were larger than 30 hectares. The money was lent by the Land Bank. The drainage of the low meadows was carried out by digging 1.8 kilometres of new ditches and cleaning the old ones. The pipes made of wood were used to drain the meadow, except in two short lines where clay pipes were planned.

In 1938, the newly drained meadow was cultivated, using the first tractor of the parish. It was expensive to drive it from its owner's farm, but Janis paid the money to have the heavy soil cultivated. The former bushy meadow was turned into good pasture.

In 1935, Janis was the first farmer who received tourists at his home, offering bed, meals, boating and fishing.

Earnings from the forest

Kalna Murnieki. In 1936 clear cutting (area 0,4 hectares) was carried out in the forest of Kalna Murnieki. It was followed by a larger one in 1937 (area 0.7 hectares). The wood was sold to the government. This helped pay off the debt to the Land Bank and finance the drainage work.

Milda Kamara remembered that young trees were not planted in their forest, the forest was left to renew naturally. However the agriculture register of 1939 showed that the forest area of Kalna Murnieki increased. It comprised 23 % of the land.

Vecpiebalga. There were really very important changes in land use during the short period of independence for our country. The inventory of 1935 showed that 76 % of the land area in Vecpiebalga parish was given over to agriculture while a further 12 % was covered by forest. 8 % of the land consisted of bogs and 4 % of other land.

In 1939 the next inventory was completed. By then, the land use structure had changed substantially with forests covering 20 % of the total area of the parish.

World War II, Russian and German occupation

Kalna Murnieki. In 1940 the Red Army of the USSR occupied Latvia. All the land was nationalised, it became the property of the Soviet state. However it did not change farming at Kalna Murnieki very much, people could stay and work at their farm, paying taxes and duties to the state. Janis was 63 then but was still running the farm.

In 1941, the war reached Vecpiebalga, but passed by very rapidly. The parish was largely undamaged. The Soviet duties were exchanged for duties to the German occupation officials.

Milda Kamara remembers that the requisition of cattle and horses was going on but she couldn't say whether any animals were taken away from their farm. The duties (mostly milk, grain, meat, eggs) were very high and taxes had to be paid. It was compulsory to grow sugar beet and flax at every farm.

In 1942, a plan for managing the forest was worked out at Kalna Murnieki. It shows the forested area now extended over 7.6 hectares, equivalent to 25 % of the farm area As a result, more land was given over to the forest.

In 1944 German troops were making a fighting retreat, and heavy battles continued for a long time, some 8 to 10 kilometres from the farm The younger generation of the family escaped to a place some 30 kilometres away from the farm while their parents remained behind at the farm to keep it safe. All the bridges, including the small ones were blown up.

Vecpiebalga. The trunks of the trees in the former battlefields are still full of metal from the cartridges and shell splinters and it is impossible to saw them into boards. The local saw mills don't buy the timber from those forests.

The return of Soviet power for more than 50 years

Kalna Murnieki. During the first years after the war the Kamara family could farm as they used to do, although taxes and duties were increasing all the time. Like many other successful peasants they were claimed to be *kulaki* (enemies of socialism, deemed by the communists to have excessive wealth). The farmer himself was arrested in 1946, but after some time was allowed to return home and spent his final years at Kalna Murnieki . His daughter Elina, living nearby was deported to Siberia and only returned after many long years spent there.

In 1949, there were 5 people at Kalna Murnieki; Janis Kamara – 82 years old, his wife Karlina – 75, daughter Paulina – 50, son Janis – 47, daughter Milda – 42.

In 1948 and 1949, the first collective farms (*kolkhozs*) were organized in Vecpiebalga but the Kamara family were not allowed to join them. They were allowed to live in the house and to use about 0.5 hectares of land for vegetables and about a hectare for pasture for a cow. The cattle shed was used for a herd of cows from the kolkhoz until its roof became damaged. However it wasn't repaired and the cows were moved to a new, larger shed. A milkmaid lived in the family's dwelling house in one of the rooms.

Their daughter Milda later went to her sister Elina's home to live there while she was in Siberia. She was offered a job at the neighbouring kolkhoz and worked there for many years, milking 17 cows by hand. She has now returned to her native home.

Janis Kamara died in 1959 at the age of 92. His wife died the following year at the age of 85.

The era of collective farming – the balance sheet in Vecpiebalga

Vecpiebalga. The small collective farms were later united into a large one named Alauksts, the name of the largest lake in Vecpiebalga. It proved to be quite successful. Although wages were very low during the 1950s and 1960s, the situation improved in the 1970s and early 1980s. Since heavy machinery was introduced into agriculture, it was not possible to cultivate the smaller fields or pastures which subsequently became rough pasture and then part of the forest.

The area of the kolkhoz was 9489 hectares. In 1980, agriculture lands covered 4329 hectares or 46 % of the area. The arable land comprised 2110 hectares. Workers on the kolkhoz were able to use 852 hectares (about 9 %) of the agriculture land for their gardens and pastures. About 48 % of the area was covered by forest.

Animal husbandry was the principal activity of the collective farm. It produced milk, pork and bred stock animals. In the 1980s, poultry farming was developed to produce meat. Chickens were fed with the food taken from other regions of the USSR. Grain crops and fodder crops were grown to feed animals. Potatoes were grown and sold as a seed culture.

Mineral fertilizers and agricultural pesticides to fight weeds and plant diseases were used in fairly large amounts. As a result the soil, streams and lakes were heavily polluted.

During the 1960s and 70s, drainage projects were carried out all over Latvia. In Vecpiebalga, streams were turned into straight ditches and wet bushy mea-

dows were turned into cultivated pastures. Following the completion of the drainage, small arable fields were integrated into larger ones Smaller plots of land were planted with trees, mainly spruces. If the forest was cut, it was planted or sown with young trees. Consequently there are now more coniferous trees in the forest than at the beginning of the 20th. century when the forest was allowed to grow itself.

In the 1970s and 1980s, the central village of Vecpiebalga was built. However it was mostly young families, or families belonging to professional occupations that had come to work here that moved to these new houses. With a few exceptions, old farmsteads weren't left empty. They are still lived in and are a part of the landscape of Vecpiebalga.

Moves were made to preserve areas of natural landscapes in Vecpiebalga at the end of the 1980s in order to save the characteristic natural and cultural environment of this area. Two new memorial museums were opened in the parish with the help of the authorities in 1987 when the Soviet regime had become more liberal. Naturally this depended on the local authorities of the kolkhoz. In the case of Vecpiebalga, it was the chairman of the kolkhoz, Andrejs Jurcins, who was greatly interested not only in economic questions but in culture as well.

The worst aspect of collective farming was the market which prevented the sale of local farm produce to local people. Farm output was taken to other regions of the USSR. People received money but the shops were empty.

A meeting with poets at the local museum Kalna Kaibeni.

In the late 1980s, private initiatives were allowed. The more active members of the kolkhoz asked for a piece of land and became farmers although the land remained as the property of the state. If it was possible, farmers were able to return to their original land.

1991–2002: the years of independent Latvia

Kalna Murnieki. After many long years of occupation, Latvia gained its independence in 1991. The Kamara family were able to return to their ancestral lands and it is now their private property. Janis Kamara, who had to inherit the farm left it by his last will to his granddaughter Daiga Satrovska, so she became the first woman, running the farm.

Daiga lives and works in the farm together with her husband Maris and their two children: Janis – 12 years old and Ance – 8 years. Daiga`s great-aunt Milda Kamara lives with them.

The Land Register affirms that the family owns 34 hectares of land, including 15,1 hectares of agriculture land (44%) and 13,1 hectares (39%) of forest.

Their strip farming (9.9 hectares) was planted with spruces in the 1980s by the kolkhoz and has become a woodland. 10% of the land is drained.

The forest provides a certain amount of income for the farm. It helps to restore the buildings. Clear cuttings are not used since people wish to preserve their forests.

There are 3 cows, calves and some other domestic animals at the farm. All the agriculture land is being cultivated, at least for hay. This helps to save a beautiful landscape. In the first years of farming, the young family wanted to restore the old model of their great-grandfather's farm but it didn't work. Now they only grow fodder roots and potatoes and vegetables for their own needs. Daiga is a teacher at the local school.

Vecpiebalga. Strong families and safe farmsteads were the two reasons that account for the rapid demise of the collective farm in our parish. People have been able

to regain their former lands or are registered as users of land if they didn't have land property in the parish before. They wanted to do their farming themselves.

The landscape of this history

Here we leave the two parallel stories and look upon todays landscape, formed by this history.

In 2000, 37 % of all the agriculture lands in Vecpiebalga were cultivated. Forests cover 41 % of the total area of the parish. The percentage of forest area is less than in the collective farming era but this is because the areas of lakes and rivers are included since they did not belong to kolkhoz.

Only a few hectares of agriculture lands have officially been turned into forest. However many smaller meadows and pastures have become overgrown with bushes since they have not been cut for many years. During the first years of private ownership, people were not able to cut their forests since the Land Registers had not been completed. In 1998, only 22 % of clear cuttings were replanted or sown with young trees. Now, if young trees are not replanted in the cutted area, it is not possible to obtain a voucher to cut the next area. Forestry has become the most important source of income for many families.

No chemicals are used in agriculture nowadays since the quality of agricultural production is high. People breed cattle and grow fodder crops, and potatoes and vegetables for themselves. 14% of farms have more than 6 cows. Land is used to make hay and as pasture for domestic animals. People do not sell their lands. They lease them, in many cases, to neighbours who are farming more successfully.

What did the students say after they had worked with the project?

The study, that begun 6 years ago, is still going on. Three of our students are completing their project work devoted to the chronicles of six chosen families from our parish this year. One of the families is the Kamara family from Kalna Murnieki.

The family and the interviewers at the house in 2002.

When we discussed the results of our long term project in 2002, it was interesting to hear the opinions of the students who had participated in the project. All of them agreed that the work carried out was important for both the scientists and the students. They said they would never know the people and the problems of our place in the way they did if they hadn't been participants in the research. Local people were very open and frank to the students: they tried to do their best to help them. One of the girls, Dace, said that she sometimes felt guilty towards the old people who were asked to recall things and events that they may have wanted to forget forever. However the other girl, Liga, thought that we obtained far more information than we could use for the project. It was a weakness of the project to allow the data and memories to remain without any further use. Students said that provided that people agreed it would be better to tape record interviews and analyse them later. Then it would be possible to return to the data when required. People allowed us to borrow their documents for some time or to make copies and use them in our project. The only difficulty was to learn to read texts written in old orthography and by hand.

It was more difficult to work with the materials of regional and state archives. At first, we did not know where to find the useful data or material. We learned

how to search for information in catalogues and were helped by archivists. Much of the data was found in archives on the original question forms of the agriculture registers of for example, 1939. They weren't collated because of World War II. We copied the pages, did all the calculations and obtained the data about the land use of Vecpiebalga parish. The square measures in Latvia were different up until the 1940s and we had to convert the results into hectares.

Many of the archive documents were written in German or Russian without any translation into Latvian. We asked for help from teachers to read and understand them.

The staff at the local museums helped us a lot by providing us with documents, literature and maps.

Agnese: I was the one who began the work in 1997. Co-operating with German scientists helped me improve my language skills. I had a chance to work in Leipzig for a month. I didn't use my knowledge about Vecpiebalga in my further studies but I have learned how to work out a project. My university diploma work will be on the economics of the environment.

Aiga: The most interesting aspect was the expedition round the parish interviewing people. I understood that I liked to be among people. I am at university now and I have chosen to work with people with special needs as my part-time job.

Liga: I understood what's happening around us. And I know that we can save some of the history of this place if we do the work. It's impossible to work out the project like ours during classwork; it's work for weekends and holidays.

Dace: If I wasn't involved in a project, I wouldn't know my own area as well as I do. You see, I hadn't noticed that the changes in land use were so great before I started to work on the project. I feel quite pessimistic about the processes going on here in Vecpiebalga. I'm afraid we are losing a younger generation, most of the former students haven't returned to their native area after their studies. There are no jobs here. Of course, there are some quite successful farmers breeding cattle for milk and beef or earning their living by forestry and woodwork or by baking good bread.

The old documents from the private archives of farmers

Kristine: If the roads were better, rural tourism could become an important part of the economy here. The scenery is marvelous in Vecpiebalga but it must be protected from overgrowing. The fact that there is a good rural upper secondary school in Vecpiebalga will help the area maintain its importance as a rural centre.

Didzis: It was exciting to see the German students and professors at school and feel that something important was done. I myself translated the materials from Latvian to German. Some of the German students said they would like to return to our place as tourists or as people seeking for a place to live and work.

Jolanta: I felt that the people whom we visited during our expeditions told us things that they wanted to be remembered and saved. I made a map of the parish, marking all the farmsteads and evaluating the condition of the farm buildings. It would be nice to keep them safe for future generations although people lack the money to restore the old buildings.

What did the teachers say?

It's a great opportunity to work with students during such a long project and to do it together with scientists. However it is a responsibility as well. We have to teach students to do things accurately and honestly. We, the teachers involved, learned how to use methods and organise the research. We also understood that the project work could teach us a lot but couldn't replace classwork.

Why did the Trees Fall?

Christian Bo Bojesen, Sönderborgs Amtsgymnasium, Denmark

Introduction. In the last month of the last millennium, December 1999, Northern Europe was hit by a very severe storm. Christian Bo Bojesen is a history teacher in Sönderborg in southern Denmark. In this article, he reflects upon his own thoughts about the relation between people and nature in connection with this storm. This led to an environmental history project with his students called Why did the trees fall? It is a good example of the ubiquitous need for a historical perspective to environmental questions.

The storm is coming

I was casually listening to the radio on Friday 3 December 1999, when I heard on the news that a storm would hit Denmark that evening. The Danes don't normally take much notice of such warnings because it is windy in Denmark about 200 days of the year. However, when I saw the evening news on TV, I realised it was actually quite serious. They were now talking about a hurricane, but everything seemed quite normal in our little village. Høruphav is situated near the seaside, and gets plenty of shelter from the wind. Besides, our house had recently been renovated, so we couldn't hear or feel anything unusual. It was only on the radio or TV that we could sense the worsening situation. Denmark evidently hadn't experienced anything like it for a century. When I opened the front door and went outside, I realised that it was blowing violently. If it hadn't been for the media, however, we would not have been aware that the hurricane had hit us.

Our house is damaged

The same evening, we had been invited to dinner by a colleague, who phoned to say that another guest had cancelled because of the hurricane, which he had already experienced at close hand. In such a small area, natural disasters can be experienced in quite different ways.

It was only the next morning that we realised Den-

Dear Ms Gillesberg

We are two teachers at the upper-secondary school in Sønderborg, Christian Bo Bojesen, history teacher and Niels Kornum, biology teacher. We are working on a project with our first-year students called Environmental History.

We have chosen the theme: "Why did the forest collapse on 3 December 1999?"

In this connection, we would like to ask for your help in answering the following questions. We would also like you to visit our class. If you don't have time for a visit, however, we certainly hope that we can meet to discuss the questions, which are to be used as a model for the students' exams. What were your first thoughts concerning the forests when you heard the hurricane warning on 3 December 1999?
Was there a connection between the composition of the forests and soil types and the number of trees that fell?
What were the aims for those types of forests and soils with regard to production, nature conservation and recreation?
What methods were used for planting, thinning out, draining and disinfestation?
How were the forests managed about 100 to 150 years ago?
Which amendments to the law have had an impact on the forests and their care today?
Has the appointment of a new supervisor had an effect on the forests?
What options did you have as the new supervisor?
What considerations did you make concerning the care of the forest after the hurricane?
Besides production, what considerations should be taken as regards diversity of species, recreation and biodiversity? How is this to be done?
Which species of trees are to be chosen according to the different types of soils?
What priority is given to local species of trees in relation to foreign species?
In what way are the methods of cultivation and care to be changed?
With regard to other biotopes (moors, lakes, ponds, swamps, etc.), what measures will be taken?
What do you think would be the response of private forest owners and their advisers to these questions?
What is your opinion of Denmark as a land of woods and forests?

mark was in a state of total chaos. We have a holiday house on the little island of Fanø, on the west coast of Denmark, and we received a phone call to say that the house had been badly damaged. We were also told that it was dangerous to go outside at all in that part of the country. What a contrast from our little village – and all in the same little country of Denmark.

Why did the trees fall?

During Saturday, the extent of the damage was shown in the newspapers and on TV. It really was a catastrophe! Many houses, cars, and other material goods had been ruined, but the pictures of the forests – or more correctly forests that had been reduced to matchsticks – left a deep and lasting impression on me and on most people I know. Previously, trees had been uprooted in storms, but never to this extent. Two weeks later, we went to Fanø to inspect our damaged holiday house. It was sad to see, but it was, after all, a matter for the insurance companies. Today, the house has been completely renovated – but not the forests! As we were driving to Fanø, the area resembled a war zone or a place that had been hit by a meteorite. It

After the winter storm of 1999, parts of southern Scandinavia resembled a war zone.

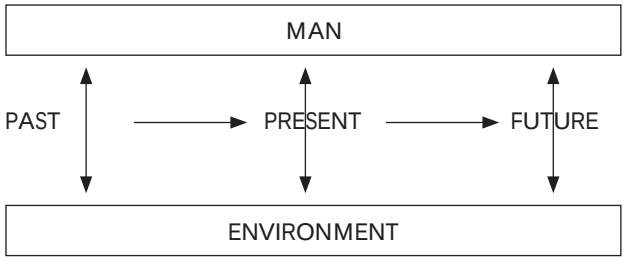
was an awful sight. My first thought was that it was because the forests on the west coast of Denmark consist mainly of coniferous plantations which are susceptible to storm damage. Back "home on the ranch" in Høruphav, the forests are mainly deciduous, and not many trees had fallen there. Could that be the explanation?

But what would a forester think? We really wanted to know and we contacted Inge Gillesberg, supervisor of the Gråsten forest district. We sent her the questions in a letter.

When raising questions like the ones above, it is important to keep in mind the following:

1. Which are the important questions to be raised?
2. How will we use the answers?
3. How can we use the answers to take action in the future?

Learning from the past for the decisions of the future



It is important that we learn to direct our thoughts and questions towards the options available for taking action.

Back in history, people believed that such catastrophes were the result of the sin of man and the anger of the Lord. Is that our explanation today?

The Oldest Oak in Mastaiciai

Birute Jasinskiene and Laura Armalyte, Mastaiciai Basic school, Lithuania

Introduction. History is not only for older students. Small children have a different view of time, which is highly abstract for them. Therefore it is necessary to be concrete in working with the time dimension. The teachers in Mastaiciai adopted this approach when they worked with the history of the forest, starting from the oldest oak. Their studies ended in a real conflict when thieves cut down the trees in their forest. After this incident they started an inventory of old trees in the area in order to protect them in the future.

The oak at the front

The oldest oak in Mastaiciai grows on the edge of a small (about 50 hectares) forest called Sniurgire. It's historical past is connected with World War I. At that time, Lithuania belonged to Czarist Russia. Kaunas, the town 10 km from Mastaiciai to the north, was established as the fortress on the Russian frontier. The fortification bunkers were built around it until 1915. In advance of the front, at a range of 30km around Kaunas, all the forests and gardens were cut, houses demolished, people evacuated and only the empty fields were left. The village of Mastaiciai belonged to that territory as well. The only thing that was left was an oak. Harrows were collected from all the villages and tins were hammered into the trunk in order that the scout could climb up the tree to watch the movement of the enemy army. Now this oak is about 200 years old according to the old people of the village.

A new forest after the war

Because of their superior war strategy and tactics, the German army took the fortress of Kaunas during 11 days, almost without a fight. The people of Mastaiciai returned to their homes and started rebuilding again. The forest, that was cut had begun to grow again. Local people told us about the forest in the period between 1935–1940. The forest, like now, occupied an area of 50 hectares. It belonged to about 30 owners who lived in the surrounding villages. Oaks, firs and

Pupils at the old oak.

ashes predominated in the forest. Many edible boletuses grew in the forest and wild strawberries were found in the grassy areas. The private areas of the forest were fenced off and guttered. Deadwood was used as firewood; leaves were raked in the autumn and used as bedding. Animals were brought to graze there. People said that the forest was a beautiful park.

In the 1940s, after Soviet occupied Lithuania, people lost their ownership of the private lands. Forests were made the property of the nation. During the 50 years of Soviet occupation, the state of the forest has changed: it has become more dense, the amount of tree shrub has increased, particularly aspen and at the edge of the forest, alders. There were also many cleared areas. It has become hard to find a way through the forest. It is humid there even during hot summers.

Although 13 years have passed since people regained ownership of the forest from the state, it has not become any better. The main reason is that for the most part, the owners of the forest are elderly people. They are about 70–80 years old, and their children live and work in other places.

The old oak grows in the northern part of the forest, which belongs to Povilas Astramskis who told us the history of the oak. The oak is about 40 meters high, while the width is 3 meters and 60 centimeters.

Working with interviews

Mastaiciai Basic School is situated near the forest. Pupils from the primary classes often go to play there, to pick up leaves and cones. The idea arose to arrange "the green classroom" in the forest. At the same time it could provide a recreation area for people from the village, something which the area lacked.

The members of the club for environmental and regional studies *Ainiai* (4–8 forms) approached the local authority with this suggestion. Its construction engineer explained that a recreation zone was to be part of the project planned for the village. However in 1991 the forest was privatized by its previous owner.

We visited the owner of the forest and found out that the immediate surroundings of the old oak were overgrown. The owner of the forest approved our ideas to clean the area around the old oak and arrange the green classroom there. He told us that a few years ago, he and his brother were going to establish a recreation area there, but his brother died and the idea was not implemented. Since this oak does not receive official environmental protection, the owner of the forest did not expect any compensation for the use of the private forest. He generously allowed us to make the green classroom. We were also allowed to create a path to the class and he even gave us a few trees from his forest to make seats and tables.

Working with our green classroom.

Protecting old trees.

Our green classroom

Because of the reasons stated earlier, we think that the communication of children with older members of the society was very meaningful. The visit of the *Ainiai* club members to the owner of the forest was also highly valuable because the children found out about the history of the old oak and were given permission to arrange the green classroom. Moreover they gained information about the local woodworker Vytautas Svirinas whose help was required to complete this project.

At the next meeting, the members of the club *Ainiai* informed the school community about their plan and announced a competition for the design of the green classroom and inviting all the pupils to take part in it.

Pupils' drawings were exhibited and discussed by the joint committee of pupils and teachers, which was led by a construction engineer. The committee selected the best drawings.

Then we requested the teachers and pupils from the whole school to assist in cleaning the environment of the old oak. We hoped that it would train the ecological and civil duty of the students since we protect what we know and create ourselves.

Then we asked the folk art craftsman, Vytautas Svirinas, to make benches and tables for the green classroom.

Listening to the old oak.

The complete project was presented, in the district newspaper and on the photo stand. In spring and autumn, pupils and teachers from our school were able to leave stuffy classrooms and conduct classes in the forest.

Every year, our green classroom is vandalised, glass is broken and benches and tables are scattered around, Pupils must put everything in order. They are surprised when people destroy things that other people have created. Will they come back?

The story of the oak

Each September, the teacher brings first year students to the oak. There they have a world cognition lesson. The oak also tells his story (on audio recorder). Then each member of the class puts his ear to the oak and listens to what the oak is telling him. Then they come up to their teacher and silently tell her what the old oak told them. Among the students answers were the following: *I heard the heart beat of an oak, The oak said: Thank you, come to visit me more often, it is sad to be there alone, It heartens me where harrow teeth were hammered, Don't burn wire on my roots and don't litter , The oak moaned, Thank you for visiting me.* Of course there were answers like *I didn't hear anything*.

The story of the old oak and the "pedagogical sun" can also be used during the lessons on ethics dealing with human beings and nature. Upon their return to class, pupils fill in the work sheet the "pedagogical sun." Students draw or write what an oak (nature) may give to a person and what a person can do to the oak (natural environment). This is a good opportunity for the students to discuss and reflect upon their own values and preferences.

The project of our oldest oak has an interesting sequel. Students told me that somebody had been cutting our forest down. They said: *Teacher, they might also cut our oak*. This shows that they felt responsible not only for their own actions but also for other people. They understood that the irresponsible actions of a few people could inflict damage on the entire community. We immediately informed the police and the thieves were caught. The criminal case acted as a precedent. This event encouraged us to create a new project called *Our trees*. We decided to register all the centuries-old oaks, growing in the village, which survived after the 1960s recultivating and to draw or take photographs of them.

The information collected by the students was organized according to a special form.

These facts were taken to Kaunas District Nature Conservancy Council with a suggestion that these trees should be recorded in the district's register of protected environmental objects

Students felt very proud when they completed good work. They understood that when seeking to fulfil a common aim, everybody's help was important.

Old large trees are impressive parts of the landscape.

Observation paper

Tree species...
Place of growth...
Age (approximately)...
State of tree...
Height (meters)...

good-grows normally bad-noticeable damage tree needs protection

Phenological observation

Phase, phenomenon	Duration, time	Notes
Vegetation period:		
– beginning		
– end		
Blossom time		
Mature seeds		
Observation points:		The amount of blossom
		Bees visited blossom
		The amount of harvest
		Fruit were picked
		Other observation points

The table notes the main phenological features:
– the first stage of vegetation (unfold of buds and leaves, sap circulation)
– blossom period (first blossoms, bloom period, bloom end)
– fruit and seeds
– end of vegetation (the beginning of leaves yellowing, complete yellowing, falling, fruit and seeds falling)

Tree indication

It is known that this tree...
Legends...
Happenings...
Songs and poems...
The tree is protected by...
Secured...
Suggestions...
Observation was made by...

Letter of the old oak tree

Hello children!
I am already old, centuries old. I have been dozing fitfully from day till day ,but after I heard you, I opened the only eye left to me and became happy.

Once upon a time, I was also as young and cheerful as you are now. At that time, even the forest was different. Mighty oak trees stood there. The whole oak-wood, the gods and holy spirits of your ancestors lived there. People used to come there and treat it as a sanctuary in order to pray and ask for help. It was an unforgivable sin to cut down a tree.

Because of the richness of the land, I grew fast towards the sun. Every summer I used to grow half a metre. My summers changed into autumns, autumns into winters. I didn't even notice how my top overgrew all my brothers and neighbours. Even after a hundred years, I was still tall, wide, strong and mighty.

Many things used to happen there. Orioles would make their nests, jays would come for acorns, even the wild boar's family would visit me. People would also pick acorns and grind them for coffee. During the famine they would make acorn flour and use it to make bread. When my bark and leaves were attacked by pests, hawfinches and starlings used to come and save me. Not only squirrels but also dormice lived in my hollows.

A hundred years ago a horrible war came to this country. Once soldiers came with axes, saws and cut down all my brothers. What was left was myself alone in an empty field.

Soldiers hammered my trunk with the rods of harrow and with their help, they used to climb to the top to watch where their enemies were coming from. I trembled when shells were flying through me but I kept silent and suffered. Thank you God, none of these touched me. I survived.

The end of the war came. People returned to their native land and started rebuilding destroyed houses. The forest was also replanted.

Such is the story of my life.

What happened later, your teacher will tell

I have a favor to ask you. Please, come there as often as you can. Make my old age bright. But please, don't make fires on my roots. These are my legs. I'm dying when the heat burns it. Please, don't leave empty bottles and bags there.

I'm not angry. People just don't understand what they are doing. They think of me as lifeless and unfeeling creature.

I believe that after you grow up, you won't do these things and will tell others the same. I'm proud that there are so many young oak trees growing around your school. Oak trees will not cease to exist in Lithuania because they are usually planted in honor of important dates and events.

I will be able to die in peace. Maybe after that I will become a cross or oak firewood, which will spread light and warmth while burning.

The Slepiotka Stream Restoration Project

Katarzyna Rdest, Tatiana Mol, Jolanta Mol, II Secondary Konopnicka School, Poland

Introduction. When the students in one upper secondary school in Katowice investigated a small river in their neighbourhood during biology lessons, it was the start of an environmental history study. What they found in today's river raised questions that led to research into the past and gave rise to thoughts about the future. They also found conflicts concerning the use of the river as a recipient of sewage and in relation to the environmental impact of coal mining. Katowice, like Gelsenkirchen in Germany, is an old coal area, but unlike the German city, its mines are still in use.

Questions

In 1994 we started our investigations of the Slepiotka stream in Katowice. During biology lessons, the students measured the amount of nitrogen, phosphate and oxygen in the water. After some time, they found that the degree of phosphate rose during the end of the week and was much higher on Fridays and Saturdays. Some other students, taking samples from other parts of the river, found that pollution was higher in certain places. When these results were discussed we were very confused. Why? What was the reasons for this? Other students had discovered that the bottom of the stream was covered with concrete. But the stream flows through forests. What was the reason for this? How people had influenced the stream in the past and continued to do so was the starting point of our enquiry. And then we started our environmental history research. This is what we found.

A small Silesian stream through time

The Ślepiotka River is a small, 8 km long stream whose drainage area is 14 km^2. It's situated within the administrative borders of the city of Katowice. It flows into the Kłodnica river on the border between Katowice and Ruda Śląska, forming one of the most important tributaries of the Odra River.

The stream flows through the southern parts of the city, where the area is not highly urbanised, although the distance to the centre is no further than 10 km.

Nevertheless about 60 % of the watershed area is covered by forests. Urbanised areas are only evident in the central part of the area. The stream valley is narrow, with steep slopes and flat bottom covered mainly by forests, gardens, meadows, pastures and wastelands. The slopes of the valley are only partly urbanised, while plants cover most of the area as well as the floodplain. There are no industrial plants in the neighbourhood of the watershed. However coal mining operations were carried on in the upper part of the valley.

Until the 20th century both the watershed and the Ślepiotka Valley hadn't been urbanised. However, since the Middle Ages, a lot of settlements have appeared in the forests. These forests are the remains of the old Silesian wilderness. Agriculture wasn't developed because of the arid, wet soil. People mainly cut down trees and took part in trade since two main trade routes crossed the area. From the 16th century, river mills were in operation.There were at least three of them on the river. In different periods, there were a dozen ponds in the valley.

The dried up channel of the Slepiotka in its spring section of the watershed. The water flows deep down into the ground because of underground mining activity. Ochojec forest.

Turning points

There are two turning points in the life of the area. The first is connected with the development of coal mining in the east Piotrowice and Ochojec forests. These settlements were developing and the inhabitants could find jobs in the mining industry.

The second turning point dates from the beginning of the 20th century. It was connected with the development of the Katowice urban agglomeration and the beginning of the railway. Two main railway tracks crossed the watershed and the road was being developed. Thus the area was slowly being urbanised.

In the period between the two World Wars, most of the settlements joined Katowice. Deforestation of the Panewniki forests and district development were planned. You can find numerous sewage pipes in the Ślepiotka River from that period. Finally, deforestation plans were stopped in the 1950s and it was planned to create a new town centre there. That's why the Ślepiotka River was regulated. But the plans weren't fulfilled. Nowadays the flow of the water is five times smaller than hundred years ago.

Until the middle of the 20th century, this river was clear and stocked with fish. People found its banks to be pleasurable recreation places, bathing and canoeing were popular in Ochojec, Zadole and Panewniki. Regulation and pollution of the river have changed everything. From 1970 to 1990 the Slepiotka was a stinking sewage canal.

Present day and witnesses of old times

The main changes affecting the Ślepiotka watershed happened in the second half of the 20th century. Housing estates appeared and the number of roads and car parks increased rapidly. Now 30 000 people live there. The share of impermeable parts in the drainage area increased by up to about 20 %, which had a negative influence on the Ślepiotka ecosystem and its valley. The good thing for the Ślepiotka is that its slopes are steep and its bottom damp. Hence it's not a good place for building. It remains a green corridor close to major settlements, crossed only by roads and bridges.

Some of them have features such as monuments – like a bridge of the old Warsaw-Vienna railway

In the Ślepiotka valley, many natural monuments have survived, and, among them, very rare in Poland, protected, mountain and underhill species of plants. They are relics from the times when these lands belonged to Puszcza Śląska (Silesian Primeval Forest). The most interesting of them are: *Streptopus amplexifolius* and *Doronicum austriacum*,*Veratrum lobelianum* and *Equisetum telmateia.*

Even in the densely populated middle section of its drainage area, the Ślepiotka flows in a green corridor. Unfortunately the valley is continuously polluted with rubbish. The view from a bridge near Zadole.

Doronicum austriacum.The unique, protected, mountain plant species – Doronicum austriacum, at an outlet of the Ślepiotka. Panewniki forest, (lower part of the Ślepiotka watershed).

Veratrum lobelianum (Ciemi¸e·zyca zielona) – very rare, mountain, protected species. The Valley of Ślepiotka in Panewniki forest (lower flow of the stream).

In order to protect these rare species of plants and forests with natural features, a part of the Ślepiotka valley in the forests near Ochojec is being protected as a nature reserve.

In the valley we can come across very old alders and beeches.

Some of this beeches are about 300 year old.

Very old trees, including 200-year-old oaks and ash-trees grow by the roads and in the parks. Most of them grow in the park situated in the neighbourhood of the Panewniki Basilica and by the old trade route crossing the district of Ligota from south to north.

Forests in the drainage area of the Ślepiotka River were treated mainly as a source of wood during the 19th and 20th centuries. As a result there isn't a single original stand of trees. There is a high proportion of pines. However near the Ślepiotka Valley, many

Equisetum telmateia. Very rare, protected plant species Equisetum telmateia growing in a gulley of the Ślepiotka. Ochojec, (middle part of watershed).

This marvelous alder tree with a circumference of over 4m. is one of the largest specimens of this species in Poland. The slope of the Ślepiotka valley, Ochojec, (upper part of the watershed).

A more or less 300-year-old beech was the features of a natural monument growing in the forest by the stream Ślepiotka. It is a keepsake from the times of the Silesian virgin forest.

charming swamps and marshy forests have remained. Such places are very rare in many parts of Poland, and they are something special in big towns. Thanks to them we have the idea of the beauty of the old Silesian natural environment.

In Ochojec and Zadole, we can still find old dams and even mill facilities. In both those districts in the Ślepiotka valley, some parts of the old underground water intakes remained in the previous fish ponds which nowadays have became small ponds in those districts.

Regulations consisting of straightening and widening the river-bed has harmed the ecosystems of the stream and the whole Ślepiotka valley. But some parts of the river-bed have retained the beauty of the old river-bed.

The edge of the forest in the valley of Ślepiotka, near a settlement. Old alders grow in grassy knolls and small valleys. Wymysłów (lower flow of Ślepiotka).

One of the lively old-beds of the Ślepiotka stream. The border of the Panewniki forest. Wymysłów, lower part of Ślepiotka watershed.

Relics of former splendid times – water mills, storage reservoirs and deep wells are forgotten and left to go to waste. The same applies to the old trees, swamplands and the remains of the natural marshy forests.

Old river-beds are gradually overgrown with plants or filled with sediments or even garbage. Ecological consciousness has a lot of difficulties to overcome within local communities. In the meantime, nature is trying to heal its wounds alone. Even in places where the banks of brooks were covered with concrete, new trees are showing up. In many parts, the river-bed managed to retrieve its natural character during 30–40 years.

Our questions

What about the pollution and phosphates? We discovered that there were a lot of pipes with water running into the stream. In the 20th century, nearly 80 canalisation pipes emit sewage and storm water into the stream. Nearly all of them belong to rain drainage. However some of them were illegal sewage pipes coming from houses where people lived. This was the reason for some of the pollution that we saw. How was this connected to the high degrees of phosphate before weekends? The explanation was that washing in washing-machines was more common on these days and consequently the use of detergents, containing phosphate. Through the illegal pipes, this wash-water went to the Slepiotka stream. The quality of water in the stream is bad because of the communal waste coming from illegal or damaged canalisation devices. There is no industrial waste. In recent years, the amount of communal waste has decreased a lot. Nearly all of it is directed to a sanitary collector along the Ślepiotka valley, which takes care of the whole drainage area. Gutters end in biological and mechanical water purification plant. After purification, the water is directed to Kłodnica. The problem concerning waste in rainwater still hasn't been solved.

Coal mining conducted over a large part of the drainage area causes a permanent deformation of the land. Over the last few years, some parts of the forest have therefore been flooded.

In 1994, the first year of our investigations, we visited the sources of the Ślepiotka stream and saw the small wet meadows and ponds with tree frogs. In 2001 we made a new visit with students and we couldn't find the ponds! The students and teachers were shocked. Had they disappeared? Why? The explanation is probably the subterranean changes that has been caused by coal mining. The area is simply drained of water. When we realised this, the students were not so surprised because they think it is normal when the ground collapses due to coal-mining.

On the concrete banks within 30 years, healthy hornbeams, alders and willows have established themselves. Zadole(middle flow of Ślepiotka).

Rainwater draining into the Ślepiotka near its outflow to Kłodnica in Panewniki. The photo was taken a few minutes after a short period of heavy rain. Dirt from nearby streets is taken by rainwater straight into the stream. This outflow and similar ones deserve to be rebuilt.

They can go home and find buckles and scars in the asphalt on the road that weren't there in the morning and they can see cracks on houses because they are moving. Collapsing reservoirs sometimes occur. Some of them are used as fishing and recreation places.

What about the concrete? We contacted a researcher, Dr. Leszek Trzaski, and asked him to accompany us along the river and explain the changes. He told us that the plans for a new city-center in Katowice, that were later abandoned, led to the regulation and straightening of the Slepiotka stream in the 1970s. A part of the regulation was to cover the bottom with concrete which damaged the eco-system. When the plans were changed it was too expensive to take up the concrete.

Future and overlooks

The city council assisted by the Katowice environmentalists now plan the development of the city according to the rules of sustainable development. For the Ślepiotka it means protection and increasing the environmental values of the valley, as well as improving its sights.

According to the declaration of the City Council in 2000, a protected corridor was created in the bottom of the valley. It also includes the river slopes. Any building sites (even fences) in the valley are banned.

Long-term plans include: solving the problem of waste, increasing the water retention in the valley, securing the opportunity for recreational use and restoration of the river bed. The areas of collapsed forest pools might become places of recreation. Bike lanes are being marked in the forests. One of them goes through Panewniki forests, along the old trade route connecting Mikołów with Bytom.

Along with the closing down of sewers, the first restoration works are being carried out as one of the largest restoration projects in Poland. We help nature to replace the concrete fortifications with plants. All this is done by young people, from our school as well, under the supervision of specialists. We have also helped by planting willow trees in order to stabilize the banks of the stream.

This story of the stream regulation led the students to conclude that it was very important to think before we caused irreversible damage to the environment. It is easy to change the environment but very difficult to undo the changes.

Plans for the future of the Slepiotka stream

Here are the plans for the next 6–7 years. They indicate what is going to be done using both the city funds and the donations from other sources.

- Legislating to protect the stream corridor.
- Keeping the permanent outflow of water from the upper, collapsing part of the watershed area.
- Eradication of illicit or illegal sanitary connections flowing into the storm water sewage system.
- Creating the program and good practice of previous area protection in the whole watershed.
- Protecting the springs of underground water flowing into the Ślepiotka.
- Managing excessive rainwater from the valley (retention and detention ponds)
- Restoration of the retention system in the valley (including old mill ponds).
- Partial re-naturisation of the river-bed and protecting the plant-cover of the stream banks.
- Promoting current methods of environmental protection (ecological uses).
- Assuring maximum continuity of the ecological corridor
- Assuring recreation opportunities in forms not harming the valley.
- Promoting the idea and demonstrating the possibilities for the ecological restoration of the Ślepiotka corridor.
- Continuation of the research and introducing a system of monitoring for the valley.

Falling, dead trees in the alder forest destroyed by ground water. Because of underground coal mining activity, the ground is collapsing and flooding. In a few years, several hectares of collapsing pond containing clean water will occur here. North spring, part of the Slepiotka watershed.

Old Ships or Orchids in Nydam Moor?

Christian Bo Bojesen and Niels Kornum, Sönderborgs Amtsgymnasium, Denmark

Introduction. The teachers in Sönderborg present a project that demonstrates great awareness of the methodological possibilities of environmental history investigations. They also stress the importance of adopting a serious approach to both the problems and opportunities raised by interdisciplinary work. The conflict between culture and nature conservation, which is the core of this project, is not unusual and poses a dilemma. It is not quite clear how the students thought about this dilemma but posing real dilemmas and reflecting upon them is good training for real decisions and action competence in the future.

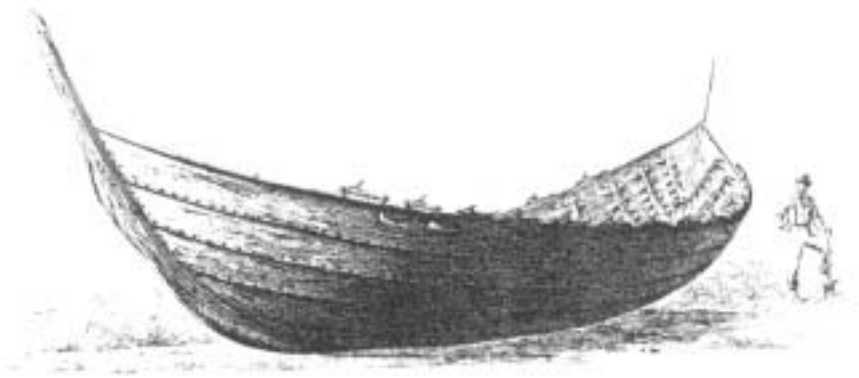
The Nydam Moor

Every year Danish archaeologists visit Nydam moor to excavate artifacts from the Roman iron age. In the 1860s, a boat was excavated and there is still plenty of relicts in the moor. However time and nature destroys and works against history. The moor is as a biotope worthy of conservation because there are lots of different plant species growing on the moor, some of them fairly rare and protected, for example orchids. At the same time, a population of Horsetails was rapidly expanding on the moor, which is a goldmine for archaeologists. What should be done?

The project

We made an agreement with our first-year students to undertake an educational project in environmental history. As teachers, we followed the official regulations for the subjects involved (history and biology), and discussed the aims of the project, the methods and the content.

The students themselves would study the history of recent environmental problems by means of methods commonly used in the two subjects involved. In that way, we hoped that the students would join in the struggle to prevent environmental problems from



The reconstructed Nydamboat from a drawing by Engelhardt 1865. From The Danish National Museum.

occurring in the future, or at least become environmentally aware.

The field of study

We chose Nydam Mose (Nydam Moor) as the field area, since the moor had all the three elements required to complete the project. These three elements comprise the aims, subject methods and the content.

Nydam Moor is today a fairly wet meadow crossed by a channel. This channel leads the water from the meadow into a big arteficial millpond created by order of the Duke Hans, who was the brother of the Danish king Christian III. (app. 1600) and owner of the region. This pond was created by means of a 300 m long, 10 m high dam along the coast of Als Sund. At the southern end of this dam there are some remnants of the water mill. The water came from the Snogebæk (a small brook), through an excavated channel into the Nydam Moor and then into the pond, through the mill into Als Sund.

In the late iron age, the Moor had been long used as a sacred lake where many offerings were placed. The natural succession covered the offerings with turf. Most of the artifacts have been preserved, although certain changes, known as well as unknown, have brought about a rapid deterioration. During the excavations, the metallic artifacts were seen to be rapidly corroding while the wooden artifacts have been affected by the roots of the Horsetail which have been growing inside the wood material. In that way you can say it´s a conflict between excavations that damages the orchids and the preservation of a rare specie of orchids. It then becomes a conflict between cultural and nature preservation. A conflict which is not unusual today.

The development of the area started during the Ice Age as a part of a small glacial trench which ran from Als into Als Sund and continued into Nydam Moor. During this period, the area developed into a lake, and then by natural evolution became first a moor and then a grazed water meadow. This brief historical presentation of the area, made us believe that a study would be able to:

- fulfill the aims of the project i.e. carrying out an examination of an environmental conflict, namely the conflict between preserving both our cultural and biological heritage.
- include the methodology of both history and biology
- cover the compulsory themes included in the subject curricula

Starting the project

In starting the project, we introduced history and biology, and held separate lessons in the different methods used in these two subjects. In this regard, the students were presented with different biology examination methods relevant to the field area. In the history lessons, the class studied an article about the Iron Age in Denmark. There were approximately ten lessons per subject, each one lasting forty-five minutes.

The next step was to discuss with the students the relevant environmental problems that could be studied in the chosen field area. These included acidification, local ground water problems, eutrophication of lakes, fjords and the sea, the extraction of raw materials in the area, changes in agricultural and forestry methods, etc. This took approximately four lessons.

Last, but not least, we all agreed on a timetable and on specific demands regarding the items to be collected, since the projects artifacts were to be presented at an exhibition at the school's "Green Day".

The Green day was a day, when all the first-year students worked all day on lectures, workshops and exhibitions on environmental matters and sustainability inside the BSP. Students and teachers from all of the nine Baltic nations participated, and the exhibition was visited by several local political representatives. The school has occasionally an international BSP-day.

Out in the moor

We cycled to Nydam Moor for a full day's exploration, during which the students were presented with a lot of information about the field area. We called this a "data storm" – glacial trench, excavation of artifacts from the Iron Age, such as the biggest boat from that time, numerous spears and swords, artifacts ruined by the roots of horsetail plants, Duke Hans (1571) using the area in a water-mill project, the area as a biotope for a population of protected orchids – all this and much more. The students undertook many biological investigations using for instance methods from Learners guide 4 (Rivers). They also made both historical and biological observations while they splashed their way through the whole area.

Map showing the location of Nydam Moor.

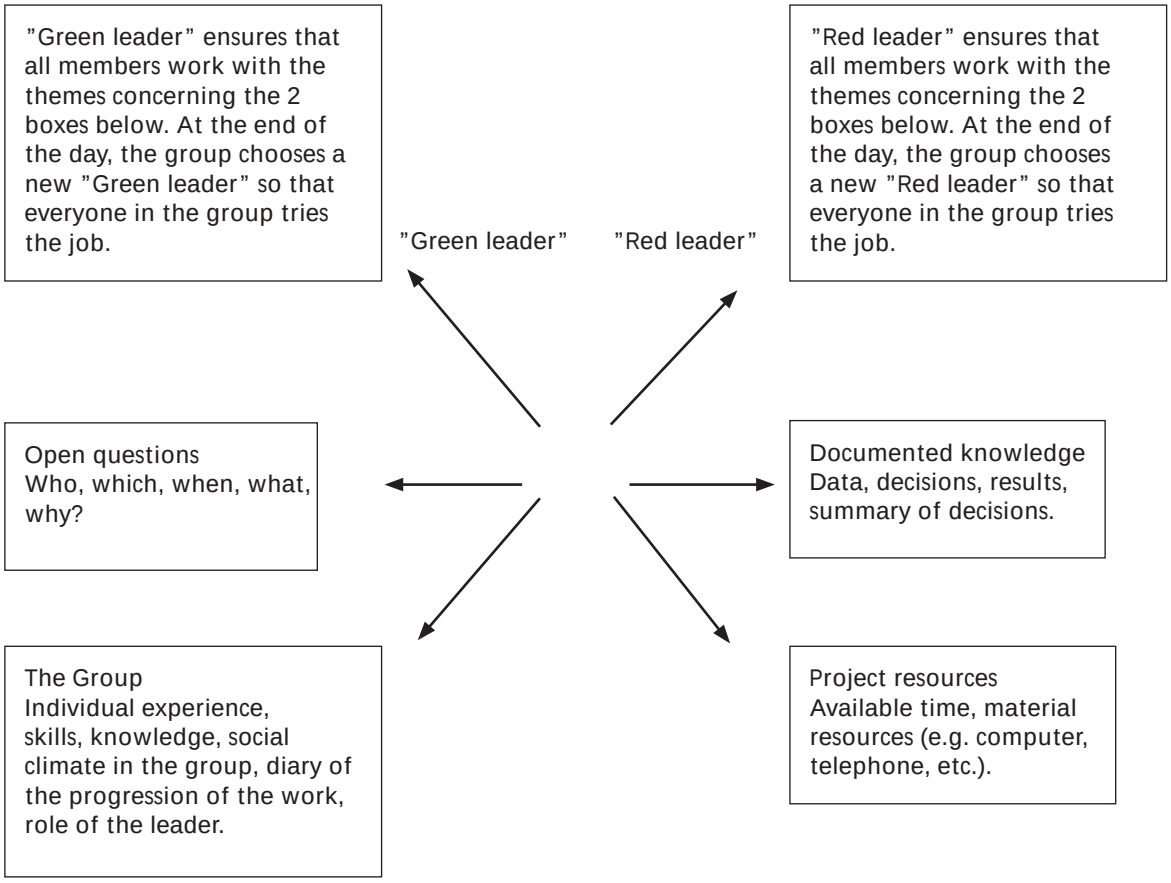
Formulating the problems

In the subsequent lessons, we wrote all the facts and information on separate small labels of paper (Post-it labels). All these labels were put on a screen, divided into groups according to common themes. These themes were given titles, which formed the basis for the students' working groups:

1. Description of society around Nydam Mose.
2. The development from lake to moor – the impact of man.
3. Conservation of the artifacts – what caused and causes their breakdown?
4. The channel and the mill. Historical needs – financial and social. Resources and energy – the impact of the channel on the area.
5. Why excavate? Financial aspects.
6. What conclusions can be drawn from the artifacts?

Working in the classroom

All teachers know about the difficulties concerning students working in groups. Some of the students are highly motivated while others are not. They lean back and let others do the hard work. Our aim during the project was to encourage everyone to be active participants and take on responsibility. We used the following working method in the group discussions in order to ensure that everyone took on this responsiblity.



Of course it is very difficult to follow it strictly, but it is a tool that can be used to try to achieve results that are both pedagogical and develop professional skills.

Steps and stones

The next step was what we called "steps and stones". The students in each group made a full range of notes on Post-it labels: everything they knew about the themes ("the stones"). They arranged the labels in relation to connections: e.g. cause and effect. Going through this process, the students made possible answers to the different connections (hypotheses), and discovered what they did not know ("the steps"). They therefore realised that they had to find new data and information. In the subsequent lessons, these details were discussed, evaluated and presented in relation to the hypotheses. The hypotheses were thus re-evaluated and new ones were formed: For example in the beginning one group working with the boat had assumed that the boat had sailed into the moor. The group found out that the boat was carried and thus had to alter the hypotheses about many elements, regarding the place in the present – past – future.

The new hypotheses were then to be confirmed or

Air-photo of Nydam moor seen from west. Als Sund in the background.

rejected by finding new data and information. The "steps" of finding new information and data took place between lessons, and the data and information were presented and discussed in the class. The students used not only libraries and the Internet, but also local contact persons, etc. This cycle occurred on several occasions until the students were satisfied and it was time to create the product.

Evaluations

Students. In addition to the other results, the main issue that all the students came to understand was the conflict: Conservation of the biotope or conservation of history? Orchids or old ships?

The student evaluation of the project Nydam was positive – maybe because we had learned a lot from earlier experiences. This time we talked about a real project where the students were involved in both decisions and implementation. The students and the teachers were able to build upon the methods, which the students had already learned in the grammar school such as asking questions about problems, mind maps etc. What was best was that the students said that they were players in a game where they had made the rules.

The students learned about the moor as both a biotope and as an historical archive. They found out that the moor was not just a grass field but consisted of an interaction between a lot of different species and historical evidence. They documented this both by working on site and in the classroom and were able to demonstrate a great awareness of learning from nature and history. Through searching for information and data, they also learned to make contacts outside the school. Because of their curiosity, they learned to formulate questions to other people and during this process they realised the conflicts. The students found it difficult to work according to the working method of red/green-leaders, because the model places great demands on the individual student's sense of responsibility and social behaviour. The students found that work concerning a specific theme with two subjects was a motivating factor, and they became very involved in the exhibition.

I hear – I forget
I see – I remember
I do – I understand

Artifacts from the moor. The shields (upper photo) partly destroyed by the Horsetail.

Teachers. As teachers, we were satisfied with the students' results, although some of the material was more historical than biological and vice versa. The students learned a lot about the methods used in the two subjects by means of a practical approach. Working in groups provided the individual student with the competence to formulate relevant questions and seek information.

The practical object of the project was the moor: looking at the moor gave the teachers of different subjects (history and biology) different associations. In discussing the educational possibilities, we had to communicate our thoughts and knowledge to each other. Accordingly we learned a lot about each other's methods and subjects. For example through discussion, we were able to agree upon a common definition of hypotheses, analysis and conclusion. We learned to cooperate not only in preparing our lessons, but also in teaching in the classroom. We also learned from each other to read a landscape which has led to many discussions of the history of our local land use.

Options to joint projects

Themes for joint projects with our colleagues in neighbouring countries could include:

The moor as a biotope and resource – past, present and future.

Water energy – past, present and future – and changes caused by nature.

Border and minority problems and solutions.

References

Nationalmuseum: *Nationalmuseets Arbejdsmark 1999*. Köpenhamn.

http://www.nydam.nu/

http://www.abc.se/~m10354/uwa/nydam-e.htm

http: //www.schloss-gottorf.de/alm/nydam.html

An Environmental Story from the Depths: The Fresh Water Pearl Mussel in Esse (Ähtävä) River

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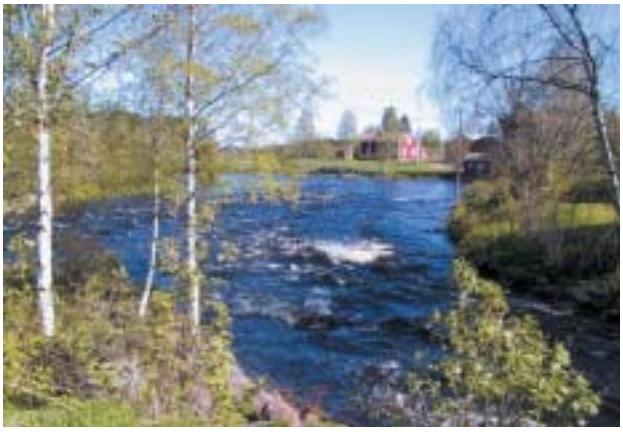
Introduction. Pedersöre gymnasium demonstrates the opportunities that arise with an interdisciplinary approach to environmental history. The question that starts their investigation is a study of the pearl mussel´s reproduction. This leads to a research project concerning the changes in land-use in the drainage area where hypotheses are tested, rejected or affirmed. In order to exert an influence on the future, the results were also made available to the general public in the form of articles in newspapers and journals. A comparative perspective and networking with other schools also makes it possible for the students to draw more advanced conclusions from their own area. A further development of the work might take the form of a historical investigation of drainage in the forest area related to the technological, economical and ideological changes in Finnish forestry.

A watercourse means a lot for people living in its surroundings. To know more about it is a natural desire. The Esse river has been an object of investigations at Pedersöre Upper Secondary School for several years. During the past three years, the investigations have been focused on one of the most exciting animals in the river, the *fresh water pearl mussel*.

The pearl mussel is an interesting animal in many respects. For instance it is able to form pearls. The formation of a valuable pearl, as large as a pea, is a slow process that lasts at least 20 years. It is estimated that only one in 10.000 mussels contains such a pearl. The capacity to produce pearls was once a serious threat to the pearl mussel. Furthermore it is also the longest living invertebrate in the world. It is not unusual to find mussels that are 150 years old.



Formerly more than 1 million pearl mussels lived in Esse river. In some places, the size of the population exceeded 100 mussels per m^2. Today there are approximately 50.000 mussels in the river, scattered into smaller populations

The pearl mussel is a demanding organism in terms of the quality of its water environment. The water course should be preferably unaffected by pollution, have a low pH level and a bottom sediment that consists of sand, gravel and stones. If the environment is favourable, the mussel remains remarkably stationary during its whole life and has the capacity to reproduce.

During the past three years, around 15 pupils at Pedersöre Upper Secondary School have worked on various mussel projects. The work has usually been carried out in teams of two pupils and has involved many contacts outside school. We have also had a highly productive exchange with Broman Upper Secondary School in Hudiksvall, Sweden, where about 20 pupils have been engaged in pearl mussel projects. On one occasion, 40 pupils from many EU countries studied mussels in Hudiksvall. On another occasion, a similar study was carried out by 20 pupils from Italy. Three pupils from Spanish schools have also visited Broman participating in the investigations as a 3 month summer job.

A few hundred years ago pearl mussels could be found throughout almost the entire Baltic Sea drainage area. In Finland, for example, mussels existed in more than 200 known watercourses over the whole country. The mussel was extremely common in rivers that had favourable conditions prior to human intervention.

Today the pearl mussel is threatened, vulnerable and in many areas, extinct. The populations in the main rivers have suffered greatly. The pearl mussel populations that remain are old and small, frequently lacking any reproductive capacity. It is apparently only a question of time before these mussels will also become extinct. Since every watercourse has its own genome, the environment becomes poorer when the mussels die out.

The deterioration in the living conditions for the pearl mussel is principally attributable to *human activity*. In fact few living organisms have suffered as much at the hands of man as the pearl mussel.

The reproduction is very complicated and has several vulnerable points. This is naturally of profound importance when it comes to the survival of the species.

The pearl mussel is mostly dioecus at high population densities, which means that there are both males and females. At low population densities, when the opportunity for cross fertilization is low, the mussels (probable only females) become hermaphrodites whereby self fertilization occurs by means of some hitherto unexplained mechanism.

Map showing rough distribution of the fresh water pearl mussel today. It is the remains of a species which had at one time very common in the Baltic Sea drainage area. (basic map from Helcom).

1. Males discharge sperms into the water. Sperms enter the female through the breathing water which results in fertilization.
2. The eggs develop to a *glochidian* larval stage. In September-October the glochidias are shed into the water. During this period the mussel is sensitive to even a slight eutrophication. One female can produce up to 3–4 million glochidian larvae/year. If the mussel is subject to stress, for example when the temperature exceeds +18°C, the larvae are discharged too early and die as a consequence.
3. The glochidian larvae use their hooks to attach themselves to trout gills where they live as parasites absorbing nutrients from the fish. The glochidian stage serves to disperse the young clams over a wide

area. New places may be colonised downstream by glochidian larvae. Upstream however host fish that carry glochidias are essential.

4. In the spring, the glochidias have developed into small mussels, which release themselves from the trout and sink to the bottom of the river. They live down in the gravel for some years before they stick up their anterior end.
5. The pearl mussel matures when it is 15–20 years old. It maintains the ability to reproduce during its entire life span, although its reproduction capacity is reduced at high age levels.

The reproduction of the pearl mussel.

The pupils noticed that there are many different species of large mussels. This has caused difficulties when interviewing people. *Anodonta* and *Unio* species were frequently mistaken for pearl mussels. As a matter of fact the large mussels are not easy to identify.

Normally the pearl mussel has a thick, dark shell in the shape of a kidney. One means of identifying the mussels is to check the *hing teeth* inside the shell. The pearl mussel has one big tooth in the right and two small in the left shell. The *Unio* species has also teeth but all the *Anodonta* mussels lack this characteristic feature. In particular, *Unio crassus* can easily be confused with the pearl mussel if only the exterior is taken into account.

From above: Margaritifera (pearl mussel), Anodonta and Unio.

Many questions arose concerning the pearl mussel in Esse river, both before and during the project work

- What is the state of the mussel today?
- Why has the pearl mussel diminished so dramatically?
- How old are the mussels in the Esse river?
- Is it able to reproduce?
- What is known about the mussel´s history?
- What are the current threats to the mussel?
- What is required for its survival?
- Why should the mussel be protected and what should be done in order to preserve it?

The relationship between man and the Esse river has been the subject of a number of projects, both past and present. One project provided an overall historical view of the relationship between a certain village

Keep the mussel as Maarit does when checking right and left shell.

and the river. Other projects have dealt with fishing, water regulation, timber transport, river engineering etc. during different periods. Although these have been carried out as separate projects, their activities are all in some way connected to the pearl mussel.

One part of a project examined how the press, mainly local papers, treated the pearl mussel in Esse river, particularly after the protection in 1955. An interesting result was that most articles were apparently published after 1978, in total 42 articles. This result also required an answer.

Some pupils have been working on the water quality. They have collected data from earlier investigations (pH values, phosphorous, nitrogen, heavy metals) and compared the data with their own water analyses. Heavy metal analyses were carried out on the moss *Fontinalis antipyrethica*.

Inventory of pearl mussel populations can be performed by water glasses. This was the main method used at the Broman upper secondary school. The inventory of the deeper Esse river was carried out by divers from the Regional Environmental Centre. Here it has been essential to record the length of the mussels. The occurrence of small (young) mussels provides a clear indication that there is reproduction in the river.

The bottoms of the water courses where pearl mussels live should consist of gravel. The current silting of these bottoms, especially in the larger rivers, creates an environment that is highly unfavourable, particularly for the young mussels. The Broman school has studied the composition of the sediment on the bottoms of the water courses in order to find out whether it was important for reproduction. Using

Newspaper articles.

Pupils from Hudiksvall and Pedersöre working together equipped with waterglasses and waders investigating the stream Navarån, Sweden. There are about 200.000 pearl mussels in the brook.

a freezing method, they compared three streams, in one of which there was no reproduction. It was concluded that the silt might influence reproduction. This method is excellent for small streams. However it was not possible to use it in the deeper Esse river where a different method had to be used. Here the relationship between organic and inorganic material was investigated in order to ascertain the origin of the silt material. Ditches have been shown to be the "bad guy". It is quite clear that reproduction is impossible in this environment.

Electro-fishing shows the presence or lack of the host fish, the brown trout. If the electro-fishing is carried out during the autumn, it is also possible to check whether there are glochidia larvae on the gills of the trout

In the Esse river, the ability of different populations to produce glochidias has been tested by putting out cages containing young brown trout (< 1 year) downstream of the populations. This showed that certain populations can produce a small amount of larvae,

Selina and Helena prepare a cage for testing the pearl mussel´s ability to produce glochidian larvae.

while others cannot. It is an important finding in the analysis of the pearl mussel´s inability to reproduce.

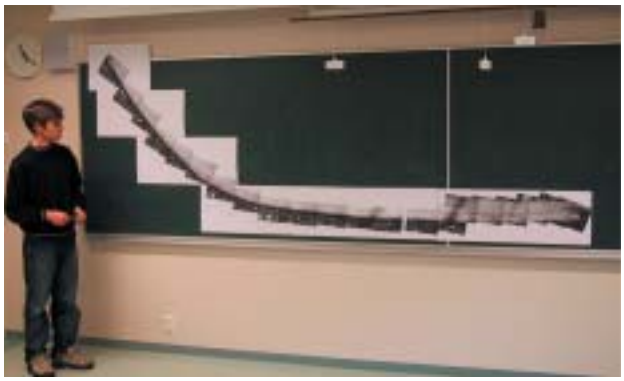
Determination of the age of the mussel: An earlier estimate indicated that the mussels in the Esse river were about 50 years old. However this estimate has not been properly tested. A study of 15 mussels at the Swedish Museum of Natural History in Stockholm showed that the mussels in the Esse river were over 100 years old. Indeed some of them were more than 170 years old. If the youngest mussel was over 100 years old, it may be concluded that no successful reproduction has taken place in 100 years. This finding was exciting and of course alarming. It was extremely important in relation to studies of the preservation of the mussel.

Mussel shells can be used as environmental monitors

It is most interesting that the shell can be read as an environmental history book. It is possible to investigate the age structure of the population by analysing information from the different year rings in relation to:

a. food availability
b. temperature
c. eutrophication

Mussels also store heavy metals and toxins in their shells. Once these elements have been incorporated into the shell, they are essentially immobile. This offers interesting opportunities to obtain information regarding previous levels of toxins and heavy metals. These analyses can only be performed in laboratories that have advanced equipment.



Jens in front of a cross-section of a whole mounted mussel shell photographed through a microscope and processed in a computer.

Mussel and pearl.

Our results

As a result of our studies, we found the following threats to the pearl mussel in both the past and present:

Pearl fishing: In order to map out the extent to which there has been pearl fishing in the Esse river, documents were studied at the Provincial Archives of Vaasa. Elderly people were also interviewed about mussel fishing. The conclusion was that no extensive fishing has been carried out in the Esse river.

In the literature, it is mentioned that fishermen could kill as many as 1.000 mussels a day in some watercourses when they were looking for pearls. However pearl fishing on its own did not exterminate the pearl mussel, since fishermen took only adults. If the environment had been satisfactory, the population would have recovered gradually.

Today the pearl mussel is protected in the EU. In Finland there has been full legal protection since 1955. The financial penalty is currently almost 600 euro per mussel. Not even a shell is allowed to be taken.

Dredging and artificial regulation: Dredging and the regulation of timber transport and hydraulic engineering in the Esse river has brought about major habitat changes. However it should also be borne in mind that hydraulic engineering has been important for the

Kattilakoski powerstation, one of seven plants on the Esse river.

Abundant vegetation is an indication of eutrofication.

industrialization of the area. The first power station in the Esse river, Björkfors, was built in 1931. As far as we know, dredging in the Esse river was carried out for the first time in the eighteenth century. Extensive dredging was carried out between 1904–1908. It was followed by many other similar measures.

The drainage of peatlands and wetforests: The drainage of peatlands and wetland forests has probably been the principal environmental threat to the Esse river during the last few decades. The water from the ditches flushes silt and plant detritus into the river and disrupts the river hydrology. There is also a chemical input from for example heavy metals and pH lowering substrates.

Absence of host fish. The successful reproduction of the pearl mussel needs a sufficiently large population of host fish. The Regional Environmental Centre has planted brown trout in the Esse river.

*Eutrophication.*There is an inverse proportionality between eutrophication and mussel growth. The glochidian larvae are especially sensitive to eutrophication. Previous studies have been examined and new analyses have been carried out. Agriculture and forestry are the main sources of phosphorus and nitrogen which cause eutrophication . The reduction of the outflow of silt from the ditches would be a most important measure. Organic agriculture as a method of cultivation would reduce the leakage of nitrogen

This ditch transports great amounts of material to the river. To reduce the load a system for sedimentation and for filtering before the water reaches the river would be absolutely necessary.

The vegetation at the shore edge absorbs nitrogen and phosphorous, preventing nutrients reaching the watercourse.

Shore without vegetation, a situation that should be avoided.

and phosphorous, as would protection zones of vegetation along the shores. Trees along the shore would also modify the light conditions and provide beneficial shade for the pearl mussels.

There are also many indirect consequences of eutrophication, for example, silting of the river beds.

Acidification. Mussels cannot exist in acid environments. In the Esse river, there is acidification especially in the areas closest to the estuary. This is mainly due to the digging of ditches, which lowers the subsoil water and thereby uncovers sulphur rich layers. The sulphur is then oxidized and becomes soluble. Furthermore heavy metals (for example iron, cadmium and aluminium) are dissolved into the water due to the low pH.

Heavy metals. We know that the freshwater pearl mussel is sensitive to heavy metals but we do not know how they are actually affected. Further study is required to illuminate these problems.

The intrusion of iron hardens a gravel riverbed making it impossible for small mussels to breed. Our investigations were carried out in cooperation with the Regional Environmental Centre and its laboratory.

Industrial pollution. There are few industries close to the river Esse. Nevertheless some of them do pose problems.

Predation on freshwater pearl mussels. There have been some discussions regarding the predation on pearl mussels. Muskrat (*Ondatra zibethica*) is obviously not important. It probably prefers clams like *Anodonta* because of their thinner shells. This might also be the case for the otter (*Lutra lutra*).

The project work has evidently increased the pupils' interest for biology and environmental issues. The pupils were often highly motivated, since they knew they were carrying out real investigations, which were considered important. Sometimes the data was fairly new and of general interest, which resulted in media reports.

The projects have given the pupils knowledge of scientific research and reports. This is largely due to contacts with scientific institutions and scientists. These contacts have been very valuable and much appreciated.

Considering the continuing rapid extermination of various species today, a serious issue raised by the projects was the pearl mussel's part in biodiversity. Does the pearl mussel have the right to exist as a species? Are we obliged to preserve the pearl mussel as part of our bio-diverse natural heritage?

We have assembled a large amount of reliable data regarding the status of the pearl mussel in the past.

Some of the pupils from the Pedersöre and Broman upper secondary schools pearl mussels reports.

We understand the threats to the pearl mussel perfectly well today. Are we interested in drawing the right conclusions and in taking the right measures? What is the importance of financial issues?

From a teacher's point of view, this kind of project work is highly stimulating.

Science is exciting! But how do we show this to our pupils? Investigative learning is definitely one method that could be used.

It is important to promote awareness regarding the threats to the pearl mussel. This knowledge is important when it comes to the preservation of the mussel. Pupils in Pedersöre and Broman Upper Secondary schools have actively contributed in many ways to this information, for example by writing articles. They have been interviewed by many journalists for papers, radio and television. Posters have been a channel of information to other pupils in schools.

By participating successfully in scientific competitions, they have received positive attention from the media.

In order to save the pearl mussel, an overall vision of the landscape ecology is necessary, since the entire drainage area influences the watercourse. Of course, the whole water ecosystem benefits when the environment for the mussel is improved. Unfortunately, despite all of the measures, it would appear that it is very hard, perhaps impossible, to save many pearl mussel populations, especially in the large rivers. The creation of a conservation programme (gene bank) for a specific watercourse might make it possible to save these genes. For a number of reasons however, the

Impressed pupils from Pedersöre and Broman gymnasium discussing with a landowner who takes responsibility for pearl mussles.

transfer of mussels from one watercourse to another has often turned out to be unsuccessful.

Preserving the freshwater pearl mussel is a matter of values. It is essential that we contribute to the survival of the mussel by creating good environmental conditions.

We would like to express our gratitude to persons and institutions for positive collaboration a.o:

West Finland Regional Environmental Centre
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Helsinki University National Museum of Natural History, Finland
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Göteborg University, Sweden
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WWF
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History and Environment along Motala Ström

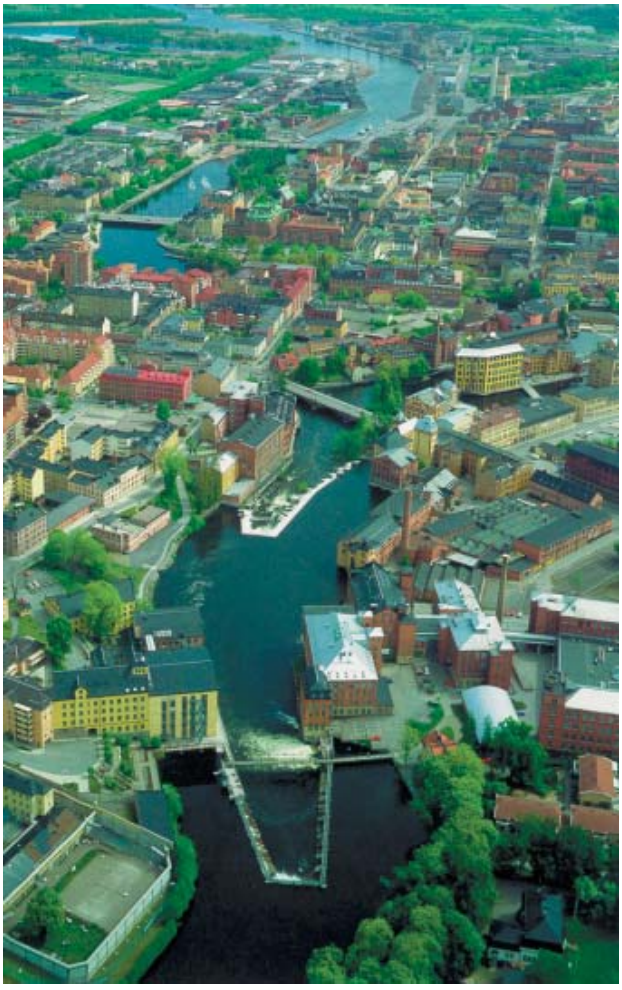
Anders Bergstrand, Peter Harrison, Gudrun Liljas, Hagagymnasiet, Nyköping Sweden

Introduction. The teachers and students of Hagagymnasiet in Norrköping, Sweden, started from questions about the new city centre established on the old industrial sites near the river. New uses of old industrial buildings is a question concerning both the city environment and the cultural heritage in many European cities today. There was no conflict about this development in Norrköping at that time. It provided a type of solution to previous environmental problems with major industries, such as paper mills and the heavy transport of goods into the city centre. Looking particularly at working conditions in the old industries, the students could understand the hardships suffered by poor people in the past and also in many parts of the world today. Their study was chronological and they presented their results in an exhibition outside school. It is more uncertain how their action competence for the future was affected but their studies allowed them to acquire methodological skills.

The Industrial Landscape of Norrköping

Norrköping once was one of Sweden's most industrialised cities. The water power extracted from Motala Ström was essential for the creation of paper mills, metal manufacturing, tobacco industries, shipyards, sugar mills and above all textile industries. During the 19th century, Norrköping expanded enormously as an industrial centre. The local textile industry accounted for more than 70% of Sweden's entire production. As a result of this concentration of industry and its position as an important port, Norrköping was for a long time ranked as the second major industrial centre in Sweden.

In the mid-20th century, Norrköping became deeply affected by the crisis that struck the Swedish textile industry. This crisis led to the closure of many factories. The question was now: What should be done with the old factory buildings that had been left idle and empty? The local authorities together with builders and contractors planned wisely and found new ways to use the old buildings. The results can now be seen in the so called *Industrial Landscape* whose unique characteristics are something for which the town may be justifiably proud. The exteriors of the old factories are intact, but inside they have taken on new and exciting functions. This part of the town,



The industrial landscape of 1940 and of 2000.

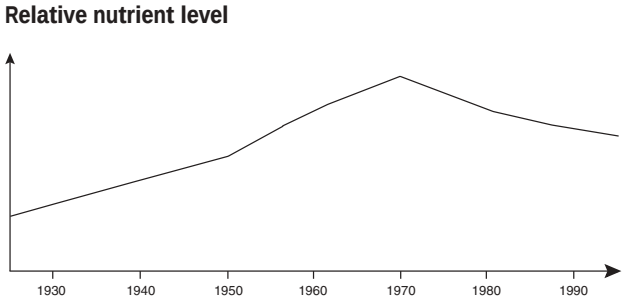
which for some decades after the closing down of the factories was a dirty, desolate and ugly area, is now a dynamic and beautiful urban centre characterised by scientific, cultural and educational activities.

The industrial landscape of 1940 and of 2000

This area of our town with its long and changing history was what we and our students wanted to discover. The students were all born during the period when the new Norrköping saw the light of day and we wanted to make them aware of the times when our town had quite different characteristics. In seven groups they investigated how the technological and industrial changes in our area had affected the environment around Motala Ström in our town.

Industry, water power and water quality in our city

One group worked with the history of the industries and another with the use of water power. A third group investigated the water quality. This group



Comparative levels of nutrients in Motala river.

soon pointed out that eutrophication was the most important problem. They interviewed several people including teachers and students at the environmental department of Linköping University. Their historical study led them to this interesting picture of the level of nutrients over the years (above).
The decrease in nutrients after the mid-seventies was explained by the decline in the textile industry, better purification of the process water from the paper industry and the extension of the purifying plant.

One of the students made a video-film of the plankton life of the stream, taking pictures through a microscope. They also took water samples and analysed for example levels of phosphorus and nitrogen.

Fish and fishing in Motala river

What kinds of fish are there in the Motala river and at the outlet into the bay of Bråviken?

The students got in touch with the local limnologist and borrowed fish nets. They found not only differences in species but also in numbers when they compared the river and the outlet. Downstream we caught pike, perch, roach, pikeperch, bleak, Baltic herring and smelt. Upstream we got pike, perch and roach, and the total catch was only 1/10 of that downstream (counted in kilograms).

The model.

Construction of a model.

Paper production in the centre of Norrköping (1950).

Some fish were kept in an aquarium for the exhibition. Historical data showed that salmon was the most important fish species. “Not salmon more than four days a week” is a common expression from the 16th century. Today the salmon can’t go upstream because of the power plant. This raised a new question: what can be done to get the salmon back?

Paper industry

Some students investigated the environmental impact of the paper industry. They found most of their material while visiting Braviken´s paper mill, a modern and environmentally conscious plant situated 10 km from the centre of Norrköping. They also found historical continuity in paper production since the company has been producing paper in Norrköping for several hundreds of years. When Holmen paper started its production in the 1630’s, there were about ten employees and they produced approximately 500–1 000 kilograms of paper. In 1837 the first paper machine was introduced and production reached a couple of tons. By now there were 60 employees. 1976 was the last year with full production in the old Holmen paper mill situated in the middle of the town (see picture). There were over 1000 employees producing 141 000 tons of paper. The dense traffic of lorries going to and from the factory made it necessary to move the paper mill out of the town. Now, in 2003, production has reached 702 000 tons and there are 825 employees in the new factory Braviken. However, they still use the fresh water and the water power from Motala ström.

Another splendid source of knowledge was discovered at the Paper Museum. Here they learned about working conditions and manufacturing techniques by interviewing retired paper industry workers. The students were also shown how to produce quality paper and envelopes by hand.

Textile industry along Motala River

The students investigating the textile industry found to their astonishment that Norrköping was once called *Sweden’s Manchester* because of its importance in textile production. Over a long period, Norrköping was by far the most important textile centre

The old papermill. Now a concert hall (2003).

in Sweden, in terms of both cotton and wool. In the middle of the 19th century there were 122 clothing factories in Norrköping! An exciting thing was to find that some innovative and far-sighted factory owners were the industrial spies of their time, when they went to England to get ideas from the successful factories there. Such a visit was the explanation for the first spinning machine in Sweden being found in Norrköping!

This group also found interesting information about how the political situation in the world had an impact on the textile industry in Norrköping. The cotton industry for example had severe problems during the American Civil War. However, it recovered and flourished until the mid 20th century when imported clothes became so cheap that the factories in Norrköping, that made clothes from cotton, couldn't survive – the last one had to close down in the 70's.

There were many different sources of information for this group. Except for "ordinary" books they had access to an archive of pictures at the City Library, and at the City Museum "Lasse Vävare" (Lasse "the Weaver") showed them the old weaving-, carding- and spinning machines. They said that this made them really aware of how noisy, almost deafening, it must have been to work in this environment. They also undertook a study visit to Strömma Sweden AB.

The environment for the factory workers

To obtain useful information for this theme the students visited the City Library and, of course, the school library, where they soon found out that there were special departments for the local history of Norrköping. In different archives they found doctors' reports, lists of salaries, statistics on deaths caused by different diseases and reports from trade unions. They also invited a retired man to the school who had been working at one of Norrköping's largest and most important textile industries when it closed down in the early 70's. For the exhibition, they spent a lot of time on building a model of a typical house, in the first part of the 20th century , consisting of tiny flats for factory workers' families.

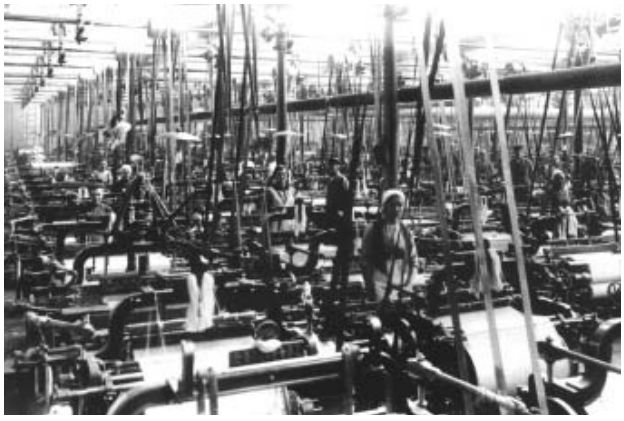
The most important findings that this group made were:

The environmental problems at the factories e.g. noise, heat, dust, bad hygienic conditions and dirt.

Owing to these problems the workers suffered from different (sometimes lethal) diseases. Doctors' reports provided statistical information on the diseases that were the most common among the workers, e.g. persistent coughing, bronchitis, different lung diseases, consumption and tuberculosis (the last mentioned disease was according to the statistics the most common cause of death for factory workers between the years 1881 and 1885!)

The lack of safety regulations in the factories made the work highly dangerous. Many accidents occurred. The students found reports on workers' hands getting stuck in machines, workers being blinded by parts coming loose from machines etc. This led them to research into the introduction of safety legislation and regulations governing safety devices etc.

Children and women in hard work. It was in no way exceptional that children and women worked in factories. Women were over-represented, particularly in the textile industry. In 1873 there were 300 women out of a total of 380 workers at Norrköping's Cotton Weaving Mill! They worked from 6.00 a.m. until 7.00 p.m. with one hour's break. According to the available statistics, 20 % of the factory workers were children in the mid 19th century.



Housing-overcrowding. For our students, today's teenagers, it is quite natural to have a room of their own at home.Therefore it was appalling for them to learn that at the end of the nineteenth century, a whole family had to make do with at best, a kitchen and a small room. What the students also learnt was that a family at that time could consist of ten or more persons! Quite often they let the room they had to somebody else to get some extra money and had only the kitchen to themselves. There are reports stating that in certain families the beds were used constantly, because the family members worked and slept in shifts!

In old Norrköping there were many areas of working class housing. They existed until the 1970's when they were demolished as part of a large scale urban renovation programme. Nowadays there are certain regrets that Norrköping didn't keep any of these houses as a reminder of old times. However, there are also those who think they were nothing to save.

Comparative figures	the 1890's	the 1990's
Working hours per week:	68 hours	40 hours
Wages per hour (within the textile industry)	0,198 kr	67,43 kr
The cost of 1 kilo wheat flour	0,28 kr	5,10 kr
– equivalent to working hours	1,4 hours	4,5 min
The cost of 1 kilo butter	1,10 kr	40,40 kr
– equivalent to working hours	5,5 hours	36 min
The cost of 1 kilo potatoes	0,05 kr	8,30 kr
– equivalent to working hours	15 min	7 min

The final result

As the final result of the project there was an exhibition at the City Museum. The opening attracted attention from the two newspapers in Norrköping as well as from the local radio station.

Having passed the entrance under the grand *Holmen Tower*, made by one of the groups from cardboard and painted in the real colours, the visitors entered the exhibition. The students' work, both texts and illustrated material, was presented on seven notice

boards. There were also different objects on display. A model of the industrial landscape with running water, the Motala river, was one of the main attractions. The public appreciated the aquarium with fish caught by the students, fishing tools, paper handmade by the students, a video-film with plankton from the river and a model of a typical house for a factory worker.

The grand opening of the exhibition.

The students' evaluation

- Working with a project is more fun than ordinary lessons.
- Project work is more demanding than ordinary lessons.
- You learn more through project work than through ordinary lessons.
- My part in the job is less visible in project work.
- I work better when my group (not the teacher) decides the organisation of the work.
- My ideas have been important in the project.
- I would like to work more with projects involving many subjects.
- The teacher/s for my group has/have supported us without interfering too much.
- The amount of time given to us for this project was sufficient.
- I have accepted my part of the responsibility for bringing through our tasks.
- I am satisfied with the final result of the exhibition.

The teachers' evaluation

We found that working with this project gave the following benefits:
Many school subjects could cooperate over a longer period.

The school work became more meaningful for the students.

It gave an insight into the world outside school

Through the new discoveries made by the students, they felt a pride in their own city

The students gained good experience in taking contact with people and organisations outside school i.e. social competence.

The exhibition was a visible result that could be shown to people outside school

They had to cooperate with each other to make things work

They discovered new, previously unknown, skills in others.

An extra ”bonus” became obvious later on when we had an exchange with a school in Estonia. At a BSP-meeting in Norrköping we were lucky to meet other teachers who were working with similar projects. We decided to arrange an exchange for a group of Estonian and Swedish students who had been part of an environmental project. The groups met in Norrköping and in Kohtla-Järve where they studied the results of their projects.

The view of nature changes as society changes. On this Polish 1000 zloty bill from 1946, we can see thirteen smoking chimneys. At that time, smoking chimneys were a sign of prosperity and wealth. Today it has other connotations.

Upstream and Downstream the Okhta River in S:t Petersburg – the Start of an Environmental History Investigation

Anna Obukhovskaya, Lyceum 179, St Petersburg, Russia
Research made by Helen Artemova Maria Goncharuk, Nariner Gevorgyan

Introduction. The students of Lyceum 179 in S:t Petersburg started out from a current environmental issue: What is the reason for the pollution in the lower part of their river Okhta? After an investigation of the water quality, they found that pollution was much higher downstream in an old industrial area. Therefore they started to investigate the history of this area. This is a work in progress and the result of their investigation are thereby tentative.

The Okhta river – a polluted river

The Okhta river is one of the main tributaries of the Neva river. That is why the history of S:t Petersburg has always been closely connected to the history of the Okhta banks. Nowadays numerous factories are situated along the banks of the Okhta. We started to examine the quality of the water in the Okhta river and the smaller Okkervil river in June 2000, using water samples for biotesting with algaes, plants and molluscs. The algae was *Daphnia magna* which is easily cultivated and highly sensitive to polluting factors of different origins. The results of our investigation were very clear. The

Bolheohtinsky bridge.

The factory on the bank of the River Okhta.

toxicological data showed us that the river is heavily polluted. In the lower parts of the river, the results from the biotests and bioindications showed a high degree of toxic substances. The samples taken upstream, in the upper part of the river Okhta, contained many more living algaes than in the samples taken downstream of the factories. Our conclusions were that the waters of both the Okhta and Okkervil rivers are highly polluted by organic and toxic elements. The factories along the river banks contribute to this pollution. However the banks of the river Okhta have a long industrial history so we started our research with this.

Foundation of S:t Peterburg

In the 17th century, the Swedish fortress and city of Nyenskans was situated on the south side of the river Okhta along with its brick works. The Okhta river was then called Svartå – the Black river. During the Nordic war at the beginning of the 18th century, the fortress was besieged and captured by Tsar Peter I. The city of S:t Petersburg was subsequently founded on the other side of the Neva river in 1703 and Nyenskans became a garden planted with trees. However the Okhta river became a centre for the Russian navy. Lumber-mills, shipyards and factories were built. The Okhta area became one of the first industrialised zones in S:t Petersburg.

Gunpowder mill and chemicals

One of the oldest factories was the gunpowder mill - Porokhoviye. Production was constantly threatened by frequent explosions and spring floods that destroyed the dams of the mill. Nevertheless gunpowder production continued and by the end of the 19th century, it had become one of the largest factories in S:t Petersburg. In 1894 the factory started to produce smokeless gunpowder and work was hard and dangerous. The heaviest explosions occurred one after another over a very short period between December 17th 1912 and January 3rd 1913. At the beginning of the Soviet era, production was changed and the factory was converted into a chemical plant, producing celluloid and bakelite for the electrical industry. In the 1930s, synthetic materials and plastics were produced. Today the factory is called Plaspolimer.

Shipyards and factories

Among other important industrial plants were the shipyards founded in 1721 for the Russian navy. They were developed into mechanical workshops in the late 1800s, producing small motor-boats and tug-boats. It was here that the first tug-boat in Soviet times was built in the 1930s. Today it is named Petrozavod and builds ships and makes equipment and machinery for ships.

The Komarovs cotton plant, paper mills and a factory manufacturing cheap roof-covering materials were also located here.

We found that industrialisation along the Okhta river had a long history. We will now proceed with our investigation and examine the production of the industries and factories that have been built during the last decades. It is possible that we will be able to find out the reasons for the concentration of pollution in the downstream areas of the industrialised zone.

The Maloohtensky Bridge over the River Okhta.

The beautiful Ilya Prophet church is situated on the bank of river Okhta.

Water Issues, Land Use and the Environment in Stockholm in a Historical Perspective

Anders Jonsson and John Toler, Kungsholmen's gymnasium, Sweden

Introduction. The teachers and students in Kungsholmens gymnasium, Stockholm, have carried out a professional historical investigation about the water issues in the 19th century in their neighbourhood. These questions are exceedingly relevant in Third World countries today and it is easy to see that the same problems with sanitation and water-borne diseases were common in Europe a hundred years ago. The same conflict arose in relation to water. Once again it was the poorest people who suffered most from a shortage of clean water. The students could see, at the level of the neighbourhood block, that there was a correlation between the delayed construction of a sanitation system, deaths from water-borne diseases and the social and economic status of the area. Poor people in hilly areas without access to clean water had a much higher mortality rate from water-borne diseases. This detailed analysis has never been carried out before, not even by professional historians.

Environmental History at Kungsholmen

The Environmental History Project at Kungsholmens gymnasium in Stockholm, 1999–2001, focused on environmental problems that have emerged over the past 150 years in Stockholm, with a special focus on our immediate environment in the inner city district of Kungsholmen, in connection with water issues, water quality, land use and the installation of water pipe-lines, drainage pipes and sewage systems. This project took its point of departure in questions that students considered to be important and attempted to form research questions out of active contact with research in a particular field or expert knowledge of specific areas concerning environmental studies. We strove to see the importance of water and land use for environmental problems in the past.

As one of the aims set by The Swedish Council for Planning and Coordination of Research (*Forskningsrådsnämnden*), the sponsor of this project, was to

spread knowledge of environmental history beyond the walls of the school, we would like to bring to your attention the results of the research work carried out by students on the Environmental Studies course at Kungsholmens gymnasium. In this account the following three aspects will be addressed:

1. What did the students find out about the relation between man and nature?
2. What happened in the minds of the students? What were their perspectives?
3. What were our experiences as teachers?

These three aspects will be addressed throughout this article, but not necessarily in this order. The aim of the project during the years 1999–2001 was to elucidate the importance of water issues for environmental thinking and action in Stockholm. We wanted to elucidate the relation between water quality and the state of health in Kungsholmen in a way that would yield new and interesting results.

We have consistently made an effort to link the questions of students to current research. This aim has been easiest to accomplish within the framework of the Environmental Studies course where students were expected to carry out a small environmental history project under the supervision of project leaders who were active in the class as teachers; one represented biology and chemistry, the other, history and philosophy.

An old house in the neighbourhood Göken, Kungsholmen at the end of the 1880s. The photo gives an idea of housing conditions in Stockholm at this time. Kungsholmen's gymnasium lies here today.

In order to understand the student learning process and the responses of teachers to these learning processes, we would like to explain how some of the questions raised in the first project year (1999–2000) provided the basis in the following project year for 1) research into an environmental issue concerning the relation between environment and health in eastern Kungsholmen at the end of the 19th century as well as 2) a continued interaction between students, project leaders, experts, archivists and the source material that ultimately led to a discovery of new knowledge.

Water Quality, water-borne diseases and mortality

The research work of one group of students focused on the relation between water quality, water-borne diseases and mortality in eastern Kungsholmen 1864–1885. The long process which extended from the ideas of students to finished product covered a period of two years. We combined the study of this seemingly simple relationship in our immediate environment in Kungsholmen (one of the islets in the inner parts of Stockholm) with the use of new technology, so that students could work with digitalised source material and produce their results in digitalised form, e.g. in charts and on maps. Our results show that mortality was highest in those parts of Kungsholmen where the inhabitants did not have water contracts with the city. These were often the poorest areas, located on hills where water was least accessible.

Research process: Problems, source criticism, research contacts and questions

The problems that arose during the first year's investigations in this area became the focus of a more concerted effort during the second one. In the first year (1999–2000), the sources used to elucidate the relation between water quality, the spread of diseases, and cause of death consisted mostly of aggregated health statistics. A lot of time was devoted to analyzing quantitative accounts of the causes of deaths in the public health statistics for the city of Stockholm. Time is an important factor in all research, in particular at the secondary-school level. The time and experience required to analyze this kind of source material was too much for students at this level; hence the importance of experts who could guide us to the right sources. In our investigation, we received invaluable help from Bo Burström, medical historian in the Department of Public Health Sciences at Karolinska Institutet in Stockholm. He informed us and the pupils about what was worth looking at when analyzing the relationship between water-borne diseases and causes of death. Through e-mail contact, we were able to receive good advice.

During the second year (2000–2001), the following questions were deemed important. What do water-borne diseases tell us about environmental conditions in eastern Kungsholmen at the end of the 19th century? To what extent did people die as a result of water-borne diseases? Is there a connection between certain causes of death and water quality? Can this connection be seen by comparing causes of death and access to good water in every city block? In what kind of environment did water-borne diseases occur in Kungsholmen at the end of the 19th century? To answer these questions a proper analysis of the sources was required.

"Second round": Making proper research preparations

The experience gained from the first project year encouraged us to carry out proper preparations for research during the second year. In order to solve an interesting research question, the right kind of source material is needed and the investigations must be planned in a way which will yield interesting and reliable results. These preconditions for successful research meant that the pupils had more limited opportunities to influence the direction of the research process. From a pedagogical view we had to abandon one of our original and most cherished aims, namely to let the pupils' questions guide research. Those pupils who could think of working with these

questions would quite simply have to become a part of an ongoing research process that linked questions raised by some of the pupils in the previous year to a deeper study of them during the following one.

During the autumn term 2000, some important preparations were made. As in-service training, one of the project leaders spent three days at the city archives (Historiska databasen, Stockholms stadsarkiv) in order to become acquainted with the population register known as the Roteman's archive. He was there at a time when the archivists were in the process of digitalising data from the Roteman's archive for rotes 4 and 17 in eastern Kungsholmen – in preparation for the production of a CD-ROM on the history of Kungsholmen to be released in the near future – it is now decided that it will be released in 2005. From the city archives, he received in digitalised form (Excel files) some of the material from the Roteman's archive and death certificates for some of the areas in Kungsholmen. We assumed at the outset that there was a connection between a declining death curve and the introduction of a water-main system in Kungsholmen in the 1870s. In order to test this assumption, the source material had to be shown to be reliable as well as the data in the water debit ledgers from this period. A brief review of the ledgers from the City water works for the period 1873–1900 made it clear that although many firms and institutions paid for water services, not everyone who lived in Kungsholmen had a water contract. Other relevant source material was acquired for analysis. In the public health records, (Hälsovårdsnämndens arkiv) there are death certificates for the parish of Ulrika Eleonora (Kungsholmen) from 1864 onwards, the ledger for contagious diseases, and the annual reports of the Chief Physician in Stockholm. In the archive of the Chief Physician (Förste stadsläkarens arkiv), there are among other sources a comprehensive account of the cholera epidemic in 1866 and a table that shows the causes of death in Kungsholmen 1864–1869. All this material made it possible to conduct a closer investigation of the relation between the frequency of water-borne diseases in different city blocks and the introduction of and connection to the water-main system in Kungsholmen.

From the map department at the city archives, we received maps in digitalised form. We received the part of the 1885 map of Stockholm (Lundgren's map) covering eastern Kungsholmen on a CD with high resolution. Another map of the same area from the 1860s (Lundin's map), which we also received in digitalised form from the map department, proved to be very useful. From Stockholm Vatten AB (City water works), we were able to borrow a number of maps that showed how the water-mains were drawn in Kungsholmen.

Getting pupils involved: forming a research group

It was important to involve a sufficient number of pupils in this research assignment. After the project leaders had met the students who were going to study Environmental Studies in January 2001 and informed them about the course and the aim of the project, we made an effort to attract a number of pupils to work on this study. On one occasion, papers from the previous year – that had been put out on the school's home page – and the digitalised map of Stockholm for the year 1885 were shown to the pupils. According to an agreement we had with the history teachers, any student who could demonstrate skills in history through being able to conduct environmental history investigations in Environmental Studies would be given a credit for skills development in the History course. In this way, the pupils were able to use between 20 and 30 hours to work on the project.

A research group was formed when one student showed a direct interest in working with digitalised maps and a few other students expressed a desire to work with health questions, the role of physicians and hygienism as a movement. Some of these pupils were also willing to analyze the death certificates. Another student showed an interest in trying to account for the installation of the water-main system in Stockholm. In this way, a group of five students was formed.

A photo of 'The Dump', at the end of the century, which provided material for filling up the water line that runs down to 'Norr Mälarstrand' on Kungsholmen.

The research process:

The role of the project leaders – The main task of the project leaders was to provide a structure to the research process so that the pupils were able to address the research questions in a scientific manner. We departed from a method that consists of four steps: Step 1: Description of the phenomenon, 2: Search for possible causes, 3: Formation of hypotheses, 4: Preliminary results.

The analysis began by seeking answers to some basic research questions. In taking the first step – describing the phenomenon – we made an effort to be as concrete as possible. What did Kungsholmen look like at the end of the 19th Century? Was there a water-main system in Kungsholmen? When was it installed? With the help of digitalised maps, we were able to get a fairly good picture of what this part of the city looked like at the end of the century. Digital technology made it possible to work in an entirely different manner. For example, rather than going to the archives and spending hours finding the right sources, digital sources could be stored on discs and used in the classroom. Knowledge of software programs such as Photoshop was helpful. Our aim was to reconstruct the phases of installation of the water-main system on a digitalised map.

The role of the pupils – Johan, a student involved in this part of the research process has given a brief account of how he went about constructing the installation phases of the water-pipe system on a digitalised map.

> "My task was to take care of the technical aspects of this production in addition to laying out the water-pipe network on digitalised maps from the 19th century. I spent a good number of hours at the city archives together with John. There I quickly learned the software programs and got going with my work. I coloured the water-pipe lines on the maps with different colours for the respective time periods. Then I put the maps on Power-point-slides where we could see the development of water-pipe installation over time. Neat! Even James could use my map to pin-point the persons who had water contracts."

Johan's coloured maps show how the water-main system was constructed on Kungsholmen at the end of the 19th C.

To answer the research questions, we began by forming a view of the health environment on the basis of official health records and then proceeded to analyse the death certificates from the archives of the city health council (Sundhetsnämnden, after 1874 Hälsovårdsnämnden) and the city population register of 1878–1926 (Rotemansarkivet).

In order to find out to what extent water-borne diseases occurred in Kungsholmen in the latter half of the 19th Century and how many people died due to water-borne diseases, use was initially made of the public health statistics. The picture the students developed during the first year of research was primarily based on the public health statistics. These facts

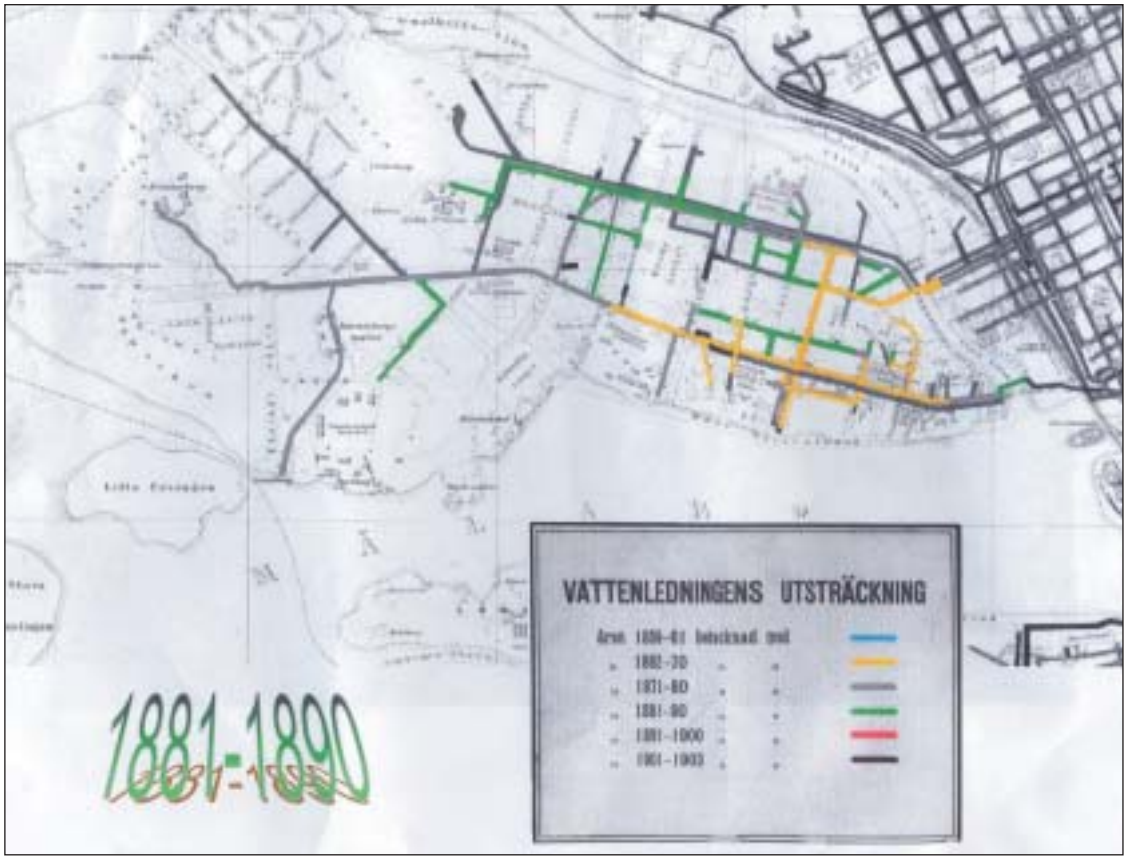


Table 1. Diarrhoea-related diseases and deaths in eastern Kungsholmen 1870–1880

Year	Population	Diarrhoea related illnesses	Deaths
1870	8 261	58	18
1871	8 526	101	33
1872	8 770	94	52
1873	9 140	54	10
1874	9 617	18	7
1875	10 093	274	36
1876	10 569	318	20
1877	11 221	326	37
1878	12 857	402	32
1879	13 086	287	72
1880	13 690	239	82

Sources: *Befolkningen i Inre staden i Stockholm 1720–1992 med kartor över invånare per kvarter 1992* (Utredningsrapport Nr 1993:5, Stefan Ström, Stockholms stad Utrednings- och statistikkontoret, 1993); *Stockholms Stads Statistik. Helso- och Sjukvård. 1870–1880* (Stockholms Stadsarkiv)

(aggregated statistics) tell us, however, almost nothing about the immediate environment of the deceased, i.e. those who died from water-borne diseases. (see Table 1). For this reason we deemed it necessary to develop a method that made it possible to acquire facts about the causes of death at the level of the individual inhabitants and the local city block. This resulted in conducting a micro-level analysis based on the death certificates that are held in the public health archives (Sundhetsnämndens arkiv, Hälsovårdsnämndens arkiv) and the Roteman's archive – the death certificates from rotes 4 and 7 in Kungsholmen for the period 1878–1926 were provided for us by the city archives (Historiska databasen).

Contact with active researchers – Active contact with researchers in the field is of importance for our kind of research. During the spring term 2000, we came into contact with Bo Burström who willingly gave us advice on what to do with the source material, in particular the death certificates – some of which were written in Latin. In Burström's analyses of mortality caused by diarrhoea, he has included those diagnoses from the death certificates that indicate acute inflation of the intestines, which means that stomach diseases would be counted as diarrhoea-related cases.

At the end of Feb., 2001, Professor Lars Nilsson, director of the Urban History Institute, made it possible for us to present our results in digital form at the annual meeting of the Urban History Association on 25th April. The theme at this meeting was urban historical research and digital space, which made our contribution especially meaningful. Moreover, the city archives agreed to let us arrange an exhibition at the city archives at the end of the spring term.

On March 10th Lisa Öberg from Södertörn's university college gave a lecture on the health policies of Stockholm, 1870–1940. The period of time on which we were working, 1860–1890, she called the 'patriarchal age' as the health policies reflected a clear gender structure.

Scope of the investigation – What periods of time should we choose to focus on? In order to clarify the relation between access to water and mortality, we decided to relate all of the facts concerning water-borne causes of death to the division of time periods found on the water-main installation maps. But, to which places on Kungsholmen? On the advice of an archivist from the map department of the City archives, we adopted the division of blocks that is found in the Chief Physician's account of the cholera epidemic of 1866 and then laid over the division of blocks from later maps – 1877 (1880) and 1885 – to this division. In this way, we could begin to conduct a systematic analysis of the relationship between water quality, water-borne diseases and causes of death at the micro level in Kungsholmen that stretched over the period 1864–1885.

Time periods – We decided to relate our analysis to three time periods, each of them corresponding to

the periods on the water-main installation map.
1) 1864–1869: for this period, the facts about water-borne diseases were taken from the Chief Physician's analysis of the cholera epidemic of 1866 and its follow-up to 1869 (See Table 2).

2) 1870–1879: For the years 1878–1879, the facts about causes of death were taken from the Roteman's archive in digitalised form. The problem was to acquire facts about causes of death for the period between 1870 and 1877. As the Roteman's archive dates from 1878, the death certificates for the years 1870–1877 could not be delivered in digitalised form: they had to be acquired by going through the death certificates one-by-one. At the end of March, we began going through the material for 1870–1877. This method of gathering data was very time consuming, but essential.

3) 1880–1885: for this period, all the facts about causes of death for the years 1880 to 1885 were taken from the Roteman's archive in digitalised form. As the material to be processed by the students was extensive, we stopped our analysis in 1885. We believed that it was more important to get a complete picture of the relationship between causes of death per city block during a unified period of time, 1864–1885, than to extend the investigation without a solid basis. Should it turn out that the method was useful and the material held for critical analysis then we could continue the analysis at a later date.

Table 2 is primarily based on figures from the archive of the Chief Physician of Stockholm (*Första stadsläkaren*). It shows how mortality in eastern Kungsholmen was distributed at the city block level in the period 1864–1869. Figures for the year 1870 are derived from death certificates. This table provided us with a basis for further analysis.

Applying the method to digitalised source material – Two of the project members, Hanna and Victoria, describe the method they used to account for the causes of death in every block."Our task was to sort out those persons who died from water-related diseases (diarrhoea and diarrhoea-related diseases) and then to group them according to blocks, in order see if there was a relation between high frequencies of death per block and access to water there.

We received discs with data from the population register (Rotemans-arkivet) about all the registered deaths in Kungsholmen during the years 1878–1885 which totalled ca 2 800 deceased. With the aid of Bo Burström, who is a medical historian at the Karolinska Institutet, we could in addition to the cases of diarrhoea that we had already found, add in those diseases whose Latin names also belonged to the category of diarrhoea-related diseases. In order to make it easier to identify those who died from the diseases that are included in our study, we coloured the cases of diarrhoea with yellow and the others with blue. The register also contains information about names, occupation, civil status, parents, street addresses, year of death, causes of death and responsible doctor." (see Table 3).

By systematically linking the causes of death in each block, the research group could get an answer to the question of how many people died as a result of water-related diseases and where it was worst in Kungsholmen.

Preliminary results – As stated above, the facts for the years 1870–1877 had to be acquired directly from records in the archives of the city health council as the population records in the Roteman's archive do not begin until 1878. Table 4 shows the distribution of deaths per block for the entire period investigated.

This table shows the results of deaths due to water-borne diseases per block on Eastern Kungsholmen 1864–1885. It is evident from the table that water-related causes of death occur year after year in certain blocks, especially in Bergsklippan Större and Göken. Can the high number of deaths in certain blocks have been due to the lack of water or bad water quality? Is it sufficient to state that the distribution of deaths was due to the fact that the water-main system was installed in stages during the 1870s and 1880s?

Need for precision – In order to gain more precision in our analysis, the number of water contracts

Table 2. The number of deaths due to waterborne diseases 1864–1870

BLOCKS	1864	1866	1867	1868	1869	1870	Total
Asplund	1	0					1
Bergamotträdet		1					1
Bergsfallet		5		1		1	6
Bergsklippan St		41	2	2	4	8	57
Bergsklippan Mdr		0					0
Blekholms norra		0					0
Blekholms södra		0				2	2
Bryggaren		4					4
Eldqvarn		0					0
Fikkonträdet	1	3					4
Göken		12				2	14
Kronoberg		3		2			5
Körsbärsträdet		8					8
Morellträdet		0					0
Murmästaren		1				2	3
Mälaren		12	1	1			14
Pilträdet		4		1		1	6
Plommonträdet		0					0
Paronträdet		2					2
Solvisaren		0					0
Tegelslagaren		0					0
Timsten		0					0
Traktören		3			1	2	6
Vattuormen		1				1	2
Vindrufvan	1	3		1			5
Åkermannen		2					2
Äpplet		2				1	3
Serafimer L		4					4
Garnisonssjukh.		1					1
Unknown		4			1		4
Total	3	116	3	8	6	18	154

Source: Tabeller öfver Dödligheten i Kungsholms Församling 1864–1869 in Statistik över dödsorsakerna i Stockholm 1864–1869 from Förste Stadsläkarens arkiv (SSA); Sundhetsnämnden. Dödsbevis Ulrika Eleonora 1870 (SSA–Stockholm City Archives).

Table 3. The causes of death at the level of city blocks 1881

Year	Address	Block	Cause of death	Date
1881	KAPLANSBACKEN 15	TIMSTENEN	CAT.INTEST.CHRON.	18810507
1881	HORNSBERG		HJERTFÖRLAMNING	18810508
1881	ARBETAREG. 4		SYFILIS CONGENIT.	18810511
1881	BRYGGARG. 24		PNEUMONIA ACUTA DEXTRA	18810512
1881	REPAREBANSG. 12		PNEUMONIA CHRONICA	18810512
1881	HANDTVERKAREG. 32		PNEUMONIA CATARRH. DEXTRA	18810512
1881	ARBETAREG. 15		BRONCHITIS CAPILLARIS	18810514
1881	HANDTVERKAREG. 1		PNEUMONIA	18810517
1881	ST.KUNGSHOLMSG. 9	BERGS-KLIPPAN ST.	DIARRH…	18810518
1881	REPAREBANSG. 13	TRAKTÖREN	CAT.GASTRO-INTEST. ACUT.	18810519
1881	HANDTVERKAREG. 31 B		ENTERITIS CHRON.	18810523
1881	ARBETAREG. 15		PERTUSSIS	18810523
1881	TRÄDGÅRDSG. 13 A	ÅKER-MANNEN	KRONISK TARM-KATARR	18810523
1881	ST.KUNGSHOLMSG. 28		PHTHISIS PULMON.	18810523
1881	KAPLANSBACKEN 15		BRONCHITIS CAPILLARIS	18810524
1881	HANDTVERKAREG. 34	HANDT-VERKAREN	TUBERCULOSIS	18810524
1881	KUNGSHOLMS FÖRSL.		VITIUM ORG.CORDIS (ORGANISKT HJERTFEL)	18810525
1881	FABRIKSGRÄND 3		SUBMERSIO	18810528
1881	ARBETAREG. 12		(CANCER VENTRICULI) MAGKRÄFTA	18810530
1881	ST.KUNGSHOLMSG.6		PNEUMONIA CHRON.	18810530
1881	ARBETAREG. 4		LUNGINFLAMMATION	18810601
1881	REPAREBANSG. 9		REUMAT.CHRON.+ PNEUMONIA CHRON.	18810604
1881	STORA KUNGSHOLMSG. 11		ORGANISKT HJERTFEL + LIFMODERBL.	18810605
1881	GARFVAREG. 11	VATTUORMEN	TARMKATARRH	18810606
1881	GL. KUNGSHOLMSBROG. 39		FEBRIS TYPHOIDES	18810607
1881	SKYDDSFÖRENINGEN	SKYDDS-FÖRENINGEN	DIARRH…	18810607
1881	HANDTVERKAREG. 33 A	GÖKEN	DIARRH…	18810607
1881	ST.KUNGSHOLMSG. 26		SCARLATINA + MORBILLI	18810607
1881	REPARBANSG. 13		PERTUSSIS	18810608
1881	HANDTVERKAREG. 33 A	GÖKEN	CATARR.INTESTINAL.	18810609
1881	STORA KUNGSHOLMSG.18		AKUT LUNGINFLAM.	18810609
1881	HANDTVERKAREGATAN 31 D	APOPLEXIA CEREBRI	18810609	
1881	KUNGSHOLMSGATAN 26	BERGSFALLET	CAT.GASTRO-INTEST. ACUTUS	18810610
1881	ARBETAREGATAN 9		CONVULSIONES	18810610
1881	GARFVAREGATAN 11	VATTUORMEN	CAT.GASTRO-INTEST. ACUTUS	18810610

Table 4. The number of deaths due to waterborne diseases 1864–1885

BLOCKS	1864–1870	1871–1880	1881–1885	Total
Ankaret			11	11
Arbetaren		6	14	20
Bergamotträdet	1	2	3	5
Bergsfallet	6	27	21	54
Bergsklippan St	57	78	18	153
Bergsklippan Mdr	0	4	3	7
Blekholms södra	2	12	4	18
Bryggaren	4	12	1	17
Dyrkaren			1	1
Fikonträdet	4	9	5	18
Grinden		2	4	6
Göken	14	70	23	107
Hantverkaren		12	17	29
Kettingen			18	18
Kronoberg	5	16	6	27
Körsbärsträdet	8	22	7	37
Morellträdet	0	19	8	27
Murmästaren	3	3	2	8
Mälaren	14	30	8	52
Pilträdet	6	6	3	15
Plommonträdet	0	3	6	9
Paronträdet	2	6	2	10
Roddaren		4	10	14
Solvisaren	0	3		3
Skörden			1	1
Tegelslagaren	0	12	5	17
Timsten	0	4	3	7
Traktören	6	29	10	45
Vattuormen		16	2	18
Vindrufvan	5	13	7	25
Väktaren		11	18	29
Åkermannen	2	11	39	52
Äpplet	3	10	2	15
Ekmans bostäder			2	2
Nya Tändsticksfabriken		1	1	
Total	154	464	285	878

were ascertained from the ledger for water payments (Vattendebiteringslängden) for the year 1873, and the result was compared with the pattern of deaths. A digitalised map was constructed that shows how many inhabitants of Kungsholmen had water contracts for the year 1873. By comparing the earliest water contracts with the latest ones, we could acquire a more precise picture of the location of people who did not have water contracts.

James's account of how he mapped the locality of those who had water contracts on Kungsholmen before 1873 is telling:

> "It was not until the 1870s that people had access to running water in Kungsholmen. The ledger for water payments [Vattendebiteringslängden] documents which households had access to water and how much the owner had to pay for water. These ledgers also show how much water the customer had used, and how many persons lived in the houses. What was most interesting for me were the street addresses of those who had water contracts. This information was written into the program Microsoft Excel so that we could use it in an easier way.
>
> In order to identify more clearly the parts of Kungsholmen that did not have water contracts, I marked out those households that did have a water contract on a map in the program Adobe Photoshop. I divided up those who had water contracts into three separate colours depending on the order in which they were written in the ledgers for water payments. The reason for this was that I wanted to see in what order households had acquired a water contract.
>
> This part was very interesting as one can compare the map that I made with the one that shows which areas for example had the highest death figures. Then one can attempt to find a connection between these and draw conclusions about to what extent those who had steady access to water actually influenced the figures for death and disease."

The mapping of the locality of those with water contracts shows more clearly that there were stretches of the water-main system in Kungsholmen where those without water contracts lived. Is there, however, enough evidence to support the assumption that there were more deaths due to water-borne diseases in these areas? The preceding analysis makes it clear that the greatest number of deceased lived in the blocks Göken and Bergsklippan Större. Both these areas were mainly inhabited by poor people.

Past perceptions of health and the environment – How did contemporaries look upon the health conditions in these parts of Kungsholmen? The accounts of the Chief Physician (Förste stadsläkaren) for the city health council (Sundhetskollegiet, after 1874 Hälsovårdsnämnden) provide us with insights into a growing awareness of the health conditions and environment of the times. Read the following quotation from the Chief Physician Axel Gabriel Carlson, who, on 31 Dec. 1866, gives an account of the spread of cholera to Kungsholmen:

> "Nos 31 and 33 at Handtverkaregatan in Kungsholmen, a property which seemed to be a hang-out for a large number of factory workers who were not able to have their own flats. Even here thorough sanitary measures were taken. However when access to living accommodations in this part of town did not meet the needs of the poorer population, overpopulation could certainly be reduced, but not prevented. While the epidemic was in process, a few cases of disease and death could also be linked to this house, which even contributed to the fact that the spread of disease within this part of the city was worst relative to the size of the population."

This quotation and other excerpts show that the Chief Physician was aware of the high frequency of mortality in Kungsholmen in relation to the size of the population and that the explanation for the high death figures was not so simple. This is why he suggested that the environment in Kungsholmen was a contributing cause.

The Chief Physician made a quick note of the geographic situation of Kungsholmen. It turned out that mortality due to diarrhoea was greatest in district 6, which lies in the western part of eastern Kungs-

A photo of a communal water post and garbage can on Östra Kvarngränd, Bergsklippan Större 1901.

holmen. There mortality was 4.88 %, while in the 7th district, in the eastern part, only 3.12 %. How could mortality vary so much within a relatively small area?

From a topographic view, one can see that the 6th district, west of Trädgårdsgatan (Scheelegatan), and Kungsholms torg, is characterized by heights and slopes where water runs down and remains in the permanently humid soil. The Chief Physician writes that ”highland, but watery soil” (”*högland, men vattensjuk mark*”) characterizes the area. The student who analysed this account came to the conclusion that the Chief Physician believed that it was precisely the quality of water that was the cause of higher mortality in the 6th district.

Completing the research process – After having completed Step 2 in the research process, “Searching for possible causes”, we began Step 3, “Formulating hypotheses”. The following hypotheses were formulated:

1. *Hypothesis with a relatively limited range of validity*: In the period 1864–1885 there were more deaths due to water-borne diseases in areas whose inhabitants lacked water contracts, especially in the blocks Göken and Bergsklippan Större.
2. *Hypothesis with a relatively larger range of validity*: The environment in these blocks has played a very important role when it comes to explaining why access to water was so limited and the water quality was so bad.

3. *Hypothesis with a greater range of validity*: In the period 1864–1885, the causes of death due to water-borne diseases have made up a relatively large part of child mortality in eastern Kungsholmen.

Preliminary results (Step 4)

The greatest number of deaths due to water-borne diseases could be traced to those areas that are situated on heights. Our results show that mortality was highest in those parts of Kungsholmen where the inhabitants did not have water contracts with the city, often the poorest areas, located on hills where water was least accessible. This was not known before!

Dissemination of the results – We decided to present the research process and results in the form of a power-point presentation. In achieving this aim, we received a lot of help from IT-strategist Stefan Fogelvik at the Historical database of the city archives. As the project financed by the Research Council was to be linked to the Historical laboratory (a pedagogical forum initiated and run by the City archives and the IT-Centre of Stockholm), we shared a common interest in creating a digital presentation that could be used as a laboratory in teaching. Some of the students in the research group worked with Stefan in setting up the presentation. A prerequisite for this kind of presentation was a good portable computer with the right kind of software. Photoshop was especially helpful when it came to mapping the installation phases of the water-main system. We were able to show a first version of our presentation at the annual meeting of the Urban History Association on 25 April 2001.

Making an exhibition – After the successful appearance at the Urban History Association, we refined the presentation so that it could be exhibited in the City archives. We worked intensively to get the exhibition in order. Two students in the research group who were taking an Art course helped put the exhibition together. The exhibition combined a traditional presentation with facts and diagrams on posters and original source material on exhibit in glass show cases with a rolling power-point presentation on a computer installed in a large wooden pulpit. We received technical help from the City archives so that the Power-point presentation was made to run smoothly.

The exhibition was opened on 29 May 2001 by the director of the city archives Rolf Hagstedt, who spoke about Stockholm in the middle of the 19th century as a stinking hole and the importance that the water system has had in raising the living standards of city dwellers. The headmaster of Kungsholmens gymnasium Olov Eriksson thanked the City Archives and expressed his wishes that this teaching aid might be able to be used in class-room teaching, possibly in a less ambitious manner.

Newspaper coverage – A reporter from the local newspaper *Vårt Kungsholmen* came to the exhibition and interviewed the students. The article, "Utställning på Stadsarkivet ger besked om vattnets betydelse" (Exhibition at the city archives explains the importance of water), was published in June 2001.

Historical laboratory – Through Stefan Fogelvik, the digital presentation has been put out on the homepage of the Historiska laboratoriet (Historical laboratory), created by the Stockholm City archives, which is linked to the educational network in Stockholm: www.itc.edu.stockholm.se/histlab. An addition to the study, which covers the period 1886–1890, has been made by a student during the spring term of 2002. Another special project, this one about a street (Fjällgatan) in south Stockholm that concerns the environment, health and social mobility, has also been put out on the homepage of the Historiska laboratoriet.

Information and further research

Information on the Environmental history project has been linked to the school's homepage so that viewers may acquire information in English and Swedish about what kinds of studies have been carried out, and about the sort of methods and sources that

may be useful for other schools who are conducting projects of their own. Our research efforts have led to a digitalised teaching aid that has been published on our school's homepage: www.kun.edu.stockholm.se/ and on the homepage: for the 'historical laboratory': http://histlab.itc.edu.stockholm.se/biblioteket/elevarbeten/kungsholmens_gymnasium/index.

In the spring term of 2004 a history student at the University of Stockholm has taken her point of departure in our study of the period 1864–1890: she is in the process of writing a senior thesis on the topic of water quality, health and the environment covering the period from 1891 to 1926. In this manner a comprehensive account of the relationship between water quality, water-borne diseases and mortality in eastern Kungsholmen from 1864 to 1926, when the Roteman's archive ends, will have been produced.

Summary of the Environmental History project and its importance for Environmental Studies:

Concluding remarks and lessons learnt – For many years, the environment and water issues have been a recurrent theme in Environmental Studies at Kungsholmens gymnasium. It has always been assumed that environmental issues must be understood and approached from several perspectives, e. g. natural science, social science, medicine and politics. Moreover, one can adopt a local/national as well as the global/international perspective in dealing with environmental issues. This approach is especially important in a school like Kungsholmens gymnasium which has an international profile.

The study of water issues and the environment is quite suitable for skill development in Environmental Studies. Scientific theories and experimental methods of research can easily be learnt by analysing different sources of water in the immediate environment. The comparative method can be used to highlight the importance of the climate and access to safe water supplies for developing countries. Students can learn how access to water influences health and the environment, as well as a country's possibility of development. Moreover, an understanding of some of the major political conflicts in the world today and in the future can be gained by focusing on water conflicts between states and within states.

What the Environmental history project has done to Environmental Studies at our school is to add a very important dimension to the study of water issues; namely the historical one. It has been especially valuable because it has provided students with the possibility of gaining a deeper understanding of how humans create and solve water problems. The pupils have seen that water problems in many cities of the developing world today existed in Stockholm in a not too distant past. For little more than a hundred years ago, water in the inner parts of Stockholm was a stinking soup; the lack of sanitation infrastructure led to the pollution of the ground-and surface water resources. Today one can go swimming from the steps of city hall. This development has been made possible by knowledge, technology and political decisions. It is very important for environmental studies in schools that students have learnt and continue to learn that environmental problems can be dealt with and changed to the better.

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The Baltic Sea Project

Environmental History has been a programme within the UNESCO Baltic Sea Project since 1995. It has developed a special approach to the study of the historical relationship between man and nature. Words such as “conflicts”, “chronology” and “actors” have been used frequently. The main goal is not better historical knowledge per se. It is rather that the students are able to develop an action-competence by discovering that their present environmental situation is the result of what real, once living, people have done in the past. We can summarise and generalise what these people did in processes such as “industrialisation” or “urbanisation”. However it is still a matter of what real people did in their own home towns. When they made decisions about the future, they decided over our present situation. And this is just what we do today. We are the history for those who will come after us. In this sense, we are both created by history and are the creators of history. This becomes quite obvious when we talk about our common environment.

In this book students, teachers and researchers share their experiences of working with environmental history, in professional research and in local school studies. All the countries around the Baltic Sea have contributed with different examples that mirror the multitude of learning opportunities from environmental history. We hope that it will inspire students and teachers to test the concept of local studies in environmental history.

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