AISHE

Auditing Instrument for Sustainability in Higher Education

=== *English text* ===

Niko Roorda, December 2001

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Commissie Duurzaam Hoger Onderwijs
Dutch Committee on Sustainable Higher Education

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Introduction

In the former years and in various countries, in different ways attempts have been made to define the way in which Higher Education should contribute to sustainable development. One of these ways is the implementation of sustainable subjects in the curricula.

For example, there are the Charters of Talloires (1990), Kyoto (1993) and Copernicus (1994). In Agenda 21 (especially in Chapter 36) too, there are directions for the "sustainification" of Higher Education. Although these documents contain important guidelines for education, none of them offers concrete prescriptions on an operational level for what Higher Education should do exactly in order to contribute maximally to sustainable development.

At this moment, many Universities are working on the effective implementation of sustainable education. So, there is a great need for a concrete list of criteria, operationalized through some auditing instrument. This instrument should make it possible to decide by internal or external auditing, up to which level the University (or a part of it) has succeeded in implementing sustainability.

Following a request of the Dutch "Committee for Sustainable Higher Education ("Commissie voor Duurzaam Hoger Onderwijs", CDHO) a working group has been installed, called the "Working Group on Criteria". Under the supervision of this group this instrument is being developed, with the name:

<p align="center">*AISHE* - *Auditing Instrument for Sustainability in Higher Education*</p>

Using AISHE, it will be possible to audit Universities (and other organisations for Higher Education, like the Dutch "Hogescholen" and the German "Fachhochschule") or parts of it (like Faculties or separate courses). Internal as well as external audits are possible.

Perhaps the instrument can also be used in institutions for secundary vocational education; no research has been done on that.

Structure of this book

The method, and this book, will be used by two categories of people.

On the one hand it will be used by managers and by experts on quality management, didactics or sustainable development. And on the other hand by the large group of the teaching staff, and possibly by students.

For this latter category, it probably is the most interesting to start without delay with the instrument, without being bothered by much theoretical backgrounds. For this group, this book starts in Part 1 with only a short practical description of how to use the method, followed by the actual instrument itself.

For the others, it will be important to know the backgrounds and the philosophy of AISHE. For them, the second half of this book is relevant. In that part the basics of the methods are treated, and the subject of validity and reliability is discussed. For the theoretically interested, perhaps it will be advisable to read chapter 3 first.

1. Description of *AISHE*

1.1. Structure

The AISHE-method is based on a model for quality management, developed by the European Foundation for Quality Management, and enhanced by the Institute for Dutch Quality Management (INK). For this reason, it is called the "EFQM-INK model".
 In the EFQM-INK model the idea is that organisations can be in one of several development stages with respect to a number of criteria. The model defines five of these stages.

The original EFQM-INK model has been developed to be used in commercial companies, for instance in industry.
By a group of Dutch Universities for Vocational Education an adaptation has been designed, suitable for Higher Education (see: HBO Expert Group (1999)). Instead of themes concerning production processes, in the educational version themes are described concerning educational processes. It is this model, which may be called "EFQM-HE", which has been chosen as a basis for AISHE.

Below, a short description is given for each of the five stages, as they are defined in the EFQM-HE version. (In appendix X1 a more detailed description is cited from the third edition of the educational version.)

General description				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Educational goals are subject oriented. - The processes are based on actions of individual members of the staff. Decisions are usually made ad hoc.	- Educational goals are related to the educational process as a whole. - Decisions are made by groups of professionals.	- The goals are student oriented instead of teacher oriented. - There is an organisation policy related to (middle)long-term goals. - Goals are formulated explicitly, are measured and evaluated. There is feedback from the results.	- The educational process is seen as part of a chain. - There is a network of contacts with secondary education and with the companies in which the graduates will find their jobs. - The curriculum is based on formulated qualifications of professionals.	- There is a long-term strategy. The policy is aiming at constant improvement. - Contacts are maintained, not only with direct customers but also with other stakeholders. - The organisation fulfils a prominent role in society.

The criteria to which these five development stages are applied are of various natures. For instance, there are themes like the organisation policy and the strategy; human resourcement; management of processes; and the achieved results.

In the *AISHE* method, 20 different criteria are defined. They are clustered in five fields of attention. Following the EFQM model, these are put together in three categories, based on the first three of the four parts of the "Deming Circle" for quality management: "PLAN" - "DO" - "CHECK" - "ACT".

The next page shows the five fields of attention in a schematic way.

Deming Circle
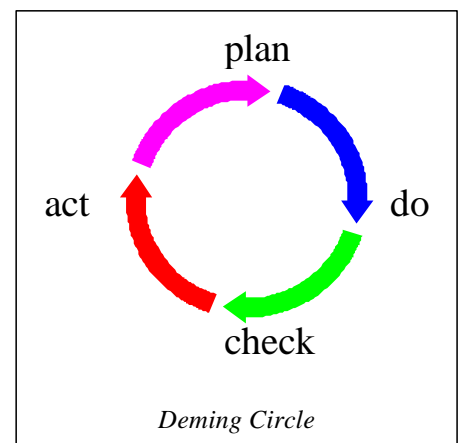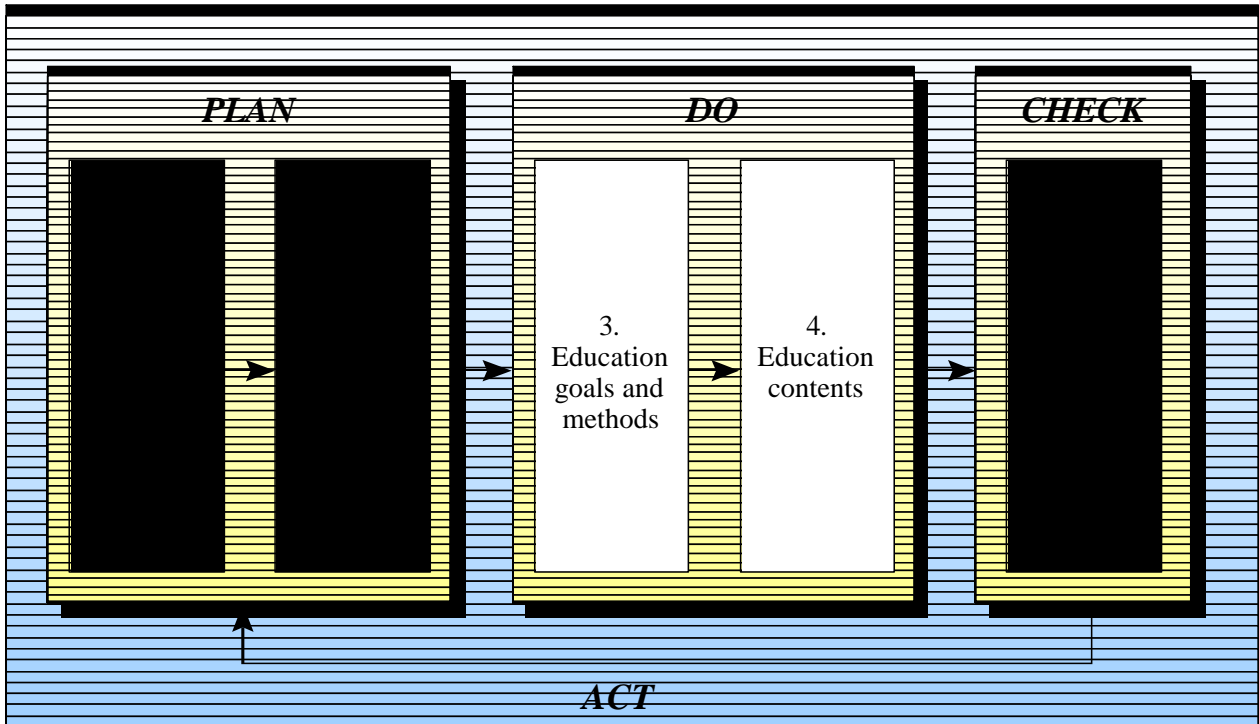
Each field of attention consists of four criteria, as the table below shows:

The criteria list	

== Plan ==	**1. Vision and policy**
	    1.1. Vision
	    1.2. Policy
	    1.3. Communication
	    1.4. Internal environmental management
	
	2. Expertise
	    2.1. Network
	    2.2. Expert group
	    2.3. Staff development plan
	    2.4. Research and external services

== Do ==	**3. Educational goals and methodology**
	    3.1. Profile of the graduate
	    3.2. Educational methodology
	    3.3. Role of the teacher
	    3.4. Student examination
	
	4. Education contents
	    4.1. Curriculum
	    4.2. Integrated Problem Handling
	    4.3. Traineeships, graduation
	    4.4. Speciality

== Check ==	**5. Result assessment**
	    5.1. Staff
	    5.2. Students
	    5.3. Professional field
	    5.4. Society

In chapter 2 each criterion is explained more thoroughly. Besides, for a number of criteria one or more appendices are offered, for example in the form of a table; these are given in chapter 4 of this book. Also, links are shown to relevant literature.

For each criterion, the more thorough description in chapter 2 offers a range of five possible stages: five short descriptions that might be characteristic for the situation with respect to an criterion in a university.
As an illustration, one criterion is shown here with all its five stages.

Example

Criterion 2.3:	**Staff development plan**			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Staff development in sustainability depends on individual initiatives.	- There is a staff development plan in sustainability. - This plan is mainly short term related. - For the execution of the plan, facilities are made available by the management.	- The need of the organisation for expertise in sustainability is known. - The development plan is based on a match between this need and the individual wishes of the staff members for supplementary training and refresher courses. - The plan is mainly middle long-term related.	- The sustainability staff development plan is long term related. - It includes a policy towards appointments and resignations, retraining, introduction of new staff members. - An explicit relation exists with the strategic policy of the organisation in general.	- The organisation policy on sustainability is based on societal and technological developments. - There is a systematic feedback to society.

The above example shows that in the ordinal scale from stage 1 to stage 5, there are several kinds of differences: several *dimensions*. Formulated a little bit loosely, these dimensions may be characterised as follows (indicating only the extremes of stage 1 and stage 5):

Dimension:	*goes from …..*	-	*….. till:*
?? ***Concerns:***	individual …	-	… society
?? ***Ambition:***	high acc. to oneself …	-	… excellent acc. to others
?? ***Policy:***	ad hoc decisions …	-	… strategic, pro-active
?? ***Time perspective:***	this semester …	-	… long term
?? ***Quality:***	incidental evaluation …	-	… evaluation by all stakeholders
?? ***Result assessment:***	once at most …	-	… comparison with the best

If you want to have a more thorough look at this, you can study the next table (next page).

Some dimensions				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Concerns Individual staff member	Team, study programme	Whole organisation	Chain: Secundary education – higher education – professional field	All of society
- Ambition Good in own eyes	Good according to the management	Good according to the organisation	Good according to the customers	Excellent in comparison with colleague institutions
- Policy Ad hoc decisions	Operational policy	Tactical, passive policy	Strategic, active policy	Strategic, pro-active policy
- Time perspective Now (= e.g. this semester)	Short term (1 to 2 years)	Middle long term (up till 5 years)	Long term (up till 10 years or more)	Long term (up till 10 years or more)
- Quality Incidental evaluations	Beginning of quality management	Systematic evaluations plus feedback: Policy circle	Evaluation involvement of customers (students and professional field)	Evaluation involvement of all external stakeholders[1]
- Result assessment Performed maximally once	Performed several times, trends are known	Result comparison with targets posed	Result comparison with colleague organisations: *Benchmarking*	Result comparison primarily with excellent colleague organisations

On the next page, the five stages are characterised again, this time in a graphical way.

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[1] E.g. by a Visitation- or Accreditation Committee

The five stages, presented graphically:
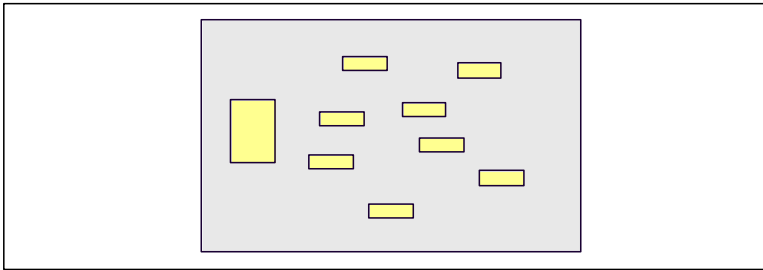
Stage 1:
Separate parts
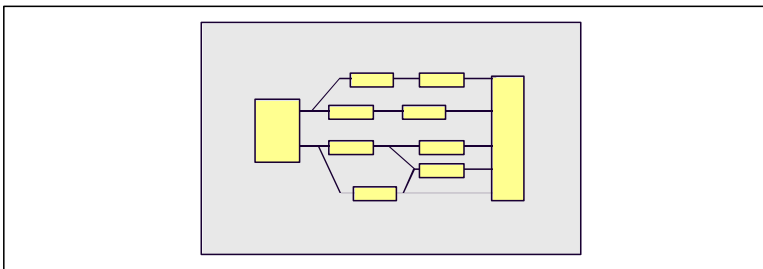
Stage 2:
One process
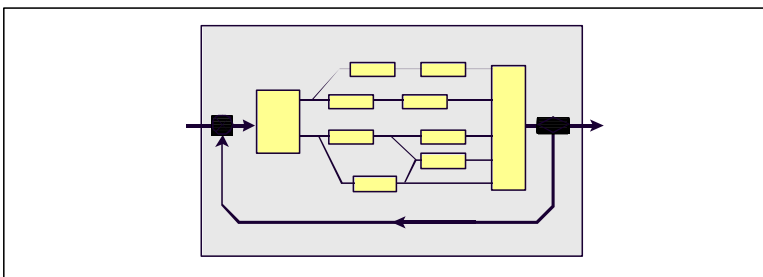
Stage 3:
Process with feedback
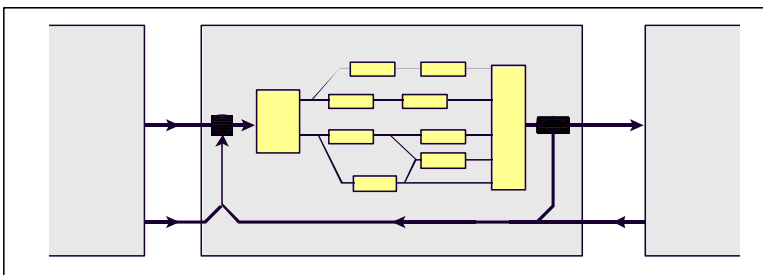
Stage 4:
Part of a chain of
processes
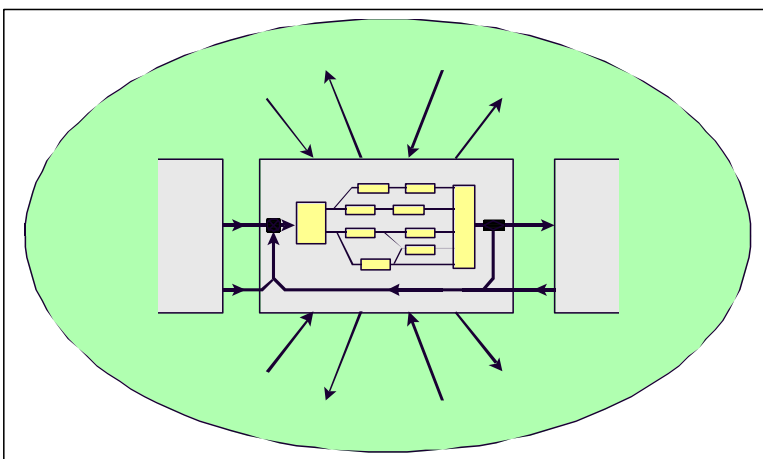
Stage 5:
Part of society

1.2. Application procedure

An AISHE assessment can best be performed with the assistance of an experienced AISHE consultant, because then the best results will be gained: more significant conclusions, a more active team of participants, more support for the conclusions and more enthousiasm to do something with them.
In the description of the application procedure the presenceof such a consultant is supposed.. If this is not the case, the procedure can be followed with some adaptations.

The application of AISHE consists of a series of steps. Some of them are necessary, some other are optional. First they will be shown schematically, then they will be treated elaborately.

The steps of an *AISHE* assessment (minimum approach)

?? Preparation with the internal assessment leader:
- Explanation of the method
- Discussion of the procedure
- Selection of criteria and appendices to be treated
- Composition of the group of participants

?? Written information to the participants

?? Introduction with the group of participants:
- Explanation of the AISHE method
- Discussion of the procedure

?? Filling in the criteria list: by the participants individually

?? Consensus meeting, participants + consultant

?? Review with internal assessment leader

Elements of a more intensive consultancy (optional)

Before:

?? Introduction of sustainable development with the staff, e.g. through presentations or workshops, as a preparation for an AISHE assessment

?? Introduction of sustainable higher education with the management, e.g. through presentations or discussions, as a preparation for an AISHE assessment

After:

?? Assistance with the translation of the results to policy- and activity plans

?? Assistance with the application of the results in relation to the (Dutch) Certificate for Sustainable Higher Vocational Education or in relation tot the Copernicus Charter

?? Assistance with the integration of AISHE and SHE in the internal quality management

?? Assistance with the application of AISHE results in the preparation of visitations and/or accreditation

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In the more elaborate description (below) both the necessary and the optional parts are treated together, in chronological order.

Necessary time
If only the minimum scenario is followed, the participants will meet two times. The first is an introductory meeting, followed immediately by the individual scoring by each participant. In the second meeting, the group works together; the details are shown below.
In that case, the necessary time is :

If the minimum scenario is followed:
?? Group of about 10 to 15 persons

For each participant:
?? Introductory meeting: ca. 45 minutes
?? Individual scoring: 60 to 90 minutes
?? Consensus meeting: 4 to 6 hours

Step 1: Preparation with the internal assessment leader

1a: Determination of the internal assessment leader
The internal assessment leader is the person who will co-ordinate the process internally, i.e. within the organisation. Possibly, this person is appointed on beforehand. If not, he or she must be determined first. E.g. it could be a member of the management team, a quality co-ordinator, a sustainability co-ordinator, etc.
The allocation of tasks between the external AISHE consultant and the internal assessment leader and possible other people involved (for instance the secretary of the meetings) will have to be made clear.

1b: Determination of the target organisation
The method is meant to be used in a department or a university: a faculty, or a separate study programme. It is also possible to use AISHE in relation to a complete university, if this is an educational institution which is not too large or complex, and if there is a clear unity of policy with respect to education, for example with respect to the educational vision and –methodology.
Unambiguously must be made clear, which part of an institution will be the object of the assessment, so that no problems about this can arise during the process.

In the text of AISHE, the term "organisation" will be used regularly. This term will consistently mean this selected target organisation, i.e. the faculty, department, study programme or the whole educational institution that has been agreed upon.

1c: Determination of the context and the meaning of the application
AISHE may be used for several reasons:
? As an *internal* audit: to assess the present situation in the organisation with respect to sustainability; to get starting points for a future policy in this subject; and to get a group of people involved in the activities undertaken to carry out this policy, in short: to create support and involvement.
? As an *external* audit: e.g. to evaluate the present situation with respect to a Protocol for SHE, in order to investigate if the demands for a Certificate have been met; or in relation to visitation or accreditation. If an external audit is going to take place, probably other people will be involved too, and perhaps the procedure will need some adaptations. At the time of the publication of this book, no information about this is available.

Before the actual assessment starts, the goals of the assessment will have to be made explicit.

Besides, the starting situation is of importance. Possibly, AISHE has been used before within the target organisation, or in a part of it; that is, it is possible to repeat the assessment, for instance after a period of a year.

On the other hand, it is possible that relevant information about the organisation has been acquired in another way, for instance information about the general quality management, or about the internal environmental management. If an AISHE assessment is done as a part of a larger assessment, the results have other implications, compared to a situation in which there is only an assessment about sustainability in education.

Information about this kind of subjects is to be brought together, and has to be sent to all people who are involved in the process.

Quickscans

Especially, it is possible to gain insight in the level up to which four different groups of stakeholders (i.e. staff, students, professional field and society as a whole) have appreciation for the organisation policy on sustainability. For this goal, the four quickscans can be used that are offered in this book (with the criteria 5.1. to 5.4).

Performing such a short preliminary investigation forms a good preparation to an AISHE assessment.

Furthermore, it is important to determine on beforehand , what will happen with the acquired information afterwards. Will the results be published, and if so, anonymised or not, and by whom? Preferrably, agreements about this are made on beforehand and communicated.

1d: Determination of the participants

Next, a group of participants is formed. In small organisations (up to about 15 staff members) each staff member can participate. In larger organisations a group of 10 to 15 participants is selected. The group has to be representative for the complete teams of the staff members and the students, so there have to be one or more managers, a number of teachers (professors, lecturers, etc.) coming from a wide variety of disciplines and curriculum parts, some students, and perhaps one or more members of the non-teaching staff.

It could be interesting to ask other people to join: for example, graduates or (other) representatives of the professional field, i.e. of the "customer". If the organisation is – on average – still in a rather low stage (up to stage 2 or 3), probably this will not be a very good idea. But if the organisation is in a number of criteria in a higher stage (3 to 4 or higher), participation by external peolpe will probably be worth while.

The members of the selected group participate on a basis of 100% equality; the opinions of all participants or equally important.

The discussions will be chaired by the AISHE-consultant, or if hè/she is absent, by the assessment leader, and *not* by a manager of the organisation.

!!! **It is absolutely vital that all participants join the *whole* process. It is impossible to have some participants being present only in the first or in the second meting.**

1e: Determination of the criteria and appendices to be treated

It is not necessary to treat all 20 criteria of AISHE at the same time. Especially if the organisation has no experience in using AISHE or similar instruments, it may have an advantage to make some restrictions.

If AISHE is used in a situation of an external audit, it will probably not be the organisation itself which determines which criteria are going to be investigated, but the external assessor.

The same is true for the use of appendices (see chapter 4): decisions about this can be made on beforehand. In principle the complete assessment can be done without the help of the appendices, but it is possible that certain criteria can be clarified by the use of them.

Decisions about this may also be made during the group meetings.

Step 2: Introduction for the participants group

2a: Distribution of information

Long before the assessment,, at least a month or so earlier, each participant receives information about what is going to happen, including dates and times.

Later, e.g. one or two weeks before the first meeting,, each participant receives a package with more information. This contains all details about the various meetings: dates and times (again), places, list of participants etc., and it also contains a copy of the AISHE book (i.e. *this* book), plus a reading guide.

2b (optional)*: Preparation: the theme "sustainable development and higher education"*

If the participants of the assessment are quite well-informed about the concept of "sustainable development" and of the relations of it with higher education, perhaps this step may not be becessary. But if this is not the case, it may be a good idea to spend some time first (a couple of hours, or half a day or so) on these subjects. This can be done through a meeting with the group of participant (plus perhaps some other managers, employees and students), where the AISHE consultant presents a paper, or leads a group discussion or a workshop.

If necessary, a separate preparatory meeting with the management can be organised.

2c: Explanation of the AISHE assessment procedure

The way in which an AISHE assessment is done (i.e. the explanation you are reading at this moment) is explained verbally with the participants. All relevant information about decisions made during the preparation is presented, for instance about the publication of the results at the end, and about the intended targets of the assessment.
The explanation, preferably given by an AISHE-consultant, will take about 45 minutes. (If all participants studied the written information thoroughly, less time will be needed.)

The next step (step 3) can best be done consecutively.

!!! **Participants should not determine their individuele scores before the introductory meeting has taken place.**

Step 3: Individual scoring

Each of the participants works individually, uninfluenced by the others, through the list of criteria. For each (selected) criterion he/she forms an own opinion about the situation in the organisation.
Probably, with most criteria the organisation will not exactly match one of the five descriptions. Nevertheless, usually one of them will come nearest to the actual situation. Based on this, for each criterion a stage is selected.
An important "rule of the game" is: it is only allowed to conclude that a certain stage has been reached, if, if all preceding stages have been reached completely, too! All stages of a criterion are meant to be "cumulative", so the demands for stage 1 are again valid for stage 2 and higher; the demands for stage 2 are again valid for stage 3 and higher, etcetera.

Thus, every participant works individually through the criterion list. For each criterion hè/she decides on a stage. The conclusion can be filled in directly in the AISHE book: for this purpose, a box is available with each criterion description.
It is importnat nor just to select a number! Please, also write down the reasons why the selected stage is the right one. For this too, with each criterion a box is available, marked with "Comments".

Criterion x.x: Xxxxxxxxxx				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
Xxxx xxxx xxx	Xxxx xxxx xxx	Xxxx xxxx xxx	Xxxx xxxx xxx	Xxxx xxxx xxx
Selected stage: *** *in this box you insert the right stage, according to you* ***				
Comments:

*** *in this box you write down (just for yourself) the reasons why you think the stage you selected is the right one.*

Later, you will bring your notes to the consensus meeting *** | | | | |

At the end, when all 20 (or less, if this was decided) criteria are treated individually, the participant fills in all the scores in a score form, which is in this book, a few pages further on, and which is also handed out as separate pieces of paper, in order to be handed back after completion.

The individual scoring of the complete list (all 20 criteria) will take 60 to 90 minutes.

Step 4: the consensus meeting

4a: the composite form
The completed forms are gathered. The scores are inserted together on one score form, this time not as marks but as numbers.
By using different colours, a distinction will be made between the various categories of participants: managers, teachers, students and others, unless objections are made against this.
This composite form is copied for each of the participants.

4b: the consensus meeting
A meeting takes place in which all of the participants are present. At the beginning (or earlier) the copied composite form is distributed.
As before, every participant has the AISHE book, in which the own scores and annotations are written: these are essential for the meeting.
The meeting is chaired by the AISHE consultant, or if there is no external assistance, by the internal assessment leader.
All participants have an equal weight in the discussions, in the proceeding of the conversation and in the decision making.
The chair can influence the process, for example by clarifying concepts, by guarding a careful decision process, by reflecting critically to the explanations of the opinions of the participants, and by guarding that no participants try push forward to decisions by using their position within the organisation. The assessment leader him/herself does not participate in the decision making.

Each (selected) criterion is discussed. On a basis of intrinsic reasoning, a common conclusion is looked for about the right score of the organisation.
If possible, decisions are made based on consensus. If, however, for some criterion no consensus can be reached, the chair will conclude that, of all proposed scores, the *lowest* is the one that is decided upon: this is, because a (higher) score has only definitively been realised if all participants agree with it. In *no* case at all, decisions are made by voting.

!!!   Decisions are never made by majority voting.

As before, during the meeting a conclusion that certain stage has been reached can only be made if all preceding stages have been completely too: remember, the stages are meant to be cumulative.

During the meeting, notes are taken. For this purpose a computer utility is available ("AISHE Score Utility", see the image), in which the notes can be typed in directly. For every criterion not only the stage is decided, but also the reasons why this stage is the right one.
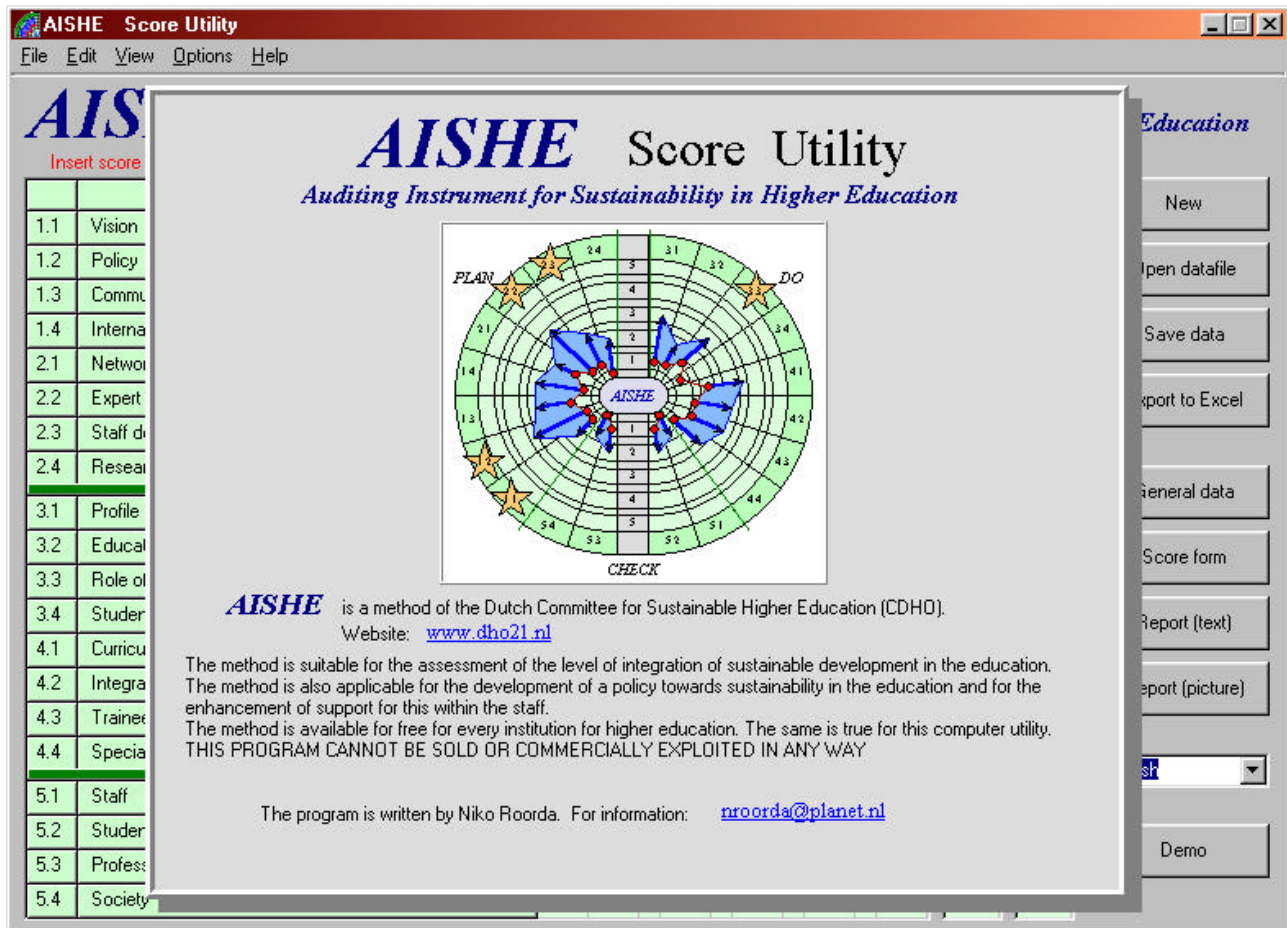
Scores "in between"
If the group has the opinion that for a certein criterion a certain stage has almost been reached but not yet completely, it is not allowed to conclude that that this stage is the right answer: this is only allowed when that stage has been realised 100%.
In such a "almost but not quite"-case it is allowed to score halfway between two stages. For example, it can be decided that the score (for the criterion in question) is: "2, going to 3".
The score form offers separate columns for this.

Desired situation, priorities, policy
During the discussion of the criteria, naturally a number of possible improvement points will rise. This will enable the group – for each criterion – to formulate a *desired* situation. This desired situation is defined, not only in the form of a stage to be reached, but also in the form of a series of concrete targets and associating activities that will lead to the desired stage.

In order to guarantee that the necessary concreteness is really achieved, at the beginning of the consensus meeting a decision is made about the (future) policy period the desired situation is related to. This may for instance be a period of one year, starting at the moment of the assessment.

When for all 20 criteria, or for a major part of them, policy intentions are defined in this way, a large list of goals and activities will be formed on which work can be done in the coming period. But then of course the danger is that if this list is rather huge, in reality probably many of them will not have much of a chance: it's a well-known fact that a policy plan with more than 3 to 5 priorities usually has not much chance of success.

This is why the meeting ends with the assignation of those elements in the list of policy ideas that the group thinks are most important: those elements receive highest priority.

So, the result is:

?? A description of the *present* situation, in the form of a number (the stage) for each criterion plus a description for each criterion in words;

?? A ditto description of the *desired* situation;

?? A *date* in which this desired situation has to be reached;

?? A list of first priorities, that are considered to be crucial in order to be permitted to conclude that the policy will have been successful.

In the end, this package has the status of "recommendations to the management".

It is rather likely that this set of recommendations has a good chance of being accepted and to become a part of concrete policy plan. This is because the management itself is represented in the group of participants (and that is exactly why that is so vital!); and the recommendations have – if all went well – been chosen in consensus by a representative group from the staff and the students, so it is likely that there is support for the conclusions.

For an assessment in which all 20 criteria are investigated, the consensus meeting(s) will probably take 4 to 6 hours.

4c: Report

The computer utility automatically turns the separately typed in decisions and comments in a report, which can be printed and distributed.

The report does *not* have any information about which positions and opinions were taken by which persons.

The report is sent to all the people that were selected to have one during the preparation.

Circular form

As an aid for the representation of all results a circular form is used, which can be found in paragraph 1.4 (a few pages from here).

After filling in, it might look like the fifth picture shown on the next page.

The computer utility produces the completed circular form automatically.

AISHE **report**

University	University of "XX" (anonymized)
Department	Department of "X"
Assessment leader	Bert Schutte
Function	Member of the Dutch project team on AISHE development
Accessible through	
Secretary	Niko Roorda
Assessment date	October 22, 2001
Date of latest assessment	
Date of desired situation	January 1, 2003

The five stages of AISHE are:

> *Stage 1: Activity oriented*
> *Stage 2: Process oriented*
> *Stage 3: System oriented*
> *Stage 4: Chain oriented*
> *Stage 5: Society oriented*

For more information: see the website www.dho21.nl *or mail to Niko Roorda,* nroorda@planet.nl .

=== *PLAN* ===

1. Vision and policy

Criterion 1.1. Vision
  Present situation: Stage 1
The Protocol on Sustainable Education has been signed for the university as a whole. There are good intentions, but there is no thoroughly developed vision.
  Desired situation: Stage 2 - *High Priority*
Explicit vision, put down in documents.

1. Empty score form: the consensus meeting is about to begin.

2. Criteria 1.1 till 1.2 are finished: there is consensus on the present and the desired situation. Criterion 2.2 is in discussion.

3. The PLAN and DO parts are finished. For criterion 3.4, no improvement is desired.

4. All criteria have been duscussed. In the CHECK part, no large improvements are foreseen.

5. Now, the priorities for the policy are discussed. The decisions are shown in the diagram as stars.

6. Small, light colored marks show the demands of a Protocol for a Certificate for Sustainable Higher Education. The present situation does not meet the demands, but the desired situation will easily do so.

Figure 2: an example of the way in which AISHE can be used as a policy instrument

4d: Global indicators

The computer utility automatically calculates five indicators that give a global image of the organisation with respect to sustainability and education.

The box shows a possible result:

Global indicators:	Present situation	Desired situation
Median	1	2
Plan Do balance	+3,5	+1,5
Policy ambition		16
Distance to Protocol 2000	3	0
Distance to Protocol 2002	7	0,5

MEDIAN:

One could be tempted to calculate the *mean* stage, in order to get an indication about the situation in general. Unfortunately this is not allowed: the stages belong to ordinal scales, and so they can't be averaged.

Instead, the *median* can be used. This is to be found as the middle value of all scored stages, after they have been put in an ascending order.

PLAN DO BALANCE:

The *Plan Do* balance is the difference between the sum of the *DO*-scores and the sum of the *PLAN*-scores.

If this balance is less than zero, relatively much attention is given to the preparation ("*PLAN*"), which is not yet implemented in education in an equal proportion ("*DO*").

If the balance is greater than zero, the education has been made sustainable in a relatively strong amount, but this is not very well anchored in the organisation.

This indicator should be used with great care! Here too it is true: the stages form ordinal scales, and so it is not allowed to add or subtract them. Because of this, the result can only be interpreted as a very rough and global indicator. A difference between a Plan Do balance of e.g. 2.5 and one of 3 cannot be interpreted as significant.[2]

POLICY AMBITION:

= the sum of all differences between the desired and the present stages.

The same cautiousness goes for this indicator: a difference between an ambition of e.g. 6 and one of 7 is not significant. But since practical tests have shown that there exist remarkable differences (policy ambitions varying between 6 and 24), the policy ambition is nevertheless an interesting quantity.

DISTANCE TO PROTOCOL:

= the total number of stage steps to take, necessary to meet the demands of a certain protocol.

At the moment of publication of this book the only protocols that exist are the ones belonging to the Certificate for Sustainable Higher Education, designed for the Dutch Higher Vocational Education.

By the way: if, as a result of an internal assessment, the distance to a certain protocol appears to be zero, one cannot conclude that the assessed organisation has a right to receive the associated Certificate. The certification process for such a Certificate is done by an independent institution. In other words: *No legal rights can be claimed from an AISHE assessment, and more specifically from the indicator "Distance to Protocol".*

Perhaps this could change, if regulations might come into existence about the use of AISHE by a certifying institution in relation to an externe audit for a Certificate for Sustainable Higher Education.

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[2] Objections from a theoretical standpoint can be made against such an indicator. But, if used in a cautious way, it is possible to draw some conclusions from it. Some strong precedents exist. The Eco-indicator, for instance, is in the same way an aggregate quantity, in which variables of an incomparable magnitude are added together through the use of weight factors. One could say: in the Plan Do balance, to all AISHE criteria a weight factor of 1 is given.

4e: Review with internal assessment leader
It stands to reason, that afterwards a short review takes place with the internal assessment leader, with or without the group of participants. In this review, the results and conclusions are evaluated briefly again, as well as the process. Arrangements for some aftercare are made, or – if they had been made before – they are repeated and/or altered in relation to the results.

Step 5: Afterwards (optional)

The end of the assessment could be the end of the process and of the contacts with the AISHE consultant. But there are a few possibilities to keep some contacts, using the results of the assessment.
Of course, this aftercare has to be made to measure, completely according to the wishes of the investigated organisation. Some options are:

5a: Policy plan
As a result of the AISHE assessment there is a list of recommendations to the management. The AISHE consultant can offer help to turn this list into a concrete policy plan and with the designing of the activities that will lead to the realisation of it.

5b: Certificate
As said before, the results of AISHE gives an indication of the distance that separates the organisation from meeting the demands formulated in a Protocol of the Dutch Charter for Higher Vocational Education.
The policy may purposefully be formulated in such a way, that at the end of the policy period those demands will be met.
Here too, the AISHE consultant can offer assistance.

5c: Integration in internal quality management
In the ideal situation the organisational policy with respect to sustainability is not an isolated subject, but instead forms an integral part of the total quality management policy.
The AISHE method expresses this by the fact that it is derived from an accepted method for quality management (the EFQM-HE-version).
Therefor it stands to reason, that assistance is offered for the integration of the sustainability policy in the general quality management.

5d: Visitation / accreditation
In a number of recent Dutch external audits (visitations) sustainability was investigated explicitly, thus showing the relation between the sustainability policy and the quality management. It is to be expected that this will increase in the near future.
So, the AISHE assessment can be used as a part of the self-evaluation as a preparation for the visitation. The AISHE consultant can offer assistance.

Discussions are going on, e.g. on the initiative of the Dutch Committee on Sustainable Higher Education (CDHO) and the Dutch Foundation for Sustainable Higher Education, to offer sustainability a prominent place in the accreditation system which is in development.
It will be investigated if AISHE could play some role in this.

Step 6: Repetition

After finishing the policy cycle, e.g. after a year, the AISHE assessment can be done again, in order to measure the rate of success of last year's policy with respect to sustainability and education.

1.4. Score forms

A. Individual Score form

AISHE - Score form								
Auditing Instrument for Sustainability in Higher Education								
Name: *(may be anonimous)*				**Function:** Teacher / Manager / Student / Other: ………….				
University:				**Department:**				
Date:				*Last AISHE Audit:* **Date:**				
Field		**Criterion**		**? - 0**	**1**	**2**	**3**	**4**	**5**
P L A N	**1. Vision and policy**	1.1	Vision						
		1.2	Policy						
		1.3	Communication						
		1.4	Environmental management						
	2. Expertise	2.1	Network						
		2.2	Expert group						
		2.3	Staff development plan						
		2.4	Research and external services						
D O	**3. Educational goals and methodology**	3.1	Profile of the graduate						
		3.2	Educational methodology						
		3.3	Role of the teacher						
		3.4	Student examination						
	4. Education contents	4.1	Curriculum						
		4.2	Integrated Problem Handling						
		4.3	Traineeships, graduation						
		4.4	Speciality						
C H E C K	**5. Result assessment**	5.1	Staff						
		5.2	Students						
		5.3	Professional field						
		5.4	Society						

B. Score form for the final results
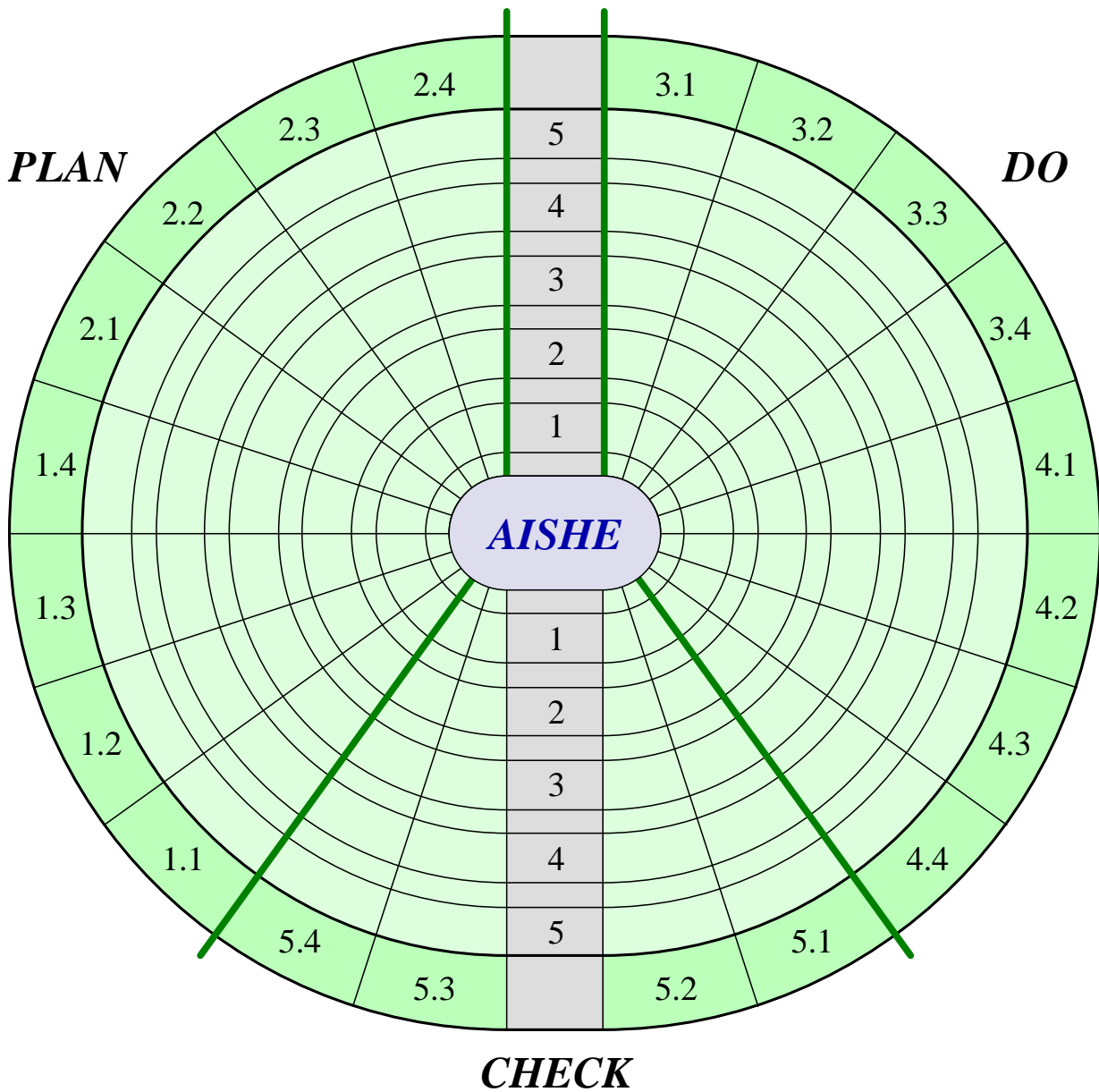
Institute / department: ....

Date: ....

Process manager: ....

2. The 20 criteria

== Plan ==

Field of attention 1: Vision and policy

Criterion 1.1: Vision				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- The management has a vision on sustainable development* and education. - This vision is only implicit*. -------------------- *(Every * in the text refers to an explanation below.)*	- The management vision on sustainability has been formulated in documents*. - The management offers opportunities and facilities to work out the vision as concrete consequences for the organisation* and the education.	- The organisation vision on sustainable development and education has been expressed in the mission statement*, and is translated in a concrete policy. - The results of the policy are evaluated regularly, using these goals. - Staff and students are involved in the vision development.	- The vision development about sustainability and the translation of it in a concrete policy takes place in interaction with the professional field* and with the secondary education.	- The organisation vision on sustainable development and education is integrated with the vision on long term development of society and the role therein of the organisation. - The vision is constantly kept up to date in interaction with many actors* in society.
Selected stage:				
Comments:				

Description:
The organisation, or at least the management, has a vision on sustainable development in general, on aspects within the own fields of expertise and on the consequences of this for the organisation policy. The vision is expressed in the strategic policy.

* **Stage 1:** "Sustainable development":
 The best known definition of the concept of sustainable development is the one of the Brundtland Commision (1987). According to their report, entitled *"Our common future - the world commission on environment and development"*, sustainable development means:

> *meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.*

(Appendix 1.1-1 contains a summary of the Brundtland report.)

In the Higher Education 21-project, which was performed in the United Kingdom, sustainable development was described as:

> *Sustainable development is a process which enables all people to realise their potential and to improve their quality of life in ways that protect and enhance the Earth's life support systems.*

Sustainable development consists of a large number of varying aspects. An overview in a table is shown with criterion 3.1.

During the huge Un Conference of Rio (Earth Summit, 1992) an extensive action plan was made, "Agenda 21". Chapter 36 of it describes the role of education. (See: appendices 1.1-2 and 1.1-3.)

This role is also described in the World Declaration on Higher Education for the Twenty-first Century:

> *Each higher education institution should define its mission according to the present and future needs of society and base it on an awareness of the fact that higher education is essential for any country or region to reach the necessary level of sustainable and environmentally sound economic and social development, cultural creativity nourished by better knowledge and understanding of the cultural heritage, higher living standards, and internal and international harmony and peace, based on human rights, democracy, tolerance and mutual respect.*

The Copernicus Charter says about this in the preamble:

> *Indeed, universities are increasingly called upon to play a leading role in developing a multidisciplinary and ethically oriented form of education in order to devise solutions for the problems linked to sustainable development. They must therefore commit themselves to an on-going process of informing, educating and mobilising all the relevant parts of society concerning the consequences of ecological degradation, including its impact on global development and the conditions needed to ensure a sustainable and just world.*

The signatories to the Copernicus Declaration promise (art. 1):

> *Universities shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development within the academic milieu.*

* **Stage 1:** "Implicit": i.e. is not formulated explicitly in documents.

* **Stage 2:** "Organisation": i.e. the university, or the department, which is selected as the object of the AISHE assessment.

* **Stage 2:** "formulated in documents" can relate to internal documents, but may also mean that a generally accepted declaration has been signed, for instance the Copernicus Declaration, the Talloires Declaration, or the (Dutch) "Handvest voor Duurzaam HBO".

Appendix 1.1-4 contains a list of the most important of these declarations.

* **Stage 3:** "mission statement": An example from reality. The *mission statement* of a Dutch university says:

> The Technical University of Eindhoven:
> ??   Wants to be an institution for technological-scientific education and research of a high quality according to international standards and with a societal relevance.
> ??   Aims the generation and the proliferation of knowledge especially at a sustainable development of society
> ??   Fulfils a stimulating role in the industrial development, especially in the own region
> ??   Characterises itself by its multi-disciplinary approach and the relation of technology with economical, social and ecological aspects.

* **Stage 4:** "Professional field": the total of all possible (and reasonably likely) future employers of the students. This may concern companies, but of course also governments, societal organisations, research centers, educational institutions, etc. In this relation (stage 4) they act as *direct* stakeholders, in contrast with the situation as described with stage 5.

* **Stage 5:** "Actors in society": for instance
-    local, regional and national governments;
-    (inter)national networks on education;
-    primary and secondary schools;
-    NGO's (non-governmental organisations), like environmental groups, welfare organisations, local agenda 21-groups, science shops, law shops, third world development projects, assistance for allochthones, etc. etc.

In contrast with stage 4, where these same institutions may be stakeholders in a direct sense (as the furture employers of the students), in the context of stage 5 they act as representatives of society as a whole.

Appendices:
Appendix 1.1-1: *Text*:   Summary of the Brundtland Report
Appendix 1.1-2: *Text*:   Agenda 21: Index
Appendix 1.1-3: *Text*:   Agenda 21, chapter 36: Promoting education, public awareness and training

Appendix 1.1-4: *Table*:   Declarations on higher education and sustainability.
Appendix 1.1-5: *Text*:   University Charter for Sustainable Development ("Copernicus charter")

Literature:

?? Mentioned already: Brundtland Report (1987), Agenda 21 (1992), Higher Education 21 (1999), Copernicus Charter (1994), Talloires Declaration (1990), Handvest voor Duurzaam HBO (1999).

?? Mazurkiewicz (1998) offers a clear overview of a number of declarations on sustainability in higher education.

?? The development of the Talloires Declaration: Clugston and Calder (2000)

?? The vision of the Club of Rome is shown clearly in Meadows (1991). See also: Rotmans & de Vries (1997).

?? The present situation in the world with respect to environment and sustainable development: UNEP (1999)

?? Van Weenen (2000) describes visions on sustainability in universities.

?? Misconceptions on the sustainable university: Leal Filho (2000a).

Criterion 1.2:	Policy			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- The policy with respect to sustainability is developed mainly top-down by the management. - Much of this policy is only implicit. - This policy development is usually motivated by incidental situations or events.	- Staff members have a visible role in the development of a policy with respect to sustainability. - The sustainability policy is made explicit in documents. - The policy plans are related to short term developments*.	- Staff members and students are involved systematically in the development of the policy with respect to sustainability. - This policy is translated in assessable* goals, and evaluated and (if necessary) adjusted. - The sustainability policy is middle long* term related.	- Also, external organisations (secundary education and the professional field, e.g. via graduates) are involved in the development of the policy with respect to sustainability. - Activities related to this policy are developed and performed together with these external parties on a regular basis. - The sustainability policy is long* term related.	- The sustainability policy is developed and carried out in close cooperation with many actors in society, and contributes explicitly to the policy realisation of these actors. - In these contacts, the organisation has an active, anticipatory role, based on a deep expertise and experience.

Selected stage:
Comments:

Description:

A vision of the organisation on sustainable development and education is nice, but it doesn't necessarily have actual consequences: in itself, it is just an opinion. The policy translates the vision in concrete plans to do something with this vision. Goals* are formulated, and activities are designed that will have to lead to the realisation of these goals.

The Dutch Charter "Handvest voor Duurzaam HBO" puts it like this (Protocol 2000, art. A1):

[The institute promises to …] make explicit the integration of sustainable development in education, research and management as a premise in the strategic policy of the university or the institute.

* "Goals": Wrongly, goals are often formulated as a series of activities. A "goal" is a description of the situation that will have to be reached at the end of a policy period. Goals are operationalised by formulating activities which are to lead to the goals that have been appointed.

* Stage **2, 3 and 4:** "Short term developments": circa 1 to 2 years, mainly operationally oriented.
"Middle long term": 3 to 5 years, with a tactical emphasis.
"Long term": 5 to 10 years or even more, on a strategical level.

* **Stage 3:** "assessable goals" are goals that have been formulated in such a way that it is possible to investigate in an objective way whether they have been reached or not. The "assessment" does not necessarily mean the betekent niet noodzakelijk het vaststellen van getalwaarden m.b.v. instrumenten: het uitvoeren van een AISHE-assessment is ook een meting.

Literature:
- ?? Sustainable development on the short, middle long and long term: Jansen & Vergragt (1993); Roorda (2001)
- ?? One of the targets for sustainable development is: an improvement of the eco-efficiency with a *factor of 10 tot 50*: see Commoner (1990). What this means in real life, can be found in RMNO (1972), DTO (1997). Technical opportunities of increasing the eco-efficiency considerably can be found in Von Weizsäcker (1997).

?? Sustainability policy in universities: Leal Filho (2000c)
?? Strategy for a sustainable curriculum policy in a developing country: Wemmenhove & de Groot (2001)

Criterion 1.3:	Communication			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Efforts of individual members of the staff or of parts of the organisation to enlarge the attention for sustainability take place.	- Sustainable development in education, research and operations is a regularly appearing subject in meetings and in internal and external publications*.	- The management has a knowledge of the opinions about sustainability and education of staff members and students. - This information is used to shape the communication about sustainability.	- Secondary education and the professional field are involved actively in the communication about sustainability: the communication is in both directions. - The communication is about sustainability in a "broad sense": not only referring to the own subjects but in a transdisciplinary way.	- A wide variety of societal actors are involved in the communication about sustainability: the communication is in both directions. - Publications by the organisation, by staff members and/or students, are leading.

Selected stage:

Comments:

Description:
Communication takes place within the organisation and with the outside world.

* Stage 2: "Publications": These may be scientific publications in journals. But also: proceedings of meetings, annual reports, university magazine, brochures, PR posters, press releases, etc.
Appendix 1.3-1 shows a larger list of possible channels for communication and publications.

Appendices:
Table 1.3-1: Communication on sustainability

Literature:
?? Resistance against Sustainable Higher Education: Mulder (1999).
?? Strategy for communication about sustainability and environment: Oepen & Hamacher (2000), Leal Filho (2000b)
?? Cooperation of universities with local and regional agenda 21-initiatives: Megerle & Megerle (2000)

Criterion 1.4:	Internal environmental management			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented

- Individual staff members and/or students look after certain aspects of the internal environmental management.	- Environmental management is a part of the policy and the management of the organisation.
	- Certain aspects of the internal environmental management are managed (rather) effectively:
	  ??Material flows
	  ??Catering
	  ??Energy efficiency
	  ??Waste prevention and separation
	- The students are involved in some way in the environmental management.
		- There is a functioning environmental management system.
		- Annually an environmental report is published.
		- The environmental management is used intentionally for the education, e.g. as an example of good practice and as an object for exercises.
			- The environmental management system includes demands for suppliers, a traffic plan for the personnel, and a long-term vision on the buildings and the surroundings.
			- The environmental management system is certified*.
			- Students have an active role in the continuous improvement and the performing of the environmental management plan.
				- The environmental management system is an integral part of the total quality management of the organisation.
				- There is an optimal embedding in the surroundings and the natural environment.
				- In the development of this, the organisation, represented in part by students, had an active role.

Selected stage:				
Comments:				

Description:

AISHE concentrates on sustainability in education, as this is the primary task of a university. Other aspects, like research related to sustainable development, the environmental management, don't get emphasis.

Nevertheless, AISHE attributes some attention to this environmental management, because it play a role with respect to education. This is true in two ways:

- as an *example* ("*modelling*") of how an organisation takes care of environmental matters;
- as an *educational tool*, e.g. for:
    - the energy management (for mechanical engineers)
    - the management of the material flows (labs etc., for chemists)

An overview of a large number of subjects belonging to the environmental management are shown in appendix 1.4-2. These subjects have been grouped in nine categories:

> Organisation
> Purchase
> Solid waste
> Problem materials
> Soil, water, air, noise
> Energy
> Country planning / building
> Nature conservancy
> Traffic

* Stage 4: "Certified": This can be based on e.g. ISO 14001, EMAS or BS 7750.

The Talloires Declaration states in art. 5, that one of the tasks of educational organisations is:

> *Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.*

Also, the Dutch Handvest Duurzaam HBO underlines this, in the Protocol 2000, art. C.1:

> *[The institute promises] to maintain an active policy to lessen the environmental impact of the institute, which can be proved by one or more action plans aiming at prevention or separation of waste, improvement of the energy efficiency and the decline of automobility.*

Appendices:

Appendix 1.4-1. *Scheme*:   The development of an environmental management system
Appendix 1.4-2. *Table*:   Aspects of environmental management

Literature:

1. Case studies:

??   University of Michigan, USA: Shriberg (2000)
??   The EMAS certified environmental management system of the German Hochschule (University of applied sciences) Zittau/Göhrlitz: Delakowitz, Hoffmann (2000)
??   University of Paderborn, Germany: Noeke (2000)
??   Various chapters in Leal Filho (2000c)

2. Specific subjects:

??   Environmental management in the laboratory: De Beer (1999)
??   Assessment of the ecological footprint of a university: Flint (2001); Venetoulis (2001)
??   Implementation of internal environmental management in Dutch higher vocational universities: SME (1996)
??   Barriers against internal enviromental management: Dahle & Neumayer (2001)
??   Success indicators for the development of EMS in universities: Herremans & Allwright (2000)

Field of attention 2: Expertise

Criterion 2.1:	Network			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Individual staff members have contacts with companies and/or centres of expertise in the professional field, and so enlarge their knowledge and experience about sustainability.	- The organisation has contacts within the professional field. - The education benefits from the expertise about sustainability that is present there: directly, e.g. through appearances of guest teachers, and indirectly, through enlargement of the knowledge of the teaching staff.	- From the perspective of the curriculum contents, regularly the need is investigated for expertise about sustainability. Based on the results, a network of external relations is maintained. - The expertise in this network is transferred to the organisation and the education.	- Regularly, exchange takes place between staff members of the organisation, of secondary education, and of the professional field. - This happens e.g. as a secondment, in which the role of sustainability has been made explicit: together, practical projects are done, education is developed, and guest colleges are given.	- The network of expertise is international and interdisciplinary. - Societal organisations are a part of it. - The organisation itself has a clear role in it as a centre of expertise with respect to sustainability.
Selected stage:				
Comments:				

Description:

The organisation maintains permanent contacts with companies and other organisations having expertise with respect to sustainability, or else having an interest in using the own expertise. These contacts are used to enlarge the expertise of the staff, and besides to bring knowledge and experience from outside the organisation directly to the students.

Such external organisations could be: commercial companies, government institutions, centres of expertise and public organisations (NGO's) which may function as a source of knowledge and expertise about sustainability, or else may profit from the knowledge that is available in the organisation about sustainable development.

Sustainability may be interpreted in the widest possible sense. Relevant subjects are, apart from sustainable development in its literal meaning, for instance: environmental problems, developmental problems (Third World), war & peace, social problems.

Copernicus Charter art. 8:

> *Universities shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement co-ordinated approaches, strategies and action plans.*

Handvest Duurzaam HBO, art. 2.1.2:

> *[The universities promise to:] put emphasis on sustainable development in its contacts with organisations in its professional fields and with other relevant sectors of society.*

Criterion 2.2:	Expert group			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- One or some members of the staff, with a special interest in developments around sustainability within their own course, take initiatives to integrate elements of it in the curriculum.	- There is a group of staff members who, facilitated by the organisation, keep their knowledge about sustainability within their own and related fields up to date and exchange it among them. - The group is involved with education development.	- An institute (or a department, a group etc.) forms a permanent centre of expertise within the organisation. - This institute participates in the educational development, and has a direct relation with the management.	- The institute has an integral vision on sustainable development and the consequences for education. - It forms a permanent connection with the professional field and with centres of expertise, and it sees to it that knowledge from them reaches the management and the staff, everywhere where it is needed.	- Members of the institute are (inter)nationally leading with respect to sustainable development and the way this is integrated in education. - The organisation propagates this expertise actively, nationally and internationally.
Selected stage:				
Comments:				

Description:

Within the organisation, there is a permanent group of staff members that possesses large and deeply integrated knowledge and expertise about sustainable development.

This group fulfils a guiding role with respect to sustainable development. It sees to it that the vision and the knowledge of the organisation and of the education are kept up to date.

For the other staff members and for the management the group has the role of address and anchorpoint.

Appendices:

Literature:

Criterion 2.3:	**Staff development plan**			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Staff development in sustainability depends on individual initiatives.	- There is a staff development plan in sustainability.* - This plan is mainly short term related. - For the execution of the plan, facilities* are made available by the management.	- The need of the organisation for expertise in sustainability is known. - The development plan is based on a match between this need and the individual wishes of the staff members for supplementary training and refresher courses. - The plan is mainly middle long-term related.	- The sustainability staff development plan is long term related*. - It includes a policy towards appointments and resignations, retraining, introduction of new staff members*. - An explicit relation exists with the strategic poloicy of the organisation in general.	- The organisation policy on sustainability is based on societal and technological developments. - There is a systematic feedback to society.

Selected stage:
Comments:

Description:

The organisation sees to it that the knowledge of the personnel about sustainability is kept at a high level and up to date.

The "level of knowledge" means: knowledge, skills and attitude of the personnel with respect to sustainable development in general, and with respect to aspects of it in the specific fields of expertise of each of the members of the personnel.

* **Stage 2:** "development plan in sustainability": of course, it doesn't have to be a separate plan, exclusively for sustainability. It may also be a form of attention to sustainability in a general staff development plan.

* **Stage 2:** "Facilities": think of: time, budget (e.g. for course- and travelling costs), timetable consequences, supervision.

* **Stage 4:** "Long term": this means for example, that there is anticipation for quite many years, e.g. considering the ages of the existing staff members, thus predicting and avoiding future lack of expertise.

* **Stage 4:** "introduction of new staff members": think e.g. of a book or an introduction course for each new staff member.

Copernicus Charter (art. 2 and 3):
> *"Universities shall promote among teaching staff, students and the public at large sustainable consumption patterns and an ecological lifestyle, while fostering programmes to develop the capacities of the academic staff to teach environmental literacy."*
> *"Universities shall provide education, training and encouragement to their employees, so that they can pursue their work in an environmentally responsible manner."*

Handvest Duurzaam HBO, Protocol 2000, art. A.3:
> *[The institute promises ...] to express aspects of sustainable development explicitly in the supplementary training of the teachers of the courses of the institute.*

Literature:

?? Training of lecturers in engineering education: Bras-Klapwijk (2000).

Criterion 2.4:	Research and external services			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- In research and external services by the organisation, aspects of sustainability are present. - Incidentally the teachers and/or the education profits from the expertise acquired in this way.	- The organisation is working on the development of a range of researches and external services in which sustainability is expressly important. - There is a policy enabling the teachers and/or the education to profit from the expertise acquired in this way.	- Based on its policy, the organisation sees to it that in a large percentage of its research and external services sustainability is a main aspect. - In a systematic way, the staff and the education profit from the expertise that is gained with it.	- With respect to research and external services, an intensive co-operation exists with external institutes having special expertise concerning sustainability, aiming at acquiring new knowledge on both sides. - Teachers and students are involved directly in this co-operation.	- With respect to research and external services concerning sustainability, the organisation belongs (inter)nationally to the best institutes.

Selected stage:

Comments:

Description:

Research done by personnel and/or students of the organisation contributes to the integration of sustainable development in education. The same is true for external services.
Aspects of sustainable development are used for the selection and the execution of research and services.

An example: The Technical University of Eindhoven (TUE) has a center for Technology in Sustainable Development (TDO). Proposals for research which have to be carried out by that center of want to have some cofinancing from it, of course have to meet some scientific, organisational and financial standards. But the list of criteria also comprises the question:

> Does the project contribute to the goals of the TUE-center TDO: does it contribute to the enlargement of knowledge necessary for the development of technology which makes it possible to meet the needs of the present generation without compromising the possibilities of future generations to meet their needs?

Literature:
- ?? Sustainability research at the University of Amsterdam: Elsen (1998)
- ?? Idem, Technical University of Eindhoven: TDO-TUE (2000)

== *Do* ==

Field of attention 3: Education goals and methodology

Criterion 3.1:	Profile of the graduate			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- The profile of the graduate contains some visible aspects of sustainable development*.	- Sustainable development is mentioned explicitly in the profile of the graduate. - The staff is actively involved in the determination of the sustainable elements in the profile. - Within the own professional fields, the profile contains a fairly complete image of knowledge and skills with respect to sustainability, according to the organisation itself.	- The students are also actively involved in the determination of the sustainable elements in the profile of the graduate. - Sustainability in a broad, multidisciplinary sense* is recognisable in the profile. - Regelar evaluations and adjustments of the profile take place.	- The professional field is also actively involved in the determination, evaluation and improvement of the sustainable elements in the profile of the graduate. - The profile contains all or most of the aspects of sustainability in a broad, *inter*disciplinary sense*, in a balanced way.	- Many actors in society are also actively involved in the determination, evaluation and improvement of the sustainable elements in the profile of the graduate: a transdisciplinary approach. - Compared with sister-institutions the organisation fulfils a leading role with respect to the determination of the profile.
Selected stage:				
Comments:				

Description:

The "profile of the graduate" can also be interpreted, if other terms are more appropriate, as: "educational programme goals"; "professional profile"; "professional competencies"; enz.

Universities, departements or programmes that don't educate towards a certain professional profiel but rather to some kind of scientific researcher, may also interpret the term as "scientific profile" or similar terms.

Usually, a separate educational institution cannot determine a profile of the graduate in complete freedom: often directions exist on a national level, from the government or from educational or professional organisations. Nevertheless, the organisation itself takes part in the determination of the profile, in two ways:

- formally: by determining the free space that usually exists, because not all 100% is determined on a national level but only e.g. 70%;
- informally, because there will allways be opportunities for interpretation or coloring of the nationally determined norms.

* **Stage 1:** "Aspects of sustainable development": these aspects are often divided in three main categories, the "*3 P's*":
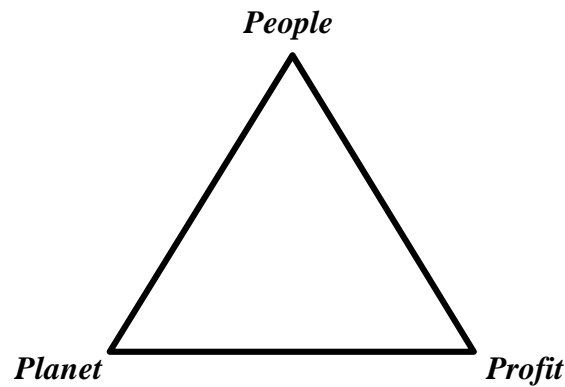
An overview of aspects belonging to each are shown in the table below:

People	**Social** Cultures Consumption patterns Prosperity, poverty, equity Minorities, emancipation Population growth, urbanisation, fugitives **Political / law** International treaties (Agenda 21, Kyoto, etc.) Laws and regulations Democracy, human rights War and peace North-south
Planet	**Environmental** Emissions, waste disposal, pollution Toxicity, safety, health Biodiversity, ecology Landscape, noise Ecological footprint **Technological** Resources and energy Life cycles, reuse, recycling Product development System innovation Eco-efficiency
Profit	**Economical** Sustainable business Production patterns Green investments Green GNP Capitalism **Management** Company mission & responsibility, Business ethics Strategy Quality management, Environmental Management System Human Resourcement Marketing

* Stage 3: "Sustainability in a broad, multidisciplinary sense": not only relating to the own fields of profession, but to all three main categories (people, planet, profit), related to each other in a multidisciplinary way.

> In a **multidisciplinary** approach there is cooperation between various disciplines, keeping intact every separate set of theoretical concepts and methodological.
>
> In a **interdisciplinary** approach there is cooperation between various disciplines, where a common methodological approach and theoretical fundament is looked for, as a synthesis of the participating disciplines. Participants try to speak "one language".
>
> In a **transdisciplinary** approach, not only co-operation takes place between specialists of various disciplines, but also others are directly involved: users, problem owners, clients, stakeholders, etc. (transdisciplinary = (literally:) *beyond* the disciplines)

* **Stage 4:** "Sustainability in a broad, _inter_disciplinary sense": in each of the three main categories (the 3 P's) ample attention is given to a broad variety of aspects, which are related with each other in a balanced and interdisciplinary way.

* **Stage 5:** "Transdisciplinary": see the box.

Handvest Duurzaam HBO, Protocol 2000, art. B.1:
> *[The promises] to express aspects of sustainable development explicitly in the end qualifications of the courses of the institute.*

Appendices:
Appendix 3.1-1. *Text*:   Learning outcomes related to sustainable development according to LSF
Appendix 3.1-2. *Table*:   Sustainable education goals according to the Sustainable Development Education Panel
Appendix 3.1-3. *Text*:   Sustainable elements in the professional profile of a technical engineer

Literature:
?? Profile of the sustainable engineer: Forum of the Future (2000)
?? The future of Environmental Education: HBO-Raad (2000)

Criterion 3.2:		Educational methodology		
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Now and then the student meets situations in which reflective* skills can be practised.	- The curriculum contains on planned places parts in which the student is gestimulated to develop a reflective attitude.	- The education methodology and the learning setting are designed in such a way that the student regularly meets realistic situations in which a reflective attitude is demanded. - The teachers provide the student feedback on this on a regular basis.	- In the process of this feedback to the individual student, regularly the relation is discussed between choices and behaviour of the student and the consequences of this for sustainable development on the short and the long term.	- In the course of the educational process the student receives this kind of feedback from a variety of actors in society *.

Selected stage:
Comments:

Description:
* **Stage 1:** "Reflective": The educational methodology is designed in such a way, that the education contributes to the development of a number of personal characteristics of the future professional that are essential for a sustainable attitude and sustainable behaviour.
Such chraracteristics may be called *reflective,* such as:

> ?? sense of responsibility
> ?? critical attitude
> ?? eye for the distinction between facts and values
> ?? respect for opinions of others
> ?? capability of making decisions

* **Stage 5:** "actors in society": see the description of stage 5 of criterion 1.1.

Appendices:
Appendix 3.2-1: Aspects of reflective learning

Literature:
?? A critical attitude and the difference between facts and values is the theme of an educational module described by Lemkowitz (2001).
?? Sustainability and education: Lijmbach (2000).
?? Sustainability and didactics: Jansen, B. (1999).

Criterion 3.3:	Role of the teacher			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Some of the teachers emphasise in front of the students a sustainable attitude through their attitude and behaviour*.	- The organisation encourages that all staff members underline the importance of a sustainable attitude through their own education, attitude and behaviour*. - The teachers receive feedback* on this.	- In the staff policy plan, a sustainable attitude and a consequent behaviour is formulated explicitly.	- Systematically, the organisation asks co-operation of companies where the students do their traineeships or graduation projects, in order to show consistently that sustainable thinking and acting should be a necessary part of daily practice.	- A regular exchange of opinions takes place between teachers, students and relevant actors in society about the question, what a sustainable attitude means and what characterises sustainable behaviour as a professional and a citizen.
Selected stage:				
Comments:				

Description:

Through their attitude and behaviour, the teachers contribute to the development of a student attitude in which sustainable development is seen as a fundamental aspect of thinking and functioning, within the professional practice as well as outside of it, experienced in such a way that it is expressed in the behaviour of the student and - later - the graduate. In other words, the teachers set an example of a good sustainable professional ("modelling").

A sustainable attitude means that, continuously and as a second nature, the graduate takes into account consequences with respect to sustainability of his/her professional actions. This also implies that the sustainably educated graduate is willing and tends to accept responsibility for his/her activities and achievements: the sustainable graduate is a responsible graduate.

* **Stage 1 and 2:** "Attitude and behaviour": meant is the attitude and the behaviour as a professional, i.e. when thinking and working on tasks belonging to the professional practice. (The private behaviour of the teacher is not in consideration.)

* **Stage 2:** "Feedback": e.g. by speaking about the sustainability policy during staff appraisals.

Criterion 3.4:	Student examination			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- In the examination of certain curriculum parts, aspects of sustainability are present implicitly or explicitly.	- All relevant aspects of sustainable development are examined in some way somewhere during the course.	- The systematic examination of sustainable subjects is spread over the curriculum in a carefully considered way, taking into account an increasing complexity, study- and examination methods, etc. - This is formulated explicitly in the examination regulations*.	- The systematic examination of sustainability is evaluated and improved regularly, with the aid of external experts. These are also involved in the actual judging the student achievements on crucial moments.	- The examination of sustainability is integrated with other, possibly conflicting societal or business-related interests. This appeals to the decision capacity and the responsibility of the student as a future professional.

Selected stage:

Comments:

Description:

Examination of the achievements of the students in relation to sustainable development is an essential part of the education. If a clearly visible examination is missing, the students will get (or strengthen) the impression that sustainability is a kind of secondary consideration (a "subject beyond the line").

Student examination on sustainability is relevant for all kinds of education methods. For instance:

- ?? preliminary and final examinations about theoretical subjects;
- ?? reports and pieces of work belonging to problem oriented education and project education;
- ?? reports on traineeships and graduation projects;
- ?? oral presentations;
- ?? publications in professional magazines.

The evaluation may take place through questions with an explicit relevance towards sustainability, or through questions and tasks with a partially, perhaps implicit sustainable background, or (especially in practical projects) through a judgement supported by checklists of relevant sustainable subjects.

* **Stage 3:** "Examination regulations": i.e. in the education examination regulations, or in related documents, like the study guide or the traineeship guide.

Field of attention 4: Education contents

Criterion 4.1: Curriculum				
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Certain education modules contain relevant elements of sustainable development.	- Basic knowledge of sustainable development has its own position in the curriculum*. - The rest of the curriculum contains elements of sustainability, building on this basic knowledge - The whole of basic knowledge and later sustainability subjects is related in a well-considered way to the profile of the graduate*.	- Sustainability is implemented systematically in the entire curriculum, in accordance with the profile of the graduate. - The relation between all education units with respect to sustainability has been made explicit. - The educational modules have, wherever possible, been placed in a sustainable framework.	- The systematic structure of sustainability in the curriculum is evaluated and adjusted regularly with the aid of experts in the various professional fields. - In the education, using realistic practical situations, the relevance of sustainability for the professional practice is shown and exercised.	- Besides, in the education, using realistic practical situations, the relevance of sustainability in its full complexity for society as a whole is shown and exercised.
Selected stage:				
Comments:				

Description:

In quite a few cases, the implementation of sustainable development in the curriculum will not mean that in every semester there will be separate "sustainability" courses. Although a basic module for an introduction to sustainable development may be a good idea, in most cases it might be preferable for the higher curriculum parts to integrate sustainability themes in existing education modules, i.e. in theoretical parts and (mainly) in practical projects.

This means that the introduction of sustainability in the curriculum will, in many cases, not have to have strong consequences concerning credit points: "crowding out" of existing curriculum parts will not have to play an important role.

Nevertheless, some space will have to be created for specific techniques and methods, which will have to be practiced. Think e.g. of life cycle assessment for technicians, and integral cost calculation voor economists.

* **Stage 2: "**basic knowledge": this is integrated in an early part of the curriculum, either as a separate module, or as a part of a larger whole. Due to the early positioning it is possible to build on it in the rest of the study programme.

* **Stage 2:** "profile of the graduate": see criterion 3.1.

Appendices:

1. For a basic module, an appendix is present, designed for the engineering education. Because there (too) sustainability is treated in a broad sense, this appendix will also be useful for other educational sectors:

Appendix 4.1-1. *Text*: Basic knowledge of Sustainable Development for engineering courses

2. For various educational sectors appendices are available:

Technology: Appendix 4.1-2: *Table*: Curriculum elements for technical courses according to HE 21

Economics and Management:

          Appendix 4.1-3: *Table*: Curriculum elements for business courses according to HE 21

Design: Appendix 4.1-4: *Table*: Curriculum elements for design courses according to HE 21
Teacher education: Appendix 4.1-5: *Table*: Curriculum elements for teacher education courses according to HE 21

Literature:

1. A remarkable series of books, the "disciplinary reviews sustainable development", is being developed by a working group of the Dutch Committe on Sustainable Higher Education (CDHO), in cooperation with the University Center for Environmental Sciences (UCM) of the Catholic University of Nijmegen (Netherlands).

Each of these books offers a concise overview of how sustainability is treated in the discipline concerned within various universities and colleges. They also contain tables of subjects to be treated.

Information can be found on the CDHO-website, www.dho21.nl .

The books appear in Dutch, and will probably be translated in Swedish and English.

Planned so far, partly already available, are:

??	Management:	Jonker en Grollers (2001)
??	Economics:	van den Bergh en Withagen (2001)
??	Physics:	Bras-Klapwijk (2001)
??	History:	van Zon (2001)
??	Biology:	van Hengstum (2001)
??	Mathematics:	Alberts (2001)
??	Informatics	(in voorbereiding)
??	Chemistry	(in voorbereiding)
??	Mechanical Engineering / Material sciences	
		(in voorbereiding)
??	Medical and health sciences	(in voorbereiding)
??	Social geography	(in voorbereiding)

2. Besides, for quite many sectors and subjects more literature is available:

??	Technology:	Weaver (2000); Wenzel (1997); de Ron (1999); Remmerswaal (2000); Ivens & Counotte-Potman (2000); Installé (1999)
??	Economics & Management:	Isaak (1998); Willums (1998); Bouma (1998); Greener Management International Journal
??	Financing:	Jeucken (1998)
??	Agriculture:	Bryden & Shucksmith (2000); Helenius (2000); Linsen (1996); van de Bor (2000)
??	Landscape management:	van Mansvelt & van der Lubbe (1999)
??	Mathematical modelling:	Meadows (1991); Rotmans & de Vries (1997)
??	Chemistry:	de Beer (1999)
??	Design:	Journal of Sustainable Product Design
??	Building and architecture:	Moll (2000)
??	Teacher education:	Shallcross & Robinson (2000); Henze (2000)

Criterion 4.2:	Integrated Problem Handling			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Based on initiatives of individual teachers, integration of some elements takes place on a subject level.	- The curriculum is designed in such a way that repeatedly subjects are related with each other during the course.	- The curriculum is designed systematically so that students practice in a growing complexity with relating with each other varying aspects within and without the own field of study. - Catchwords: = multidisciplinary = product innovation = functional orientation	- Catchwords: = chain management = interdisciplinary = natural constraints = middle long term	- Catchwords: =transdisciplinary = international = intercultural = societal constraints = long term
Selected stage:				
Comments:				

Description:

The curriculum has been designed in such a way that the students acquire a wide range of knowledge and practical experience with an integrated problem solving style. This means that problems, derived from the professional practice are approached and solved while taking into account many different facets and points of view.

Problems can be complex for many reasons. Especially when sustainability plays a role, it is necessary to include all such kinds of complexity in the problem approach, because otherwise wrong solutions, suboptimalisation and reboundeffects will result.

The table below shows a number of reasons for complexity of problems. (see next page)

Copernicus Charter, art. 5:

> *Universities shall encourage interdisciplinary and collaborative education and research programmes related to sustainable development as part of the institution's central mission.* Universities shall also seek to overcome competitive instincts between disciplines and departments.

Handvest Duurzaam HBO, art. 2.1.2:

> *[The university promises:] to design education and research in such a way that teachers and students learn to look upon problems with aspects of sustainable development from a multidisciplinary point of view.*

Copernicus Charter, art. 7:

> *Universities shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.*

Complexity of problems: some aspects	
Functional orientation	Consumer needs
	Societal constraints
	Natural constraints
System orientation	Product improvement
	Product innovation
	System innovation
Future orientation	Short term (operational)
	Middle long term (tactical)
	Long term (strategic)
Integral chain management	Business: Management of the company chain
	Technical: life cycle assessment
	Economics: Integral cost calculation
Interdisciplinarity	Monodisciplinary
	Multidisciplinary
	Interdisciplinary
	Transdisciplinary
International	Geographical variety
	Cultural variety
	Climatological variety

Appendices:
Appendix 4.2-1: *Diagram*:   Growth of complexity in an engineering curriculum

Literature:
?? Integrated problem solving in the Cirrus project (sustainability in technical courses): Roorda (1999).
?? Consumer behaviour: Midden & Bartels (1994)
?? Interdisciplinary education in which e.g. math, sciences, literature and history meet each other: Flint (2000)

Criterion 4.3:	Traineeships, graduation			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Incidentally, practical student projects include elements of sustainable development.	- If possible, in practical student projects attention is given to sustainability aspects. - All students are informed that this is expected from them.	- In at least one traineeship-, graduation or other practical student project sustainability is one of the main aspects. - This is written in the examination regulations*. - This demand is a part of the systematic integration of sustainability in the curriculum.	- At least one practical student project with sustainability as a main aspect has to be performed as a member of an interdisciplinary team. - This is written in the examination regulations*.	- The interdisciplinary team consists of members coming from other sectors of education or businesses. - The project includes ethical aspects, in which the personal responsibility of the student as a (future) professional is expressed.

Selected stage:
Comments:

Description:

In (a part of) the practical tasks (traineeships, graduation, perhaps other practical projects) the students meet facets of sustainable development. They are stimulated to take position on these subjects, and let them have a role in their decisions and recommendations.

The design of the task, the choice of the subject and the selection of the surroundings enable this.

Students are invited to perform at least part of their project as a member of an interdisciplinary (student) team.

* **Stage 3 and 4:** "Examination regulations": ": i.e. in the education examination regulations, or in related documents, like the study guide or the traineeship and graduation regulations.

Literature:

?? Interdisciplinary graduation projects: Ivens & Middelkoop (2000).

Criterion 4.4:		Speciality		
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Students have the opportunity to select an optional subject related to sustainability, if necessary in another educational institution.	- The organisation makes available a series of optional subjects in which sustainability is a main aspect. - Students are enabled to obtain a special certificate or an annotation on the diploma.	- Students have the opportunity to become a specialist on the area of sustainable development.*	- Starting from a specialism, students have the opportunity to follow a wide, interdisciplinary course in which in which sustainable development plays a main role, and so graduate as a generalist with respect to sustainability.	- This wide, interdisciplinary course is (inter)nationally known as a top level education programme.

Selected stage:
Comments:

Description:

Students who desire so, are enabled to specialise during their course as an expert in sustainable development within the own professional field.

This may be realised through (a combination of): a (partly) individual education traject; a suitable choice for traineeship(s), for graduation projects and eventual other projects; and new curriculum elements that are developed by the student him-/herself.

***Stage 3:** e.g. through:
- a separate course aiming at sustainability aspects within the own professional field
- a ditto graduation speciality
- a ditto post-academic continuation course
- the opportunity to design an individual study course with a lot of sustainability aspects.

Appendices:
Appendix 4.4-1: *Text*: The certificate "Technology in Sustainable Development"

Literature:

?? The course "Milieugerichte Materiaaltechnologie" (Environmentally oriented Materials Technology) of the Brabant University of Professional Education educates students to become a specialist in sustainable technology: Roorda (1997).

== Check ==

Field of attention 5: Result assessment

Criterion 5.1:	Staff			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Data are available about the level of appreciation of the staff about sustainability in the organisation.	- Trend data* about this appreciation are available. - These data are analysed and documented.	- These trend data have been compared with the policy targets. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from colleague-organisations. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from excellent organisations in within and outside of the country. - The conclusions of this comparison are used for the policy determination.
Selected stage:				
Comments:				

Description:
The organisation investigates the level of appreciation about the policy on sustainability among the staff.
Such an investigation can be done in a number of ways:
- Of course, an AISHE assessment contributes to the acquisition of such information. But AISHE produces primarily process data rather than result data.
- On the next page a quickscan is shown, developed to investigate the level of appreciation of the staff members. (With the next 3 criteria, treating the appreciation of the students, the professional field and societal organisations, comparable quickscans are available.)
- A more extensive questionnaire is developed by the American networkorganisation ULSF (University Leaders for a Sustainable Future). This questionnaire is available in appendix 5.1-1.

* **Stage 2:** "trend data": i.e. the information about the appreciation has been assessed several times, after which changes in them have been investigated.

Appendices:
Appendix 5.1-1: *Questionnaire*: ULSF Sustainability Assessment Questionnaire (SAQ)

Quickscan *staff*: Results of sustainability					
Name (event. anonymous):			Function:		
University:			Department:		
Location:			Date:		
Instruction: decide (as an individual staff member) how correct the theses below are. In the box of your choice, write down the corresponding number (0, 1, 2 or 3 points). Finally, add the scores. The total score is at least 0, and maximally 30 points.					
Thesis	*See criterion*	Not true at all: **0** points	A little bit true: **1** point	Mostly true: **2** points	Absolutely true: **3** points
1. The management takes sustainable development with respect to the organisation, research and education seriously: with them, it is not only words but also actions.	1.1, 1.2				
2. In our organisation magazine, criteria on sustainable development are to be found on a regular basis.	1.3				
3. The regulations for internal environmental management are well observed by the staff and the students.	1.4				
4. Some members of our staff are real experts on sustainable development.	2.2, 2.3				
5. I am well-informed about aspects of sustainability within my own fields of expertise.	2.3				
6. Our research and/or external services contribute well to the knowledge and experience of the teaching staff with respect to sustainability.	2.4				
7. The curriculum of my study programme contains enough aspects of sustainable development.	3.1, 4.1				
8. Sustainability with us is more than a specialism: we take it as a broad, interdisciplinary thing.	3.2, 4.2				
9. I contribute to the education of my students towards responsible citizens and professionals.	3.3				
10. When evaluating student projects / traineeships / graduation assignments, I always take sustainability aspects into consideration.	4.3				
Total per column					
Total score (maximum: 30)					

This and the other 3 quickscans have been designed according to the model of the "Concise Organisation Climate Index" (Verkorte Organisatieklimaat Index, Vokipo). See: de Cock (1986) en Swanink (1988).

Criterion 5.2:		Students		
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Data are available about the level of appreciation of the students about sustainability in the organisation.	- Trend data about this appreciation are available. - These data are analysed and documented.	- These trend data have been compared with the policy targets. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from colleague-organisations. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from excellent organisations in within and outside of the country. - The conclusions of this comparison are used for the policy determination.

Selected stage:

Comments:

Description:

The organisation investigates the level of appreciation about the policy on sustainability among the students.

Such an investigation can be done in a number of ways:

- Using AISHE, see criterion 5.1
- The next page shows the quickscan for the students
- A third way to assess the level of appreciation of the students is, to invite them to make a statement at the moment of graduation, about sustainability or about their professional ethics. This may be compared with the "Oath of Hippocrates", which is promised by medical students. The percentage of students that are willing to do so forms an indication for the support among the students for sustainability.

A short text which is suitable for this is the "Pugwash Declaration":

> I promise to work for a better world, where science and technology are used in socially responsible ways.
> I will not use my education for any purpose intended to harm human beings or the environment.
> Throughout my career, I will consider the ethical implications of my work before I take action.
> While the demands placed upon me may be great, I sign this declaration because I recognise that individual responsibility is the first step on the path to peace.

A more extensive text is the "INES Appeal", reprinted in appendix 5.2-1.

The call for the making of such a statement is supported by UNESCO, which writes:

> *All scientists should commit themselves to high ethical standards, and a code of ethics based on relevant norms enshrined in international human rights instruments should be established for scientific professions.*

Appendices:

Appendix 5.2-1: *Text*:   INES appeal to engineers and scientists

Literatuur:

- ?? Pugwash Declaration
- ?? INES Appeal: INES (1995)
- ?? The call by UNESCO is in article 41 of UNESCO (1999)

Quickscan *students*: Results of sustainability					
Name (event. anonymous):		Year of study:			
University:		Department:			
Location:		Date:			

Instruction: decide (as an individual staff member) how correct the theses below are. In the box of your choice, write down the corresponding number (0, 1, 2 or 3 points).
Finally, add the scores. The total score is at least 0, and maximally 30 points.

Thesis	*See criterion*	Not true at all: **0** points	A little bit true: **1** point	Mostly true: **2** points	Absolutely true: **3** points
1. In our organisation magazine, criteria on sustainable development are to be found on a regular basis.	1.3				
2. The regulations for internal environmental management are well observed by the staff and the students.	1.4				
3. Some of my teachers are real experts on sustainable development.	2.2, 2.3				
4. Thanks to my study, I am well-informed about aspects of sustainability within my own fields of interest.	3.1				
5. The curriculum of my study programme contains enough aspects of sustainable development.	4.1				
6. Sustainability with us is more than a specialism: we take it as a broad, interdisciplinary thing.	3.2, 4.2				
7. The teachers take sustainable development with respect to the organisation, research and education seriously: with them, it is not only words but also actions.	3.3				
8. It is right that ethical aspects are expressed in a serious way in my study programme.	3.3				
9. When evaluating our projects, traineeships and graduation assignments, the teachers always take sustainability aspects into consideration.	4.3				
10. When I graduate, I am prepared to make a statement about sustainability in relation to my behaviour as a professional.	5.2				
Total per column					
Total score (maximum: 30)					

Criterion 5.3:	Professional field			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Data are available about the level of appreciation of the companies in the professional field* about sustainability in the organisation.	- Trend data about this appreciation are available. - These data are analysed and documented.	- These trend data have been compared with the policy targets. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from colleague-organisations. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from excellent organisations in within and outside of the country. - The conclusions of this comparison are used for the policy determination.
Selected stage:				
Comments:				

Description:
On the next page you will find the quickscan for the professional field.

* **Stage 1:** "companies in the professional field": this can be all the companies with which the organisation has or should want a relation. For example: companies where
- trainees and/or graduating students work
- graduates have their job
- teachers have a parttime job or a secondment
- practical projects with groups of students are done
- guest teachers and associate professors come from
- services are delevered by the unversity

Quickscan *Professional field*:	Results of sustainability				
Name (event. anonymous):	Function:				
Company:	Department:				
Location:	Date:				

Instruction: decide how correct the theses below are. In the box of your choice, write down the corresponding number (0, 1, 2 or 3 points).
Finally, add the scores. The total score is at least 0, and maximally 30 points.

Thesis	*See criterion*	Not that I know: **0** points	A little bit true: **1** point	Mostly true: **2** points	Absolutely true: **3** points
1. In the communication with our company the university underlines regularly the importance of sustainable development.	1.3				
2. Transfer of knowledge about sustainability is more than one way directed from our company to the university: we profit from their expertise.	2.1				
3. The university disposes of teachers who are real experts with respect to sustainable development.	2.2, 2.3				
4. If our company would need (paid) research or services by a university, related to sustainable development, this university will certainly be in the picture.	2.4				
5. The trainees / graduates of this university show by their *thinking* and *professional behaviour*, to dispose of a sufficiently sustainable attitude.	3.3				
6. The trainees / graduates of this university dispose of enough *knowledge* and *insight* about sustainable development.	4.1				
7. The trainees / graduates of this university dispose of enough *skills and methods & techniques* about sustainable development.	4.1				
8. For the trainees / graduates of this university sustainability is more than a specialism: they consider it in a broad, interdisciplinary way.	4.2				
9. The trainees / graduates of this university have or get, thanks to the university education, a wide experience in working in an interdisciplinary team.	4.3				
10. In the evaluation of our trainees from this university we always involve sustainability aspects, in accordance with the wishes of the university.	4.3				
Total per column					
Total score (maximum: 30)					

Criterion 5.4:	Society			
Stage 1: **Activity** oriented	*Stage* 2: **Process** oriented	*Stage* 3: **System** oriented	*Stage* 4: **Chain** oriented	*Stage* 5: **Society** oriented
- Data are available about the level of appreciation of relevant societal organisations* about sustainability in the organisation.	- Trend data* about this appreciation are available. - These data are analysed and documented.	- These trend data have been compared with the policy targets. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from colleague-organisations. - The conclusions of this comparison are used for the policy determination.	- These trend data have been compared with those from excellent organisations in within and outside of the country. - The conclusions of this comparison are used for the policy determination.
Selected stage:				
Comments:				

Description:

On the next page you will find the quickscan for societal organisations.

Another way of investigating the level of appreciation for the university concerning sustainability by society is, is to look at which "official" societal recognitions are received by the organisation in recent years. You can think of awards, certificates, etc. A list of this kind of recognitions can be found in appendix 5.4-1.

The societal significance of universities with respect to sustainable development is stressed by many declarations on sustainability. Some examples:

?? Agenda 21, chapter 36 art. 8:

There is still a considerable lack of awareness of the interrelated nature of all human activities and the environment, due to inaccurate or insufficient information. Developing countries in particular lack relevant technologies and expertise. There is a need to increase public sensitivity to environment and development problems and involvement in their solutions and foster a sense of personal environmental responsibility and greater motivation and commitment towards sustainable development.

?? Talloires Declaration, art. 1:

Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

?? Copernicus Charter, art. 6 and 9:

Universities shall support efforts to fill in the gaps in the present literature available for students, professionals, decision-makers and the general public by preparing informative didactic material, organising public lectures, and establishing training programmes. They should also be prepared to participate in environmental audit. Universities shall devise environmental educational programmes on these issues for different target groups: e.g. business, governmental agencies, non-governmental organisations, the media.

The supportive role towards primary and secondary education is expressed in the Talloires Declaration (art. 8):

Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

* **Stage 1:** "relevant societal organisations": see the list in the description of stage 5 of criterion 1.1.

Appendices:

Appendix 5.4-1: *Table*: Societal approbations

Literature:

?? The German Hochschule (University of applied sciences) Zittau/Göhrlitz is EMAS certified: Delakowitz, Hoffmann (2000).

?? ISO 14001 and the daily practice: Sheldon (1997)

Quickscan *Societal institutions***: Results of sustainability**					
Name (event. anonymous):		Function:			
Organisation:		Department:			
Location:		Date:			
Instruction: decide how correct the theses below are. In the box of your choice, write down the corresponding number (0, 1, 2 or 3 points). Finally, add the scores. The total score is at least 0, and maximally 30 points.					
Thesis	*See criterion*	Not that I know: **0** points	A little bit true: **1** point	Mostly true: **2** points	Absolutely true: **3** points
1. The university has a policy which demonstrate a truely societal responsibility.	1.1, 1.2				
2. In the communication with our organisation the university underlines regularly the importance of sustainable development.	1.3				
3. If we would seek cooperation related to sustainable development with a university, this university will certainly be in the picture.	1.3				
4. The expertise of this university is of importance for our organisation.	2.1				
5. The university disposes of teachers who are real experts with respect to sustainable development.	2.2, 2.3				
6. We cooperate with teachers of this university who are capable of working with us on sustainable development in the broadest sense: *people*, *planet* and *profit*.	3.3				
7. The students of this university dispose of enough *knowledge* and *insight* about sustainable development.	4.1				
8. The students of this university dispose of enough *skills and methods & techniques* about sustainable development.	4.1				
9. We cooperate with students of this university who are capable of working with us on sustainable development in the broadest sense: *people*, *planet* and *profit*.	4.2				
10. The trainees / graduates of this university have or get, thanks to the university education, a wide experience in working in an transdisciplinary team.	4.3				
Total per column					
Total score (maximum: 30)					

3. Theory and backgrounds

3.1. The "correctness" of *AISHE* : What is sustainable education?

3.1.1. The concept of "sustainable education"

The auditing instrument AISHE is designed to measure the level to which sustainable development has received a place in the education of an institution (or a part thereof). In short: AISHE measures "sustainable education".

This term "sustainable education" is formally incorrect. It is not the sustainability of education itself, which is the point of interest: this would be the literal meaning of the term, meaning that it will be present for a very long time

Usually something else is referred to. This is formulated as a definition:

Fundamental definition:

> Sustainable education is:
> education which contributes effectively to a sustainable development of society.

In principle this is a very clear definition. However, the main problem that arises immediately is: what does such education have to look like? In other words, theoretically the definition may be perfectly correct, but it doesn't offer much practical information.
Looking for a more concrete description, it seems a good idea to define something in terms of educational results that have to be reached. This hands us a concept that perhaps looks like the following:

Conceptual definition:

> Sustainable education is education in which students:
> ??   acquire knowledge and insight about sustainable development, in general and in their own field of profession
> ??   are trained in skills, methods and techniques supporting their work as a (future) professional
> ??   develop an attitude in which sustainable development is seen as important

In order to turn this into a practically usable definition, it will be necessary to add more details. Of course it is obligatory to be in agreement with what is generally accepted as the meaning of the concept. Therefore, the experiences and opinions will have to be used of people who deal with sustainable development and education as a job or publish about it. Out of these experiences a list can be designed of characteristics that are more or less important in making education contribute to sustainable development. Such a list might look like:

Enumerative definition:

> Sustainable education is education in which students acquire knowledge, insight and skills about:
> ??   environmental problems
> ??   limited resources
> ??   technological opportunities and limits
> ??   social-cultural opportunities and limits
> ??   (infra)structural opportunities and limits
> ??   policies leading to sustainable development
> ??   etc. etc.

Such a criteria list can only be meaningful if it is possible to use it in real life. So, it needs prescriptions indicating how a link can be made between the theory (the criteria list) and reality (education as it is realised in a certain course). In other words, the criteria have to be *measurable* and *testable*. In short, the criteria have to be made *operational*. As long as this hasn't been done, actually the definition of "sustainable education" is incomplete.

3.1.2. Operational definition

An operational definition is a definition that indicates, in the form of a series of actions, how the level of sustainability of education can be determined. Therefore, such a definition requires a measuring method, for instance AISHE. This renders (for instance) the following definition:

Operational definition:

Sustainable higher education is:
education which, when measured using AISHE, is judged as sustainable.

Now however a fundamental problem arises.
On the one hand it is important to determine whether AISHE is a valid instrument, i.e. if it really measures what it should measure. In order to determine this it is necessary to define sustainable education first, and next find out whether it is this which is measured by AISHE.
On the other hand it appears to be impossible to define sustainable education in a practically meaningful way without a reference to a measuring method, for instance AISHE.

In other words, it is fundamentally impossible to formally establish the validity of AISHE.

Actually, this is not a very extraordinary situation. In alpha and gamma sciences there are many concepts which are defined by a reference to a measuring instrument. A well known example is the concept of "intelligence": the definition is usually given in terms of the intelligence quotient (IQ), which is determined through a series of measurements according to detailed prescriptions. The question whether such a measuring method is formally correct cannot be answered any more than the question of the formal validity of AISHE.

"Even" in the exact sciences the situation is not different. Concepts of which a layman may think are defined very precisely in exact mathematical terms, like "length" and "mass", are really defined in exactly the same way as "sustainable education" and "intelligence". "Mass", for instance, is defined in terms like: "If you put together this-and-that equipment in such-and-such a way and carry out these-and-those actions, the quantitative result will be the mass of this-and-this physical object".
Frederick Suppe, philosopher of science, describes this as follows (Suppe 1977, page 17):

> "If a correspondence rule defines "mass" (a theoretical term) as the result of performing measurements *M* on an object under circumstances *S* (where *M* and *S* are specified using observation terms), this specifies an empirical procedure for determining mass, defines "mass" in terms of that procedure, and does so in a way to guarantee the cognitive significance of the term "mass".
> (Correspondence rules also are referred to variously as co-ordinating definitions, dictionaries, interpretative systems, operational definitions, epistemic correlations, and rules of interpretation.)" [3]

The conclusion is, it is not meaningful to answer the question whether AISHE is a formally valid measurement instrument. So, the validation will have to be established in another way.

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[3] This description refers to the so called "Received View", which has its origins in the science philosophy of the Wiener Kreis (Vienna Circle). Although later discussions have led to interesting differentiations, fundamentally the cited text is still relevant.

3.1.3. Validity, reliability and acceptability

Validity

Since it is impossible to prove objectively that AISHE is valid, it is all the more important that the validity is made likely in another way.

The validity will be established in two complementary ways.

Input: An investigation will be done to the existing literature and completed researches with respect to sustainable education. All relevant sources will be used in order to follow closely the already developed insights and conclusions. Chapter 8 offers an overview of sources that have been used.

Output: A forum will be formed which will test the method. The composition of the forum is based on a stakeholder-analysis. In various stages of the development AISHE will be put forward to the forum as a concept, and the forum will react (see figure 4). At all times, consensus will be the goal.
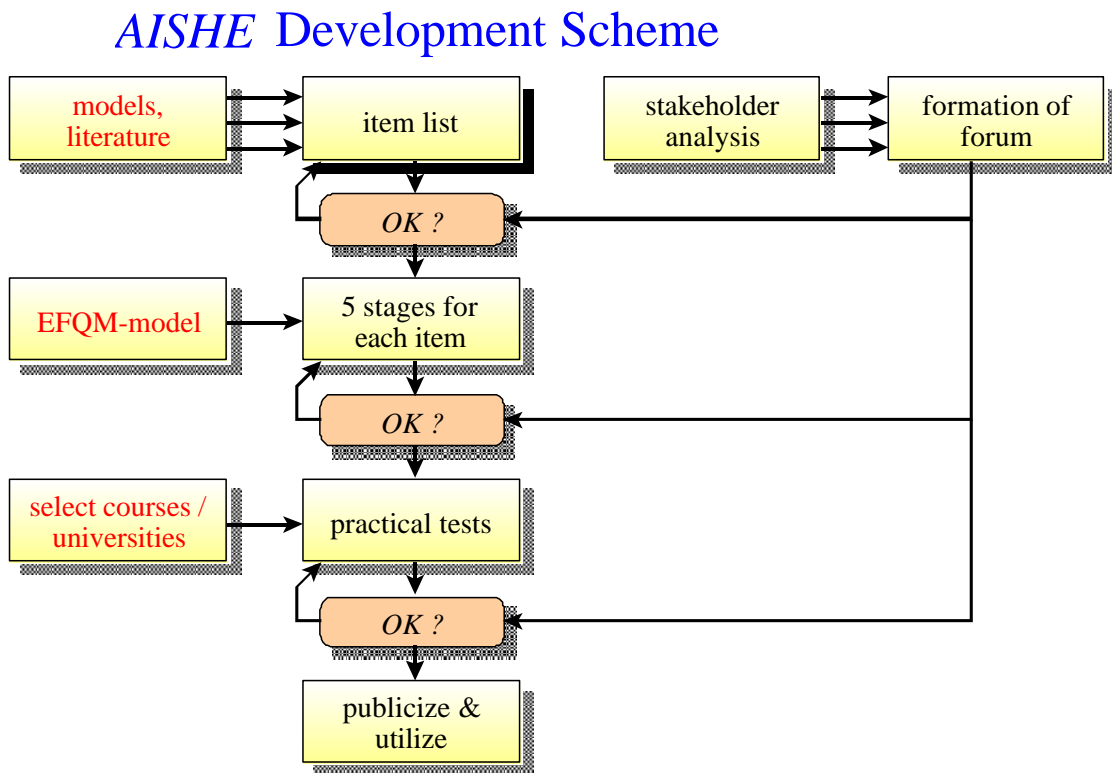

Figure 4: Development scheme of *AISHE*

In preparation of the composition of the forum a number of prior conditions have formulated. A target group for the AISHE method has been defined, and priorities have been chosen; a description can be found in chapter 10. The basic philosophy of AISHE has been formulated; this is printed in chapter 9.

Conditions to the composition of the forum are:
?   One part of the forum should be representative of all relevant sectors of society; for practical reasons, the geographical area has been limited to the Netherlands;
?   The other part should be representative of international higher education.
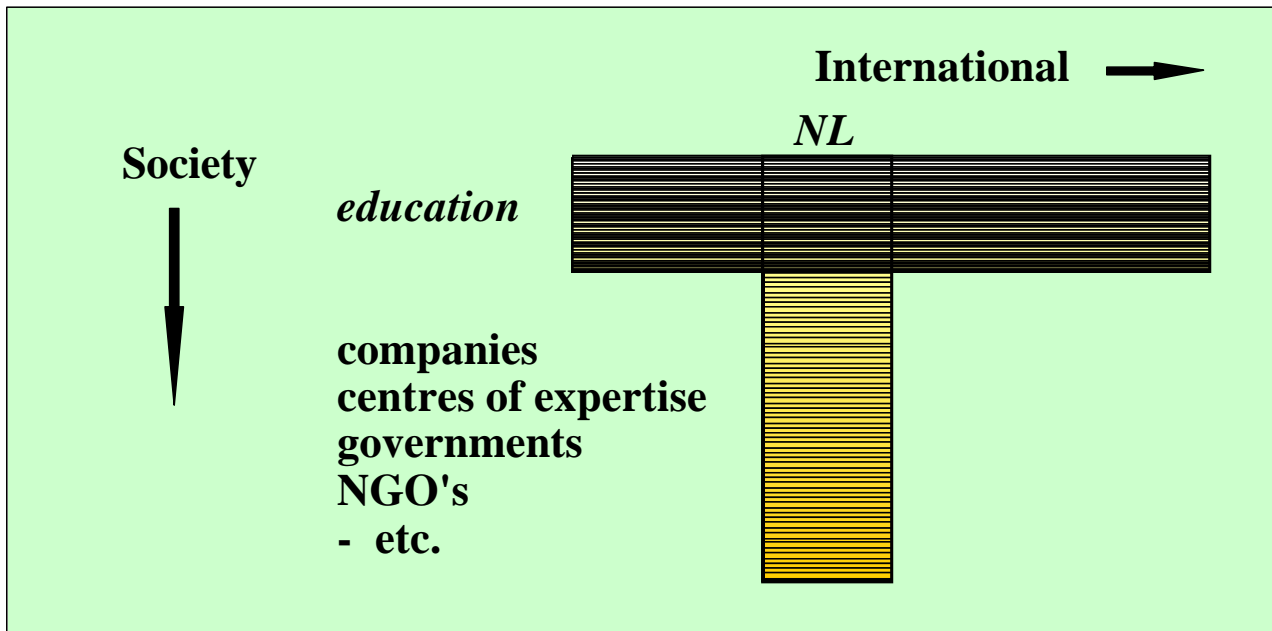
Figure 5: Composition of the Forum

This is shown schematically in figure 5.

The forum will be asked to evaluate the validity of AISHE with respect to:

? concept *validity*: does AISHE measure what it claims; relevance of the method in its entirety and of each part

? *representativity*: completeness; right classification and balance

Appendix 4 contains information about the composition of the forum, and about the time schedule for the development of AISHE.

Reliability

As shown in figure 4, the development route consists of three rounds. The third round consists of practical tests that will be done in a number of countries.

These tests will serve to investigate whether AISHE renders reliable results. The aspects that will be tested are:

? equivalence (dependency on the composition of the group of participants of the audit; dependency on the process manager)

? stability

? internal consistency

? practical workability

Acceptability

After the third round, the method will be published. In this stage an attempt will be made to acquire some kind of formal acknowledgement from one or more relevant organisations. Of course, the subject will be communicated with these organisations in an earlier stage.

Relevant organisations are for instance:

? The VSNU and the HBO-Raad, i.e. the associations of the Dutch universities and the Dutch vocational universities respectively;

? Comparable institutions in other countries in (Western?) Europe;

? The Steering Committee for the Dutch Charter of Sustainable Professional Education (Handvest Duurzaam HBO) and the Foundation for Sustainable Higher Education (Stichting Duurzaam Hoger Onderwijs), which controls the Dutch Certificate for Sustainable Education;

? International organisations concerning sustainable higher education, like: CRE Copernicus, EEE Network, Essence, perhaps related to certificates that might be developed by those organisations;

? Individual universities inside and outside the Netherlands;

? Governmental organisations, like Departments of Education and of Environment;

? International organisations like UNEP and UNESCO.

In a later stage the decision will be made, what kinds of formal acknowledgement will be looked for.

3.1.4. The classification of the criteria

The criteria of AISHE are categorised according to the Deming-scheme "PLAN" - "DO" - "CHECK" - "ACT". Following the original EFQM method, all criteria are related only to the first three of these four.

The classification of the criteria according to the three categories may cause confusion. For example: designing a professional profile is characterised as part of "ACT"; it may seem to be more correct to group it with "PLAN".
As figure 6 shows, the Deming scheme can be applied on several levels. At the highest level (management) the nature of the subjects differs from the second (teachers) or third level (students). Designing a professional profile belongs to the responsibility of the teachers; for them it is of a "PLAN" nature. For the management this is part of the "DO" phase. One of the tasks of the management is to enable the teachers to do this, for instance to guard an adequate level of expertise, which (for the management) belongs to "PLAN" at level 1.

Figure 6: Circles in (Deming) circles: PLAN – DO – CHECK – ACT at three different levels

3.2. Sources

The sources that have been used for AAISHE belong to three categories:

1.   Methods and literature on total quality management and internal environmental management
2.   Methods, research and literature on sustainable education
3.   Literature on sustainable development

Total quality management and internal environmental management
Of course, the main sources are the well-known systems for integral quality management and internal environmental management:
?   ISO 9000 and ISO 14000
?   EMAS
?   BS 7750

Besides, for AISHE an important source is the EFQM method, which stands as a model for AISHE. Two versions of this method have been used as input:
?   The original version, developed by the EFQM aiming at business and industry
?   The educational version, developed by the Dutch Expert Group for Vocational Higher Education (Expert-groep HBO), aiming at higher education. The second and the third version have been used.

Sustainable education
First, a number of researches and projects on sustainability in the education have been used. For instance:
?   The British Higher Education 21 (HE21) project
?   Two Dutch projects in Technical Universities
?   The Dutch Cirrus project, aiming at higher technical professional education
?   A number of German researches

With respect to these researches, AISHE could function as a connecting element: the criterion list places a large number of aspects of sustainable higher education in their mutual relationships, and the results of various earlier projects can be used to fill in many of the AISHE criteria.

Besides these projects on sustainable higher education, there are many declarations and manifestos that express intentions for sustainable higher education. Some of them are:
?   The Copernicus Charter (the text of which is inserted in appendix 1)
?   The declarations of Stockholm, Kyoto, Talloires, Tessaloniki and more
?   The Dutch Charter for Sustainable Professional Higher Education (Handvest voor Duurzaam Hoger Beroepsonderwijs), to which is added a Protocol which demands concrete obligations for the signing universities

An overview of these declarations can be found in table 1.3, in part 3.

Figure 7: the criterion list of AISHE as a connecting element of a series of studies on Sustainable Higher Education

Sustainable development
To start with, various declarations and reports on have been consulted. Among these are:
?   The "Brundtland-report" of the United Nations (a summary is reprinted in Appendix 2)
?   Agenda 21: especially chapter 36 is relevant, because this is about education
?   The Earth Charter

Besides, all kinds of literature on sustainable development have been used, in general as well as on various specific subjects.

In chapter 2 of this AISHE method (the description of each criterion) an attempt is made to name all relevant sources for each criterion separately.

3.3. The philosophy of *AISHE*

Criteria for Sustainable Higher Education can be formulated in a number of ways.
In special, three fundamental choices are dominant:
?   content oriented versus process oriented
?   quantitative versus qualitative
?   prescriptive versus descriptive

In this chapter each of these three dimensions is explained; for each, an elucidated choice will be made.

Dimension 1: Content oriented versus process oriented criteria

Content oriented criteria are about the concrete selection of subjects that should or should not be part of certain curricula, from a sustainable perspective, and about guidelines for the organisation management.
Process oriented criteria give information about the way in which the curricula are to be designed, and about the way in which decisions are made concerning the organisation management. These are criteria on a meta level.

Examples:

Dimension 1	Content oriented	Process oriented
Curriculum	Photovoltaic cells are a part of the curriculum	Decisions about sustainable subjects in the curriculum are made explicit
Vision	The use of hen batteries is not compatible with sustainable development	The organisation has a vision on ethical questions that are relevant for the own professional fields. This vision is updated regularly
Staff development	Engineering teachers receive supplementary schooling in environment oriented product development	there is a policy and a budget for staff development in sustainable development

Considerations
The advantage of content oriented criteria is, they offer clarity: clarity about product that is to be delivered (the educational content) and about the process (curriculum development, staff development).
At the same time, this clarity is a disadvantage, for various reasons:
?   They are absolute: they don't leave space for the own responsibility of an individual education institute (or a part of it);
?   Fundamentally, they are not generally acceptable: they mirror the subjective opinion of the designer of the criterion, and so they carry the risk that others don't agree with them. If so, at best a never-ending yes-no-discussion could rise;
?   They are time related and statical: they have a risk of getting obsolete because of new developments. When for instance a new technical invention would be made which would make photovoltaic cells technically obsolete, at the same time the criterion would be obsolete.

Although process oriented criteria carry the risk of vagueness, this doesn't really have to be a serious disadvantage. For instance, the above mentioned criterion about a vision on ethics entails that educational organisations in which animal welfare is a relevant subject, will not be allowed to deny taking position about hen batteries.

Choice
Actually, the point about adopting process-oriented criteria is that, if the processes are formulated carefully and are executed carefully as well, it may be expected that the resulting contents will be ok too.
On the basis of this point, in the AISHE method the process-oriented principle has been chosen.

Dimension 2: Quantitative versus qualitative criteria

Criteria can be formulated as quantitative measuring data, or in a less precise, more describing, qualitative way.
In the British "Higher Education 21" programme ("HE21") a large amount of quantitative indicators has been designed. Some examples are shown in the table below, in the column "quantitative".

Dimension 2	quantitative	qualitative
Curriculum	percentage of students participating in modules that are related to sustainability	The relation between sustainability aspects in the professional qualifications and the curriculum has been formulated explicitly
External effect	Number of sustainability related conferences, organised in the current year	The organisation contributes actively to enlargement of knowledge and insight about sustainable development in society and to the public opinion
Internal environmental management	CO_2 emission per FTE[4] per annum	Annually an environmental report is published.

Considerations
Using quantitative criteria can only be meaningful, if the indicated quantities can be defined and measured in an exact way, and if there is an objective method to agree upon limits for them.
This is a problematic point of all above-mentioned quantitative examples.
? The mentioned percentage of students, for example, can only be measured if it is possible to determine for each module if it is related to sustainability. But, how can this be determined? According to some people, nuclear energy is essential for a sustainable system of energy, while others combat this opinion; does a module on nuclear energy count for the above percentage?
? How does one determine whether a certain conference is sustainability related? Is, let's say, a conference on waste processing sustainability related?
? For which kinds of CO_2 emission will the educational institute be held accountable, and which will not? And: how exactly will the measurements be done to establish the numbers?

On top of all this, for all the above examples the decision of choosing a limit value is subjective and normative, and so each measured quantity will always be questionable.
In other words, the disadvantage of quantitative criteria is that they suggest a fictitious level of exactness that in real cannot be made true.

The "right" percentage of credits
A characteristic example of this fictitious exactness is the in some places ongoing discussion about the "right" percentage of the curriculum that should be dedicated to sustainable development (expressed in a percentage of the credit points). According to some this should be 5%; others claim the optimal value should higher or lower. In fact every concrete percentage is fundamentally wrong. In the first place because of the fictitiousness of the exactness: does a module handling, say, environmental law, fall within this percentage of sustainable curriculum parts? And what about the earlier mentioned module on nuclear energy?
In the second place, quite a few modules have nothing or hardly anything to do with sustainability when viewed on their own, but are very relevant for sustainability when viewed in a larger framework. A characteristic example is a module in a mechanical engineering course dealing with connection technologies (gluing, screwing, welding, clamping, etc.): on their own these techniques are not clearly more or less sustainable. But when a product consisting of several components is to be designed, subjects appear like design for disassembly, reuse and recycling, which are very relevant for sustainability; and a thorough knowledge of connection technologies contributes to a good designing process. Such a module doesn't belong in a direct sense to the percentage of sustainable curriculum parts, but it certainly does in an indirect way.
So, the only correct (but not very illuminating) answer to the question of the optimal percentage of sustainable curriculum parts is: 100%.

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[4] FTE = Full Time Equivalent, full time employment position

Choice

Many aspects of the level to which sustainability has been integrated in education and in the organisation have fundamentally no exact nature. This does *not* imply that they cannot be measured; but usually they have to be expressed on an ordinal scale, instead of a quantitative interval scale.

Therefore, with respect to the AISHE method a qualitative approach has been adopted; and the results are expressed on ordinal scales.

Dimension 3: Prescriptive versus descriptive criteria

Criteria can be designed as obligatory prescriptions, as is usual with many of the customary instruments for quality and environmental management. In the table below in the left column a number of examples are shown, derived from ISO 14001, EMAS and BS7750.

The alternative is a descriptive character. This may take the form of an ascending progression of descriptions, together constituting an ordinal scale; an organisation can compare itself with this scale and determine which organisation development stage it is in.

A good example of this is the EFQM method: for a series of criteria five "stages" are discerned. The table below shows some examples in the right column.

Dimension 3	prescriptive	descriptive
Staff Development	The organisation shall (…) require that all personnel whose work may create a significant impact upon the environment, have received appropriate training. *(ISO 14001: 4.4.2)*	*stage 1:* Staff counselling, training and development are dependent on individual initiatives. *(EFQM-HE: 3.5)*
Policy	The company environmental policy shall be adopted and periodically reviewed. *(EMAS: appendix 1, A.2)*	*stage 3:* The policy is evaluated on the basis of a systematic analysis (...). *(EFQM-HE: 2.4)*
Communication	The organisation shall establish and maintain procedures for receiving (…) communications (internal and external) from relevant interested parties. *(BS7750: 4.4.1)*	*stage 4:* Interested parties are actively involved in discussions about policy development and implementation. *(EFQM-HE: 2.3)*

Considerations

The use of prescriptive criteria has several disadvantages.

A main problem is that the prescription of criteria is *normative*. True enough, the actual designing of sustainable education is fundamentally normative, because the goals and the contents are strongly related with the personal view of those who are responsible on the ideal future society and on their ethical norms. But exactly because of this, it is impossible to construct a measuring instrument based on normative prescriptions and then receive a general acceptance.

Besides, imposing external obligatory criteria would contradict one of the most important cornerstones of sustainable development: the own individual responsibility of each person and institution involved in the process of sustainable development.

Another problem with forceful prescription is of a more practical nature. Prescribing criteria offer exactly two possible states: *either* the organisation satisfies the requirements, *or* it does not. Such an on-off criterion makes it impossible to describe a situation in some details. So, such a measuring instrument is not very discerning. It will not offer much insight in the situation in an organisation, and it won't offer many starting points for choosing priorities with respect to the policy.

And there is another point. Only a few universities have appeared to be able to meet high standards: for instance, in Europe there aren't many universities possessing an ISO certificate. This is a serious disadvantage of obligatory prescriptions: if they can hardly be met, they don't stimulate to try to reach them. And the only alternative - lowering the limit - doesn't sound attractive because this means compromising on beforehand.

A final argument is that it isn't always evident that an educational organisation will have to strive for the highest quality demands in all respects: the maximum isn't always the optimum. An organisation may decide deliberately to aim at another stage for certain aspects, on the basis of internal or external reasons. If a measuring instrument would be based on on-off prescriptions, an organisation doing so would automatically disqualify itself.

Choice

Criteria for sustainable education should place the responsibility for choosing limits with those take care of designing and implementing education, i.e. with individual organisations (universities or parts of universities).

Besides, criteria should be practically applicable and contribute to the organisation policy.

For these reasons AISHE is decided to consist of descriptive criteria, enabling the formulation of auditing results in more than two possible values.

3.4. Boundaries and priorities

Educational level
The target group for AISHE is higher education (universities and vocational universities). It certainly is important that other parts of education (primary and secondary) pay attention to sustainable development, but the differences between those and higher education are that large that it doesn't make sense to try to design one instrument for all of these categories.

Geographical boundary
In principle the geographical target area consists of the countries of Europe. Goal of the development of the instrument is to become a rather generally accepted standard in the Netherlands (where it is developed) and in al least a few other countries in Western Europe; an attempt will be made to reach acceptation and implementation in as many European countries as will appear possible.
Eventual opportunities will be used to reach agreement and implementation elsewhere in the world. For practical reasons, this has a lower priority.

Education as main target
Universities fulfil a number of core tasks. Primary tasks are: education; research; services (part of them on a commercial base) to third parties.
For the development it has been decided to aim primarily at education.
Besides, relatively small attention has been given to the internal environmental management of the educational institute.
This is because of the following reasons:
? A university in its function as an institute for research or external services doesn't differ very much from other organisations performing such functions. These other organisations already have at their disposal instruments for measuring the stage of their environmental management (ISO 14001, for one) and of their contributions to sustainable development, or else those instruments are under development at the moment. It would be inefficient to develop a separate measuring instrument for these functions of educational institutes.
? Education fulfils an essential role in sustainable development. By educating students to become professionals who are acquainted with sustainable development and the meaning of it in their own professional practice, it will be possible to work on sustainable development on a scale which would be several magnitudes bigger than everything that is happening now. So, the contribution of educational institutes to sustainable development by educating students in a sustainable way is enormously more important than everything they can reach by their research, external services or a solid internal environmental management system: in all those areas they are only a few between many others.

Nevertheless, in AISHE research and external services are mentioned, as well as the internal environmental management. This is not because they are valuable goals in themselves (which of course they are) but because they can contribute to, or set boundaries for the integration of sustainability in education: they contribute to the expertise of the educating staff, to a supporting multimedia resource centre, to an external network, and in general to an atmosphere of expertise.

4. Appendices

Appendix 1.1-1. *Text*:   Summary of the Brundtland Report

(*Summary of proposed legal principles for environmental protection and sustainable development adopted by the WCED experts group on environmental law*)
(From*: Our common future - the world commission on environment and development*)

I. GENERAL PRINCIPLES, RIGHTS, AND RESPONSIBILITIES

Fundamental Human Right
1. All human beings have the fundamental right to an environment adequate for their health and well-being.

Inter-Generational Equity
2. States shall conserve and use the environment and natural resources for the benefit of present and future generations.

Conservation and Sustainable Use
3. States shall maintain ecosystems and ecological processes essential for the functioning of the biosphere, shall preserve biological diversity, and shall observe the principle of optimum sustainable yield in the use of living natural resources and ecosystems.

Environmental Standards and Monitoring
4. States shall establish adequate environmental protection standards and monitor changes in and publish relevant data on environmental quality and resource use.

Prior Environmental Assessments
5. States shall make or require prior environmental assessments of proposed activities which may significantly affect the environment or use of a natural resource.

Prior Notification, Access, and Due Process
6. States shall inform in a timely manner all persons likely to be significantly affected by a planned activity and to grant them equal access and due process in administrative and judicial proceedings.

Sustainable Development and Assistance
7. States shall ensure that conservation is treated as an integral part of the planning and implementation of development activities and provide assistance to other States, especially to developing countries, in support of environmental protection and sustainable development.

General Obligation to Co-operate
8. States shall co-operate in good faith with other States in implementing the preceding rights and obligations.

II. PRINCIPLES, RIGHTS, AND OBLIGATIONS CONCERNING TRANSBOUNDARY NATURAL RESOURCES AND ENVIRONMENTAL INTERFERENCES

Reasonable and Equitable Use
9. States shall use transboundary natural resources in a reasonable and equitable manner.

Prevention and Abatement
10. States shall prevent or abate any transboundary environmental interference which could cause or causes significant harm (but subject to certain exceptions provided for in Art. 11 and Art. 12 below).

Strict Liability
11. States shall take all reasonable precautionary measures to limit the risk when carrying out or permitting certain dangerous but beneficial activities and shall ensure that compensation is provided should substantial transboundary harm occur even when the activities were not known to be harmful at the time they were undertaken.

Prior Agreements When Prevention Costs Greatly Exceed Harm
12. States shall enter into negotiations with the affected State on the equitable conditions under which the activity could be carried out when planning to carry out or permit activities causing transboundary harm which is substantial but far less than the cost of prevention. (If no agreement can be reached, see Art. 22.)

Non-Discrimination

13. States shall apply as a minimum at least the same standards for environmental conduct and impacts regarding transboundary natural resources and environmental interferences as are applied domestically (i.e., do not do to others what you would not do to your own citizens).

General Obligation to Co-operate on Transboundary Environmental Problems

14. States shall co-operate in good faith with other States to achieve optimal use of transboundary natural resources and effective prevention or abatement of transboundary environmental interferences.

Exchange of Information

15. States of origin shall provide timely and relevant information to the other concerned States regarding transboundary natural resources or environmental interferences.

Prior Assessment and Notification

16. States shall provide prior and timely notification and relevant information to the other concerned States and shall make or require an environmental assessment of planned activities which may have significant transboundary effects.

Prior Consultations

17. States of origin shall consult at an early stage and in good faith with other concerned States regarding existing or potential transboundary interferences with their use of a natural resource or the environment.

Co-operative Arrangements for Environmental Assessment and Protection

18. States shall co-operate with the concerned States in monitoring, scientific research and standard setting regarding transboundary natural resources and environmental interferences.

Emergency Situations

19. States shall develop contingency plans regarding emergency situations likely to cause transboundary environmental interferences and shall promptly warn, provide relevant information to and co-operate with concerned States when emergencies occur.

Equal Access and Treatment

20. States shall grant equal access, due process and equal treatment in administrative and judicial proceedings to all persons who are or may be affected by transboundary interferences with their use of a natural resource or the environment.

III. STATE RESPONSIBILITY

21. States shall cease activities which breach an international obligation regarding the environment and provide compensation for the harm caused.

IV. PEACEFUL SETTLEMENT OF DISPUTES

22. States shall settle environmental disputes by peaceful means. If mutual agreement on a solution or on other dispute settlement arrangements is not reached within 18 months, the dispute shall be submitted to conciliation and, if unresolved, thereafter to arbitration or judicial settlement at the request of any of the concerned States.

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Appendix 1.1-3. *Text*:   Agenda 21, Chapter 36:
Promoting education, public awareness and training

REPORT OF THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT
Rio de Janeiro, 3-14 June 1992

INTRODUCTION

36.1. Education, raising of public awareness and training are linked to virtually all areas in Agenda 21, and even more loosely to the ones on meeting basic needs, capacity-building, data and information, science, and the role of major groups. This chapter sets out broad proposals, while specific suggestions related to sectoral issues are contained in other chapters. The Declaration and Recommendations of the Tbilisi Intergovernmental Conference on Environmental Education organized by UNESCO and UNEP and held in 1977, have provided the fundamental principles for the proposals in this document.

36.2. Programme areas described in the present chapter are:
(a) Reorienting education towards sustainable development;
(b) Increasing public awareness;
(c) Promoting training.

PROGRAMME AREAS

A. *Reorienting education towards sustainable development*

36.3. Basis for action
Education, including formal education, public awareness and training should be recognized as a process by which human beings and societies can reach their fullest potential. 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 to be incorporated as an essential part of learning. Both formal and non-formal education are indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns. It is also critical for achieving environmental and ethical awareness, values and attitudes, skills and behaviour consistent with sustainable development and for effective public participation in decision-making.
To be effective, environment and development education should deal with the dynamics of both the physical/biological and socio-economic environment and human (which may include spiritual) development, should be integrated in all disciplines, and should employ formal and non-formal methods and effective means of communication.

36.4. Objectives
Recognizing that countries, regional and international organizations will develop their own priorities and schedules for implementation in accordance with their needs, policies and programmes, the following objectives are proposed:
(a)   To endorse the recommendations arising from the World Conference on Education for All: Meeting Basic Learning Needs (Jomtien, Thailand, 5-9 March 1990) and to strive to ensure universal access to basic education, and to achieve primary education for at least 80 per cent of girls and 80 per cent of boys of primary school age through formal schooling or non-formal education and to reduce the adult illiteracy rate to at least half of its 1990 level. Efforts should focus on reducing the high illiteracy levels and redressing the lack of basic education among women and should bring their literacy levels into line with those of men;
(b)   To achieve environmental and development awareness in all sectors of society on a world-wide scale as soon as possible;
(c)   To strive to achieve the accessibility of environmental and development education, linked to social education, from primary school age through adulthood to all groups of people;
(d)   To promote integration of environment and development concepts, including demography, in all educational programmes, in particular the analysis of the causes of major environment and development issues in a local context, drawing on the best available scientific evidence and other appropriate sources of knowledge, and giving special emphasis to the further training of decision makers at all levels.

36.5. Activities

Recognizing that countries and regional and international organizations will develop their own priorities and schedules for implementation in accordance with their needs, policies and programmes, the following activities are proposed:

(a)   All countries are encouraged to endorse the recommendations of the Jomtien Conference and strive to ensure its Framework for Action. This would encompass the preparation of national strategies and actions for meeting basic learning needs, universalizing access and promoting equity, broadening the means and scope of education, developing a supporting policy context, mobilizing resources and strengthening international cooperation to redress existing economic, social and gender disparities which interfere with these aims. Non-governmental organizations can make an important contribution in designing and implementing educational programmes and should be recognized;

(b)   Governments should strive to update or prepare strategies aimed at integrating environment and development as a cross-cutting issue into education at all levels within the next three years. This should be done in cooperation with all sectors of society. The strategies should set out policies and activities, and identify needs, cost, means and schedules for their implementation, evaluation and review. A thorough review of curricula should be undertaken to ensure a multidisciplinary approach, with environment and development issues and their socio-cultural and demographic aspects and linkages. Due respect should be given to community-defined needs and diverse knowledge systems, including science, cultural and social sensitivities;

(c)   Countries are encouraged to set up national advisory environmental education coordinating bodies or round tables representative of various environmental, developmental, educational, gender and other interests, including non-governmental organizations, to encourage partnerships, help mobilize resources, and provide a source of information and focal point for international ties. These bodies would help mobilize and facilitate different population groups and communities to assess their own needs and to develop the necessary skills to create and implement their own environment and development initiatives;

(d)   Educational authorities, with the appropriate assistance from community groups or non-governmental organizations, are recommended to assist or set up pre-service and in-service training programmes for all teachers, administrators, and educational planners, as well as non-formal educators in all sectors, addressing the nature and methods of environmental and development education and making use of relevant experience of non-governmental organizations;

(e)   Relevant authorities should ensure that every school is assisted in designing environmental activity work plans, with the participation of students and staff. Schools should involve schoolchildren in local and regional studies on environmental health, including safe drinking water, sanitation and food and ecosystems and in relevant activities, linking these studies with services and research in national parks, wildlife reserves, ecological heritage sites etc.;

(f)   Educational authorities should promote proven educational methods and the development of innovative teaching methods for educational settings. They should also recognize appropriate traditional education systems in local communities;

(g)   Within two years the United Nations system should undertake a comprehensive review of its educational programmes, encompassing training and public awareness, to reassess priorities and reallocate resources. The UNESCO/UNEP International Environmental Education Programme should, in cooperation with the appropriate bodies of the United Nations system, Governments, non-governmental organizations and others, establish a programme within two years to integrate the decisions of the Conference into the existing United Nations framework adapted to the needs of educators at different levels and circumstances. Regional organizations and national authorities should be encouraged to elaborate similar parallel programmes and opportunities by conducting an analysis of how to mobilize different sectors of the population in order to assess and address their environmental and development education needs;

(h)   There is a need to strengthen, within five years, information exchange by enhancing technologies and capacities necessary to promote environment and development education and public awareness. Countries should cooperate with each other and with the various social sectors and population groups to prepare educational tools that include regional environment and development issues and initiatives, using learning materials and resources suited to their own requirements;

(i)   Countries could support university and other tertiary activities and networks for environmental and development education. Cross-disciplinary courses could be made available to all students. Existing regional networks and activities and national university actions which promote research and common teaching approaches on sustainable development should be built upon, and new partnerships and bridges created with the business and other independent sectors, as well as with all countries for technology, know-how, and knowledge exchange;

(j)   Countries, assisted by international organizations, non-governmental organizations and other sectors, could strengthen or establish national or regional centres of excellence in interdisciplinary research and education in environmental and developmental sciences, law and the management of specific environmental problems. Such centres could be universities or existing networks in each country or region, promoting cooperative research and information sharing and dissemination. At the global level these functions should be performed by appropriate institutions;

(k)   Countries should facilitate and promote non-formal education activities at the local, regional and national levels by cooperating with and supporting the efforts of non-formal educators and other community-based organizations. The appropriate bodies of the United Nations system in cooperation with non-governmental organizations should encourage the development of an international network for the achievement of global educational aims. At the national and local levels, public and scholastic forums should discuss environmental and development issues, and suggest sustainable alternatives to policy makers;

(l)   Educational authorities, with appropriate assistance of non-governmental organizations, including women's and indigenous peoples' organizations, should promote all kinds of adult education programmes for continuing education in environment and development, basing activities around elementary/secondary schools and local problems. These authorities and industry should encourage business, industrial and agricultural schools to include such topics in their curricula. The corporate sector could include sustainable development in their education and training programmes. Programmes at a post-graduate level should include specific courses aiming at the further training of decision makers;

(m)   Governments and educational authorities should foster opportunities for women in non-traditional fields and eliminate gender stereotyping in curricula. This could be done by improving enrolment opportunities, including females in advanced programmes as students and instructors, reforming entrance and teacher staffing policies and providing incentives for establishing child-care facilities, as appropriate. Priority should be given to education of young females and to programmes promoting literacy among women;

(n)   Governments should affirm the rights of indigenous peoples, by legislation if necessary, to use their experience and understanding of sustainable development to play a part in education and training;

(o)   The United Nations could maintain a monitoring and evaluative role regarding decisions of the United Nations Conference on Environment and Development on education and awareness, through the relevant United Nations agencies. With Governments and non-governmental organizations, as appropriate, it should present and disseminate decisions in a variety of forms, and should ensure the continuous implementation and review of the educational implications of Conference decisions, in particular through relevant events and conferences.

Means of implementation

Financing and cost evaluation

36.6. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $8 billion to $9 billion, including about $3.5 billion to $4.5 billion from the international community on grant or concessional terms. These are indicative and order-of-magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

36.7. In the light of country-specific situations, more support for education, training and public awareness activities related to environment and development could be provided, in appropriate cases, through measures such as the following:

(a)   Giving higher priority to those sectors in budget allocations, protecting them from structural cutting requirements;

(b)   Shifting allocations within existing education budgets in favour of primary education, with focus on environment and development;

(c)   Promoting conditions where a larger share of the cost is borne by local communities, with rich communities assisting poorer ones;

(d)   Obtaining additional funds from private donors concentrating on the poorest countries, and those with rates of literacy below 40 per cent;

(e)   Encouraging debt for education swaps;

(f)   Lifting restrictions on private schooling and increasing the flow of funds from and to non-governmental organizations, including small-scale grass-roots organizations;

(g)   Promoting the effective use of existing facilities, for example, multiple school shifts, fuller development of open universities and other long-distance teaching;

(h)   Facilitating low-cost or no-cost use of mass media for the purposes of education;

(i)   Encouraging twinning of universities in developed and developing countries.

B. Increasing public awareness

36.8. Basis for action

There is still a considerable lack of awareness of the interrelated nature of all human activities and the environment, due to inaccurate or insufficient information. Developing countries in particular lack relevant technologies and expertise. There is a need to increase public sensitivity to environment and development problems and involvement in their solutions and foster a sense of personal environmental responsibility and greater motivation and commitment towards sustainable development.

36.9. Objective
The objective is to promote broad public awareness as an essential part of a global education effort to strengthen attitudes, values and actions which are compatible with sustainable development. It is important to stress the principle of devolving authority, accountability and resources to the most appropriate level with preference given to local responsibility and control over awareness-building activities.

36.10. Activities
Recognizing that countries, regional and international organizations will develop their own priorities and schedules for implementation in accordance with their needs, policies and programmes, the following activities are proposed:

(a)   Countries should strengthen existing advisory bodies or establish new ones for public environment and development information, and should coordinate activities with, among others, the United Nations, non-governmental organizations and important media. They should encourage public participation in discussions of environmental policies and assessments. Governments should also facilitate and support national to local networking of information through existing networks;

(b)   The United Nations system should improve its outreach in the course of a review of its education and public awareness activities to promote greater involvement and coordination of all parts of the system, especially its information bodies and regional and country operations. Systematic surveys of the impact of awareness programmes should be conducted, recognizing the needs and contributions of specific community groups;

(c)   Countries and regional organizations should be encouraged, as appropriate, to provide public environmental and development information services for raising the awareness of all groups, the private sector and particularly decision makers;

(d)   Countries should stimulate educational establishments in all sectors, especially the tertiary sector, to contribute more to awareness building. Educational materials of all kinds and for all audiences should be based on the best available scientific information, including the natural, behavioural and social sciences, and taking into account aesthetic and ethical dimensions;

(e)   Countries and the United Nations system should promote a cooperative relationship with the media, popular theatre groups, and entertainment and advertising industries by initiating discussions to mobilize their experience in shaping public behaviour and consumption patterns and making wide use of their methods. Such cooperation would also increase the active public participation in the debate on the environment. UNICEF should make child-oriented material available to media as an educational tool, ensuring close cooperation between the out-of-school public information sector and the school curriculum, for the primary level. UNESCO, UNEP and universities should enrich pre-service curricula for journalists on environment and development topics;

(f)   Countries, in cooperation with the scientific community, should establish ways of employing modern communication technologies for effective public outreach. National and local educational authorities and relevant United Nations agencies should expand, as appropriate, the use of audio-visual methods, especially in rural areas in mobile units, by producing television and radio programmes for developing countries, involving local participation, employing interactive multimedia methods and integrating advanced methods with folk media;

(g)   Countries should promote, as appropriate, environmentally sound leisure and tourism activities, building on The Hague Declaration of Tourism (1989) and the current programmes of the World Tourism Organization and UNEP, making suitable use of museums, heritage sites, zoos, botanical gardens, national parks, and other protected areas;

(h)   Countries should encourage non-governmental organizations to increase their involvement in environmental and development problems, through joint awareness initiatives and improved interchange with other constituencies in society;

(i)   Countries and the United Nations system should increase their interaction with and include, as appropriate, indigenous people in the management, planning and development of their local environment, and should promote dissemination of traditional and socially learned knowledge through means based on local customs, especially in rural areas, integrating these efforts with the electronic media, whenever appropriate;

(j)   UNICEF, UNESCO, UNDP and non-governmental organizations should develop support programmes to involve young people and children in environment and development issues, such as children's and youth hearings and building on decisions of the World Summit for Children (A/45/625, annex);

(k)   Countries, the United Nations and non-governmental organizations should encourage mobilization of both men and women in awareness campaigns, stressing the role of the family in environmental activities, women's contribution to transmission of knowledge and social values and the development of human resources;

(l)   Public awareness should be heightened regarding the impacts of violence in society.

Means of implementation

36.11. Financing and cost evaluation
The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $1.2 billion, including about $110 million from the international community on grant or

concessional terms. These are indicative and order-of-magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

C. Promoting training

36.12. Basis for action
Training is one of the most important tools to develop human resources and facilitate the transition to a more sustainable world. It should have a job-specific focus, aimed at filling gaps in knowledge and skill that would help individuals find employment and be involved in environmental and development work. At the same time, training programmes should promote a greater awareness of environment and development issues as a two-way learning process.

36.13. Objectives
The following objectives are proposed:
(a)   To establish or strengthen vocational training programmes that meet the needs of environment and development with ensured access to training opportunities, regardless of social status, age, gender, race or religion;
(b)   To promote a flexible and adaptable workforce of various ages equipped to meet growing environment and development problems and changes arising from the transition to a sustainable society;
(c)   To strengthen national capacities, particularly in scientific education and training, to enable Governments, employers and workers to meet their environmental and development objectives and to facilitate the transfer and assimilation of new environmentally sound, socially acceptable and appropriate technology and know-how;
(d)   To ensure that environmental and human ecological considerations are integrated at all managerial levels and in all functional management areas, such as marketing, production and finance.

Activities
36.14.   Countries with the support of the United Nations system should identify workforce training needs and assess measures to be taken to meet those needs. A review of progress in this area could be undertaken by the United Nations system in 1995.

36.15.   National professional associations are encouraged to develop and review their codes of ethics and conduct to strengthen environmental connections and commitment. The training and personal development components of programmes sponsored by professional bodies should ensure incorporation of skills and information on the implementation of sustainable development at all points of policy- and decision-making.

36.16.   Countries and educational institutions should integrate environmental and developmental issues into existing training curricula and promote the exchange of their methodologies and evaluations.

36.17.   Countries should encourage all sectors of society, such as industry, universities, government officials and employees, non-governmental organizations and community organizations, to include an environmental management component in all relevant training activities, with emphasis on meeting immediate skill requirements through short-term formal and in-plant vocational and management training. Environmental management training capacities should be strengthened, and specialized "training of trainers" programmes should be established to support training at the national and enterprise levels. New training approaches for existing environmentally sound practices should be developed that create employment opportunities and make maximum use of local resource-based methods.

36.18.   Countries should strengthen or establish practical training programmes for graduates from vocational schools, high schools and universities, in all countries, to enable them to meet labour market requirements and to achieve sustainable livelihoods. Training and retraining programmes should be established to meet structural adjustments which have an impact on employment and skill qualifications.

36.19.   Governments are encouraged to consult with people in isolated situations, whether geographically, culturally or socially, to ascertain their needs for training to enable them to contribute more fully to developing sustainable work practices and lifestyles.

36.20.   Governments, industry, trade unions, and consumers should promote an understanding of the interrelationship between good environment and good business practices.

36.21. Countries should develop a service of locally trained and recruited environmental technicians able to provide local people and communities, particularly in deprived urban and rural areas, with the services they require, starting from primary environmental care.

36.22. Countries should enhance the ability to gain access to, analyse and effectively use information and knowledge available on environment and development. Existing or established special training programmes should be strengthened to support information needs of special groups. The impact of these programmes on productivity, health, safety and employment should be evaluated. National and regional environmental labour-market information systems should be developed that would supply, on a continuing basis, data on environmental job and training opportunities. Environment and development training resource-guides should be prepared and updated, with information on training programmes, curricula, methodologies and evaluation results at the local, national, regional and international levels.

36.23. Aid agencies should strengthen the training component in all development projects, emphasizing a multidisciplinary approach, promoting awareness and providing the necessary skills for transition to a sustainable society. The environmental management guidelines of UNDP for operational activities of the United Nations system may contribute to this end.

36.24. Existing networks of employers' and workers' organizations, industry associations and non-governmental organizations should facilitate the exchange of experience concerning training and awareness programmes.

36.25. Governments, in cooperation with relevant international organizations, should develop and implement strategies to deal with national, regional and local environmental threats and emergencies, emphasizing urgent practical training and awareness programmes for increasing public preparedness.

36.26. The United Nations system, as appropriate, should extend its training programmes, particularly its environmental training and support activities for employers' and workers' organizations.

Means of implementation

36.27. Financing and cost evaluation
The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $5 billion, including about $2 billion from the international community on grant or concessional terms. These are indicative and order-of-magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

Appendix 1.1-4. *Table*: Declarations on higher education and sustainable development

Declaration	Year	Source
Stockholm Declaration	1972	UN Conference on Human Environment
Talloires Declaration	1990	Association of University Leaders for a Sustainable Future
Halifax Declaration	1991	International Association of Universities (IAU), UN University, Association of Universities and Colleges of Canada
Agenda 21: Chapter 36	1992	UN Conference on Environment and Development ("Rio")
Swansea Declaration	1993	Association of Commonwealth Universities
Kyoto Declaration	1993	International Association of Universities (IAU)
Copernicus Charter	1994	Association of European Universities (CRE)
Thessaloniki Declaration	1997	UNESCO Conference on Environment and Public Awareness for Sustainability
World Declaration on Higher Education for the Twenty-first Century	1998	UNESCO World Conference on Higher Education
Handvest Duurzaam HBO	1999	Dutch Association of Universities of Professional Education (HBO-Raad)

Appendix 1.1-5. *Text*:   University Charter for Sustainable Development ("Copernicus charter")

Preamble
Man's exploitation of the biosphere is now threatening its very existence and delicate balance. Over the last few decades, the pressures on the global environment have become self-evident, leading to a common outcry for sustainable development. In the words of the Brundtland report, we must learn to care for the needs of the present without compromising the ability of future generations everywhere to meet their own needs.

The awareness is there. What is required is a comprehensive strategy for building a sustainable future which is equitable for all human beings, as highlighted by the Rio Conference (UNCED) in 1992. This requires a new frame of mind and new sets of values.

Education is critical for promoting such values and improving people's capacity to address environment and development issues. Education at all levels, especially university education for the training of decision-makers and teachers, should be oriented towards sustainable development and foster environmentally aware attitudes, skills and behavior patterns, as well as a sense of ethical responsibility. Education must become environmental education in the fullest sense of the term.

The role of universities
Universities and equivalent institutions of higher education train the coming generations of citizens and have expertise in all fields of research, both in technology as well as in the natural, human and social sciences. It is consequently their duty to propagate environmental literacy and to promote the practice of environmental ethics in society, in accordance with the principles set out in the Magna Chart of European Universities and subsequent university declarations, and along the lines of the UNCED recommendations for environment and development education.

Indeed, universities are increasingly called upon to play a leading role in developing a multidisciplinary and ethically-oriented form of education in order to devise solutions for the problems linked to sustainable development. They must therefore commit themselves to an on-going process of informing, educating and mobilizing all the relevant parts of society concerning the consequences of ecological degradation, including its impact on global development and the conditions needed to ensure a sustainable and just world.

To achieve these aims and fulfill their basic mission, universities are urged to make every effort to subscribe to and implement the ten principles of actions set out below.

Principles of action

1. Institutional commitment
Universities shall demonstrate real commitment to the principle and practice of environmental protection and sustainable development within the academic environment.

2. Environmental ethics
Universities shall promote among teaching staff, students and the public at large sustainable consumption patterns and an ecological lifestyle, while fostering programmes to develop the capacities of the academic staff to teach environmental literacy.

3. Education of university employees
Universities shall provide education, training and encouragement to their employees on environmental issues, so that they can pursue their work in an environmentally responsible manner.

4. Programmes in environmental education
Universities shall incorporate an environmental perspective in all their work and set up environmental education programmes involving both teachers and researchers as well as students - all of whom should be exposed to the global challenges of environment and development, irrespective of their field of study.

5. Interdisciplinarity
Universities shall encourage interdisciplinary and collaborative education and research programmes related to sustainable development as part of the institution's central mission. Universities shall also seek to overcome competitive instincts between disciplines and departments.

6. Dissemination of knowledge
Universities shall support efforts to fill in the gaps in the present literature available for students, professionals, decision-makers and the general public by preparing information didactic material, organizing public lectures, and establishing training programmes. They should also be prepared to participate in environmental audits.

7. Networking
Universities shall promote interdisciplinary networks of environmental experts at the local, national, regional and international levels, with the aim of collaborating on common environmental projects in both research and education. For this, the mobility of students and scholars should be encouraged.

8. Partnerships
Universities shall take the initiative in forging partnerships with other concerned sectors of society, in order to design and implement coordinated approaches, strategies and action plans.

9. Continuing education programmes
Universities shall devise environmental educational programmes on these issues for different target groups: e.g. business, governmental agencies, non-governmental organisations, the media.

10. Technology transfer
Universities shall contribute to educational programmes designed to transfer educationally sound and innovative technologies and advanced management methods.

Appendix 1.1-6: *Text*: Relation between AISHE and the Protocols of the Dutch Charter for Sustainable Vocational Higher Education

To the Dutch "Charter for Sustainable Vocational Higher Education" (Handvest for Duurzaam HBO), a Protocol is added which will be renewed each two years. If Dutch universities for professional education ("Hogescholen") meet the demands of this Protocol, they will receive the Certificate for Sustainable Higher Education (Keurmerk voor Duurzaam Hoger Onderwijs).

The demands, formulated in the Protocols of 2000, 2002 and 2004, can be found in AISHE in the form of certain stages of certain criteria. The table below shows the relation.

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<tr><td colspan="5" align="center">*AISHE* and the Handvest Duurzaam HBO Protocols</td></tr>
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   1.2. Policy
   1.3. Communication
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<tr><td>**2. Expertise**
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On the next page both Protocols are shown in the score form of *AISHE* .
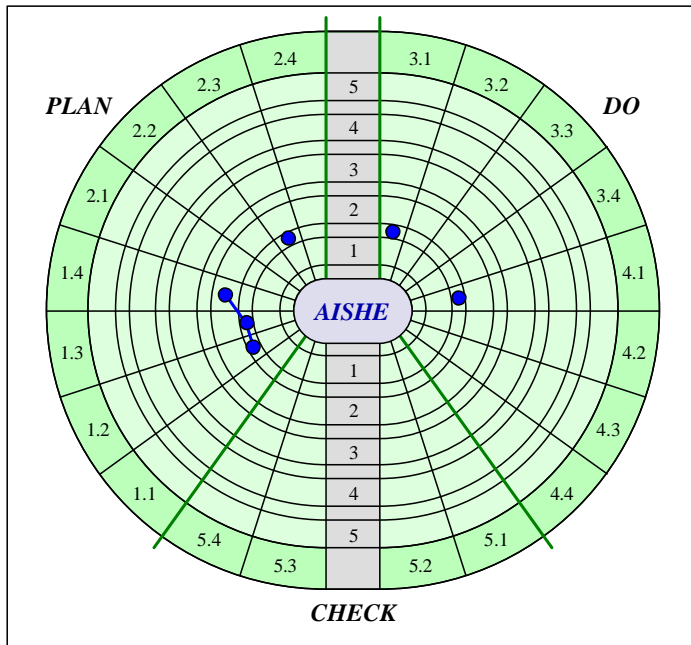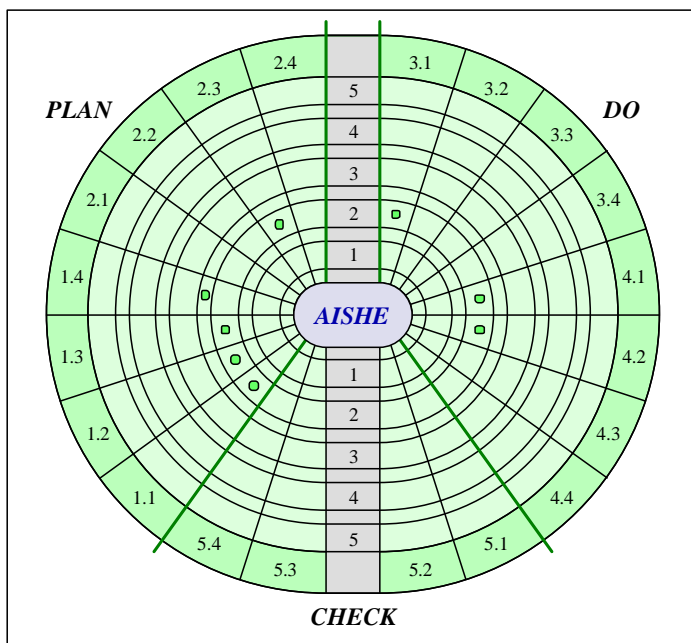
Protocol 2000
shown in the score form of *AISHE*
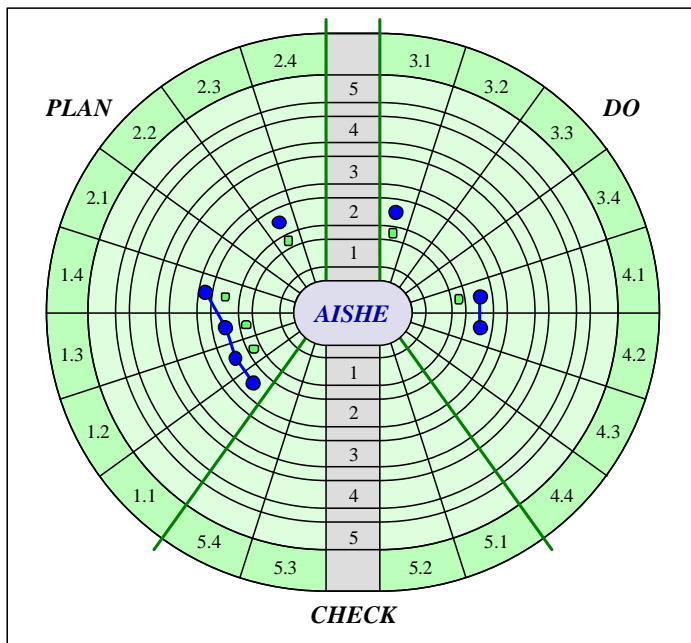
Protocol 2002
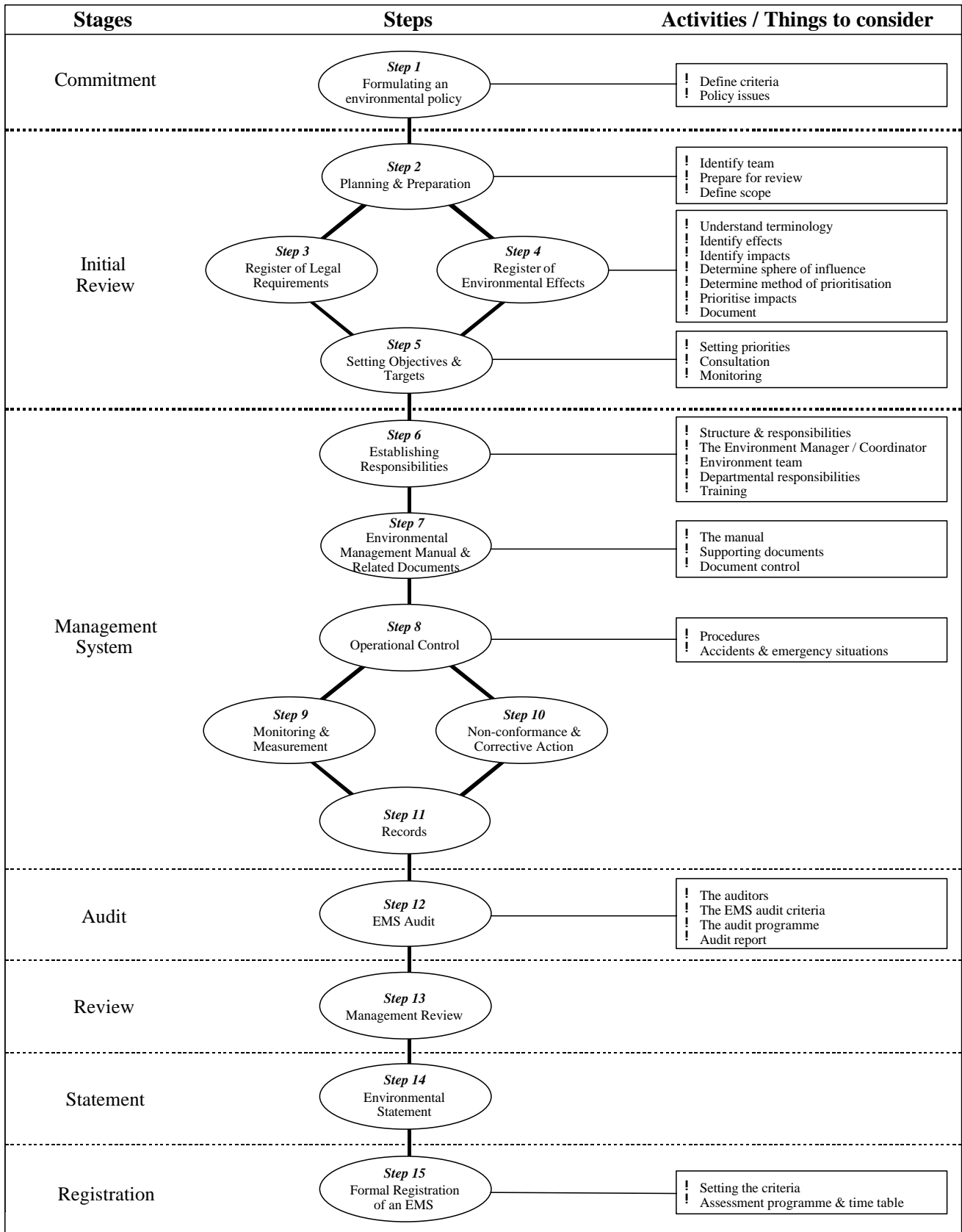Protocol 2000 is shown (as small rectangles).

Protocol 2004 (draft)
Protocol 2002 is shown (as small rectangles).

Appendix 1.3-1. *Table*:   **Communication on sustainability**

Relevance	Possible means of communication	Situation / performed activities
	Mission statement	
	Policy statement	
	Strategic plans	
	Contracts with third parties	
	Course handbook	
	Minutes of meetings	
	Separate annual report on sustainability	
	Sust. As a subject in annual report	
	Research reports	
	Posters	
	General brochure	
	Brochure on sustainability	
	Web site	
	Open House / public information sessions	
	Visit to secondary education	
	Information video or CD-ROM	
	Exposition	
	Newsletter (e-mail)	
	Newsletter (mail)	
	Journal for relations/students/personnel/alumni	
	Press report	
	Conference, Symposium	
	Paper by staff members (internal)	
	Paper by staff members (external: congresses etc.)	
	Publication by staff member	
	Discussion group (Internet)	
	E-room	
	Award for sustainable graduation project	
Relevance	**Some possible subjects**	**Situation / performed activities**
	Sustainability in strategic policy	
	Sust., organisation structure and responsibilities	
	Sustainability and budgeting	
	Internal environmental management	
	Sustainability in research	
	Sustainability in external services	
	Sustainability in curricula	
	Student initiatives on sustainability	
	Agenda of events around sustainability	
	Reports of events around sustainability	
	Newly published sustainability literature	
	Messages of the sustainability expert group	
	Sustainability in the experience of students	
	Discussions on current sustainability themes	
	Sustainability links	

Appendix 1.4-1. *Scheme*: The development of an environmental management system

Stages	Steps	Activities / Things to consider
Commitment	**Step 1** — Formulating an environmental policy	! Define criteria ! Policy issues
Initial Review	**Step 2** — Planning & Preparation	! Identify team ! Prepare for review ! Define scope
	Step 3 — Register of Legal Requirements **Step 4** — Register of Environmental Effects	! Understand terminology ! Identify effects ! Identify impacts ! Determine sphere of influence ! Determine method of prioritisation ! Prioritise impacts ! Document
	Step 5 — Setting Objectives & Targets	! Setting priorities ! Consultation ! Monitoring
Management System	**Step 6** — Establishing Responsibilities	! Structure & responsibilities ! The Environment Manager / Coordinator ! Environment team ! Departmental responsibilities ! Training
	Step 7 — Environmental Management Manual & Related Documents	! The manual ! Supporting documents ! Document control
	Step 8 — Operational Control	! Procedures ! Accidents & emergency situations
	Step 9 — Monitoring & Measurement **Step 10** — Non-conformance & Corrective Action	
	Step 11 — Records	
Audit	**Step 12** — EMS Audit	! The auditors ! The EMS audit criteria ! The audit programme ! Audit report
Review	**Step 13** — Management Review	
Statement	**Step 14** — Environmental Statement	
Registration	**Step 15** — Formal Registration of an EMS	! Setting the criteria ! Assessment programme & time table

From: Barwise (1998), in which each step is explained in detail.
The method was designed within the HE21 (Higher Education 21) project.

Appendix 1.4-2. Table: Aspects of internal environmental management

Aspect	
Organisation	*situation / performed activities*
Central environmental co-ordinator	
Decentralised environmental advisors per control unit	
Established tasks / responsibilities of control units	
Structured environmental consult	
Environmental tasks explicitly in job descriptions	
Suitable knowledge through education and training	
Complete system of environmental licenses	
Internal check on fulfilment of environmental regulations / licenses	
Instructions about and furnishing of personal safety equipment	
"environment" in employees' participation regulations	
Financial stimulation of environmentally successful control units	
Financial levying in environmentally lagging units	
Measuring and registration system of environmental impact	
Periodical reporting, e.g. annual environmental report	
Integration of environment / health / safety	
Emergency procedures for environmental accidents	
Purchase	
Preference for suppliers with a return system	
Insistence with suppliers on environment-friendly packaging	
Preference for products with an environmental certificate	
Purchase prescriptions / directives	
Solid waste	
Environmental accountancy	
Attune org.structure to division: chemical, company, radioactive waste	
Diminish flow of waste	
Diminish paper use with ICT and with efficient addressing	
Separate collection: paper, organic, plastics, glass, small chemical etc.	
Propagation of recycling	
Environmentally optimal processing (e.g. burning instead of landfill)	
Problem materials	
Avoid use of problem materials / products containing problem materials	
Inventory of deployed asbestos	
Action plan for removal of asbestos	
Protocol for removal of asbestos	
Inventory of deployed CFC's aiming at minimisation	
Directives on CFC's in purchase regulations	
Policy action plan on fire extinguishers	

Soil, water, air, noise

Prevent soil pollution due to operational activities	
Map possible soil pollution	
Consider soil aspects in land purchase / building plans etc.	
Prevent / minimise draining of problematic materials to sewer	
Idem to surface water	
Idem to groundwater	
Limiting water deployment	
Use rainwater instead of tap water wherever possible	
Strict regulations with respect to leakages in emergency situations	
Prevent / limit emission of problematic gases to air	
Instructions for use of fume cupboards etc.	
Prevent annoyance due to smell / dust / vibrations	
Measure noise in surroundings	
Measure noise for own personnel	
Consider noise in building plans	
Consider noise in purchase of equipment	
Take noise reducing actions if necessary	

Energy

Complete mapping of energy use through measurements	
Energy extensivation through efficiency improvement	
Lighting / heating only where / when necessary	
Sharpening of demands to heating installations	
Consider energetic power when purchasing equipment	
Energy co-ordinator	
Annual energy plan and –report	
Integration of building and energy plans	

Country planning / building

Integration of envir. / country planning: relation university / surroundings	
Avoid damage to landscape	
Environment in strategy of demolition, renovation, new buildings	
Use of environment-friendly building materials	
Directives about ecological building (specifications, contracts)	
Separation / reuse of building and demolition waste	

Nature conservancy

Minimising use of chemical insecticides	
Ecological nature conservancy wherever possible	
Enlargement of green areas	
Differentiation in flora and fauna	

Traffic

Discourage use of cars by personnel	
Encourage use of public transportation and bicycles	
Diminish total amount of traffic kilometres	

Sources: TU Delft (1991); SME (1996); BS 7750; EMAS

Appendix 3.1-1. *Text*:   Learning outcomes related to sustainable development according to LSF

These are the knowledge, skills and values relevant to sustainable development that Learning for a Sustainable Future considers necessary to ensure a sustainable future.

Source: LSF (Learning for a Sustainable Future)
http://www.schoolnet.ca/learning/teacher/index_en.html

Knowledge
This is a list of the knowledge that today's youth will need to acquire in order to become responsible citizens in the 21st century.
- ?? The planet earth as a finite system and the elements that constitute the planetary environment.
- ?? The resources of the earth, especially soil, water, minerals, etc., and their distribution and role in supporting living organisms.
- ?? The nature of ecosystems and biomes; their health, interdependence within the biosphere.
- ?? The dependence of humans on the resources of the environment for life and sustenance.
- ?? The sustainable relationship of native societies to the environment.
- ?? The implications of the distributions of resources in determining the nature of societies and the rate and character of economic development.
- ?? Characteristics of the development of human societies including nomadic, hunter gatherer, agricultural, industrial and post industrial and the impact of each on the natural environment.
- ?? The role of science and technology in the development of societies and the impact of these technologies on the environment.
- ?? Philosophies and patterns of economic activity and their different impacts on the environment, societies and cultures.
- ?? The process of urbanization and implications of de-ruralization.
- ?? The interconnectedness of present world political, economic, environmental and social issues.
- ?? Aspects of perspectives and philosophies concerning the ecological and human environments; for example, the interconnectedness of matter, energy and human awareness.
- ?? Cooperative international and national efforts to find solutions to common global issues, and to implement strategies for a more sustainable future.
- ?? The implications for the global community of the political, economic and socio-cultural changes needed for a more sustainable future.
- ?? Processes of planning, policy-making and action for sustainability by governments, businesses, non-governmental organizations and public.

Skills
This is a list of the skills that today's youth will require to contribute to a sustainable future.
- ?? Frame appropriate questions to guide relevant study and research.
- ?? Apply definitions of fundamental concepts, such as environment, community, development and technology, to local, national and global experiences.
- ?? Use a range of resources and technologies in addressing questions.
- ?? Assess the nature of bias and evaluate different points of view.
- ?? Develop hypotheses based on balanced information, critical analysis and careful synthesis, and test them against new information and personal experience and beliefs.
- ?? Communicate information and viewpoints effectively.
- ?? Develop cooperative strategies for appropriate action to change present relationships between ecological preservation and economic development.
- ?? Work towards negotiated consensus and cooperative resolution of conflict.

Values
This is a list of the attitudes and values that today's youth will need to acquire in order to become responsible citizens in the 21st century.
- ?? An appreciation of the resilience, fragility and beauty of nature and the interdependence and equal importance of all life forms.

??   An appreciation of the dependence of human life on the resources of a finite planet.

??   An appreciation of the role of human ingenuity and the individual creativity in ensuring survival and the search for appropriate and sustainable progress.

??   An appreciation of the power of humans to modify the environment.

??   A sense of self-worth and rootedness in one's own culture and community. A respect for other cultures and recognition of the interdependence of the human community.

??   A global perspective and loyalty to the world community.A concern for disparities and injustices, a commitment to human rights and to the peaceful resolution of conflict.

??   An appreciation of the challenges faced by the human community in defining the processes needed for sustainability and in implementing the changes needed.

??   A sense of balance in deciding among conflicting priorities. Personal acceptance of a sustainable lifestyle and a commitment to participation in change.

??   A realistic appreciation of the urgency of the challenges facing the global community and the complexities that demand long-term planning for building a sustainable future.

??   A sense of hope and a positive personal and social perspective on the future.

??   An appreciation of the importance and worth of individual responsibility and action.

Appendix 3.1-2. *Table*: Sustainable educational goals according to the Sustainable Development Education Panel

Value and dispositions	*Skills and aptitudes*	*Knowledge and understanding*
Interdependence		

Compassion for all humanity and concern for social justice globally, now and for the future.
  Concern for and appreciation of all living things, their needs and interrelationships.
  Appreciation of the earth and universe as a source of inspiration and challenge to human creativity.
	Reflect critically on one's lifestyle and choices in the light of interdependence.
	  Discern patterns of interrelationship between environment and development topics and between actions and consequences.
		The environment and the human condition are inextricably interrelated.
		  Personal understanding of the environment derives from direct experiences which may be spiritual, aesthetic or practical, as well secondary sources.
		  How people continually impact on the environment and others, as individuals and as part of wider society, from local to global levels.
		  How biological systems operate and support life on earth and are affected by human activity.
		How major issues such as poverty, consumption, development, health, and loss of species are interrelated.
		  How changes in science and technology have changed the nature and extent of people's effect on the environment.
		  How the economy, society, and the environment are mutually affecting and interdependent.

Citizenship, stewardship		

Willingness to act as a responsible citizen, learning from and working with others to improve situations, with respect to sustainability.
  A sense of responsibility for personal and group actions, and an awareness of their likely impact on natural and human communities, both locally and globally.
	Engage in and manage change at individual and social levels.
	Find information, weigh evidence, and present reasoned argument on sustainable development issues.
	Express and communicate personal responses to social and environmental issues in a variety of ways.
		Community action and partnership is necessary to the achievement of more sustainable lifestyles.
		  The connection between personal values and beliefs and behaviour.
		  How the school, community and household can be managed more sustainably.
		  The roles and responsibilities of government and business in achieving sustainable development.

Future generations		
Appreciation that the quality of life of future generations is endangered or enhanced by actions we take now.	Consider the future direction of society and the environment, and personal role and contribution to the future.	Conservation, efficiency and restraint in use of resources is necessary to ensure quality of life in the future. How the current quality of the environment is a result of human and natural history.
Diversity		
Respect and value both human diversity - cultural, social, and economic - and biodiversity.	Weigh impact on diversity of personal and group decisions.	The maintenance of diversity is necessary to the health and sustainability of natural and human systems.
Quality of life and equity		

Appreciate why equity and justice is necessary to a sustainable society.	Distinguish between wants and needs.
	  Express quality of life in personal terms beyond consumption.
		There are basic human needs and these are universal.
		Inequality, exclusion and injustice persist within and between societies.
		  Quality of life is a broader concept than standard of living.

(see next page)

Development, carrying capacity and change		
Appreciation of the need to develop lifestyles which respect resource and carrying capacity limits.	Envision and distinguish between probable and possible futures. Question decisions, practices and processes which affect sustainable development issues and critically explore alternatives.	The earth's resources are finite, precious and access to them is unequal. A variety of economic and political forces determine how resources are used and managed. A variety of cultural and social values influence how resources are viewed. The carrying capacity of any environment, and of the earth as a whole, is limited by natural systems and resources. How increasing efforts by people around the world are working towards more sustainable development How business and industry is responding to the challenge of sustainable development.
Uncertainty and precaution		
Appreciation that there are a range of possible approaches to sustainable development issues. Appreciation that the limits of knowledge about the environment and sustainable development requires critical thinking about its validity and caution in use. Appreciation of the need for life-long learning in relation to sustainable development and change.	Listen to, critically evaluate, and learn from a range of voices and opinions on sustainable development issues. Explore the urgency, need for and nature of sustainable development in the local and global community. Think critically and systemically about sustainable development issues. Respond positively to uncertainty and change in working towards a more sustainable future.	Knowledge about the environment and our relation to it is growing, changing and uncertain.

From: Sustainable Development Education Panel (1999)

Appendix 3.1-3. *Text*:   Sustainable elements in the professional profile of a technical engineer

A. *When designing a product or a process, the engineer is capable of …*

? **Product specification:**
… weighing the importance of sustainable development in the specification of functional demands, and translating this in a list of requirements

? **Technical optimisation:**
… considering possible suboptimisations or rebound effects of the design, for instance due to the translation of functional demands to product specifications

? **Consumer behaviour:**
… estimating possible differences between *expected* and *actual* behaviour of the future user of technical products and processes, and relate this estimate in the design of the products and processes
Relevant concepts: user friendly; bringing technology to the people instead of vice versa; rebound effects

? **Integrated Problem Handling:**
… minimising suboptimisations and rebound effects by working according to Integrated Problem Handling (IPH)

? **Consequence period:**
… determining the consequence period of decisions about the design, putting these against time scales concerning sustainable development, and using the conclusions while making decisions
Relevant concepts: product improvement (short-term development); product innovation (medium term); system innovation (long term)

? **Selection of materials and energy:**
… determining the applicability of reused parts, recycled materials, renewable materials and inexhaustible energy; minimising the use of non-renewable materials and exhaustible energy (both during production and during use and life end) and determining the consequences to the estimated working life and product quality and to the production process
Relevant concepts: substitution; renewable materials; FMEA; signature analysis

? **Integral cost account:**
… calculating the integral costs of a product based on the full life cycle, including costs during and after the working life.
Relevant concepts: Integral Chain Management; LCCA (Life Cycle Cost Account)

? **Assess consequences:**
… mapping the effects of the design on sustainable development, and applying the conclusions in decision-making.
Relevant concepts: environmental impact; LCA (Life Cycle Assessment); scarcity of resources (like: raw materials, energy, surface area, clean water, biodiversity); quality of life

? **Weighing of interests:**
… making a balanced weighing of the interests stemming from technical, economical, sustainability- and user demands, and deciding on the basis of this.
relevant concepts: environment oriented product development; design for disassembly (DFD); design for environment (DFE)

? **Critical reflection:**
… reflecting critically to received tasks and research questions, while taking into account the consequences of them to sustainable development, from the own individual responsibility

B. As a professional, the engineer is capable of ...

?   **Professional responsibility:**
… rendering an account of his/her functioning, by estimating and communicating the societal consequences on the short and the long term of the work he/she performs, seen in the light of sustainable development
Relevant concepts: the responsible engineer; the sustainable engineer

?   **Information:**
… explaining to third parties, including others than professional colleagues, why considerations around sustainable development have certain consequences for certain designs

?   **Societal role:**
… taking part in discussions with others than professional colleagues on the basis of his/her expertise about technical and non-technical aspects of sustainable development, and thus contributing to the societal formation of opinions

Appendix 3.2-1: Table: Aspects of reflective learning

relates education contents with skills, values and attitudes		
stimulates critical thinking (forming of opinion and decision making)		
creative thinking		
stimulates problem solving thinking		
stimulates the target group to share own values and conclusions with others		
creates and stimulates opportunities to consciously make decisions		
stimulates consultations, discussions and joint decision making		
stimulates self-reliant learning		
stimulates learning in groups		
stimulates a methodical style of working on tasks and problems		
teaches the target group that emotional commitment is allowed		
teaches the target group to utilise knowledge and experiences		
stimulates values like	righteousness	
	equality	
	solidarity	
	respect	
	tolerance	
	sustainability	
Offers a real perspective (no doomwatch)		
offers evaluation and adjustment		
is innovative		

(Table derived from: Aminal - Administratie Milieu-, Natuur-, Land- and Waterbeheer: Dossier nr. 1. Ministerie of the Vlaamse Gemeenschap, Brussels 1999)

Appendix 4.1-1. *Text*: Basic knowledge of Sustainable Development for engineering courses

Contents of a Dutch basics module

1. Introduction

    1.1.   The concept of sustainable development
    1.2.   The concept of sustainable technology

2. From environment issues to sustainability issues

    2.1.   Main lines
    2.2.   Pollution
        2.2.1.   Risks of materials and substances
        2.2.2.   Effects: emission, transmission and immission
        2.2.3.   Environmental effects of extraction and deployment of resources
    2.3.   Depletion
        2.3.1.   The use of our resources
        2.3.2.   Energy
    2.4.   Growth of population and prosperity
        2.4.1.   Population growth
        2.4.2.   Unequal distribution of prosperity
    2.5.   Limits to growth
    2.6.   Environment exploitation space

3. From environmental law to sustainable policies

    3.1.   Contemporary environmental law and –regulations
    3.2.   Policy development phases
    3.3.   Development of a vision on sustainability
    3.4.   The Dutch situation
        3.4.1.   The STD method
        3.4.2.   Eco-efficiency
        3.4.3.   System approach
    3.5.   The role of private initiatives

4. Sustainability in a societal framework

    4.1.   Introduction
    4.2.   Economy and environmental costs
    4.3.   Consumption patterns
    4.4.   Cultural aspects
    4.5.   Influences and change

5. Sustainability in companies

    5.1.   Introduction
    5.2.   Sustainability as a strategy
    5.3.   Instruments for sustainability
        5.3.1.   Integral chain management
        5.3.2.   Co-operation with other companies

6. The sustainable engineer

6.1.   Makers, directors and translators
6.2.   Different thinking, different acting
6.3.   Design for sustainability
6.4.   Instruments for improvements
    6.4.1.   Integral chain management
    6.4.2.   Life Cycle Assessment (LCA)
    6.4.3.   Ecological footprint

7. Main themes in sustainable development

7.1.   Energy
7.2.   Housing / building
7.3.   Integral water management
7.4.   Infrastructure of business parks
7.5.   Raw materials
7.6.   Agriculture and food
7.7.   Consumer behaviour

Source: Venselaar & Roorda (2000)

Appendix 4.1-2. *Table*: Curriculum elements for technical courses according to HE 21

Global issues	Global warming	
	Accumulation of toxic waste	
	Depletion of finite resources	
	Desertification	
	Ozone depletion	
	Acid rain	
Key sustainability concepts	Laws of thermodynamics	
	Interdependence of natural, social and economic systems	
	Limits to growth / carrying capacity	
	Precautionary principle	
	Intergenerational equity	
	Conservation	
	Resource efficiency	
	Biodiversity	
Legislation, policy and control	International environmental / sustainability policy and agreements	
	European environmental / sustainability policy & law	
	National environmental / sustainability policy & law	
	Economic instruments	
Tools and techniques for sustainable solutions	Environmental management systems principles	
	Environm. management systems standards (ISO 14001, EMAS)	
	Environmental reporting	
	Eco-labelling	
	Environmental impact analysis	
	Life-cycle analysis/input-output analysis	
	Product stewardship	
	Environmental / sustainability indicators	
	Stakeholder analysis	
	Social reporting	
	Social audit	
Responsibility	Environmental ethics and values	
	Social ethics and values	
	Means of delivering sustainability (legal, economic, managerial, design, scientific, technological, educational solutions)	
	Individual social & environmental responsibility	
	Engineers' social and environmental responsibilities	

Key skills	Strategic planning	
	Critical analysis	
	Information management	
	Team management	
	Effective communication	
	Autonomy / self reliance	

Source: HE21-programme, 1999: from a questionnaire, propounded to British academic technical courses.

Added curriculum elements for technical courses acc. to HE21	
Safety and loss prevention including risk assessment as applied to processes and products and hazard analysis	
Pollution prevention, integrated pollution control and monitoring, treatment technology	
A systems approach to problems	
Emissions trading and penalties	
Design life and design efficiency in relation to electrical, electronic and mechanical systems	
Renewable energy including alternative energy sources and their role in the energy market	
Environmental costs of using a specific material	
Technology in society and appropriate technology	
Energy systems and safety and environmental engineering	
Wind turbine design	
Conservation and resource management	
Deforestation	
Water quality	
Air pollution	
Traffic management and transport	
Social impact assessment	
Local Agenda 21	
Recycling and reclamation	
Design for disassembly	
Renewable energy	
Wave power	
Sustainability technology	

Source: HE21-programme, 1999: in reaction to a questionnaire, propounded to British academic technical courses, added by respondents.

Appendix 4.1-3. *Table*: Curriculum elements for business courses according to HE 21

Corporate Responsibility	Environmental ethics and values	
	Social ethics and values	
	Corp. environm. & social responsibility / corp. citizenship	
	Individ. environm. & social responsibility / global citizenship	
	Environmental stewardship	
	Stakeholders and stakeholder management	
Systems Thinking and Methods	Systems thinking	
	Environmental systems / natural cycles	
	Limits to growth / carrying capacity	
	Applic. of systems thinking to the search for solutions	
Corporate Strategy and Change	The role of leadership/corporate visions	
	Long termism vs short termism	
	Converting threats into opportunities	
	Contribution of business to sustainable solutions	
	The role of lifelong learning	
	Sustainable economics	
Management Systems, Tools and Techniques	Environmental management systems principles	
	Environm. managem. systems standards (ISO 14001, EMAS)	
	Environmental reporting	
	Environmental impact analysis	
	Life-cycle analysis/input-output analysis	
	Product stewardship	
	Environmental / sustainability indicators	
	Social audit/social reporting	
Managing partnerships and networks	Stakeholder analysis	
	Rationale for external partnerships	
	Managing external partnerships	
	Rationale for inter and intra organisational networks	
	Managing networks	
	Corporate community investments	
Environmental legislation, policy and control	International, European and national environmental policy and law	
	Administration and enforcement	
	Fiscal instruments	
	Economic instruments	
	Integrated pollution control	
	Integrated transport policy	

Source: HE21-program, 1999: from a questionnaire, propounded to British academic business courses.

Added curriculum elements for business courses acc. to HE21	
Balance between personal and organisational demands	
Methods of managing change	
Environm. influences on consumer behaviour; implications on marketing strategy	
Consideration of corporate image: marketing / PR	
Role of Quality Management in reducing waste in organisations	
Neg. influence of leisure on environment: overuse of pop. areas, countryside erosion	
Unsustainable tourism	
Planning effects of urban tourism	
Organisational support for learning, e.g. mentoring	
Gaia theory	
Deep ecology	
Rural issues	
Sustainable tourism operations & International Hotel Environment Initiative	
Environmental influence on R&D	
Environmental influence on technological innovation	
Green agenda	
Major threats to planet	
Ecodesign & manufacture	
Energy efficiency	
Waste management and waste minimisation	
Green marketing & purchasing	
Environmental communication & awareness-raising by campaign groups	
Product & process design	
Recycling	
Transport economics	
ISO 14001: due for incorporation in 1999	
Environmental reporting, SMEs and environmental management, individual environmental and social responsibility	
Environmental marketing, environmental communication	
Perspectives on change: incremental, transformational, and a critique of these	

Source: HE21-program, 1999 in reaction to a questionnaire, propounded to British academic business courses, added by respondents.

Appendix 4.1-4. *Table*: Curriculum elements for design courses according to HE 21

Responsibility	Environmental ethics & values	
	Social ethics & values	
	Corporate environm. & social responsibility / corporate citizenship	
	Individual environm. & social responsibility / global citizenship	
	Environmental stewardship	
	Stakeholders & stakeholder management	
Systems thinking and methods	Systems thinking	
	Environmental systems / natural cycles	
	Limits to growth / carrying capacity	
	Application of systems thinking to the search for solutions	
Design for the future	Vision	
	Long termism vs. short termism	
	Converting threats into opportunities	
	Contribution of design to sustainable solutions	
	The role of lifelong learning	
	Sustainable economics	
Management systems, tools and techniques	Environmental management systems principles	
	Environmental manag. systems standards (ISO 14001, EMAS)	
	Environmental reporting	
	Eco-labelling	
	Social reporting	
	Social audit	
	Environmental impact assessment	
	Life-cycle analysis/input-output analysis	
	Product stewardship	
	Environmental / sustainability indicators	
Managing partnerships and networks	Stakeholder analysis	
	Rationale for external partnerships	
	Managing external partnerships	
	Rationale for inter and intra organisational networks	
	Managing networks	
Environmental legislation policy and control	International, European and national environmental policy and law	
	Administration and enforcement	
	Fiscal instruments	
	Economic instruments	
	Integrated pollution control	
	Integrated transport policy	

Source: HE21-program, 1999: from a questionnaire, propounded to British academic design courses.

***Added* curriculum elements for design courses according to HE21**	
Consumerism used as a basis for discussing broadcast texts	
Aspects of sustainability relevant to packaging and print technology and papers	
De-materialise; interdisciplinary team working, meeting needs, materials; aesthetics & ethics	
Environmental risk management	
Ecological footprinting	
Consumption levels and distribution, waste streams	
Risk assessment, resources management, sustainability as a political theme	
Use of new & recycled materials	
Eco-packaging	
Population growth, environmental & global consequences, design solutions	
Legislation & policy via professional practice module	
New & alternative technologies	
Consideration of stakeholder participation	
Sustainable waste management	
Energy management	

Source: HE21-program, 1999: in reaction to a questionnaire, propounded to British academic design courses, added by respondents.

Appendix 4.1-5. *Table*: Curriculum elements for teacher education courses according to HE 21

Systems thinking	Socio-political systems	
	Economic systems	
	Cultural systems	
	Links between the above systems	
Key sustainability themes	People as part of nature	
	Biodiversity	
	Conservation	
	Resource efficiency	
	Limits to growth / population / carrying capacity	
	Precautionary principle	
	Ecological footprint	
	Intergenerational equity	
	Social cohesion	
	Partnerships	
Global problems	Global warming	
	Accumulation of toxic waste	
	Depletion of finite resources	
	Desertification	
	Ozone depletion	
	Acid rain	
	Poverty	
Approaches to sustainable solutions	Legal	
	Economic	
	Managerial	
	Scientific and technological	
	Educational	
Sustainable development tools and techniques	Visioning	
	Environmental management systems standards	
	Life cycle analysis / input-output analysis	
	Environmental impact analysis	
	Environmental audit	
	Social audit	
	Eco-labelling	
	Environmental reports	
	Social reports	
	Environmental / sustainability indicators	

Responsible global citizenship	Clarification of values re sustainability	
	Clarification of ethical position re sustainability	
	Democratic rights and responsibilities	
	Individual environmental rights and responsibilities	
	Individual social rights and responsibilities	
	Corporate responsibility	
Pedagogy	Values clarification	
	Holistic thinking	
	Long term thinking	
	Positive solutions thinking	
	Cautious decision making	
	Taking responsibility / principles into practice	
	Interdisciplinary dialogue	
	Emotional Intelligence / diplomacy	

Source: HE21-program, 1999: from a questionnaire, propounded to British academic teacher education courses.

Appendix 4.2-1. Diagram: Growth of complexity in an engineering curriculum

(The arrow of time points upwards: the propaedeuse is at the bottom, the final year is at the top.)

The sustainable engineer in a sustainable society

Responsibility as a professional and as a citizen
Vision on sustainable development
Vision on nature
Role of technology
Backcasting
Growth and dematerialization
(Sub)optimisation
Sharing prosperity
Relation with war & peace

Consumer oriented Design

Actual product use
Tune technique on the customer
Ergonomics
From product to services
"Intelligent" equipment
Rebound effects

Sustainable business

Investment strategy (short -
      medium – long term)
Mission, reason for existence
Market strategy
Product definition
Advertising
Innovation management
Environmental and clean economics
Management systems
Transport and logistics
Packaging
Individually oriented flexible production
Public relations
Consumer oriented eco indicators
Company responsibility:
      Ethical;
      Legal liability
"Robust" management
Safety
Organisational chain management
Business parks, cooperations

Technical Design

Methodical design incl. sustainability aspects
   Product chain management
   LCA, LCCA
   DFA, DFD, DFE, Signature Analysis
   Product quality
   Material and energy efficiency
   Making decisions

Resources

Space, surface area, landscape, silence
Water, air
Nature, biodiversity, carrying capacity
Threats:
      degradation, pollution, depletion
Considerations

Technology

Production technologies
New technologies:
   Nanotechnology,
   ICT,
   Artificial intelligence,
   Gene technology,
   Virtual Reality
Catalysis technology
Materials processing
Surface techniques
Assemblage technology
Simulations
Cybernetics

Energy

Finite sources: oil, gas, ...
Infinite sources: sun, wind,
   biomass, water, ...
Generation technology
Transport and storage
Energy for transport
Total energy system
Costs
Risks, safety
Effects: landscape, climate,
   environment, town and
country planning, ...
Extensivation
Electrification
Future perspectives

Materials

Sources, finity
Renewable materials
Life cycles
Substitution
Environmental effects
Standardisation
Recycling
Lansink's Ladder
Design of materials

Culture

Consumer behaviour
Cultural differences
Consumption needs
Individualisation
Need for transportation
Recreation
Living and working
Occupation percentage
Domestic refuse
Food

Structure

Town and country planning
Multifunctional use of
      surface area
Integral water management
Transport systems
Demography
Nature
Eco-capacity
Visions on sustainability
Government:
   Green GNP, FCA
   Policy premises
   Law
   Stimulating role
   Convenants
(Inter)national institutions

Introduction: Technology and Sustainable Development

Appendix 4.4-1: *Text*:   The certificate "Technology in Sustainable Development"

*The Technical University of Eindhoven (*TUE*) has a center for Technology in Sustainable Development (*TDO*). One of the tasks of this center is to provide education in sustainable technology. In order to have the right to receive a special certificate at the graduation, certain demands have to be fulfilled. In the brochure it says:*

With the TDO certificate of the TUE a student shows that he or she:
- ?? is able to present the essentials of the most important environmental problems and the directions for solutions in sustainable development and sustainable technology;
- ?? is able to indicate a number of important environmental problems and a number of research areas about sustainable development within the own professional field;
- ?? in able to integrate environmental aspects in the design process within the own professional field;
- ?? recognizes the multidisciplinary nature of sustainable technology;
- ?? is able to indicate for design problems which other disciplines are important;
- ?? is able to function in multidisciplinary groups.

Demands to the curriculum

In order to receive the TDO-certificate, at least one year (42 credit points) has to be dedicated to sustainable development, environment and energy. The credit points are spread over the curriculum and the graduation project. The At least 6 module have to be chosen (14 credit points). These may consist in part of obligatory or optional subjects of the own study programme. The major part of the 42 credit points consist of the graduation project of the own study programme, which is done in a TDO-area. The studie can be integrated into the normal study programme.

The 42 credit points are scored as follows:

- ?? The most important part for the TDO-certificate id formed by the graduation research project, which has to be performed in a TDO-area. The credit points of this project account 100% for the TDO-certificate.

- ?? Obligatory are the two basic modules Technology and Sustainability and the Multidisciplinary Project on Sustainable Development. These modules together count for 6 credit points or more.

- ?? From the list of specialisation courses at least 4 courses have to be selected. At least one of them is on a policy subject, and at least two of them on technical subjects: one of those is outside the own technical discipline. Together, these specialisation courses count for at least 8 credit points.

- ?? So, in total at least 6 courses have to be followed in a TDO-area. This counts for at least 14 credit points.

- ?? The rest of the credit points is received for the graduation project and/or supplementary courses in a TDO-area of the own faculty and/or a traineeship in a TDO-area. In each faculty, one or more specialisation courses exist in TDO-areas.

Appendix 5.1-1. *Questionnaire*: Sustainability Assessment Questionnaire (SAQ)

for Colleges and Universities

from: ULSF (1999)
Association of University Leaders for a Sustainable Future

Curriculum

1. Indicate the extent to which your institution offers courses which address topics related to sustainability. (Such topics could include globalization and sustainable development; environmental policy and management; environmental philosophy; nature writing; land ethics and sustainable agriculture; urban ecology and social justice; population, women and development; sustainable production and consumption; and many others.)
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please list any courses you are aware of in which such topics are taught.

2. What courses do you regard as essential that are not being taught?

3. Indicate the extent to which sustainability is a focus woven into traditional disciplinary education in science, math, literature, history, the arts, etc.?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please comment on how this is done.

4. The shift to sustainability requires critical thinking about the role of the institution in its social and ecological systems. Circle which of the following your institution attempts to instil in its students:
    a - how the campus functions in the ecosystem (e.g. its sources of food, water, energy, as well as the endpoint of waste and garbage)
    b - a sense of place: the natural features, biota, history and culture of the region.
    c - the institution's contribution to a sustainable economy and sustainable local communities
    d - how the institution views and treats its employees (such as staff and faculty involvement in decision-making, their status and benefits, etc.)
    e - the basic values and core assumptions that shape the content and methods of the academic disciplines

Scholarly Activities

5. Estimate the amount of research or scholarship being done in the various disciplines in the area of sustainability (for example, renewable energy, sustainable building design, ecological economics, indigenous wisdom and technologies, population and development, total environmental quality management, etc.).
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please list any research and scholarly activities you are aware of related to sustainability.

6. a) What percentage of faculty members teach or do research on sustainability issues?
    b) What percentage of faculty members do you estimate would be interested in teaching and research on sustainability issues?

7. Does your institution have established multidisciplinary and interdisciplinary structures for research, education and policy development on sustainability issues?
    If yes, please describe.

Institutional Operations

8. The chart below lists some of the operational practices emphasized by institutions moving toward sustainability. Please complete the chart and indicate the extent to which your institution has implemented these practices using the following scale:
    1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 - don't know.

Practices	Rate from 1 - 5	Please comment
CO2 and air pollution reduction practices (including alternative fuel use, renewable energy sources, emission control devices, etc.)		
Indoor air quality standards and practices		
Building construction and renovation based on ecological design principles		
Energy conservation practices (in offices, laboratories, libraries, classrooms and dormitories)		
Local or organic food purchasing program		
Purchasing from and investing in environmentally and socially responsible companies		
Waste reduction practices		
Recycling of solid waste (including paper, plastic, metal, etc.)		
Transportation program (including bicycle/pedestrian friendly systems, car pools, bus pass programs, electric / natural gas campus vehicles, etc.)		
Water conservation practices (including efficiënt shower heads and irrigation systems)		
Integrated Pest Management practices		
Source reduction of toxic materials and radioactive waste		
Sustainable landscaping (emphasizing native plants, biodiversity, minimizing lawn, etc.)		
Others (please specify):		

9. What do you see when you walk around campus that tells you this is an institution committed to sustainability?

10. To what extent are your operations practices integrated into the educational and scholarly activities of the school?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please provide examples of this integration.

Faculty and Staff Development and Rewards
11. To what extent do criteria for hiring, tenure and promotion recognize faculty member contributions to sustainability (in scholarship, teaching, or campus and community activities)?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Describe how such considerations are weighed in these decisions.

12. To what extent does your college or university provide significant faculty and staff development opportunities to enhance understanding, teaching and research in sustainability?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please describe recent faculty or staff development opportunities in these areas.

Outreach and Service
13. A sustainable institution supports sustainable communities in the surrounding region through partnerships with primary and secondary schools and relationships with local governments and businesses. It also seeks international cooperation in solving global environmental justice and sustainability problems through conferences, student/faculty exchanges, etc. To what extent is your institution involved in sustainable community work or partnerships at local, regional, national or international levels?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Please describe.

14. What sustainability related community service, service learning and/or internship programs exist at your institution?

Student Opportunities

15. Institutions committed to sustainability provide students with particular opportunities and settings. Please check which of the following are present on your campus:
    - ??   Student Environmental Center
    - ??   Ecology House or Sustainable Dormitory
    - ??   Orientation programs on sustainability for students

16. How does your college or university encourage students to consider sustainability issues when choosing a career path? Please check where applicable:
    - ??   Job fairs and career counseling focused on work in sustainable enterprises
    - ??   Pledge of social and environmental responsibility
    - ??   Other: . . . .

17. To what extent are student groups across campus directly involved in sustainability initiatives?
    1 (none) 2 (a little) 3 (quite a bit) 4 (a great deal) 5 (don't know)
    Describe which groups are most involved and how.

Institutional Mission and Structure

18. To what extent do the formal written statements describing the purposes and objectives of the units listed below reflect a commitment to sustainability? (Such statements include policy and planning documents, annual reports, brochures, catalogues, etc.)
    - ??   The institution as a whole   *1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 -don't know*
    - ??   Your college or division   *1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 -don't know*
    - ??   Your unit/department   *1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 -don't know*
    - ??   Other units within the
      institution (please define)   *1 - none; 2 - a little; 3 - quite a bit; 4 - a great deal; 5 -don't know*

19. Institutions committed to sustainability create certain positions and committees, as well as engage in certain practices which reinforce this commitment. Please check which of the following are present on your campus:
    - ??   Environmental Council or Task Force
    - ??   Environmental Coordinator- (   ) student or (   ) staff member
    - ??   Dean of Environmental Programs or Director of Sustainability Programs (a high level officer responsible for these activities)
    - ??   Energy Officer
    - ??   Green Purchasing Coordinator
    - ??   Institutional Declaration of Commitment to Sustainability/Environmental Responsibility
    - ??   Orientation programs on sustainability for faculty and staff
    - ??   Socially responsible investment practices and polices
    - ??   Regularly conducted environmental audits
    - ??   Other: . . . .

20. How is a concern for, and commitment to, sustainability given broad visibility on your campus (for example, with guest speakers, conferences, Earth Day celebrations, etc.)? Please describe key events that have happened in the past year.

21. Please describe the greatest strengths and weaknesses of your institution in educating for sustainability.

22. a)   What "next steps" are planned at your college or university to strengthen your commitment to sustainability?
    b)   What "next steps" would you like to see planned?

Appendix 5.2-1: *Text*:   INES appeal to engineers and scientists

Cited from: INES (1995)

INES Appeal to Engineers and Scientists
Opened for signature on July 16, 1995,
the 50th anniversary of the first nuclear explosion (Trinity Test).

APPEAL

Science and technology influence the social, economic and political development of civilisation throughout the world. In many ways science and technology have made our life easier, richer and safer. However, science and technology can be used for destructive purposes and are key factors in the current growth economy that is threatening the viability of the biosphere and of human societies.

In its origins, science is a search for truth about our world. Its results can be used for good and misused for evil. Technological consequences are now so powerful and interconnected, so sweeping in unforeseen results, that they endanger basic requirements for sustaining life on earth. Without adherence to generally accepted ethical standards, science and technology can damage the future of society and life itself.

The greatest challenge of our time is to enable to all members of the world population to live in dignity in a manner that is sustainable for humankind and nature. In meeting this challenge science and technology - if used in the right way - play a decisive role by providing the necessary means or by analyzing the various consequences of human activities.

The web of humanity and life as a whole must not be endangered by vested interests. Knowledge gives power, and power may corrupt and be used for destructive purposes. Therefore, social structures and institutions on local, national, regional and global levels are urgently needed to promote responsible uses of science and technology. We appeal to engineers and scientists to respect human rights and human dignity unconditionally.

Secrecy of scientific and technological research allows its misuse. Our vision is a science which seeks truth in open discourse.

In the last decades several initiatives promoting ethical pledges of scientists have been launched. The values underlying these pledges can form the foundation of a worldwide community of responsibility among scientists and engineers. In adherence to the UNESCO Declaration for Scientific Professionals of November 1974, we have attempted to harmonize existing pledges into the following code of ethics:

(next page)

Pledge

1. I acknowledge as a scientist or engineer that I have a special responsibility for the future of humankind. I share a duty to sustain life as a whole. I therefore pledge to reflect upon my scientific work and its possible consequences in advance and to judge it according to ethical standards. I will do this even though it is not possible to foresee all possible consequences and even if I have no direct influence on them.

2. I pledge to use my knowledge and abilities for the protection and enrichment of life. I will respect human rights, and the dignity and importance of all forms of life in their interconnectedness. I am aware that curiosity and pressure to succeed may lead me into conflict with that objective. If there are indications that my work could pose severe threats to human life or to the environment, I will abstain until appropriate assessment and precautionary actions have been taken. If necessary and appropriate, I will inform the public.

3. I pledge not to take part in the development and production of weapons of mass destruction and of weapons that are banned by international conventions. Aware that even conventional arms can contribute to mass destruction, I will support political efforts to bring arms production, arms trade, and the transfer of military technology under strict international control.

4. I pledge to be truthful and to subject the assumptions, methods, findings and goals of my work, including possible impacts on humanity and on the environment, to open and critical discussion. To the best of my ability I shall contribute to public understanding of science. I shall support public participation in a critical discussion of the funding priorities and uses of science and technology. I will carefully consider the arguments from such discussions which question my work or its impact.

5. I pledge to support the open publication and discussion of scientific research. Since the results of science ultimately belong to humankind, I will conscientiously consider my participation in secret research projects that serve military or economic interests. I will not participate in secret research projects if I conclude that society will be injured thereby. Should I decide to participate in any secret research, I will continuously reflect upon its implications for society and the environment.

6. I pledge to enhance the awareness of ethical principles and the resulting obligations among scientists and engineers. I will join fellow scientists and others willing to take responsibility. I will support those who might experience professional disadvantages in attempting to live up to the princi ples of this pledge. I will support the establishment and the work of institutions that enable scientists to exercise their responsibilities more effectively according to this pledge.

7. I pledge to support research projects, whether in basic or applied science, that contribute to the solution of vital problems of humankind, including poverty, violations of human rights, armed conflicts and environmental degradation.

8. I acknowledge my duty to present and future generations, and pledge that the fulfilment of this duty will not be influenced by material advantages or political, national or economic loyalties.

The above text incorporates material and ideas from the following declarations :
- ?? The Mount Carmel Declaration on Technology and Moral Responsibility (Haifa, 1974)
- ?? The Biologists Pledge (MIT, 1987)
- ?? Hippocratic Oath for Scientists (Nuclear Age Peace Foundation, (1987)
- ?? The Buenos Aires Oath (Buenos Aires, 1988)
- ?? The Uppsala Code of Ethics for Scientists (Uppsala, 1984)
- ?? Hippocratic Oath for Scientists, Engineers and Executives (Inst. for Social Inventions, 1987)
- ?? Scientists Pledge Not to Take Part in Military-Directed Research (SANA, London, 1991)
- ?? Appeal to Scientists (Wittenberg, 1989)
- ?? A Pledge for Scientists (Berlin, 1984)
- ?? The Toronto Resolution (Toronto, 1991)

Appendix 5.4-1: *Table*:   Societal approbations

Approbation	Result
Award for a student paper, graduation report etc. related to environment or sustainable development	
Certificate for the Internal Environmental Management: ISO 1400x, EMAS, BS7750	
Award for education innovation related to environment or sustainable development	
Certificate for Sustainable Education	
Environmental certificate for a product or service developed by students or staff members	
Award for a mini-company by students with a clear environmental or sustainability mission	
Award for a publication by students or staff members in which sustainability is a strong aspect	
Honorary doctorate for an excellent achievement related to sustainable development	

Appendix X1: The educational version of EFQM
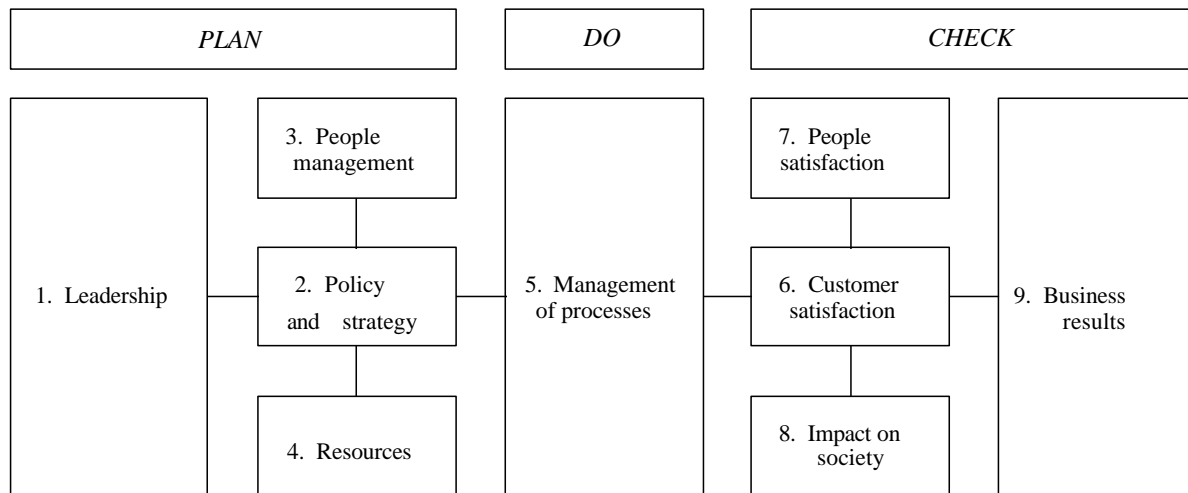
Division in 9 fields of attention of the EFQM Excellence Model.
(©EFQM 1999. The EFQM Excellence Model is a Registered Trademark.)

The 5 stages of EFQM (educational version)

Text from: "Method for improving the quality of higher education based on the EFQM-model", third version, Eindhoven (Netherlands) 1999.

Stage 1: Activity-oriented
In a department, faculty, or institute for Higher Education as a whole whose average score throughout all units places it in stage 1, it is the professional, the craftsman, the *specialist teacher,* who teaches the students to find their way into his or her subject on the basis of his or her individual vision on the subject or profession in question. The teacher's activities mainly consist of the transfer of knowledge. Some teachers may have many contact hours (e.g. 28 hours per week). The subject matter is the central issue. Students are counselled on an individual basis by teachers who are willing to do so. First and foremost, the teacher is a professional.
The actual teaching is strongly individual. The organisational policy is aimed at facilitating teacher activities and, in a way, to leave the teachers to do their job. The working methods and culture are highly informal. The sum of the competences of the individual teachers comprises the total vision of the organisation on the profession and the education. Decisions are typically made on an ad-hoc basis and aimed at the short term. *Objectives* have been formulated for *each subject.*
The relevance of *documenting* agreements is recognised only to a limited extent.
If quality is evaluated at all, this is mainly *the responsibility of the individual teacher.*
At this stage, the educational organisation could be called a *craft- or subject-oriented school.*

Art(s) departments share many characteristics of this stage. The educational processes are mainly organised in the form of a year-grading system. The organisation has chosen not to adopt a single vision on the form of art it teaches and the education it provides, but rather to provide plenty of room for other, divergent, visions. The contacts between 'master' and 'pupil' are frequent and intense. Deliberate decisions are made, for example, to employ top musicians for a particular instrument. These individuals often have a highly personal perspective on their art and the way it should be taught, but this should he treasured, and not destroyed by regulations, procedures, or systems. The work cannot be done without emotion, without passion, which is why the colour red has been chosen for this stage.

Stage 2: Process-oriented

Typical for an educational organisation in this stage is that, in addition to the subject matter, *the educational process* receives the attention it requires. Teachers pay much attention to the effectiveness of their teaching methods. Students receive study counselling if they so wish. Teaching is a profession. First and foremost, the teacher is a pedagogue.

The school is divided into *specialist sections*. The autonomy of teachers has declined, because they have to attune their work to that of their colleagues. This also means that they should consult each other about what they do in their courses.

There is a clear short-term policy. The contours of *a policy cycle* are beginning to appear at the level of the organisation, but the policy is limited to a few aspects of the organisation. The specialist sections share a common vision of the profession and education. Within the specialist sections, the aim is integration - by means of thematic courses, for example. End terms have been formulated for each discipline or theme. The activities students are to undertake within such a theme have been documented.

Procedures are becoming more unequivocal and transparent. *Parts* of the educational process have been described and documented.

Parts of an evaluation system are operational; the responsibility for this rests with *the specialist sections.*

A study course, study department, or Institute for Higher Education as a whole that is 'on average' in stage 2 (process-oriented) might be called a *teaching school.*

Departments as they were ten years ago, when careful experiments were made with modularisation and integration through the use of themes or projects, had many characteristics of this stage. The educational organisation has chosen not to communicate a single vision on education, but to provide the specialist sections with sufficient scope to make a specific contribution to the professional profile. Educational development mainly takes place within these specialist sections.

Besides themes and projects, the curriculum also contains many single-subject modules. Teachers are not only selected for their knowledge of a specific subject, but also for their didactic skills and experience. This approach is, to some extent, business-like, which is why the colour blue has been chosen for this stage.

Stage 3: System-oriented

Typical for an educational organisation in stage 3 is that, apart from the subject matter and the educational process*, supporting processes* receive the attention they require. The learning process of the student has become the central issue of the organisation and the education it provides. Studyability and 'small-scale quality' are key concepts in this stage. The teacher activities are derived from the student activities. Each student receives study counselling. Facilitating learning processes is what teaching is all about. The teacher is the manager of the student's learning process, his or her 'study coach'.

The study courses, as components of the organisation, function as centres of expertise for the entire organisation. The commitment of employees and students clearly increases. The autonomy of individual teachers has decreased even more, because they function here as members of teams within the study course, taking *joint responsibility* for the curriculum (by means of, for example, problem or project-oriented teaching).

The study course management - a team whose tasks include management, educational development, teaching activities, research, and providing services to third parties - manages teaching teams on the basis of shared agreements. A *medium-term policy* has been developed for the entire organisation. Measurable goals related to the policy have been formulated.

Convincing evidence is furnished that activities are carried out in accordance with directives and procedures.

The general orientation shifts from internal to *external* and is directed towards the market and the profession. A quality management system is operational and a start has been made with the careful definition and application of performance indicators. The organisation is responsible for quality improvements. The *PDCA cycle* is closed and realised in its entirety.

A study course, study department, or Institute for Higher Education as a whole in stage 3 (system-oriented) might be called a *learning school.*

In recent years, study courses all over the Netherlands have made the student the central element in their educational activities in some form or other. All kinds of project-oriented teaching, integrative courses, problem-oriented teaching, and mixtures of these types of education have been developed. Contact hours have dropped further to no more than 15 hours per week. The student is required to work independently. The University of Maastricht, with its centrally managed educational development towards problem-oriented education, is a good example, and the Open University is another.

Recent developments in which responsibilities have been passed back to teaching teams organised in the form of self-managed teams or autonomous task groups are also typical of this stage. This approach expects students and staff to operate self-reliantly, which is why the colour yellow bas been chosen for this stage.

Stage 4: Chain-oriented

Typical for an educational organisation in stage 4 is that the organisation regards itself as a *link* between supplying schools (for example intermediate and secondary education) and the labour market. The organisation continuously anticipates the desires and requirements of its customers. It engages in market-oriented activities commissioned by the professional field which produce a visible 'spin-off' for the regular study programmes, as in the form of projects, for example. At universities, scientific research has the same effect.

Students are given study career guidance (before, during, and after their studies). The organisation feels that its responsibility extends beyond simply letting students graduate. When the students enrol, the organisation positions itself as an education broker; when they leave it acts as a supplier to the labour market. The organisation has a rightful place within 'education permanente'. Apart from being managers of learning processes, teachers should also establish the link between learning at school and on-the-job learning.

The organisation has contacts with supplying schools and with representatives of the professional field. The external orientation is firmly embedded in the organisation. It monitors its competitors and adjusts its policy accordingly (with the help of instruments such as the Dutch *HBO-monitor,* for example, which is a nation-wide questionnaire presented to graduates from Higher Professional Education, concerning the attunement of Higher Professional Education to the labour market).

A general positive trend can be distinguished in comparison to similar organisations. The organisation may be visualised as an inverted pyramid with the customer at the top. It is *tilted.*

The policy orientation is mainly *external,* also regarding developments abroad (internationalisation). When designing the structure and tasks of the organisation, the management continuously evaluates which tasks the organisation should carry out itself and which tasks or services it should buy in. Activities and objectives are visibly related to the strategic and medium-term policy.

Procedures and directives are formulated on an organisation-wide basis in conjunction with the professional field, and activities are carried out *in conformity with* these procedures and directives. Where necessary, they will be improved.

The centre of expertise may also be used by the professional field. An integrated, operational and concretely elaborated quality management system is operational and leads to *continuous improvement.* Interested parties are stimulated to become closely involved, in all relevant stages.

There is a clear positive trend in comparison to similar organisations.

A study course, a study department, or an Institute for Higher Education as a whole in stage 4 (chain-oriented) might be called a *linking school.*

Faculties are currently taking initiatives in the field of dual learning and new educational methodologies with the aid of information and communications technology. This seems a response to elements from stage 4.

The colour chosen for this stage is orange, a mixed colour that symbolises the transition from internal to external.

Stage 5: Total quality management

Typical for an educational organisation in this stage is that the organisation also takes stakeholders into account other than its immediate customers. The organisation not only pursues objectives supported by the professional field, but also initiates developments. It recognises its *role in society.* Moreover, the organisation has demonstrable evidence of continuous improvement. Continuous improvement is embedded in all layers of the organisation and has become second nature, as it were, to the staff. It is at least the equal of the best organisations in its branch. The organisation bas become a model to be emulated.

Where this is relevant, *society* actively participates in the development of the organisation.

External developments are central to the policy development; the long-term policy has been implemented. *Scenarios for the future* and trend analyses help to determine the policy.

Throughout the organisation, activities are carried out in accordance with procedures and directives. Apart from the customers, *other interested parties* are also involved in the formulation of procedures and directives.

A complete quality management system is firmly embedded in the organisation. The performance indicators show a positive trend. The organisation systematically compares itself to *excellent organisations.*

A study course, study department, or Institute for Higher Education as a whole in stage 5 (directed at total quality management) might be called an *open school.*

Such schools do not exist (yet). The colour is green, partly chosen also to represent the school's social responsibility. Open schools are educational organisations that are innovative in all fields. They do not follow developments, they initiate them, and they are pro-active in their behaviour towards the professional field and other interested parties.

Appendix X2: Information about the development of AISHE

Dutch Forum for the Validation	
Members of the Forum participate in a private capacity	
Forum members	Organisation
Drs. G. van Amerongen	Dep. Of Environment
Ir. J. Andringa	Project office Sustainable Technology Development
Drs. G. Appel	Free University, Amsterdam
Ir. J.B.F.C. van Assum	Dep. Of Agriculture
Ir. J. Berends	DSM
Drs. I. van den Berg	Dep. Of Education and Sciences
Prof. R. van Dam-Mieras	Scientific Council for the National Goverment (WRR), Council for the Dep. Of Environment (VROM-Raad), CRE Copernicus, Open University
F. Duinhouwer	RMNO
Drs. R. Duvekot	Dep.of Business Affairs
K. van Gageldonk	Association of Professional Universities (HBO-Raad)
Dipl. ing. D. van der Goes	Dutch Normalisation Institute (NNI)
Drs. A.J.P. Heideveld	University of Amsterdam
Drs. F. Hengeveld	Inspection of Higher Education; Editor of EFQM-educ. version
F. Hermans	Technical University of Eindhoven
Ir. P. v.d. Hoeven	Dep. Of Environment
J. Huibers	Student
E. van Kemenade	Expert Goup Vocational Higher Education (Expert-groep HBO)
Drs. K. Kuipers	Technical University of Delft
J. de Laat	Student
Dr. M. E. Leegwater	Dep. Of Education and Sciences
Drs. ir. S. Lijmbach	University of Agriculture
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Dr. ir. K.F. Mulder	Technical University of Delft
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