MASTER

Attitudes and behavioural change with respect to the environment : design and implementation of a training course for secondary schools in the Republic of Belarus

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TECHNOLOGY AND DEVELOPMENT STUDIES

Faculty of Technology Management

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ing. W.M.A.A. Schellens-Haans October, 1997

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Design and implementation of a training course for secondary schools in the Republic of Belarus

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Preface

This research is conducted to obtain the Masters of Science degree at the Eindhoven Technological University, Eindhoven, the Netherlands. It originates from my first stay in the Republic of Belarus from the 16th of September until the 13th of December 1996, which started at Arab Snack in Minsk, the Republic of Belarus with at the background 'Last Christmas' (Wham). During this time I conducted a research together with Paul Boekhout and Corne Spreij and with the help of three Belarusian students. This period was mend as a preparation on my graduation. In these first three months I investigated the energy and water saving policies conducted by the local authorities of Minsk and the government of the Republic of Belarus. I as well investigated the information flows about energy and water saving possibilities for households, their knowledge about those activities as well as their willingness to try some small saving actions. The plan was the extend my stay and finish my research for my MSc. degree on an evaluation method for energy and water saving policies. However, during these three months, it soon became obvious that that was of no use, since hardly policy plans were converted into strategies and actually implemented. The results of the questionnaire showed that most people did not know how they could save energy and water. People stated that they were aware of energy and water saving possibilities, but when they were asked to give examples not even one-third of the respondents could. This was the start of a new project to enlarge people's environmental awareness.

During this research I had great help of my supervisors at the Eindhoven University of Technology. First of all dr. P.E. Lapperre. I had the privilege to have him as my first supervisor and during that time I was not only a great help in my work, but I learned to know him as a wonderful honourable person, with special sense for my situation. I thank you very, very much for your understanding! Secondly I want to thank prof. Dr. C.J.H. Midden which guided me especially in the field of concepts regarding (energy saving) behaviour and thirdly Mrs. Ir. E. Van Egmond-de Wilde de Ligny.

My second stay lasted from the 22nd of January until the 25 of April 1997. During this time again I had great help from my Belarusian friends.
First Mr. Dorozhko, who as always solved my minor problems and arranged the necessary appointments. I am thankful to him that I again could stay at 'his' Belarusian Folk High School. Pavel and Sveta (in alphabetical order!) have become true friends who helped me at the Poly Technical Academy and were never to tired to listen to my stories. The staff of the ecological department of the Polytechnical Academy has made it very easy for me to do my work, to practise my little Russian and to send e-mail.

Special thanks I want to give to all my floor-mates and the Minsk-students of the Belarusian Folk High School and it's staff. Thank you for the wonderful time, all your interest, all your efforts to teach me Russian and for spending so long a time with me. Back in the Netherlands I know you still haven't forgotten me, because of carts and letters I still receive every week.

Mrs. Mischenko and the ecological club of School 24 have again helped me very much during my project by explaining the Belarusian habits and by letting me test my training course. Furthermore they distributed more than 100 questionnaires at the 10th and 11th grade of the classes with English as first language. Thank you and thanks to all respondents for their valuable and useful information. Almost the same amount of questionnaires was distributed in School 5 for which I am very grateful to especially Ludmilla and the other English teachers for giving me the time to interrupt their lessons. Again I owe many thanks to all respondents and I appreciate it very much that I could test my training course also with 10th and 11th grade students. Thank you all for your attention and your positive evaluation.

Furthermore I want to thank the Minsk Ecology Committee for allowing me to copy all my questionnaires.

In Minsk I owe thanks to Tanya and especially Nastya who were there for me when I needed help whether it was with translating or just to talk (in English, Russian and Dutch).

I also want to thank all people, who have been writing me. It was always a great delight to receive mail, whether it was by normal post, e-mail or fax.

I owe special thanks to my parents, Cleem and Thea, who made it possible for me to travel and who decreased my telephone bill by allowing collect calls. Thank you all, dear family for your never unabated interest.

Most of all I thank my husband, Chris, who took care of everything in a time with many other difficulties. Thank you for always listening and supporting me, thank you for visiting me, and driving to Frankfurt am Oder, but most of all thank you for loving me!

Thank you all for support and prayers during an important and wonderful experience,

Wendy Schellens-Haans

Executive summary

1. Background

My first acquintance with the Republic of Belarus (RB) came during a student's exchange, when Belarusian students visited Eindhoven. About half a year later, I participated in a co-operation project between the science shop of the study Technology and Society and the municipalities of Eindhoven and Minsk. This project focused on the feasibility of the EcoTeam approach in Minsk, the capital of the RB and aimed at establishing a Bureau for Environmental Consultancy (BURENCO). During my first stay of three months, I investigated the water and energy saving policy of authorities and the willingness and personal possibilities of people to contribute to the improvement of the environment. One of the conclusions of this research was that - apart from students - virtually no one is truly interested in environmental problems.

2. Problem setting

During the autumn and winter in the RB the enormous energy deficits become apparent. In daily life one is also confronted with air and water pollution and waste problems. The environmental problems nowadays form a serious threat to people's health. Before the RB's independance in 1991 the U.S.S.R. based its development on five year plans. In these no attention, nor priority was given to environmental issues. People trusted the state to take care of nature, but by and large it did not. After the Chernobyl disaster, in 1986, environmental problems, however, featured more prominently and enormous amounts of money were spent to deal with the consequences. Children, who were five to eight years old at the time of the Chernobyl disaster, now are students much more interested in their living environment and their future. Without measures to improve the environmental situation, the RB will be heading for an economical and a social disaster. Measures, however, will be more effective when a certain level of awareness with respect to the environment is present. The final research goal, therefore, was defined as:

Contributing to the awareness with respect to the environment by the design of an 'environmental awareness course' for young people in the age group 15-18 years in Minsk, Belarus.

In the course of the field work it became apparent that the Belarusian counterpart was not acquintated with the methodology of the intended research. In a rather late stage it was decided to elaborate the methodology in order for the research to serve as an example for further investigation. In practice this led to an additional research goal:

Present the Belarusian counterpart with a comprehensive theoretical framework to:

1. *design an environmental awareness course;*
2. *perform an inventory and analysis of environmental problems;*
3. *perform a survey to investigate the student's view with respect to the environment.*

3. Research questions

The research was directed to three subjects as described in the three main research questions presented below.

Research question 1:

How should a course in the field of environmental awareness be designed?

Research question 2:
What are the most important environmental problems in the RB?

Research question 3:
How do students in the age 15-18 years view environmental problems in the RB?

All three research questions were subdivided into various sub research questions.

4. Methodology

Design of an environmental awareness course

The design of the training course is based on the work of Kessels & Smit (1989)[1]. The first step has been added on basis of Bergenhenegouwen (1992), and further additions have been made according to SVH-opleidingen (1992). The design contains 15 steps (including two steps - A,B - with respect to evaluation criteria and instrument).

Step 1: mapping internal and external developments, which is further elaborated in next paragraph;
Step 2: determining the necessity of a training course;
Step 3: formulating the main training objectives;
Step 4 and 5: selecting participants and first selection of teachers;
Step 6: performing task analysis, which is further elaborated in the last paragraph;
Step 7: formulating concrete learning objectives;
Step A and B: determining evaluation criteria and evaluation instrument;
Step 8 and 9: designing work methods and making instruction material;
Step 10 and 11: creating conditions for a succesfull training course and executing the course;
Step 12 and 13: evaluating the training course and measuring the long term effect.

Inventory and analysis of environmental problems in the RB[2]

Mapping internal development is done on basis of a division in relevant institutions in the RB. A picture is drawn of the role 'the environment' and environmental protection plays in daily life in the RB. It does not include an environmental assessment, but the way in which environmental activities are displayed on all levels of society. The institutions kinship, politics, economics and education and their effects on the environment are discussed. The state of technology and science is briefly described as well.

According to the Committee Long-term Environmental Policy (CLTM) in the Netherlands, a structure to describe environmental problems for long-term policy recommendations has to comply with two terms:

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1 Main literature used:
Leerdoelen, in: Handboek voor opleiders in organisaties, J.W.M. Kessels & C.A. Smit, Deventer, 1989
Strategisch opleiden in organisaties, G.J. Bergenhenegouwen, e.a., Deventer, 1992
Checklist Extern Opleiden, SVH-bedrijfsopleidingen, Den Haag, 1992

2 Main literature used:
Europe's environment, The Dobris Assessment, Stanners and P. Bourdeau, European Environment Agency, Copenhagen, 1995
National Human Development Report '96, Belarus: environment for people, United Nations, Minsk, 1996
The National Report on Environmental Conditions in the Republic of Belarus 1994, the Ministry for National Resources and Environmental protection of the Republic of Belarus, Minsk, 1995
Milieu: denkbeelden voor de 21ste eeuw, Commissie voor Lange Termijn Milieubeleid, Kerckebosch, Zeist, 1990

- analyses regarding the structure should be possible in a consistent way;
- the structure has to be identifiable and relevant for social and political activities in order to formulate new policies.

The method developed by the CLTM is used to make an inventory of environmental problems. The model is descriptive-explorative and describes which environmental problems exist. A step sequence can be filled in and the results can be analysed in a consistent way. In that way the environmental problems of the RB can be compared with the global situation and all environmental problems are at the same time placed in a broader context.

Fig. 1: *structure to inventory and analyse environmental problems*

Also aspects of involvement of people in environmental issues are described to draw a picture of current behaviour. Indicators are present to determine the seriousness of environmental problems. The indicators and their usage are discussed as well. The information is extracted from literature and interviews are conducted with key persons. By mapping all these internal developments and analysing the information gathered, characteristics that can be influenced by people are extracted to design a useful training course.

Student's view with respect to the environment

In order to analyse the student's view with respect to the environment, a survey was carried out among students in the age bracket 15-18. The methodology of the research was divided in a theoretical and an experimental part. The sequential steps are presented in figure 2 - next page-. The choices made and the actual results are added, where necessary.

The theoretical part consisted of:
1. formulating problem;
2. formulating aim(s);
3. performing a literature study[3];
4. determining units of analysis: defining and describing concepts (knowledge, involvement, perception of risks, social dilemma, willingness to change, feedback, attitude);
5. designing a theoretical model and defining hypotheses, which is presented in figure 3;
6. translating definitions to variables.

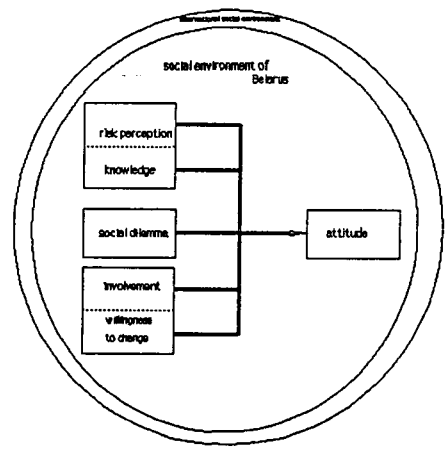


Figure 3: *theoretical model*

[3] Main literature used:
Energiebesparing door gedragsbeïnvloeding, C.J.H. Midden, W.H. Weenig e.a., VUGA, 's-Gravenhage, 1982
Milieuvoorlichting en -educatie, Open Universiteit, Heerlen, 1993
Consument en Milieu, red. C.J.H. Midden en G.C. Bartels, 1994

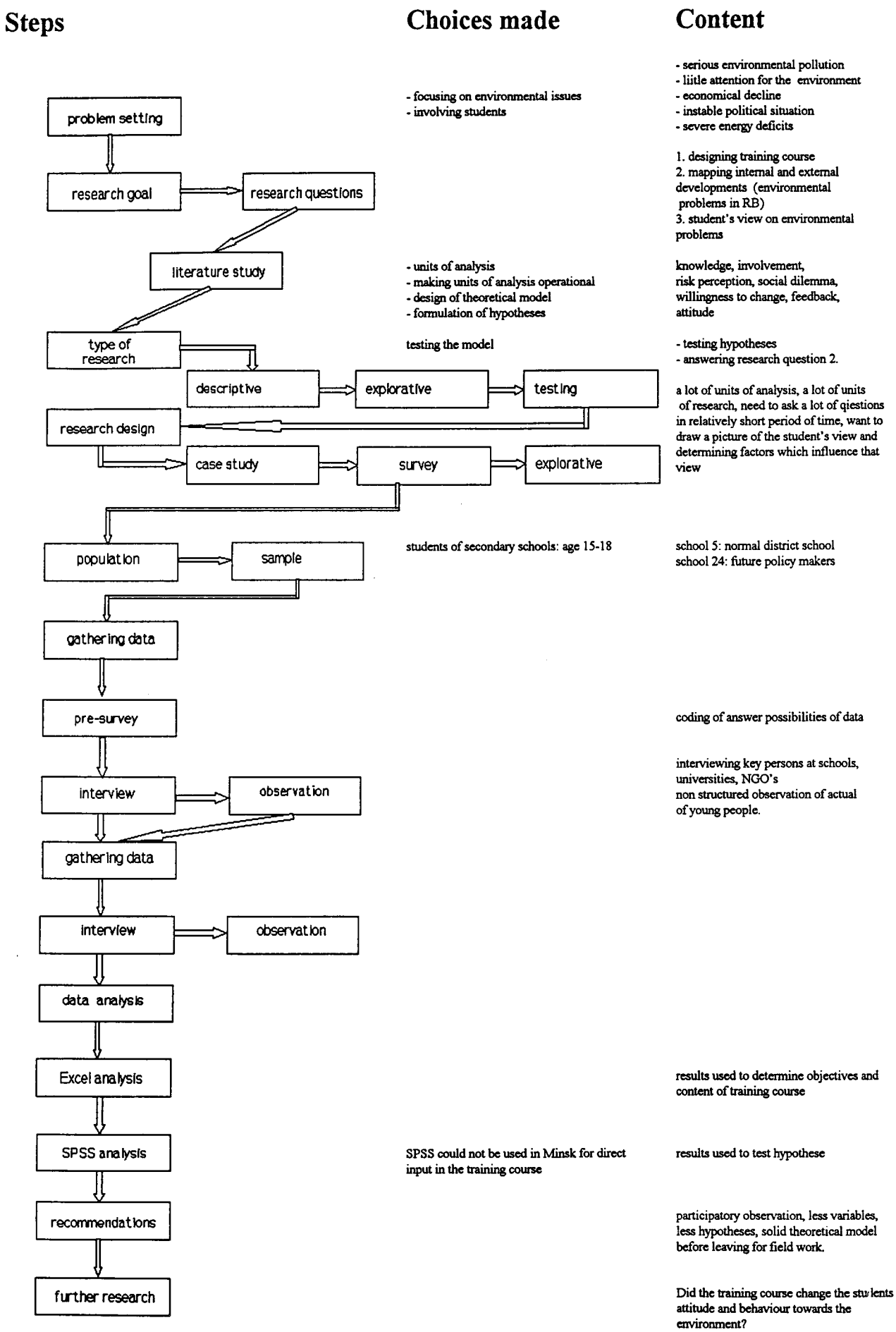


Figure 3: *steps, choices made and content of the survey*

The experimental part of the survey consisted of:
1. defining population and research units (students in the age of 15-18 years old);
2. describing the sample (schools 5 and 24) and sampling method ;
3. collecting data (by means of a questionnaire);
4. analysing data (in preparation of the contents of the course by Excel and to test the hypotheses by SPSS);
5. interpretation of the results.

The sequential steps taken to perform the SPSS analysis are presented in figure 4 next page. Where necessary, choices made and results are presented as well.

5. Conclusions

Design of an environmental awareness course

The theory about designing training courses (see 4. Methodology) and environmental awareness, attitudes and behaviour, determined the steps which were undertaken to design the final training course. The aspects that refer to the content of the training course, - the necessity of a training course, as well as the main training objectives, the task analysis, the concrete learning objectives, the works methods, instruction material and evaluation criteria -, are based on the results of the survey.

Eventually, the training course's main objectives were defined as:
to gain more knowledge about the need to change behaviour with respect to the environment, by means of:
1. creating more awareness in the field of environmental problems in the light of sustainable development and
2. contributing in solving part of these problems by demonstrating small actions people can undertake in their own households.

The concrete learning objectives were defined as:
- enlarging knowledge about the RBs environmental problems now and in the future;
- enlarging knowledge about the consequences of environmental problems directly related to the trainees;
- enabling trainees to start small actions in their own households to contribute solving part of local environmental problems.

The training course centered on 5 issues:
1. Why should energy be saved?
2. Saving water: why and how?
3. Waste disposal: reduce, reuse, recycle and replace.
4. How to prevent water pollution.
5. Is noise an environmental problem?

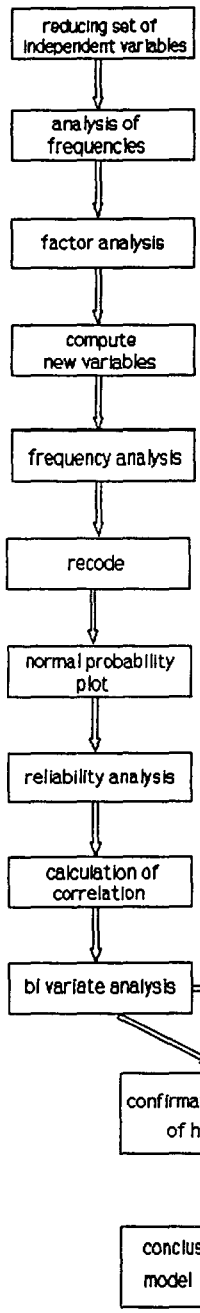
Steps	Choices made	Content
		
	refuse outlyers test usefulness of data	all 120 variables could be used
	KMO > 0.53 Bartlett's test of sphericity >>> significance = 0.00 than factor analysis is reliable	clustering variables distinguishing elements in variables 17 sets were found
	clustering variables if valua > 0.53 single variables if value > 0.53	new sets of variables were formulated according to: new = (old1 + old2)/2
	refuse outlyers test usefulness of data	
	according to new values determine necessity for recoding	
	testing normal distribution of data according to it's deviation of a normal probability plot	no new variables were rejected
	calculation of Crohnbach's alpha alpha > 0.60 than new set is reliable	rejection or confirmation of new sets (3 rejections)
	calculation of Pearson correlation if significance is about 0.00	107 correlations were tested
		only bivariate analysis was carried out
	if more than 50% of possible correlations is conformed, hypothesis is conformed.	2 hypotheses could be confirmed
	comparing confirmed hypotheses with model	model should not be rejected on on basis of results SPSS analysis, because it is based upon rational literature. some variables correlated: indication of existing correlation.

Figure 4: *steps, choices made and content of SPSS analysis*

Inventory and analysis of environmental problems in the RB

The internal mapping of environmental problems in the RB resulted in the following important conclusions:

- too little attention is paid to environmental problems by the government, the industry and the population;
- the consequences of environmental problems do not play a role in daily life;
- little education and very little literature is present to teach people about environmental problems;
- too little concrete activities are initiated by the government, the industry and the population;
- the consequence of the Chernobyl disaster and other environmental pollution are a severe threat to people's health.

The external mapping of environmental problems in the RB resulted in the following conclusions:

- the industry produces too pulluting and is wasting enormous amounts of energy by lack of proper technology, safety regulations and attention of people;
- households also have to save energy, since they waste energy and prices are about to rise enormously. Saving energy is necessary to combat further deterioration of the environment and to prevent very high energy bills in the future;
- the consequences of the Chernobyl disaster - air, water and soil pollution - are the most pressing environmental problems in the RB;
- environmental problems influence the financial state of the government and people's health if nothing is done soon. Environmental problems will possibly lead to economic disaster and surely to a social disaster;
- a sustainable Belarusian society is still very far away.

The method of inventory and analysis of environmental problems proved to be a suitable, useful method. Its results, however, depend on the quality of the data input. At this moment of time, hardly any detailed, quantative data are available. Unless the RB is going to develop a comprehensive national system of monitoring the main environmental problems as indicated above, the usefulness of the output will be limited. However, it is very unlikely that the RB is going to invest in this monitoring system for the next decades, if ever.

Analysis of the student's view with respect to the environment

Students have an extremely negative view on the environment with respect to the future. They are willing to help solving environmental problems, but they hardly know how. Until now, they did not help solving environmental problems, exceptions excluded, and very few are member of an environmental organisation or club. The results of the survey indicate in several ways that students know about environmental problems in their country, but that they do not deploy activities themselves, nor search for activities to help solving those problems. They indicate that everybody should help, but on the other hand they do not know how they can help solving environmental problems.

Especially the passive attitude of the students should be changed. Stimulating people is difficult. Students already are aware of the political problems in their country, financial problems, problems concerned with their age (puberty). Environmental problems are just one more item that can be added. By translating the general problem 'environment' into a more personal problem, the students will easier understand the need why they have to change their behaviour. Especially, the consequences of their behaviour at this moment, for the future can help them to understand why a change now is necessary.

Although the testing of the hypotheses was incomplete and yielded little, the results are added to show the Belarusian counterpart how this kind of research should be conducted. All steps are described, not all have been executed. Furthermore, this kind of research has not been conducted before in the RB in the field of environmental issues, so it is a basis for possible further research.

6. Recommendations

The training course can be given by people from the Bureau for Environmental Consultancy as a concrete product in their educational activities. Furthermore, the training course can be presented by teachers of secondary schools, ecological clubs or by members of all kind of ecological and environmental organisations. Anybody who wants to inform people about the environment and a way people can contribute to the protection of the environment and can help solving environmental problems, can use the training course. Since the course uses no difficult technical terms, unless they are explained, the training course is suitable for the original target group - students in the age of 15-18 - but also for younger students and adults who do not have much knowledge about environmental aspects.

The training course focuses on 5 different issues which can be given with a week interval, but more effectivity of changes in attitude is expected when the time between the presentation of the separate parts is longer. For students, the preferable time to present the training course is during an English lesson (if the course is presented in English) or a biology, chemistry or physics class during school time. The students are enthousiastic, because it is different from the normal way of teaching, it is new material for them and they are able to keep their attention. The last item can be a problem when the training course is presented after a long day of classes. If it is not possible to conduct the training course during school time, it is better to present it in the evening, when the students have had time to eat and relax a bit.

It is important that the tests included in the teacher's manual are actually filled in by the participants. In that way, the teacher, but more important also the participants, will know exactly what they still remember and they will become aware of their actual behaviour. Difficulties and insecurities will be brought up as well and then can be discussed.

7. Recommendations for further research

Whether the training course actually contributed to an increase in environmental awareness and a change in attitude and behaviour in the short or long term is not known. This should be the subject of further research. The goal of such research can be:
'Determining the effectiveness of the training course: '*Environmental problems and a way to help solving them*' in the short and long term.
This research, however, will take a lot of time, especially if long term changes will be studied.

Before the actual changes will be studied a solid theoretical model should be presented on which a further approach should be based. During a pre survey and maybe after the field work, the theoretical model can be adapted, but this theoretical model is very important. Otherwise the testing of hypotheses will lead to problems, because of the poor operationalisation of variables used in the model. A possible model is presented in figure 5.

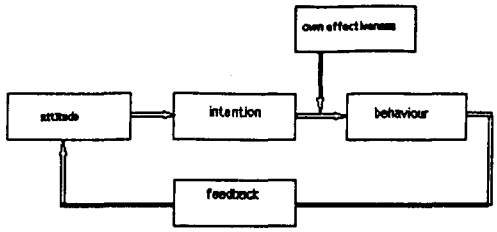


Figure 5: *possible theoretical model for further research*

During the research people's attitudes and behaviour was investigated by means of a survey using a questionnaire with closed questions. Already during the pre-survey it was discovered by unstructured observations that the questions about behaviour were answered in such a way that they confirmed environmentally correct behaviour (socially desired answers). This, of course is a phenomenon, which is well known also in Western countries and can be reduced by asking the right questions in the right context. The pre survey therefore led to changes in the questionnaire. Still, in my opinion, socially desired answers are more easily given in the RB, maybe also on account of the fact that people - for generations - had no experience and were not exposed to questionnaires. Therefore, participatory observation techniques could be more suitable in the RB and lead to more reliable and useful information. This, however, will probably only be the case when the observations are carried out by well instructed Belarusians. If a West European researcher would carry out the observation, the old problem would manifest again, forced expected behaviour.

To provide a sustainable development in the RB an unabridged approach of environmental problems in the light of socio-economic improval is necessary. Both the authorities, the industry and the population have to be involved in solving environmental problems. It has to become a topic which is taken into account when making decisions at all levels of society. First of all a full co-operation and financial support of the government is necessary. Policy makers and implementors should be more aware of the implications of the environment on the economy, health and the whole society of the RB. Especially small activities employed by students and non-governmental organisations should not be ignored and thwarted but supported, because then, the people will stay interested in helping to solve environmental problems.

Poverty and backwardness are our country's main problems

(Vlaai, student of the BFHS, 29th of January 1997)

Chapter 1 General description of the Republic of Belarus

1.1 History[4]

The Republic of Belarus is independent since 1991. The country is surrounded by five countries: in the East the Russian Federation, in the south the Ukraine, in the south-west Poland, in the mid-west Lithuania and in the north-west Latvia. Belarus has a moderately continental climate. It's surface area is 207.6 thousands square kilometres.
In the 20th century alone, Belarus lived through three revolutions and three wars. National independence was first declared in 1918. The Second World War is known as the Great Patriotic War (1941-1945). This War is one of the most heroic and tragic periods in the country's history. The price of freedom was extremely high. The RB lost more than 3 million people (approximately one-third of the population). The population reached its pre-war level only in 1971. The level of pre-war industrial production was restored by 1975. The Belarusian population is very open towards both Western and Eastern cultural influences.

The RB's capital city is Minsk. Besides the Minsk region, the RB is further divided in six sub-national administrative units (oblasts) and 118 sub-regional administrative ones (rayons). The oblasts are called: Vitebsk (in the north), Grodno (in the west), Brest (in the south-west), Gomel (in the south-east) and Mogilev (in the east).

1.2 Socio-economic indicators

A general profile of the Republic of Belarus (RB) is based on an analysis of the elements of the different institutions[5]: kinship, politics, religion, economy, education, social security and health. Special attention is given to health to, in general terms, determine the effects of the Republic's industry on public's health and the environment.
The different institutions are described in the following paragraphs, each made operational according to the following socio-economic indicators:

Kinship:
- population density, population growth rates, male/female composition;
- family type and size, divorce rates;
- ethnic composition;
- urban/rural composition;
- life expectancy, age group distribution, working/non-working rates.

Politics:
- changes in the political system;
- Supreme Soviet: legislature;
- Council of Ministers: the executive.

Religion:
- religious composition.

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4 This paragraph is based on: *National Human Development Report '96, Belarus: environment for people*, United Nations, Minsk, 1996, p.3

5 According to: *Man, Technology, Society and development: from the hunters and gatherers to the First Industrial Revolution 3,5 million years ago until AD 1760*, P.E. Lapperre, Eindhoven University of Technology

Economy:
- national income, economical sectors, industry;
- employment structure, industrial employment, unemployment;
- wages and wage structure.

Education:
- educational structure;
- educational attainments population:
    - literacy;
    - level of education;
    - number of establishments;
    - number of students in higher and secondary establishments.

Social Security:
- social security benefits expenditure.

Health:
- population per doctor;
- public expenditure on health;
- total expenditure on health.

All figures presented refer to 1995 unless stated differently.

1.2.1 Kinship[6]

The RB has a population of 10.26 million with an average population density of 50 persons per km^2. The annual population growth rate is negative since 1995. In 1996 the growth rate is -0.3%. East Slavonic nationalities (Belarusians, Russians, Ukrainians, Lithuanians, Tartars) account for 94% of Belarus' population, and 78% are ethnic Belarusians. The other 6% are Poles, Jews and others.

In 1996 68.9% of the population lived in urban areas. Urban population growth fell from an annual 2.9% to 1.45%. The rural population decreased by an average of 1.3% per year until 1986 and by 1.7% annually during the ten years after. Substantial differences also exist in the age structure between the rural and urban population. One-third of all rural residents are of retirement age. Children residing in rural areas constitute only 28% of the total population of the children in the country. This is especially the case in remote areas. This situation is very unfavourable, because these areas comprise 60% of the country's territory.

The average life expectancy 68.6 and is decreasing. Life expectancy at birth for a woman is 74.3. The divorce rate increased in the last 5 years from 35% (1990) until 55% (1995). These percentages are calculated on basis of the number of marriages contracted.

Generally, the demographic structure of the population is worsening. Between 1975 and 1995, the number of children under the age of 15 has decreased from 27.6% to 23.5% of the total population and the number of people at age of retirement increased from 16.2% to 20.9%.

1.2.2 Politics

In the constitution as adopted in March 15th, 1994, it is stated that the state is founded on the principle of separation of powers: legislative, executive and juridical. The president of the Republic, Alexander Loekashenko, is Head of the state and the executive. The highest standing

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[6] This paragraph is based on: *National Human Development Report '96, Belarus: environment for people*, United Nations, Minsk, 1996, p.7 (ethnic composition), p191 (urban population), p.189 (life expectancy), p.39 and 189 (population figures).

representative and the unique legislative body of state authority of the RB is the Supreme Council of the RB.
This Supreme Soviet has five general tasks in the sphere of environment, namely:

- defining main directions of the state ecological policy;
- adopting laws;
- defining the working procedures of bodies on state management of nature protection and use;
- announcing territories, in case of necessity, as zones of ecological disaster;
- approving the state ecological programs of the Republic of Belarus.

The Local Soviets of the deputies are responsible for the condition of environments in their territories. They have to organise the implementation of the state ecological programs and plans as well as they have to organise their material and financial support[7].
The Supreme Soviet selects the Council of Ministers, which is the executive body. The chairman of the Council of Ministers is the Prime Minister of the Republic. In the ecological sphere, the Council of Ministers is responsible for the practical implementation of the state's ecological policy. Furthermore they are responsible for:

- development and realisation of the ecological programs and large nature protection objects;
- co-ordinating activities of Ministries and other republican departments in the field of environmental protection and use;
- defining the order of natural resources accounting;
- evaluation;
- keeping of survey information.

The main state executive body in the field of environmental protection is the Ministry of Natural Resources and Environmental Protection (MinNature). This ministry supervises different committees. Three of them are the industrial association "Belarusgeologya" and the Committee on Land Resources and the Committee for Fish Protection. Then there are six oblasts (see 1.1) and Minsk urban committees and 123 local inspections on natural resources and environmental protection. There is an independent ecological police system. Several scientific establishments such as the Central Scientific Research Institute for Complex Use of Water Resources (CSRICUWR) and the Belarusian Research Centre "Ecology" give scientific support, as well as research institutes of the Academy of Sciences of Belarus and research institutes and centres of various ministries and departments.
Particular questions of state control and regulation are dealt with by the Ministry of Public Health Care and the Ministry on Emergency Measures and Protection of the Population from the Consequences of the Accident at Chernobyl NPP. The first one's sanitary department is responsible for labour hygiene, control of quality of water and foodstuffs. The second one is responsible for monitoring water sources, atmospheric air and soil pollution as well as solving the whole complex of questions linked with monitoring radiation contamination. The Ministry of Forestry is, logically, responsible for forest conditions and protection and for the majority of especially protected territories.

The main principles on which MinNature bases its policies are permission and prohibition. The economic mechanism for managing environmental protection and use are based on the following policy instruments:

- taxes and other payments for use of natural resources;
- discharge and disposal of pollutants in the environment;
- waste allocation;
- the penalties for infringements of the nature protective legislation;

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[7] Information about environmental political system obtained from: *The National Report on Environmental Conditions in the Republic of Belarus 1994* the Ministry for National Resources and Environmental protection of the Republic of Belarus, Minsk, 1995, pages 90-92

- claims for indemnification of damage caused to environment.

The realisation of the state's ecological examination is regulated by the Law of the RB "On state ecological examination". This Law was adopted by the Supreme Soviet of the RB on June 18, 1993. This Law defines the objectives of the state ecological examination, its place in the decision making system, establishes the general order of examination organisation and realisation, rights and duties of the parties, the order of appeal against the conclusions and considerations of deputies and the responsibility for infringements of the legislation. The Law includes 12 articles. The public ecological examination has been recorded in the Law of the RB "On protection of environment" [8].

1.2.3 Religion

About 75% of the Belarusians belong to Eastern Orthodox religions. Roman Catholic religion, initiated by the Polish, is the religion of about 20% of the population. The rest are Jews, Muslims and Protestants [9].

1.2.4 Economy[10]

More than two-third of the population of the RB lives below the official poverty line. This poverty line is defined as 'a monthly income less than 60% of the Minimum Consumer Budget per family member'. The Minimum Consumer Budget (MCB) 'represents the cost of the minimum set of goods and services meeting the basic physical and social needs of the individual'. The size of MCB is based on the average cost of the minimum set of goods and services in all types of training outlets'.

In 1995 the income of 80% of the population was *less than* or *equal* to the MCB. The poorest 10% of the inhabitants receive only 2.6% of the aggregate monthly income, whereas the wealthiest 10% receive 25% that income. The nominal Gross Domestic Product (GDP) is $10.5 billion dollar, but the real GDP's growth rate is -10.0%. The budget deficit is 2.5% as percentage of GDP. The average wage is $76 per month.

Inflation is enormous in the RB. The average annual rate of inflation is 268.4%. Sources of inflation are the rising costs of imports, the lifting of price controls on consumer goods, transport, communal and other services, like energy prices. 'The Belarusian economy is still dominated by industries with low turnover'. They need large capital investment and have a lot of difficulties adapting to market conditions.

In Soviet times, the Republic of Belarus was the country's main industrial centre. After its independence, the RB has been unable to compensate for the loss of its old markets by the acquisition of new ones. Main export products of the RB are trucks, tractors, metal cutting machinery, tires, potassium fertilisers, household refrigerators and freezers, colour TVs and bicycles.
In 1995, the RB exported 43% of GDP and imported 47% of GDP, which leads to a deficit on the foreign trade balance of $300 million. The country's estimated foreign debt is $ 2 million. This does not include its debts to the Russian Federation.

Industrial production accounts for 26% of GDP and is still declining. Agricultural production counts for 11% and services for 47%. Since agricultural production is also declining, the

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[8] *The National Report on Environmental Conditions in the Republic of Belarus 1994*, Environmental protection of the Republic of Belarus, Minsk, 1995, p.95

[9] National Human Development Report of Belarus 'Environmental for People', 1996, page 7.

[10] This paragraph is based on the National Human Development Report of Belarus 'Environmental for People', 1996, pages 13-17.

services sector is growing more and more. This becomes clear in the complex governmental structure of ministries, departments, committees and organisations.

Before 1990, industrial production was entirely based upon five-year plans. Neither environmental protection, nor the effects on nature of production played a role in these plans. The extent to which nature was damaged in those years is hardly known, because no record is kept of the period before 1986. In 1986, the Chernobyl disaster brought abrupt changes to this view. Besides the terrible health problems which occurred, agricultural land and the air were severely polluted. More than one-fifth of Belarusian territory was polluted and useless for agricultural production. Nowadays, the burden of the industrial pollution is less, because of the enormous decrease in production. This does not mean that the state of the environment is improving (see chapter 4).

1.2.5 Education

The adult literacy rate is 98.4%. Since at least 1990 this rate has been slightly more than 98%, which is very high. Mean years of schooling for people who are over 25 years old is 9.1. For women this is 8.6 and for men 9.6 years. In the age of 17-18, 33% of students are enrolled in tertiary education of which 35% is female[11]. Nineteen percent of the 19-year old's are still in full time education. The RB has 143 scientists and technicians (persons with specialised secondary and tertiary education employed in the public sector) per 1000 inhabitants. Per 10000 people there are 21 R&D scientists and technicians which is still decreasing since 1990, when there were 57 R&D scientists and technicians

The total education expenditure as percentage of GDP was 7.0% in 1994. The public expenditure on education as percentage of GDP at that time was 5.9%. There are 40 higher educational establishments in the RB They are all situated in the big cities (Grodno, Brest, Minsk, Gomel and Vitebsk).

Since 1991, the government has officially approved the Republican Program on training in the sphere of environmental protection. There are two major tendencies in school education, namely ecologisation of all educational disciplines and the introduction of special courses on nature protective subjects. In my first stay in Minsk, however, I have not found examples of these courses. The Minsk Ecology Committee, which also develops educational material on environment, does not give lectures structurally, only when this is specifically requested by interested schools.

1.2.6 Social Security

Belarus has a well developed social security system. In most cases social services and benefits are provided as a part of the wage package. This means directly that people are afraid to loose their job, because then they loose the right to the social services. This is also used to threaten people. Factories often do not produce every workday. Still people have to come to their work place and do nothing there. This is a way of employers protecting their employees. In 1994 the social security benefits expenditure as % of GDP was 12.4% [12]. There are no funds of unemployment benefits to help unemployed people in a structural way. Pensioners who have no other source of income are in a real bad situation of lack of money. Of adults suffering from various degrees of disability, the largest difficulties are experienced by those who are dependent on outside-help. Their main problem is that they need a place to stay and people to help them and to look after them[13]. In Belarus, most of those physically handicapped adults live in ordinary homes with their families, who virtually spend their entire lives looking after them. Assistance to people with no families is provided by social support authorities, the Red Cross

[11] id. p. 188,189 (literacy figures) and 105 (total education expenditure).

[12] id. p. 190

[13] id. p. 130-131

and, rarely, by other charitable organisations. In order to protect their interests, many invalids and their relatives have formed public associations, such as Society of Deaf, the Union of Chernobyl Invalids, the Council of War and Labour Veterans, etc. The quality of medical assistance in the homes is the biggest complaint among handicapped. However, state hospitals and polyclinics do not have enough staff to meet the needs and services necessary for sufficient care.

1.2.7 Health

Preventive and clinical medical treatment is regulated by the Law "On Health Care", adopted in 1993[14]. This Law states that 10% of the National Income should be used for the funding of health care, but in 1995 about 5% was realised. Public health and mortality statistics have worsened. In the past 20 years there has been a significant decline in life-expectancy in Belarus. This is also the case for other former Soviet republics. However, this is in contradiction with the improvements in Western European countries. The reason for this is probably the one-sided food, smoking and the enormous alcohol consumption. It is not known which role environmental pollution plays in this tendency. The problems after the Chernobyl disaster and probably air, water and soil pollution exert influence on the state of health.

The conditions of treatment in some clinics are desperately poor. Patients are asked to bring their own dishes and food and they have to buy their own medicines.[15]. In contradiction to the number of medical institutions, hospital beds and medical staff, which are quite high, the health care system is faced by a shortage of medicines, medical supplies and equipment. Its structure is often too complex and inefficient. The population per doctor also increased. In 1995 this was 230 people per doctor. The public expenditure on health as % of total public expenditure was 14.9%. Total expenditure on health was 7.0% of GDP in 1994[16].
The buildings in which the hospital and medical institutions are situated are often not suitable. This is also still a major problem. A health reform program is currently being developed. It emphasises the need for a greater co-ordination between reform in the national economy and public health[17].

The natural environment has suffered extensive damage resulting from industrial activity, Big cities have become sources for continuous pollution of the air, water and soils. The Polessye district's unique landscape has been adversely affected by mass irrigation programs. Almost one quarter of Belarus' territory is contaminated by radioactive fall-out from the Chernobyl disaster. In the Mogilev and Gomel regions, the changes in health of young people are striking. All diseases, which were common previously, have increased by 3.5, 4.0 and up to 4.9 times[18]. Examples of more common diseases are: fainting, diseases of respiratory tract, thyroid gland cancer, drowsiness and lethargy.

According to Jakovenko, studies show that more than 85% of the Belarusian population is in a state of social and ecological anxiety, apathy and despair for their lives and the future. Consequences are heavy drinking, high crime rates and other anti-social behaviour. When the definition of health as used by the World Health Organisation is used: 'health is a state of complete physical, psychological and social decency, not just an absence of diseases or handicaps', one can say that especially in the contamination affected area, the majority of the inhabitants are people with poor health.

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14 id. p. 11
15 id. p. 111
16 id. p. 190
17 id. p. 133
18 Jakovenko, 1996, p.43

1.3 Research goal

1.3.1 Environmental problems in the RB in short

The environmental problems in the Republic of Belarus are extensively discussed in chapter 4. The state of environment in the big cities and industrial centres is a matter of major concern. The present environmental situation is more the result of prolonged negligence in the past than lack of action at present. Especially the regional capitals Gomel and Mogilev have substantial environmental problems. Their major problems are dangerous levels of atmospheric pollution, noise levels exceed existing norms, water is polluted, the ecosystems of separate surface watersheds have been ruined and soil contains high levels of salts ad heavy metals. Both cities are located in the Chernobyl-affected territory. This situation makes it impossible to ensure environmental safety and directly affects public health. Also in Minsk, one-third of the territory is described as 'extremely unfavourable'. 'The main reasons for worsening health conditions are a rapid decrease in standard of living, ageing of the population with an increase in pension aged persons and the increasing influence of the ecological situation'. The established ecological situation nowadays reduces the quality of life of the population. [19]

The air pollution is very high in industrial big cities. Main sources are cars (71.3%), less than one-third is due to wastes by the industry. Main polluters are carbon oxide, sulphur dioxide, hydrocarbons and nitrogen oxides.

There is also a big problem with surface and underground waters which are heavily polluted. In 1994 1727 million m^3 of sewage was dumped in rivers, lakes and reservoirs of which 91.0 million m^3 was determined to be classified as 'fully polluted'. This means that the sewage was not or hardly purified.

Another serious ecological problem in the Republic is the accumulation of waste. The most prioritised ecological problem, however, is still the radioactive contamination of the environment.

At present when the economy is declining and people's moral is often low, it is important to conduct research and to develop possibilities to influence people's attitude. It is necessary to develop within themselves the desire and responsibility to change their living environment. People also have to be informed about plans and planned changes and actions by the government to create understanding for their actions. Social consciousness and more specifically environmental consciousness, has to increase.

1.3.2 BURENCO

In October 1995, both municipalities of Eindhoven and Minsk organised a seminar about energy saving within the framework of the Twinned Cities Program. One of the results of this seminar was the decision to establish a special bureau for environmental consultancy (BURENCO) in Minsk.

[19] The following figures and these statements are based on: Ministry of Environmental protection of the Republic of Belarus, Minsk, 1995, p. 8

The aims of the bureau should be:

1. to supply organisations and citizens with independent information and advice on matters of environmental protection;
2. to co-ordinate a regular exchange of information and knowledge between the Netherlands and Belarus, especially between Eindhoven and Minsk;
3. to create more global awareness on environmental aspects, especially between the citizens of both cities.

The aims were given form in three main spheres of attention, namely, implementing the EcoTeam approach in households, implementing the Environmental Management System in industry and environmental education. Since this research focuses on aim 3 and some it relates to environmental education, the research was conducted with help of BURENCO. Eventually the training course can also be used by BURENCO as a practical guideline for secondary schools.

1.3.3 EcoTeam approach

From September to December 1996 I was in Belarus and conducted a research about the possibilities to implement the EcoTeam approach in Belarus for the joint municipalities of Eindhoven and Minsk.
The EcoTeam program is developed by the Global Action Plan for the World (GAP) to show people how they can contributed to solve a part of the world's environmental problem, by starting in their own household. The program focuses on energy, water, gas, heating, consumption, waste and transport. The aim of the research was to find out how the EcoTeam idea could be implemented in Minsk and which changes were necessary.

Within the scope of this project policies regarding energy and water saving had to be inventoried and analysed. One of the conclusions of the study is that social policy instruments (training courses, advertisements, education, information centres) are hardly used to inform and educate people about the environmental condition of their country in general and specifically about energy and water problems. This leads to people not knowing about the possibilities to solve these problems. They are not prepared at all when, in the near future, energy prices are going to rise enormously.

Using the EcoTeam approach people can be made more aware of the possibilities they have themselves to help solving environmental problems, specifically those concerned with, energy and water saving, waste, heat saving, consumption behaviour and transportation. In Minsk, heat saving is hardly feasible for people, because they there is a central city heating system.

1.3.4 Environmental education

Another conclusion of the study mentioned in 1.3.2 is that young adults are a very interesting group to start educational activities. A questionnaire was distributed in a test area among and by students from school 24, the linguistic college in Minsk. At the end of the questionnaire people could sign in to join an EcoTeam or when they wanted more information. From the 300 respondents, 50 people reacted positively. The majority of those had an age below 30 years.

Students are an interesting target group to start environmental education for several reasons. First because of their *starting interest in the environment*, their general surroundings and its problems. They now learn more about foreign countries and their problems and they are also really interested to hear more about their *possibilities and ways of solving national (environmental) problems*. Third, after the Chernobyl disaster, and the fact that the government informed people too late about the effects of the accident, *they realise that their actions now determine the future*. A change in habits, customs, ideas, conceptions now, *works through in their adult life and affects their children*. Independent information gives them a

chance to form their own opinion, which is important, since some of those students will become *future policy makers* and implementors.

In the Netherlands environmental issues are a compulsory part of the educational program in primary and secondary schools. In this way is stimulated that students start to think about environmental problems. Like in all spheres of the economy, in the RB plans have been made to introduce environmental training at all levels of education. Two tendencies were suggested, namely 'ecologisation of all educational disciplines' and 'introduction of special courses and subjects on nature protective themes'. Most of those efforts do not take place in school, but in ecological clubs, by scouts or musea. The government states that 'high school is the key link in the system of preparation of ecologically competent specialists'. New specialisations at academies have been started[20].

Again it becomes obvious that there are a lot of plans, but they are not or not fully carried out. In practice it is not possible to 'ecologise all educational disciplines' in a school's program, because teachers are committed to a certain program. In Minsk, The Minsk Ecology Committee has developed some material to teach children about environmental protection, but they only come on specific request. Their newspaper 'Minsk Ecology', one of the major mass media sources, has not been published the last six months.

Educational environmental courses can be a good start. And until nothing has changed in the school programs, environmental courses are a good substitute.

1.3.5 Involvement of school 24

The choice to start with students from school 24 is based on the fact that there are already close contacts. More important is that students speak and understand English very well, so that the first course can be run and evaluated in English without severe language problems. This period I was in the RB for three months so lack of time is an important factor. Further more, the students of school 24 are children of well educated parents with eminent jobs in the Belarusian society. The students are very likely to succeed their parents.

1.3.6 Definition of the research goal

Unfavourable living conditions, caused by rapidly falling living standards, growing social and economic instability and the deteriorating environmental situation are affecting people's mental health as well as their behaviour and life styles.

As Röling (1994) says, providing information in the form of extensive education is especially suitable if:

* the aim of the information is helping realising the aims of the trainees, or solving communal problems;
* the aim of the information can be linked to the aims of the trainees;
* trainees adapt their aims to the aims of the information.

In this research information is used to inform people (about environmental problems), to help people (to teach them in which way they can help solving part of the environmental problem) and to fulfil the aims of the trainees (to save money while saving energy).

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[20] *The National Report on Environmental Conditions in the Republic of Belarus 1994* the Ministry for National Resources and Environmental protection of the Republic of Belarus, Minsk, 1995, p.96

Taking all which is mentioned above into consideration, this leads to the following research goal:

Contributing to the awareness with respect to the environment by the design of an 'environmental awareness course' for young people in the age group 15-18 years in Minsk, Belarus.

As is explained in the next two chapters, in preparation of the design of this research goal two important studies are also necessary. To determine the main points of attention, with respect to environmental problems, ***an inventory and analysis of major environmental problems in Belarus*** is conducted. Secondly ***a description and analysis of views of young people (in the age of 15-18) with respect to the environment*** is carried out.

All steps made to answer the three research goals are described in detail to show the Belarusian counterpart how they can carry out this sort of research. So when they want to perform a research of this kind next time, they know which steps to take and which choices to make. The choices made and the results are, where necessary, emphasised and further explained. Schedules are presented for different parts of the research to provide a systematic approach.

Chapter 2 Research questions

In this chapter the main research questions are formulated based on the research goal. In preparation of designing a useful training course, it is necessary to focus on the most important environmental problems and the view of young people with respect to the environment. That is why three main questions are defined with respect to:

1. the environmental conditions of the Republic of Belarus;
2. the opinion of people regarding those environmental problems;
3. instruction material and a possible theoretical framework of the training course.

Every main question is further specified in sub-questions. All sub-questions contribute to answering the main research questions. The last paragraph explains the structure of the report in relation to the research questions.

2.1 Main research questions

The main research question consist of three parts.

Research question 1:
How should a course in the field of environmental awareness be designed?

Research question 2:
What are the most important environmental problems in the RB?

Research question 3:
How do students in the age 15-18 years view environmental problems in the RB?

2.2 Sub research questions

For each of the above mentioned questions, a number of sub-questions are formulated and put in logical order. All sub-questions contribute to answering the main research questions.

Research question 1: Design of a course/instruction material
How should an environmental awareness course be designed?

a. Will a course be necessary?
b. If so, what are the general objectives?
c. In which form will the course take place (one day-more days)?
d. What will be the tasks of the participants?
e. What will be the concrete learning objectives?
f. What should be the contents of the course?
g. Should the course be developed based on the EcoTeam-approach?
h. What will be the criteria necessary to evaluate the course afterwards?
i. Which instrument should be used to evaluate the course?
j. If a course is not the best suitable way to increase environmental awareness, can instruction material be designed?
k. If so, what kind of instruction material is necessary?

Ad research question 2: Analysis of environmental problems in the RB

a. *What are a country's general characteristics in the field of environmental aspects?*
b. *How can these characteristics be described?*
c. *Which of these general characteristics are specifically relevant with respect to people's opinion towards environmental problems?*
d. *Can those characteristics be categorised?*
e. *Which standards are present to determine the seriousness of environmental problems?*
f. *Which standards are present to determine the effects of environmental problems in the future?*
g. *Which characteristics can be influenced by people's activities?*

Ad research question 3: student's view on environmental problems

a. *What kind of information about environmental problems is available to students of both schools?*
b. *What do students actually know about environmental problems?*
c. *Are students interested in environmental problems?*
d. *What are the main subjects in which students are interested?*
e. *How can students be taught about environmental problems?*
f. *Do students think that they can influence the environmental condition of the RB?*
g. *Do students foresee problems in the future because of the environmental pollution?*
h. *Do students feel that their behaviour is satisfactory?*
i. *How can the student's attitude towards nature be influenced?*

2.3 Continuation of the research

In the next chapter, the methodology to answer the research questions will be explained. The inventory and analysis of environmental problems in Belarus and a description of the place environmental subjects take in the society of Belarus are presented in chapter 4. The inventory and analysis is also carried out for environmental problems on global and continental levels. Those results are described in appendix I. Chapter 5 then describes the theoretical background for answering research question 2. The results of investigating views of young people with respect to the environment are elucidated in chapters 6 and 7. Chapter 8 describes the structure of designing the training course.

In the appendices the theoretical background of 'environmental problems in Belarus', the concept 'environmental awareness', 'communication' and 'training courses' are described.

Chapter 3 Methodology

In this chapter the structure of the research is explained. The main research goal is to contribute to awareness with respect to the environment by designing an environmental awareness course. In paragraph 3.1 the theoretical framework for designing a training course in general is presented. All steps are discussed shortly. The formulation of the main training objectives and the concrete learning objectives are described more extensive to emphasise the main goals of the training course. On basis of the research questions, a further approach to the research is explained.

3.1 Design of an environmental awareness course

In this paragraph a general theoretical design of a framework for developing a course is presented, in order to answer research question 1:

How should a course in the field of environmental awareness be designed?

Theoretical backgrounds about communicational aspects and the choice for a training course are presented in appendix I. More theoretical background about the different steps in the design is elaborated in Appendix II.

This concerns the preparatory steps[21] to develop the training course. Also some general aspects that have to be taken into account while carrying out the research in the RB to design, execute and evaluate the training course are explained. The method of developing a training course is a combination of indicators mentioned by Kessels & Smit (1989), Bergenhenegouwen e.a.(1992) and SHV-Bedrijfsopleidingen (1992).

The development of the course is directed to its objectives in a planned way. In this case it contains 15 steps which are depicted in the figure below.

Step 1: mapping internal and external developments
In comparison with Kessels and Smit's model changes have been made. First, a step is added according to Bergenhenegouwen. This step is step 1. Mapping internal and external developments. This is necessary to a draw a clear picture of the general circumstances in which the course takes place. It is important to know the general problem setting and the practical implications for a country or a specific organisation to adapt the course as much as possible to local circumstances. In this case step 1 consists of a **description of the role 'the environment' plays in the society of the RB** (internal mapping) and secondly of an **inventory and analysis of environmental problems in the RB**. The method used to perform this inventory and analysis is described in paragraph 3.2. This step differs from step 4: performing task analyses, because in this step the opinion of people which will follow the course will be determined. Striking results of the task analyses will be used in the general design of the training course. This to avoid general theory in the course. The method used to determine people's view with respect to environment is explained in paragraph 3.3.

[21] Based upon: *Leerdoelen, in: Handboek voor opleiders in organisaties*, J.W.M. Kessels & C.A. Smit, Deventer, 1989

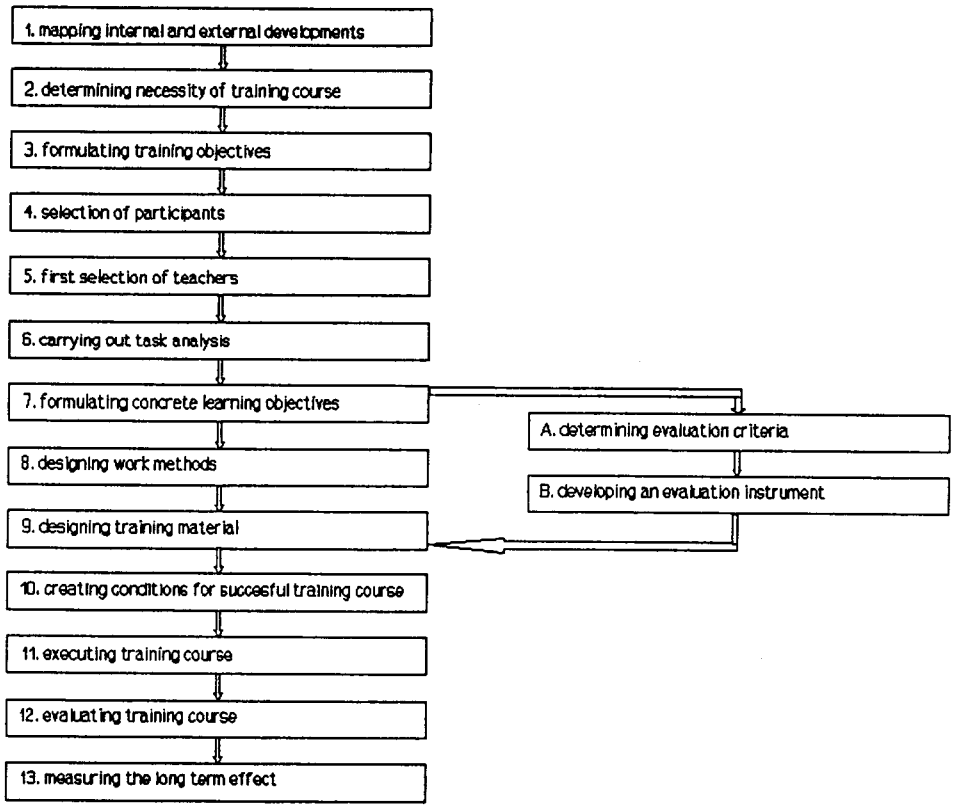

Fig. 3.1: Theoretical framework to design a training course

Step 2: determining the necessity of training course

In this research we chose to use a training course to inform and educate people about environmental problems and the way they can help themselve, in their own households to solve these problems. However, the choice for a training course is not always the right one. Sometimes, general instruction material as brochures, or the opposite more intensive, enduring help is necessary.

Step 3: formulating the main training objectives

Based on the mapping of the internal and external developments and the necessity of training, in general the principals (management or heads of organisations) have to define the general training objectives. Main training objectives are the general description of the qualifications a trainee can obtain with the help of the course.

In this case the *main training objectives* are:
Gaining more knowledge about the need to change bahviour by:

- creating more awareness in the field of environmental problems in the light of sustainable development;
- contributing in solving part of these problems by demonstrating small actions people can undertake in their own households.

Step 4: selection of participants
Selecting participants is put forward, because it is necessary to know the general characteristics of the participants before the course is started (see also 5.6 Task analysis). Depending on these characteristics the general framework has to be adapted.

Step 5: first selection of teachers
I think it is important to carried out a first selection of teachers, before formulating the concrete learning objectives. The reason for this is, that in this way the future teachers will be much more involved in the backgrounds, the general, but more important the specific ideas behind the training course. Especially in a country, like the RB, where this form of information is not commonly used, it is important to teach the trainers the basics of the training course. When small changes are necessary, possibly depending on the target group, the teachers can convey those themselves.

Step 6: carrying out task analyses
Besides avoiding general theory, the task analyses is also necessary to determine where exactly the trainees are engaged in. During this task analysis **people's view on environmental subjects is determined**. A survey and questionnaire are used for this purpose. For further methodology we refer to paragraph 3.3.

Step 7: formulating concrete learning objectives
Learning objectives have different functions. They can help with determining the contents of the course, or help designing the course and choosing the work-units. They can also serve as mean of communication between the trainer and trainee, trainer and lecturer, trainer and principal and mutual trainers.

In this case learning objectives are defined in order to fix the aimed results and secondly to help designing work-units (in practice the whole course).

The learning objectives influence the method of evaluation, the choice of the trainer and the contents of the course.

By enlarging the public awareness of people, an increase in their concern in environmental problems can be achieved. This can be done by:
1. enlarging knowledge about the RB's environmental problems now and in the future;
2. enlarging knowledge about the consequences of environmental problems, directly related to the trainees;
3. enabling trainees to start small actions in their own household to contribute solving part of local environmental problems;
4. increasing knowledge about need to change behaviour from a passive into an active one;
5. stimulating self reflection of behaviour with respect to specific environmental problem.

The final elaboration of the design of the training course and the instruction material is presented in chapter 8. Still some aspects have to be taken into account before the training course is designed, namely:
1. perfect translation is necessary. An interpreter during the first run is a necessity to avoid language problems as much as possible.
2. the training course will also be submitted to professors of university students. This, to obtain their opinion about how applicable the course is for older students.

Steps A and B: determining evaluation criteria and developing evaluation instrument
Three evaluation criteria play a role. The first one is directed to the effectiveness of the training course: has the information provided reached the aim. The second one involves the actual content of the training course and the way the different subjects are presented. The last form of evaluation concerns the long term effect.

Step 8 and 9: designing work methods and instruction material
In general the task analysis and the learning objectives have to be translated into an effective training program. The so-called screen method has been developed for this purpose. The screen method consists of the following steps (van Haastrecht, 1996, p. 74):

1. Determine the learning objectives (is done during step 7);
2. Split each learning objective into sub-learning objectives;
3. Brainstorm to choose the best suitable form for each sub-learning objective to realise each sub-learning objective (work-unit);
4. Determine for each work-unit its attractiveness for the program (for example with the help of ++ for very attractive and -- for not attractive at all);
5. Determine the necessary amount of time for each work-unit;
6. Make a screen and fill in those parts of the program that are known;
7. Fill in the rest of the program with a selection of the work-units determined under point 3. Aspects that have to be considered are attractiveness, variety in instruction material, the group process and so on.

Steps 10 and 11: creating conditions for a successful training course and executing the training course
The conditions for a successful training course depend on the situation in which the course is performed. For instance, the place where the course is given, the trainer and the instruction material is important. In general a good preparation is necessary.

Step 12 and 13: evaluating the training course and measuring the long term effect
The course is evaluated according to the method chosen. The long term effect is not measured during this research. There was enough time to set up a scientifically based measurement method for long term effects. Only recommendations regarding this part of the study will be given.

3.2 Environmental problems in Belarus

In this paragraph the steps to answer research question 2a -*What are the most important environmental problems in the RB?*- are presented. It is methodology of elaborating the mapping of internal and external developments, with respect to environmental problems in the RB. Internal developments refer to the place the environment takes in the society of Belarus. A picture of external developments is drawn by making and inventory of environmental problems in Belarus and analysing the results of the inventory in the light of providing a sustainable future for Belarus.

3.2.1 Mapping internal developments
According to a description of relevant institutions a picture is drawn of the role 'the environment' and environmental protection plays in daily life in Belarus. It does not include an environmental assessment, but the way in which environmental activities are displayed at all levels of society. The institutions politics, economics, education and kinship and their effects on environment are discussed. Also aspects of involvement are described to draw a picture of current behaviour. Indicators are presented to determine the seriousness of environmental

problems. The indicators and their usage are discussed as well. The information is obtained from literature and interviews are conducted with key persons. These key persons are representatives from the Ministry of Nature Protection and Minsk Ecology Committee, representatives from different NGO's, students and teachers from universities (Poly Technical Academy, the Sagarov Institute, Belarusian State University) and secondary schools. I also attended a seminar about ecological education, and the results of this seminar are also used in the report. By mapping all these internal developments and analysing the information gathered, characteristics that can be influenced by people are extracted to design a useful training course. The results of the mapping of internal development is presented in chapter 4, paragraph 1.

3.2.2 Mapping external developments

Industrial processes are never perfectly clean. There are always some waste products. Industrial pollution does not just involve direct emissions from production plants. The product itself will often not be a big environmental problem, until it is used (think of cars, fertilisers and pesticides). If the product can not be recycled and reused, it will be disposed after usage and various of those disposed products contain a huge polluting content.

Environmental problems can be divided in global (the earth's), continental (Europe, the Common Wealth of Independent States, the Baltic States and Georgia) and national (the Republic of Belarus) problems. All four aspects are described in appendix III. The emphasis will be on national problems. It is important to draw a picture of the global and continental environmental problems as well. In this way it can be determined which problems are most relevant for the RB. Also solutions and actions taken all over the world can be related to these problems.

Environmental problems are described in different ways. Initially this was done practically by classifying the problems in the way they harm the environment. Examples are: air pollution, pollution of soil. Later, environmental problems were described in a specific structure. Different structures are used. One way is to describe the problem according to it's effects on the threatened compartments air, water and soil. Structures based on processes, effect-processes such as acidification and the effects of abundant usage of fertilisers and the processes pollution-corroding-exhaustion are also used. Another structure that is often used is the life-cycle-analysis method. With this method the entire life-cycle of products from the extraction of raw materials to the destruction of products is mapped. This concept is very useful when effects of certain polluting components are discussed. Environmental impact assessments are mainly based on this structure.

All structures have specific characteristics which can be used for different goals. According to the Committee Long-term Environmental Policy (CLTM) in the Netherlands, a structure to describe environmental problems for long-term policy recommendations has to comply with two terms. Analyses regarding the structure should be possible in a consistent way. The structure has to be identifiable and relevant for social and political activities in order to formulate new policies.

The method developed by the CLTM will be used in this chapter to make an inventory of environmental problems. The model is descriptive-explorative and describes which environmental problems exist. A scheme can be filled in and the results can be analysed in a consistent way. The environmental problems of the RB in that way can be compared with the global situation and all environmental problems are placed in a broader context.

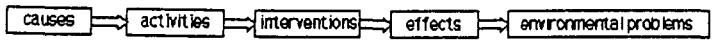

Fig. 3.2: *Structure to inventorise and analyse environmental problems*[22]

Causes are defined as social problems which are at the basis of environmental problems. Besides environmental problems at different levels, there are also different sources which cause environmental deterioration. Like population growth (global level) all human activities cause, to a certain extent, environmental problems. *Activities* are more specific social phenomena, processes and situations. Examples of those activities are the industry, transport, energy supply, consumers and recreation. *Interventions* are activities of adding and/or extracting natural and antropogene, renewable and not-renewable natural resources and energy supplies.
Effects are classified as indirect or direct and are directed to air, water, soil and living creatures[23].
The emphasis will be on causes, the present situation, recent interventions and a list of environmental problems. As stated in the introduction, the *environmental problems* will be inventorised at global, continental and national levels.

The results of the inventory and analysis of environmental problems in Belarus are described in chapter 4, paragraph 2. Detailed information regarding the extensive inventory and analysis can be found in appendix III.

3.3 Student's view with respect to environmental problems

The main question that has to be answered is:

How do students in the age of 15-18 years view environmental problems in the RB?
(This is research question 3.)

This question contains sub-questions, which answers will lead to answering the main question. The sub-questions are also described in chapter 2. In order to analyse the student's view with respect to environmental problems, a survey was carried out among students from 15-18 years old. The methodology of the research is divided in a theoretical and an experimental part.
The theoretical part consists of:
1. formulating problem (paragraph 3.3.1);
2. formulating aim(s) (paragraph 3.3.1);
3. performing literature study (chapter 5 and appendix IV);
4. determining units of analysis: defining and describing concepts (paragraph 3.3.2);
5. designing theoretical model (chapter 5);
6. translating definitions to variables (appendix V).

The experimental part consists of:
1. defining population and research units (paragraph 3.3.3);
2. describing sample and sampling method (paragraph 3.3.4);
3. collecting data (paragraph 3.3.5);
4. analysing data (chapter 6 and 7);
5. interpretation of results (chapters 6 and 7).

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[22] *Milieu: denkbeelden voor de 21ste eeuw*, Commissie voor Lange Termijn Milieubeleid, Kerckebosch, Zeist, 1990

[23] *Nationbaal Milieubeleidsplan, Kiezen of verliezen,*, Ministerie van VROM, SDU, 's-Gravenhage, 1989, p.52

Step 3 of the theoretical part and steps 5 and 6 of both the theoretical and the experimental part are not discussed below. An extensive review is presented in the chapters mentioned.

3.3.1 Problem definition and formulation of aims

The problem definition was the same as research question 3: How do students in the age of 15-18 years view environmental problems? In other words: what influences a student's view on environmental subjects? The aim of the survey was to answer the sub research questions 3 as mentioned in chapter 2. In this way a picture can be drawn of the way the research units view environmental problems. In other words, the survey is conducted to determine the usefulness and the content of the training course. Also the willingness to participate in the training course was investigated.

3.3.2 Literature study

The literature study was performed to determine the variables that describe environmental awareness, attitudes and eventually behaviour. Those variables then were made operational to formulate the questions of the questionnaire. Later the literature was used to design a theoretical model and to formulate hypotheses to test the theoretical model. The result of the literature study are presented in chapter 5 and appendix IV.

3.3.3 Units of analysis

The units of analysis during the study were:
* general characteristics;
* knowledge;
* involvement;
* perception of risks;
* social dilemma;
* willingness to change;
* feedback;
* attitude.

These units of analysis have been chosen on basis of the literature study as presented in Appendix IV. The definition and description of the unit of analysis is presented in chapter 5, the elaboration of the theoretical model.

The question was what kind of information that should be provided as well as the extent to which the information should be specific or general. Generally can be said that the level of knowledge with respect to the environment of the students in the Republic of Belarus at this time can be compared to the level of knowledge in the Netherlands about twenty years ago, when environmental problems were first brought under the attention of the citizens.

3.3.4 Formulation of the theoretical model

The theoretical model is designed to determine how the variables influence the student's attitude with respect to the environment. This was the basis to conduct the research with respect to the student's view on environmental subjects. The variables and their relations are tested by the questions in the questionnaire. The final theoretical model and the literature on which this is based is discussed in chapter 5. The theoretical model has not influenced the content of the training course, since the final design of the theoretical model and the testing of the hypotheses was done in the Netherlands. No suitable computer was present in the RB to use the statistical program necessary. The final theoretical model was not necessary to design the training course, since the information about the variables and, partly, their relations was already present.

3.3.5 Research units and the definition of the population

The population consisted of students of secondary schools. The training course is developed for students in the 10th and 11th grade, because these students have the age of pre-adults. The 10th and the 11th form are the two forms before graduating from secondary schools. The students prepare for entering university and for entering their adult life. In this age period they prepare also for going to live on their own. It is essential that in this period of time, correct customs and habits with respect to the environment are developed, so that they apply these habits when they start their more or less independent live. The final definition of research units was: *'students in the 10th and 11th grade of the investugated secondary schools'*. The population of the study, thus, consisted of all students in the 10th and 11th grade of secondary schools.

3.3.6 Type of research

The research was a survey. In this part of the research, to obtain an overview of the situation in the RB, concepts with respect to attitudes are investigated for a group of units of research. No causal hypotheses were tested so a survey is extremely suitable for this purpose. Conducting a survey, a large number of research units (the students) can be questioned about a large number of variables by one measure (the questionnaire) at one moment (or a small time period). Before the final questionnaire (see data collection) was distributed among the students, a pre-survey was carried out. During the pre-survey about 5 students per school-type (school 5 and 24) were interviewed in order to develop the final questionnaire. The pre survey was held among the students of the ecological club of school 24, a group of students of both school 5 and the Belarusian Folk High School. The pre survey was carried out for the following purposes:

1. to check the formulation of the questions;
2. to check the order of the questions;
3. to check the relevancy of the question;
4. to check the answer possibilities;
5. to check the validity of the questions;
6. to check whether the students were familiar with the ways of answering a questionnaire.

The pre survey is further elaborated in appendix VI.

3.3.7 Sample and sampling method

The sample consists of the 10th and 11th grade classes with English as a major course of two schools. *School 5* is a normal secondary school, in which every student can participate, independent of their parents social status. *School 24* is a rather elite school in which students get excellent education, foreign languages and, to a certain extent, ecology classes. The students from this school 24 are trained to become policy makers and opinion leaders in the future. Considering their level of education, these students maybe contain 'the highest level of environmental awareness' possible in the Belarusian educational system. The other school, school number 5, a gymnasium, does not have an ecological club. The school takes part in students exchanges with the Eckart College in Eindhoven.

The choice of the two schools is based upon their differences in character with respect to the key positions the parents of the school 24 students have in comparison to the school 5 students and more important to the difference in activities with respect to the environment. School 5 follows the normal school program. School 24 has an ecological club and is involved in an international project about 'Living healthy!". Only students with English as first foreign language were involved in the sample.

In school 5, the 10th and 11th grade contained about 100 students and the 11th grade (including the classes with German as first language) contained about 160 students. Finally 101 students of school 5 and 118 students of school 24 filled in the questionnaire.

3.3.8 Data collection

Data were collected by carrying out a questionnaire among the sample. The questionnaire was designed according to the concepts which were made operational. A questionnaire was chosen, because in this way a lot of questions could be asked in a relatively short period of time. In school 5, I was given the opportunity to have the students fill in the questionnaire during the English classes. The questionnaire contained an instruction paper, explaining the methods of answering the questions. Some classes were filling in the questionnaire, but I was able to visit each group to help the students if necessary. In school 24, the students of the ecological club took care of the distribution. They had filled in the questionnaire themselves as well and they were instructed also. Those students were already familiar with the way of questioning, because they had already helped in the earlier research about the feasibility of EcoTeams in Minsk. The questionnaire contained only closed questions, sometimes with options to explain the answer. Our former questionnaire showed that people do not fill in easily open questions[24]. The questions are based on the units of research. The questionnaire was formulated in English, but following to the results of the pre survey, some translations were added.

3.3.9 Data analysis

The data collected are analysed in two ways. First percentages of respondents are calculated using Excel. These results were used to determine

1. the level of knowledge of the units of research;
2. the level of involvement to the environment of the units of research;
3. the view with respect to the future of the units of research;
4. the level of social dilemma of the units of research;
5. the willingness to change of the units of research;
6. the influence of feedback;
7. the attitude with respect to the environment of the units of research;
8. the interest in a training course;
9. the final aim and concrete learning objectives of the training course;
10. the contents of the training course.

These 10 aspects are discussed in chapter 6.

Back in the Netherlands, the data were also processed using the Statistical Program for Social Studies (SPSS). According to the theory found, and on basis of the theoretical model, hypotheses were formulated. The theoretical model was verified by testing the hypotheses as formulated in paragraph 5.3. The procedures used in SPSS are listed below, but the explanation of the procedures can be found in appendix VII.

SPSS is used to perform consecutively:

1. factor analysis, including KMO-tests and Bartlett tests of sphericity to test whether factor analysis is allowed;
2. reliability analysis: to determine the extent to which the items in the questionnaire are related to each other
3. calculation of frequencies to see whether factors have to be recoded;
4. recode: on basis of results of frequencies;
5. compute: new factors are computed and named;
6. crosstabs: all variables are compared to each other to determine possible linkages;
7. bivariate correlation: to determine the strength and the direction of the linkages;
8. comparing test results with conceptual model.

The results of the SPSS analysis are presented in chapter 7.

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[24] *Feasibility of EcoTeam approach in Minsk, Belarus*, P. Boekhout, W. Haans, C. Spreij, 1997

3.4 Structure of the report

In the next chapter the inventory and analysis of environmental problems in Belarus and a description of the place environmental subjects take in the society of Belarus is presented. The inventory and analysis is also carried out for environmental problems at global and continental levels. Those results are described in appendix III. Chapter 5 then describes the theoretical background for answering research question 2. The theoretical model as a basis for further investigation of the student's view on the environment is explained. The results of the investigation of views of young people with respect to the environment are elaborated in chapters 6 and 7. Chapter 8 describes the final design of the training course. Chapter 9 consists of conclusions and recommendations.

Chapter 4 Environment in the Republic of Belarus

In this chapter the mapping of internal and external developments is elaborated upon to determine the main points of attention in the training course. The place the environment takes in the society of Belarus is discussed according to a description of aspects of involvement of the government, the industry and the population in environmental issues in Belarus. A picture of external developments is drawn by making and inventory of environmental problems in Belarus and analysing the results of the inventory in the light of providing a sustainable future for Belarus.

4.1 General problem setting: The place of the environment in the RB

The main question that is answered in this paragraph is: what are a country's general characteristics in the field of environmental aspects? This question does not include an environmental assessment, but the way in which environmental activities are displayed at all levels of society. It therefore also depicts the place environment takes in daily life of people in Belarus.
The aim of this paragraph is to describe the obstacles people can experience and which hamper the implementation of the attitude into behaviour. The reason an attitude is not always applied in real life can have several reasons. These reasons are described according to relevant institutions (economics, politics, education and kinship) also mentioned in chapter 1.

4.1.1 Kinship

When the place of environment in the society of Belarus is studied, Belarus can be compared with Albania (Maluka and Qirjo, in conference paper 9, 1993). After the collapse of communism, processes of economic and political adjustments introduced a new concept of 'environment' to people. During the communistic regime, the environment was a taboo subject. Environmental problems were treated as solved, although, in reality, they were just hidden or obscured by other issues. The process of democratisation brought to light many environmental problems, but environmental awareness has not been developed to a satisfactory level. It is overshadowed by other acute economical problems. Like the Albanians, Belarusians regard environmental problems as issues of secondary importance and others pay no attention to them at all. Nowadays, more and more people are getting involved in environmental activities, however still no political 'green' party is present, nor a significant level of environmental education. The very difficult economic situation is still confronting the population.

Another problem that occurs is the contradicting attitude of parents and their children. A specific example is described in 'The EcoTeam approach in Minsk', 1997. A group of students started to implement the EcoTeam approach in their own households and met quite severe problems with their parents. Some of them were willing to try to change their behaviour as well, others were ignored or even thwarted. This caused difficulties in families.

4.1.2 Politics

To draw a picture about the involvement of government in environmental issues, the following characteristics can be distinguished:

- environmental protection
- monitoring of environment
- prevention of environmental problems
- existence of non-governmental environmental organisations

A differentiation has to be made between ecological and environmental subjects.
Ecological subjects deal with nature in general, the way flora, fauna, and human beings exist on earth: their influences, their effects, the life cycles and disturbances. Environmental subjects refer to the surroundings, the state of nature as a living environment.

In paragraph 1.1.2 the official political structure is explained. As can be read, officially a lot of ministries, committees and other organisations are involved in ecological subjects in the RB. It is not known which of them specifically are involved in environmental subjects. Environmental protection, monitoring of environment and prevention of environmental problems are given a place in the structure. However, what actually is implemented and accomplished is seen when crossing for instance the capital Minsk. Severe air pollution and the waste problem are very obvious. After an interview at the MinNature with the responsible person of environmental education and propaganda, it became clear that the problems are known at governmental level, the knowledge how to solve the problems as well. However, the financial resources are few and often from even higher in the hierarchical structure, initiatives are rejected.

The public environmental organisations as described in the brochure mentioned in paragraph 3.2.1 are: the association of professional ecologists, Belarusian department of the International Academy of Ecology, Belarusian social and ecological union 'Chernobyl', Belarusian society of reservation of nature, Belarusian society of hunters and fishers, Youth ecological movement 'Belaya Rus', and the Independent Belarusian Ecological science and production association. The Belarusian society of Reservation of Nature is situated in Minsk and exploits 'the House of Nature'. This is an official organisation supported by the government. This 'House of Nature' among other things, organises expositions related to nature. The one I visited was incredible: a room of about 50 square meters containing small cages with tropical animals as guinea pigs and agapornisia (small parrots), spiders, but also apes, a lynx and ant eaters. They had very little space, people could touch the cages and scared the animals and fed them with candies and cookies. The cages were not cleaned and contained plastic leftovers from the candies. The people who were guarding the space did not warn the people at all. This exhibition was a travelling exhibition through Belarus.

The government has started campaigns to stimulate saving of energy and water. Much more is known about the consequences of the Chernobyl disaster as well, but environmental activities still are not a point of high priority at governmental level. This harms initiatives from civilians at schools, NGOs or just individuals.

4.1.3 Economics

The problems with energy supply are causing severe economical problems for the whole country and affect the energy and water situation in the households. The RB depends heavily on the co-operation with Russia regarding energy supply since they import 80% of their fuel supplies from this country. Since the RB's independence a special agreement between the two countries is in force which states that Belarus does not have to pay the world market price for energy supply. Since April 1997, the alliance between Russia and the RB is even closer. Still, the world market prices increased and Russia naturally increased its prices as well. The RB, therefore, also had to pay more. However, it was important for the government to maintain the support of the people, so the prices for energy remained practically the same and are much under cost price. The industry was charged considerably more than households. The existing distortion in tariffs provides a cross-subsidy of the population at the account of the industry.

The Ministry of Housing and Communal Services and the Ministry of Economics eventually are responsible for setting the prices. Prices are likely to increasefor some time to come and

the increase should be such that the consumers are going to pay approximately 80% of cost price.

It has to be stated that these problems of cross subsidy and financial problems in households, hardly play a role in daily life of students. Energy and water prices are not of their concern, because they are not paying the bill. It does not play a role in their life yet, but they have to be taught that that is going to change in a few years. Then it will be even more difficult to change their behaviour. Saving energy and water is necessary, this also in connection with air and water pollution. Nowadays there is a major inefficiency in water and energy usage. In future prices have to rise and people will not be able to pay those prices. The students from now, in several years will have their own households, and develop their own habits

4.1.4 Environmental education

The information in this paragraph is based on the results of meetings with key persons and the result of a seminar with a session called 'environmental education'. First I want to state that a difference should be made between ecological and environmental education. Ecological education also involves nature in general, the way flora, fauna, and human beings exist on earth: their influences, their effects, the life cycles an disturbances. Environmental subjects refer to the surroundings, the condition of nature as a living environment for flora, fauna, human beings as well as property and cultural inheritances. So when ecological subjects are discussed this not necessarily means that environmental problems are discussed as well.

Environmental education plays a role in every aspect of conservancy. People should be made aware of the environmental situation, problems, risks, the norms, the effects now and in the future and the way they can participate in creating a more liveable world. Measures directed to the source (people as consumers and polluters) is more important than combating the effects of their actions, because a single source can cause more detrimental effects. The need for environmental education was once more stressed in 'The final text of agreements negotiated by Governments at the United Nations Conference on Environment and Development' (UNCED) in June 1992 (Rio de Janeiro, Brazil), known as 'Agenda 21' as well. Education , raising public awareness and training are said to be linked to all areas in this Agenda:

'Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. While basic education provides the underpinning for any environmental and development education, the latter needs too be incorporated as an essential part of learning. Both formal and non-formal education..... are critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development.....'

Moreover, environmental education of children and young adults is necessary because they will be on one hand the main polluters in the future, but on the other hand they will determine general opinions and make decisions at either local (their place of residence), national (their country), continental or global levels.

During a seminar of the International Educational Centre of Minsk on 6th of February, in an ecological education section, six major problems concerning ecological education in the Republic of Belarus and more specific in Minsk were formulated.
First, different ecological classes are given. It totally depends on the interests of the teachers in the schools how much and in which form ecological classes are provided. Nothing is organised, no guidelines are developed which topics should be discussed, no literature is recommended. This constitutes the second problem: the system of ecological education is not

differentiated. The third problem emphasises the lack of specialists to teach the students about environmental problems. This is a result of lack of money (the fourth problem), but even more a lack of environmental awareness of all people (the fifth problem), but especially grown ups. They do not feel responsible for their general living environment. Ecological education is necessary for all people of the Republic. It has to be a form of psychological education of people concerning environmental problems -in other words- increasing their environmental awareness. At this time the government does not participate (the sixth problem) in providing a method to start decent basic ecological education at secondary and even primary schools.

Neither in school 5, nor in school 24, both schools involved in this research, ecological classes are a part of the system. However, in school 24 an ecological club is present. This ecological club does not concentrate only on environmental related subjects, but also on the living environment and healthy life in general. Lessons of geography, biology, English, etc. are used to inform students about environmental problems. In school 24 a special project was also dedicated to the effects of the Nuclear Power Plant accident in Chernobyl. Besides the effects, ways to protect yourself and necessary medication was brought under the attention of the students. The extent to which students are brought into contact with environmental problems depend on the interest of their teachers.

The only secondary school that has special ecology classes is the Poly Technical gymnasium. The lectures discuss three main issues, namely a general basis about how nature maintains itself, secondly, how nature can be influenced and monitored and thirdly about radio-activity and consequences of radio active radiation. At this gymnasium students are specially prepared to enter the Poly Technical Academy.

There are several organisations which are involved in ecological education. On governmental level this is the Republican Educational Centre, which has a special department for ecological education. In the city of Minsk, a City Environmental Centre and the methodological centre, which is responsible for preparation of school programs and ecological programs, are present as well.

4.1.5 Technology

Although I do not think of technology as an institution, a special paragraph is added to discuss the influence of technical possibilities of households to help solving environmental problems. It depends a lot on the housing situation of people whether for example energy and water saving activities are possible (see also ' Feasibility of EcoTeam Approach in Minsk, Belarus', 1997). Especially the absence of water and gas meters makes people think they can not save energy and water. Technical appliances which save energy and water are not always available and if available (for example energy saving lamps), they are too expensive. There is no system waste separation and waste collection is done carelessly. Initiatives of students to start a battery collection and system of disposal was not supported by the municipality, nor the government. Of course there are also small, cheap technical activities as placing draught stoppers, and collecting glass, which can be stimulated. People should become more aware of those possibilities.

4.2 Inventory and analysis of environmental problems in the RB

The national environmental reports of 1994 and 1995 direct their attention to the environmental problems of air, soil, water and the consequences of the Nuclear Power Plant Accident in Chernobyl. The same strategy is followed in the Belarus Environment Strategy Study, prepared in 1993 by the World Bank. However, the RB has almost no natural resources as well. Problems related to energy supply and the necessity of saving activities are also discussed in the document of the World Bank and in this report.

4.2.1 Air pollution[25]

The main sources of air pollution of Belarusian territory originate from industrial enterprises, power engineering and motor transport. In 1994, the listed sources discharged 2082.2 thousand tons of pollutants to the atmosphere. The majority of these were produced by transport. The content of the discharges was made up of carbon oxide (54.2%), sulphur oxide (15.3%), hydro-carbons (12.5%) and nitrogen oxides (9.1%). The majority of the pollutants from stationary sources are part of the enterprises of the Ministry of Energy. Among the Belarusian cities, the highest volume of pollution in 1994 was measured in Minsk. The contribution of the city transport to the total discharge is 72.7%. During transport in the atmosphere, emissions of sulphur and nitrogen oxides and volatile hydrocarbons are transformed into sulphuric and nitric acids, ammonium salts and ozone. They deposit on the ground in dry particles, rain, snow, frost, fog and dew. During the past years a tendency towards decreasing volumes of pollution has taken place. The main reasons for this were the results of the air protection measures introduced in the second half of the 80s and the consequences of the economic crisis in the 90s. The latter refers to the decreasing production activities of the industry. Atmospheric pollution is not only a local urban-industrial problem involving people's health. It is a much more complex issue, encompassing materials and ecosystems. The pollutants from the air also cause severe damage on land and water, they corrode buildings, metallic structures and vehicles.

4.2.2 Water

Although the water availability in the RB is rather favourable, the problem of water protection from pollution is urgent. This despite the measures undertaken for sewage purification. Over a number of years (1980-1991), the intake of river and underground waters in the RB has grown, and reached a maximum value of 3055 million m3 per year in 1991. However, since 1992, a reduction of water consumption occured in various branches of the national economy. This is not a result of direct saving actions, but of a decrease in production. Water consumption in the industrial sector decreased. Still the industry and the households remain the main consumers of water (more than 57%) in 1994. Household used more than industry. In the Minsk oblast during the years the total water consumption on average remained the same. The percentage of fresh water economies remained the same despite the decrease of water usage from systems of recycling and repeated sequential water-supply.

In 1994, the hydro-economic balances of the main river basins were positive. The water resources were quite enough to satisfy water needs. However in dry periods and low-water years a deficit of water in some basins might occur, but this can be compensated at the expense of river flow regulation.

The most powerful source of water pollution is domestic sanitary sewage. The share of industrial waste water is 25% (in 1994). In total those two form 99% of the loading percentage from localised sources (Biological Oxygen Demand-value), 93% of suspended substances and

[25] The information in this and the following paragraph is based upon: *The National Report on environmental conditions in the Republic of Belarus 1994*, the Ministry of Natural Resources and Environmental Protection, Minsk, 1995

100% of petroleum products. Totally, during 1994, 0.45 thousand tons of petroleum, 16 thousand tons of organic substances and 18 thousand tons of suspended substances were discharged into natural water systems. One of the highest quantities of polluted sewage is discharging into the Svisloch river in Minsk.

The quality of river water in the RB is established according to the water pollution index (WPI), which consists of seven classes of polluted water. WPI is determined as 1/6 of total average concentration in relation to maximum permissible concentration of six parameters:
- dissolved oxygen;
- BOD5 (Biological Oxygen Demand value at 5 minutes);
- ammonium nitrogen;
- nitrite nitrogen;
- petroleum and
- phenols.

Several norms can be applied, but priority is given to fish industry norms, which have more rigid requirements. Most of the Belarusian rivers fall into the category of moderately polluted. The river waters basically have a low pollution level by BOD5 (organic substances), but petroleum is present everywhere in the surface waters: its concentration exceeding the norm by 2 - 9.8 times! The pollution of river waters by ammonium nitrogen is typical for the Svisloch and W. Dvina. Practically all rivers have nitrite nitrogen pollution. The most polluted river is the Svisloch (Minsk). The reasons for this are high loading (Minsk city dumps more pollutants than the other oblasts), insufficient sewage purification and urban purifying constructions and insignificant self-purifying ability of the river.

Underground waters are mainly used for domestic drinking water supply because they are rather clean. About 15% of total underground waters is used for industrial water supply. The quality of fresh underground water used for centralised water supply basically corresponds to the requirements of the State's Sectorial Standard for drinking water, except for the increased content of iron and manganese of natural origin. In 1994, however, the tendency of chemical composition change of underground waters already took place by separate components of MPC. In some cases the pollution was recorded at depths of more than 50-70 m (for example in Minsk, Brest, and Grodno). The underground waters are mostly polluted in urban areas, development zones, in regions of purifying constructions and reservoir settlers, filtering fields, tailing storage, dump, cattle breeding and poultry arms, mineral fertilisers and toxic chemicals warehouses. Then agriculture is a major polluter, because of it's infringement of mineral and organic fertilisers rules. In wells around urban settlements, increasing water mineralisation, concentration of nitrates, chlorides, sulphate, ammonium nitrogen, manganese and iron occurs. Also increased concentrations of petroleum, phenols, heavy metals and nitrates are often found.

Constant control of the content of caesium-137 and strontium-90 takes place in surface waters. In the period 1987-1994 it showed that the content of the mentioned radio-nuclides in water is much lower than the Republican Permissible Level in drinking water. In the first days after the NPP accident, the increase of radio-nuclides concentration in water was due to direct fall of it on the water surface. Now, the concentration is defined by secondary processes: exchange with bottom sediment, radio-nuclides washing out from surface of the river catchment.

It is obvious that the purification of water to obtain drinking water quality costs the republic an enormous amount of money. The more the surface and underground waters remain polluted, the more these purification activities will cost.

4.2.3 Consequences of the NPP Chernobyl disaster[26]

On April 26, 1986, a major accident took place at the 4th power unit of the Chernobyl Nuclear Power Plant (NPP). This NPP is situated 12 km off the southern border of the Republic of Belarus. After the explosion a great amount of radioactive substance was thrown out of the wrecked reactor into the atmosphere, Later the fall-out covered the territory of Belarus, the Ukraine and the western part of Russia.

As a result of the accident 23% of the Belarusian territory, where more than two million people inhabit 3668 towns and villages was polluted with caesium-137 over 37 kBq/sq.m. The contamination is not uniformly distributed over the RB. The rate of radio-active contamination in different areas depended on the nature of release from the damaged reactor and meteorological conditions. Despite the global effects of the accident, two thirds of radioactive substances fell on the territory of Belarus due to the prevailing direction of wind. The largest damage was caused to the oblasts Gomel and Mogilev. The highest rates that were measured were 2220, 2272 and 5402 kBq/sq.m. By the end of 1995 caesium-137 soil deposition rate had decreased by approximately 20% due to its natural decay.

The situation was aggravated by the fact that in some regions of the republic the areas of radioactive pollution coincided with those of high chemical pollution, which had existed earlier.

The demographic situation in the RB has changed to the worse after the Chernobyl disaster. Since 1986, the birth-rate has decreased almost by a factor two. The adult life expectancy went down. The mortality rate increased, including the infant mortality. People in the affected areas were questioned and more than 80% of those people believed that their health had worsened during and since the disaster.

A major part of the population has to live on the territories with higher density of radioactive pollution. In contaminated areas still people use domestic farm produce. This is the main source of influx of radio-nuclides into the human organism. People, in this way, become heavily exposed not only to external but also to internal irradiation.

Not only health problems occurred after the disaster, also socio-economic problems of adaptation for people resettled from the contaminated areas and financial problems increased. Belarus' total losses have been estimated at US $235 billion for the period from 1986 to 2015. The main contribution to these losses will be made by expenditures for eliminating and minimising the consequences. Still one fourth of the national budget is used for combating the Chernobyl effects.

What the effects will be for future generations is still not certain. Genetic effects and increased sensitivity of subsequent generations of mammals to mutagenic (being able to influence genetic material) effects of radio-nuclides are already found. A considerable amount of radio-nuclides accumulated in the upper layer of soil. Now soil is the major source of radio-nuclides in agriculture production. Radioactive pollution of ecological systems has created conditions which rule out normal farming and forestry activities for decades to come.

4.2.4 Energy deficits

Together with Armenia, Georgia, Latvia, Lithuania and Moldavia, the RB is one of the six states having virtually no energy sources of their own. Now, the RB completely depends on

[26] The information is this paragraph is based upon: ***Chernobyl, ten years after***, V. Jakovenko, Belarusian socio-economical union Chernobyl, Minsk, 1996, and ***The Chernobyl trace in Belarus***, Committee for Hydrometeorology, the Ministry for Emergencies and population protection from the effects of the Chernobyl accident, third edition, Minsk, 1996

Russia for its energy supplies. There is a special agreement between the two countries, but in times of scarcities in Russia, the RB does not obtain the amounts of oil and gas necessary. Then the economical crisis in the RB causes such lack of money that the energy bill is not paid. The RB's lack of natural resources can also be put in a world-wide context, because all over the world the natural resources are decreasing fast.

Fossil fuel combustion probably accounts for the major part of anthropogenic carbon dioxide emissions. It was reported that the atmospheric concentrations have risen over the past 200 years as follows:
carbon dioxide from 280 parts per million by volume (ppmv) to an estimated 353 ppmv in 1990; methane from 0.8 ppmv to an estimated 1.72 ppmv. Still it is said that "the unequivocal detection of enhanced greenhouse effect from observations is not likely for a decade or more". (World Energy Council, 1993).

In order to provide a sustainable environment for people, solutions in the sphere of energy sources have to be found to:
1. teach and change people to behave more carefully with respect to the natural resources;
2. find new, sustainable, energy sources.

4.2.5 Sustainable development in the Republic of Belarus

In December 1996 a document was released compiled by the Economic Planning Committee in which governmental plans based upon a sustainable development were described. The sorrow fact is that out of the contents of the document it can be said that the concept 'sustainable development' was not known by the writers of this document. Instead of decreasing transportation, decreasing wastes by industry, decreasing the use of natural resources, more employment, more industry and more transportation possibilities were suggested. Like in so many cases in this country, the idea was good, but the implementation poor. At the moment suggestions are formulated by experts, in the hope these will substitute parts of the document.
This situation clearly illustratess the state of the environment in the Republic of Belarus: it is subordinate to other problems, like the country's economic crisis.

4.2.6 Conclusion

The environmental problems as described above contain several differences and similarities. Especially the causes are the same at every level: urbanisation, industrialisation, population growth and an increase of welfare. It is obvious that better conditions for a lot of people brought unexpected harmful consequences. Most problems, however, people have to deal with now, orginated in the past.

Environmental problems are connected. Besides their mutual causes (social tendencies), their effects can also be divided in three categories:
1. breaking or changing life cycles;
2. more extensive use of energy;
3. neglect of quality aspects in production processes and products.
Breaking and changing life cycles expresses is a consequence of adding or subtracting different components of nature. Examples of this are diverse: from the surplus of carbon dioxide that is released in the atmosphere until dying out of certain species of vegetation and animals. The more extensive use of energy is the basis of a lot of environmental problems as can be seen in the table presented in the paragraph above. Efficiency and care for waste are still too low a priority in almost all countries. Not only (nuclear) waste of energy, but waste in general is causing major problems. Especially in developing countries, no system of separating paper, glass, chemical waste and biologic degradable waste from other waste is available. Factories producing chemical waste are often careless and still dump their waste in rivers, seas or the air.

Production processes should be closed, i.e. the waste streams during production should be minimised. Improvement of quality would extend the (economical) life time of products, producing less polluting waste. Another aspect that can be added is, that only products that satisfy the essential needs of man should be produced. However, this immediately refers to a sober life for most people. This is not necessarily the case, if people only would start thinking about the environmental consequences of the products they use and buy.

Environmental problems originate from a process of shifting or transferring. When decisions are made, the effects towards the environment barely play a role. The costs of deterioration are transferred to another level, to other groups of society or to future generations. Dumping waste in the sea as a matter of not having the troubles on land, in people's neighbourhood, is an example of transfer to another level. At the same time, fishes and other sea life are exposed to the waste (transfer to other groups) and no one knows what the effects for future generations of sea life, mammals and human beings will be (transfer to future generations). This is in all terms in contradiction to developing a sustainable world.

Some points of view of the last decades are the stand still principle (the quality of the environment should not decline), combat at the source (to remove the causes at the source of the pollution instead of resisting the symptoms at the effect-side), prevent unnecessary pollution and integrating environmental aspects in actions in every aspect of society. In order to combat in a sustainable way further deterioration, the three aspects mentioned above should be the basis. Closing life cycles of the *resources - production process - product - waste and emissions*-chain, saving energy together with efficiency improvement including using sustainable energy sources and encouraging quality of products and production processes, are the three major elements.

The key elements of sustainability regarding energy supply and energy use that have to be reconciled are:

- sufficient growth of energy supplies to meet human needs;
- energy efficiency and conservation measures, such that waste of primary resources is minimised;
- public health recognising the problems of risks to safety inherent in energy sources;
- protection of the biosphere and prevention of more localised forms of pollution.

In this research the elements **environmental awareness, energy and water saving activities** and **sustainable development** will be of major concern. The training course is designed to enlarge people's environmental awareness. To show people can help solving the environmental problems of their country, examples of small energy and water saving actions will be included. All the information is presented in the light of creating a sustainable world.
Reduction of carbon dioxide by energy efficiency and using gaseous fuels instead of oil/coal for domestic uses is necessary to reduce acidification and to reduce air pollution. Both environmental problems are really visible and perceptible for people. Therefore, the examples of energy and water saving can be used to show the use of the saving activities.

4.3 Aspects of involvement of people

The main question that is answered in this paragraph is:
How are the government, the industry and the population involved in environmental issues? To draw a picture about the involvement of government, citizens and industry in environmental issues, the following characteristics can be distinguished:

1. governmental structure concerning environmental issues, including:
   - environmental protection;
   - monitoring of environment;
   - prevention of environmental problems;
2. people's environmental awareness;
3. environmental education (is already discussed in 4.1.3);
4. existence of non-governmental environmental organisations;
5. industrial environmental awareness.

Industrial environmental awareness will only be discussed briefly to complete the overview, but it is not relevant for the rest of the reserach project.

4.3.1 Governmental structure with respect to environmental issues

Again the differentiation between ecological and environmental subjects has to be emphasised. Ecological subjects deal with nature in general, the way flora, fauna, and human beings exist on earth: their influences, their effects, the life cycles and disturbances. Environmental subjects refer to the surroundings, the state of nature as a living environment. When the place of the environment in the society of the RB is studied, the RB can be compared with Albania[27]. After the collapse of communism, processes of economic and political adjustments introduced a new concept of 'environment' to people. During the communistic regime, the environment was a taboo subject. Environmental problems were treated as solved. Although, in reality, they were just hidden or obscured by other issues. The process of democratisation brought to light many environmental problems, but environmental awareness has not been developed to a satisfactory level. It is overshadowed by other acute economical problems. Like the Albanians, Belarusians regard environmental problems as issues of secondary importance and others pay no attention to them at all. Nowadays, more and more people are getting involved in environmental activities, however still no political 'green' party is present, nor is there a significant level of environmental education. The very difficult economic situation is still confronting the population and overshadows all these things.

The governmental structure concerning environmental issues was, in general, already described in paragraph 1.2.2. In the brochure 'System of State management of Protection of Environment and State Control of Nature Exploitation in the Republic of Belarus', a scheme is presented containing the environmental management structure of the RB. Besides the president, the Cabinet of ministers, Committees and Ministries of the Supreme Soviet also executive committees and public environmental organisations on district level and in Minsk City are mentioned.

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[27] According to Maluka and Qirjo in: *Aspects of environment and education, working with youth groups,* Conference Paper number 9, Federal Ministry for Environment, Youth and Family, European Youth Exchange, Umweltbundesamt, Vienna, 1993

4.3.2 People's environmental awareness

This subject is described in detail in chapter 5 and appendix IV. A brief description is given below.

The state of people's environmental awareness in the republic of Belarus can be qualified as 'very low'. Little attention is paid to the effects people's actions have on nature. On a small scale, in small groups, initiatives have started to gain attention for the state of nature. Examples of these are NGOs, ecological clubs at schools, a separate Ecological Department at the Polytechnical Academy. In television programs time is reserved for environmental subjects. The government has started to prepare plans to base it's policy on sustainable development ideas and in several committees people are working on a concept for ecological (including environmental) education. Concluding: people are starting to be become more involved with environmental issues. However, those initiatives are not co-ordinated so the committees and organisations do not know from each other with which subjects they are dealing. All efforts are still plans and nothing has been actually implemented on a large scale.

4.3.3 Existence of non-governmental environmental organisations

However, more NGOs and also a number of ecological clubs at secondary schools are present which have innovating and useful activities. They provide people with information about nature in general and, for example, environmental problems. They organise camps, do research activities for other organisations, teach children how to behave better towards nature, organise discussions, start collection of batteries and so on. At MinNature the usefulness of non-governmental organisations (NGOs) is known, however this point of view is not shared by a majority of responsible policy makers and implementers. NGOs are important in stimulating environmental awareness and environmental activities among the population. A lot of people participate voluntarily in those organisations and the costs are relatively low. The number of non-governmental organisations occupied with environmental issues is a measure of the way people in a country voluntarily participate in environmental activities. Those people have a high degree of personal conviction that they fight for a good cause. It is difficult to discourage them, but repeated refusal of (financial) support is only enlarging that. This is surely the case in Belarus (according to interviews with several NGOs).

In general, the NGOs are founded by individual persons or groups of people interested in environmental subjects. Their budget is very low and generally they are looking for (inter)national partners to join their efforts. The NGOs are, among others, EcoLine, EcoPhone, EcoHome, For Mother Earth, Green Arrow, Assana, 'School 2'. The following schools have, among others an ecological club: the Polytechnical Gymnasium and the Linguistic College (school 24). The main problem of the NGOs is their lack of financial resources, lack of information and lack of co-operation by authorities.

4.3.4 Industrial environmental awareness

According to the ministry of Nature Protection, the industrial environmental awareness is still very low. Responsible people in factories and production plants often do not want to take the environment into account. This is due to mentality and lack of money. An example of the way of thinking is the following. The factory is rather closed for one or two days a week to reduce the energy costs, than money is invested to produce less energy consuming, which would pay itself back in a short time. People rather have to work with very little light than paying attention to the loss of safety.

More and more the government tries to stimulate the production plants to become aware of the effects on nature while producing. By granting subsidies and providing money for projects that can be formulated and submitted to the government, the authorities try to start a change in

attitude there. However, the choice of granting the amount of money to a specific company is rather doubtful. Also the evaluation of the projects is not always carried out according to the right standards.

4.4 Standards present to determine the seriousness of environmental problems

Standards can be of a chemical character for the maximum concentration of pollutants allowable in air, water, soil, or they refer for example to the minimal thickness of the ozone layer. Besides standards for pollutants in water, air, etc., environmental problems can also be classified according to their harmfulness to all aspects of life according to the definition of 'sustainable development' which includes activities not detrimental now or in the future for:

1. people's health (risk for human health);
2. nature and wildlife (ecological damage);
3. buildings, sculptures, other cultural inheritance (social or cultural impacts and economic loss).

4.4.1 People's health

Epidemoligical research is necessary, to discover trends in diseases. However, these researches are very expensive and resources are needed. Most of the information nowadays is based on death figures. Death, in this case, is considered as the most severe health deficiency (Stanners, Bourdeau, 1995). Total and age mortality data, causes of death combined with data of age structure of population, are used to calculate the demographic indicator 'life expectancy'. This indicator and 'cause of death' have been a basis in The Dobris Assessment (European Environment Agency) to present a descriptive analysis of the main aspects of the population of Europe.

Risk factors of most frequent and severe diseases (circulatory diseases, cancer, respiratory disease, digestive system diseases, infectious disease, injuries) are related to various host characteristics as genetic predisposition, individual susceptibility or behavioural and lifestyle factors. However, a number of environmental factors can adversely influence health.

Changes in health can occur immediately, shortly after exposure or in the long term. Especially when exposures are prolonged and of low intensities, or a combination of exposures, adverse health effects in the long term can occur.

The most common environment related health problems concern exposure to excessive levels of air pollutants. The exposure, in most cases, relates to urban populations in short episodes. In door air pollution is also causing health problems as decrements in lung function, cough or eye irritation. The most common types of indoor air pollutants are carbon monoxide and nitrogen dioxide generated by combustion stoves, tabacco smoke, volatile organic compounds emitted from building materials, etc. Especially in the UK, France, the former Russian Federation, former Yugoslavia, Romania and Scandinavian countries, outbreaks of diseases due to microbiological contamination have been reported. Contamination of drinking water and food with microbiological agents can be a source of a variety of communicable diseases such as hepititis A, salmonellosis or shigellosis.

For effects in the future trends in life expectancy, occurrence of diseases and death rates have to be studied.

4.4.2 Nature and wildlife

The quality of an ecosystem is described by the presence of individual species as well as by the "completeness" of the living communities within it. Over years and years landscapes have been changed, both by human activity (deforestation, hunting) and natural interventions (ice ages, volcanic eruptions, etc.). Animal and plant species have disappeared and were lost. In case of killing species for hunting, food and other consumer purposes, the loss of species is an indicator of environmental problems. However, changes in species and loss of species can also have a natural cause which can be difficult to be distinguished from environmental changes. Still, everywhere ecosystems are facing stresses and decline. So the extent to which changes in habitat and nature, caused by human interference, lead to the loss of species and environmental stresses is an indicator for the seriousness of environmental problems with respect to nature and wildlife.

4.4.3 Buildings, sculptures and cultural inheritance

Damage to buildings, sculptures and cultural inheritance can be presented in expenditures necessary for restoration. It becomes more difficult when no restoration is possible anymore and the building, sculpture or other form of cultural inheritance is lost. The value of such an object is often difficult to define. It cannot always be expressed in figures (roubles or dollars). That is why a list should be kept of objects that have deteriorated.

4.4.4 Natural resources balance sheet[28]

The United Nations use eight indicators to compose a natural resources balance sheet in national human development reports. In this way the figures can be easily compared with other countries. The eight indicators are:

1. land area (in thousands km^2);
2. population density (people per km^2);
3. arable land and permanent cropland (as % of land areas);
4. grasslands (as % of land areas);
5. Forest and wooded land (as % of arable land area);
6. irrigated land (as % of arable land area);
7. internal renewable water resources per capita (1000 m^3 per year);
8. annual fresh water withdrawals (as a % of water resources and per capita in m^3).

The figures for all these indicators are present for the years 1990-1995.

4.4.5 Environment and pollution according to UN indicators[29]

The United Nations use nine indicators to describe the state of environment and pollution in national human development reports. In this way, again, figures can be easily compared with other countries. The nine indicators are:

1. major cities with highest concentration of SO_2 (in microgrammes of SO_2 per m^3);
2. sulphur and nitrogen emissions (in kg of SO_2 and NO_2 per capita);
3. share of global emissions, also called the greenhouse index (in absolute share and per 10 million people);
4. pesticide consumption (in metric tons per 1000 people);
5. nuclear waste from spent fuel (in metric tins of heavy metal per 1000 km^2);
6. hazardous and special waste production (in metric tons per km^2);
7. generation of municipal waste (in kg per capita);
8. population served by municipal waste services (in %);
9. waste recycling (as % of all waste, divided in paper and cardboard, and class).

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[28] the National Human Development Report of Belarus 'Environmental for People', 1996, page 192.

[29] the National Human Development Report of Belarus 'Environmental for People', 1996, page 192.

Only the figures for indicators 1, 2, and 7 are present for the years 1990-1994. The figures for indicator 9 are present for the years 1990-1994. The fact hat there are no other figures present indicates the lack of interest and efforts to monitor environmental pollution.

4.5 Which characteristics can be influenced by people's activities?

The state of people's environmental awareness in general in the RB can be qualified as 'very low'. Little attention is paid to the effects people's actions have on nature. However, people are starting to be become more involved with environmental issues. However, those initiatives are not co-ordinated so the committees and organisations do not know form each other with which subjects they are dealing.

When students really want to continue their positive attitude towards nature into an active behaviour, several obstacles can occur.
At the political level:
1. no interest for or even opposition against plans;
2. no financial support;
3. no licence or support from official committees.

At the family level:
1. no interest for or even opposition of parents and other family members;
2. disagreements in family, no acceptation, ignorance.

At the educational level:
1. no knowledge about how to solve environmental problems;
2. no interest for environmental subjects at future policy makers and implementers;
3. no future teachers;

no unambiguous level of education.
At the level of the economy:
1. no interest in energy and water saving;
2. no interest in investing in environmental friendly production and products;
3. energy and water saving equipment (for example, lamps and special taps) is too expensive.

At the technological level:
1. giving up ways to contribute to better environment;
2. usefulness of activities does not become clear.

Consequences of the economic situation can be ignored for students, the subject of the research. However, for adults the lack of financial resources, is probably the most determining obstacle for not translating a positive attitude towards nature into an active behaviour.

All obstacles mentioned can lead to giving up good initiatives and loss of interest, getting a feeling of uselessness of activities. A loss of interest and an increased feeling of social dilemma is the result.

At the same time, the obstacles mentioned above can be influenced by people's activities. The governmental structure is hard to change by citizen's activities. However, more activities of the government can be enforced by attracting attention of the government by all kind of activities from seminars, forming organisations, to forming a 'green' political party or movement between several political parties. Laws are being formulated, but if nobody lives by reasonable laws nothing will change.

Providing information can make a large difference in people's knowledge about the need to change their behaviour and about the ways they can act in a better way with respect to the

environment. Especially in family life, the children can inform their parents, but the parents probably need prove before they except the commands of the children.

In general, people can create a movement towards a better attitude and behaviour with respect to the environment by developing more activities and talk more about environmental subjects. They should pay more attention to the effects to the environment while living their normal daily life.

Chapter 5 Theoretical model: environmental awareness, attitude and behaviour

Environmental awareness expresses itself in an *attitude towards the environment* [30]. An attitude is the **weighed opinion of people about behaviour**, an object, an idea or a person. That object, idea or person are the objects of attitude (Open Universiteit Heerlen, 1993, page 82). The weighed opinion is a judgement after evaluating (for the person's relevant) aspects about the object of attitude. The expected consequences determine an attitude. The concept that actually can be measured by a survey as in this research is 'attitude towards the environment'. More about the theoretical background can be found in appendix IV. The relation between environmental awareness, attitude and behaviour is more extensively discussed there.

5.1 Determinants of environmental attitude: variables

Proper environmental attitude is defined as an attitude that does not harm the environment. According to literature the attitude towards the environment is determined by number of variables: *knowledge of environmental problems*, *involvement*, *perception of risks*, *social dilemma*, *willingness to change* and *feedback*. An attitude with respect to the environment is the best predictor of a person's intention to actual behaviour. In this study general characteristics of the units of research arenot considered, because no exhaustive list of general characteristics could be investigated.

All aspects can be joined into a conceptual model which is the basis for determining the variables which influence the student's attitude towards nature. In this way the information in the training course can be developed more specifically. Effective information has to contribute to the following goals:
1. draw the attention of the students for a certain message;
2. make the message understandable;
3. provide a change of behaviour;
4. retain a change of behaviour.

Since increasing environmental awareness expresses itself in an attitude, intention and finally behaviour towards the environment, the ultimate goal of the training course will be changing people's attitude and behaviour.

The variables are discussed below.

5.1.1 Knowledge of environmental problems

The influence of knowledge on environmental awareness, attitude and behaviour has been described extensively in literature (among others: Teleac, Midden, Open Universiteit, Midden en Weenig, De psycholoog, Willink).

[30] *Consument en Milieu*, red. C.J.H. Midden en G.C. Bartels, 1994, p. 172

Increasing knowledge can have different purposes:
1. to create insight in a specific subject (Midden en Weenig, 1982);
2. to become able to make choices with respect to final attitude and behaviour (Open Universiteit Heerlen, 1993) ;
3. to create more general understanding about the circumstances of the problem (Boekhout, Haans, Spreij, 1997);
4. to get to know why and how behaviour has to change (Teleac, 1993);
5. to influence behaviour (Midden en Weenig, 1982).

Enlarging the knowledge about environmental problems (pollution, energy deficits, etc.) and the importance of a clean living environment now and in the future can broaden a person's environmental awareness. The information can be provided during special campaigns about the general problems. Or specific activities can be embedded in specific campaigns.

Information can be directed to explaining the main environmental problems in the RB and the city of Minsk. First it has to be determined whether people are interested in their national problems as well or whether this does not affect them. When information is too general, people will not feel responsible. More specific information to enlighten certain subjects and to show what people can and should (not) do, increases the willingness of people to participate[31]. The knowledge of people in this case is directly related to problem awareness with respect to the environment.

Knowledge is closely connected with the concepts know how (skills), technology and science. However, the questionnaire only includes questions about knowledge. Know how in its turn is closely related to own effectiveness. Technology and science are discussed in paragraph 4.1.5, because the state of technology and science and technical possibilities for people in the RB are about the same for every inhabitant.

5.1.2 Involvement

Involvement refers to the affective aspect of attitude. It is defined as *the extent to which people feel responsible for their living environment.* It is also a form of interest. The more people feel attached to the environment the more they will think about it, know about it and pay attention to the environment in their behaviour. Environmental involvement originates from direct experiences, indirect experiences from other people and experiences from the mass media. These sources of information can have negative and positive effects on involvement[32]. Negative and positive information play an important roll in the extent to which people feel involved in environmental issues. Specially negative information has a more pronounced impact, with longer lasting consequences. Attitudes are directed to objects and rather lasting, which determine both the difference between attitude and involvement.

Affective factors play an important role in all kind of forms of human behaviour. When radically, extreme changes in lifestyle, necessary for a sustainable development, have to be stimulated, involvement is an important characteristic that can be influenced. An example in the Belarusian society which shows how important involvement is, is the persisting activities of non-governmental organisations. Almost without support NGOs continue their activities because they believe in their actions and still see the need.

5.1.3 Perception of risks

The definition of risks used in this research is: *risks are factors that interact strongly with other priorities in a negative way.* In other words: risk is determined by the product of the chance and the dimension of negative consequences of an activity per unit of time[33]. Perception

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31 *Consument en Milieu,* red. C.J.H. Midden en G.C. Bartels, 1994, p. 133

32 id. p.152

33 *Cursus Milieuvoorlichting en -educatie,* tweede druk, Open Universiteit, Heerlen, 1993, p. 227

and acceptation of risks are aspects of the way people count risks. The perception of environmental risks is an important characteristic of effective environmental policies. Significant changes can be stimulated only when a threat is taken seriously[34]. When people feel that the environment is really threatened and that will cause risks for their personal health, people are more likely to change their attitude and actual behaviour into a less harmful one.
While considering a change in attitude, advantages and disadvantages are compared, especially those concerning the future seem to play an important role in people's choices[35].

5.1.4 Social dilemma

The social dilemma is an expression for *the extent to which people are willing to give sacrifices for public interest*[36]. It can also be described as the situation in which the interest of the individual is in contradiction to the collective interest[37] -own interest principle-. The bigger the chance that people feel that they stand alone, the less willing they will be to continue their special behaviour (in this case behaviour less harmful towards the environment). If people feel that other people do not contribute -reasonableness principle- and profit from their actions, they will loose the willingness to change their behaviour. The efficienty principle refers to the risk per activity people experience and which they take into account in their considerations.

In general in the Netherlands, people are more guided by individual short term interests than by collective long term interests due to the individualisation of the Dutch society. Whether this is also the case in Belarus is not known. The people in Belarus are not really used to think about these kind of problems. The government used to decide the way they had to live and think. Under the current regime this is even getting worse. It is important that people know that however small their contribution, it is always worth the effort. Therefore it is important that the effects of the people's activities are clear -effectiveness principle-. Information about other activities, if possible all over the world, in this case can be a major stimulation.

5.1.5 Willingness to change

Willingness to change refers to the conative aspect of attitude. Willingness to sacrifice money, time and or efforts to change attitude is important, because if a person has the time, opportunities and all the right circumstances, the still have to want to change. Both risk perception and social dilemma influence willingness to change. The more obstacles and difficulties that have to be conquered the less useful a change in attitude will seem to be.

5.1.6 Feedback

Feedback is *information provided about the consequences of individual behaviour*. The information can also be directed to urge desired behaviour. It can contain encouraging elements. Incentives should come up to a certain level of specification, proximity, comfort, efficiency and friendliness[38]. Feedback can have different purposes (Midden, Schmidt, Open Universiteit Heerlen):

1. learning of wrong behaviour;
2. clarifying relations;
3. stimulating desired behaviour;
4. clarifying (new) behaviour;
5. providing specific advice and ideas;
6. (financial/written) reward.

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34 *Consument en Milieu*, red. C.J.H. Midden en G.C. Bartels, 1994, p. 223

35 *Cursus Milieuvoorlichting en -educatie*, tweede druk, Open Universiteit, Heerlen, 1993, p. 83-84

36 *Consument en Milieu*, red. C.J.H. Midden en G.C. Bartels, 1994, p. 130

37 *Cursus Milieuvoorlichting en -educatie*, tweede druk, Open Universiteit, Heerlen, 1993, p. 187

38 *Consument en Milieu*, red. C.J.H. Midden en G.C. Bartels, 1994, p. 180

The effectiveness of feedback depends on variables as attractiveness, comprehensibility, credibility and relevance of the provided information[39] and the frequency of the feedback. The frequency of effective feedback depends on the needs of the target group.

5.2 Theoretical model

In the model the variables which influence attitude are illustrated. Risk perception and knowledge are closely linked, because of the final operationalisation of the variables (see appendix V). The same can be said of involvement and willingness to change.

This model is applicable in the social and technical environment of the Republic of Belarus, which is represented by the inner circle. The outer circle refers to the international social environment. For a more extensive discussion of environmental problems in the RB related to the international social environment we refer to appendix III. In this appendix also the causes and consequences of the main environmental problems in the RB, Europe, the former U.S.S.R. and the world are explained.

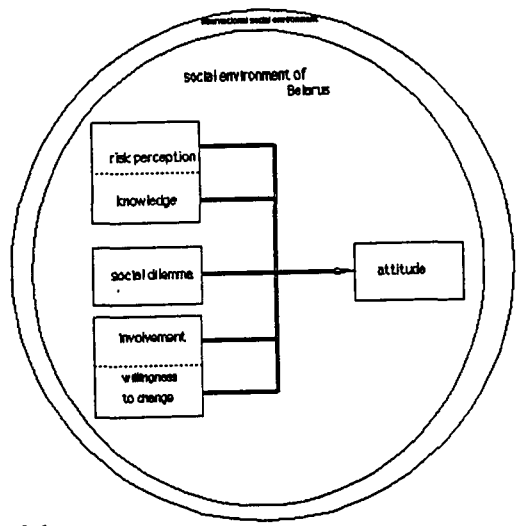

Figure 5.2: *the theoretical model*

The questionnaire investigates the relations between the different determinants of environmental attitude and their mutual linkages. These relations have not been presented in the model, because that would make the model unclear. Also the linkages with feedback are studied. Feedback can only be given as a result of specific behaviour, so it has not been included in this model as a variable. It influences attitude through the other variables. In the model for further reasearch it's role is made clear.

The background variables are discussed above. Social circumstances (or obstacles or own effectiveness) are discussed in chapter 4. The choice is made to take social setting of its original place in the model, because in general inhabitants of Belarus are influenced by the same social circumstances, such as the state of politics, economics, kinship, education and technology. The relations between the different variables are explained in the next paragraph.

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[39] *Consument en Milieu*, red. C.J.H. Midden en G.C. Bartels, 1994, p. 183

5.3 Relations between the different variables

Knowledge

Knowledge is one of the central variables. A lot of emphasis is placed on knowledge because with knowledge people can judge their own behaviour, think of the consequences and, very important, they have a basis on which they can make choices.

In general it is stated that more knowledge will lead to a more positive attitude towards nature. A lot of literature is present about the state of the environment. When reading about environmental problems, the necessity to act more positively towards nature becomes more clear. This implies immediately the influence on knowledge on willingness to change. Knowledge also correlates with the other characteristics perception of risks, involvement and social dilemma.

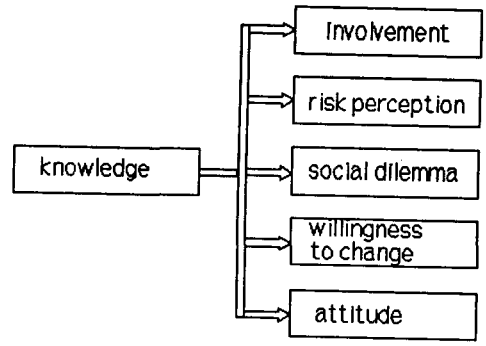

Figure 5.3: *relations between knowledge and the other variables.*

Knowledge about the consequences of all activities in a society shows the risks and consequences in future. Whether knowledge correlates with social dilemma in a positive or negative way depends on the kind of information provided. People can experience the social dilemma stronger by reading about problems. Especially when consequences are described in detail, the feeling that it is impossible to change the situation into a better one by yourself without help of community can be stronger instead of less. On the other hand knowledge about activities all over the world will decrease social dilemma, but this is discussed later when dealing with the consequences of lack of feedback.

Involvement

Involvement correlates with knowledge. When people feel responsible for nature they are more willing to change their attitude and eventually their behaviour. The need to change becomes more clear. When they feel affected to nature they possibly are also more interested in more information about nature which will increase their knowledge. Whether involvement correlates with one's perception of risks is not sure, because when people feel extremely affected to a certain subject, their view, maybe, is not objective anymore.

Risk perception

Risks influence willingness to change, involvement and social dilemma. When a negative view with respect to the future is present, people on the one hand will be encouraged to feel more responsible towards nature and they are willing to change. On the other hand, social dilemma can be strengthened, because the use of activities becomes less clear.

Social dilemma

Social dilemma correlates with involvement. When people feel that they stand alone, they alone are interested in nature, they can lose their interest. They will be less inclined to change their behaviour, because the necessity to change is not clear. Social dilemma can influence one's perception of risk, since the effectiveness and usefulness of certain activities becomes less apparent when social dilemma is present.

Willingness to change

Willingness to change correlates with attitude, social dilemma, risk perception, and knowledge. If a person wants to change, this directly influences that person's attitude towards the problem involved. The opinion about social dilemma can also be different, whether that is more positive or negative is not known. I tend to state that if people are willing to change it becomes more clear that still very little is done to improve the state of the environment.

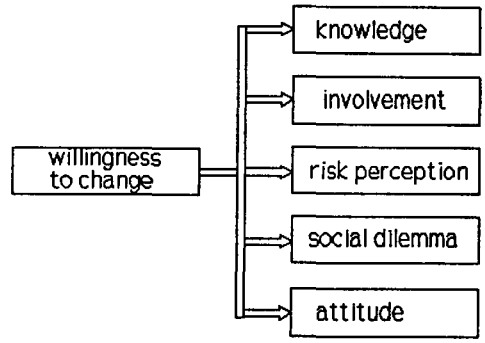

Figure 5.4: *relations between willingness to change and the other variables*

Actions by individuals seem useless - in other words - the social dilemma increases. If people are willing to change this can also influence their perception of risks. Again it is not known whether the perception of risks will become better or worse. Willingness to change can influence knowledge. When no knowledge is present about how to change and they really want to change, people will start looking for information and knowledge will increase.

Feedback

Feedback correlates with all other characteristics. It can increase knowledge, but when it is not up-to-date anymore it even can have a negative influence on knowledge. The social dilemma only gets worse when no feedback is provided about activities undertaken. It does not become clear whether the activities undertaken were effective so the intention also can get worse to undertake even more activities. The same can be said for risks. When no feedback is supplied, no improvement for the future is seen and social dilemma will increase, whilst involvement will decrease.

5.4 The hypotheses

Based on the relations between the variables as described in paragraph 5.2, 23 hypotheses can be formulated.

Knowledge:

Knowledge of the environment correlates with:

1. attitude;
2. involvement;
3. perception of risks;
4. social dilemma;
5. willingness to change.

Involvement:

Involvement correlates with:

6. attitude;
7. knowledge;
8. willingness to change.

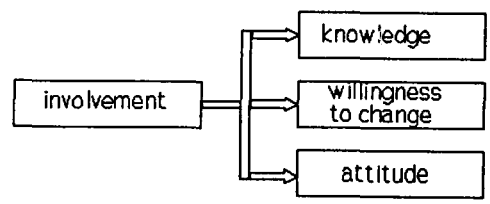

Figure 5.5 *relations between involvement and the other variables*

Perception of risks:
Perception of risks correlates with:
9. attitude;
10. involvement;
11. social dilemma;
12. willingness to change.

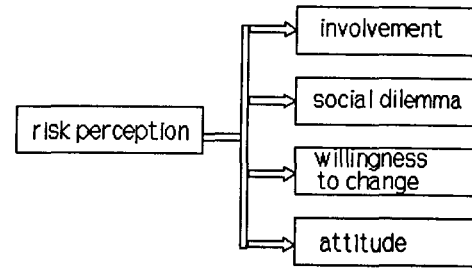

Figure 5.6: *relations between perception of risks and the other variables*

Social dilemma:
Social dilemma correlates with:
13. attitude;
14. involvement;
15. perception of risks;
16. willingness to change.

Willingness to change:
Willingness to change correlates with:
17. attitude;
18. social dilemma;
19. knowledge;
20. involvement;
21. perception of risks.

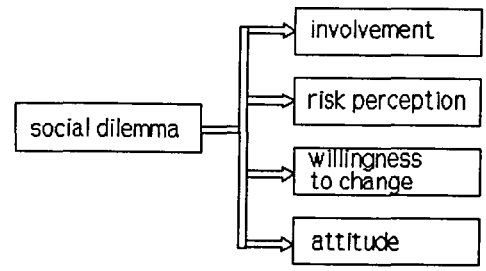

Figure 5.7: *relations between social dilemma and the other variables*

Feedback:
Feedback correlates with:
22. attitude;
23. knowledge;
24. social dilemma;
25. involvement;
26. perception of risks;
27. willingness to change.

5.5 Next steps

In chapter 7 the result of the analysis of the data using Excel are presented. Conclusions with respect to the content of the training course are mentioned as well. In chapter 7, the SPSS analysis of the data is presented and discussed. The hypotheses are tested and the last paragraph contains conclusions with respect to the model.

Chapter 6 Results with respect to the training course

In this chapter, the results of the questionnaire in percentages of respondents, performed with the help of Microsoft Excel are discussed. Both the results of the two schools separately and the joint result are presented. The total number of respondents was 219. I want to state again that the questionnaire was not translated into Russian on purpose, because of two main reasons. First the teachers of the students insisted on leaving the questionnaire in the English language, because it was a good practice for the students. Secondly, if possible I wanted to test the training course myself and in this way I could determine the level of English of the participants and their knowledge of relevant terms as 'energy deficits' , 'greenhouse effect', 'depletion of ozone layer' and 'sustainable development'.

6.1 General characteristics

In total 219 students responded. Of these 101 were students at school 5 and 118 at school 24. School 5 proved to be a good example of a district school. Of the 101 respondents, 63% lived in Patizansky district, the other districts were represented with less than 7% each. School 24 confirmed it's status as a 'city' school. About 25% of the students lived in Fruntzensky district, although the school is situated in Centralny district, but the other districts are represented by percentages varying from 5 until 16%. Both schools are gymnasia, preparing students for university. The majority of the parents education at both schools was also university. However, it is known that the parents of the students of school 24 have high positions in government, municipality, army or they are a director of firms. Because of this background, these students are very likely to become policy makers themselves in the future. In both schools the population consisted of 38% male and 62% female. The average age was respectively 15.9 and 16.1 years in school 5 and 24. This small difference can be explained, because in school 5 about 65% of the students were 10th form students and in school 24 this was 50 %.

In both schools, the majority of the students stated that environmental problems are only discussed during other classes of for example geography and biology. In school 24, 16% of the students answered that they had separate classes, which is the same percentage as people who stated to be a member of an ecological club or organisation. These can therefore be the same people.

6.2 Perceived environmental problems

In both schools, the questions regarding environmental problems in the world, the Republic of Belarus and Minsk, lead to almost the same answers. In table 6.1 the seven most acknowledged problems at all three levels are mentioned. The seven most acknowledged are mentioned because they were pointed out as real environmental problems by at least 50% of the respondents.

Problems for the world	Problems for the RB	Problems for Minsk
Air pollution	Air pollution	Air pollution
Depletion of ozone layer	Water pollution	Water pollution
Water pollution	Nuclear Power Plant accidents	Waste disposal
Deforestation	Waste disposal	Nuclear Power Plant accidents
Soil pollution	Soil pollution	Noise
Greenhouse effect	Deforestation	Soil pollution
Waste disposal	Energy deficits	Energy deficits

Table 6.1: *Perceived environmental problems by at least 50% of the respondents*

When students were asked whether they thought they could help solving the mentioned environmental problems about 80% of the students of school 5 and 70% of the students of school 24 stated that they thought they could only help a little, but respectively 95 and *92% of the students wanted to help solving the problems*. About one fifth of the students saw themselves as never interested in environmental subjects, this means *that students who see themselves as not interested still want to help solving the problems. About 60% of all students does not know how they can help*, but about 80% thinks it is everybody's task to help. Yet, only 1 student of school 5 is member of an environmental orientated organisation, in school 24 these are 18 students (16%).

6.3 Information about environmental issues

A large majority of students has looked for information about environmental subjects (74 vs. 82%, school 5 and 24). This was merely information about environmental problems and hardly about activities (about 65% in comparison with 22%!). The information was most often obtained from television, newspapers and school. From the respondents of the school with the ecological club, however, only 43% of the students said that they obtained information by school in comparison with 75% of the students of school 5. Almost all students, about 90%, said that this information was sufficient.

Environmental subjects are discussed at most 1 hour a week according to an ample majority. Only 30% of the students of school 5 and 50% of the students of school 24 undertake or have undertaken activities to help solving environmental problems. Of those, less than one third received any kind of feedback about their activities.

The term 'recycled' was mentioned by 33% of the respondents of school 5 and 65% of the students of school 24. Other students called the recycling sign: 'ecologically clean' or 'Gruner Punkt'. The term 'sustainable development' was known by 15% of the students of school 5 and 38% of the students of school 24. It is not known yet whether the percentages mentioned include members of an ecological organisation or not.

6.4 The future

Most students thought the general environmental situation of the Republic of Belarus will worsen (64% of school 5 and 89% of school 24). Main reasons for this are presented in the table 6.2. The numbers refer to the most frequently given answers (1 most mentioned, 5 least mentioned).

Reason why situation will worsen	School 5	School 24
The same problems that are present now, will only become worse	1	1
Insufficient actions are undertaken by industry	2	2
New problems will occur that are not visible now	3	3
Insufficient actions are undertaken by people	4	3
Insufficient actions are undertaken by government	5	5

Table 6.2: *Qualification of reasons why the environmental situation in the RB will worsen.*

The first two reasons were mentioned by about 70% of the students, the next three by about 60% of the students. Only 2% of the students thought of another reason, which only two students specified. The said that they were afraid that the president would start a nuclear war.

Necessary to ensure safe living conditions for the future were :
- people should pay more attention to the effects of their actions on the environment;
- the industry should produce less polluting;
- the government should do more.

6.5 Energy and water saving

A large majority of the students has obtained information about energy and water saving and the information was useful in about 80% of the cases. The students experienced an energy deficit in their country. Half of the respondents experienced it sometimes, about 43% of the respondents really experience it all the time. Most of the students thought that a deficit will occur, because of an increasing demand by the industry (63% of the respondents). School 24 respondents also stated for about the same percentage that it would be because of the failure of technologies and because too little is saved. However only about 40% of the school 5 respondents agreed with that. Increasing demand by households was a cause for energy deficits according to about 35 and 45% of the respondents of school 5 and 24. To prevent energy deficits biogas, wind energy, solar energy and energy saving measures should be used in the first place. The usage of nuclear energy was mentioned by 42% of the school 24 respondents and 23% of the school 5 respondents.

Almost all students thought that energy saving measures are necessary. The population should take care of the savings in about 80% of the cases, the government was included in about the same percentage. The industry was included in about 70% of the cases, although they were mentioned as the main cause of energy deficits. In about 55% of the cases all three groups were included.
Reasons to save energy were mainly:
- to gain time to develop alternative energy sources;
- to prevent the construction of Nuclear Power Plants;
- to combat further contamination of the environment.

Rising energy prices were for half of the respondents a reason to save. To gain more independence of Russia was for school 24 respondents only in 38% of the cases a reason to save energy. For school 5 this was 47%.

Students were very unsatisfied with their behaviour regarding electricity, heat and water usage and waste disposal. Especially water usage and waste disposal dissatisfied more than half of the respondents of school 5. This was about 40% for school 24. Only 27% of the students is satisfied with their behaviour regarding waste disposal. About 20% of the students used the 'I do not know' option in one or more cases.

6.6 Analysis

The results of the questionnaire indicate in several ways that students know about environmental problems in their country, but that they do not employ activities themselves, nor search for activities to help solving those problems. They indicate that everybody should help, but on the other hand they do not know how they can help solving environmental problems.

Almost all students state that they obtained sufficient information. It is the question whether this also includes the students who looked for information about activities regarding environmental subjects. More information about environmental subjects and more environmental education also scored lowest at the question about what to their opinion is necessary to ensure safe living conditions of future generations. Still, I have the impression the information that they obtained satisfies their needs regarding information about problems, but this information does not stimulate them to undertake any kind of activities.

As a result of the questionnaire and interviews with ministry of nature protection, teachers, professors at the university, people from the ecological educational centre, a discussion with teachers and people from the Sagarov institute and students, it became clear that a change in attitude and behaviour towards nature is definitely necessary. That is the reason why it is decided to formulate the following major learning objective of the training course:

'to gain more knowledge about the need to change behaviour'.

Especially the passive attitude should be changed. Stimulating people is difficult. Students already are aware of the political problems in their country, financial problems, problems concerned with their age (puberty). Environmental problems are just one more item that can be added. By translating the general problem 'environment' in a more personal problem, I think the students will easier understand the need why they have to change their behaviour. Especially the consequences of their behaviour at this moment for the future, can help them to understand why a change now is necessary.

In general the training objectives can be formulated as:
1. increasing knowledge about environmental subject in Belarus: gaining more knowledge about the general situation in which the problem exists;
2. increasing consciousness raising of consequences of actual behaviour in the future;
3. increasing knowledge about ways to change behaviour with respect to specific environmental problems;
4. increasing knowledge about need to change behaviour from a passive into an active one;
5. stimulating self reflection of behaviour with respect to specific environmental problem.

In the next chapter the results of the SPSS analyses are discussed. The concrete filling in of the training course is described in chapter 8.

Chapter 7 Results with respect to testing the hypotheses

The procedures used during the SPSS analysis are described in appendix VI. There, question B1 is worked out as an example to explain the procedures, the aim of the procedures and possible results. Paragraph 7.1 describes how the variables knowledge, involvement, perception to risk, social dilemma, willingness to change, feedback and attitude are made operational. The results of the SPSS analysis are separated in two analyses. First the calculation of the correlation between the variables of one factor. For example, the calculations of the correlation between PREVENT, HOWWANT and PROBLEMS of the factor knowledge, which is described in paragraph 7.2. In case of feedback and attitude, this is not necessary, because only one variable describes those factors. Secondly, SPSS is used to test the hypotheses as defined on basis of the theoretical model in paragraph 5.4. In the last paragraph the conclusions of the SPSS analyses are presented. The names of the variables are used in this chapter. Their meaning is described in appendix V.

7.1 Making the concepts operational

To make a clear distinction between knowledge, involvement, perception to risk, social dilemma, willingness to change, feedback and attitude, and the variables which describe these subjects, the term 'concepts' is used to describe the variables of the theoretical model. The term 'variables' is used to describe the way the concepts are made operational.
The procedures used to make the concepts operational are KMO and Bartlett's test of sphericity, and the reliability analysis with indicator Crohnbach's alpha. An explanation of the procedures and their criteria is extensively described in appendix VII. In short: KMO has to be higher than 0.60, the significance of Bartlett's test has to be approximately 0,000 and the Chi-square of Bartlett's test has to be high. A frequency analysis and normality test, by means of a normal probability plot, were performed and no variables were rejected on basis of those results. The results are not added to this report, but can be obtained from the autor.

7.1.1 Knowledge

In appendix V the separate variables which describe different aspects of the concept knowledge as asked in the questionnaire are depicted. This results in a list of 55 variables. To decrease this number, first KMO and Bartlett's test of sphericity were used to test whether a factor analysis as a whole was allowed. This was not the case, so separate groups of variables were tested. These groups were chosen of basis on internal validation and consisted of the following variables:

1. BELARUS: all 11 variables referring to the environmental problems in Belarus (names of variables start with COUNTxxx;
2. MINSK: all 11 variables referring to the environmental problems in Minsk (names of variables start with MINSKxxx;
3. WORLD: all 11 variables referring to the environmental problems in the world (names of variables start with WORLDxxx;
4. SCHOOL: the variables: TIMES, RECYCL, SUSTAIN
5. ENERGY: the variable DEFICIT and the variables of questions E9, E10 (names both starting with DEFxxxxx) and E14 (names starting with REASxxxx) about energy deficits, the sources, how to prevent it and the reasons to save energy.

The results of the KMO and Bartlett's test are presented in table 7.1

		Belarus	Minsk	World	School	Energy
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.685	0.740	0.744	0.453	0.593
Bartlett's Test of Sphericity	Approx. Chi-Square	218.605	254.024	267.856	20.144	350.449
	degrees of freedom	55	55	55	6	153
	Significance	0.000	0.000	0.000	0.03	0.000

Table 7.1: *results of the KMO and Bartlett's test with respect to 'knowledge'*

This means that a factor analysis is sustained for the groups BELARUS, MINSK, WORLD and ENERGY. The value for KMO and significance for the group SCHOOL is too low to allow a reliable factor analysis. However, I have chosen to treat **HOWWANT** as a single variable also determining the variable knowledge, because it asks directly for the state of knowledge about possibilities to solve environmental problems.

The remaining three groups could be divided in the following categories as a result of the factor analysis. Internal validation did not lead to changes, since the items in the categories relate to each other in level of acknowledgement by the government and people and information available.

Belarus
1. greenhouse effect, deforestation;
2. water pollution, soil pollution, waste;
3. depletion of ozone layer, NPP accidents;
4. Baltic Sea pollution, noise;
5. energy deficits, air pollution.

Minsk
1. depletion of ozone layer, greenhouse effect and deforestation;
2. water pollution, soil pollution and energy deficits;
3. air pollution, nuclear power plant accidents and noise.

World
1. depletion of ozone layer, energy deficits, noise, deforestation and the greenhouse effect;
2. air pollution, soil pollution and water pollution;
3. waste disposal, Baltic Sea pollution and nuclear power plant (NPP) accidents.

Energy
1. prevention by solar energy, prevention by wind energy, prevention by biogas, prevention by energy saving measures;
2. deficits present of coal, oil, gas and in general;
3. reason to save to stop rising prices, to prevent building of NPP's, to gain more independance of Russia and to combat further deterioration.

The reliability analysis tested the reliability of all new 14 sets. Set 2 and 3 of energy resulted in a Crohnbach's alpha too low to result in a reliable set of variabes. The value was respectively 0.3656 and 0.4647. The alpha of energy set 1 was 0.5820 containing all four aspects. When prevention by energy saving measures would be deleted, the alpha would even rise to 0.6994, but I still chose to take prevention by energy saving measures into account, oecause this refers

to actions people can employ and not only theoretical aspects. The new variable referring to knowledge about prevention of energy problems is further called **PREVENT**.

In the cases of the sets Belarus, Minsk and world, immediately new factors were defined, namely Belarus 1 to Belarus 5 and Minsk, respectively world 1 to 3. A strong correlation between the new factors in a set was expected and that is why also reliability tests between the sets where performed. In all three cases, the results were that again new factors could be formed of which eventually three main variables could be extracted, namely BELARUS, MINSK and WORLD. The Crohnbach's alpha of the tests were:
BELARUS: 0.5323
MINSK: 0.5678
WORLD: 0.5717
This calculation is confirmed by a direct reliability analysis of the whole set of variables for Belarus, Minsk and the world which lead to Crohnbach's alpha's of respectively: 0.6016, 0.6670 and 0.6658.

A new factor analysis and reliability analysis between those three factors resulted in the extraction of one overall variable named **PROBLEMS**. A combination of the variables BELARUS, MINSK and WORLD results in Crohnbach's alpha of **0.8060**.

Finally the set of 55 variables is reduced to three factors, namely HOWWANT, PREVENT and PROBLEMS. **HOWWANT** refers to the knowledge of the students about ***solving*** environmental problems. **PREVENT** refers to the knowledge of the students about ***prevention of energy deficits*** and finally **PROBLEMS** refers to the knowledge of students about the ***major environmental problems in general.***

7.1.2 Involvement

The concept involvement is investigated in the questionnaire by means of 18 variables. Combining all 18 variables in order to perform a factor analysis leads to following results of the KMO and Bartlett's test.

		Involvement
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.639
Bartlett's Test of Sphericity	Approx. Chi-Square	304.086
	degrees of freedom	153
	Significance	0.000

Table 7.2: *results of the KMO and Bartlett's test with respect to 'involvement'*

Rotated factor analysis of 23 variables resulted in 8 factors:

1. necessity of more information, more money in budget, more governmental activity and more education, and (a negative formulation of) who should take care of savings;
2. interest in activities in the world and in Belarus;
3. (a negative formulation of) solving environmental problems is a governmental task, necessity of training and interests in information about problems in the world;
4. necessity of other actions;
5. ever looked for information, interest in information about environmental problems in Belarus;
6. interest in information in general, membership of environmental organisation;
7. interest in other information.

Validation with respect to the content led to not taking factors 4 and 7 into further consideration. In factor 2, a negative formulation of savings was left without further consideration.

The reliability analysis of the remaining 6 sets, resulted in 3 sets which answered the demand of Crohnbach's alpha being above 0.53, namely sets 1, and 2. Their alpha's were respectively: 0.5752 and 0.5549. The sets were renamed **NECESSIT** and **INFOACTI**. **NECESSIT** refers to the ***needs the students regard as important in environmental issues*** and **INFOACTI** measures whether the students ***really are that affected to the environment that they are actually looking for information about activities*** which they employ themselves. The answer possibilities that are involved in question D5, which now partly form variable NECESSIT are aspects, in general qualified important for sustainable development.

7.1.3 Perception of risks

The concept perception of risks is described in the questionnaire by 22 variables as can be seen in appendix V The variables can be divided in three sets which refer to:

1. a positive view to the future(question D2);
2. a negative view to the future (question D3);
3. reasons why energy deficits can occur in the future (questions E7 and E8).

To perform a factor analysis enough respondents are necessary, which what not the case for the set of data which refer to a positive view to the future. In other words, most respondents had a negative view of the future and the sample was too small to process the answers on question D2 (set 1) in a sensible and reliable way.

The results of the KMO and Bartlett's test reflect the same reasoning.

		Positive view to the future	Negative view to the future	Energy deficits in the future
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.523	0.665	0.543
Bartlett's Test of Sphericity	Approx. Chi-Square	**21.307**	164.527	175.068
	degrees of freedom	15	15	45
	Significance	**0.127**	0.000	0.000

Table 7.3: *results of the KMO and Bartlett's test with respect to 'perception of risks'*

Especially the significance and the chi-square give insufficient results to perform an adequate factor analysis. Therefore this is only carried out for sets 2 and 3.

The rotated factor analysis of set 2 resulted in 3 factors:

1. situation will worsen because of insufficient actions by people, government and industry;
2. situation will worsen because of new problems that are not known yet;
3. situation will worsen because of same problems that will get worse.

The rotated factor analysis of set 3 resulted in 3 factors:
1. energy deficits will occur because technologies fail and too little is saved;
2. energy deficits will occur because of Western politics and policies of oil companies;
3. energy deficits will occur because of the increasing demand by the industry and households.

Internal validation does not lead to changes.

The reliability analysis shows that because of Crohnbach's alpha's value four final variables will remain. The first variable will be named **RISKWORS** and consists of factor 1 of set 2: situation will worsen because of insufficient actions by people, government and industry. **RISKWORS** therefore describes ***the reasons of the negative feelings of the students with respect to the future***. Crohnbach's alpha of this set equals 0.7939. The second variables remains **WORSENEW**: factor 2 of set 2 and the third variable remains **WORSEOLD**: factor 3 of set 3.
The fourth variable is named **FUTUDEFI** and consists of factor 1 of set 3: energy deficits will occur because technologies fail and too little is saved. The Crohnbach's alpha of this set, was the only one which was sufficient, that is 0.6090. **FUTUDEFI** describes ***the reasons why the students think an energy deficit will occur in the future***.
The Crohnbach's alpha of the other two sets were respectively 0.3981 and 0.4492, too small to be included in the research.

7.1.4 Social dilemma

The concept social dilemma is described in the questionnaire by 7 variables as can be seen in appendix V From the factor analysis of set 1 of the concept perception of risks it is already known that the data set for the variables IMPROSOC and IMPROGOC is too small to process. These are left without further consideration. The set of 6 variables left was used for factor analysis.

The KMO value of 0.575 > 0.53 so this seems well, but both Bartlett's test and the significance do not come up to the terms of a reliable factor analysis. Bartlett's test of sphericity results in a Chi-Square of 23.663 and the significance is 0.071.

Therefore two variables that both refer to a negative and a positive aspect of social dilemma are chosen to describe social dilemma, namely **DEFPRENO**: ***an energy deficit cannot be prevented*** and **SOLSELF**: ***do you think actions you employ yourself will help solving environmental problems?***

SELFSUCC cannot be used because of the few respondents, as is the case with the 'IMPROVE' set.

7.1.5 Willingness to change

The concept willingness to change is described by 5 variables, namely SOLWANT, BEHAVWAT, BEHAVELE, BEHAVHEA, BEHAVWAS, SAVING and NECESPEO (respectively questions B4, E13, E12 and D5:2).

This whole set was used to perform the factor analysis. KMO and Bartlett's test gave good results, namely:

		Willingness
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.760
Bartlett's Test of Sphericity	Approx. Chi-Square	312.211
	degrees of freedom	21
	Significance	0.000

Table 7.4: *results of the KMO and Bartlett's test with respect to 'willingness to change'*

The factor analysis resulted in two factors.
1. satisfaction with behaviour with respect to electricity usage, waste disposal, water usage and heat usage;
2. willingness to help solving environmental problems, people should pay more attentions to effects of heir actions to nature.

The reliability analysis of both sets resulted in a distinction of the second factor in both separate variables, because Crohnbach's alpha equalled 0.3411, not sufficient for a reliable set. Crohnbach's alpha of the first set was 0.8270.

Willingness to change will be described by three variables namely: **SATISFAC** which describes the satisfaction ***of the students behaviour*** with respect to some environmental issues. **SOLWANT** tests ***the willingness of the students to help solving environmental problems*** and **NECESPEO** goes into ***the attention people should pay to nature.***

7.1.6 Attitude

The concept attitude is described by one single variable, namely **HOWTHINK**. This variable explains ***how students think about themselves with respect to environmental subjects.*** In other words, how they judge their own attitude.

The actual attitude can be tested by observation, which is not included in this study. The attitude can also be tested by asking more specific questions which can indicate to which extent students behaviour is polluting. This sort of questions was tested in the pre survey which is hereby referred to.

7.1.7 Feedback

The concept feedback is described by the variables FEEDBACK and therefore does not need a factor or reliability analysis. The variable **FEEDBACK** asks directly whether ***the students experienced any kind of feedback on their activities.***

The concepts intention and behaviour are not further involved in the data analysis so they are not discussed in this section, nor will they below.

7.2 Correlations of the variables of one concept

The correlation among variables of one concept is calculated to examine whether and to which extent the variables influence each other.

7.2.1 Knowledge

Knowledge is made operational through three variables PREVENT, HOWWANT and PROBLEMS.

First a cross tabulation calculation is performed to check the significance of the possible correlation. In all three cases in which the variables were compared to each other, the significance was too high (varying from 0.199 to 0.463) that a correlation calculation is unnecessary. Three variables do not correlate to each other.

7.2.2 Involvement

Involvement is made operational through into two variables, namely NECESSIT and INFOACTI. A cross tabulation calculation shows that the significance is that low that a possible correlation is present. The results of bivariate correlation show that a weak positive correlation is present between both variables. Both the significance and the correlation coefficient are presented in table 7.5.

Correlations		NECESSIT	INFOACTI
Pearson Correlation	NECESSIT	1.000	0.182*
	INFOACTI	0.182*	1.000
Significance (2-tailed)	NECESSIT		0.015
	INFOACTI	0.015	
Number of data	NECESSIT	218	178
	INFOACTI	178	179

* Correlation is significant at the 0.05 level (2-tailed).

Table 7.5: *correlation with respect to the variables describing 'involvement'*

A two-tailed significance is necessary, because the direction of the correlation (positive or negative) is not known yet.

In other words this correlation means that *the more students qualify aspects of sustainable development important in environmental issues, the more they are looking for information about activities with respect to the environment.* The variables correlate to each other, nothing is known yet about cause and consequence.

7.2.3 Perception of risks

Perception of risks is made operational through four variables: RISKWORS, WORSENEW, WORSEOLD and FUTUDEFI. The results of the cross tabulation and bivariate correlation calculation is presented in table 7.6.

Correlations		RISKWORS	FUTUDEFI
Pearson Correlation	RISKWORS	1.000	0.169*
	FUTUDEFI	0.169*	1.000
Significance (2-tailed)	RISKWORS		0.040
	FUTUDEFI	0.040	
Number of data	RISKWORS	170	148
	FUTUDEFI	148	185

* Correlation is significant at the 0.05 level (2-tailed).

Table 7.6: *correlation with respect to the variables describing 'perception of risks'*

This means that, with 95% reliability, it can be said that there is a weak correlation between the variables RISKWORS and FUTUDEFI. This means that *the more students have the reasons of the negative feelings with respect to the future, the more they know reasons why an energy deficit is likely to occur in the future.* The variables correlate to each other, nothing is known yet about causality. The other variables did not lead to any significant correlation.

7.2.4 Social dilemma

The concept social dilemma is made operational through the two variables DEFPRENO and SOLSELF. There is no sufficient significance (significance is > 0.120) to be able to perform a reliable bivariate correlation calculation. So no correlation is present between the two variables.

7.2.5 Willingness to change

Willingness to change is made operational through three variables: SATISFAC, SOLWANT and NECESPEO. Only SOLWANT and NECESPEO correlate to each other. Of both other possible sets, the significance is approximately 0.350.

Correlations		NECESPEO	SOLWANT
Pearson Correlation	NECESPEO	1.000	0.231**
	SOLWANT	0.231**	1.000
Significance (2-tailed)	NECESPEO		0.001
	SOLWANT	0.001	
Number of data	NECESPEO	218	218
	SOLWANT	218	218

** Correlation is significant at the 0.01 level (2-tailed).

Table 7.7: *correlation with respect to the variables describing 'willingness to change'*

Even with 99% reliability can be said that there is a weak correlation between SOLWANT and NECESPEO. *The more students want to help solving environmental problems the more they think that people should pay more attention to nature.* The variables correlate to each other, nothing is known yet about cause and consequence.

7.3 Correlations of the different variables

7.3.1 Hypotheses with respect to knowledge

Five hypotheses have to be tested according to the conceptual model. These hypotheses are:
Knowledge of the environment correlates with:

1. attitude;
2. involvement;
3. perception of risks;
4. social dilemma;
5. willingness to change.

The results of the bivariate correlation calculation are presented in table 7.8 below. In the table also the percentage of valid associations is depicted. These are calculated by dividing the number of valid associations by the total possible associations for that particular set of combinations. A hypothesis is confirmed when the percentage is larger than 50% and rejected when it is 50% or lower. The results of the cross tabulation are not depicted, because when the level of significance was too high, no reliable correlation coefficient is possible.

Variable	Variable	Result of bivariate correlation (correlation coefficient)	Percentage of valid associations	Rejection or confirmation of hypothesis
PROBLEMS	HOWTHINK		2/3 * 100 = 66.7%	confirmation
HOWWANT		0.143*		
PREVENT		0.104		
PROBLEMS	INFOACTI		3/6 * 100 = 50%	rejection
HOWWANT		0.158*		
PREVENT		0.171**		
PROBLEMS	NECESSIT			
HOWWANT				
PREVENT		0.232**		
PROBLEMS	FUTUDEFI		3/12 * 100 = 25 %	rejection
HOWWANT				
PREVENT		0.242**		
PROBLEMS	RISKWORS			
HOWWANT				
PREVENT		0.212**		
PROBLEMS	WORSENEW			
HOWWANT				
PREVENT				
PROBLEMS	WORSEOLD			
HOWWANT				
PREVENT		0.159*		
PROBLEMS	SOLSELF		1/6 * 100 = 16.7 %	rejection
HOWWANT				
PREVENT				
PROBLEMS	DEFPRENO			
HOWWANT				
PREVENT		-0.329**		
PROBLEMS	SATISFAC	-0.108*	4/9 * 100 = 44%	rejection
HOWWANT				
PREVENT				
PROBLEMS	SOLWANT			
HOWWANT				
PREVENT		0.193**		
PROBLEMS	NECESPEO			
HOWWANT		0.231**		
PREVENT		0.167**		

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 7.8: *results of the test of hypotheses with respect to 'knowledge'*

Conclusion:

Hypothesis 1 : knowledge of the environment correlates with attitude can be confirmed. Although it has to be said that this correlation is weak. The other hypotheses have to be rejected.

7.3.2 Hypotheses with respect to involvement

Three hypotheses have to be tested according to the conceptual model. These hypotheses are:
Involvement correlates with:

6. attitude;
7. knowledge;
8. willingness to change.

The results of the bivariate correlation calculation are depicted in the table below.

Variable	Variable	Result of bivariate correlation (correlation coefficient)	Percentage of valid associations	Rejection or confirmation of hypothesis
INFOACTI NECESSIT	HOWTHINK	0.145*	½ * 100 = 50%	rejection
INFOACTI NECESSIT INFOACTI NECESSIT INFOACTI NECESSIT	PROBLEMS PREVENT HOWWANT	 0.171** 0.232** 0.158*	3/6 * 100 = 50%	rejection
INFOACTI NECESSIT INFOACTI NECESSIT INFOACTI NECESSIT	SATISFAC SOLWANT NECESPEO	 0.146* 0.169**	2/6 * 100 = 33.3%	rejection

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 7.9: *results of the test of hypotheses with respect to 'involvement'*

Conclusion:
All hypotheses have to be rejected.

7.3.3 Hypotheses with respect to perception of risks

Four hypotheses have to be tested according to the conceptual model. These hypotheses are:
Perception of risk correlates with:

9. attitude;
10. involvement;
11. social dilemma;
12. willingness to change.

The results of the bivariate correlation calculation are depicted in the table below.

Variable	Variable	Result of bivariate correlation (correlation coefficient)	Percentage of valid associations	Rejection or confirmation of hypothesis
FUTUDEFI RISKWORS WORSENEW WORSEOLD	HOWTHINK		0%	rejection
FUTUDEFI RISKWORS WORSENEW WORSEOLD FUTUDEFI RISKWORS WORSENEW WORSEOLD	INFOACTI NECESSIT 	0.167* 0.156* 0.243** 0.273** 0.301** 0.211** 0.206**	7/8 * 100 = 87.5%	confirmation
FUTUDEFI RISKWORS WORSENEW WORSEOLD FUTUDEFI RISKWORS WORSENEW WORSEOLD	SOLSELF DEFPRENO 		0 %	rejection
FUTUDEFI RISKWORS WORSENEW WORSEOLD FUTUDEFI RISKWORS WORSENEW WORSEOLD FUTUDEFI RISKWORS WORSENEW WORSEOLD	SOLWANT SATISFAC NECESPEO 	 0.151* 0.221** 	2/12 * 100 = 16.6 %	rejection

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 7.10: *results of the test of hypotheses with respect to 'perception of risk'*

Conclusion:
Hypothesis 10 is confirmed. Perception of risk correlates with involvement in a weak positive way. The more the students feel risk for the future (the more negative view they have with respect to the future) the more they will feel affected to nature. The other hypotheses have to be rejected.

7.3.4 Hypotheses with respect to social dilemma

Four hypotheses have to be tested according to the conceptual model. These hypotheses are:
Social dilemma correlates with:
13. attitude;
14. involvement;
15. perception of risks;
16. willingness to change.

The results of the bivariate correlation calculation are depicted in the table below.

Variable	Variable	Result of bivariate correlation (correlation coefficient)	Percentage of valid associations	Rejection or confirmation of hypothesis
SOLSELF DEFPRENO	HOWTHINK	not significant	0%	rejection
SOLSELF DEFPRENO	INFOACTI		0%	rejection
SOLSELF DEFPRENO	NECESSIT			
SOLSELF DEFPRENO	FUTUDEFI		0%	rejection
SOLSELF DEFPRENO	RISKWORS	not significant in both cases		
SOLSELF DEFPRENO	WORSENEW			
SOLSELF DEFPRENO	WORSEOLD			
SOLSELF DEFPRENO	SATISFAC		1/9 * 100 = 11.1%	rejection
SOLSELF DEFPRENO	SOLWANT			
SOLSELF DEFPRENO	NECESPEO	-0.188**		

** Correlation is significant at the 0.01 level (2-tailed).

Table 7.11: *results of the test of hypotheses with respect to 'social dilemma'*

Conclusion:
All hypotheses have to be rejected.

7.3.5 Hypotheses with respect to willingness to change

Five hypotheses have to be tested according to the conceptual model. These hypotheses are:
Willingness to change correlates with:
17. attitude;
18. knowledge;
19. social dilemma;
20. involvement;
21. perception of risks.

The results of the bivariate correlation calculation are presented in table 7.12 below. This table is a compilation of all other hypotheses, but for the sake of completeness and clarity this table is added as well.

Variable	Variable	Result of bivariate correlation (correlation coefficient)	Percentage of valid associations	Rejection or confirmation of hypothesis
SATISFAC SOLWANT NECESPEO	HOWTHINK	0.143*	1/3 * 100 = 33.3%	rejection
SATISFAC SOLWANT NECESPEO	PROBLEMS	-0.108*	4/9 * 100 = 44.4%	rejection
SATISFAC SOLWANT NECESPEO	PREVENT	0.193** 0.167**		
SATISFAC SOLWANT NECESPEO	HOWWANT	0.231**		
SATISFAC SOLWANT NECESPEO	SOLSELF	-0.188**	1/6 * 100 = 16.7%	rejection
SATISFAC SOLWANT NECESPEO	DEFPRENO			
SATISFAC SOLWANT NECESPEO	INFOACTI		2/6 * 100 = 33.3%	rejection
SATISFAC SOLWANT NECESPEO	NECESSIT	0.146* 0.169**		
SATISFAC SOLWANT NECESPEO	RISKWORS	0.221**	2/12 * 100 = 16.6%	rejection
SATISFAC SOLWANT NECESPEO	FUTUDEFI			
SATISFAC SOLWANT NECESPEO	WORSENEW	0.151*		
SATISFAC SOLWANT NECESPEO	WORSEOLD			

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 7.12: *results of the test of hypotheses with respect to 'willingness to change'*

Conclusion:
All hypotheses have to be rejected.

7.3.6 Hypotheses with respect to feedback

Six hypotheses have to be tested according to the conceptual model. These hypotheses are:
Feedback correlates with:
22. attitude;
23. knowledge
24. social dilemma;

25. involvement;
26. perception of risks;
27. willingness to change.

The only correlation that was found between all the variables was the one between FEEDBACK and NECESPEO (people should pay more attention to the effects of their actions towards nature). The correlation was weak (0.225 correlation coefficient with 0.05 significance). Therefore all hypotheses have to be rejected. This could already be expected since feedback is rare in the society of the RB.

7.4 Overview of steps, choices made and results

Variance analyses and multiple regression analyses are left out of this research, because they are expected to contribute nothing or very little to the results as they are presented now. The variance analysis could give an indication of the causality (direction) of the correlation between the concepts. The multiple regression analysis could give an indication of the relative weight of the concepts explaining attitude. It is the question whether this would contribute to extra valuable information to design a training course even more specified and directed to a special target group. More specification does not seem necessary according to the results of the Excel analysis.

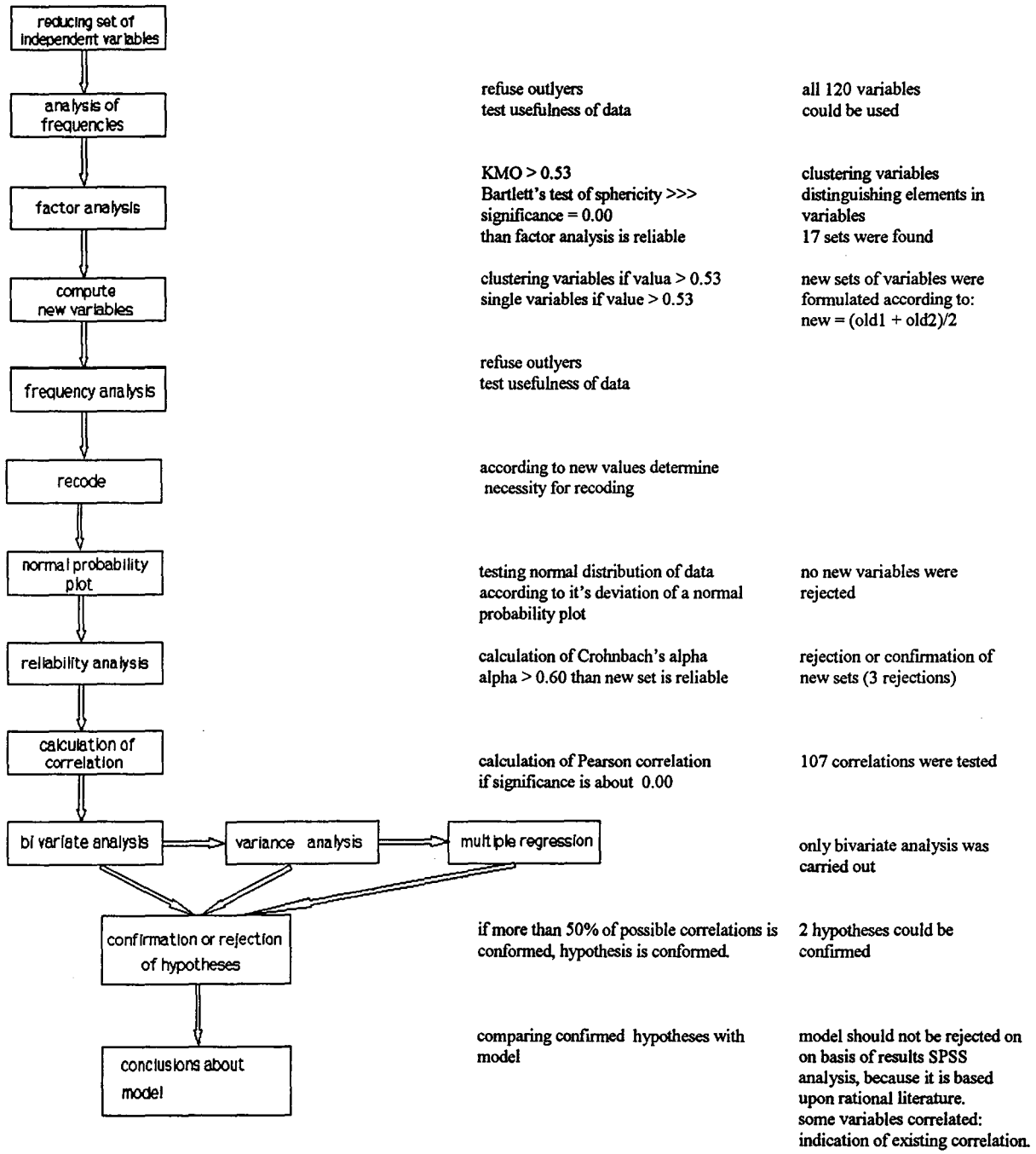

Figure 7.1: *steps, choices made and content of SPSS analysis*

7.5 Conclusion

The results of the SPSS analysis concern the tests of the correlation between the variables of one single factor and the testing of the hypothesis. The statements that gave a significant correlation at 95% or 99% reliability level, are depicted below. The two hypotheses that can be confirmed meat the criteria that at least more than 50% of the combination of variables displays correlation, the hypothesis is not rejected. The following statements can be deprived from these analyses.

The more students qualify aspects of sustainable development important in environmental issues, the more they are looking for information about activities with respect to the environment.

The more reasons of the negative feelings with respect to the future students have, the more they know reasons why an energy deficit is likely to occur in the future.

The more students want to help solving environmental problems the more they think that people should pay more attention to nature.

The more students know about the environment (are aware of environmental problems), the better their attitude towards the environment will be. (Hypothesis 1)

The more the students feel risk for the future (the more negative view they have to the future) the more they will be involved in nature. (Hypothesis 10)

Whether the concept knowledge influences attitude directly and whether perception of risk influences involvement directly is not sure. The correlations between the diferent variables indicate that the correlation can also be due to other variables. For example, a negative view with respect to the future correlates also with knowledge of reasons why an energy deficit is likely to occur. Energy deficits are one of the environmental problems which is experienced by everybody, so the involvement in environmental issues can be the consequence of this experience.

negative view with respect to the future ----------> involvement in environmental issues

negative view w.r.t. future ----------> knowledge of energy deficits ----------> involvement

No general characteristics have been taken into account, so whether the correlations that have been tested are really due to those two specific variables is not known. The two groups of students were the same on this qualifications:

- age;
- male/female composition;
- education of parents;
- knowledge of English;
- acquaintance with foreign secondary schools.

Acquaintance with foreign secondary schools is indication that both schools are not only interested in the normal obliged school program. The two main differences between the schools are that school 24 is involved in a large project about a healthier way of life, in which also foreign schools are involved. School 5's activities are not specifically directed to certain project. Secondly, school 24 engenders and prepares students for exclusive positions in the society of the RB: the future policy makers and implementers.

The correlations could be tested and correlations were found. Whether the correlations are completely due to the influence of the single variables is not clear. Intermediate variables can also play a role, but that possibility is left without consideration in this report. The results of this analysis only provides an indication of possible correlation. A much more extensive research is necessary, in which the separate concepts knowledge, involvement, perception of risk, social dilemma, willingness to change and feedback are made operational through more detailed variables. More detailed, in this case, means that more specific aspects of the concepts with respect to attitude and behaviour should be investigated. However, whether such a research would gain more information is to be doubted, because the people in the RB are not used to think about their attitude and behaviour with respect to the environment.

Chapter 8 The training course

The training course 'environmental problems and a way to help solving them' is developed to increase environmental awareness of students and to present ways in which they can develop a better attitude towards nature.
The results of the survey were a preparation on the concrete filling in of the training course. The results are used in mapping internal developments, determining the necessity of the training course, formulating training objectives, task analysis, concrete learning objectives and the instruction material. Part I of the training course is tested with students in the age of 15-16-17 years, but it can also be used for younger and older students, with some minor changes in language used. The training course is designed according to the theoretical model described in appendix VII. A teacher's manual with the sheets and tests is also available.

8.1 Preparatory steps: steps 1 to 5

Step 1: mapping internal and external developments
This step is performed by carrying out an inventory and analysis of environmental problems in Belarus in comparison to the one's in Europe, the former U.S.S.R. and the world. The results of the inventory and analysis can be found in appendix I. Chapter 2 and 4 describe the situation in Belarus in general and specifically with respect to environmental subjects.

Step 2: determining the necessity of a training course
A training course is definitely necessary. Too little environmental education, in general, is present. Specifically in secondary schools environmental education plays a minor role. In only about 7 secondary schools in Minsk an ecological club is present, but this is an 'outschool' activity only co-ordinated by the school. Secondly, the training course can be used in two more ways. First to teach coaches of future EcoTeams and secondly as an introduction at the first meetings of new EcoTeams. Those EcoTeams will be co-ordinated by BURENCO. This means that a training course developed can be used for more purposes.

Step 3: formulating training objectives
As a result of the questionnaire and interviews with the ministry of nature protection, teachers, professors at the university, people from the ecological educational centre, a discussion with teachers and people from the Sagarov institute and students, it became clear that a change in attitude and behaviour towards nature is definitely necessary. So, the main aim of the training course is to gain more knowledge about the need to change behaviour with respect to the environment, by:

1. creating more awareness in the field of environmental problems in the light of sustainable development and
2. contributing in solving part of these problems by demonstrating small actions people can undertake in their own households.

Step 4: selection of participants
The training course originally was to be carried out four times. Two times at each school, one time for 10^{th} and one time for 11^{th} grade students. For school 24 this would result in one session with the students from the ecological club (11^{th} grade students) and one session with 10^{th} grade students, which had enrolled the list provided with the questionnaire or students which had written their name under the questionnaire instead. Unfortunately, it was not possible to perform the training course with the 10^{th} grade students because of severe illness of the teacher involved. The training course was presented for the students of the ecological club.

The training course was presented one time also at school 5, with participants both from the 10th and 11th grades. In this case there was less possibility to test different techniques of presenting the practical part of the training course, but that was not a problem. In this school no video equipment was available, so the discussion of statements could be tested here. More information about the two test cases is presented in paragraph 8.1.5.

Step 5: first selection of teachers
Originally the training course was developed for BURENCO (see paragraph 1.3.2) in Minsk which is inventorising, gathering and developing educational material for schools about ecological and environmental issues. One consultant of this bureau is involved in this project. However, she was also involved in other activities such as her graduation project, so she did not participate in the actual development of the training course. However, we had regularly meetings about the project. The training course is developed in such a way that teachers of secondary schools easily can present the training course themselves as well.

8.2 Task analysis: step 6

Step 6: carrying out task analysis
The survey with a questionnaire was carried out to gain more specific insight in the interest and the knowledge of the students about environmental issues. More information about the methodology and the results is provided in chapters 3, 5 and 7.

The case is that students know about environmental problems and, to a certain level, how these problems affect their lives, but they do not know how they can help solving environmental problems. They are interested, but this interest (passive attitude) is not transformed into an active attitude and actual behaviour in which students take the effects on nature into account. They hardly look for solutions and when they are looking they are hampered because of the difficulty to find comprehensible information. This all led to a practical filling in of the training course in which a theoretical and practical part can be distinguished. The theoretical part is meant as an introduction to the condition of the environmental problem in the RB. The practical result translates the general subject 'environmental problems' into personal problems for which they have to learn to feel responsible. That is why the training course is divided in 5 parts in which different environmentally related subjects are discussed.

Each part of the training course starts with a general introduction of the environmental problem in Belarus. The second part concerns, with exception of the subject 'water pollution', the consequences of the environmental problems for the future, which ends with the question:
In what way can the students participate in solving this problem to ensure a sustainable society?

After the break, several practical tests and instructions are assimilated to stimulate the participants to think about their own behaviour and the way they have to change that behaviour into a less damaging one towards nature.

Separate time is made available for questions and discussion. In case time is left, statements can be discussed in this part as well. The last part concerns the formulation of a personal action plan with respect to the subject of that meeting. In this way students are again asked to think what they can do, in their own household, to help solving environmental problems. In this way, the concepts explained in the training course can be repeated in a small summary.

The teacher's manual consists of the set of sheets for each part of the whole training course. When available, also pieces of video tapes or cassettes are recommended. Teaching techniques are added as well.

The manual provides a flexible set of sheets which can be used as a guidance for teachers to present environmental problems. Depending on the selection of participants in this way emphasis can be placed on different parts of the training course. The language in the training course is easy to understand for different age categories.

8.3 Learning objectives and evaluation methods: steps 7, A and B

Step 7: formulating concrete learning objectives
Each part of the training course has it's own specific training objectives. According to those objectives the information necessary to meet those objectives is searched for. Later evaluation criteria and evaluation instruments to test the participants of the training course will be formulated. In general, the training objectives can be formulated as:

1. increasing knowledge about environmental subject in Belarus: gaining more knowledge about the general situation in which the problem exists;
2. increasing consciousness-raising of consequences of actual behaviour in the future;
3. increasing knowledge about ways to change behaviour with respect to specific environmental problem;
4. increasing knowledge about need to change behaviour from a passive into an active one;
5. stimulating self reflection on behaviour with respect to a specific environmental problem.

The different objectives are be subdivided for the specific parts of the courses, if necessary. The final result of the definition of the training objectives, their evaluation criteria and instruments is described in appendix VIII.

Steps A and B: determining evaluation criteria and developing an evaluation instrument

Three evaluation criteria play a role. The first one is directed to effectiveness of the training course: has the information reached the aim. Did the training course enlarge the students' knowledge, raise their consciousness and stimulate self reflection? The second one involves the actual content of the training course and the way the different subjects were presented. This item is further discussed in step 14. The last form of evaluation concerns the long term effect. This form is discussed in step 15.

The first aspect, evaluating whether the concrete learning objectives were achieved, is examined by a test. This test contains theoretical questions about the information provided during the training course. This test should be carried out within two weeks until a month of the training course. In that case, the direct information transfer is tested. The teacher's manual contains the five tests and specific assistance about the execution of the test.

8.4 The actual training course: steps 8 and 9

Step 8 and 9: designing work methods and training material

In general the task analysis and the learning objectives have to be translated into an effective training program. The so-called screen method has been developed for this purpose. The screen method consists of the following steps (Gijs van Haastrecht, p. 74):

1. determine the learning objectives;
2. split each learning objective into sub-learning objectives;
3. brainstorm to choose the best suitable form for each sub-learning objective to realise each sub-learning objective (work-unit);
4. determine for each work-unit its attractiveness for the program (for example with the help of ++ for very attractive and -- for not attractive at all);
5. determine the necessary amount of time for each work-unit;
6. make a screen and fill in those parts of the program that are known;
7. fill in the rest of the program with a selection of the work-units determined under point 3. Aspects that have to be considered are attractiveness, variety in instruction material, the group process and so on.

Part 1 and 2 are already executed in step 7 of the main program. During part 3, I had interviews with students and teachers about the work methods and teaching methods, used at the two schools and at the university. In general, teachers use little alternation while teaching students. Most of the time they lecture and question the students. Sometimes the teachers use group assignments and tape recorders. Group discussion, quizzes and tests without judgement are hardly used. The same can be said for the involvement of video and computers.
Therefore, different quizzes and tests were developed to stimulate students to participate actively in the practical part of the training course. Also statements for discussion were prepared. In the two test cases the different forms of tests and quizzes were tested. Each form could be divided in an individual, group or interactive form. Depending on the level of knowledge of the students, the final form as presented in the teacher's manual was chosen. For further information about the concrete filling in of the practical part, I refer to the introduction of each part of the training course in which the different work methods are described.

Two important results of the questionnaire were the student's overall pessimistic view of the future and the fact that they want to help solving environmental problems, but that they do not have the know how and, as a result, hardly had developed activities on their own. As has been stated before, the main aim of the training course is to change that passive attitude into an active one. One organisation that is trying to achieve that goal also is Global Action Plan for the World, which has developed the EcoTeam approach. The EcoTeam approach was discussed shortly in paragraph 1.3.2. This approach has showed to be very successful in different societies in countries all over the world. The important issue in this approach is that participants are shown how they have to and can change their behaviour in daily life by small changes and minor efforts. This approach also appreared applicable (Boekhout, Haans, Spreij, 1997) in Minsk. The study mentioned also stated that specifically students and young adults should be involved, because of their great interest in the subject.

The EcoTeam approach and a training course developed by TELEAC, called 'Consument en Milieu' are used to design the practical filling in of the training course. An extra part, which involves the consequences of activities in the future, is added to show the students more specifically what effect which activities have. In this way they are made aware of their responsibility towards future generations. The concept 'sustainable development' is used to emphasise that even more.

According to the recommendations of my first research in Belarus, the results of the questionnaire and the EcoTeam approach, the content of the training course is directed to five subjects.

1. Why should energy be saved?
2. Saving water: why and how?
3. Waste disposal: reduce, reuse, recycle and replace.
4. How to prevent water pollution.
5. Is noise an environmental problem?

The general content of each of the parts can be divided in
Introduction
Environmental problems in Belarus
A look at the future
BREAK
Your daily life: Practical ideas
Questions and Discussion.
Personal Action Plan.

8.5 Execution of the training course: steps 10 and 11

Steps 10: creating conditions for a successful training course

To be sure all necessities are present, about two weeks until a week before the training course will be executed, people have to contact the school. Video is not always present, so then the trainer can prepare himself extra for the discussions.
Besides the normal activities such as being in time to check the class room, television, video and overhead (light) projector, to create conditions for a successful training course, the English teachers and an interpreter were present to overcome possible language problems. I distributed name cards to be able to speak more directly to the students and to be able to involve passive students in discussions and tests. I also distributed paper, so that students could take notes. After the training course teachers and students were able to ask for the sheets, if they were interested.

Step 11: executing the training course

Part I: 'Why should energy be save?' was presented one time at both schools. In school 24 a video was present so no statements were discussed during the part III: consequences for the future. During part IV the practical part was tested in the following ways:

1. *your daily life:* in groups of three to four students each group was discussing the energy consuming activities in one part of the day (morning, afternoon and evening: defined by time periods). After 10 minutes a representative of the group was asked to tell the results and the teacher wrote down the results on the blackboard. This was repeated for each group. Also the number of times an activity was carried out was counted. After that the trainer stated the possibility to reduce the number of times an activity was carried out and the energy saving variant of some activities. The second time (school 5) the approach changed, because the number of participants doubled (from 8 to 16). This time three or two sets of two students discussed a part of the day and one student of each part of the day was asked to write down the result. This approach caused a higher involvement of all students, because of it's form of competitiveness of being able to find even more energy consuming activities.

2. *quiz about energy consuming equipment and their kWh*: the first time this quiz was tested by letting students write down their answers individually. However, since most students had absolutely no idea about it, this part can best be presented 'interactive'. By giving students time to read the question, probe the general opinion and asking one of those students for his opinion and when it is wrong, asking more students, again high involvement of the participants is reached. Emphasise, that it is important to keep the amount of electricity a piece of equipment uses in mind especially when new equipment has to be bought.
3. *quiz about electrical equipment and their year of first appearance*: this quiz was first tested in an interactive way and this was prolonged in the second test case. Students have more knowledge (or right guesses) about this subject, this part can also be presented interactive after having given the students the time to read the question and to make some choices by themselves. This quiz is presented on a sheet and the participants are asked to find the right date of first usage of a certain piece of equipment. During the presentation of the results, the necessity and rational usage are stipulated. Emphasise the time of appearance and the need to use some of this equipment as often as we do.
4. *test yourself!:* in both cases this part was presented individually. The first time, however, minor explanation was given, to find out where students needed extra information. It proved that students needed time to read the statement, but it also possible to read the statements, one y one, and explain if necessary. In this case, everybody has the same time to write down their score and the statements are explained for everybody at the same time.

The approach of tests and quizzes can be used in every part of the training course, so this will not be repeated every new subject.

8.6 Evaluation: steps 12 and 13

Step 12: evaluating the training course

The content of the training course and the way the different parts were presented was evaluated immediately after the training course at both schools. The two English teachers also gave their personal opinion of the content of the training course. The results are discussed below.

On a scale 1 to 5 students were asked to give their opinion about different statements.

The content of the training course as a whole was good (4.6 on a scale to 5), as well as the level of novelty of the information provided and the presentation of the teacher. Part 1 and 2 ('environmental problems in Belarus' and 'a look at the future') were quite specific and your daily life provided specific information. So the goal to present specific information to give environmental problems a more personal character was reached.
The students found the practical examples and the writing of a personal action plan useful (4.4 and 4.3). The balance between individual work and work in groups was good, although some (3) students stated that more group work could be included. The length of the training course overall was good, although the students of school 24 found it longer than the students of school 5, but the students of school 24 already had a school day passed. The training course at school 5 was given during other classes. The level of English was easy to understand.

The most interesting part, was the practical part, your daily life. The students enjoyed that part most. They liked to see changed part I containing information about environmental problems in Belarus, because they want to know more about all kind of other environmental problems as pollution of water, soil and air. Nothing should be removed and, except one, all of them were interested in a follow up which should contain of more practical examples of how to help

solving other environmental problems. All students thought that they could apply the concepts of the training course in daily life and all, except one, were also planning to use them. The need to change their behaviour had become clear for all of them.

The conclusion of this evaluation is that nothing was going to be changed of the content of the training course. The level of English should stay unchanged as well and a follow up is very useful. Therefore, the other four parts of the training course were also developed. Especially the practical parts were very interesting for the students and in the other parts this would also be the main issue. The objectives as stated before: increasing the knowledge about why their behaviour should be changed and presenting ways to help solving environmental problems has been reached until so far.

The teachers gave also a very positive evaluation. Especially the work methods were interesting to them as well. The teacher of school 24 stated that she could easily use it for students of other grades as well. School 5's teacher stated that there was a lot of new information for her as well. She was very surprised to hear that small changes can have such an impact if they are done by a lot of people. She intended to apply the practical examples as well.

Step 13: measuring the long term effect

The long term effect is not measured during this research. There was enough time to set up a scientifically based measurement method for long term effects. Only recommendations regarding this part of the study will be given. To measure the long term effect of the training course the attitude and behaviour of the participants of the training course should be measured over a long period of time, for example a year or two. Then still the measuring of the attitude and behaviour is very difficult. People easily experience this kind of evaluation as an infringement of their privacy. Setting up reliable and accurate questionnaires would need a whole new research. Furthermore, people in Belarus are not really used to filling in questionnaires.

Chapter 9 Conclusion and recommendations

9.1 Conclusions with respect to research question 1

A training course is definitely useful to inform small groups about general environmental problems. Those issues can be translated to a personal objective in which the need to change behaviour is made clear. In this way a general introduction and specified useful information can be provided in the same time. The small groups can consist of students of secondary schools, but also of primary school children, university students, adults, and non governmental organisations. The general objective of the training course is to show people that they need to change their behaviour from a passive into an active one. They should become more aware of the consequences their activities have. Gradually, the effect on the environment should become a normal question when acting.

The training course consists of five issues, namely:
1. Why should energy be saved?
2. Saving water: why and how?
3. Waste disposal: reduce, reuse, recycle and replace.
4. How to prevent water pollution.
5. Is noise an environmental problem?

The course is partly based on the concepts of the EcoTeam approach. Especially the emphasis on small activities that can be applied in normal daily life are very important. It should become clear for the participants that it is easy to change their behaviour. It is more difficult to continue that new behaviour.

The tasks of the participants is to apply the ideas they obtained in the training course. They have to try to change their behaviour. To keep the participants interested and to give them the chance to apply the practical assistance, each of the five parts should be presented at least two weeks after each other. In the next session of the training course, tests can be made to find out which information was best kept and to reflect on the difficulties of the past period. New ideas can also be exchanged.

Evaluation of the training course is necessary, especially when the group of participants does not consist of students in the age category 15-18. For the measuring of long term effects, a completely new research should be designed.

To start and to inform relatively small groups (up to 20 people) the training course is very suitable.

9.2 Conclusions with respect to research question 2

An analysis of the environmental problems in the RB is made in two ways. First by means of a technical analysis, which means a description of the problems, with their causes and the consequences. Another way was the analysis of the place environment takes in the society of the RB. This means: on the one hand 'what are the problems?' and 'what should be done?' and on the other hand 'what is actually done?'.

The technical analysis of the environmental problems is described in appendix II. The main conclusions are that the most important environmental problems in the RB are: air, water and

soil pollution, energy deficits resulting in even more air, water and soil pollution, the results of Nuclear Power Plant accidents, no sustainability in the whole society of the RB. The problems are caused by: lack of clean and cleaning technologies, power engineering, transport, consumption of households and industry, more demand for hygiene, lack of maintenance, unknown consequences, absence of planning, absence of financial resources and lack of knowledge.
A whole list of problems which indicate immediately the poor state of the economy of the RB as well. The first hurdle that has to be taken, is the disinterest of policy makers and implementers when it comes to taking the environment into account. A change in awareness and attitude in the whole country is necessary to be able to initiate activities with respect to the protection of nature. Special attention has to be placed on the consequences of present behaviour, of which people are hardly aware. The use of investments, especially for the industry, should be pointed out for example by productivity calculations.

In all of this, the place the environment takes in daily life of the population of Belarus turns out to be the major issue. A governmental structure with respect to nature protection is present. The outcomes of for example energy and water saving policies, however, are very low. People's environmental awareness will remain low, if not some large campaign is started to bring environmental problems under people's attention. Especially secondary schools, but also primary ones, should become involved in teaching children a better way to conduct. Environmental education plays a crucial role in this process. The efforts of non-governmental organisations and ecological clubs at schools should be stimulated and encouraged by interest in their activities of official authorities and by financial aid. The same can be said for industrial awareness. In this case also the need for energy management and environmentally friendly production should be stimulated.

9.3 Conclusions with respect to research question 3

Research question 3 refers to the student's view on environmental problems. Visits to different schools and interviews with the Republican Ecological Educational Centre and several NGO's proved that a lot of information about the environment is present in Minsk (sub research question 3a) is spread over different mall places at organisations, libraries and centres. The information present is often in English and was obtained with financial aid from abroad. Sister organisations, municipalities, foreign funds and so on, supplied the institutes with information. Very often, this information was not up-to-date anymore. The government supplies the population with information by television and radio. Special commercials about energy and water saving are made and sometimes special programmes are broadcasted. Concluding, information is present, though hard to find and not up-to-date.

The knowledge of students about environmental problems (sub question 3b) can be defined as general knowledge. This means that they are aware of the problems, that they know to a certain extent what the causes are, but that they do not know how they can help solving the problems. I got the impression that even more knowledge about environmental problems all over the world is present, than knowledge about environmental problems in the direct environment.

Most students are definitely interested in environmental problems. They want to help solving the problems, but they do not know how. They have a very pessimistic view to the future and at the same time they feel responsible for that future. It is not possible to say in which subjects they are most interested. It depends on the student and no general opinion could be extracted from the results of the questionnaire after the training course (sub questions 3b-d,g).

The students can be taught about environmental problems in different ways (sub question 3e). First the training course proved to be suitable. Secondly, a program involving all courses in school should be possible, if the government would support (read initiate and impose) this new program. However, new books and other material as video's, cassettes and information papers should be present to base the program on actual and reliable information.

Students feel as if they can influence the environmental condition of the RB, but immediately they state that everybody should be involved: government, industry and population. They express that the state of the environment is a matter of everybody: not only the government, not only the industry, not only the population (sub question 2f).

Students are very unsatisfied (sub question h) with their behaviour towards energy and water usage, heat usage and waste disposal. They obtained useful information about energy and water saving activities, but during the training course about energy saving, they still said that most of the information was new. Especially the practical part was interesting for them.

The student's attitude towards nature can be influenced by providing them more information about why and how they should change their attitude. A change in attitude from a passive into an active one is necessary, but this needs a change of general mentality. Because of the enormous problems in the RB, the general motivation to change seems useless. Especially the fact that also small things help should be made clear. Showing the students the major consequences of their and their parent's activities makes it even more clear for them that a change is necessary. The last thing they want, is living in a society that even gets worse.

9.4 Recommendations

Still a lot has to be done, but the youth gives enormous stimulation and good perspective for the future. They especially are very interested in nature and feel responsible for their actions, more than their parents. The training course can be used to stimulate and help people to change their attitude from a passive into an active one and at the same time increases people's environmental awareness. Providing information is still very important to give people a basis on which they can make their own choices.

Whether the training course actually contributed to an increase in environmental awareness and a change in attitude and behaviour in short or long term is not known. This should be the subject of further research. The goal of such research can be:
'Determining the effectiveness of the training course: '*Environmental problems and a way to help solving them*' on short and long term.
This research, however, will take a lot of time, especially if long term changes will be studied.

Before the actual changes will be studied a solid theoretical model should be presented on which a further approach should be based. During a pre survey and maybe after the field work, the theoretical model can be adapted, but this theoretical model is very important. Otherwise the testing of hypotheses will lead to problems, because of the poor operationalisation of variables used in the model. A possible model is presented in figure 9.1.

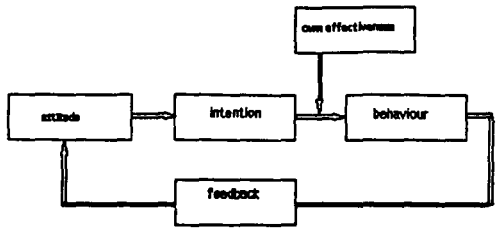

Figure 9.1: *possible theoretical model for further research*

Technically, also a lot still has to be changed to make it easier for people to change their attitude and to keep it changed. In and around houses changes are necessary. Changes in the sense of measuring equipment as well as setting up systems for waste gathering and disposal.

Environmental and ecological education can play an important role when one already teaches young children how to behave in a, environmentally spoken, correct way. Young adults which stand on the point of going to live on themselves or starting their own family, already should have proper ways of conduct and they should be aware of nature.

To provide a sustainable environment in Belarus it is not only a duty of inhabitants to change, but also on governmental level and in the industry major behavioural changes are necessary. More money should become available and the need to invest in more environmentally friendly techniques and conditions is a must.

In the light of this research, concerning environmental education, a proper system of ecological and environmental education should be designed. This does not mean that courses should be given in primary and secondary schools specifically about environmental problems, but students should become more aware of the overall impact their attitude towards nature has on life. A study of the variables of long term change of behaviour toward nature is absolutely useful. Also a study of the availability of information, in books, newspapers, on television, in libraries and on internet, is very useful. Now, everywhere information can be gathered, but for individuals it is difficult to find the right place to obtain specific information.

Furthermore, the information provided by the government and other organisations should be based on the need to change behaviour. Of course it is important that the government sets the right example.

During the research people's attitudes and behaviour was investigated by means of a survey using a questionnaire with closed questions. Already during the pre-survey it was discovered by unstructured observations that the questions about behaviour were answered in such a way that they confirmed environmentally correct behaviour (socially desired answers). This, of course is a phenomenon, which is well known also in Western countries and can be reduced by asking the right questions in the right context. The pre survey therefore led to changes in the questionnaire. Still, in my opinion, socially desired answers are more easily given in the RB, maybe also on account of the fact that people - for generations - had no experience and were not exposed to questionnaires. Therefore, participatory observation techniques could be more suitable in the RB and lead to more reliable and useful information. This, however, will probably only be the case when the observation are carried out by well instructed Belarusians. If a West European researcher would carry out the observation, the old problem would be manifest again, forced expected behaviour.

To provide a sustainable development in the RB an unabridged approach of environmental problems in the light of socio-economic improval is necessary. Both the authorities, the industry and the population have to be involved in solving environmental problems. It has to

become a topic which is taken into account when making decisions at all levels of society. First of all a full co-operation and financial support of the government is necessary. Policy makers and implementors should be more aware of the implications of the environment on the economy, health and the whole society of the RB. Especially small activities employed by students and non-governmental organisations should not be ignored and thwarted but supported, because then, the people will stay interested in helping to solve environmental problems.

Appendices

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Appendix I Communication & information

In the first two parts of the study it is determined what kind of place the target has in the environmental awareness process. The Republic of Belarus can be compared with the Dutch situation. The Netherlands know already twenty years of environmental education. During these twenty years the provision of information has had several priorities. In the beginning of the seventies, only general information was provided. Later this approach seemed little effective and a more specific approach was used[1]. Specific in the sense of more detailed information about specific subjects. At that time that was a more effective approach. However, lately a mixture of general and specific information seems more effective.

In this chapter, theoretical backgrounds of communication, extension education and designing training courses is presented. The theoretical background indicates that a training ourse is a suitable way to educate people in the situation of the RB. The actual design of the training course will be explained in paragraph 3.3. The theory in this chapter is used to categorise the ways information can be used to educate people. It presents the place training courses take in communication strategies. General information about extension education and training courses is used to determine the general characteristics of a training course. Points of attention and critizism are taken into account when designing the actual training course.

I.1 General aspects of communication

Training courses are a form of communication in which messages are transmitted. The trainer (transmitter) has an idea (the goal of the training) and wants to transmit that to the trainee (the receiver). The message is transmitted by a channel, the voice or other means of communication. It this process it is important that the message is encoded as the trainer meant it[2].

There are different types of communication of which extension education is one of them. In this research this form of communication, worked out in a training course, is chosen to inform people about environmental subjects. The other forms of communication are education, public relations, propaganda and advertisements[3].
The difference between extension education and education in general is the measure in which each of them is directed to problems. Extension education is more directed to specific problems. General education is more directed to qualification, or a general ability to take certain decisions. The general difference between extension education or information on one hand and the other types of communication on the other hand are the effects at the collective level. This means that advertisements are meant to promote the sale of a certain product or service. Propaganda is used to spread cultural and political ideas and public relations serve the interest of companies and organisations. Extension education serves a client, or public or collective interest. Those interests can only be reached by individual voluntary changes[4].

Extension education is the suitable form to start informing people about environmental subjects, because of it's direction to specific problems. It is also suitable because environmental problems concern, people's personal and collective and public interests.

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1 *Energiebesparing door gedragsbeinvloeding*, C.J.H. Midden, W.H. Weenig e.a., VUGA, 's-Gravenhage, 1982, p.55

2 *Van plan tot uitvoering inleiding in voorlichting*, M.F. Vos, Culemborg, 1988, p.25

3 id. p.26

4 *Basisboek Voorlichting*, A. Blaauwbroek e.a., Wolters-Noordhoff, Groningen, 1992, p.31.

With respect to the different forms of communication, then can have different functions for companies or organisations:
a. granting service
b. increasing publicity
c. forming a picture
d. stimulating changes in behaviour
e. contribute to serving public interests
f. increasing support
g. increasing sales.
The first two functions are serving the needs of the public, the other ones are applying communication as policy instrument as is the case in this research[5].
In this case c, d, e and f are functions of the extension education. See also paragraph 4.4.

I.2 Extension education

There is no simple definition of extension education available. However, when several definitions are studied, it seems that extension education has several characteristics on which basis for every specific case a definition can be chosen.

Those characteristics are:
1. helping with forming opinions and taking decisions;
2. giving an overview of most important relevant data and insight;
3. promoting desired developments and preventing undesired developments;
4. transferring knowledge and insight;
5. changing voluntarily behaviour in the direction of assumed collective interest;
6. changing the reasons for other people's acting[6].

Extension education is a programmed, planned activity directed to a specific aim. It can also be used as a policy instrument to intervene in processes, but this is not the case in this research[7]. In this case it can be seen as a supportive policy instrument. Because extension education does not aim itself at the circumstances in which people act, but at the reasons why people act that way, it is not compelling. People can say 'no' and if a change in behaviour is the aim of the information, then people have to want that change themselves, otherwise nothing will change[8].

Depending on the final goal of the course, the following definition of extension education can be chosen. Extension education is an attempt to transfer knowledge and insight to a trainee to help him to make independent and conscious decisions according to his own and communal well-being (free to van Gent en Katus 1980 and 1994, in Röling, 1994). It is stated here in short that changing behaviour is not the prime objective of the course.

I.3 Why a training course?

Extension education can have different modalities. Modalities are ways in which the extension education is given form.

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5 M.F. Vos, Culemborg, 1988, p. 32
6 Röling, 1994, p.22-23
7 id. p. 25
8 id. p.29

Two distinctions can be made with respect to forms in which information can be provided. First on basis of how the target group has to be reached: individually or not. When it is not necessary to reach persons individually, the mass media can be used to inform people. However, these campaigns cost a lot of money. This immediately excludes this possibility. In this case people have to be reached personally. This can also be done in a small group. Training courses are not yet a common feature in the RB. Small groups are advised to stimulate people to participate in discussions. Secondly information can be provided written or spoken. Written information like brochures, flyers and newspapers are forms that should be available. However, the information that is available is without obligation and people do not pay very much attention to it. While talking to people they immediately can intervene when things are not clear or when they want more information. Personal contact with people 'lowers the threshold' and is more direct.

I.4 Characteristics of the training course

Extension education can be informative, educational and persuasive (Open Universiteit, 1993, p.17, Röling, 1994 p.217). The form of extension education that is chosen in this research, an environmental awareness course, has several characteristics derived from the three possible forms of information. The course will be mostly informative because of it's advising and it's provision of information[9]. Then, of course, it will be educational as well. General solutions to specific environmental problems in the RB are not possible. It is also important that the picture of knowledge and experiences of people can be drawn further. People are taught why and how toparticipate in environmental actions in their own household[10]. Because a certain goal will be set according to a plan to possibly change the mental state of the trainee, one can speak of persuasive information. This change can be a change of attitude resulting, in the long term, in change in behaviour. This voluntary change, however, will depend upon whether people know how to, want, can, and are allowed to change their behaviour[11] .

I.5 Criticism on effectivity of training courses

TNO-report (1995) states that extension education seems little effective when it is used to influence habits and customs. Firstly because advantages and disadvantages are not weighed consciously in this kind of behaviour. Secondly, because sometimes people are not open for new information, because they do not want to change their satisfying habits. However, this criticism should be read against the Dutch situation in which people can feel that there is an overkill of information. This is obviously not the case in the Republic of Belarus, because little, if any, information is available. Extension education supporting other policy instruments is always possible.

Van Woerkum (in Bardoel, 1993) emphasises that extension education is effective, only when it is felt as 'help'. When people feel that they are influenced then the actual changes on influencing decrease very fast. It is not sure whether this also is applicable for the Belarusian situation since its communistic-socialistic history used propaganda to inform people. Where rules and subsidies can not change people's behaviour, instrumental extension education can lead to better results. It is cheaper and when it leads to changes that one beneficial for the future (Paling in Bardoel, 1993).

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9 id. p.181

10 id. p. 199

11 Blaauwbroek, 1992, p.30

During the first audio conference of the new course of the Baltic University program at the 20th of February 1997, environmental awareness and a way to change people's behaviour (the ultimate aim) was a topic of discussion. The question was in which order events to change people's behaviour should take place. First doing, than learning or first learning than doing. People's activities can be positive or negative towards nature, behaviour with negative side effects will not change unless people know and are judged on their negative behaviour. They first have got to know why that behaviour is negative before they can make a choice how to behave in future. When positive behaviour takes place and people learn why it is positive, then people learn by doing. A balance should be found between the learning and doing activities. For this reason in the training course ways to solve environmental problems will be discussed and shown where possible as well.

Appendix II Training Courses

The steps as mentioned in paragraph 3.3 are further discussed in this appendix. Also the changes in comparison with Kessels and Smit's model are explained.
The changed model is depicted below.

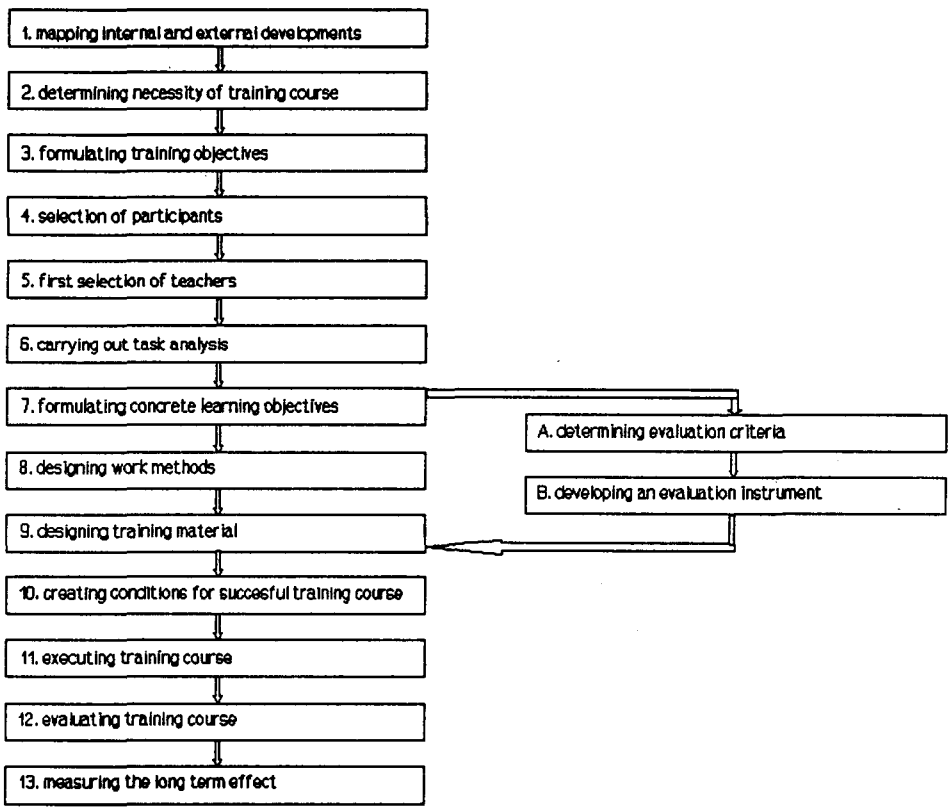

Figure II.1: Model to develop a training course[12]

Step 1: Mapping internal and external developments
In comparison with Kessels and Smit's model a changes have been made. First, a step is added according to Bergenhenegouwen. This step is step 1. Mapping internal and external developments. This is necessary to a draw a clear picture of the general circumstances in which the course takes place. It is important to know the general problem setting and the practical implications for a country or a specific organisation to adapt the course as much as possible to local circumstances. This step differs from step 4: performing task analyses, because in this step the opinion of people which will follow the course will be determined. Striking results of the task analyses will be used in the general design of the training course. This to avoid general theory in the course.

Step 2: Determining the necessity of training course
In this research is chosen to use a training course to inform and educate people about environmental problems and the way they can help themselves, in their own households to solve these problems. However, the choice for a training course is not always the right one. Sometimes, general instruction material as brochures, or the opposite more intensive, enduring help is necessary.

[12] based on: *Leerdoelen, in: Handboek voor opleiders in organisaties*, J.W.M. Kessels & C.A. Smit, Deventer, 1989

When informing people in a training course is the best or cheapest alternative to solve a certain problem, training is necessary.

A training course is definitely necessary. Too little environmental education, in general, is present. Specifically in secondary schools environmental education plays a minor role. In only about 7 secondary schools in Minsk an ecological club is present, but this is a 'outschools' activity only co-ordinated by the school. Secondly the training course can be used in two more ways. One to teach coaches of future EcoTeams and second as an introduction at the first meetings of new EcoTeams. Those EcoTeams will be co-ordinated by BURENCO. This means that a general training course is developed.

Step 4: Select participants
Selecting participants is put forward, because it is necessary to know the general characteristics of the participants before the course is started (see also 5.6 Task analysis). Depending on these characteristics the general framework has to be adapted.

Step 5: First selection of teachers
I think it is important to carried out a first selection of teachers, before formulating the concrete learning objectives. The reason for this is, that in this way the future teachers will be much more involved in the backgrounds, the general, but more important the specific ideas behind the training course. Especially in a country, like the RB, where this form of information is not commonly used, it is important to teach the trainers the basics of the training course. When small changes are necessary, possibly depending on the target group, the teachers can convey those themselves.
Future teachers will be members of BURENCO. However, at the moment this step had to be taken, nobody was officially employed by BURENCO and no specific person was dedicated to teach the coaches of EcoTeams.

Step 6: Perform task analyses
Besides avoiding general theory, the task analyses is also necessary to determine where exactly the trainees are engaged in. During this task analysis people's view on environmental subjects can be determined. For further methodology is hereby referred to chapter 6. The first time a more extensive research to this subject will be conducted.

When the course is repeated, if necessary, the questionnaire (or a short version) can be submitted to a few participants. In this case can be determined whether the emphasis has to be led at different aspects of the general form.

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Step A and B: Determine evaluation criteria and evaluation instrument
Two evaluation criteria are playing a role. The first one is directed to the knowledge of the trainees about environmental problems. Did the training course enlarge their knowledge? The second one involves the usefulness of the training course.

The first aspect, enlarging knowledge about environmental problems and their solutions, can be examined by a test. In this test theoretical questions are asked about the information provided during the training course. This test should be carried out within two weeks until a month of the training course.

Step 8 and 9: Design work methods and making instruction material
In general the task analysis and the learning objectives have to be translated into an effective training program. The so-called screen method has been developed for this purpose. The screen method consists of the following steps (Gijs, p. 74):
1. Determine the learning objectives (is done during step 7);
2. Split each learning objective into sub-learning objectives;
3. Brainstorm to choose the best suitable form for each sub-learning objective to realise each sub-learning objective (work-unit);
4. Determine for each work-unit its attractiveness for the program (for example with the help of ++ for very attractive and -- for not attractive at all);
5. Determine the necessary amount of time for each work-unit;
6. Make a screen and fill in those parts of the program that are known;
7. Fill in the rest of the program with a selection of the work-units determined under point 3.
Aspects that have to be considered are attractiveness, variety in instruction material, the group process and so on.

Steps 10 and 11: Create conditions for a successful training course & Execute the training course
The conditions for a successful training course depend on the situation in which the course is performed. For instance, the place where the course is given, the trainer and the instruction material is important. In general a good preparation is necessary.

Step 12 and 13: Evaluate the training course and Measure the long term effect
The course will be evaluate according to the method chosen. The long term effect is not measured during this research. There was enough time to set up a scientifically based measurement method for long term effects. Only recommendations regarding this part of the study will be given.

Appendix III Environmental problems in the Republic of Belarus

Environmental problems can be divided in different categories. One possibility is a division at the global, continental, national and local level. The first three levels will be described in this chapter. Global level refers to the earth's environmental condition. Continental is defined as problems occurring in Europe, the Common Wealth of Independent States, Georgia and the Baltic States. The emphasis will be on the national problems of the RB. The inventory presented in this appendix is already presented in paragraph 4.2 as well. However, it has been mentioned here again to obtain a clear overview of the national and international situation. Then the results of the invetory can be compared more easily. Regional problems are not discussed separately because this leads to the same results as the national inventory. Only air pollution occurs more severely in Minsk, but all other problems are in principle the same. It is important to draw a picture of the global and continental environmental problems as well. In this way can be determined which problems are most relevant for the RB as a part of the world.

The environmental problems are categorised according to the method described in paragraph 3.2. At the end of the chapter a schedule is presented in which the problems at the different level are presented according to their causes, activities, interventions and effects. A separate paragraph is dedicated to sustainability at all three levels.

III.1 Global environmental problems

World-wide, environmental problems are discussed abundantly. Environmental problems are nowadays directly related to health problems, economical decisions, production processes, quality of life: every aspect of human life. In past decades especially local health effects and effects on nature featured prominently. Now, also the social and economical functions of the environment receive attention.

Global environmental problems can be divided in three main problems, each of them related to other problems[13] :
1. changes in climate: disappearance of species, warming up of the earth?
2. depletion of the ozone-layer: greenhouse effect;
3. decreasing natural resources: energy sources and water.

The result of those three major problems is that sustainability at the global level can not be provided.

III.1.1 Changes in climate

Changes in climate relate to wind, deposition, temperature, increase of the sea level and the greenhouse effect. Changes in climate are caused by deforestation, erosion of the surface, de-peating, too much fishing, too much hunting. All these aspects lead to exhausting the reservoirs. Deforestation (by highland farmers) causes flooding on lowland farms. In Latin America and Asia, more floods are caused by deforestation.

The burning of fossil fuels and the cutting and burning forests release carbon dioxide into the atmosphere possibly causing gradual global warming. The global warming is caused by the accumulation of carbon dioxide, along with other gases in the atmosphere, which traps the solar radiation near the Earth's surface. This is called the 'greenhouse effect'. By early next century it can have increased average global temperatures enough to shift agricultural production areas and raising sea levels. (WCED, 1987)

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[13] *Zorgen voor Morgen, Nationale Milieuverkenning 1985-2010*, RIVM, Eindred. F. Langeweg, Tjeenk Willink, Samsom H.D., Alphen aan de Rijn, 1989

Critics however state that one can not yet, speak of global warming. Only in the next century trends of temperature would be visible. A few tenths of degrees in the last couple of years, do not necessarily mean 'global warming'.

Most efforts at thel level are directed to stop the growth of concentration of materials which influence the climate (NMP, 1989). For materials which affect the ozone layer this has to be reached very soon.

III.1.2 Depletion of the ozone-layer[14]

Ultraviolet (UV) radiation is transmitted by the sun. It can be divided into three smaller bonds UV-A, UV-B and UV-C radiation, with wavelengths of pectively 320-400 nm ([15]), 280-320 nm and <280 nm. The amount and intensity of UV-radiation that reaches the Earth' surface varies with the angle of the sun, the weather and the altitude. At sea level, almost 95 percent of the UV radiation is UV-A radiation, 5 percent is UV-B radiation. Most solar UV is absorbed by the atmosphere.

UV radiation is sufficiently energetic to rupture chemical bonds. It can also energise molecules into an excited state, which can initiate various chemical and biological processes. Although UV-C radiation is especially lethal because of it's interaction with proteins and DNA, it is not an environmental problem from natural sources, because it is almost completely absorbed by oxygen and ozone in the atmosphere even at reduced levels. UV-A radiation is little absorbed by the atmosphere or ozone, but in comparison with UV-C and UV-B it is relatively less harmful to most living things. UV-B wavelengths are of most concern. UV-B is partially absorbed by ozone, but it may have damaging effects on the biosphere. Only minor changes in the ozone layer can have significant effectson the amount of UV-B that reaches earth.UV-B radiation can cause skin cancer, it can damage DNA and can kill cells.

The depletion of the atmospheric ozone layer is caused by gases released during the production of foam and the use of refrigerants and aerolos. Especially chlorofluorcarbons (CFC's) are responsible for the depletion of the earth's stratospheric ozone. The increase of concentration of broom (Br) and chloride (Cl) affects the ozone layer. Those trace-gasses influence the demolition and construction of ozone. In general depletion of the ozone-layer is given in percentages of the ozone concentration and in percentages of the total amount of ozone in vertical direction in a year of reference. Direct emissions of nitrogen oxide into the stratosphere from aircraft contribute as well to the depletion of the ozone layer. NO_x catalyses ozone removal and possiblyit enhances additional formation of polar stratospheric clouds that activate chlorine-catalysed destruction of ozone.

III.1.3 Decreasing amount of natural resources

Energy is necessary for daily survival. Future development crucially depends on its long-term availability in increasing quantities from sources that are dependable, safe and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need. Concern about a dependable future for energy is only natural since energy provides 'essential services' for human life: heat for warmth, cooking and manufacturing, or power for transport and mechanical work. At present, the energy to provide these services comes from fuels, oil, gas, coal, nuclear, wood and other primary sources (solar, wind or water power). In many countries world-wide, a lot of primary energy is wasted because of the inefficient design or running of the equipment used to concert the energy sources into the services required. In

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[14] This paragraph is based on information of: *Europe's environment, The Dobris Assessment,* D. Stanners and P. Bourdeau, European Environment Agency, Copenhagen, 1995

[15] nm = namometer = 10^{-9} meter

1987[16], the average person in an industrial market economy uses more than 80 times as much energy as someone in the sub-Saharan Africa. When developing countries should use as much as the industrialised world, global energy use should increase five times by the year 2025. This is not possible, because the planetary ecosystem can not cope with threats of global warming and acidification are so hazardous, that not even doubling of the use is possible. Awareness in energy conservation and efficiency is growing. In theory, all the energy sources have their own economic, health and environmental costs, benefits, risks and priorities.

Until now, too little has been achieved in tackling local and regional environmental impacts of energy provision and use, in relation to the scale and extent of these problems. Existing technologies are not being implemented rapidly and widely enough, and much needs to be done to achieve further innovation and diffusion of appropriate new technology. Notable progress advances have been made reducing emissions of particles, lead and sulphur in many (richer) industrial countries[17]. However, the reduction of sulphur dioxides emissions, even in these countries, has a considerable way to go. In many poorer countries of the world, emissions of particles, lead and sulphur continue to rise. The result is city smog, respiratory and other health problems, acid rain deposition and a deteriorating natural environment. Less satisfactory progress has also been made in reducing or curbing a number of other emissions: nitrogen oxides (NO_x), nitrous oxide (N_2O), volatile organic compounds, carbon dioxide (CO_2), carbon monoxide (CO) and methane (CH_4). Anthropogenic emissions of these gases are rising generally, promoted by the overall rise in global energy provision and particularly by the rapidly growing oil-based transportation sector. These emissions have local, regional and global impacts[18].

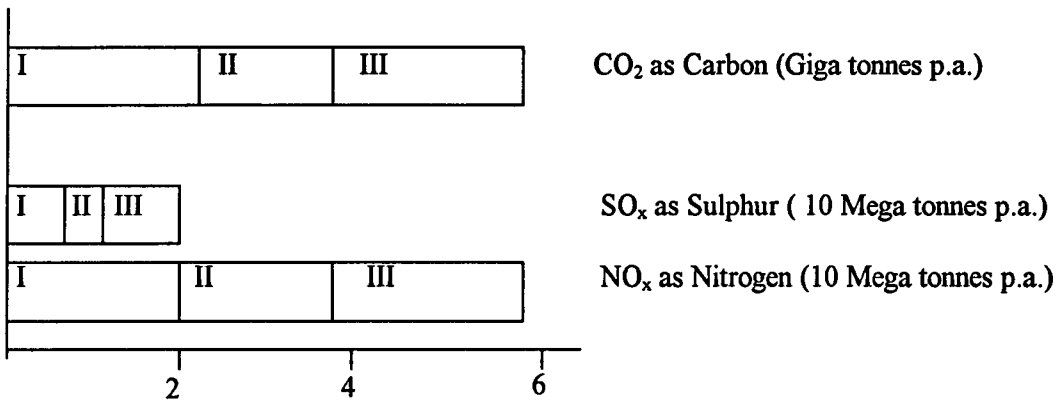

figure III.1[19]: Emissions of fossil fuel burning

In the figure above, the emissions of fossil fuel burning are depicted. The figures refer to 1990.
I: OECD-countries
II: CEE/CIS
III: DC's
p.a.: per annum

As WEC states it is a key element in a precautionary strategy to encourage an awareness of the need to conserve the world's resources in order to achieve sustainable development.

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16 The World Commission on Environment and Development, 1987, p.14

17 id.

18 The information about emission is deprived from: World Energy Council, 1993, pages 229 and 230

19 id.

II1.4 Sustainability on global level

Disturbance of the radiation situation of the earth, warming up of the atmosphere and more UV-B radiation, disturb the balance in the different life cycles. A loss in components of the biosphere is inevitable when nothing changes within a short period of time. Destabilisation of processes in nature and the loss of species are consequences of impoverishment of the diversification of components as well as the functions of components. The loss of living creatures will lead to a decrease in the genes reservoir which results in an increase in vulnerability.
Further more, a lot of consequences and effects of pollution now and in the past are not even known. Future generations have to deal with pollution caused by their ancestors.

III.2 Continental problems[20]

In Europe and more specificically the Common Wealth of Independent States, Georgia and the Baltic States, five main problems can be distinguished. Again the depletion of the ozone layer plays a role. Furthermore acidification, distribution of aerosols, nuclear power plant accidents (see I.3.3) and energy deficits at continental level are the most important environmental problems. Again these problems do not provide for a sustainable environment of the continent.
For depletion of the ozone layer I refer to III.1.2. Global and continental, the same problems are relevant. A special paragraph is dedicated to the state of the Baltic Sea. This subject is chosen because of the RB's special involvement in providing a future for this sea.

III.2.1 Acidification by air pollution[21]

A variety of air pollutants kill trees and lakes, damage buildings and cultural treasures. Sometimes even thousands of kilometres from the points of emission, objects are suffer from the pollutants. Most detrimental effects are caused by sulphur and nitrogen-containing components. The atmosphere contains those components and during rainfall the components reach ground. The strong oxidants make the soil more acid. Also the production of cattle food, fertiliser and cars produce a very large amount of sulphur and nitrogen-containing materials. Acid emission reductions of 80 until 90% are necessary. This is necessary to maintain and recover the forests in Europe and to maintain the cultural heritage. The acidification of the environment threatens large areas of Europe and North America. In 1987 Central Europe received more than one gram of sulphur on every square meter of soil each year. This is five times more than thenatural background. Europe is experiencing an immense change to irreversible acidification. The precise damage mechanisms are not known, but the air pollution component is definitely one of the major causes.

III.2.2 Distribution of aerosols

The environmental problems deriving from the distribution of aerosols are closely related to the depletion of the ozone layer and acidification. Carbon dioxide, nitrogen oxide, hydrocarbons, cholorofluorcarbons, dust all cause several environmental problems. Factory waste is often very polluted, most of the waste is dumped, but also a significant amount is spread by the large chimneys.

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20 Europe: the countries of the European Union, Austria, Finland, Iceland, Norway, Sweden, Switzerland and Liechtenstein (EFTA), Albania, Bulgaris, Croatia, Czech Republic, Hungrary, Poland Romania, Slovak Republic, Slovania, remaining former Yugoslavia (Central Europe), the whole of former U.S.S.R. including Baltic Republics, Belarus, Ukraine, Moldova and the Russian Federation (Former U.S.S.R.), Cyprus and Malta.

21 Information in this paragraph is based on: *Our Common Future,* The World Commission on Environment and Development, 1987

III.2.3 Energy supply[22]

The Commonwealth of Independent States, Georgia and the Baltic States account for 5.5% of world population. The region consumes 17% of the world commercial primary energy use and is a net exporter of energy. In particular this can be said for oil and natural gas. However, the regions is experiencing energy production difficulties and there is a declining surplus of energy for export.

Although economic activity has fallen, primary energy use has not fallen in line. This arises from inefficient energy economies, caused by energy abundance, low energy prices not reflecting world prices, the slow spread of energy efficient technology and problems exploiting scientific progress. The region has 6% of world proven oil reserves, 38% of proven gas reserves and 22% of proven coal reserves. However, these reserves are concentrated in only a few of the Independent States and only three of them are net exporters (the Russian Federation (RF), Khazakstan and Turkmenia).

The Baltic Region is among the most fossil fuel dependant in the world. In this region the energy use has quadrupled in one generation, between 1950-1970, but has slightly decreased since. The large dependence is based on hard coal and lignite (the south), oil (Estonia), gas and oil (the East).

The energy demand is expected to rise, net of energy conservation, by 1.3 or 1.4 times the 1990 level by 2020 to 1.5 to 1.6 billion toe. Electricity's share of the market is expected to rise from about 25% in 1990 to 27% in 2000 and 32% in 2020. The main gain in energy saving will be from the penetration of energy efficient technologies.

Burning fossil fuels for three-quarters cause the harmful emissions in the region. These contribute to the greenhouse gas emissions and up to 80% of the harmful emissions into the atmosphere. The fossil fuels in combustion give rise to the known emissions as carbon dioxide, sulphur oxide and heavy metals. These lead to enormous environmental problems (see also global level). In the period 1986-1990 considerable efforts were directed to the protection of the environment and a decrease of harmful emissions was achieved. For the period 1991-2005 the total volume of investment for environmental protection in the fuel and energy is estimated at 117 billion roubles, at 1990 prices, including 28.4 billion roubles in the period 1991-1995. The environmental protection component of total energy cost in the year 2005 will be in the range 6-50 roubles per toe at 1991 prices.

Within OECD, the government's are spending about 6% of all energy research in renewable sources. Still 94% is allocated for fossil fuels and nuclear power[23].

III.2.4 The Baltic Sea[24]

Eighteen million people in fourteen countries live in the drainage basin of the Baltic Sea. As a matter of fact, the drainage basin is more than four times as large as the sea itself. To the west it stretches to Norway; to the south it reaches the northern-most parts of the Tjech republic and Slovakia. To the east it reaches far into Russia, Ukraine and the RB. The rivers in the RB belong to the basins of two seas: the Baltic Sea (44% of territory) and the Black Sea (56%)[25]. The Baltic Sea includes Oresund, the Kiel Bight, the Danish Belt Sea and strains of the Kattegat. In 1990, the sea region received a total of 1304900 tonnes of nitrogen and 55360 tonnes of phosphorous components. More than a third of all nitrogen which ends up in the

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22 The figures in this paragraph are deprived from: *Energy for Tommorrow's World - the realities, the Real Options and the Agenda for Achievement*, WEC Commission, St. Martin's Press, 1993

23 *Teacher's guide for training course Sustainability in the Baltic region*, Baltic University, Uppsala, 1997

24 The information in this paragraph is based on *A future for the Baltic?*, Scientists discuss an Environmental Challenge, The Swedish Council for planning and coordination of research, Solna, 1994

25 the Ministry for National Resources and Environmental protection of the Republic of Belarus, 1995, p. 32

Baltic comes from the air. Of the atmospheric deposition, half comes from agriculture and half comes from the combustion of fossil fuels (traffic). Western European agriculture and the expansion of mass road transport in the former Eastern European states around the Baltic are two major obstacles. The prevailing winds are south-westerly, which means that countries like the United Kingdom (11%), the Netherlands (5%), France (4%) and Belgium (2%) are responsible for significant shares of nitrogen atmospheric depositions. (Figures refer to the 1990 situation). Germany is the largest polluter, it was responsible for 25% of the nitrogen atmospheric depositions.

At the moment, life in the Baltic Sea exists in a condition that allows very little change. Since the turn of the century, levels of phosphorus have increased eight-fold, and levels of nitrogen have increased fourfold. More than a third of the sea bottom of the Baltic Sea lacks oxygen and is completely dead.
Things are starting to change. The threat of DDT and PCB's (from fertilisers) have decreased in importance. In addition, new threats are emerging. New diseases flared up, the levels of dioxin and chloro-organic substances in fish are alarming. The exhaust fumes from sports boats also cause serious injury to specific sorts of fish (perch and salmon). However, the level of oxygen in the sea bottom is increasing. Extensive clean-up work within an international framework has begun to reduce the enormous nitrogen and phosphorous emissions.

Special task forces are started to clean up the Baltic Sea. In the first period 1993-1997 ECU 5 billion will be invested in cleaning up point sources and non-point sources with an emphasis being put on the southern and eastern parts of the Baltic Coast. In phase 2: 1997-2012, investment in sewage treatment will continue, but also money will be used to put an end to non-point sources as, for example, nutrient leakage from agriculture. In total, fourteen countries participate in a special force to clean the Baltic Sea. Besides the 'real' Baltic countries, the RB, the Czech Republic, Slovakia, Norway and the Ukraine participate.

III.2.5 Sustainability at continental level

Although in most Western European countries, environmental problems already play a significant role in policy formulation and implementation in all spheres of the economy, this is hardly the case in the Eastern European countries and most countries of the Common Wealth of Independent States, the Baltic Region and Georgia.
The current environmental problems and the lack of interest of these countries to solve these problems, will not provide a sustainable environment. In all spheres of the economy this has got to obtain a place, otherwise more pollution will occur now and in the future.

III.3 Environmental problems in the Republic of Belarus

The national environmental reports of 1994 and 1995 attribute the environmental problems to air, soil, water and the consequences of the Nuclear Power Plant Accident in Chernobyl. The same strategy is followed in the Belarus Environment Strategy Study, prepared in 1993 by the World Bank. However, the RB has almost no natural resources as well. Problems related to energy supply and the necessity of saving activities are also discussed in the document of the World Bank and in this report.

III.3.1 Air pollution[26]

The main sources of air pollution in the Belarusian territory originate from industrial enterprises, power engineering and motor transport. In 1994, the listed sources discharged to the atmosphere 2082.2 thousand tons of pollutants. The majority of it was produced by transport. The content of the discharges consisted of carbon oxide (54.2%), sulphur oxide (15.3%), hydro-carbons (12.5%) and nitrogen oxides (9.1%). The majority of the pollutants from stationary sources are part of the enterprises of the Ministry of Energy. Among the Belarusian cities, the highest volume of pollution in 1994 was measured in Minsk. The contribution of the city transport to the total discharge is 72.7%. During transport in the atmosphere, emissions of sulphur and nitrogen oxides and volatile hydrocarbons are transformed into sulphuric and nitric acids, ammonium salts and ozone. They deposit on the ground in dry particles, rain, snow, frost, fog and dew. During the past years a tendency towards decreasing volumes of pollution has taken place. The main reasons for this tendency were the results of the air protection measures introduced in the second half of the 80's and the consequences of the economic crisis in the 90's. The latter refers to the decreasing production activities of the industry. Atmospheric pollution is not only a local urban-industrial problem involving people's health. It is a much more complex issue, encompassing materials and ecosystems. The pollutants from the air also cause severe damage to land and water, they corrode buildings, metallic structures and vehicles.

III.3.2 Water

Although the water content in the RB is rather favourable, the problem of water protection from pollution is very urgent. This despite the measures undertaken for sewage purification.
Over a number of years (1980-1991), the intake of river and underground waters in the RB has grown, reaching a maximum value of 3055 million m3 per year in 1991. However, since 1992, the reduction of water usage took place in various branches of the national economy. This is not a result of direct saving actions, but of a decrease in production. Because of this reason, water consumption especially decreased in the industrial sector (21%). Still the industry and the households remain the main consumers of water resources (more than 57%) in 1994. Household used more than industry. In the Minsk oblast during the years the total water consumption on average remained the same. The percentage of fresh water economies remained the same despite the decrease of water usage from systems of recycling and repeated sequential water-supply.

In 1994, the hydro-economic balances of the main river basins were positive. The water resources were quite enough to satisfy water needs. However in dry periods and low-water years a deficit of water in some basins might occur, but this can be compensated at the expense of river flow regulation.

The most powerful source of water pollution is domestic sanitary sewage. The share of industrial waste water is 25% (in 1994). In total those two form 99% of loading percentage from localised sources (Biological Oxygen Demand-value), 93% of suspended substances and 100% of petroleum products. Totally, during 1994, 0.45 thousand tons of petroleum, 16 thousand tons of organic substances and 18 thousand tons of suspended substances were discharged into natural water objects. One of the highest quantities of polluted sewage is discharging into the Svisloch river in Minsk.

The quality of river water in the RB is established according to the water pollution index (WPI), which consists of seven classes of polluted water.

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[26] The information in this and the following paragraph is based upon: *The National Report on environmental conditions in the Republic of Belarus 1994*, the Ministry of Natural Resources and Environmental Protection, Minsk, 1995

WPI is determined as 1/6 of total average concentration in relation to maximum permissible concentration of six parameters:
- dissolved oxygen;
- BOD5 (Biological Oxygen Demand value at 5 minutes);
- ammonium nitrogen;
- nitrite nitrogen;
- petroleum and
- phenols.

Several norms can be applied, but the priority is given to fish industry norms, which have more rigid requirements for water composition. Far most of the Belarusian rivers concern to category of moderately polluted. The river waters basically have low pollution level by BOD5 (organic substances), but petroleum is present everywhere in the surface waters: the concentration exceeding the norm by 2 - 9.8 times! The pollution of river waters by ammonium nitrogen is typical for the Svisloch and W. Dvina. Practically all rivers have nitrite nitrogen pollution. The most polluted river is the Svisloch (Minsk). The reasons for this are high loading (Minsk city dumps more pollutants than the other oblasts), insufficient sewage purification and urban purifying constructions and insignificant self-purifying ability of the river.

Underground waters are mainly used for domestic drinking water supply, because it is in a rather clean state. About 15% of total underground waters is used for industrial water supply. The quality of fresh underground water used for centralised water-supply basically corresponds to the requirements of the State's Sectorial Standard for drinking water, except for the increased content of iron and manganese of natural origin. In 1994, however, the tendency of chemical composition change of underground waters already took place by separate components of MPC. In some cases the pollution was recorded at depths of more than 50-70 m (for example in Minsk, Brest, and Grodno). The underground waters are mostly polluted in urban areas, development zones, in regions of purifying constructions and reservoir settlers, filtering fields, tailing storage, dump, cattle breeding and poultry farms, mineral fertilisers and toxic chemicals warehouses. The agricultural land is a major polluter, because of it's infringement of mineral and organic fertilisers rules. In wells around urban settlements, increasing water mineralisation, concentration of nitrates, chlorides, sulphate, ammonium nitrogen, manganese and iron occurs. Also increased concentrations of petroleum, phenols, heavy metals and nitrates are often found.

Constant control of the content of caesium-137 and strontium-90 takes place in surface waters. In the period 1987-1994 it showed that the content of the mentioned radio-nuclides in water is much lower than the Republican Permissible Level in drinking water. In the first days after the NPP accident, the increase of radio-nuclides concentration in water was due to direct fall of it on the water surface. Now, the concentration is defined by secondary processes: exchange with bottom sediment, radio-nuclides washing out from surface of the river catchment.

It is obvious that the purification of water to obtain a good drinking water quality costs the republic an enormous amount of money. The more the surface and underground waters remain polluted, the more these purification activities will cost.

III.3.3 Consequences of the NPP Chernobyl disaster[27]

On April 26, 1986, a major accident took place at the 4th power unit of the Chernobyl Nuclear Power Plant (NPP). This NPP is situated 12 km off the southern border of the Republic of Belarus. After the explosion, a great amount of radioactive substance was thrown out of the

[27] The information is this paragraph is based upon: ***Chernobyl, ten years after***, V. Jakovenko, Belarusian socio-economical union Chernobyl, Minsk, 1996, and ***The Chernobyl trace in Belarus***, Committee for Hydrometeorology, the Ministry for Emergencies and population protection from the effects of the Chernobyl accident, third edition, Minsk, 1996

wrecked reactor into the atmosphere. Later the fall-out covered the territory of Belarus, the Ukraine and the western part of Russia.

As a result of the accident, 23% of the Belarusian territory, where more than two million people inhabit 3668 towns and villages, were polluted with caesium-137 over 37 kBq/sq.m.. The contamination is not uniformly distributed over the RB. The rate of radio-active contamination in different areas depended on the nature of the release from the damaged reactor and meteorological conditions. Despite the global effects of the accident, two thirds of radioactive substances fell on the territory of Belarus due to the prevailing direction of wind carrying air flows containing radio-nuclides. The largest damage was caused to the oblasts Gomel and Mogilev. The highest rates that there were measured were 2220, 2272 and 5402 kBq/sq.m. By the end of 1995, the caesium-137 soil deposition rate had decreased approximately by 20% due to its natural decay.

The situation was aggravated by the fact that in some regions of the republic the areas of radioactive pollution coincided with those of high chemical pollution, which had existed earlier.

The demographic situation in the RB has changed badly after the Chernobyl disaster. Since 1986, the birth-rate has decreased almost by a factor two. The adult life expectancy also decreased. The mortality rate increased, including infant mortality. People in the affected areas were questioned and more than 80% believed that their health had worsened since the disaster.

A major part of the population has to live on the territories with higher density of radioactive pollution. In contaminated areas still people use domestic farm produce. This is the main source of influx of radio-nuclides into the human organism. People, in this way, become heavily exposed not only to external but also to internal radiation.

Not only health problems occurred after the disaster, also socio-economic problems of adaptation for people resettled from the contaminated areas and financial problems increased. Belarus' total losses have been estimated at US $235 billion for the period from 1986 to 2015. The main contribution to these losses will be made by expenditures for eliminating and minimising the consequences. Still one fourth of the national budget is used for the removal of the Chernobyl effects.

What the effects will be for future generations is still not sure. Genetic effects and increased sensitivity of subsequent generations of mammals to mutagenic (being able to influence genetic material) effects of radio-nuclides are already found. A considerable amount of radio-nuclides accumulated in the upper layer of soil. Now soil is the major source of radio-nuclides in agriculture production. Radioactive pollution of ecological systems has created conditions which rule out normal farming and forestry activities for decades to come.

III.3.4 Energy deficits

Together with Armenia, Georgia, Latvia, Lithuania and Moldavia, the RB is one of the six states having virtually no energy sources of their own. Now, the RB completely depends on Russia for its energy supplies. There is a special agreement between the two countries, but in times of scarcities in Russia, the RB does not obtain the amounts of oil and gas necessary. Then the economical crisis in the RB causes such lack of money that the energy bill is not paid. The RB's lack of natural resources can also be put in a world-wide context, because all over the world the natural resources are decreasing fast.

Fossil fuel combustion probably accounts for the major part of anthropogenic carbon dioxide emissions. It was reported that the atmospheric concentrations have risen over the past 200 years as follows:
carbon dioxide from 280 parts per million by volume (ppmv) to an estimated 353 ppmv in 1990; methane from 0.8 ppmv to an estimated 1.72 ppmv. Still it is said that "the unequivocal detection of enhanced greenhouse effect from observations is not likely for a decade or more". (World Energy Council, 1993).

In order to provide a sustainable environment for people, solutions in the sphere of energy sources have to be found to:
1. teach and change people to behave more carefully with the natural resources;
2. find new, sustainable, energy sources.

III.3.5 Sustainable development in the Republic of Belarus

In December 1996, a document was released by the Economic Planning Committee in which governmental plans based on a sustainable development were described. The sorrow fact is that it can be said that the concept 'sustainable development' was apperently not known to the writers of this document. Instead of decreasing transportation, decreasing wastes by industry, decreasing the use of natural resources, more employment, more industry and more transportation possibilities were suggested. Like in so many cases in this country, the idea was good, but the implementation was poor. At the moment suggestions are formulated by experts in the hope that these will substitute parts of the document.
This situation clearly depicts the state of the environment in the Republic of Belarus: it is subordinate to other problems, like the country's economic crisis.

III.4 Inventory of environmental problems

In this paragraph the environmental inventory is presented in a schedule. The inventory is based on the method used by the CLTM as described in paragraph 3.1, it is repeated below.

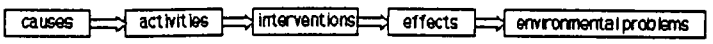

Figure III.1: *method of inventorying environmental problems*

Causes are defined as social problems which are at the basis of environmental problems. Besides environmental problems at differer t levels, there are also different sources which cause environmental decline. Like population growth (global level), all human activities cause, to a certain extent, environmental problems. Activities are more specific social phenomenon, processes and situations. Examples of those activities are the industry, transport, energy supply, consumers and recreation. Interventions are activities of adding and/or extracting natural and antropogene, renewable and not-renewable natural resources and energy supplies.
Effects are classified as indirect or direct and are directed to air, water, soil and living creatures (T. Willink, 1989).

Level	Causes	Activities	Interventions	Effects	Environmental Problems
Global (the Earth)	* increasing welfare	* more consumption, * more recreation, * more transport	* deforestation, * more fishing and hunting * erosion of the surface * de-peating	* exhausting reservoirs in all possible ways (species, vegetation)	* changes in climate
	* increasing welfare	* changes in consumer behaviour * more transport	* increasing amount of Br and Cl in atmosphere (adding CFC's)	* removal of ozone	* depletion of the ozone-layer
	* urbanisation * industrialisation * population growth	* more industry * more buildings * more transport * more food necessary	* more energy necessary * more water necessary	* more pollution of water * more energy necessary * more waste of energy and water	* decreasing natural resources: energy sources and water
	* population growth * industrialisation * urbanisation * more welfare	* changes in consumer behaviour	* more UV-B radiation, * loss of components in the biosphere	* disturbing the balance of life cycles * destabilisation of processes in nature * increase of vulnerability	* no sustainability on global level
Continental (The Common Wealth of Independent States, the Baltic States, Georgia and Europe)	* increasing welfare	* changes in consumer behaviour * more transport	* increasing amount of Br and Cl in atmosphere	* removal of ozone	* deletion of the ozone-layer
	* population growth * increasing welfare	* more exhaust from transportation * more agriculture (fertilisers)	* increasing exhaust of sulphuric and nitrogen containing components	* acidification of the soil	* air pollution, acidification of soil
	* industrialisation * urbanisation	* more complex infrastructure * more transportation	* distribution of aerosols	* air, soil, water pollution	* deletion of ozone layer
	* population growth * industrialisation	* lack of maintenance * unknown future consequences	* removing nuclides * adding nuclear waste	* pollution of atmosphere, soil, water * diseases	* NPP accidents
	* population growth * increasing welfare	* more agriculture * more exhaust from transportation	* adding nitrogen, phosphorous and chloride containing components * adding dioxin, DDT. PCB's	* pollution of sea water	* pollution of Baltic Sea
	* population growth * increasing welfare * urbanisation * industrialisation	* absence of planning * absence of financial resources	* adding pollutants	* no balance in ecological system	* no sustainability on continental level
National (The Republic of of Belarus)	* industrialisation	* lack of cleaning technologies * power engineering * transport	* adding CO_2, SO_2 * adding hydrocarbons * adding NO_x's	* pollution of air	* air and soil pollution
	* population growth * industrialisation * increasing welfare	* more consumption by households and industry * more demand for hygiene	* adding heavy metals * adding acids * adding waste (in general)	* pollution of water	* water and soil pollution
	* population growth * industrialisation	* lack of maintenance * unknown future consequences	* removing nuclides * adding nuclear waste	* pollution of atmosphere, soil, water * diseases	* NPP accidents
	* population growth * increasing welfare * industrialisation	* more consumption	* using more energy sources * using more water * adding methane and CO_2	* energy and water deficits	* air and soil pollution
	* population growth * increasing welfare * industrialisation	* absence of planning * absence of financial resources * lack of knowledge	* adding pollutants	* no balance in ecological system	* no sustainability on national level

Table III.1: *Overview of inventory of environmental problems*

III.5 Analyses[28]

The analyses of environmental problems is presented according to the different aspects of the model of CLTM, used to inventory the problems. The environmental problems as described above contain several differences and similarities.

The social problems which are at the basis of environmental problems, are approximately the same for all levels (global, continental, national). Causes as urbanisation, industrialisation, population growth and an increase of welfare to assure better circumstances for a lot of people brought unexpected harmful consequences. Fact is that we have to deal now with the consequences of the past. Industrialisation is also mentioned as a cause for environmental problems for the RB. Since the RB's independance however, the industrial activities have decreased enormously. This resulted in a decrease of the amount of waste, air, water and soil pollution by the industry. However, when producing, the industry with his old and ineffcient production processes harms the environment much more than they should do.

Especially lack of planning, maintenance, fianacial resources, technology and knowledge have influence on the environmnetal state of the RB. These **activities** are directly related to the poor economic state of the RB. The activities with respect to the RB therefor differ from the activties mentioned at continental and global level. For the RB the activities are mainly due to their backlog, where the activities at the other levels is due to economic and social development. Activities are the lst stage to prevent the actual deterioration of the environment. Prevention can be accomplished by taking the environment into account for the different activities. Investments, not only financial, here are little in comparison with the investments that are necessary at the next stage to control and limit the actual harm to the environment.

The **interventions** refer mainly to waste of materials into the air, soil and water. Few figures are known about the amount of CO2, SO2, Nox etc. which is added to nature. Total figures are present but specified figures for polluting sources are not available. At this state the actual pollution to the environment takes place. Pollution can not be prevented anymore, it can only be monitored. Special technologies, knowledge and -often expensive- equipment which the RB lacks is necessary to solve environmental problems at this stage.

The main **effects** on the environment of the RB, at continental and global level are the same. Pollution of air, water and soil, energy deficits, and waste: all these problems are visible or can be felt or smelled. Deseases occur and the overall deterioration of nature is a fact. At this stage the actual hram already has been done. The pollution only can be monitored and environmental problems have to be decreased or solved. Even more than during the stage of interventions, technologies, knowledge, etc. is necessary to change the actual state of the environment. Environmental pollution at this stage is going to influence the whole national and international society. Economy, politics, health care, social security, education, they all habve to be involved in to accomplish changes.

Environmental problems are related to each other. Besides their mutual causes (social tendencies), their effects can also be divided in three categories:
1. breaking or changing life cycles;
2. more extensive use of energy;
3. neglect of quality aspects in production processes and products.

Breaking and changing life cycles expresses is a consequence of adding or subtracting different components of nature. Examples of this are diverse: from the surplus of carbon dioxide that is

[28] Main aspects of this paragraph are de rived from: *Nationaal Milieubeleidsplan (NMP)*, Ministerie van VROM, EZ, Landbouw en Visserij en Verkeer en Waterstaat, SDU uitgeverij, 's-Gravenhage, 1989

released in the atmosphere until the disappearance of certain sorts of vegetation and animals. The more extensive use of energy is at the basis of a lot of environmental problems as can be seen in the table presented in the paragraph above. Efficiency and care for waste still have a low priority in almost all countries. Not only (nuclear) waste of energy, but waste in general is causing major problems. Especially in developing countries, no system of separating paper, glass, chemical waste and biologic degradable waste from other waste is available. Factories producing chemical waste are often careless and still dump their waste in rivers, seas or the air. Production processes should be closed, i.e. the waste streams during production should be minimised. Improvement of quality would extend the (economical) lifetime of products, producing less polluting waste. Another aspect that can be added is, that only products that satisfy the essential needs of man should be produced. However, this immediately refers to a sober life for most people. This is not necessarily the case, if people only would start thinking about the environmental consequences of the products they use and buy.

Environmental problems originate from a process of shifting or transferring. When decisions are made, the effects towards the environment barely play a role. The costs of deterioration are transferred to another level, to other groups of society or to future generations. Dumping waste in the sea as a matter of not having the troubles on land, in people's neighbourhood is an example of transfer to another level. At the same time, fishes and other sea life are expelled to the waste (transfer to other groups) and no one knows what the effects for future generations of sea life, mammals and human beings will be (transfer to future generations). In all aspects, this is in contradiction to developing a sustainable world.

Some points of view of the last decades are the stand still principle (the quality of the environment should not decline), combat at the source (to remove the causes at the source of the pollution instead of resisting the symptoms at the effect-side), avoid unnecessary pollution and integrate environmental aspects in actions in every aspect of society. In order to combat in a sustainable way further deterioration, the three aspects mentioned above should be the basis. Closing life cycles of the *resources - production process - product - waste and emissions*-chain, saving energy together with efficiency improvement including using sustainable energy sources and encouraging quality of products and production processes, are the three major elements.

The key elements of sustainability regarding energy supply and energy use that have to be reconciled are:

- sufficient growth of energy supplies to meet human needs;
- energy efficiency and conservation measures, such that waste of primary resources is minimised;
- public health recognising the problems of risks to safety inherent in energy sources;
- protection of the biosphere and prevention of more localised forms of pollution.

With respect to causes, activities, interventions and effects the following statements are important to prevent and solve environmental problems:

> All social tendencies, especially those involved in development strategies, imply consequences for the environment, so environment has to be taken into account in all processes.
>
> Investments and development of technology, knowledge and planning should be stimulated, together with financial investments, these aspects are important in the last stage to prevent environmental problems.

Figures specified to polluting sources are necessary to prevent and intervene in polluting activities.

More activties should already be directed to prevent environmental problems. Now, a lot of environmental problems already exist and it is even more expensive to decrease and eventually solve them. To provide a sustainable development this should not be necessary anymore.

In this project the elements **environmental awareness, energy and water saving activities** and **sustainable development** are of major concern. The training course is designed to enlarge people's environmental awareness. To show people can help solving the environmental problems of their country, examples of small energy and water saving actions will be included. All the information is presented in the light of creating a sustainable world.
Reduction of carbon dioxide by energy efficiency and using gaseous fuels instead of oil/coal for domestic uses is necessary to reduce acidification and to reduce air pollution. Both environmental problems are really visible and perceptible for people. Therefore, the examples of energy and water saving can be used to show the use of the saving activities.

Appendix IV Environmental awareness

The research started as an extension of my first stay in the RB. During the research is was obvious that people are hardly interested in environmental problems in general and specifically energy saving activities. Very little is done to create more awareness about environmental problems. Little information is spread to inform people about present and future problems as result of polluting the environment.

IV.1 The concept environmental awareness

In this paragraph the concept environmental awareness is introduced and explained.

IV.1.1 Definitions[29]

Environmental awareness expresses itself in an *attitude towards the environment*. An attitude is the **weighed opinion of people about behaviour**, an object, an idea or a person. That object, idea or person are the objects of attitude. The weighed opinion is a judgement after evaluating (for the person's relevant) aspects about the object of attitude. The expected consequences determine an attitude.

Attitude consists of three components. Those three components are called **cognitive, affective** and **conative**. In the content of environmental aspects, environmental awareness has three components as well.

* ***Cognitive***: the extent to people acknowledge the present-day's destruction of nature and pollution of environment;
* *Affective* (evaluating): the extent to people are attached to nature and a clean living environment;
* ***Conative***: the extent to people are willing to sacrifice money, time and or efforts.

In the Netherlands information has been supplied to a large extent. Information about environmental problems would lead to knowledge of environmental problems and their causes and furthermore to the realisation that another way of life is necessary. In this way people would obtain a positive attitude towards behaviour not harmful for the environment. After about ten years, it seemed that the effect of this strategy was not as large as policy makers expected. A discrepancy between general environmental awareness and behaviour not harmful towards the environment is present. A highly developed cognitive aspect of environmental awareness does not necessarily mean that people act more positive towards the environment.

IV.1.2 Environmental awareness and behaviour

According to van Meegeren and van Woerkum (in Consument en Milieu, red. Midden, Bartels) the discrepancy between high environmental awareness and consequent behavior can be explained according to four main causes. This is based on the theory that discrepancies between general attitudes and specific forms of behaviour can be explained by social psychological models of determinants of behaviour.

The discrepancy can have four causes:

1. Specific behaviour is custom-determined;
2. Lack of knowledge of the detrimental consequences of the specific behaviour;
3. The specific behaviour is still negative, in spite of the knowledge of the consequences, and

[29] This paragraph is based on Midden en Weenig, 1982, p. 172, 173 and Open Universiteit, Heerlen, 1993, p. 82

4. The specific behaviour is positive, but other factors hamper execution of the desired behaviour.

IV.2 The theoretical model

In this paragraph the general model which is the foundation for the rest of the theoretical explications is presented.

IV.2.1 Definitions

First the concepts attitude, intention, behaviour, social influence and own effectiveness are defined.

Attitude[30]**:** own position of a person compared with the actual behaviour; people's view on subjects. The attitude of a person shows the relation between on one hand what people feel for certain subjects and how they act towards these subjects on the other hand. In general the attitude unlike bahviour is fairly stable.

Intention: the willingness of people to act in a certain way. However, this willingness does not always directly result in the final goal, because obstacles can interfere. Behavioural intention predicts behaviour best[31]. Intention can be regarded as a direct predictor, where own effectiveness is seen as an indirect one. The more people are forced to change their conduct, the less they are inclined to change. However in the RB, people are more used to propaganda and external pressure.
The final aim of environmental policy is a proper environmental way of life. According to Bem[32] people attribute changed behaviour to own intention or preference when external pressure is low. Heavy external pressure leads to unstable behavioural changes, because then the intention of people, deep inside, in not really changed.

Behaviour: the way people eventually do what they do, the way they (re)act in situations.

Environmental behaviour[33]**:** the set of human conduct that affects the quality of the physical living environment. Environmental behaviour is also a term for all kind of behaviour that affects the environment one way or the other. People can act as consumer, producer, technical designer and political actor (who makes decisions at certain levels). In this research the students are regarded as consumer and political actor: people who consume goods (use energy and water, buy goods, produce waste) and people who make decisions (what to eat, buy, cook, how to act). This includes environmental behaviour being determined by not only environmental-related considerations.

Social influence: influence of the social environment (views and conduct of others) on a person's behaviour.

Own effectiveness: estimation of own skills that are essential for realisation of the behaviour. It is related to the obstacles that can disturb the relation between intention and behaviour[34].

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30 Open Universitit, tweede druk, Heerlen, 1993, p.79 and 81

31 id. p.79

32 n Midden en Bartels, 1994, p.185

33 id. p.2 and 127

34 pen Universitit, tweede druk, Heerlen, 1993, p.89

IV.2.2 The model to describe attitude and behaviour

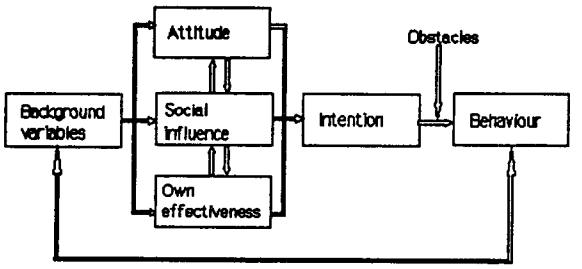

Figure IV.1: The Attitude-Social influence-own Effectiveness model[35]

The model shown above is called the ASE-model: Attitude, Social influence, own Effectiveness and is developed by Azjen and Fishbein. In this model attitude, social influence and own effectiveness are beliefs (suppositions of a person about the consequences of his or her behaviour). This model is often used in studies about environmental behaviour.

During earlier studies among citizens of Minsk and students of school 24, among other things own effectiveness was studied (see ' Feasibility of EcoTeam Approach in Minsk, Belarus', 1997, p. 36/37).
The willingness and possibilities of saving energy and water in households were investigated by proposing saving activities in households. The respondents were asked to answer whether they were willing to try this activity and why they gave that specific answer. The saving activities were behavioural and technical measures. The results of this study was that of the respondents about 50% were willing to try at least 7 out of 10 measures proposed! This percentage was even higher for the school 24 respondents. The actions people were most willing to try were technical measures such as placing draught stoppers, isolation of windows and repairing leaking taps. Activities that needed repeated efforts scored less. The most mentioned reason to try a certain action was 'easy to do' followed by 'having technical possibilities'. 'Difficult to do' and 'costs too much' were the reasons most often mentioned for not wanting to try a measure.
Own effectiveness, as stated in before, is related to the obstacles that can disturb the relation between intention and behaviour. Therefore it is not included as a separate variable, but technical restrictions are shortly discussed in the chapter about social setting.

IV.2.3 Determinants of environmental attitude: the variables

Proper environmental attitude is defined as an attitude that does not harm the environment. According to literature the attitude towards the environment is determined by number of subjects: knowledge of environmental problems, involvement, risks, social dilemma, feedback and intention.

All aspects can be joined into a conceptual model which is the basis for determining the variables which influence the student's attitude towards nature. In this way the information in the training course can be developed more specifically. Effective information has to contribute to the following goals:
1. draw the attention of the students for a certain message;
2. make the message understandable;
3. provide a change of behaviour;
4. retain a change of behaviour.

[35] Open Universitit, tweede druk, Heerlen, 1993, p.80

Since increasing environmental awareness expresses itself in an attitude and behaviour towards the environment the ultimate goal of the training course will be changing people's attitude and behaviour.

Appendix V Pre survey and final questionnaire

V.1 Pre survey

The pre survey was held among the students of the ecological club of school 24, a group of students of both school 5 and the Belarusian Folk High School. The pre survey was carried out for the following aims:

1. to check the formulation of the questions;
2. to check the order of the questions;
3. to check the relevancy of the question;
4. to check the answer possibilities;
5. to check the validity of the questions;
6. to check whether the ways of answering are familiar.

The main questions that have to be answered are:
Ad 1:
- do the students understand the question?
- which words are too difficult?

Ad 2:
- are the questions asked in a logical order?

Ad 3:
- is the answer always 'don't know' or 'no answer'?
- are the answers always the same?

Ad 4:
- is there an answer possibility missing?
- is there an irrelevant answer possibility?

Ad 5:
- am I measuring what I want to measure?

Ad 6:
- are the students familiar with multiple choice questions?
- are the students familiar with filling in tables?
- do the students understand cross-references to other questions?

First of all already before the pre survey I decided to use mostly closed questions. This was a result of research I conducted in the the RB before. First of all, most of the people were not familiar with answering questions about their opinion and their behaviour. They had to think long before they answered the questions. Providing them with answer possibilities reduced the time and they immediately knew what kind of answers they were expected to give. Open questions resulted in many different answers which eventually mend the same.

The pre survey resulted in adaptation of several questions. In the final questionnaire the a translation of the terms 'greenhouse effect' and 'deforestation' was added. In the pre survey question B1 of the final questionnaire had to be answered by giving marks for the environmental problems in order of decreasing detriment. This took too much time and the system of giving marks ('1' for most detrimental problem and '10' for least detrimental problem) was mistaken several times.

Filling in tables was no problem and even worked out well to decrease the time the students needed to fill in the questionnaire. In accordance with the teachers of the schools, the time

filling in the questionnaire would take was restricted to 30 minutes, because a lessons takes 45 minutes and then everything could be handled with one English lesson.

In question B2 of the final questionnaire, the answer possibility 'yes, but a little' was added, because the students did not want to make a choice between 'yes' and 'no', and rather did not answer the question at all.

The original questionnaire contained a section called 'Attitude towards the environment'. The questions of this section were added to section B of the final questionnaire, because the students stated that they were afraid to fill in negative answers towards the environment. They wanted to show 'good behaviour'. Adding the questions to the section about 'Environmental problems' released them of that pressure.

The original questionnaire contained the following question:
In which way are you involved in solving environmental problems? (More answers possible)
0 I am not involved at all
0 I am a member of an ecological club (at school, scouts, (non) governmental organisation, etc.)
0 I am a subscriber of a magazine (newspaper, etc.) about environmental subjects
0 Other, please specify.....

However, this question did not really make clear whether the students were actually active involved in solving environmental problems. Therefore this questions was splitted up in questions B9, C7 and C8. The answer possibility which refers to the interest in written information already was covered by the questions C1-C4 in section C. The question about environmental subjects at school was added, because students seemed to have a different opinion about it. Question E13 of the final questionnaire was originally also part of the section about 'Attitude towards nature' and is replaced to section E 'Energy and water saving'.

Questions about specific behaviour towards nature, such as: 'do you ever throw waste, as chewing gum paper, at the street?' or ' do you always throw your garbage in a trash can, also when you are walking down the street?' or 'do you ever take into account the amount of water you are wasting when washing the dishes?' resulted in the deletion of the questions. The questions were stated to be irrelevant, because the answers would be the same in possibly every case: respectively, yes, no and no. The students thought of it as stupid questions, because everybody sometimes acts in the wrong way towards the environment. The suggestion that I could ask the question, but that the answer should be given in a certain number of times a week, was rejected, because none of them knew the answer and they would give no answer or completely impossible answers.

Cross references were understood clearly, which was tested in the questions about the student's view to the future. In question D2, 'The environmental situation has become a topic of our government nowadays' was added. In question D3answer possibility 2 and 5 were added.

Question D4 was reformulated, because the definition of sustainable development contained too many difficult words. Besides it was a good way of testing the knowledge of the students of their English vocabulary with respect to terms about environmental subjects. The question whether the students would support an environmental oriented political party, was stated to be completely irrelevant by the students, since they hardly thought about this subject since they are not entitled to vote yet. But a more important aspect is the fact that the way the political party looks at the economical and health problems and situation of poverty in their country was stated to be as important or even more important than the subject of environmental problems.

The rest of the questionnaire remained unchanged. The questions were clear, the answer possibilities seemed relevant and the students understood everything.

V.2 Final questionnaire

Remark: the final questionnaire also contained an instruction paper, explaining the different answering methods.

Questionnaire for students of the 10th and 11th forms of school 5 and school 24

In this questionnaire you will be asked to give your opinion about environmental problems. It concerns environmental problems in your country, the Republic of Belarus, as well as the environmental problems of Minsk and the whole world. I want to stress again that it is mend to give your opinion, it is not a test in which you should show your knowledge on environmental aspects. It will take about 15 until 20 minutes to fill them in.

Some personal characteristics will be asked as well. These are necessary to analyse the outcomes of this questionnaire. All information is treated confidentially and the results will be analysed anonymously.

The results of the questionnaire will be used to design a general training course to enlarge people's awareness about the environment. The training course will be designed for different target groups, among which students of your age. This is part of the project I am carrying out to finish my studies at the Eindhoven University of Technology.

Please, fill all questions in and answer them as honest as possible. This will enable me to analyse the results faster and easier. Feel free to add comments if you think it is necessary. If there are any questions do not hesitate to ask them.

I want to thank you very much for your co-operation. If you are interested in the results of the questionnaire you can let me know. I will provide your teacher with a brief report with the results.

Good luck,

Kind regards,

Wendy Haans

A. General Characteristics

The questions in this section are general questions about your school and about you.

A1. What is the number of your school?
0 5
0 24

A2. In which form are you studying?
0 10th form
0 11th form

A3. In which group are you?
0 A
0 B
0 V

A4. Have you ever had specific ecological classes?
0 Yes
0 No, but we discussed environmental subjects during other classes like geography and English
0 No, not at all

A5. What is your gender?
0 male
0 female

A6. What is your age?
..... years

A7. In which district do you live?
0 Centralny district
0 Fruntzensky district
0 Leninsky district
0 Moskovsky district
0 Oktobersky district
0 Partizansky district
0 Pervomaisky district
0 Sovjetsky district
0 Zavodskoi district

A8. What is the highest level of education of both your parents (mother and father)?
(More answers possible)
0 Primary school
0 Secondary School
0 Vocational School
0 College
0 University
0 Other, please specify.....

B. Environmental Problems

The questions in this section are about the way you think about environmental problems and the way you are involved in helping to solve some of these problems.

B1. Do you feel the following problems are environmental problems for respectively the Republic of Belarus, Minsk and the world?
You can cross the box of your choice.
DK: refers to I do not know
Water pollution refers to pollution of rivers, seas and also drinking water.
An example of Nuclear power plant accidents is the accident in Chernobyl.
The greenhouse effect in Russian is: *Deforestation in Russian is:*

Environmental Problem	Problem for your country			Problem for Minsk			Problem for the world		
	YES	NO	DK	YES	NO	DK	YES	NO	DK
Air pollution (in eneral									
Soil pollution (in eneral									
Water pollution									
Energy deficits									
The greenhouse effect									
Depletion of ozone layer									
Nuclear Power Plant accidents									
Noise									
Waste disposal									
Deforestation									
Baltic Sea pollution									

B2. Do you think you, personally can help solving the problems which are mentioned in question 1 of this section (see above)?
0 Yes, I think I can help solving the environmental problems mentioned above
0 Yes, but a little
0 No, I think I cannot help solving any of these problems.

B3. How do you think of yourself regarding environmental subjects?
0 I am always interested in environmental subjects
0 I am only interested in specific environmental subjects, namely.....
0 I am never interested in environmental subjects

B4. Do you want to help solving environmental problems?
0 Yes
0 No

B5. Do you know how you can help solving environmental problems?
0 Yes
0 No

B6. Do you feel that solving environmental problems is a governmental task?
0 Yes, I think it is **only** a governmental task
0 No, I think it is not only a governmental task but also of,
please specify .....

B7. Do you think that actions you employ yourself will help solving environmental problems in your country?
0 Yes *(please go to question B9)*
0 Yes, but a little *(please go to question B9)*
0 No *(please go the next question)*

B8. Do you think that on your own you will not succeed in making a difference in the environmental condition of your country?
0 Yes, on my own I will not succeed in making a difference
0 No, I think that my efforts will contribute to a better environment

B9. Are you a member of any kind of environmental orientated organisation or club (examples: scouting, Greenpeace, World Nature Foundation, ecological club at school, etc.)
0 Yes
0 No

C Information about Environmental Issues

The questions in this section concern the information you may have looked for and got about environmental related subjects.

C1. Have you ever looked for information about environmental subjects?
0 Yes, *(please go to the next question)*
0 No *(please go to question C5)*

C2. What kind of information were you interested in?
(More answers are possible)
0 About environmental issues in general
0 About environmental problems in the Republic of Belarus
0 About environmental problems all over the world
0 About activities in the Republic regarding environmental subjects
0 About activities all over the world regarding environmental subjects
0 Something else, please specify .....

C3. Where did you obtain information about environmental subjects?
(More answers are possible)
0 Nowhere
0 Television, please specify program.....
0 Newspaper, please specify.....
0 Magazine, please specify.....
0 Friends
0 School
0 Environmental organisation, please specify.....
0 Somewhere else, please specify.....

C4. Was this information sufficient?
0 Yes
0 No, because,.....

C5. How many times a week do you discuss environmental subjects at your school *(including discussions during for instance biology classes and meetings of ecological club, if you are a member)*?
0 Never
0 1 hour a week
0 2 hours a week
0 3 hours a week
0 more than 3 hours a week

C6. What do these signs mean?

Answer: .....

C7. Did you ever undertake actions to help solving environmental problems?
0 Yes
0 No *(please go to section D)*

C8. Did you have any kind of feedback (financial or written information) about these actions?
0 Yes
0 No

D. The Future

In the questions of this section you can give your view on the future regarding environmental problems in your country.

D1. What do you think about the general environmental situation of your country in the future?
0 The situation will improve *(please go to D2)*
0 The situation will worsen *(please go to D3)*
0 The situation will remain the same as it is now *(please go to D4)*

D2. Why do you think the situation will improve? *After answering this question please go to D4*
(More answers are possible)
0 Nature will restore itself
0 In all levels of society people are involved in solving environmental problems
0 The environmental situation has become a topic of our government nowadays
0 There is much more money for improving the environmental condition
0 Much more is known about environmental problems
0 Other, please specify. .....

D3. Why do you think the situation will worsen?
(More answers possible)
0 New problems will occur, that are not visible now
0 The same problems that are present now, will only become worse
0 Insufficient actions are undertaken by government
0 Insufficient actions are undertaken by people
0 Insufficient actions are undertaken by industry
0 Other, please specify.....

D4. Do you know what 'sustainable development' means ?
0 Yes
0 No

D5. To your opinion what actions are necessary to ensure the safe living conditions of future generations?
(More answers possible)
0 More information about environmental subjects should be available
0 People should pay more attention to the effects of their actions on the environment
0 The government should do more
0 More environmental education is necessary
0 More money should be planned in the budget
0 The industry should produce less polluted

D6. Are you interested in a training course about environmental problems and a way to help solving them?
0 Yes
0 No, *(please go to section E)*

D7. What time is most convenient for you to join the training course?
(More answers possible)
0 During school time (for instance during English classes)
0 During the week, after school time, in the afternoon
0 During the week, before school time, in the morning
0 In the evening (after 18:00h)
0 At Saturdays (after school time)
0 At Sundays
0 Other, please specify.....

E. Energy and water saving

The questions in this section are all related to energy and water saving activities.

E1. Did you ever receive information about energy problems in your country?
0 Yes
0 No

E2. Did you ever get information about how to save energy in your own household?
0 Yes
0 No *(please go to E4)*

E3. Was the information about saving energy useful?
0 Yes
0 No

E4. Did you ever obtain information about how to save water in your own household?
0 Yes
0 No *(please go to E6)*

E5. Was the information about saving water useful?
0 Yes
0 No

E6. Do you feel as if there is a deficit of energy in your country?
0 Yes
0 Sometimes
0 No

E7. Do you think that a deficit will occur in the future (with 5-10 years)?
0 Yes
0 No *(please go to E10)*

E8. Why do you think the deficit will occur?
(More answers possible)
0 Increasing demand by households
0 Increasing demand by industry
0 Policy of government
0 Oil companies
0 Politics of Western countries
0 Fail of technologies
0 Too little is saved
0 Other, please specify.....

E9. For which sources do you think the deficit is present or will occur?
(More answers possible)
0 Coal
0 Gas
0 Oil
0 Wood
0 Other, please specify.....

E10. How do you think energy deficits in your country can be prevented?
(More answers possible)
0 It cannot be prevented
0 energy saving measures
0 using solar energy
0 using biogas (îòõîäû)
0 using nuclear energy
0 using wind energy
0 other, please specify.....

E11. Do you think energy saving measures are necessary?
0 Yes
0 No *(please go to E13)*

E12. Who should take care of the savings?
(More answers possible)
0 The government
0 The population
0 The industry

E13. Do you feel satisfied with your behaviour at the moment regarding the following subjects
(Please cross your choice.)

Subject	Yes	No	I do not know
Water usage			
Electricity usage			
Heat usage			
Waste disposal			

E14. Which reasons are there to save?
Please state your opinion by crossing your choice

Reason	I agree	I do not know	I disagree
To gain time to develop alternative energy sources			
To combat further contamination of the environment			
To gain more independence of Russia			
To prevent the building of nuclear power plants			
To stop rising energy prices			

E15. Do you approve the building of a new Nuclear power Plant?
0 Yes
0 No

This is the end of the questionnaire, thank you for your co-operation. You can return the questions to me. or your teacher If there are any questions or remarks about the questionnaire, please write them down and give them to me together with this questionnaire.

If you are interested in a training course about environmental problems and a way to help solving them, you can enrol (sign the list) after filling in the questionnaire.

Wendy Haans

Appendix VI Definition of variables

Dependent variable	Question number	Question	Answer (description independent variable)	Name independent variable
Knowledge				
	B1.	Are the following problems environmental problems for your country?		
			air pollution	**COUNTAIR**
			soil pollution	**COUNTSOI**
			water pollution	**COUNTWAT**
			energy deficits	**COUNTENE**
			greenhouse effect	**COUNTGRE**
			depletion ozone layer	**COUNTOZO**
			NPP accidents	**COUNTNPP**
			noise	**COUNTNOI**
			waste	**COUNTWAS**
			deforestation	**COUNTDEF**
			Baltic Sea pollution	**COUNTBAL**
		Are the following problems environmental problems for Minsk?		
			air pollution	**MINSKAIR**
			soil pollution	**MINSKSOL**
			water pollution	**MINSKWAT**
			energy deficits	**MINSKENE**
			greenhouse effect	**MINSKGRE**
			depletion ozone layer	**MINSKOZO**
			NPP accidents	**MINSKNPP**
			noise	**MINSKNOI**
			waste	**MINSKWAS**
			deforestation	**MINSKDEF**
			Baltic Sea pollution	**MINSKBAL**
		Are the following problems environmental problems for the world?		
			air pollution	**WORLDAIR**
			soil pollution	**WORLDSOI**
			water pollution	**WORLDWAT**
			energy deficits	**WORLDENE**
			greenhouse effect	**WORLDGRE**
			depletion ozone layer	**WORLDOZO**
			NPP accidents	**WORLDNPP**
			noise	**WORLDNOI**
			waste	**WORLDWAS**
			deforestation	**WORLDDEF**
			Baltic Sea pollution	**WORLDBAL**
	B5	Do you know how you can help solving environmental problems?	Yes No	**HOWWANT**
	C5	How many times a week do you discuss environmental subjects at our school?	Number of times of discussion in hours a week.	**TIMES**
	C6	What does this sign mean?	recyclable product	**RECYCL**

	D4	Do you know what 'sustainable development' means?	Yes No	SUSTAIN
	E6	Do you feel as if there is an energy deficit in your country?	Yes No	DEFICIT
	E9	For which sources do you think the deficit is present?		
			coal	DEFSOCOA
			gas	DEFSOGAS
			oil	DEFSOOIL
			wood	DEFSOWOO
			other	DEFSOOTH
	E10	How do you think energy sources in your country can be prevented?		
			not	DEFPRENO
			energy saving measures	DEFPREES
			solar energy	DEFPRESO
			biogas	DEFPREBI
			nuclear energy	DEFPRENU
			wind energy	DEFPREWI
			other	DEFPREOT
	E14	Which reasons are there to save?		
			gain time for development alternative energy sources	REASTIME
			combat further contamination	REASCOMB
			gain more independence of Russia	REASINDE
			prevent NPP	REASPNPP
			stop rising energy prices	REASPRIC
Involvement				
	B6	Do you feel that solving environmental problems is only a governmental task?		SOLGOVER
	B9	Are you a member of an environmental oriented organisation or club?		ENVORGAN
	C1	Have you ever looked for information about environmental subjects?		INFOENVI
	C2	What kind of information were you interested in?		
			general	INFORGEN
			problems in RB	INFOPROB
			problems in the world	INFOPROW
			activities RB	INFOACTB
			activities in the world	INFOACTW
			other	INFOELSE
	D5	What actions are necessary to ensure safe living conditions of future generations?		

			more information	**NECESINF**
			people should pay more attention to effects of their actions on nature	**NECESPEO**
			government should do more	**NECESGOV**
			more env. education	**NECESEDU**
			more money in budget	**NECESMON**
			industry should produce less polluted	**NECESIND**
			other	**NECESOTH**
	D6	Are you interested in a training course?	Yes No	**TRAINING**
	E12	Who should take care of energy savings?	government: g population: p industry: I g+i, g+p, p+i, g+p+i	**SAVING**
Perception of risks				
	D1	What do you think about the general environmental situation of your country in the future?	improve, worsen, same	**FUTURE**
	D2	Why do you think the situation will improve?		
			nature will restore itself	**IMPRORES**
			people are more involved	**IMPROSOC**
			topic of government	**IMPROGOV**
			more money available	**IMPROMON**
			more known	**IMPROKNO**
			other	**IMPROOTH**
	D3	Why do you think the situation will worsen?		
			new problems	**WORSENEW**
			same problems, but worse	**WORSEOLD**
			insufficient actions by government	**WORSEGOV**
			insufficient actions by people	**WORSEPEO**
			insufficient actions by industry	**WORSEIND**
			other	**WORSEOTH**
	E7	Do you think that an energy deficit will occur in future?		**DEFFUTUR**
	E8	Why do you think energy deficits will occur?		
			increasing demand households	**THFUDEHO**
			increasing demand industry	**THFUDEIN**
			policy of government	**THFUPOLL**
			oil companies	**THFUOILC**

			politics Western countries	**THFUWEST**
			fail technologies	**THFUFAIL**
			too little is saved	**THFUTOOL**
			other	**THFUOTHE**
Social dilemma				
	B7	Do you think actions you employ yourself will help solving environmental problems in RB?	yes, little, no	**SOLSELF**
	B8	Do you think that on your own you will not succeed in making a difference?		**SELFSUCC**
	D2	Why do you think situation will improve?		
			people are more involved	**IMPROSOC**
			topic of government	**IMPROGOV**
	E10	How do you think energy sources in your country can be prevented?		
			not	**DEFPRENO**
			energy saving measures	**DEFPREES**
	E11	Do you think energy saving measures are necessary?		**ENERNEC**
Feedback				
	C8	Did you have any kind of feedback?		**FEEDBACK**
Willingness to change				
	B4	Do you want to help solving environmental problems?		**SOLWANT**
	E13	Do you feel satisfied with your behaviour at the moment regarding following subjects:		
			water usage	**BEHAVWAT**
			electricity usage	**BEHAVELE**
			heat usage	**BEHAVHEA**
			waste disposal	**BEHAVWAS**
	D5	What actions are necessary to ensure safe living conditions of future generations?	people should pay more attention to effects of their actions on nature	**NECESPEO**
Attitude	B3	How do you think of yourself regarding environmental subjects?	interested: always-sometimes-never	**HOWTHINK**

Appendix VII SPSS procedures

The procedure as followed with all dependent and independent variables is explained below. All individual procedures are described and one example is added for further explanation. The result of the whole procedure is described in the next paragraph.

VII.1 The example: variable 'knowledge'

For the example part of the variable 'knowledge' is used. In the questionnaire the knowledge of students is tested by for example question B1. The question consists of three parts in which students can give their opinion about environmental problems in the world, their country (the RB) , their city (Minsk). To reduce the set of variables first for each set of answers separately (world, country and Minsk) a factor analysis is performed.

Dependent variable	Question number	Question	Answer (description independent variable)	Name independent variable
Knowledge	B1.	Are the following problems environmental problems for your country?		
			air pollution	COUNTAIR
			soil pollution	COUNTSOI
			water pollution	COUNTWAT
			energy deficits	COUNTENE
			greenhouse effect	COUNTGRE
			depletion ozone layer	COUNTOZO
			NPP accidents	COUNTNPP
			noise	COUNTNOI
			waste	COUNTWAS
			deforestation	COUNTDEF
			Baltic Sea pollution	COUNTBAL
		Are the following problems environmental problems for Minsk?		
			air pollution	MINSKAIR
			soil pollution	MINSKSOL
			water pollution	MINSKWAT
			energy deficits	MINSKENE
			greenhouse effect	MINSKGRE
			depletion ozone layer	MINSKOZO
			NPP accidents	MINSKNPP
			noise	MINSKNOI
			waste	MINSKWAS
			deforestation	MINSKDEF
			Baltic Sea pollution	MINSKBAL
		Are the following problems environmental problems for the world?		
			air pollution	WORLDAIR
			soil pollution	WORLDSOI
			water pollution	WORLDWAT
			energy deficits	WORLDENE
			greenhouse effect	WORLDGRE
			depletion ozone layer	WORLDOZO
			NPP accidents	WORLDNPP
			noise	WORLDNOI
			waste	WORLDWAS
			deforestation	WORLDDEF
			Baltic Sea pollution	WORLDBAL

Table VII.1: *environmental problems in the world, the RB and Minsk*

[36] The information about the procedures used is deprived from the 'Help' option of SPSS, a summary written by L.A.G. Oerlemans and M.T.H. Meeus to carry out *SPSS procedures for the course 'Technology Assessment 3 / Data Analysis'*, 1992, and from *Van probleem naar analyse, de keuze van een gepaste multivariate analysetechniek bij een sociaal-wetenschappelijke probleemstelling*, Jacques tacq, 2e herziene druk, ABC, De Lier, 1992

VII.2 Factor analysis

A factor analysis is used to determine groups of coherent variables to decrease the number of explaining variables. Factor analysis attempts to identify underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. It is often used in data reduction, by identifying a small number of factors which explain most of the variance observed in a much larger number of manifest variables. Factor analysis can also be used to generate hypotheses regarding causal mechanisms or to screen variables for subsequent analysis.

In order to perform the final factor analysis correlation matrices between the variables are calculated by the computer. The available options are coefficients, significance levels, determinant, inverse, reproduced, anti-image, and KMO and Bartlett's test of sphericity.
KMO means the 'Kaiser-Meyer-Olkin Measure of Sampling Adequacy'. KMO and the Bartlett Test of Sphericity are calculated to determine whether a factor analysis is suitable for the data used. The Bartlett Test of Sphericity tests the hypothesis: ' the correlation matrix is a unity-matrix'. The unity matrix is a matrix in which diagonally 1's are depicted and the other places contain the value 0. If this hypothesis can not be rejected, than a factor analysis is not permitted. If the value of the test is high and the significance level is low (about 0) than the hypothesis has to be rejected. In practice the result of Bartlett's test has to be large for the Chi-square calculation and the significance has to be approximately 0.
The KMO test is an index in which the observed correlation coefficients are compared to the partial correlation coefficients. If variables share mutual factors, then the partial correlations have to be small if the effects of other variables are eliminated. KMO has to be over 0.5, then a factor analysis is useful.

Example:
Results of KMO and Bartlett's test for the variables regarding environmental problems in Belarus.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,685
Bartlett's Test of Sphericity	Approx. Chi-Square	218,605
	degrees of freedom	55
	Significance	,000

Table VII.2: *KMO and Bartlett's Test results of example*

Since KMO > 0,5, Chi-square is large and significance is approximately 0, a factor analysis with this set of variables is permitted.

The next step of the factor analysis is the determination of the eigenvalues of the variables. Eigenvalues of the variables have to be larger than 1. Eigenvalue means the total variance that explains a factor. As a definition each variable has a variance that equals 1. For 33 variables the eigenvalue is maximum 33. So variables with eigenvalue exceeding 1 determine more than 1 separate variable. A factor with eigenvalue below 1 is not interesting, because the original variable has eigenvalue 1, which would contribute more.

Content validation has to be performed as well to prevent a validity problem. Otherwise variables which cannot be combined with respect to the content will still be captured in one factor.

A varimax rotation is often used for better interpretation of the results. The total explained variance remains the same, but the distribution of the variances of the factors changes. Varimax rotation means that the explained variance of the factors is redistributed under this one condition that the independence of the factors is maintained.

Results: rotated component or rotated factor matrices: sets of variables which each form a factor.

Example:

Rotated factor matrix[a]	Factor				
	1	2	3	4	5
Air pollution in Belarus?					0.347
Baltic sea pollution in Belarus?				0.595	
Deforestation in Belarus?	0.498				
Energy deficits in Belarus?					0.414
Greenhouse effect in Belarus?	0.631				
Noise in Belarus?	0.302			0.299	
NPP accidents in Belarus?			0.504		
Depletion ozone layer in Belarus?			0.555		
Soil pollution in Belarus?		0.516			
Waste disposal in Belarus?	0.227	0.229			
Water pollution in Belarus?		0.673			

Table VII.3: *rotated varimax factor analysis results of example*

Extraction Method: Alpha Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 6 iterations.

Factor analysis of knowledge about environmental problems in Belarus leads to 5 factors. Internal validation leads to the choice to classify noise in factor 4 together with Baltic Sea pollution and waste disposal in factor 2 with soil and water pollution. These choices are rectified by the reliability analysis as described below.

1. greenhouse effect, deforestation;
2. water pollution, soil pollution, waste;
3. depletion of ozone layer, NPP accidents;
4. Baltic Sea pollution, noise;
5. energy deficits, air pollution.

VII.3 Reliability analysis

Reliability analysis allows you to study the properties of measurement scales and the items that make them up. The reliability analysis procedure calculates a number of commonly used measures of scale also provides information about the relationships between individual items in the scale.

N example: does the question about environmental problems in Belarus measure the knowledge of students about this subject in a useful way? Using reliability analysis, the extent to which the items in the questionnaire are related to each other is determined. An overall index of the

repeatability or internal consistency of the scale as a whole can be obtained as well as an identification of problem items that should be excluded from the scale.

The following models of reliability are available:

Alpha (Cronbach). This is a model of internal consistency, based on the average inter-item correlation.
Cronbach's alpha is based on the average correlation of items in a test. Variables are supposed to form one scale, which correlate positively with each other. (Since they have until a certain degree a mutual character.) The average correlation of a variable with other variables explain the extent of the mutuality. A value of Cronbach's alpha larger than 0.6 indicates a reliable scale.

Example: Reliability analysis - scale (alpha)

		Mean	Std Dev	Cases
1.	BELARUS1	,9201	,4561	219,0
2.	BELARUS2	,9711	,2382	219,0
3.	BELARUS3	,9338	,4299	219,0
4.	BELARUS4	1,1758	,5923	219,0
5.	BELARUS5	,9863	,3101	219,0

N of Cases = 219,0

Statistics for scale	Mean	Variance	Standard deviation	Variables		
	4.9871	1.5616	1.2497	5		
Item variances	Mean	Minimum	Maximum	Range	Max/Min	Variance
	0.1793	0.0568	0.3508	0.2941	6.1816	0.0131
Inter-item Correlations						
	0.2040	0.1381	0.2801	0.1421	2.0289	0.0011
Item-total Statistics if item deleted						
	Mean	vari nce	Item-total correlation	Squared multiple correlation	**Alpha**	
BELARUS1	4.0670	1.0661	0.3053	0.1009	**0.4722**	
BELARUS2	4.0160	1.3312	0.3160	0.1027	**0.4921**	
BELARUS3	4.0533	1.0601	0.3578	0.1309	**0.4381**	
BELARUS4	3.8113	0.8521	0.3280	0.1186	**0.4797**	
BELARUS5	4.0008	1.2720	0.2766	0.0910	**0.4943**	

Reliability Coefficients 5 items

Alpha = 0.5323 Standardized item alpha = 0.5616

Table VII.4: ***results reliability test of example***

Alpha about 0.60 so reliability analysis is allowed. Alpha only gets worse if items are deleted so the final factors can be defined.

VII.4 Frequencies

A frequency test, resulting in a distribution graph or table, is performed to test the usage of the data and the existence of out-lyers. If necessary, the results of the frequency test can be used to re-code the variables into more meaningfull values. The calculation of frequencies provides an overview of results, their average, median and quartiles, standard deviation and variance.

VII.5 Re-code

Factors can be re-scaled and re-coded to explain the final result of the statistical analysis and the tests of the hypotheses. The recoding takes place on basis of the results of the frequencies analysis.

VII.6 Compute

Using the option compute new factors are formed and named.

Here new variables are definitely computed, named and defined.

Example:

New factor	Old variables
Belarus1	(COUNTRGRE + COUNTDEF) / 2
Belarus2	(COUNTWAT + COUNTSOI + COUNTWAS) / 3
Belarus3	(COUNTOZO + COUNTNPP) / 2
Belarus4	(COUNTBAL + COUNTNOI) / 2
Belarus5	(COUNTENE + COUNTAIR) / 2

Table VII.5: *computing new variables of example*

VII.7 Normal probability plot

A normal probability plot shows the cumulative ditribution of a variable on one axis and the cumulative distribution expected from a normally distributed variable on the other. If a variable is normally distributed, the plotted points form a straight diagonal line. A detrended normal probability plot shows the deviations of the plotted points. They form a straight line. For a normally distributed variable no pattern should be apparent. Out-lyers again are indicated by their large deviation of the detrended normal probability plot.

VII.8 Crosstabs

Using the function crosstabs, all variables are compared to each other to determine to which extent they influence each other. No direction (positive or negative sign) is known yet, but

already can be said whether the factors influence each other. Results are values of Chi or gamma .

Example: crosstabs made of final factors Belarus and Minsk which contain the student's opinion about environmental problems in Minsk and Belarus.

Chi-Square Tests

	Value	df	Asymp. Significance (2 tailed)
Pearson Chi-Square	1492,032	720	**,000**
Likelihood Ratio	506,224	720	,000
Linear-by-Linear Association	137,553	1	,000
N of Valid Cases	219		

Symmetric Measures

	Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Ordinal by Ordinal				
Kendall's tau-b	,631	,035	17,082	**,000**
Kendall's tau-c	,602	,035	17,082	,000
Gamma	,685	,036	17,082	,000
Spearman Correlation	,765	,036	17,520	,000
Interval by Interval				
Pearson's R	,794	,029	19,262	,000
N of Valid Cases	219			

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.
c Based on normal approximation.
df degrees of freedom

Tables VII.6: *results of cross tabulation calculation of the example*

The significance in all cases is very close to 0, which indicates that there is a reliable correlation between both variables.

The Chi-Square test of independence, tests the hypothesis that two variables of a cross tabulation are independent. By definition, two variables are independent if the probability a case falls into a given cell is simply the product of the marginal probability of the two categories defining the cell. A statistics which is used often to test the hypotesis that two variables (row and column) are independent is the Pearson chi-square. It is calculated by adding the squared residuals divided by the expected frequencies over all cells.

The calculated chi-square is compared to the critical points of the theoretical chi-square distribution to provide an estimate of how (un)likely this calculated value is, if the two variables are in fact independent. As stated before it does not result in information about the direction or the strength of the relation between the variables.

Kendall's tau-b is a non parametric measure of correlation, which can be used for ordinal data. Spearmann correlation is a non parametric version of the Pearson's correlation coefficient. It is

based on the ranks of the data rather than the actual values. It can be used for ordinal and for interval data that do not satisfy the normality assumption.

VII.9 Bivariate correlation

The extent to which the factors correlate is calculated. Also the direction of the correlation is found. A positive value of the correlation means that an increase of one factor also leads to an increase in the other. A negative one means that the increase of on factor leads to a decrease of the other.

Example: calculation of the correlation between the two variables MINSK and BELARUS

Correlation	BELARUS	MINSK	
Pearson Correlation	BELARUS	1.000	0.794**
	MINSK	0.794**	1.000
Sig. (2-tailed)	BELARUS		0.000
	MINSK	0.000	
N (number of observations)	BELARUS	219	219
	MINSK	219	219

Table VII.7: *results of the correlation calculation of the example*

** Correlation is significant at the 0.01 level (2-tailed).

The variables Belarus and Minsk are strongly positively correlated, which means that an increase in one variable leads to an increase in the other variable. In this case it means that a student estimates the environmental problems in Minsk well if he does the same for environmental problems in Minsk. If the student knows little about environmental problems in Belarus than he knows also little about environmental problems in Minsk.

The correlation coefficient can have a value between 0 and 1. The strength of the relation depends on the value of the coefficient. In general can be said that a value between 0.00-0.09 means that their is no significant relation. Between 0.10 and 0.29 the relation is weak. The relation is mediocre if the value is between 0.30 an 0.49. Between 0.50 and 1.00 one can speak of a strong relation.

VII.10 Comparing test results with conceptual model

When the hypotheses are tested by calculating the correlations between the final factors, the results of those calculations have to be compared to the correlations depicted in the conceptual model. When 50% or more of the correlations possible is confirmed, the hypothesis is confirmed as well. In all other cases, the hypothesis is rejected. This 50%-rule is applied according to the work of Schulte (1995).

Appendix VIII Learning objectives - Evaluation criteria - Evaluation instruments

VIII.1 Why should energy be saved?

Learning objective		Evaluation criterion	Evaluation instrument
1a.	Increase knowledge about the main environmental problems in Belarus	The five main environmental problems are asked.	At least 4 answers correct (question III).
1b.	Explanation of two mutual causes of the environmental problems in Belarus.	Student has to write down the two mutual causes.	Both causes have to be mentioned (question IV).
2a.	Consciousness-raising of consequences of actual behaviour in the future.	Student has to write down three alarming consequences of nowadays behaviour.	Three correct consequences have to be mentioned (question V).
2b.	Consciousness-raising of in-depth meaning of health.	Student has to write down the definition of health according to the World Health Organisation.	Aspect that health does not only refer to physical condition has to be present.
2c.	Explanation of concept 'sustainable development'.	Student has to write down the definition of sustainable development.	Aspects 'now and in the future' should be included.
2d.	Explaining linkage between sustainable development and need to change behaviour.	Student has to write down what is necessary to provide a sustainable future in Belarus.	At least 'changing behaviour, attitudes or more environmental awareness for everybody' should be mentioned.
3.	Increasing knowledge about ways to change behaviour with respect to energy saving.	Student has to write down 5 ways to change behaviour regarding energy usage.	Five correct answers have to be given.
4.	Increasing knowledge about need to change behaviour.	Student has to describe main aim of personal action plan.	No criterion. (If no answer is given, then aim is not reached!)
5.	Stimulation of self reflection of energy consuming behaviour.	Student has to describe whether he tried to change his behaviour and whether it was difficult or easy.	The results of this question have to studied carefully and discussed with the overall results in the next edition of the training course.

VIII.2 Water saving: why and how?

Learning objective		Evaluation criterion	Evaluation instrument
1a.	Increasing knowledge about the situation in Belarus with respect to water.	Student has to describe branches in which water is used and spoiled most.	At least three correct branches have to be mentioned.
1b.	Increasing knowledge about water wasting activities in households.	Student has to mention water wasting activities in households.	At least four correct activities have to be mentioned.
2a.	Consciousness-raising of consequences of spoiling water	Student has to describe consequences of spoiling water.	At least three correct answers have to be given.
2b.	Increasing knowledge about reasons to save water.	Student has to give reasons for saving water.	At least three correct answers have to be mentioned.
3.	Increasing conscious-ness-raising of water saving and water wasting options in daily life.	Student has to give examples of activities where water can be used in a wasting and saving way.	All three examples have to be correct.
4.	Increasing knowledge about water consuming figures in relation to waste figures.	Student has to show he knows how much water daily activities cost.	At least 4 answers have to be correct within a range of 20%.
5.	Increasing knowledge about need to change behaviour.	Student has to describe main aim of personal action plan.	No criterion. (If no answer is given, then aim is not reached!)
6.	Stimulation of self reflection of water consuming behaviour.	Student has to describe whether he tried to change his behaviour and whether it was difficult or easy.	The results of this question have to studied carefully and discussed with the overall results in the next edition of the training course.

VIII.3 Waste disposal: reduce, reuse, recycle and replace

Learning objective		Evaluation criterion	Evaluation instrument
1a.	Increasing general knowledge about the concept 'waste'.	Student has to give the definition of waste and the ways waste can occur.	Question has to be answered correctly.
1b.	Increasing knowledge about waste producing branches.	Student has to mention waste producing branches, the kind of waste they produce and how waste can be disposed.	Question has to be answered correctly.
2a.	Explanation of ways to solve waste problem.	Student has to mention the concepts reduce, reuse, recycle and replace and examples.	All four concepts have to be mentioned, at least one correct example has to be given as well.
2b.	Stipulating waste as an environmental problem, especially for the future.	Student has to give reasons why waste is an environmental problem.	The damaging character of waste as well as the (unknown) consequences for the future have to be mentioned. If 'contrary to sustainable development' is mentioned then extra point.
3.	Increasing knowledge about waste in households.	Student has to give examples of sorts of ways that are disposed in households.	At least four examples have to be correct.
4.	Increasing knowledge about ways the student can help solving the waste problem.	Student has to show how much he knows about ways to help solving the waste problem.	Answers based on at least three of the four concepts (see 2a) have to be mentioned.
5.	Increasing knowledge about the relation between different environmental problems.	Student has to describe why used paper should be used as raw material for paper production is necessary.	The relation between energy usage, water usage and pollution has to be mentioned.
6.	Increasing knowledge about need to change behaviour.	Student has to describe main aim of personal action plan.	No criterion. (If no answer is given, then aim is not reached!)
7.	Stimulation of self reflection of waste producing behaviour.	Student has to describe whether he tried to change his behaviour and whether it was difficult or easy.	The results of this question have to studied carefully and discussed with the overall results in the next edition of the training course.

VIII.4 How to prevent water pollution?

Learning objective		Evaluation criterion	Evaluation instrument
1a.	Increasing knowledge about the situation in Belarus with respect to water pollution.	Student has to describe why water pollution is an environmental problem.	Relations between water pollution, air pollution and soil pollution should become clear as well as the danger for health.
1b.	Increasing knowledge about consequences of water pollution.	Student has to mention consequences of water pollution	At least four correct consequences have to be mentioned.
1c.	Increasing knowledge about sources of water pollution.	Student has to mention all categories of water polluters.	At least four correct answers have to be given.
1d.	Increasing knowledge about water polluting activities in general.	Student has to present water polluting activities caused by different sorts of polluters.	At least two correct examples each for four different categories have to be mentioned.
2a.	Increasing knowledge about water polluting activities in especially households.	Student has to present water polluting activities in households.	At least four correct answers have to be given.
2b.	Increasing knowledge about water polluting detergents used in daily life.	Student has to mention detergents and their polluting components.	At least two correct examples.
3	Increasing knowledge about ways to prevent water pollution in households.	Student has to give ways to prevent water pollution in daily life.	At least four correct answers have to be mentioned.
4.	Increasing knowledge about need to change behaviour.	Student has to describe main aim of personal action plan.	No criterion. (If no answer is given, then aim is not reached!)
5.	Stimulation of self reflection of water polluting behaviour.	Student has to describe whether he tried to change his behaviour and whether it was difficult or easy.	The results of this question have to studied carefully and discussed with the overall results in the next edition of the training course.

VIII.5 Is noise an environmental problem?

Learning objective		Evaluation criterion	Evaluation instrument
1a.	Increasing knowledge about the concept 'noise'.	Student has to give the definition of noise.	The aspect that noise depends on people's level of acceptation has to be mentioned.
1b.	Increasing knowledge about environmental noise..	Student has to mention different forms of noise.	The two forms should be mentioned.
1c.	Increasing knowledge about the concept 'noise'.	Student has to mention the unit of noise.	Decibels or it's abbreviation has to be mentioned.
2a	Increasing awareness of noise as an environmental problem.	Student has to give reason why noise is an environmental problem as well.	Unknown consequences of different types of radiation in future and harmfullness to elements of nature such as plants, has to be included.
2b.	Increasing knowledge about harmfullness of noise.	Student has to give level when noise gets harmfull.	Answer in describing the level in terms of noise that aeroplanes make, etc. or in decibels is correct.
3a.	Increasing knowledge about sources of noise.	Student has to mention sources of noise.	At least five correct examples.
3b.	Increasing awareness of consequences of noise.	Student has to give main consequences of noise.	At least two of the answers have to be correct.
3c.	Increasing knowledge about ways to avoid noise pollution in households.	Student has to give ways to avoid noise in daily life.	All four correct answers have to be mentioned.
4.	Increasing knowledge about need to change behaviour.	Student has to describe main aim of personal action plan.	No criterion. (If no answer is given, then aim is not reached!)
5.	Stimulation of self reflection of behaviour with respect top production of noise in daily life.	Student has to describe whether he tried to change his behaviour and whether it was difficult or easy.	The results of this question have to studied carefully and discussed with the overall results in the next edition of the training course.

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