

Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Outputs





Environmental Portfolio for Quality in University Education

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Intellectual Output (O2)

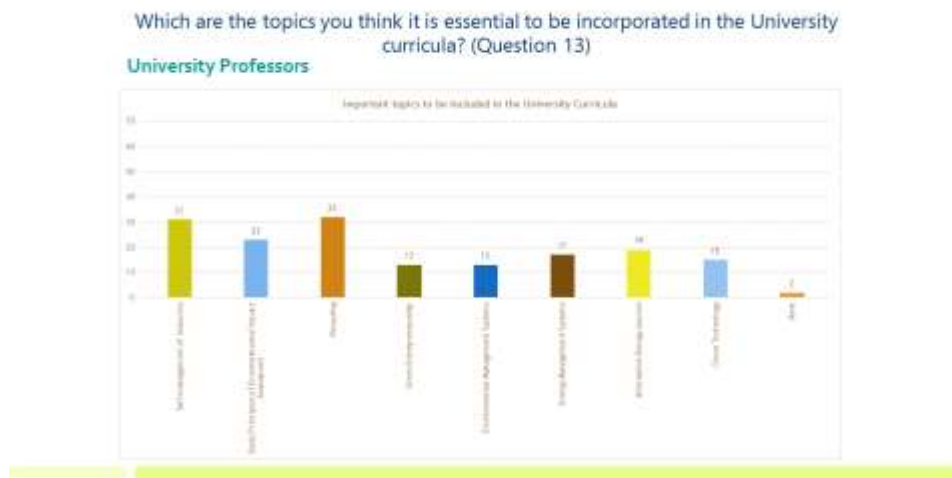


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Intellectual Output (O2)

The second intellectual output was a logical continuation of the first, which constituted the basis on which the second was developed. Its content was based on the question: Which are the topics you think it is essential to be incorporated in the University curricula? (Question 13).



All the topics emerged from the questionnaire were integrated into the Courses' contents for the creation of the Environmental Portfolio. The Environmental Portfolio consists of four courses.



All the courses are accompanied with a narrative description of the course, a template for each module which presents the course schematically and briefly and one handout for each module which gives further information about the modules' objectives, the didactical approach, assignments, bibliographical material, etc. All the above documents constitute the outline of the courses in the same way that curricula are structured. Each course consists of 4 modules:

Participatory methods in sustainable management of natural resources



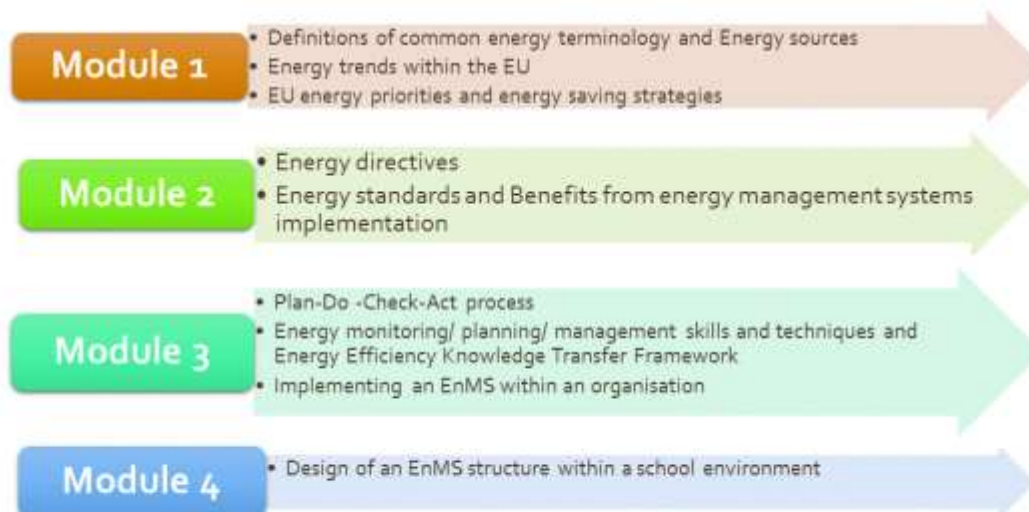
Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective



Entrepreneurship-Intelligent energy



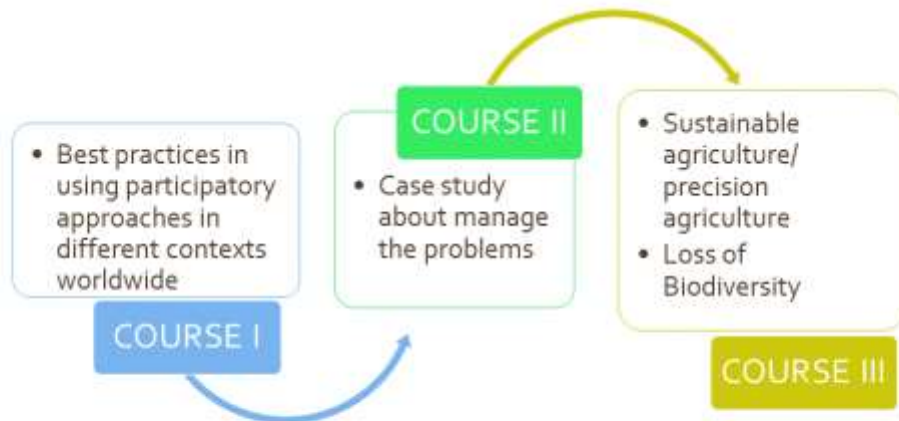
Applied Energy management systems in/for enterprises



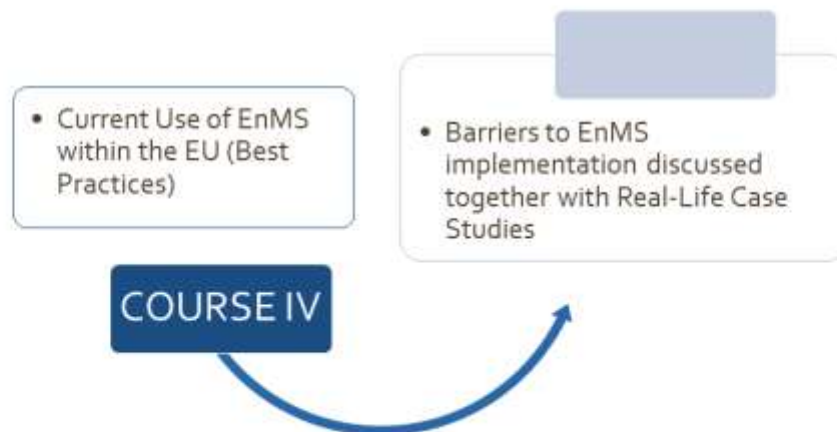
The courses are interrelated but they can also be applied independently. Each course gives to the students 12 ECTS. This total emerges if you break it down into its modules. The first 3 modules give 3 ECTS each and the 4th module of each course gives 6 ECTS because it constitutes the Case Study of each course. The calculation of the Courses' ECTS was a consortium's co-decision and it was based on the average credits attributed to the postgraduate courses. Based on the EQF the Courses correspond to the 7th level.

After the validation phase of the project, during the Intensive Study Programme in Ioannina, some extra modules were emerged, which were developed by the ISP students as their final assignment. Those modules were integrated into courses' contents during the finalization phase of the Environmental Portfolio.

Some new modules were also created by the Epoque students



Some new modules were also created by the Epoque students



Environmental Portfolio for Quality in University Education

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Intellectual Output 2 Course I

Participatory methods in sustainable management
of natural resources



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Intellectual Output 2 Course I

Participatory methods in sustainable management
of natural resources

Course Description & Outline





Course Description

COURSE TITLE: Participatory methods in sustainable management of natural resources
PARTICIPATING ORGANIZATIONS: University of Ioannina and University of Naples Federico II
DESCRIPTION: There has been a growing interest in the use of participatory approaches in sustainable management of natural resource. Action research activities are widely seen as a pool of concepts and practices that enable citizens to enhance their knowledge for sustainable development. We propose to use as teaching material case studies in which participatory approaches have been successful or have encountered obstacles of different nature such as authorities or communities. The methods of the social sciences and qualitative research are discussed in the course starting from a critical analysis of these cases studies. Aim of the course is to develop transversal competencies in science, in economic and social sciences for an education that involves people as citizens. Learners learn to recognize the complexity of many phenomena with a critical integrating knowledge coming from different disciplines. Learning activities will be focused on dealing with real problems and critically evaluating the consequences of different solutions. The teacher/lecturer will assume different roles in the same activity: expert, because he studied a problem before; stimulator, capable of bringing out different points of view; researcher, able to systematize and produce analysis documenting the processes of learning and teaching. The course will rely upon case studies on problematic situations of interest in environmental education and sustainable development. The course address students from different degree courses, school teachers and educators who work in local institutions and will be held in different locations: universities, schools and museums to meet the general public. The assessment is formative, trying to develop, in itinere, the ability to analyze and document the phenomena of environmental interest.

COURSE X	ECTS	CONTENT	METHOD/TOOL
Module 1	3	Topic 1: Action research, reflexivity and participatory methods Topic 2: Case study analysis	Face to face / Laboratories
Module 2	3	Topic 1: Transversal competencies in environmental education Topic 2: Complexity of biodiversity and impacts on local communities	Face to face / Laboratories
Module 3	3	Topic 5: Core ideas and crosscutting concepts in science education Topic 6: Complex system	Face to face/ Laboratories
Case study	6	Topic 7: Recycling and sustainable management of natural resources	Face to face/Laboratories/ Fieldwork



Templates

COURSE I. PARTICIPATORY METHODS IN SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES.

COURSE – TEMPLATE

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	7
Number of labs	8
Homework	Yes
Meetings/tutorial	No
Course objectives	Knowledge <ul style="list-style-type: none">- to stimulate learners to recognize the complexity of many phenomena with a critical integrating knowledge coming from different disciplines, to deal with real problems and to critically evaluate the consequences of different solutions Competences <ul style="list-style-type: none">- To develop transversal competencies in science, economic and social sciences for an education that involves people as citizens
Course contents	Action research, participatory methods and case study analysis; transversal competencies in environmental education, complexity of biodiversity and impacts on local communities; core ideas and crosscutting concepts in science education; recycling and sustainable management of natural resources.
Assessment	The assessment will be based on attendance (30%); participation and assignment in laboratories, team activities and workshops (40%); written and oral assignment in case study analysis (30%).



MODULE 1 – TEMPLATE

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	2
Number of labs	2
Homework	Yes
Meetings/tutorial	No
Course objectives	Knowledge <ul style="list-style-type: none">- Introduction to qualitative research strategies and participatory methods Skills <ul style="list-style-type: none">- to apply action-research and case study analysis to the sustainable management of natural resources.
Course contents	Basic principles of action-research and other kinds of participatory methods (community learning, team and collaborative activities, participatory visual methods); reflective practices in education; case study analysis.
Assessment	The assessment will be based on attendance (40%); participation and written and oral assignment in laboratories and homework (60%).



MODULE 2 – TEMPLATE

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	1
Number of labs	2
Homework	Yes
Meetings/tutorial	No
Course objectives	Knowledge <ul style="list-style-type: none">- to elaborate a critical approach to environmental issues able to recognize the complexity of many phenomena and their impact on local communities Competences <ul style="list-style-type: none">- To develop multidisciplinary and transversal competencies in environmental education
Course contents	Connections between natural sciences and social sciences in environmental education; complexity of the idea of biodiversity and impacts of environment changes on local community; addressing the needs of people now and in the future.
Assessment	The assessment will be based on attendance (40%); participation, written and oral assignment in laboratories and homework (60%).



MODULE 3 – TEMPLATE

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	3
Number of labs	1
Homework	No
Meetings/tutorial	No
Course objectives	Knowledge <ul style="list-style-type: none">- To reformulate the perspective of environmental education Skills <ul style="list-style-type: none">- to encourage learners to adopt a complex system approach involving science, economic and social science education
Course contents	Introduction to core ideas from different disciplines making reference to their relevance in environment related issues. Discussion of the relevance of disciplinary core ideas within the framework of environmental issues with reference to students' knowledge, experiences and cultural background. Presentation to the complex systems approach with reference to its meaning and value for the analysis of environmental issues. Discussion of the idea of complex system in relation with its application to economic and social sciences.
Assessment	The assessment will be based on attendance (40%); participation and assignment in laboratories (60%).



MODULE 4 – CASE STUDY – TEMPLATE

Title	Description
Level (EQF)	7
ECTS	6
Teaching language	English
Number of lectures	1
Number of labs	3
Homework	Yes
Meetings/tutorial	No
Course objectives	Knowledge <ul style="list-style-type: none">- identifying their environmental, economic, social and cultural consequences Skills <ul style="list-style-type: none">- Analyzing a case study of waste management emergency- comparing solutions proposed and implemented- elaborating innovative and sustainable projects
Course contents	Background analysis focused on different actors playing in the scenario described (government and local authorities; inhabitants). Critical analysis of the implemented policies and their effects. Elaboration of different sustainable solutions.
Assessment	The assessment will be based on attendance (40%); participation, written and oral assignment in laboratories and homework (60%).



Handouts

COURSE 1. PARTICIPATORY METHODS IN SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

MODULE 1 - HANDOUT

Introduction	<p>The aim of this Module is to help learners to build in-depth specific competencies within qualitative research strategies and participatory methods in order to apply them in research and education fields related to the sustainable management of natural resources.</p> <p>The Module provides an introduction to the basic principles of action-research, case study analysis and other kinds of participatory methods which are nowadays widely seen as a pool of concepts and practices that enable citizens to enhance their knowledge for sustainable development.</p> <p>With the aim of making the class-group a sort of “educating community”, i. e. an open, democratic environment where everyone is able to contribute to the learning process, Module 1 means to increase learners’ awareness with regard to the value of mutual labour between teachers and students and the importance of working together to promote social change toward a sustainable development. Integral part of this kind of participatory approach to research and education is a stress on reflexivity, that means the ability of learners to focus on their pre-existing attitudes, experiences and beliefs, both developing or systematizing their knowledge and bringing it into question, by debating with other learners and teachers. After the in-depth introduction to action-research and case study analysis, learners will be stimulated to find practical application of these methodologies, in particular with regard to environmental research and education and to the sustainable management of natural resources.</p>
Task description	<p>Face-to-face Lecture: Short introduction to basic principles and different kinds of participatory methods. Learners will be familiarized with reflective practice in education and encouraged to think about the very learning process, on the pre-existing beliefs put in place in learning and how to blur the separation between theory and practice in the education context. After a short introduction to action research and to the specific learning/research process related to this methodological approach, learners will have the opportunity to discuss other kinds of participatory methods, such as community learning, team and collaborative activities or other specific methodologies. In comparing different kinds of participatory methods and different practices, they will be able to compare tools and discuss their capacity of enabling people to take action for solving their own problems or communicating that to decision-makers, local communities or public opinion.</p> <p>Face-to-face lecture: Introduction of case study analysis, a multidimensional and holistic approach to a subject which could include events, periods, projects, policies, institutions or complex systems in order to address a specific case which represent a sample of a theoretical object.</p>



	<p>Analyzing some practical cases stimulates learners to investigate a phenomena or a class of phenomena within a real-life context and encourages them to consider alternative but realistic solutions to solve a specific problem. Different steps of the case study analysis will be illustrated: description of background and context; selection of relevant facts and issues; focus on key problems; evaluation of impacts on people and environment; identification of decision makers and strategies implemented; uncovering of possible alternative solutions (and eventually why they were rejected); selection of the best and most effective solution and discussion with supporting evidence. A particular stress will be put on the multiple sources of evidence used in a case study (mix of quantitative and qualitative evidence), on advantages and challenges of using case studies, how case study can be used as a learning tool for it allow students to take part directly in discussion of real case studies and to learn (somehow unconsciously) through a co-operative, role-playing similar process.</p> <p>Laboratory 1: The laboratory will be focused on the case study “Cooling off a Warming Planet: Analyzing the Tradeoffs in Policies for Climate Change”; learners will analyse it following the teaching methodology of role playing.</p> <p>Laboratory 2: Case study writing.</p> <p>Assignments:</p> <ul style="list-style-type: none">- Homework: Environmental-related questions will be submitted to learners to find practical application of theories already debated. Learners will select a specific participatory methods to solve a particular environmental case, explain their choice and discuss with other learners and with the teacher.- Laboratory 1: Learners’ task will be to collectively contribute to the development of the policy statement; each member of a group will represent one of four different characters designed to embody real facts, points of view, and concerns regarding how to address the economic, environmental, social, and political consequences of climate change legislation.- Laboratory 2: Learners will be asked to write a case study from well-known episodes or policies related to environmental issues. Each group will provide texts, evidence and other materials in order to build a learning tool, suitable for environmental education to submit to an imaginary class of students.
References	<p>Apple, M. W.; Au, W. and Gandin, L. A. (eds.) (2009) The Routledge International Handbook of Critical Education. London: Routledge</p> <p>Dewey J. (1997) Democracy and Education. An Introduction to the Philosophy of Education. New York: The Free Press</p> <p>Herr, K. G. & Anderson, G. L. (2015) The Action Research Dissertation: A Guide for Students and Faculty. Los Angeles: Sage.</p>



	<p>McKernan, J. (ed.) (1996) Curriculum Action Research: A Handbook of Methods and Resources for the Reflective Practitioner. London: Routledge</p> <p>Nilsson, K.; Pauleit, S. et al. (eds.) (2013) Peri-urban futures: Scenarios and models for land use change in Europe. New York: Springer</p> <p>Thomas, G. (2011) How to Do Your Case Study. A Guide for Students and Researchers. Los Angeles: Sage</p> <p>Wilmsen, C.; Elmendorf, W. F. et al. (eds.) (2008) Partnerships for Empowerment: Participatory Research for Community-based Natural Resource Management. New York: Earthscan</p> <p>Yin, R. K. (2013) Case Study Research: Design and Method. Los Angeles: Sage</p> <p>Yin, R. K. (2012) Application of Case study Research. Los Angeles: Sage</p>
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MODULE 2 - HANDOUT

Introduction	<p>Aim of Module 2 is to develop transversal competencies in environmental education, integrating skills and approaches from different disciplines in science, economic and social sciences. Environmental education can effectively engage people as active citizens only if they learn to recognize the complexity of many environmental phenomena. Therefore, dealing with real environmental problems means to adopt an holistic approach which consists in a in-depth analysis of the causes of environmental problems and a critical evaluation of the consequences of the solutions put in practice which both includes the consideration of environmental issues on local communities. Stimulated to adopt a more complex perspective on environmental issues make the learners go beyond a generic idea of education and sensitivity to sustainable development. Rather, a multidisciplinary approach to environmental education encourages participants to embrace an overall and detailed vision of what it means to educate people to live in the environment, to preserve it or to act on it, which include reference to social, cultural as well as economic issues.</p>
Task description	<p>Face to face Lecture: Introduction to the holistic approaches to sustainability based on the recognition of four axes of intervention: environmental, economic, social and cultural and explanation of the connections between natural sciences and social science in the research fields related to the sustainable development. Learners will be familiarized with the idea that dealing with global challenges means integrate the concerns of the economy, the environment, the society and the cultural heritage. An effective sustainable development, that means at least to limit damages caused by the growth, should always start from the simple assumption that society is a integrated systems. An integrated understanding of the multiple social, cultural and economic factors related to environmental issues should go with a detailed focus on the role that, in every specific location, those factors have in preventing or promoting social changes aimed at providing more healthy and fulfilling lifestyles.</p> <p>Laboratory 1: Discussion and debate: sustainable policies vs green washing.</p> <p>Laboratory 2: Evaluating environmental impact and rethinking biodiversity.</p> <p>Assignments:</p> <ul style="list-style-type: none">- Homework: Internet-based researches aimed at identifying environmental intervention in different locations and areas.- Laboratory 1: Participants will asked to discern, among the identified environmental interventions, the real sustainability-oriented interventions from the “green-washing” ones, discussing their opinions with other learners and teachers, by stressing the different factors (social, economic, cultural) of the environmental problem in each case.- Laboratory 2: After the projection of documentaries or short films, learners will be asked to analyses the impact of the environment



	<p>crises on local communities or rather (traditional or innovative) examples of positive integration of society and environment according to the visual material submitted. Then they will elaborate an idea of biodiversity involving not only science knowledge but also economy and social science findings in this field.</p>
References	<p>Ardoin, N.M., Clark, C., & Kelsey, E. (2013) An exploration of future trends in environmental education research, <i>Environmental Education Research</i>, 19: 4, 499-520.</p> <p>Bachiorri, A., Puglisi, A. & Giombi, G. (2009) <i>Environment, our common future: Exploring students' perceptions in an environmental education framework. Abstract book of the 5th World Environmental Education Congress</i>, Montreal, Canada</p> <p>Krasny, M. & Dillon, J. (eds.) (2012) <i>Trading zones in environmental education: Creating transdisciplinary dialogue</i>. NewYork: Peter Lang.</p> <p>NAAEE (1996) <i>Environmental education materials: Guidelines for excellence</i>. Washington: North American Association for Environmental Education</p> <p>Russo Krauss, P., (2008) <i>Ecolandia – Principi, metodologia e didattica dell'educazione ambientale</i>. Napoli: Edizioni Stagrame</p> <p>Sauvé, L., (2005) Currents in environmental education: Mapping a complex and evolving pedagogical field. <i>Canadian Journal of environmental education</i>, 10: 1, 11-37.</p> <p>WEEC. <i>World Environmental Education Congress</i> http://www.environmental-education.org</p>



HANDOUT – Module 3

Introduction	<p>In order to develop significant competencies within the wide framework of environmental issues, Module 3 intends to stimulate some changes in perspectives about the environment and its management. This need for a change in perspective is the core idea on which the paradigm of environmental education is based: the use of scientific competencies when dealing with the environment cannot simply mean adapting scientific disciplinary contents to the study of this specific system; instead the environment should be perceived as a complex system which can be dealt with only by constructing a reasonable blend of different disciplines that has to be integrated with each other also by connecting them to social, cultural and economic issues. In this sense environmental science has to be considered as a brand new discipline which has its own specific contents and methodologies. This brand new discipline has to be built by getting a series of core ideas from the traditional scientific disciplines and revisiting them in the light of more general crosscutting (transdisciplinary) concepts (i.e. system, interaction, transformation, conservation, irreversibility).</p>
Task description	<p>Face to face Lecture: Introduction to disciplinary core ideas and revisiting them in the light of crosscutting concepts. Core ideas from different disciplines are introduced making reference to their relevance in environment related issues. Examples of core ideas can be those of matter, force, energy or entropy in physics, atom, molecule, bond or reaction in chemistry, cell, structure, function or ecosystem in biology. On the one hand, these core ideas can be deepen by discussing analogies and differences in their meaning in different disciplines; on the other hand they can be revised and brought to a more general and holistic level by reinterpreting and mixing them in the light of crosscutting concepts such as system, interaction, transformation, conservation, irreversibility.</p> <p>Laboratory: Reflexivity and environmental education: discussing the relevance of disciplinary core ideas in facing environmental issues with reference to learners' knowledge, experiences and cultural background.</p> <p>Face to face Lecture: In order to revisit the previous contents in the light of the complex systems approach, the complex systems approach will be presented making reference to its meaning and value for the analysis of environmental issues. Attention will be focused on the description of a complex system as made of small interacting parts that can give rise to emerging collective behaviors, which are non-deterministic, predictable only on a statistical basis and which are determining the ways in which the complex system interact with the whole environment around it.</p> <p>Face to face Lecture: to connect the use of the complex system approach in natural sciences with its use in economic and social sciences and develop a brand new approach to environmental issues, the idea of complex system will be discussed in relation with its application to economic and social sciences. The complex systems approach will then be revised in the light of the possibility of using it as a general, transdisciplinary approach to the</p>



	<p>study of environmental issues which can lead the students to develop a deep awareness of the huge complexity of these issues and link the knowledge they are developing to skills that make them able to make decisions that are informed and responsible from a socio-economical point of view. Attention will be also paid to discuss with students their general idea of what science is and is meant for, trying to go in the direction of including in the scientific perspective the expectations and needs that come from all of us as human being who want to preserve the environment in which they live.</p> <p>Assignment:</p> <ul style="list-style-type: none">- Laboratory 1: : Learners will be invited to discuss the relevance of disciplinary core ideas in facing environmental issues with reference to their knowledge, experiences and cultural background. Then, students are invited to construct themselves argumentations about the relevance of core ideas in discussing ways to exploit, manage and preserve the environment.
References	<p>NECSI – New England Complex Systems Institute. (http://necsi.edu)</p> <p>Naeer Bar-Yam, Dynamics of complex systems. Addison-Wesley, Reading, Massachusetts, 1997. http://necsi.edu/publications/dcs/Bar-YamTOC.pdf</p> <p>NICO - Northwestern Institute on Complex Systems, Northwestern University, IL, USA. http://www.nico.northwestern.edu/</p> <p>YouTube channel collecting NICO seminars on complex systems. https://www.youtube.com/channel/UC7OtqKhLoQVH2WBnyBpDK1g</p> <p>Vermont Complex Systems Center, University of Vermont, USA. http://www.uvm.edu/~cmplxsys/blog/</p> <p>Materials from the lectures of the Principles of Complex Systems course with Professor Peter Dodds. http://www.uvm.edu/~pdodds/teaching/courses/2013-08UVM-300/content/lectures.html</p>



HANDOUT – Module 4 – CASE STUDY

Introduction	<p>The module starts from an overview of the basic concepts of modern waste management policies, which are grounded on the so called “3 Rs”: Reduce, Reuse, Recycle. The waste management issue is presented through the waste hierarchy pyramid, making also reference to its legal aspects and to those aspects that are strongly connected to sustainability, such as the life cycles of products and the actions aimed at resource recovery.</p> <p>Once a general perspective about waste management has been gained, the module shifts the attention to an emblematic case study that has been at the focus of the media attention worldwide: the waste emergency in the Campania region in southern Italy.</p> <p>The waste emergency in Campania was symptomatic of a wrong use of natural resources but also of a lack of democracy since national and local authorities seemed unwilling to stimulate a process of active citizenship to find out virtuous solutions. The government had to use military force to make citizens accept in their territory the creation of new waste elimination and processing plants, incinerators or even landfills: as a consequence the adopted policies not only were unable to resolve the crisis, but also increased public unrest and exacerbated the conflict.</p> <p>The waste emergency revealed the implicit danger of not adopting an Integrated Solid Waste Management System, also making clear the involvement of criminal organizations in the waste management industry. The so-called “Land of Fires” is an area in Campania where since the end of the ‘80s, toxic wastes have been dumped by organized crime, along with the significant role played in this field by many businessmen and firms.</p> <p>Yet, a not expected and indirect effect of the waste emergency is the rising of a new widespread awareness in the Campania region inhabitants about social impacts and environmental damages that can derive from a lasting wrong use of natural resources or from an incorrect management of waste, and, as a rule, a growth of sensitivity to sustainable development. As a consequence from 2008 different kinds of experiences (social movements, cooperatives, associations, etc.) emerged with the aim of promoting and to practice a virtuous and sustainable management of natural resources and solid urban waste.</p> <p>The case study analysis will focus on the following actors playing in the scenario described above: government and local administrative authorities; national health institute and local health authorities; associations and organizations of inhabitants. In particular, we will focus on the solutions proposed both by policymakers and citizens organizations, trying to stimulate in participants an attitude to comparative and critical analysis of impacts, consequences, problematic and advantages derived from both.</p>
Task description	<p>Face to face lecture: Introduction of the basic concepts of modern Waste Management policies. Brief description of the “Campania’s Waste Emergency” case study. Analysis of evidences on the effects of the accumulation of waste in terms of contamination of soil, water and air. Background analysis and guidelines to approach the case study (what does it mean to adopt the point of view of a particular decision maker) and clarify the steps students should take in analyzing the case (e.g.: identify constraints</p>



and opportunities each character was operating under; then, evaluate the decisions each character made and their implications; finally, explain what you would have done differently and why).

Laboratory 1 - Role play

Laboratory 2 – Figuring out alternative solutions

Laboratory 3 – Fieldwork: good practices in recycling and sustainable management of natural resources in Campania

Assignment:

- **Homework:** Individually, students will have the time to read and think about the case study trying to answer some basic questions proposed by the teachers in his/her introduction to the case (central problem(s); possible course(s) of action, potential obstacle(s)?)
- **Laboratory 1 – Role play:** The class will be divided into groups each of one will be assigned a specific roles or position: the aim of the laboratorial activity is to break up the case in many parts, stressing the different points of view of actors involved in the case or the multilevel impact (economic, social, cultural) of the considered problematic.
- **Laboratory 2 – Looking for alternative solutions:** One half of the class will be provided with a few mini-case studies focused on a sustainable project of waste management really implemented in Campania region after the waste emergency; the other half will try to elaborate innovative environmental-sensitive solutions and to identify the consequences of its application to the case study context. The students will present to the class their cases or their solutions and finally discuss them.
- **Laboratory 3 – Fieldwork:** students will have the chance to experience good practices in recycling and sustainable management of natural resources in the students' home regions. They will visit a number of organizations and associations both aimed at local sustainability awareness campaign and at alternative or experimental management and recycling of solid urban waste.
- **Homework:** Students will be invited to synthesize the case study, core problematic, solutions implemented and limits and to write their conclusion or to figure out other possible courses of action.

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Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2 Course I

Participatory methods in sustainable management
of natural resources

Course Contents – PPTs



PARTICIPATING METHODS IN SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES

MODULE 1



PARTICIPATING METHODS IN SUSTAINABLE MANAGEMENT OF NATURAL RESOURCES MODULE 1

Participating Organizations:

UNIVERSITY OF NAPLES
(UNINA) <http://www.unina.it/home>

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ACTION RESEARCH

What is it?

- It is a form of research which can be undertaken in any context, regardless of the status or position of the participants.
- It involves research in depth and it is a kind of self-reflective practice.
- In action research practitioners are potential researchers, and researchers are practitioners. (McNiff J., Whitehead J., 2002)

ASPECTS OF ACTION RESEARCH

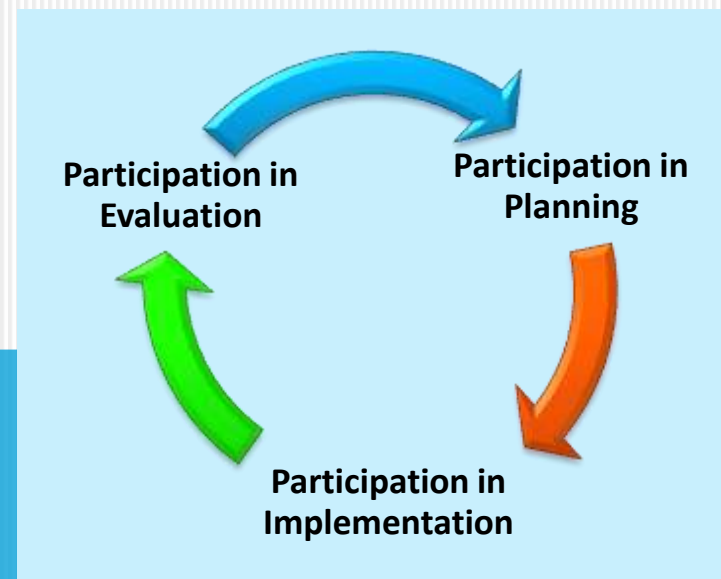
- ❖ **Ontology** → How we view ourselves
- ❖ **Epistemology** → How we come to know
- ❖ **Methodology** → How we do things
- ❖ **Socio-political intent** → What we hope to achieve

PARTICIPATORY APPROACH

- 'The public' is actively involved in decision-making processes
- The relevant 'public' depends upon the topic being addressed
- The public can be average citizens, the stakeholders of a particular project or policy, experts and even members of the government and a private industry.
- Policy processes can be seen as a three-step cycle of
 1. planning,
 2. implementation and
 3. evaluation,

A participatory approach may include certain or all of these steps.

(Slocum N., 2003)



PARTICIPATORY APPROACH

When is it appropriate?

A participatory approach is particularly appropriate for addressing:

- Themes that require ethical, social or cultural study and may call for a choice between fundamental values and principles.
- Policy issues that call for a combination of public awareness, learning, a search for solutions and emotional or moral acceptance of the eventual decision.
- Public policy choices that will rely on the precautionary principle or the weight of evidence.
- Underlying values and principles that must be clarified before detailed proposals or risk management options are brought forward.
- A clearly defined set of options or proposals that support the search for consensus or innovative solutions

OTHER PARTICIPATORY METHODS AND TECHNIQUES

- **Charrette**
- **Citizens Jury**
- **Consensus Conference**
- **Delphi**
- **Expert Panel**
- **Focus group**
- **Participatory Assessment, Monitoring and Evaluation**
- **Planning cell**
- **Scenarios**
- **The World Cafe**

CHARRETTE

DEFINITION:

- An intensive face-to-face process designed to bring people from various sub-groups of society into consensus within a short period of time.
- The pre-Charrette planning breaks the main issue into component parts, to which sub-groups of people are assigned.
- The subgroups periodically report back to the whole group and feedback from the whole is then addressed in the next round of sub-group discussions. This sequence is repeated until consensus is reached at the final deadline for a report.
- Charrettes vary in size, from 50 to over 1,000 people, and in time, from four days to two weeks.

CHARRETTE

WHEN TO USE:

In general, a Charrette will:

- ✓ assemble practical ideas and viewpoints at the beginning of a planning process
- ✓ encourage input and collaboration from a wide range of participants
- ✓ facilitate decisions on difficult issues when a process is mature
- ✓ resolve indecision or deadlocks between groups toward the end of a process
- ✓ develop feasible projects and action plans with specific practical steps for the successful development
- ✓ of projects based upon citizen input
- ✓ identify potential funding sources for projects.

CITIZENS JURY

DEFINITION:

- A means for obtaining informed citizen input into policy decisions.
- The jury is composed of 12-24 randomly selected citizens, who are informed by several perspectives, often by experts referred to as ‘witnesses’.
- The jurors then go through a process of deliberation and subgroups are often formed to focus on different aspects of the issue.
- Finally, the jurors produce a decision or provide recommendations in the form of a citizens’ report. The sponsoring body (e.g. government department, local authority) is required to respond to the report either by acting on it or by explaining why it disagrees with it.
- Usually in a 4-5 day process the Citizens Jury intends to provide a means for more democratic decision-making.

CITIZENS JURY

WHEN TO USE:

- In a wide range of topics, including economic, environmental, social and political issues.
- It is most applicable when one or more alternatives to a problem need to be selected and the various competing interests arbitrated.
- Sponsors are usually government agencies, but can also be NGOs or anyone interested in providing a context in which competing alternatives can be expressed and arbitrated. However, the sponsor(s) should be seen as unbiased toward a particular outcome.
- The method is most likely to lead to concrete action when it is directly linked to legislation or other decision-making process.

CONSENSUS CONFERENCE

DEFINITION:

- A public enquiry centered around a group of 10 to 30 citizens who are charged with the assessment of a socially controversial topic.
- These laypeople put their questions and concerns to a panel of experts, assess the experts' answers and then negotiate among themselves.
- The result is a consensus statement that is made public in the form of a written report directed at parliamentarians, policy makers and the general public that expresses their expectations, concerns and recommendations at the end of the conference.
- The goal is to broaden the debate on a given issue and include the viewpoints of non-experts in order to inform policy-making.

CONSENSUS CONFERENCE

- This method is most useful for combining many forms of knowledge (e.g. local, traditional, technical).
- It is a useful method for obtaining informed opinions from laypersons.
- It can also allow for the inclusion of subjective knowledge in scientific, technological and other technical developments.
- More generally, it is a viable alternative to use when all or most of the following criteria are present:
 - Citizens' input is required for policies under review or development.
 - Issues are controversial, complex and/or technical.
 - Many diverse groups and individuals have concerns.
 - Ensuing decisions significantly and directly affect select groups or individuals.
 - There is a need for increased public awareness and debate.
 - There is citizen desire for a more formal involvement.

DELPHI

DEFINITION:

- It involves an iterative survey of experts.
- Each participant completes a questionnaire and is then given feedback on the whole set of responses.
- (S)He then fills in the questionnaire again, this time providing explanations for any views they hold that were significantly divergent from the viewpoints of the others participants.
- The explanations serve as useful intelligence for others. In addition, (s)he may change his/her opinion, based upon his/her evaluation of new information provided by other participants.
- This process is repeated as many times as is useful.
- In most Delphi processes the mount of consensus increases from round to round.

DELPHI

- It is traditionally conducted via mail,
- Other variations of Delphi can be conducted online or face-to-face.
- The key characteristics of original Delphi process are:
 1. structuring of information flow
 2. feedback to the participants
 3. anonymity for the participants.
- In a face-to-face Delphi, the anonymity is eliminated.
- Another variation of the Delphi is the 'Policy Delphi', the main goal of which is to expose all the different options and opinions regarding an issue and the principal pro and con arguments for these positions.

DELPHI

WHEN TO USE:

Usually one or more of the following properties of the application leads to the need or usefulness of employing Delphi:

- The problem does not lend itself to precise analytical techniques but can benefit from subjective judgements on a collective basis.
- The individuals needed to contribute to the examination of a broad or complex problem have no history of adequate communication and may represent diverse backgrounds with respect to experience or expertise.
- More individuals are needed than can effectively interact in a face-to-face exchange (except through the face-to-face Delphi's shuttle process between plenary and sub-groups).

DELPHI

- Time and cost make frequent group meetings infeasible.
- The efficiency of face-to-face meetings can be increased by a supplemental group communication process.
- Disagreements among individuals are so severe or politically unpalatable that the communication process must be refereed and/or anonymity assured.
- Heterogeneity of the participants must be preserved to assure validity of the results, i.e. avoidance of domination by quantity or by strength of personality.

EXPERT PANEL

DEFINITION:

- The main task is usually synthesizing a variety of inputs – testimony, research reports, outputs of forecasting methods, etc. – and produce a report that provides a vision and/or recommendations for future possibilities and needs for the topics under analysis.
- Specific tools may be employed to select and motivate the panel, assign tasks and elicit sharing and further development of knowledge.

EXPERT PANEL

WHEN TO USE:

- Expert panels are particularly appropriate for issues that require highly technical knowledge and/or are highly complex and require the synthesis of experts from many different disciplines.
- This method is not designed to actively involve the broad public.

FOCUS GROUP

DEFINITION:

- A planned discussion is held among a small group (4-12 persons) of stakeholders facilitated by a skilled moderator.
- It is designed to obtain information about peoples' preferences and values pertaining to a defined topic and the reasons why these are held. Participants are involved in observing the structured discussion of an interactive group in a permissive, non-threatening environment.
- A focus group can be seen as a combination between a focused interview and a discussion group.
- Focus groups can also be conducted online.

FOCUS GROUP

WHEN TO USE:

Focus groups are useful to:

- gauge the nature and intensity of stakeholders' concerns and values about the issues
- obtain a snapshot of public opinion when time constraints or finances do not allow a full review or survey
- obtain input from individuals as well as interest groups
- obtain detailed reaction and input from a stakeholder or client group to preliminary proposals or options
- collect information on the needs of stakeholders surrounding a particular issue or concept
- determine what additional information or modification may be needed to develop consultation issues or proposals further.

PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

DEFINITION:

A Participatory Evaluation is an opportunity for the stakeholders of a project to stop and reflect on the past in order to make decisions about the future. Through the evaluation process participants share the control and responsibility for:

- ❖ deciding what is to be evaluated
- ❖ selecting the methods and data sources
- ❖ carrying out the evaluation and
- ❖ analyzing information and presenting evaluation results.

PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

WHEN TO USE:

Participatory Evaluation may be conducted for the following reasons:

➤ **Because it has been planned(!)**

Participatory Evaluation can be planned at various points throughout a project. These can be mid-way through a series of activities or after each activity, depending on when the community decides it needs to stop and examine past performance.

➤ **Because a (potential) crisis is looming**

Participatory Evaluation can help to avoid a potential crisis by bringing people together to discuss and mediate a solution to important issues.

PARTICIPATORY ASSESSMENT, MONITORING AND EVALUATION

➤ Because a problem has become apparent

Problems, such as a general lack of community interest in activities, may be apparent. Participatory Evaluation may provide more information that can help people determine why there is a problem and how to remedy it.

➤ To introduce and establish a participatory approach.

A Participatory Evaluation may shed some understanding on why a project is not working very well. The results of a Participatory Evaluation may be the entry point for a more participatory approach to the project in general.

PLANNING CELL

DEFINITION:

- It engages approximately twenty-five randomly selected people, who work as public consultants for a limited period of time (e.g. one week), in order to present solutions for a given planning or policy problem.
- The cell is accompanied by two process-escorts, who are responsible for the information schedule and the moderation of the plenary sessions.
- A project may involve a larger or smaller number of planning cells.
- In each cell participants acquire and exchange information about the problem, explore and discuss possible solutions and evaluate these in terms of desirable and undesirable consequences.
- Experts, stakeholders and interest groups have the opportunity to present their positions to the cell members.

The final results of the cells' work are summarized as a 'citizen report', which is delivered to the authorities as well as to the participants themselves.

PLANNING CELL

WHEN TO USE:

The following criteria should be used to evaluate the suitability of the Planning Cells procedure for a given application. When all or most are answered positively, the Planning Cell method will be suitable.

- Variability of options: Do the participants have the choice of selecting one option out of a variety of options that are all feasible in the specific situation?
- Equity of exposure: Are all groups of the community or the respective constituency exposed in some way to the potential disadvantages of the proposed options?

PLANNING CELL

- Personal experience: Do participants have some experience with the problem and do they feel competent about giving recommendations after they are further educated about the problem and the remedial options?
- Personal relevance: Do participants judge the problem as serious enough to sacrifice several days of their time to work on solutions?
- Seriousness and openness of sponsor: Is the sponsor willing to accept, or at least carefully consider, the recommendations of the Planning Cell(s) or do they pursue hidden agendas?

SCENARIOS WORKSHOPS

DEFINITION:

Scenarios are narrative descriptions of potential futures that focus attention on relationships between events and decision points.

SCENARIOS WORKSHOPS

WHEN TO USE:

As a rule, scenario construction is particularly useful in situations where the past or present is unlikely to be a guide for the future, in particular where:

- ☐ the problem is complex
- ☐ there is a high probability of significant change
- ☐ the dominant trends may not be favourable and thus must be analyzed
- ☐ the time-horizon is relatively long.

SCENARIOS WORKSHOPS

Thus, the main applications of scenario workshops are to:

- improve long-term decision-making
- motivate change
- generate alternative trajectories for future developments
- improve preparedness for emergencies and contingencies
- guide key choices
- build future-oriented knowledge and action networks
- generate a vision and action-plan for realization.

THE WORLD CAFE

DEFINITION:

- A creative process for facilitating collaborative dialogue and the sharing of knowledge and ideas to create a living network of conversation and action.
- In this process a cafe ambiance is created, in which participants discuss a question or issue in small groups around the cafe tables.
- At regular intervals the participants move to a new table.
- One table host remains and summarizes the previous conversation to the new table guests.
- The proceeding conversations are cross-fertilized with the ideas generated in former conversations with other participants.
- At the end of the process the main ideas are summarized in a plenary session and follow-up possibilities are discussed.

THE WORLD CAFE

WHEN TO USE:

The World Café process is particularly useful in the following situations:

- to engage large groups (larger than 12 persons) in an authentic dialogue process (Groups of 1200 have been conducted!).
- when you want to generate input, share knowledge, stimulate innovative thinking and explore action possibilities around real life issues and questions.
- to engage people in authentic conversation – whether they are meeting for the first time or have established relationships with each other.
- to conduct in-depth exploration of key strategic challenges or opportunities.
- to deepen relationships and mutual ownership of outcomes in an existing group.
- to create meaningful interaction between a speaker and the audience.

CASE STUDY

WHAT IS IT?

A case study is expected to capture the complexity of a single case, and the methodology which enables this has developed within the social sciences. Such methodology is applied not only in the social sciences, such as psychology, sociology, anthropology, and economics, but also in practice-oriented fields such as environmental studies, social work, education, and business studies.

The case study should have a “case” which is the object of study. The “case” should:

- be a complex functioning unit,
- be investigated in its natural context with a multitude of methods, and
- be contemporary.

WHEN TO USE A CASE STUDY APPROACH ?

According to Yin (2003) a case study design should be considered when:

- a) the focus of the study is to answer “how” and “why” questions
- b) you cannot manipulate the behavior of those involved in the study
- c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study or
- d) the boundaries are not clear between the phenomenon and context.

THREE STEPS IN DESIGNING CASE STUDIES:

1. Defining a “Case”
2. Selecting One of Four Types of Case Study Designs
3. Using Theory in Design Work

1. DEFINING A CASE

- Arriving at even a tentative definition helps enormously in organizing your case study.
- A “case” is generally a bounded entity (a person, organization, behavioral condition, event, or other social phenomenon), but the boundary between the case and its contextual conditions—in both spatial and temporal dimensions—may be blurred
- The case serves as the main unit of analysis in a case study. At the same time, case studies also can have nested units within the main unit

2. SELECTING ONE OF FOUR TYPES OF CASE STUDY DESIGNS

Decide whether your case study will consist of a single or multiple cases—what then might be labeled as a single- or a multiple-case study.

Whether single or multiple, you can also choose to keep your case holistic or to have embedded subcases within an overall holistic case. The resulting two-by-two matrix leads to four different case study designs.

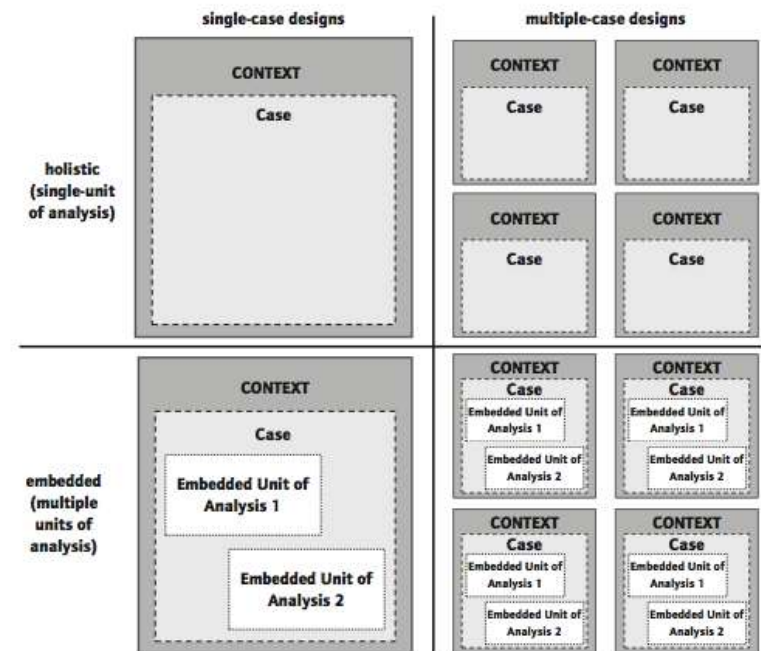


Figure 2.4 Basic Types of Designs for Case Studies
SOURCE: COSMOS Corporation.

3. USING THEORY IN DESIGN WORK

- Decide whether or not to use theory to help complete your essential methodological steps, such as developing your research question(s), selecting your case(s), refining your case study design, or defining the relevant data to be collected.
- The use of theory also can help organize your initial data analysis strategies and generalize the findings from your case study.

DATA SOURCES

A hallmark of case study research is the use of multiple data sources, a strategy which also enhances data credibility (Patton, 1990; Yin, 2003).

You may use these six in any combination, as well as related sources such as focus groups (a variant of interviews), depending on what is available and relevant for studying your case(s).

1. Direct observations (e.g., human actions or a physical environment).
2. Interviews (e.g., open-ended conversations with key participants).
3. Archival records (e.g., student records).
4. Documents (e.g., newspaper articles, letters and e-mails, reports).
5. Participant-observation (e.g., being identified as a researcher but also filling a real-life role in the scene being studied).
6. Physical artifacts (e.g., computer downloads of employees' work).

PRESENTING CASE STUDY EVIDENCE

- Present the evidence in your case study with sufficient clarity (e.g., in separate texts, tables, and exhibits) to allow readers to judge independently your later interpretation of the data.
- Ideally, such evidence will come from a formal case study database that you compile for your files after completing your data collection.

CASE STUDY ANALYSIS

- 1) **Pattern-matching** logic would later enable you to compare your empirically based pattern (based on the data you had collected) with the predicted one.
- 2) A case study may not have started with any predicted patterns but in fact may have started with an open-ended research question that would lead to the use of an **explanation-building** technique.
- 3) A third technique mimics the ***time-series analyses*** in quantitative research. In case study research, the simplest time series can consist of assembling key events into a *chronology*.

CASE STUDY TYPOLOGIES

Business School Case Studies	Best Practice Case Studies
Field Case Study: Gathering of original research. Usually involves direct observation and interviews.	Implementation Case Study: Focuses on the change management aspects of putting a practice into effect within the workplace. Focus is on major stages of the process, not necessarily the long-term outcome.
Literature Case Study: Developed by looking exclusively at already existing/published materials.	Success Case Study: Looks at those practices that have proven successful in terms of outcomes. Suggests methodologies where similar practices can be used in other areas of Public Administration.
Armchair Case Study: Explains a management idea by presenting a hypothetical scenario.	Failure Case Study: Looks at situation where things went wrong with the intention of identifying lessons learned.

CONCLUSION

Field Case, Implementation Case and Success Case methodologies seem most plausible for training purposes for the following reasons:

- **Challenge:** these approaches generally tend to highlight why an event is worth discussing
- **Context:** highlight salient points about the context and circumstances affecting an issue at hand.
- **Strategy:** highlight approaches adopted to address identified challenges
- **Outcome:** show results achieved and lessons learnt and finally
- **Discussion Points:** facilitate discussions through issues and questions readers may identify.

CONCLUSION

Field Case Studies

**Implementation
Case Studies**

**Success
Case Studies**

The Challenge:

Why is this event worth discussing

The Context:

Salient points about the environment and the circumstances affecting the issue at hand.

The Strategy:

The approach adopted to address the challenges.

The Outcome:

The results achieved and the lessons learned.

Discussion Points:

Questions or issues that readers of the case may want to consider and discuss.

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THANKS FOR YOUR ATTENTION!



Best Practices in Using Participatory Approaches in Different Contexts Worldwide

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Several definitions have been given in order to address the **best practice** issue and different terms have accordingly been used.

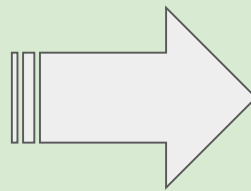
Good practices, best practices & smart practices are examples of terminology used in the literature.

These terms can be found either overlapping or diverging. Nonetheless all the approaches – more or less – converge in that the best practice is oriented on constant:

.Learning

.Feedback

.Reflection



On what works and why

&

what does not work and why

(Veselý, 2011).

FAO Definition (2003):

A good practice is not only a practice that is good, but a practice that has been proven to work well and produce good results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, which has been repeated and deserves to be shared so that a greater number of people can adopt it.

Chinapah & Blom (2012): *Practices which are effective in improving and changing society and quality of life and which are socially, economically and environmentally sustainable are defined as 'good practices'. Thus, some elemental features are (FAO, 2013):*

.Functionality

.Innovativeness

.Replicability &

.Adaptability

transferability

**.Environmental,
economical and social
sustainability**

.Gender sensitivity

.Effectiveness &

.Technical feasibility

Success

.Crisis – Risk – Disaster

.Inherent Inclusiveness

Reduction

– Participatory

approaches

Two variables interacting when implementing a good practice:

● **Source Target:** institution or -in general- situation providing inspiration for internal change (dependent variable).

● **Site Target:** institution or situation whose working is to be improved (independent variable).

When it comes to participatory methods:

Participatory Learning and Action is a family of:

- approaches
 - methods
 - attitudes
 - behaviours
- relationships

They enable and empower people to:

- analyze
- share
- enhance
- their knowledge of their life & conditions

And urge people to plan, act, monitor, evaluate and reflect on their actions.

Case studies of good practices in participatory approaches

- ❖ **A class-action suit to defend the environment.**
- ❖ **European Charter for Sustainable Tourism (*ECST*)**
 - ❖ **Green supply chain management in China**
 - ❖ **Participatory urban planning**

A class-action suit to defend the environment (case study #1)

Thanks to the interest of a sensible American lawyer and an American company, Texaco, has been accused in the U.S.A. for having damaged an Ecuadorian indigenous population. Different interests (economic, political, cultural) are involved in this case

Retrieved from:

<http://www.umich.edu/~snre492/paul.html>

The Huaorani

- The Huaorani are a group of indigenous people who has always lived in the Ecuadorian Amazon (also called Oriente)
- The daily life of this population is totally based upon non intensive and traditional exploitation of the surrounding environment
- Before the 1950s the region in which they live never entered in contact with what is generally defined as « modern civilization »

Looking for oil

- The first oil company to work without legal permission in the Oriente region was Texaco in 1967. It produced many damages to the environment polluting the watershed and dramatically influencing the social and cultural structure of the indigenous group
- Maxus Energy Corporation came in the region in 1992 having received a concession by the Ecuador government. They build an oil road which passed through a national park but tried also to influence in a positive way the public opinion (providing education and health opportunities, employing indigenous people)

Some useful strategies used by the Huaorani :

- They try, thanks to the help of other indigenous groups, to start a tourism economy as an alternative to oil
- They make efforts to internationalize the conflict involving international and local organizations
- They wish to start a public debate around these topics

European Charter for Sustainable Tourism (ECST)

coordinated by EUROPARC (case study #2)

<http://www.european-charter.org/home/>

The charter was developed by the Europarc Federation on behalf of the European Union.

The Europarc Federation is a pan-European Body representing some 500 national parks, nature parks and biosphere reserves.

ECST is a management tool. It is one of the two methodologies recommended by the European Union for the development of Sustainable Tourism in Natura 2000 areas.

Requires the fulfillment of a participative planning method that results in a common Strategy and an Action Plan.

How the Charter works?

Quality

Encourages good practice

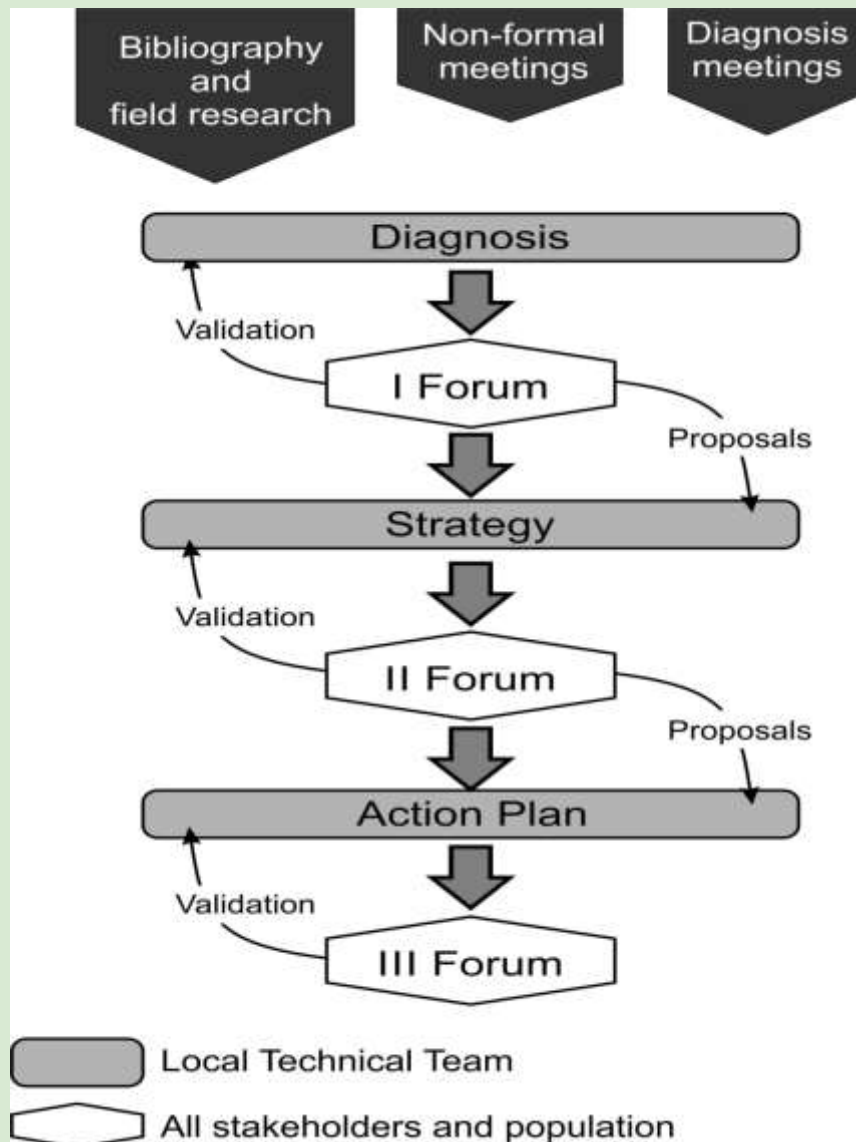
Agreed requirements must be met

Partnership

Involves all those implicated in tourism, in and around the protected areas, in its development and management.

Community participation and adaptive management are commonly considered as good approaches for long – term success of environmental policies.

Scheme of the methodology applied for public participation



What are the benefits to protected areas?

1. Basis for strengthening relationships with local tourism stakeholders and wider tourism industry.
2. Higher profile in European arena as an area devoted to sustainable tourism.
3. Public relations opportunities with visitors, locals and national media.
4. Opportunity to work with and learn from other European parks in a network.
5. Greater credibility amongst potential funding partners
6. Helpful internal and external assessment, which may lead to new ideas and improvements

Case study of the application of ECST in the Lands of Priolo (Eastern councils of Sao Miguel Island, Azores, Portugal)

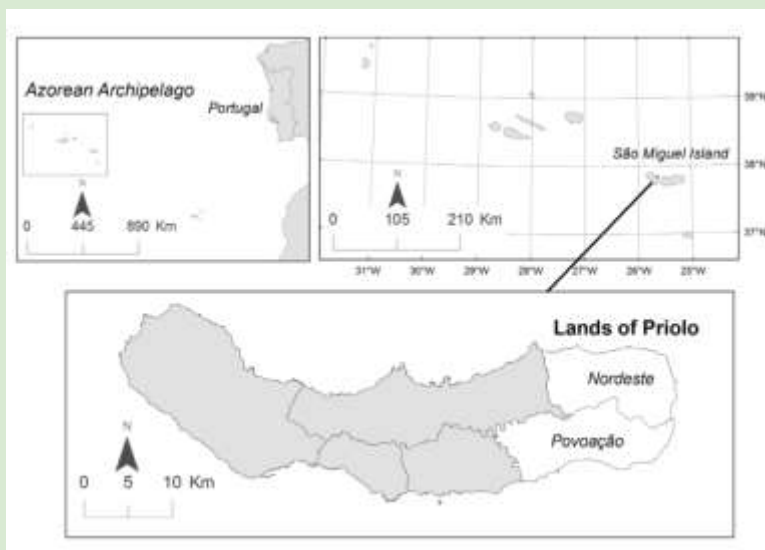
The Lands of Priolo is home of the rare endemic Azores Bullfinch of Priolo (*Pyrrhula mulina*).

Visitation has increased considerably and if not adequately managed it can cause conservation problems.

ECST was considered to be the best methodology to promote a joined work in the territory.

Objectives:

1. To guarantee a long term maintenance of conservation work necessary to ensure the protected areas, priority habitants and the population of the Azores Bullfinch.
2. To promote a sustainable tourism activity in the territory that would contribute to increase well-being among local population in social, environmental and economic terms.
3. To increase the interaction and the cooperation among all stakeholders involved in the tourism activity and in the management of the territory with final focus on the conservation of the bird species and its habitat.



Participatory planning process (2011) – Strategy and Action Plan (2012 – 2016)

<http://www.azores.gov.pt/Gra/srrn-cets-en/menus/principal/cets/ECST.htm>

- More than one hundred people participated in the process, representing 50% of the stakeholders identified.
- The European Charter for Sustainable Tourism proved to be an adequate methodology for the participative planning of a strategy towards sustainable tourism.

Planning results:

- Cooperation and coordination (8 actions)
- Hiking trails and activities (10 actions)
- Cultural and environmental interpretation (11 actions)
- Protected area conservation (4 actions)
- Promotion and disclosure (11 actions)
- Sustainability of tourism (10 actions) and
- Monitoring (1 action).
- A Priolo Brand was created to encourage and allow companies to join the process.

Green supply chain management in China



China is a major manufacturing country, which supplies 19.8 % of the world's goods.

It has yearly revenue of \$2,342.75bn in exports. In general, one could say it has a booming economy and a great future!

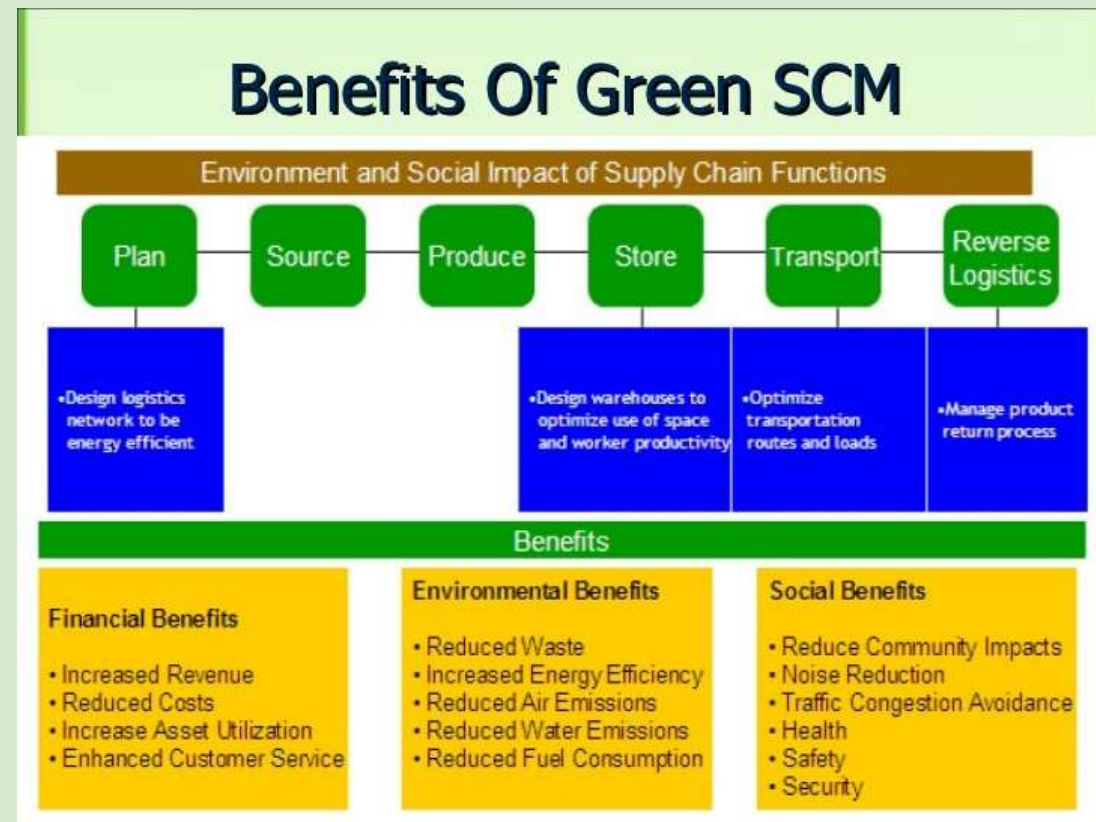
However,

- China is facing great pollution problems related to the growing output of production for global economy.
- It also has great amounts of “imports” of end-of-life-products from multinational companies and developed countries. Yet just like many developing countries it doesn't have the infrastructure needed to process all those materials, a reality, which only aggravates the environmental issues the country is already facing.
- On top of all that China has to deal with the environmental effects of its own growing population.

International agreements and competitiveness in a global market

Green supply chain has emerged as an important archetype for enterprise management in late 1990. It provides guidelines for businesses to achieve profit and market share objectives by lowering their environmental risks and by increasing their ecological efficiency.

Adherence to International Organizational Standards, such as ISO 9000 serial and ISO 14001 certification, has put companies in developed countries in a position where they have to demand their suppliers and product manufacturers to meet certain environmental standards in order to be able to import the goods into their countries.



It is estimated that during the period 1997-1999 the value of goods that was rejected from being imported from China because of Chinese manufacturers' failure to comply with those regulations (not required by Chinese government) is approximately 20 billion US dollars.

Pursuit of market share and competitiveness

Facing the challenges of:

- Loss of money in revenues due to returned products,
- Scarcity of resources,
- Degradation of environment,
- Increasing pressure from citizens for cleaner environment

Chinese government has shifted its policies from subsidizing resources manufacturers had to procure, to levying taxes on natural resources such as water, coal and natural gas. It also encouraged (pressured) the industries to adopt GSCM practices to help spur the economic development.

From encouraging the market growth,

To encouraging environmentally sustainable market growth.



Some of the discovered results of internationally enforced national measures

Research (2004) conducted in the 2 largest industrial zones in China (TEDA and DETDZ) has shown that from 314 participating manufacturing enterprises (all heavy polluters and 1/3 of them with over 2000 employees) has shown:

1. Chinese enterprises have experienced pressures/drivers from variety of sources to adopt and implement GSCM.
2. Chinese enterprises have initiated or already adopted some GSCM practices and encouraged to progress in that direction by senior management.
3. The adherence to GSCM practices is a **result of economic pressures by global markets** and not yet a change in thinking. As a result a regulatory practice is the most important factor in adopting GSCM practices (domestic pressures have been initiated in order to boost the exports and attract foreign investment).
4. Better awareness of GSCM practices, understanding their underlying philosophy as well as particular ways of adopting changes is still needed at all levels of management of manufacturing industry in order for the changes to be effective and permanent.

Participatory urban planning

Urban planning

- “The branch of architecture dealing with the design and organisation of urban space and activities” (Commin, 2013)
- An unfinished social project whose task is to manage our coexistence in the shared spaces of cities and neighbourhoods in such a way as to enrich human life and to work for social, cultural and environmental justice” Sandercock (2004,134)

In participatory urban planning the focus is on the local actors - the citizens, politicians, administrators, entrepreneurs and their networks

The goal is an urban planning process in which the stakeholders are participating in order to create an end result that appeals and benefits the actors that are connected to the environment.

Top-down urban planning is still the most common way of planning but participatory methods are becoming more and more popular.

The case: Roihuvuori Neighbourhood Yard

- The participants were engaged to develop their own visions of the area.
- Instruments used in the participatory planning process:
 - neighbourhood meetings, local rallies, digital tools, social media applications
- The outcomes:
 - E-tools can engage people who usually are not being heard in the traditional planning process. In the Roihuvuori Neighbourhood Yard they were successful in engaging especially adolescents and people that are too busy to take part in the neighbourhood meetings etc. (Wallin et al., 2010).
 - E-planning enables more stages of participation and more early on in the process than in the traditional process

Pros of participatory e-planning

- urban planning process as a community development and local governance contributor, integration of the planning process with the substance of planning, more personal information and visions from the community, participation in different stages of the process, new and more actors and participants, embeddedness in co-governance.



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<http://www.participatorymethods.org/glossary-terms?page=2>

<http://www.slideshare.net/sandyskadam/green-supply-chain-management-8714198>

Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2 Course II

Current State and Future of the Baltic and
Mediterranean Area in an interdisciplinary
perspective



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Intellectual Output 2 Course II

Current state and future of the Baltic and
Mediterranean Area in an interdisciplinary
perspective

Course Description & Outline





Course Description

Course title: COURSE II – **Current State and Future of the Baltic and Mediterranean Area in an interdisciplinary perspective**

Participating organizations: University of Ioannina, University of Helsinki

DESCRIPTION:

This course explores the present and future state of the Baltic and the Mediterranean area through interdisciplinary approaches. Specifically, concerning The Baltic Sea Region, it should be mentioned that it occupies several countries and all of them forms a Council of the Baltic Sea Nations. On the other hand, the Mediterranean Sea covers portions of three continents: Africa, Asia and Europe. Furthermore, this area includes the Mediterranean climate, which is responsible for its rich flora in the entire region. Finally, both of these areas face a number of problems environmentally related, so on the occasion of this course, we will try to name these problems, study them and of course to give some solutions.

Course Content:

- The issue of harmful and toxic substances from the factory and agricultural activities, maritime transport, etc. which reach the Baltic Sea. Also, illegal marine and airplanes fuel deposits. Proposed solutions.
- The problem of eutrophication and the extinction of marine species and water quality in the Baltic and the Mediterranean Sea. Proposed solutions.
- Case Study program: Baltic Sea Action Plan (BSAP). Necessary participation.
- The Baltic and Mediterranean history, geology, climate and biodiversity.
- Study of economic, political, social and cultural status of the two regions. Comparisons.
- Concentration and bioaccumulation of organochlorine pesticide residue in herons and their prey in wetlands of Mediterranean area.
- The status of pesticide pollution in surface waters (rivers and lakes) of Mediterranean and Baltic Sea.
- Regional efforts to find solutions for collective addressing environmental problems in the countries directly affected.
- Ecological risk assessment of agrochemicals in European estuaries.
- Information and awareness to all European citizens and not only to the citizens of the specific regions.
- The controversial role of the European Union on cooperation between the two regions.

Teaching Methods for the course

- Lectures
- Teaching teamwork
- Laboratories in jigsaw groups
- Individual work



Goals - Purposes

- Students become aware of the situation of the Baltic and Mediterranean regions.
- Students will develop attitudes and skills for applying the knowledge acquired in the teaching practice through collaborative learning, assignments and interdisciplinary approaches.
- Teachers and students will discuss and propose solutions for preserving and contribute to the further development of the two regions.

COURSE X	ECTS	CONTENT	METHOD/TOOL
Module 1	3	Topic 1: Significance and Biodiversity	
Module 2	3	Topic 2: Problems and toxics	
Module 3	3	Topic 3: Managing problems and Avoid climate change	
Case study	6	Toxics and human wastes of the ships	



Templates

COURSE II Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective

MODULE 1 TEMPLATE: Significance and Biodiversity

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	1
Number of labs	-
Homework	Significance to humans and nature from different perspectives. Biodiversity in different ways.
Meetings/tutorial	-
Course objectives	Knowledge <ul style="list-style-type: none">- Understanding many various significances at sea areas to humans and environment- Familiarize with biodiversity and which components causes them- Review and understanding many ways to protect biodiversity
Course contents	-Sea areas significance in different perspectives: industry, transport, port activity, recreational use etc. -Discussions about significance to different people in different economic classes -Biodiversity and what leads to it: physical history, climate, ice age, human activities etc. -Marine species in different seas -Biodiversity protection -Issues with biodiversity and proposed solutions
Assessment	Assignment – 1 Get familiar with the Baltic Sea region and make short, clear answers to next questions: 1) What are the main special natural characteristics in the Baltic Sea which make it problematic and sensitive sea area?



-Handle geography, history, natural water quality ect.

2) What means eutrophication in the Baltic Sea area?

-Think about main sources and reasons, possible solutions and policy

3) What are the biggest problems in the Baltic Sea?

Don't forget to Justify your thoughts. There is no one right answer!

Assignment – 2

Get familiar with the Mediterranean region by reading the above resources as examples and make short, clear answers to the next questions:

1) What are the main special natural characteristics in the Mediterranean Sea which make it problematic and sensitive sea area?

-Handle geography, history, natural water quality ect.

2) What does eutrophication mean in the Mediterranean Sea area?

-Think about main sources and reasons, possible solutions and policy

3) What are the biggest problems in the Mediterranean Sea?

Don't forget to justify your thoughts. There is no right answer!

Assignment – 3

Read the European Commission's case study: "Exploring the potential of maritime spatial planning in the Mediterranean".

Carry out a desk research on the legislation of maritime spatial planning of the Mediterranean Sea in the last decades and create a timeline.

1. Propose some ideas for a better management.

Assignment – 4

Read the European Commission's country report: "**Greece**".

1. Identify the Mediterranean characteristics of the country (Greece) in the relevant report.

Conduct a comparison and write an essay on the characteristics identified and those are not.



MODULE 2 TEMPLATE: Problems and toxics

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	1
Number of labs	Field studying and labs with samples
Homework	
Meetings/tutorial	-
Course objectives	Knowledge <ul style="list-style-type: none">- Understanding of toxics main sources- Knowledge of the various problems Skills <ul style="list-style-type: none">- Can make research about toxics from samples
Course contents	<ul style="list-style-type: none">-Problems in sea areas, what are the main causes etc.-Where toxics come: agriculture, factories, industrial, transport, sewage and other human activities etc.-Surface water and toxics-How toxics and other harmful components will affect nature-Field work and collecting of samples-Toxics concentration and accumulation in food chain-Reducing toxics
Assessment	Field working and making toxics research from samples Discussion about proposed solutions to prob. and toxics



MODULE 3 TEMPLATE: Managing problems and Avoid climate change

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	1
Number of labs	-
Course objectives	Knowledge <ul style="list-style-type: none">- Understanding how management of problems depend on culture of the area and why same solutions doesn't work in different areas- Knowledge what is Europeans knowledge about water pollution and climate change
Course contents	<ul style="list-style-type: none">-Study of economic, political, social and cultural status of two sea regions- Information and awareness to all Europeans-Climate change: what causes it and how it effects to sea region-How to avoid climate change and also prepare it
Assessment	<p>Get familiar with arguments, justifying opinions and critical articles.</p> <p>In this module managing problems is handled. Select topic and write critical article about selected topic.</p> <p>Let your friend read it through e-platform.</p>



MODULE 4 TEMPLATE: Toxics and human wastes of the ships

Title	Description
Level (EQF)	7
ECTS	6
Teaching language	English
Number of lectures	1
Number of labs	-
Homework	Reputation of earlier subjects.
Meetings/tutorial	First meeting and then one middle point meeting and in necessary more
Course objectives	Knowledge <ul style="list-style-type: none">- Ship transport in sea areas, different transport types and various attributes Skills <ul style="list-style-type: none">- To put in a practice all topics covered earlier- Analyses and application earlier information to this case study
Course contents	Case study work
Assessment	Case study work
Assessment	Case study work



Course Handouts

COURSE II Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.

MODULE 1: Significance and Biodiversity

Introduction	<p>Main themes in this module are significance and biodiversity of Mediterranean and Baltic Sea areas. After the module 1 student understands many various significances of the sea area to humans and environment. The module provides advice information about different biodiversities and differences between them. Also, the various ways to project them will be introduced.</p> <p>In this module the teaching consists of 12*90min lectures, where 2 last lectures includes the presentations of students.</p> <p>Grading will be on a scale from 1 to 5 where 5 is the best grade. Evaluation of the course consists of essay, presentation and lecture presence, each on contributing one third of the grade.</p>
Lecture presence of 80% is demanded.	
Homework 1	<p>Essay about the significance of Mediterranean/Baltic Sea area. The essay should examine the significance of sea area from different perspectives.</p> <p>Instructions for essay: 2000 words, spacing 1.5, front Times New Roman.</p>
Homework 2	<p>Presentation (a'15min) about biodiversity of sea area. After presentation discussion is led by students. Could be done also in groups. Subjects of presentations will be decided based on individual interest during the course.</p>
References	<ul style="list-style-type: none">Abdulla, A., & O., Linden (edit) (2008). Maritime traffic effects on biodiversity in the Mediterranean Sea. Review of impacts, priority areas and mitigation measures. Switzerland and Malaga, Spain: IUCN https://cmsdata.iucn.org/downloads/maritime_v1_lr.pdf (last visit 6/5/2016)



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MODULE 2: Problems and toxics

Introduction	<p>Main themes in this module are problems and toxics in Mediterranean and Baltic Sea areas. Module handles sources of toxics and how they affect to environment and nature. Also, toxics concentration and accumulation in food chain will be introduced. After module 2 students will be able to collect samples and make research about them. Phases of research will be familiar. Student will be able to do research, analyze the results and examine results critically.</p> <p>In this module, the teaching consists of 12*90min lectures and 12*2h labs and field work.</p>
Lecture presence of 80% is demanded.	
Grading will be on a scale from 1 to 5 where 5 is the best grade. Evaluation of the course consists of study diary and lecture/lab presence, where diary contributes two third of the grade and presence one third.	
Homework	Study diary about doing research. The diary should include: note after every lecture, lab and field work, reviewing personal learning, thoughts about learning process, doing research step by step, lab work diary and critical arguments about own research.
References	<ul style="list-style-type: none">• Blenckner, et. al (2011). FishSTERN, A first attempt at an ecological-economic evaluation of fishery management scenarios in the Baltic Sea region. Report 6428. Swedish environmental protection agency.• Briney, A., (2014). Geography of the Mediterranean Sea. Learn Information about the Mediterranean Sea. <i>About Education</i>. Retrieved from http://geography.about.com/od/specificplacesofinterest/a/Mediterranean-Sea-geography.htm (last visit 6/5/2016)• Bäck, S., M. Et. al (toim.) (2010). Itämeren tulevaisuus. Gaudeamus. Helsinki.• Danovaro, R. (2003). Pollution threats in the Mediterranean Sea: An Overview. <i>Chemistry and Ecology</i> 19 (I), 15-32.• EEA Report No 4 (2006). Priority issues in the Mediterranean environment, 10-15. Retrieved from



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MODULE 3: Managing problems and avoiding climate change

Introduction	<p>Main themes in this module are managing problems and avoiding climate change. Students will become aware of the situation of Mediterranean and Baltic Sea areas. They familiarize different components which causes various statuses. Students will be introduced to different solutions and why is important to know cultural and environmental components in study area. Students will know how to present and argue their opinions.</p> <p>In this module the teaching consists of 12*90min lectures and 6*90min discussion sessions.</p>
Lecture presence of 80% is demanded.	
Grading will be on a scale from 1 to 5 where 5 is the best grade. Evaluation of the course consists of panel discussion, article and lecture presence, each on contributing one third of the grade.	
Homework 1	Panel discussion is discussion between two different perspectives. Participants prepare their arguments and counter arguments. They also make literature review to support their arguments.
Homework 2	Critical article 2000 words, spacing 1.5, font Times New Roman. Article will be based on researches which's arguments should be handle critically
References	<ul style="list-style-type: none">• Backer, H., J-M. et. Al (2010). HELCOM Baltic Sea Action Plan – A regional programme of measures for the marine environment based on the Ecosystem Approach. Marine Pollution Bulletin 60, 642-649.• Blenckner, T., R. et. Al (2011). <i>FishSTERN, A first attempt at an ecological-economic evaluation of fishery management scenarios in the Baltic Sea region</i>. Report 6428. The Swedish Environmental Protection Agency.• Cebrian, D., (2008). Changing climate, changing biodiversity in South-East Europe. Belgrade. Serbia. http://www.ecnc.org/uploads/documents/impacts-of-cc-on-the-bd-of-the-mediterranean-sea-d.pdf (last visit 6/5/2016).• EEA, (2006). Priority issues in the Mediterranean environment. EEA Report No 4/2006.



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MODULE 4: Toxics and human wastes of the ships.

Introduction	<p>Main themes in this module are toxics and human wastes of the ships, which are examined in case study groups. Case study research is done on Mediterranean and Baltic Sea regions. Both regions face several environmental problems. In this module, these problems will be named, studied and solutions will be proposed.</p> <p>In this module teaching consists of 12*90min lectures where theoretical basis will be introduced and 6*90min meeting where results will be presented.</p>
Lecture presence of 80% is demanded.	
Grading will be on a scale from 1 to 5 where 5 is the best grade. Evaluation of the course is based in case study research. Case study work is based to Baltic Sea action plan (BCAP).	
References	<ul style="list-style-type: none">• Austen Mel (2013) http://www.marine-vectors.eu/factsheets/FS-15_baltic_overview.pdf.• http://www.coexistproject.eu/• Rydén Lars. Steps to a sustainable baltic Sea region. Baltic University. Programme Uppsala University. www.balticuniv.uu.se• Sirola, M. (2013) Marine monitoring and science –opportunities with BONUS, the joint Baltic Sea research and development programme < http://www.bonusportal.org/ >.• http://writing.colostate.edu/guides/guide.cfm?guideid=60• http://mpas.helcom.fi/apex/r/mpa/files/static/v9Y/Short%20instructions_HELCOM%20MPA%20database.pdf

Environmental Portfolio for Quality in University Education

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Intellectual Output 2 Course II

Current state and future of the Baltic and
Mediterranean Area in an interdisciplinary
perspective

Course Contents – PPTs



Significance and Biodiversity

Module 1 from course II: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective

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Noora Kivikko University of Helsinki



Contents

- Course objects
- The Mediterranean Sea
 - Location, features, characteristics
- The Baltic Sea
 - Location, features, characteristics
- Significance
 - The Mediterranean Sea
 - The Baltic Sea
- Biodiversity
 - The Baltic Sea
 - The Mediterranean Sea

Course objects

- Understanding of many various significances of Baltic and Mediterranean Sea areas to humans and environment
- Familiarize different biodiversities, dimensions of biodiversity and which components cause the differences
- Special features of both Sea areas
- Understanding and reviewing of many ways to protect biodiversity

The Mediterranean Sea

Overview

- Sea is surrounded by the Mediterranean region between Southern Europe and Anatolia, on the south by North Africa and on the east by Levant
- Surface area 2 500 000km² ,volume 3 750 000km³
- Average depth 1,5km, max depth 5,3km
- The Mediterranean-rim countries hold around 400 million people, and 135 million of them live on the coast, basin countries about 60



The Mediterranean Sea

Overview

- Connected to the Atlantic Ocean by the Strait of Gibraltar, by Suez Canal connected to the Red Sea
- 5000 islands (marine biodiversity hotspot)
- Mediterranean climate characterizes basin, cool wet winters, hot long summers
- Salinity at 5m depth is 3,8%
- Annual rainfall 50mm (Libya, Egypt)- 1000mm (Balkan)
- Evaporation is high in eastern half



The Mediterranean Sea

History

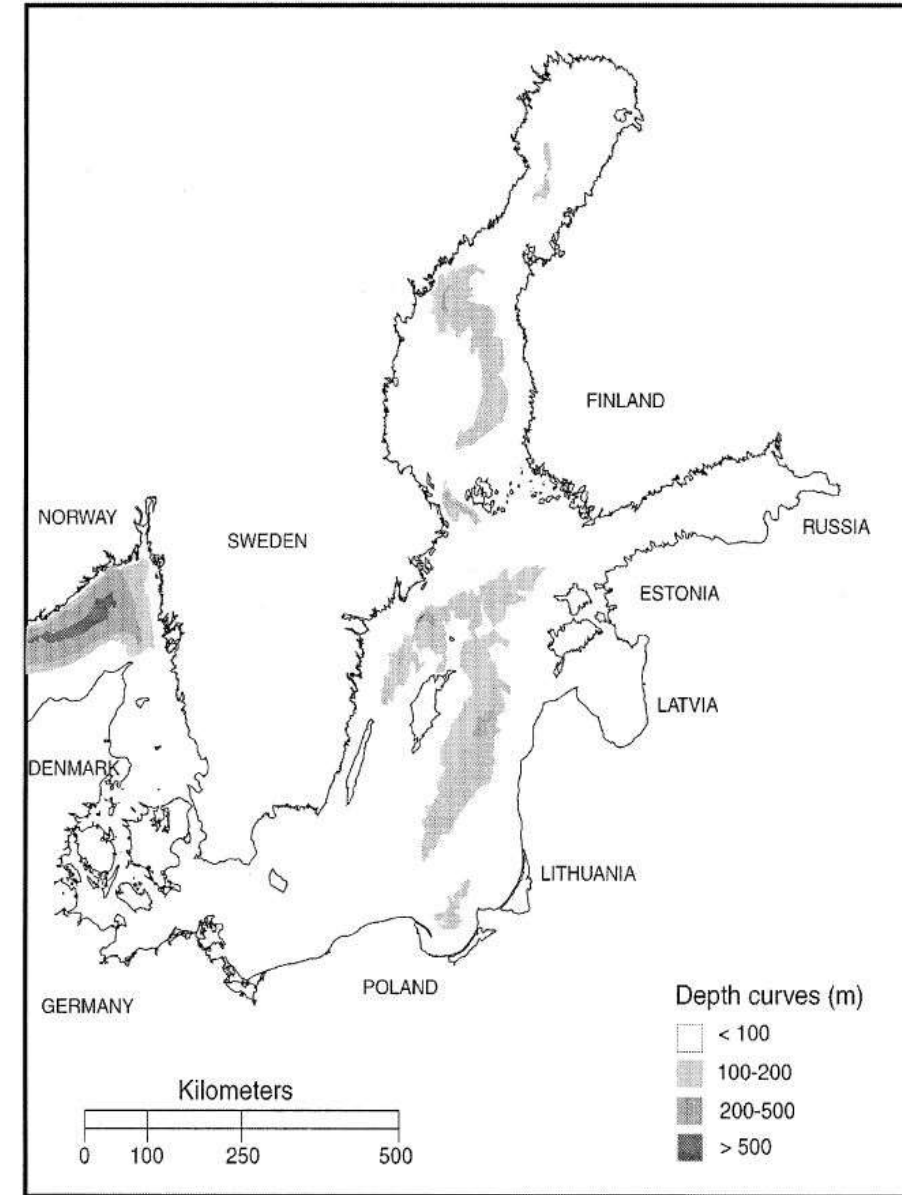
- Geological history: involved in the tectonic break-up and then collision of the Africa and Eurasian plates, dried seasons (12-5 mil. years ago), several different stages
- Biological history: old flora and fauna, lot of endemic species, species from Atlantic and Red Sea
- Human history:
 - Situated at the crossroads of Africa, Europe, and Asia, the Mediterranean coasts have witnessed the flourishing and decline of many civilizations
 - Migration towards coastal areas, south and east of the Mediterranean



The Baltic Sea

Overview

- The Baltic Sea lies between 53° N and 66° N latitude and 10° E and 16° E longitude
- Area 422,000 km²
- Volume is about 20,000 km³
- Shallow sea, mean depth 54m, max depth 459m
- Semi-enclosed
- Ice cover
- Brackish water- a mixture of fresh water and saline seawater
 - Salinity 0,6 % (one fifth of the salinity of the oceans)
 - Water remains within the sea for up to 30 years
- Drainage area 4 times larger than the sea region
 - 85 mill. people



(Rönning& Bonsdorff (2004))

époque



The Baltic Sea

Measurements

- The stratification by salinity and temperature levels
 - Halocline is situated at ca. -50- 80m
 - Termocline is situated at ca. -30m
- The salinity of the surface waters varies between 1‰-8‰
- The deep waters of central Baltic have salinity of 15-20‰
- Hypoxia in bottom water
 - Oxygen concentrations less than 2mg/l
 - Caused by excess nutrient loading and decompose of sinking death algal blooms
- Other measurements: phosphory, nitrogen, pH, alkalinity, hydrogen sulphine etc.
- Saline pulses

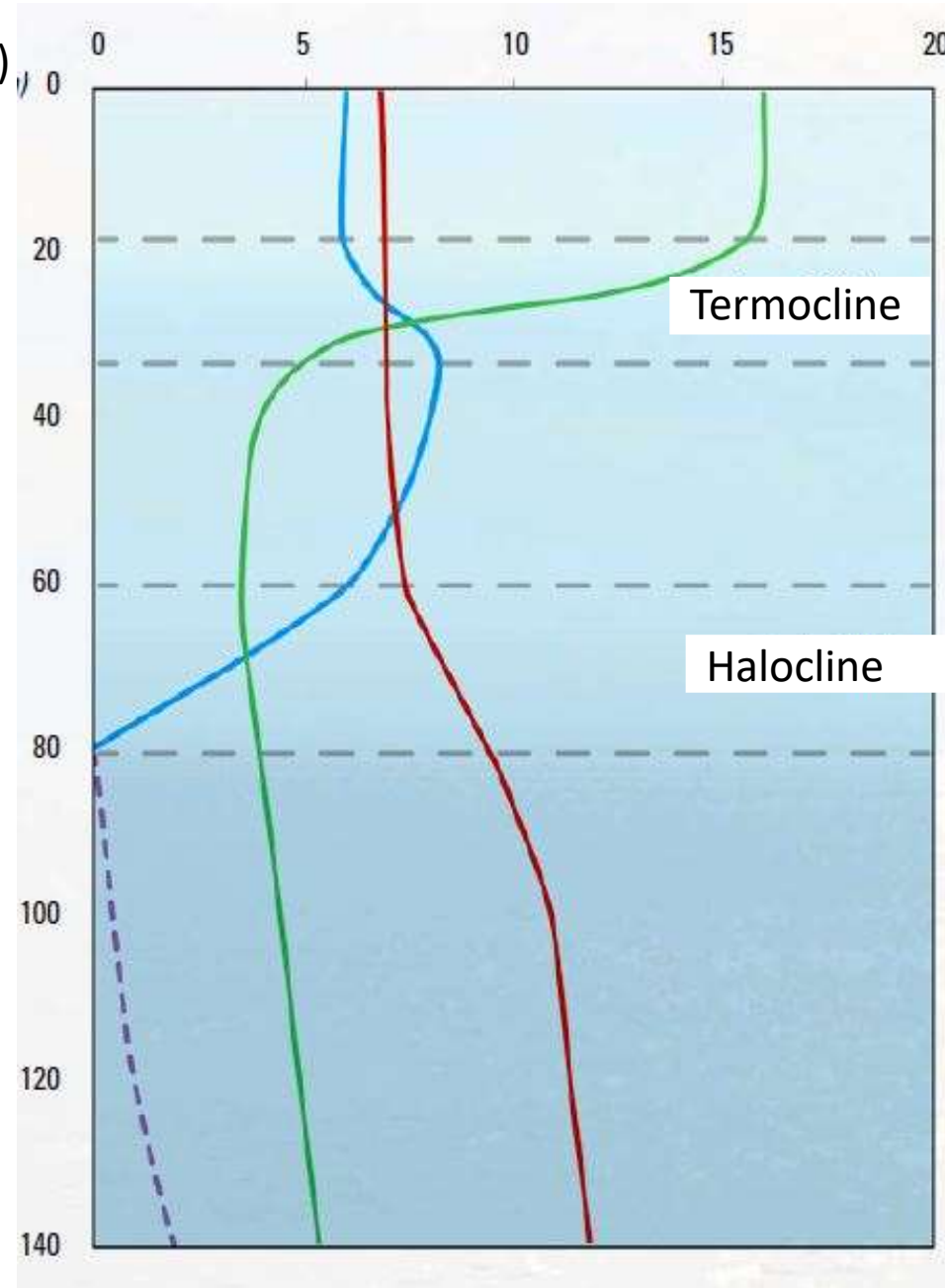


The Baltic Sea

Measurements



Depth (m)



Gotland Basin
August



The Baltic Sea

Measurements

- From 1892 regular measurements of hydrographic parameters have been carried out
 - Salinity is at the same level as at the beginning of century, maximum 1950s, minimum 1992-1993.
 - Temperature trend shows a clear rise
 - Oxygen trend is clearly negative
 - Nutrition levels varied
- The Baltic Sea has problems with nutrient overload (eutrophication)

The Baltic Sea

History

- Young sea, current form 3000 years
- Have developed to current form after last Ice Age.
 - Earlier stages: Baltic Ice Lake, Yoldia Sea and Ancylus Lake
 - Connection to the Atlantic opened 8000 years ago
- Different water levels and saline conditions
 - Sediments and fossil records
- Basement of the Sea is variable and archipelago is scattered (continental ice, water flows etc.)
 - Variable habitats



Significance of Sea

- Significance of the Mediterranean and Baltic Sea areas can be divided into two parts i) significance to humans and ii) to nature and environment
- Inside these two sections can be found several different perspectives
- Because of various different significances of the Mediterranean and Baltic Sea areas there is no simple solutions of problems of those Sea areas



Significance for humans

The Mediterranean Sea

- History of the Mediterranean region
 - Development of many modern societies
 - Phoenicians, Greeks , Roman Empire, Byzantine Empire, Ancient Egypt, Arab Empire, Ottomans
- Route
 - Merchants and travellers
 - Trade
 - Cultural exchange
- Source of food
- Leisure



Significance for nature

The Mediterranean Sea

- Marine biodiversity hotspot region, 17 000 species
 - 7,5% of all marine species
- Second most important area to endemic species after tropic regions
 - Endemic species: nesting sea birds 20%, sea squirts 50% and sponges 46% of all species
- Several different habitats
 - Coral reefs

Significance for humans

The Baltic Sea

- Humans have advantage of resources of the Baltic Sea for thousands of years- long history of human activities
 - Frisian 6th century, first marine trade routes and ports
 - Hanseatic League, 14th to 17th-century trade group
 - Archeology
 - Understanding of the past
- Strategically important area for surrounded countries
- The second busiest sea region after English channel
 - 80% of foreign trade of Finland is transported by the Baltic Sea



Significance for humans

The Baltic Sea

- Energy
 - Source of energy and way for transport it (windmills, Nord-Stream)
- Transport
 - Industry, raw materials, energy, labor, foreign trade
- Trade
 - Aqua activities, tourism, market products
 - 50% of tourists and immigrants of Finland are from surrounding countries of the Baltic Sea



Significance for humans

The Baltic Sea

- Leisure
 - Cruises
 - Housing
 - Beach activities, fishing etc.

”The most popular recreation activities in the Baltic Sea is hanging around on the beach and fishing. There is differences between the countries around the Baltic Sea”

(http://www.centrumbalticum.org/sites/default/files/raportit/ahtiainen_heini_ja_artell_janne_final.pdf)

Significance for nature

The Baltic Sea

- Significance for nature
 - Water quality
 - Biodiversity, habitats, fauna, flora
 - Nesting region
 - Endangered species

Biodiversity

- Biodiversity is the variety of life and habitats. The term is used to describe the variety of life found on Earth and all of the natural processes. It includes ecosystem, genetic and cultural diversity and the connections between these and all species. Coined by Edward O. Wilson in the 1980s.
- How to value biodiversity?
 - Normally valuation happens with species which are easy to calculate (mammals, birds, vascular plants). Depiction of totality of biodiversity distorts. Example microbes.



Biodiversity

- Favourable conservation status of biodiversity
 - Natural landscapes and seascapes
 - Thriving and balanced communities of plants and animals
 - Natural species diversity
 - Viable populations of species

(HELCOM)

Biodiversity

Protection

- Protected area over 1,1 million square kilometres (EU)
- In the EU, only 17% of habitats and species and 11% of ecosystems protected under EU legislation are in a favourable state
- Several protection programmes: Biodiversity strategy for 2020 (EU), Natura 2000
- Around 30% of the linear coastline in Mediterranean is under some form of protection (1200000 hectares)
- The system of marine protected areas covers 0,4% of the Mediterranean Sea surface
- BSAP (the Baltic Sea Action Plan)
 - One of main goals of the plan is to achieve a favourable conservation status of Baltic Sea biodiversity
- Red list of Baltic Sea species, biotopes, habitats in danger of becoming extinct
 - The harbour seal (*Phocoena phocoena*), the Baltic ringed seal (*Phoca hispida botnica*), Eurasian otter (*Lutra lutra*), the Kentish plover (*Charadrius alexandrinus*), the eel (*Anguilla anguilla*) etc.
- Blue Plan



Biodiversity

Researches

- Themes of biodiversity researches: How benthic communities handle external interferences and recover from it? Non-native animals, interesting perspective for ecological research. Biodiversity technologies. Spatial and temporal patterns of species diversity. Undescribed species.

Biodiversity of the Mediterranean Sea

Overview

- High amount of marine species- 17 000
- Islands- high value to global biodiversity due to their wealth of species
- Endemism
- Species inhabiting coastal sand dune systems are vulnerable
- Undescribed species- deep-sea areas, south and east regions
- Biodiversity generally higher in coastal areas and continental shelves, and decreases with depth

Important habitats that support biodiversity

- **rocky reefs**

- Endangered Mediterranean monk seal (*Monachus monachus*) as well as several endemic fish and invertebrates

- **seagrass meadows**

- breeding, feeding, and resting areas for numerous marine species, particularly fish, crustaceans, and marine turtles

- **upwelling areas**

- Ligurian Sea, most important in the Mediterranean



Local Species

19 species of cetaceans can be encountered

- 8 of them are considered common

Fin Whale *Balaenoptera physalus*, **Sperm Whale** *Physeter macrocephalus*, **Striped dolphin** *Stenella coeruleoalba*, **Risso's dolphin** *Grampus griseus*, **long finned Pilot whale** *Globicephala melas*, **Bottlenose dolphin** *Tursiops truncatus*, **Common dolphin** *Delphinus delphis*, **Cuvier's beaked whale** *Ziphius cavirostris*

- 4 are occasional and

Minke Whale *Balaenoptera acutorostrata*, **Killer whale** *Orcinus orca*, **False Killer whale** *Pseudorca crassidens*, **Rough toothed dolphin** *Steno bredanensis*

- 6 accidental, alien to the Mediterranean, but occasionally sighted in the last 120 years

among them the **Humpback whale** *Megaptera novaeangliae*



Characteristic species

- Endangered **Mediterranean monk seal** (*Monachus monachus*),
- **Mediterranean mussel** (*Mytilus galloprovincialis*),
- **Mullet** (*Mugilidae spp.*),
- **Gilthead sea bream** (*Sparus auratus*),
- **Sea bass** (*Dicentrarchus labrax*), and
- The **Greater flamingo** (*Phoenicopterus ruber*)

Also found in this ecosystem are:

- **loggerhead sea turtles** (*Caretta caretta*),
- **green sea turtles** (*Chelonia mydas*), and
- **leatherback sea turtles** (*Dermochelys coriacea*)



Biodiversity of the Mediterranean Sea

Risks

- Grow of population, migration
- Tourism – 200 million visitors per year
- Overexploitation and habitat loss
- Pollution
- Non-native species
- Climate change

Impacts of Climate Change in biodiversity

Mediterranean Sea

- Extreme events (Storms, gales, floods, thermal anomalies)
 - Massive habitat destruction
 - Scarce endemic species mortality
 - Stress induced epidemics
- Sea level rise
- Temperature increase → Migration Migration towards the North
 - Marine turtles:
 - Prompt nidification and short laying intervals
 - Low clutch success
 - Changes in distribution and abundance of the species
 - Migration routes modifications
 - Reduction of breeding beaches



Impacts of Climate Change in biodiversity

Mediterranean Sea

- Sesile invertebrates:
 - Risks of local populations extinction, loss of genetical diversity
- Fishes:
 - Physiological modifications and effects on reproduction
 - Migration alterations
 - Effects on growth rates and population dynamics
- Alien species:
 - Boosting of colonization and expansion towards the North
 - New arrived toxic phytoplankton species
- Birds:
 - Phenological changes (included migration)
 - Changes in distribution and geographical range
 - Impact on demographical parameters (performance of reproduction, eggs' size, laying dates, breeding success...)



Threatened coastal and marine habitats

Mediterranean Sea

- **Wetlands** (submersion by sea-level rise)
- **Sea grass beds** (changing sediment flux)
- **Coraligenous calcareous formations** (lack of opportunity for northwards migration after temperature increase)
- **Pelagic waters planktonic fringes** (Sea acidification by CO₂, altered nutrients load and water transparency)

Threatened coastal and marine species

Mediterranean Sea

- **Isolated populations**

- Closed sea
- Not a migration pathway
- Most affected habitats of the coolest aeries

- **New warmer-waters species**

- Extinction of local populations
- Disease transmission
- Direct predation

- **High species biodiversity vs. Low population numbers** → High niche specialization =>

- extinction vortex and
- possibly limited resilience to climatic change



Other risks

Mediterranean Sea

- Shipping noise
- Marine vessels on benthic habitats and species
- Shipping – derived antifouling biocides
- Collisions with marine mammals and turtles
- Ship-generated oil discharges and exhaust emissions



Biodiversity of The Baltic Sea

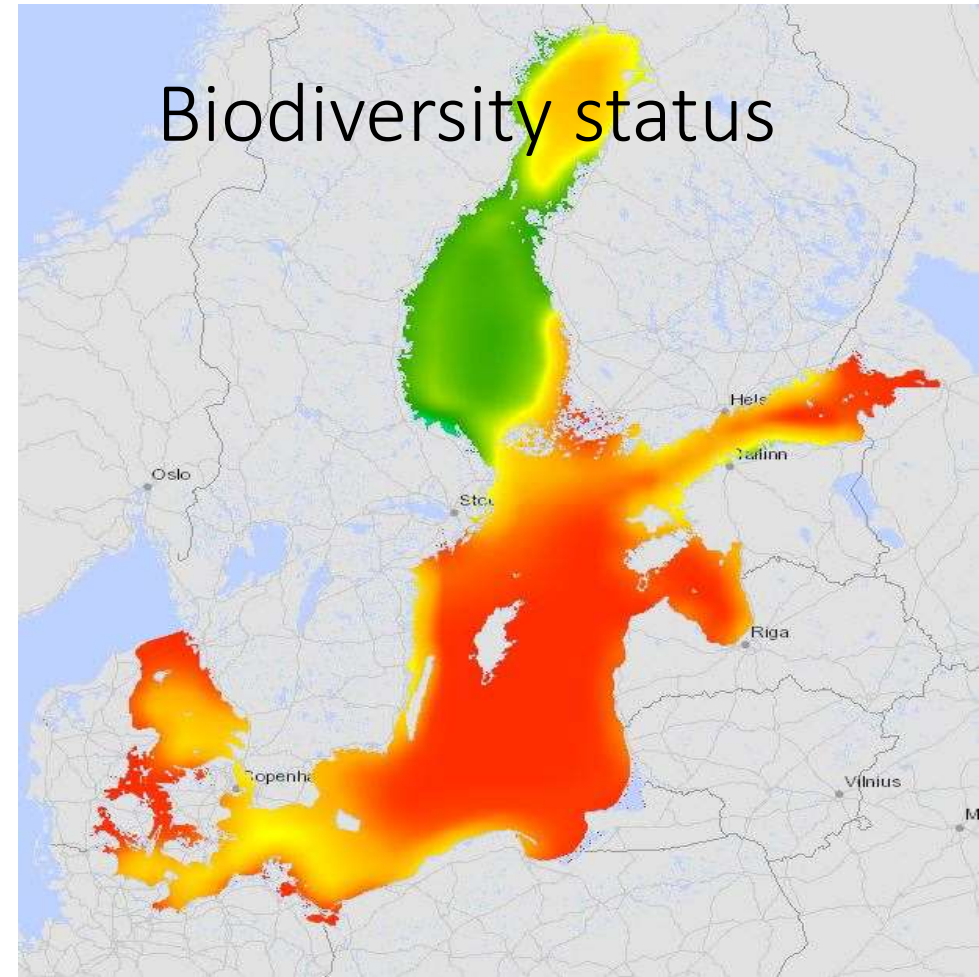
Overview

- An estimates 150 habitats, 100 species of fish, 450 species of macroalgae, 1000 zoobenthos species, 3000 plankton species and thousands of unknown species of viruses and bacteria
- The largest backish water basin in the world: species from marine, brackish and freshwater.
 - Main ecological barrier is salinity factor (Atlantic)
 - Water exchange is very limited

Biodiversity of The Baltic Sea

Overview

- Lot of different habitats and ecosystems
- Archipelago is scattered (ice age) and seabed is multiform
- Multiform environment (openness, soil ingredients, altitude differences) and variable conditions (salinity, brightness, nutrient content) offers several different habitats and ecological niches
- Increasing variety of habitats → More species
- Biodiversity status varies due several different components
- Species composition changes due salinity



<http://maps.helcom.fi/website/SeaEnvironmentalMonitoring/index.html>

Biodiversity of The Baltic Sea

Ecosystems

- Offing ecosystem
 - Plankton, upwelling, sedimentations, grazing chain
- The coastal ecosystems
 - Hard seabed habitats
 - Algae communities
 - Mussel communities
 - Soft seabed habitats
 - Benthic communities
- Multiform seabed structure has strong significance to habitats
- Hypoxic waters

Biodiversity of The Baltic Sea

Fauna and flora

- Fauna and flora consist of saline and fresh water species
 - Limited number of species (60 evident species)
 - Organisms origin from seas or lakes
 - Current species can handle low salinity/brackish water
 - Fossil records show an alternating dominance by typical freshwater and marine species since the last glaciation period
- In the most common salinity level the number of species is low
- During of it's history the fauna and flora have been subject to major environmental changes several times.
 - Fossils & present flora/fauna



Biodiversity of The Baltic Sea

Benthos and invertebrates

- Benthos and invertebrates- decreases from south to north, ability to tolerates fresh water
- Problematic oxygen situtation causes changes in benthic community- changes to ecosystem
- Lot of undescribed species

Biodiversity of The Baltic Sea

Algae and vascular plants

- Low rocks: colourfull algae
- Upper rocks: green and brown annual algae
- Deeper rocks: bigger perennial algae
- On the rocks: sheeting algae
- Deeper solid rocks: polyp colonials and mussels
- Bright sand beds: rooted vascular plants

Biodiversity of The Baltic Sea

Birds, fishes and mammals

- Birds
 - Lot of different species, nesting regions, archipelago.
- Fishes
 - Composition varies due salinity, salt pulses has positive effect, spawning rivers
- Mammals
 - 4 species: 3 seals and 1 whale (*Phocoena phocoena*)

Biodiversity of The Baltic Sea

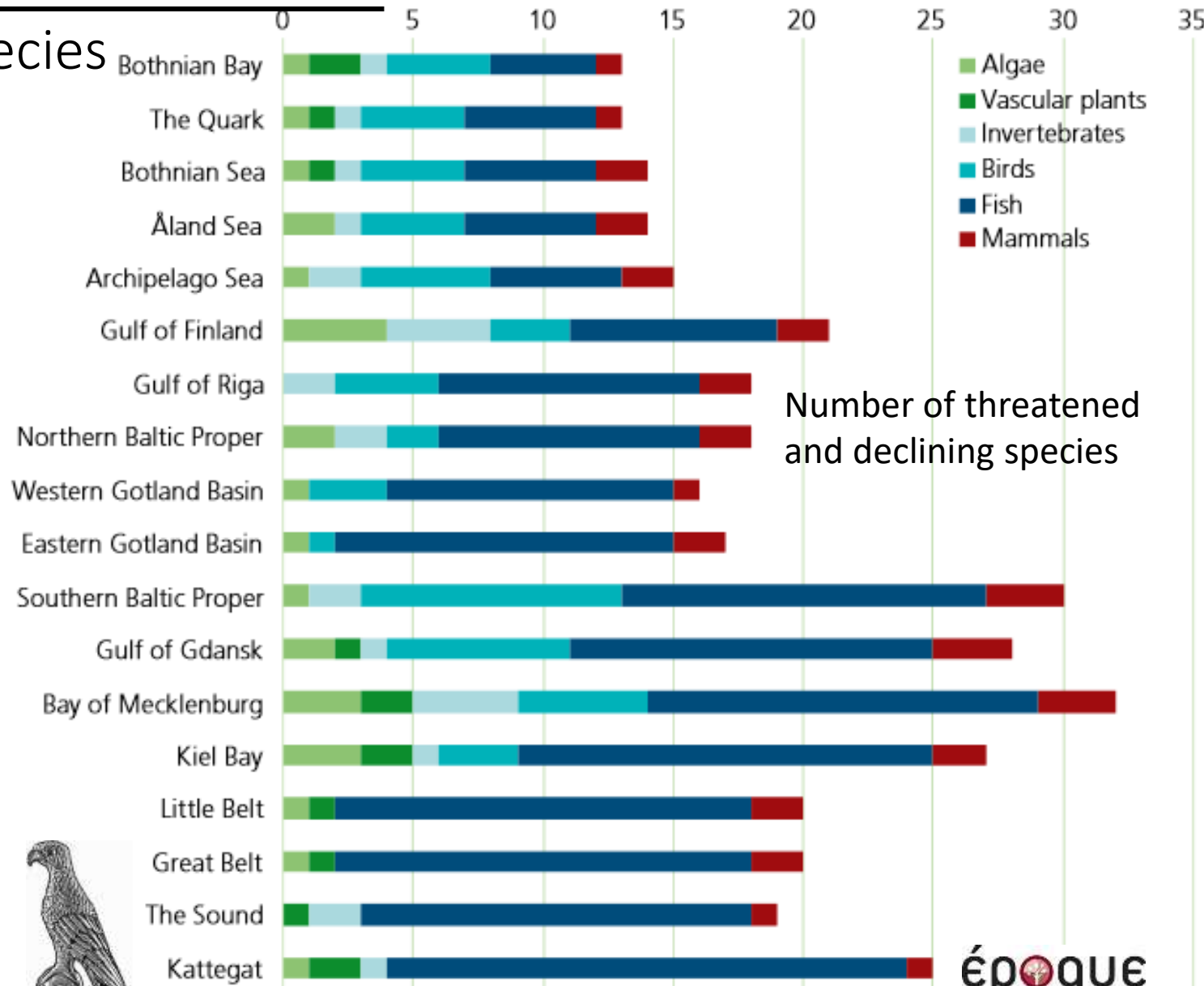
New species

- New species are founded
 - Immigration
 - DNA research
 - Prokaryotic and eukaryotic cells, other microbes
 - Non-native animals

Biodiversity of The Baltic Sea

Threatened and declined species

- During the past one hundred years, the system has undergone decadal variations in salinity, oxygen and temperature
- Changes in hydrography have been linked to changes in the abundance and distribution of pelagic and littoral species and communities
- Ecosystem is sensitive- small changes in flora/fauna could have massive consequences in whole ecosystem



Biodiversity of The Baltic Sea

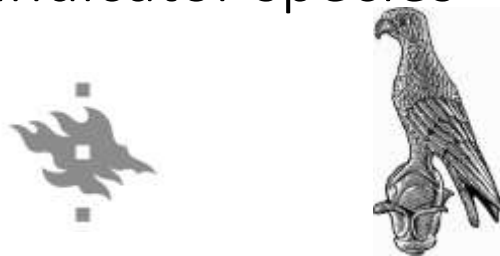
Threatened and declined species

What causes the declining?

- Human activities have changed the sea environment in many ways: nutrients, hazardous substances, physical loss and damage, pollution, contamination, biological disturbance etc.
- Non-native species displaces
- Climate change impacts on environmental variables

Indicator species

- Biodiversity core indicator species
 - Assessing



Biodiversity of The Baltic Sea

Non-native species

- Non-native species have significantly altered ecosystems of the SE Baltic coastal lagoons, while their role in the northern coastal waters still is much less important.
- From Atlantic, other neighbouring water bodies by rivers and canals
- Growing problem
- In species-poor native communities non-native animal species manifest their ability of modifying their novel habitats
 - Increase of: physical and functional diversity, benthic-pelagic linkages
- *Teredo Navalis*, shipwrecks



Assessments

- Essay about significance of sea area 1/3 grade
- Presentation about biodiversity 1/3 grade
- Presence at lectures 1/3 grade

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Problems and toxics

Module 2 from course II: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.

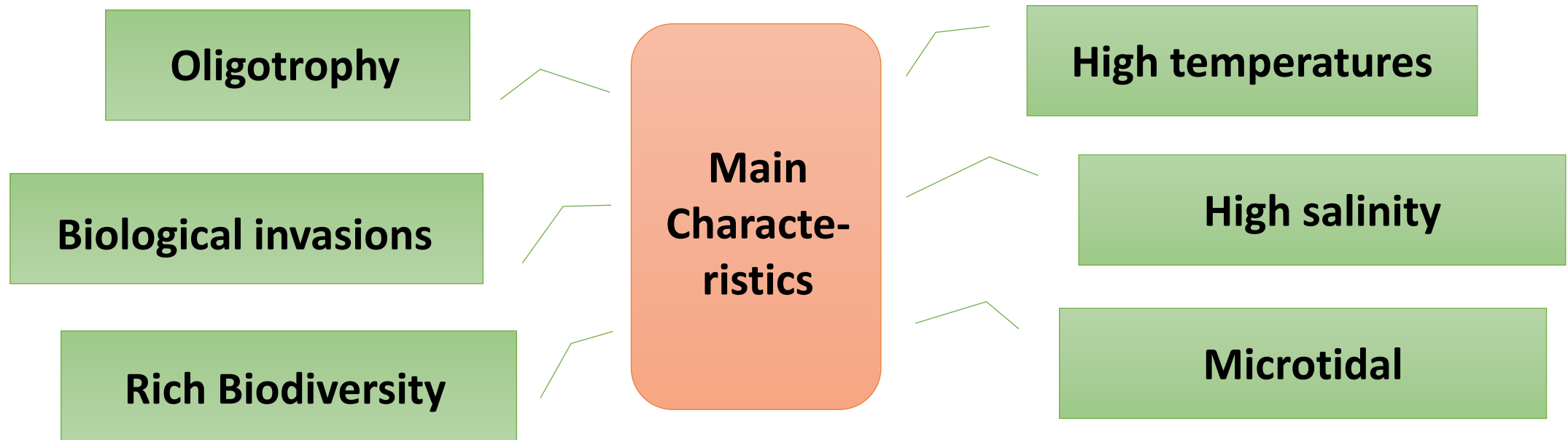
Katerina Plakitsi, Triantafyllos A. Almpanis & Athina C. Kornelaki University of Ioannina
Noora Kivikko University of Helsinki

Contents

- The Mediterranean Sea
 - The special features
 - Problems
 - Toxics
- The Baltic Sea
 - The special features
 - Problems
 - Toxics
- Doing research

The special features of the Mediterranean Sea

Overview



The special features of the Mediterranean Sea

Overview

- Deep, elongated, and almost landlocked irregular depression lying between latitudes 30° and 46° N and longitudes $5^{\circ}50'$ W and 36° E
- Stretches
 - from the Atlantic Ocean on the west
 - to Asia on the east and
 - separates Europe from Africa



The special features of the Mediterranean Sea

Connections

- Connected with
 - the **Atlantic Ocean** by the narrow and shallow channel of the Strait of Gibraltar
 - narrowest point roughly 13 km
 - the depth of the sill is about 320 m
 - the **Black Sea** through the Dardanelles
 - Northeast
 - sill depth of 70 m
 - the **Sea of Marmara**
 - the **strait of the Bosphorus**
 - sill depth of about 90 m
 - the **Red Sea** by the Suez Canal
 - southeast



The special features of the Mediterranean Sea

Basins

Natural divisions

- Mediterranean Sea is divided into **western** and **eastern** parts by a submarine ridge between the island of Sicily and the African coast with a sill depth of about 365 m
- **Western** part (western basin) is subdivided into three principal submarine basins:
 - Alborán Basin is east of Gibraltar, between the coasts of Spain and Morocco
 - Algerian Basin, east of the Alborán Basin, is west of Sardinia and Corsica, extending from off the coast of Algeria to off the coast of France
 - Tyrrhenian Basin, that part of the Mediterranean known as the Tyrrhenian Sea, lies between Italy and the islands of Sardinia and Corsica



The special features of the Mediterranean Sea

Basins

Natural divisions

- **Eastern** part is subdivided into two major basins:
 - Ionian Basin, in the area known as the Ionian Sea, lies to the south of Italy and Greece, where the deepest sounding in the Mediterranean, about 4,9 Km
- A submarine ridge between the western end of Crete and Cyrenaica (Libya) separates the Ionian Basin from the Levantine Basin to the south of Anatolia (Turkey)
- The island of Crete separates the Levantine Basin from the Aegean Sea, which comprises that part of the Mediterranean Sea north of Crete and bounded on the west and north by the coast of Greece and on the east by the coast of Turkey

The special features of the Mediterranean Sea



Mediterranean Basins

The different basins and its main wind and fluvial patterns.



Problems of the Mediterranean Sea

Habitat destruction and physical alteration

- shoreline construction and alteration
- wetland and salt-marsh alteration
- marine waters and coastal watershed alteration

Problems of the Mediterranean Sea

Emerging issues threatening ecosystems

- biological invasions
- overexploitation of fisheries resources
- expansion of aquaculture
- increasing appearance of Harmful Algal Blooms (HABs)

Problems of the Mediterranean Sea

Overexploitation of fisheries resources

- More than 90 species of marine fishes in Europe's waters are threatened with extinction (IUCN).
- *“Overfishing is not the only problem in the Mediterranean. Illegal fishing activities and overcapacity, among others, are shortcomings that must be addressed with the appropriate enforcement of existing legislation. Moreover, fishing policy should be compatible with the implementation of measures responding to conservation-related EU legislation such as the designation and management of Natura 2000 sites at-sea”, added Pastor.*

Problems of the Mediterranean Sea

Harmful Algal Blooms (HABs)

Different types of algal bloom:

- toxic blooms that discolor the water,
- blooms of non toxic species that harmlessly discolor the water or
- toxic blooms without causing discolored waters.

Become dangerous when:

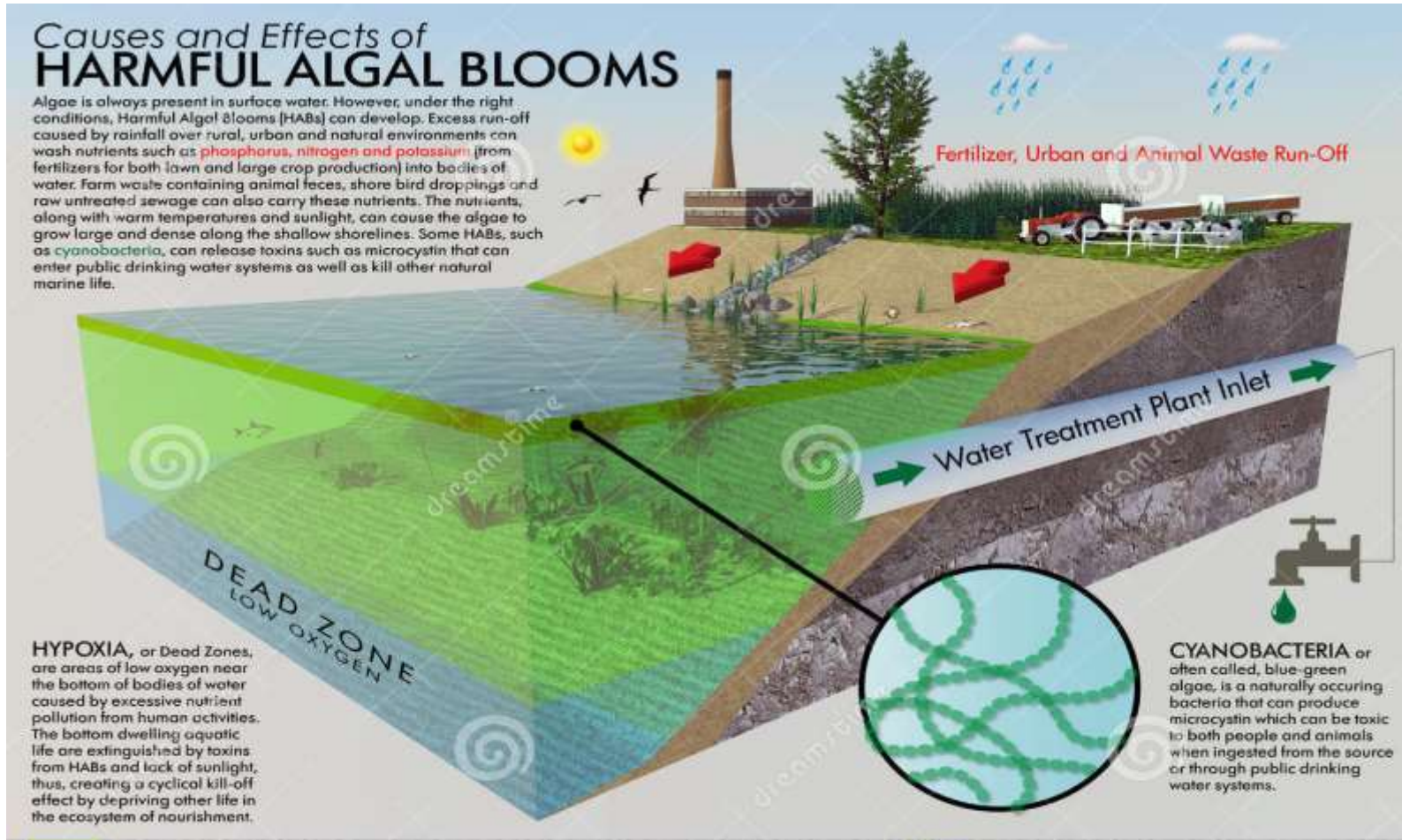
- present at certain densities (few hundreds per litre) and
- concentrated by filter feeders (such as the common mussel) that are subsequently ingested by humans.



Team HABs <http://www.teamhabs.info/habs.html>

Problems of the Mediterranean Sea

Harmful Algal Blooms (HABs)



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William Roberts | Dreamstime.com

Problems of the Mediterranean Sea

Harmful Algal Blooms (HABs)

- Highest toxicity in mussels
- followed by other shellfish such as the Pecten, and
- practically negligible in oysters.
- 52 species dinoflagellates, endemic of the Mediterranean have been identified which are able to produce Diarrhetic Shellfish Poisoning
 - Eight species in the whole Adriatic
- Only DSP toxicity cases have been reported in the Mediterranean



Problems of the Mediterranean Sea

Harmful Algal Blooms (HABs)



Problems of the Mediterranean Sea

Other Problems

- Eutrophication
- Pollution
- Tourism
- Shipping
- Climate Change

Problems of the Mediterranean Sea

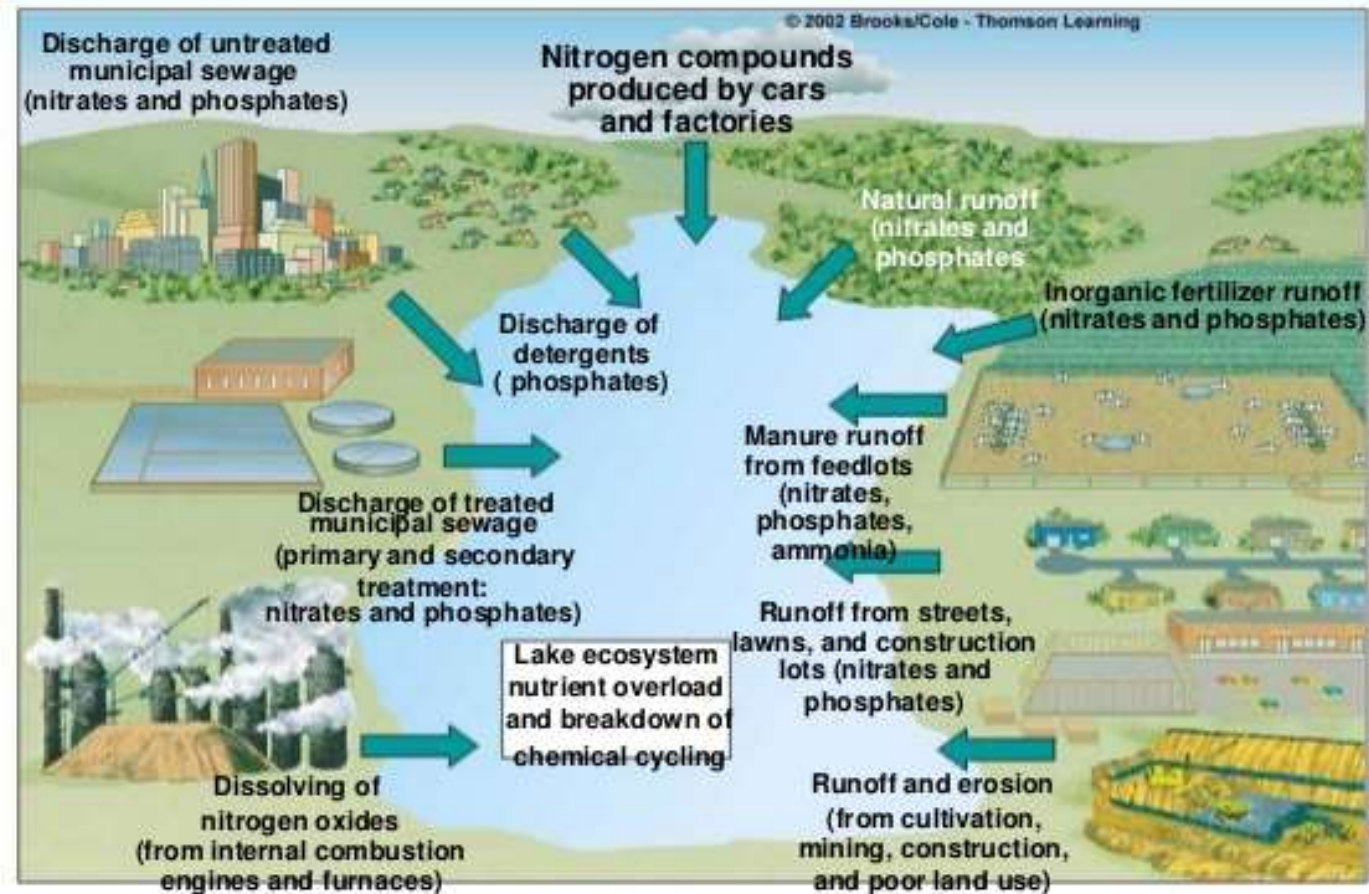
Land-based sources of pollution

- sewage and urban run-off
- urban solid wastes
- persistent organic pollutants (POPs)
- heavy metals
- organohalogen compounds
- radioactive substances
- nutrients
- suspended solids
- hazardous wastes

Problems of the Mediterranean Sea

Eutrophication

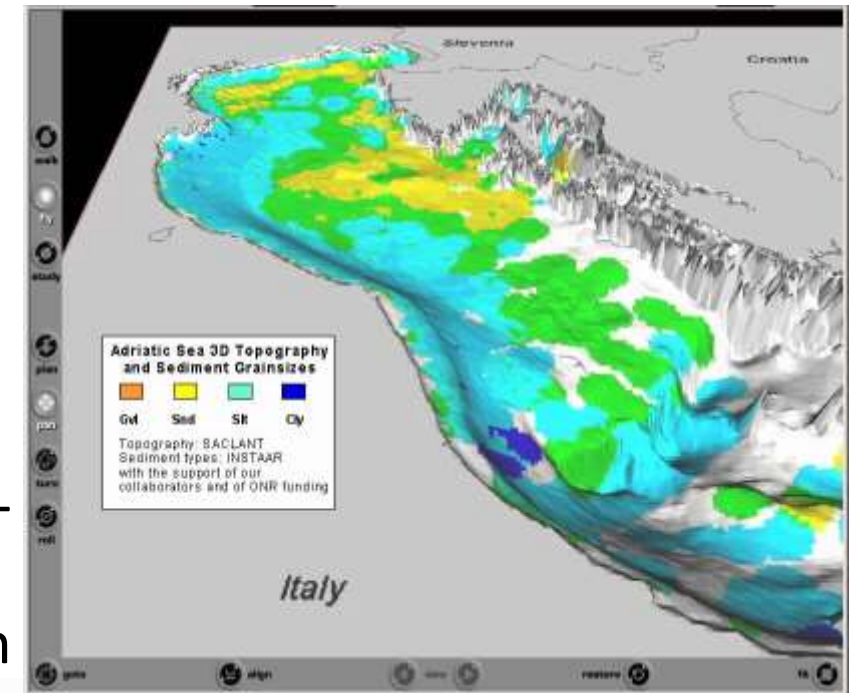
Sources of Eutrophication



Problems of the Mediterranean Sea

Eutrofication

- The most endangered area is **Adriatic Sea**
 - surface about 132,000 km², corresponding to 1=20 of the entire surface of the Mediterranean, but equivalent to 1=125 of its volume.
 - receives a large freshwater → highly susceptible to eutrophication.
 - Phytoplankton in the Adriatic is composed of various taxa
 - 150–200 species, largely dominated by Diatoms and Dinoflagellates have been identified so far.
 - Phytoplankton density ranges from 1000 to 600,000–700,000 cells per lit., depending upon location
 - In eutrophicated areas bloom cell densities can reach hundreds of millions per lit.



Problems of the Mediterranean Sea

Eutrofication

- **French coast**

- The French coast is mostly affected by the Rhone river discharge that delivers five million tons of suspended solids, 76,000 tons of inorganic N and 8400 tons of P per year.
- Blooms of diatoms and dinoflagellates occur in favourable conditions (low hydrodynamism, high temperatures, high stratification).
- The problem does not affect the French and Italian Riviera due to the cyclonic circulation from the Ligurian Sea.



<http://maplists.com/map-of-france-south-coast/>

Problems of the Mediterranean Sea

Eutrofication

- **Spanish coast**

- The Spanish coast is characterized by both natural enrichment due to upwelling and an induced eutrophication caused by human discharge.
- The high productivity of the Alboran Sea appears to be related to the upwelling generated by the anticyclonic circulation generated by the flow of Atlantic waters entering the Mediterranean through the Gibraltar strait.
- Highly eutrophicated areas appear to be coastal areas close to Valencia and the Ebre delta



Problems of the Mediterranean Sea

Eutrofication

- **Eastern Mediterranean**

- The Eastern Mediterranean is generally characterised by highly oligotrophic conditions.
- Coastal Greek waters, especially in bays and estuaries appear rather endangered. Algal blooms have been described in the Gulf of Salonika, and Thessaloniki.
- The same applies to the Lebanon coasts, while in Egypt eutrophication has been largely observed in coastal waters as a result of the large nutrient input (though the Nile input was reduced by 90% in the last decades), such as in Alexandria and in some places nitrogen limitation and hydrogen sulphide production is observed.

Problems of the Mediterranean Sea

Mass tourism impact

- Land and landscape
 - Construction causes the greatest negative impact to the fragile coastal and marine ecosystems
 - Loss of biodiversity and landscape attractiveness
- Species
 - Over 500 plant species threatened with extinction and are under intense pressure from tourism development in some overbuilt destinations.
 - In Zakynthos (Greece), sea turtles have had their coastal nesting grounds disturbed and destroyed by tourism development and tourist behaviour
 - Impact on monk seal is devastating due to the loss of habitat

Problems of the Mediterranean Sea

Mass tourism impact

- Freshwater
 - During the summer months water supplies are exacerbated by tourist flows for use in hotels, swimming pools and golf courses.
 - This number increases to 880 lit. if the tourist uses accommodations with swimming pools and golf courses.
- Pollution and wastes
 - receives 10 billion tones of industrial and urban waste per year with little or no purification.
 - The production of wastewater and solid waste in tourist areas often exceeds the carrying capacity of local infrastructures due the high seasonal demand.
 - Pollution also negatively affects water quality in beach areas and drinking water supplies.

Problems of the Mediterranean Sea

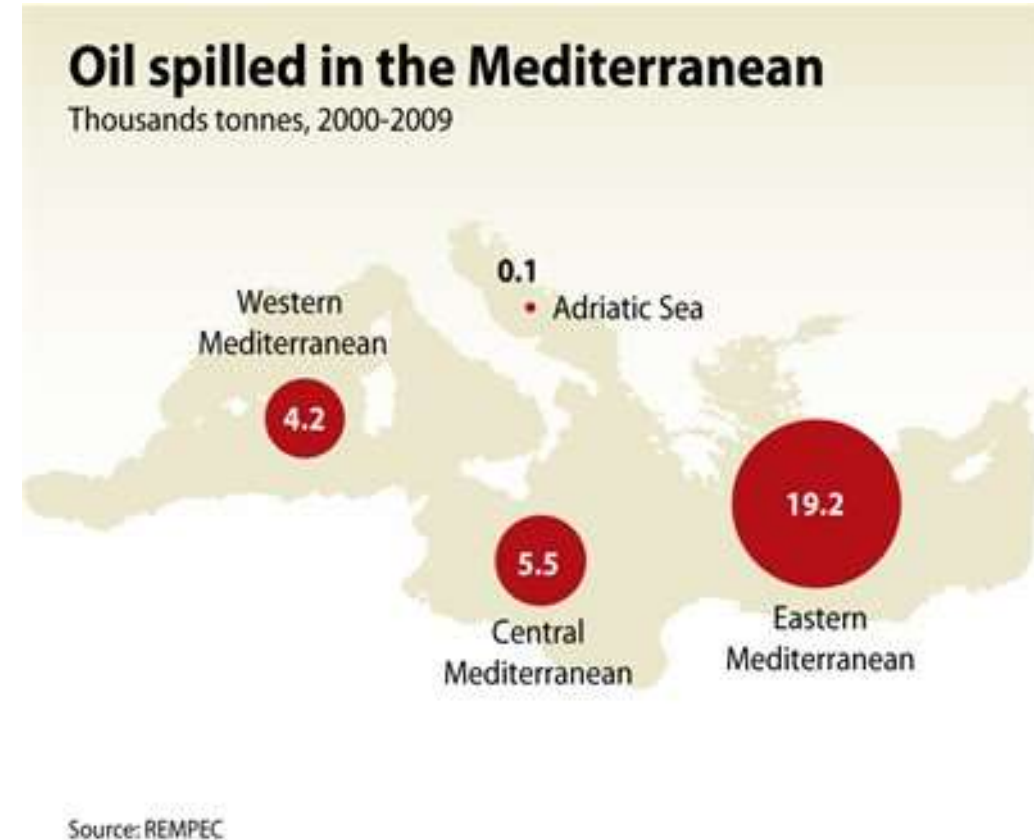
Shipping

- Some of the world's busiest shipping routes can be found in the Mediterranean
- Hazardous cargo carry
- Discharge of chemical tank washings and oily wastes
- Accidental oil spills

Toxics of the Mediterranean Sea

Oil/ Main effects

- reduction in oxygen levels
- changes in sediment properties (including changes in RPD-Redox Potential Discontinuity-layer depths)
- sediment hypoxia or anoxia are present only temporarily in areas very close to the oil spills
- reduction of the redox-potentials in sediments contaminated by oil have been observed with concentrations above 1000 ppm
- oil emulsion and tar particles may affect sediment structure and related sediment characteristics



Toxics of the Mediterranean Sea

Oil/ Main effects

- Oil toxicity is affected by:
 - its composition (percentages of saturates, n-alkanes aromatics and insoluble)
 - the use of dispersants (such as organic solvents: phenol, propane, furfurole; and other substances contained in standard decontaminants such as Prodesolv 128=D, Albisol BPS, TC6)
- Under normal conditions, oil is removed by physical forces (tidal movements, evaporation, dispersion adsorption on particles, photo-degradation) that rapidly reduce hydrocarbon concentrations
- However, a large fraction of the oil might be buried in the sediments where microbial degradation plays an important role, unless oil reaches the deeper anaerobic layers, thus remaining un-degraded for years

Toxics of the Mediterranean Sea

Heavy metals

- Egypt coastal waters one of the most polluted areas:
 - About 5 to 14 tons of Hg are discharged annually to the coastal waters.
 - Hg and Pb are accumulated in organisms from regions affected by chlor-alkali, textile and dyes industries.
 - These metals are toxic causing several adverse effects on the mussel *Mytilus edulis*
- Similarly high heavy metal concentrations have been reported from Greek coasts (especially Saronikos Gulf and Elefsis Bay)
 - Cd concentrations in coastal sediments facing the River Arno estuary are up to 20 times higher than background levels in pristine sites of the Ligurian Sea.
 - Are related to the industrial discharge through river input, and have been reported to cause a decrease bacterial density and activity in sediments directly influenced by the river plume

Toxics of the Mediterranean Sea

Heavy metals

- Large accumulation of heavy metals has been observed in sediments facing the Besos and Llobregat river deltas in Spain
- By contrast analysis of dissolved Cd, Cu, Ni and Zn in the Adriatic Sea indicate that overall the zone is not contaminated with these metals and concentrations are similar to values reported in open ocean and other coastal systems

Toxics of the Mediterranean Sea

Pesticides

- *Aldrin, dieldrin, endrin and heptachlor*
- *DDT*

Industrial compounds

- *Hexachlorobenzene (HCB)*
- *PCBs*

Unintentional by-products

- *PCDD/PCDFs*

Toxics of the Mediterranean Sea

Other PTSs of concern in the region

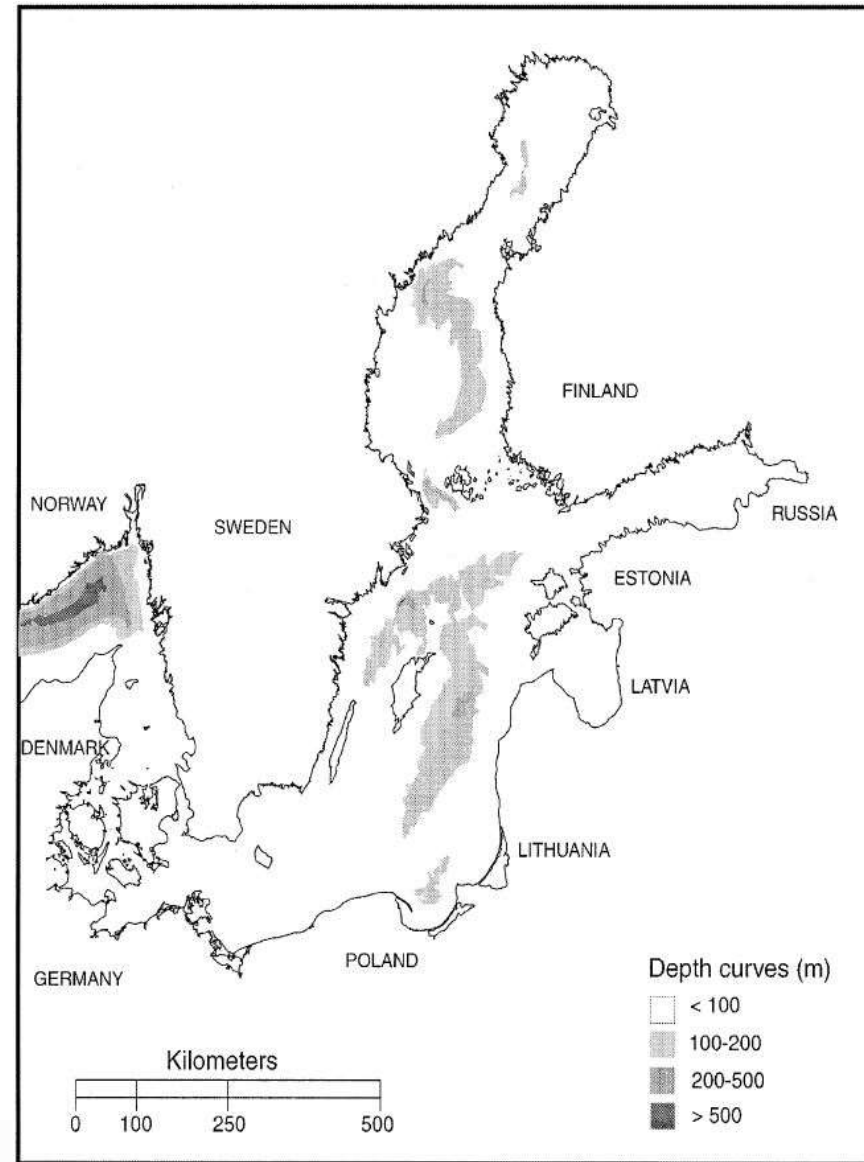
- *HCHs*
- *PAHs*
- *Alkylphenols*
- *Organomercury compounds*

The special features of the Baltic Sea

Overview

The Baltic Sea has various combination of climatic, geographic and ecological characteristics that make it highly sensitive to environment impacts

- Shallow sea, mean depth 54m, max depth 450m
- Barckish water, salinity 0,6‰
- Water remains within the sea for up to 30 years



The special features of the Baltic Sea Drainage Basin

- Four times larger than sea region
- Population 85 millions
- Active land use and heavy traffic

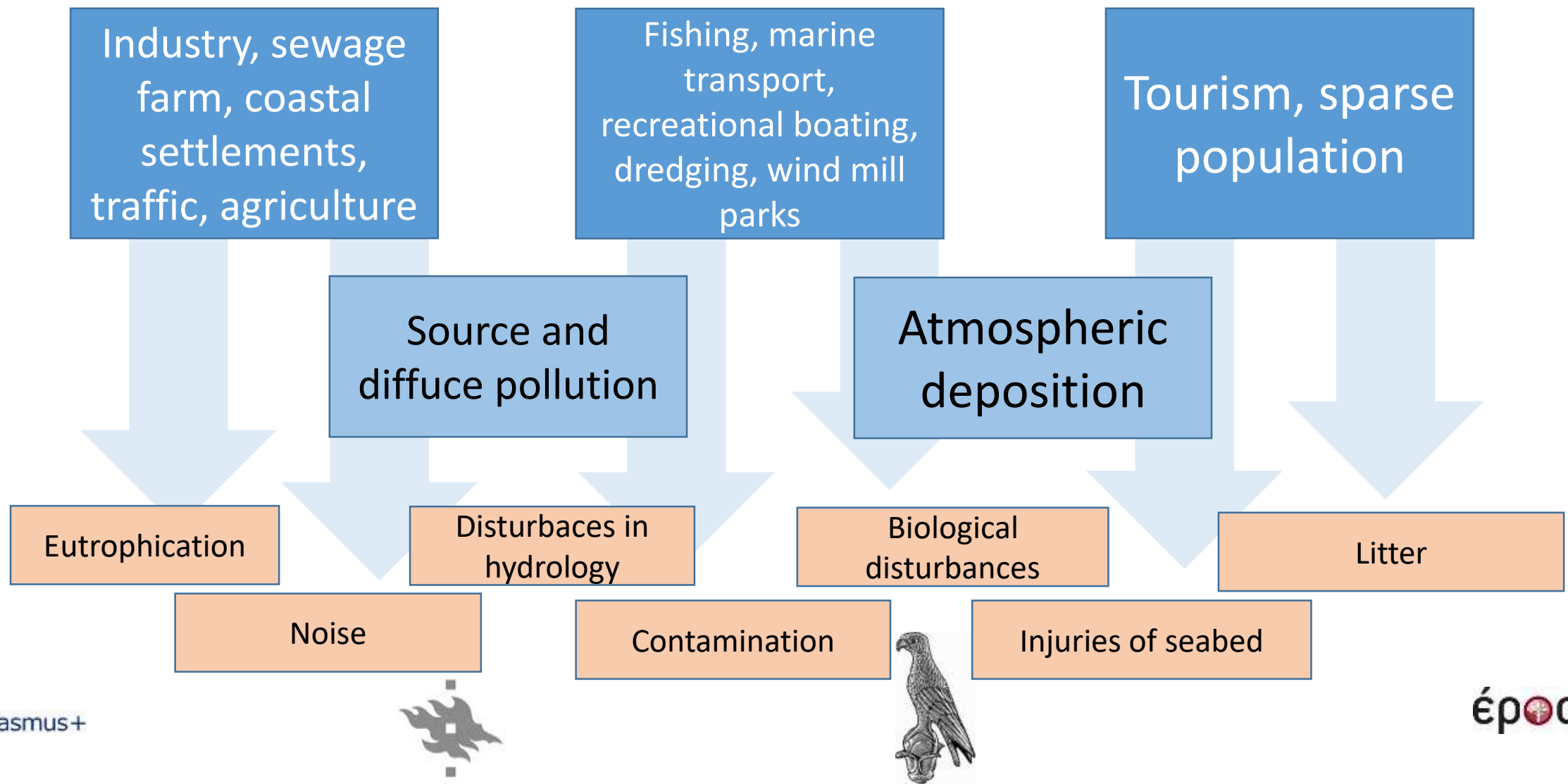
Natural conditions and human impact caused problems to the Baltic Sea

- There are many different type of problems in the Sea area.
- It's easier to find solution to some problems than other.
- Problems are connected to each other
- HELCOM has indentified 100 hotspots



Problems of the Baltic Sea

Overview



Problems of the Baltic Sea

The main reasons

- Increasing pressures to the ecosystem of the Baltic Sea Region
- Political challenges
 - Surrounded by 9 states, 14 states in drainage basin
 - International environmental cooperation depends: financial support, international organizations, attitude of states, international law and status of environmental problems
 - The Baltic Sea is a great example of international governance of maritime environment
- In 1892 was suggested that regular measurements of hydrographic parameters should be carried out.
 - Temperature, phosphore, nitrate has rised and other measurement has varied
 - Several different programs, laws, guides, settings etc.

Problems of the Baltic Sea

Eutrophication

- Eutrophication is the ecosystem's response to the addition of artificial or natural substances.
- Natural eutrophication is natural occurrence in the Baltic Sea
- Mechanism of eutrophication arises from the oversupply of nutrients, which includes explosive growth of plants and massive algae blooms.

What causes eutrophication?

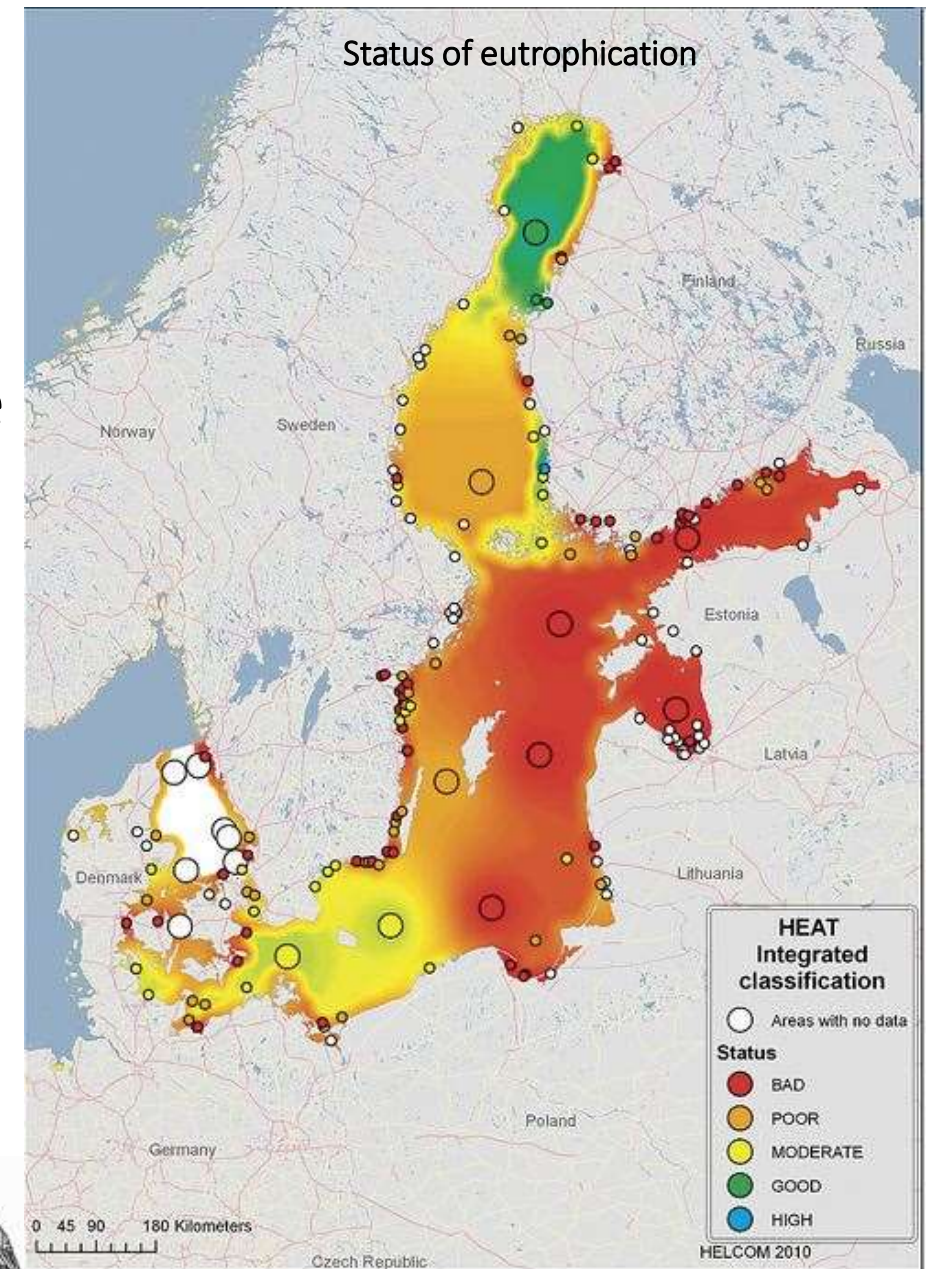
- Land use, tourism, oil & gas, coastal defence, ports & navigation, military activities, culture, conservation, dredging & disposal, submarine cables, fishing, renewable energy, marine recreation, mineral extraction etc.
- About 80% of all nutrients in the sea come from land-based activities, including sewage, industrial and municipal waste and agricultural run-off



Problems of the Baltic Sea

Eutrophication

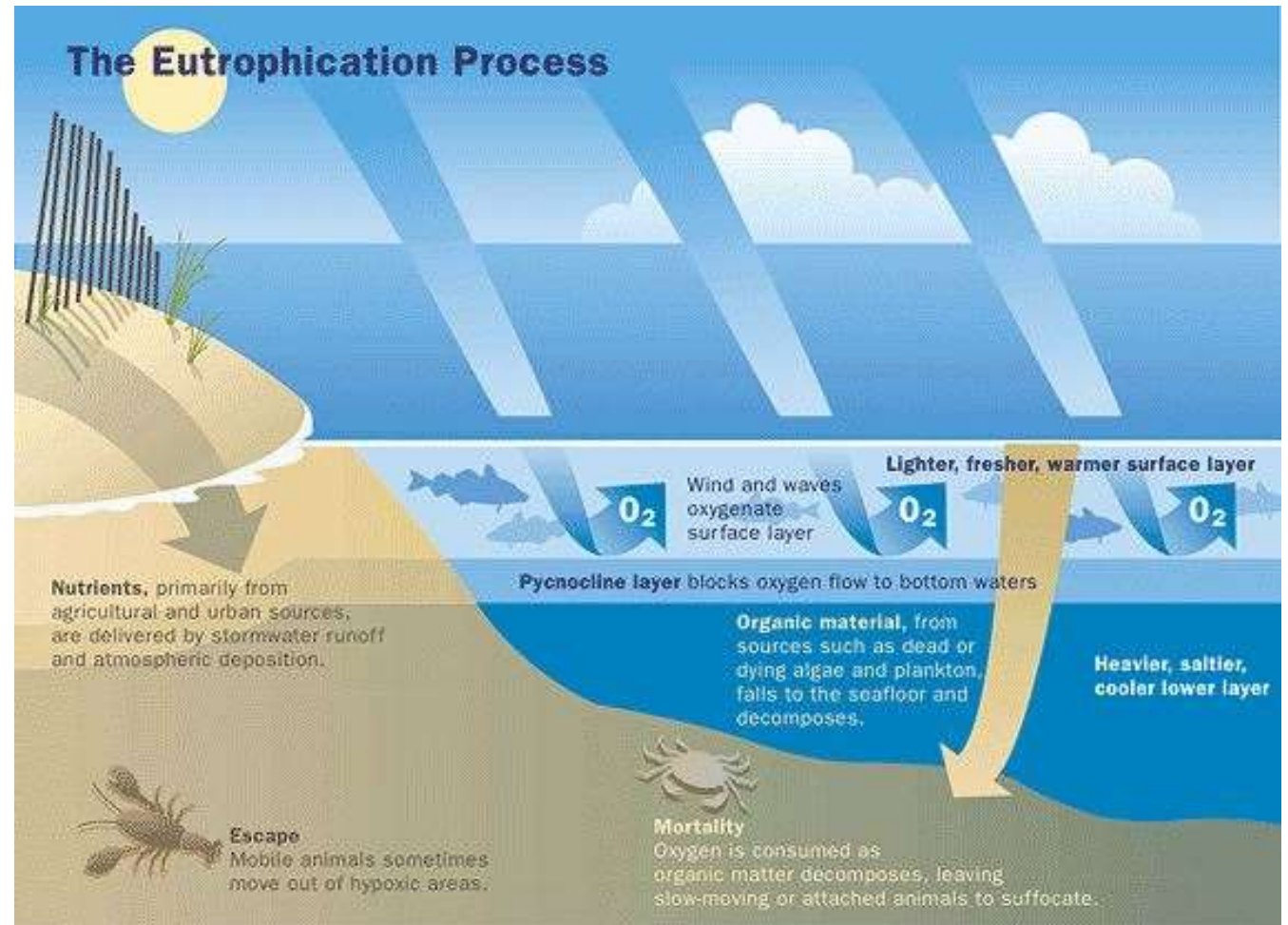
- The biggest sources of nutrient over load are Poland and Russia
- Moves of water will spread the problems to another sea areas, NIMBY "Not in my back yard"
- The researches show that all regions in the Baltic respond similarly to nutrient over-enrichment but there is local important variations



Problems of the Baltic Sea

Eutrophication

- Eutrophication process causes problems to the ecosystem in the sea
- Increasing activities in the Baltic
 - land use and heavy traffic, tourism



<https://www.flickr.com/photos/48722974@N07/4859897047>

Problems of the Baltic Sea

Eutrophication

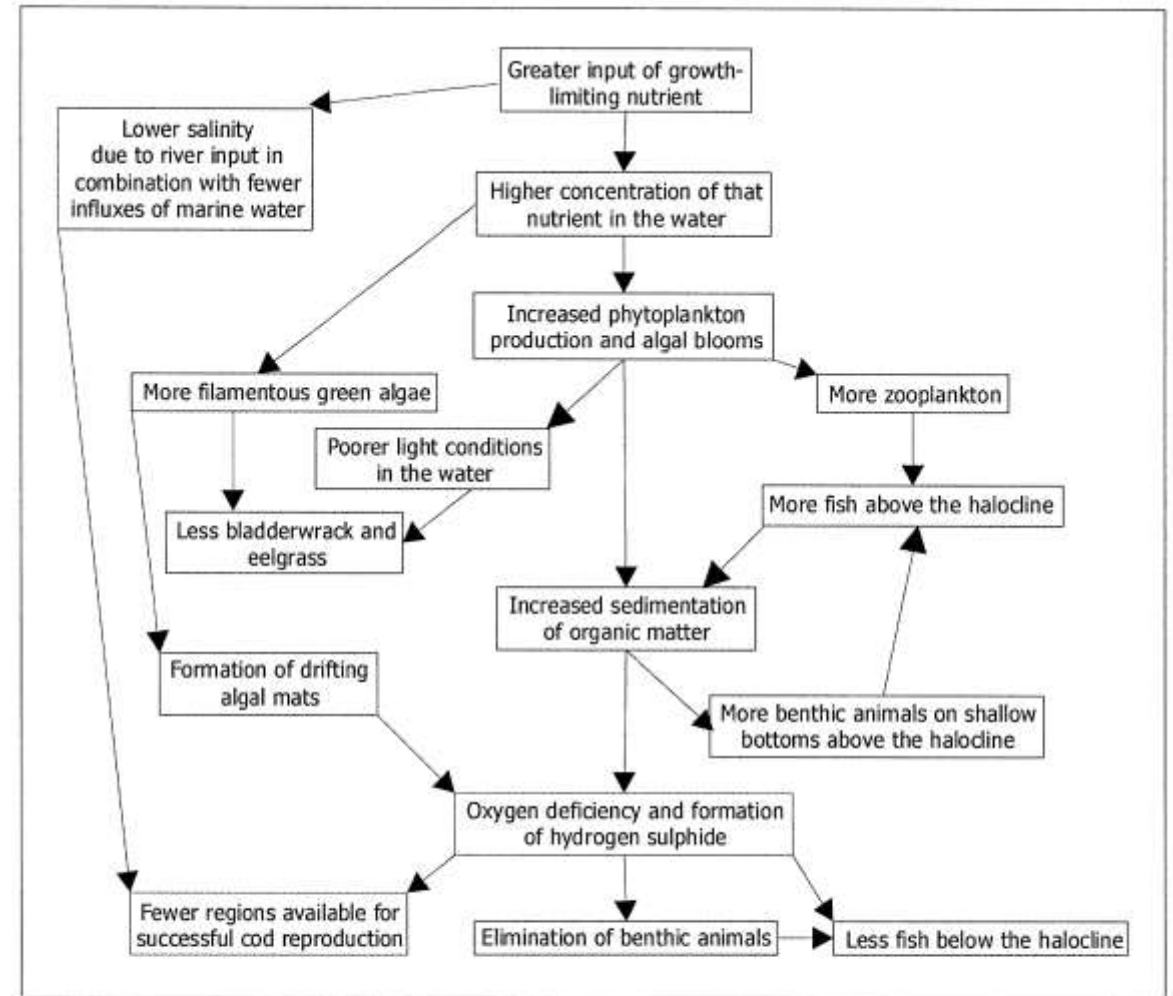
- Nutrient over-enrichment causes elevated levels of algae and plant growth, increasing turbidity, reduces dissolved oxygen in the water and affects the ecosystem and species composition
- Internal load of nutrients, cycle of phosphory: algae blooming-nitrogen runs out-algae dies-to sea bottom- digestion of nutriens- lack of oxygen- -phosphory dissolves in water- cyanobacters use it +nitrogen from air- nitrogen is released when cyanobacter dies.



Problems of the Baltic Sea

Eutrophication

- Surface water (0-40m) of sea moves to the counter day-ends from another country's coastal area.



Rönnberg & Bonsdorf 2004

Bold text in box

= small to moderate changes

Bold text with thicker box borders

= severe change

Bold text with thickest box borders

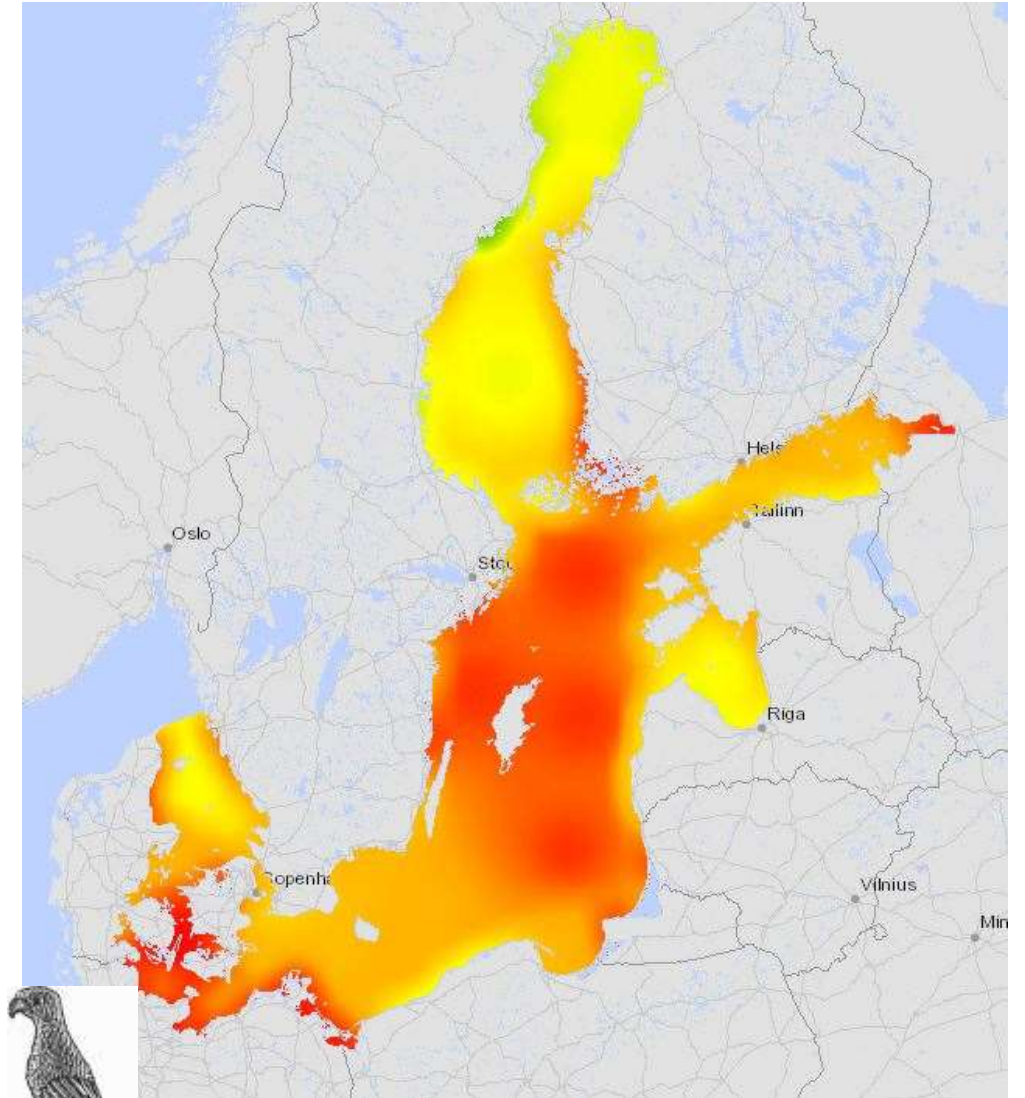
= very serious change

Problems of the Baltic Sea

Eutrophication

- Although efforts have been made, the load of nutrients have increased.
 - Pressure from agriculture
 - EU has increased cultivation areas

Ecosystem health status



Problems of the Baltic Sea

Increasing activities in the Baltic

- Port construction, road development, building of bridges, power plants, industrial production facilities, cables, pipelines, shipping routes, removal of sand/ gravel
- Windmill parks
- Other uses/ activities
- Maritime transportation and logistics, fisheries, aquaculture, recreation
- Marine protection/ conservation is also a mode of use
- Oil transportation in the Baltic Sea has increased

Doing Research

According to Fang et al. 2008

A 14-step Process of doing research:

- 1)** Choose a problem **2)** Review the literature **3)** Evaluate the literature
- 4)** Be aware of all ethical issues **5)** Be aware of all cultural issues
- 6)** State the research question or hypothesis
- 7)** Select the research approach
- 8)** Determine how the variables are going to be measured
- 9)** Select a sample **10)** Select a data collection method
- 11)** Collect and code the data **12)** Analyze and interpret the data
- 13)** Write the report **14)** Disseminate the report

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Managing problems and avoiding climate change

Module 3 from course II: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.

Katerina Plakitsi, Triantafyllos A. Almpanis & Athina C. Kornelaki, University of Ioannina

Noora Kivikko, University of Helsinki

Contents

- Course objectives
- Managing problems
 - The Mediterranean Sea
 - The Baltic Sea
- Avoid climate change
 - How it affects?
 - The Mediterranean sea area
 - The Baltic sea area
 - What can be done?

Course objectives

- Main themes in this module are managing problems and avoiding climate change
- Situation of Mediterranean and Baltic Sea areas
- Different solutions of problems and importance of knowledge of cultural and environmental components in study area
- How to present and argue opinions

Managing problems

- Find the range of potential solutions
 - De-materialise the economy, recycle the resources, de-carbonise the energy flows
- Search for lower cost methods
- Increase awareness
 - With the increasing environmental problems public awareness to the problems has also risen

Managing problems

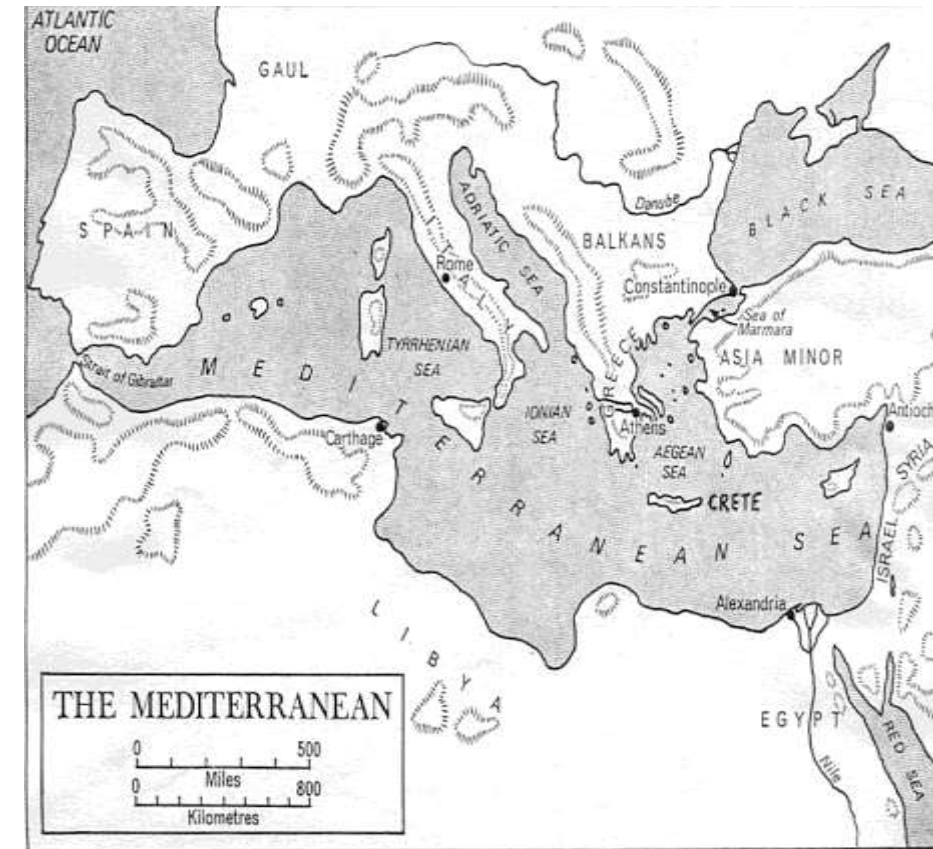
How to approach?

- 1) Basic (material or energy flows)
 - 2) Sectors (industry, agriculture etc)
 - 3) Societal framework (legal framework, governance)
 - 4) Personal (lifestyle, ethics)
- (Lars Rydén)

Managing problems

The Mediterranean Sea Overview

- the largest of the semi-enclosed European seas
- surrounded by 22 countries
- together share a coastline of 46 000 km
- 480 million people living across three continents: Africa, Asia and Europe
- one of the world's busiest shipping routes with about one-third of the world's total merchant shipping crossing the sea each year
- one-third of the Mediterranean population is concentrated along its coastal regions



<http://www.viavilla.com/k/d615196903>

Managing problems

The Mediterranean Sea

What causes the problems?

- Environmental pressures (population growth, growth of coastal urban hubs, tourism, shipping, fisheries)
 - Increased demand for water
 - Increased energy resources
 - Generation of air
 - Water pollution
 - Waste generation
 - Land consumption
 - Degradation of habitats, landscapes and coastlines



<http://www.viavilla.com/k/d615196903>

Managing problems

The Mediterranean Sea
Problems/ Issues

- Pollution spans diverse activities including land-based activities, marine transport and sea-bed exploitation.
- Conservation of biodiversity.
- Sustainable exploitation of fishery resources

(EEA Report, 2006)

Managing problems

The Mediterranean Sea/ Management of Fisheries

Fishery policies/frameworks:

- The United Nations Convention on the Law of the Sea (UNCLOS)
 - Food and Agriculture Organization (FAO)
 - General Fisheries Commission for the Mediterranean (GFCM)
 - MPAs
 - Regional Activity Center for Specially Protected Areas (RAC-SPA) (Tunis, 1985)
- The Convention on Biological Diversity (CBD)
- EU
 - Marine Strategy Framework Directive (2008/56/EC)
 - Common Fisheries Policy (CFP) (2371/2002/EC)
 - legislation regulates the minimum depth and distance offshore for trawling (EC Reg. 1967/2006)

Managing problems

The Mediterranean Sea/ MPAs

- The first MPAs were created in the 1960s
- 681 Mediterranean MPAs:
 - 170 national and international MPAs
 - 507 Natura 2000 sites
 - The Pelagos Sanctuary
 - 4 GFCM fisheries restricted areas
- Not other types of MMAs specifically for fisheries management

(Pipitone et al., 2014)

Managing problems

The Mediterranean Sea/ MMAs

- Fishery reserves
 - Etablissements de pêche (fishery establishments) and cantonnements de pêche (fishery reserves)
 - Off-shore managed areas
 - No-trawl areas
 - No-take zones
- Fisheries restricted areas
- Marine protected areas
- Biological protection zones
- Artificial reef areas
- Exclusive fishing zones

(Pipitone et al., 2014)



Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

STRENGTHS	WEAKNESSES,
<ul style="list-style-type: none">➤ Common awareness of the problem➤ Regional Instruments such as ENPI and MAP.➤ Well-developed national monitoring facilities in most countries➤ Political support at Ministerial level (UfM)➤ Well qualified and connected scientific community➤ Observatories of contamination in all countries➤ Social and business support➤ Alignment with mainstream policy on resources efficiency, and environmental protection➤ The region is open to innovation: desalination, reuse of waters, better coastal management	<ul style="list-style-type: none">➤ Lack of common laws results oriented, regulations and enforcement mechanisms related to the subject.➤ Lack of common standards and harmonized data base. Lack of accountability and transparency➤ Lack of regional drought and flood strategy➤ No integrated regional monitoring system➤ No common repository of knowledge sources➤ Insufficient area specific capacity building at scientific scale (human and material resources)➤ Public awareness is weak at national level➤ No effective incentives to engage in these actions

Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

- No clear overall approach from the catchment scale to the sea
- Technology treatment is behind the state of the art of knowledge
- Lack of awareness of the importance of coastal and marine waters on the economy of the region
- Lack of long term strategy to increase water efficiency
- Low level of uptake of research results

Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

OPPORTUNITIES	THREATS
<ul style="list-style-type: none">➤ Demands of water creates the need for integration of waste water in water management strategies, and allows for lowering sea contamination➤ Water scarcity as driver for innovation and sustainable water management (SWM)➤ De-contamination of the Mediterranean,	<ul style="list-style-type: none">➤ Time is working, the problem dimension increases➤ Political blockage in agreeing common initiatives➤ Alteration and destruction of habitats, decline of fish stock and biodiversity➤ No early warning system➤ Unknown effects of sewage and chemical

Managing problems

The Mediterranean Sea

Research Agenda for De-Contamination/ SWOT Analysis

<p>is of common interest and a source for direct business activities impacting other sectors such as fisheries, tourism or transport. H2020 and SEIS, under development, will be reference actions and systems</p> <ul style="list-style-type: none">➤ Appropriate Technology co-development and Transfer in pollution prevention and Innovation Provisions => Incentives➤ Possible Joint Programming of riparian countries on De-Contamination and SWM issues➤ Networking of research laboratories, integrated consortia with participation of all countries to deal with the problem.➤ Search for harmonization of standards➤ Direct access to research programming➤ Development of the socio-economic dimension of research under a Mediterranean common interest	<p>pollution, particularly of emerging pollutants</p> <ul style="list-style-type: none">➤ Implementation of policies, such as tourism development without incorporating the contamination prevention precautionary principle➤ Increasing coastal urban and industrial development➤ Increasing agricultural use of water without appropriate monitoring of diffuse contamination impact➤ Population migration to the coastal and water availability area➤ Water conflicts at regional level <p>(MIRA 2012). REPORT ON THE MEDITERRANEAN SEA POLLUTION SITUATION ADDRESSED BY THE HORIZON 2020 PROGRAM OF THE ENPI, AND CHALLENGES IN THE RESEARCH DOMAIN)</p>
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Managing problems

The Mediterranean Sea

Main Laws and Regulations

- Barcelona Convention for the protection of the Sea
- ENPI Neighborhood Policy Program
- Other international agreements and tools of monitoring and data sharing on this issue (e.g. MEDPOL, SEIS, etc.)
- EU Member States → Water Framework Directive (WFD, 2000)
- Marine Policy Directive

Southern and eastern part of the Mediterranean Countries:

- National laws and regulations are the governing laws that ensure the preservation of water resources and water bodies. (MIRA 2012)

Managing problems

The Mediterranean Sea

Main institutions

In the north:

- Ministries and National Agencies
- Basin Organizations
- River Basin Districts
- Regional Authorities
- Local Authorities
- Local management Structures
- User Associations (MIRA, 2012)

Managing problems

The Mediterranean Sea
What has been done?

Pollution

- Regional agreements and policy instruments
 - SAP/MED: Strategic Action Programme in the Mediterranean for the implementation of the LBS Protocol to the Barcelona Convention
 - EU Water Framework Directive (WFD)
 - HAB related policies
- International conventions and policy instruments
 - The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, (MARPOL 73/78).
 - The Stockholm Convention on Persistent Organic Pollutants (POPs).
 - The Basel Convention strictly regulates the transboundary movements of hazardous wastes and provides obligations to its parties to ensure that such wastes and their disposal are managed of in an environmentally sound manner when moved across national boundaries.
 - The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.
 - International Code of Conduct on the Distribution and Use of Pesticide



Managing problems

The Mediterranean Sea
What has been done?

Conservation of biodiversity

- Regional agreements and policy instruments
 - The Specially Protected Areas and Biodiversity Protocol to the Convention of Barcelona (SPA)
 - The Strategic Action Program for Biodiversity in the Mediterranean Region (SAP/BIO)
- Other regional conventions, directives and action plans
 - The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) was made in 1996 under the Bonn Convention.
 - The Berne Convention (on the Conservation of European Wildlife and Natural Habitats) is being implemented in all the European countries.
 - Action plan for the conservation of cetaceans in the Mediterranean Sea.
 - Action plan for the management of the Mediterranean monk seal (*Monachus monachus*).
 - Action plan for the conservation of Mediterranean marine turtles.
 - Action plan for the conservation of marine vegetation in the Mediterranean Sea.



Managing problems

The Mediterranean Sea

What has been done?

- International conventions
 - Global Convention on the Protection of Biological Diversity (CBD).
 - The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979).
 - The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
 - The RAMSAR Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971).

(EEA Report, 2006)

Managing problems

The Mediterranean Sea Challenges

- Fragmentation of institutions / Role duplication
- Legislative frameworks in the South and North are top down, i.e., the participative processes are limited.
- Lack of enforcement mechanisms at some southern countries and mainly at basin and trans-basin levels
- Lack of financial instruments and lack of incentive strategies to reduce pollution
- The provisions for multi-stakeholder participation and dialogue as well as public engagement are vague in the southern governance while it is better articulated in the north.
- Low accountability and transparency
- No clear provisions to support and encourage innovation, mainly in the southern part of the Basin.
- No clear link between academia, stakeholders and industrial entities in the southern part of the Basin. Such interrelationships may support and encourage innovation approach

(MIRA, 2012)

Managing problems

The Mediterranean Sea

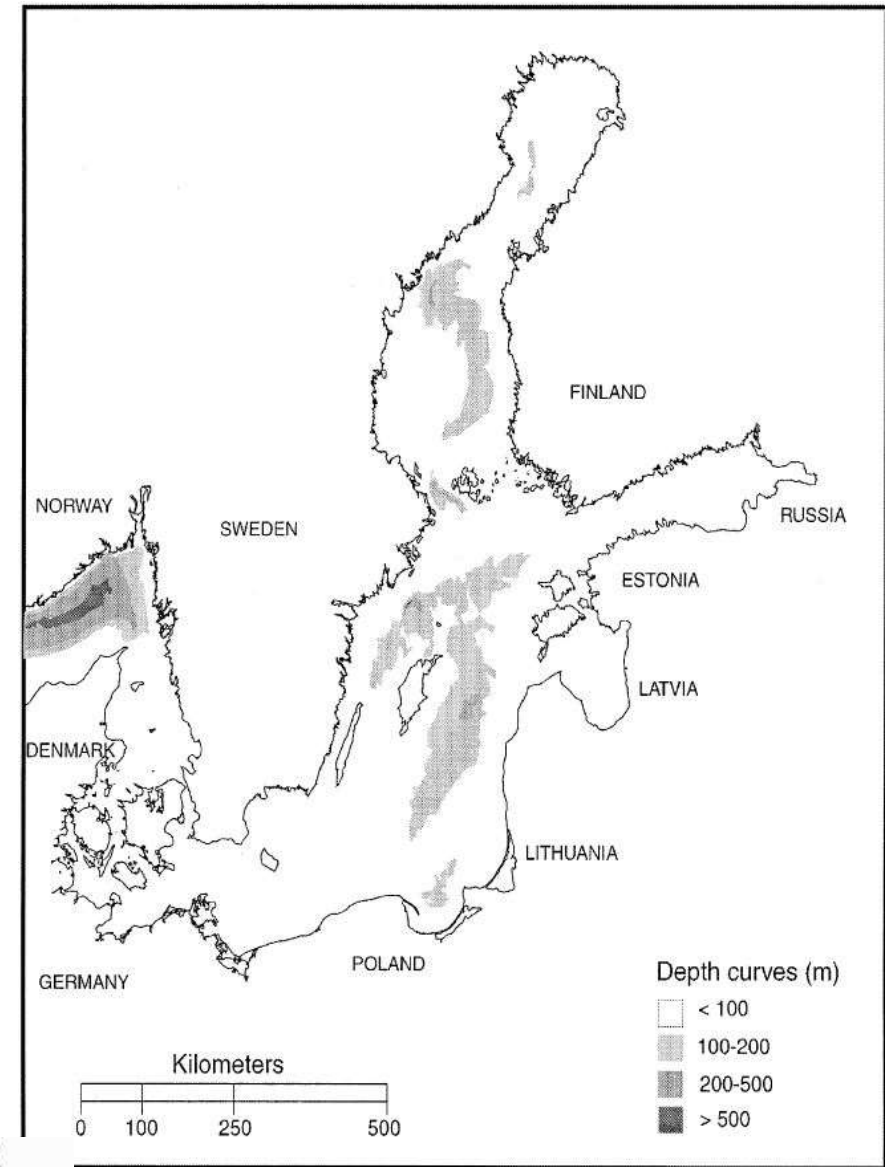
Recommendations

- “...in the Mediterranean region water shortages have historically provided the incentive to promote water-related technologies and saving practices, and the Region has been since pre-history the origin of important ‘technologies’ for the storage, treatment and reuse of waters. The main focus of action is currently shifting to the reuse of wastewater...” (MIRA, 2012)

Managing problems

The Baltic Sea Overview

- The Baltic Sea has various combination of climatic, geographic and ecological characteristics that make it highly sensitive to environment impacts.
 - Shallow
 - Water stratification
 - Poor water turnover
 - Large drainage basin (85 mill. people)
- The Baltic Sea has large variances and gradients in topography, geology, hydrography, climate, salinity and significant environmental variations between coastal areas, open sea, archipelago
- IMO has indentified the Baltic Sea as particularly sensitive sea area

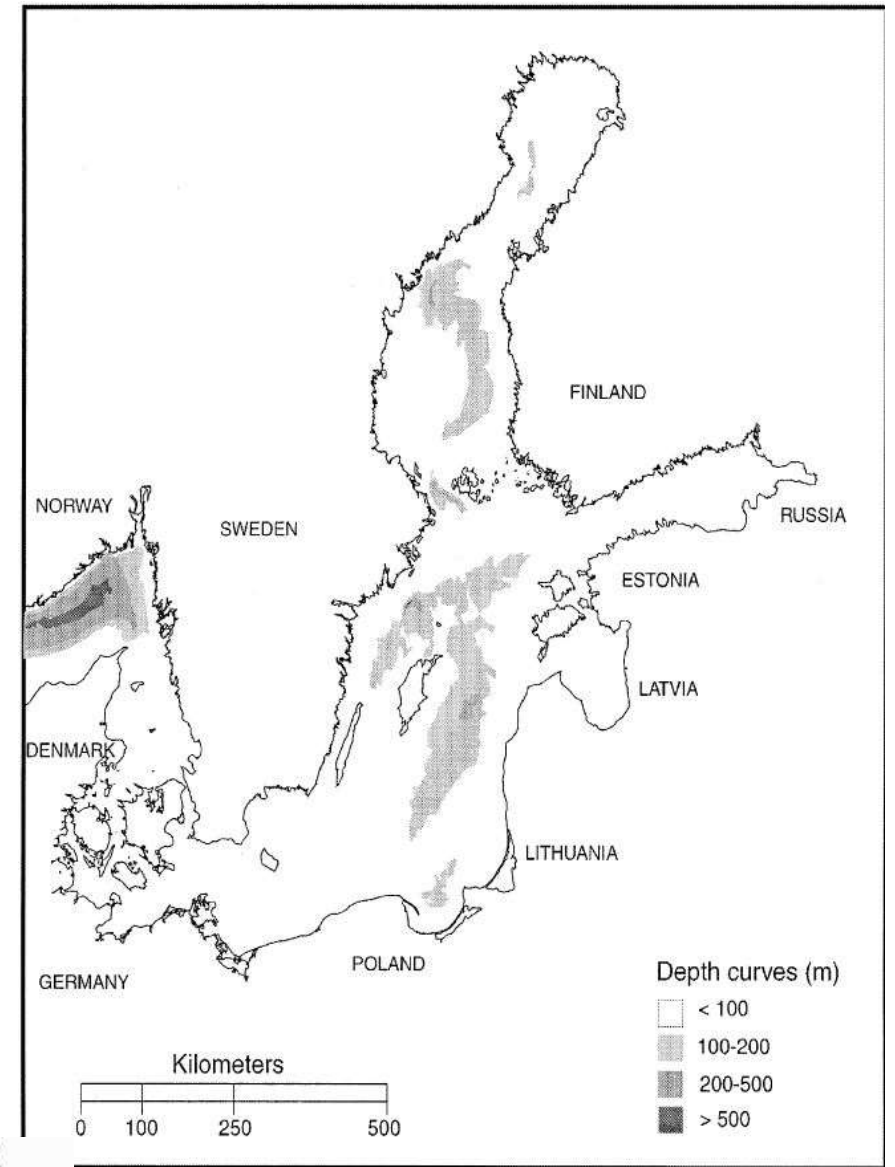


Managing problems

The Baltic Sea

What causes the problems?

- Contaminations is caused by the long history of discharges from different sources
- Long history of discharges from industry and municipalizes, sewage, runoff from agriculture and air bone pollutants.
- Lot of research and potential solutions, gap between information and policy-makers
- Diversity of cultures and countries: resining opinions and political lines



Managing problems

The Baltic Sea

Four segments in Baltic Sea region:

- Eutrophication
- Hazardous substances
- Biodiversity and nature protection
- Maritime Activities

TOP THREE causes of pressure:

- 1) Nutrients
- 2) Fisheries
- 3) Pollution

(Laamanen)

4 problem areas

1. Energy
2. Transport
3. Urbanisation
4. Demography

(Lars Rydén)



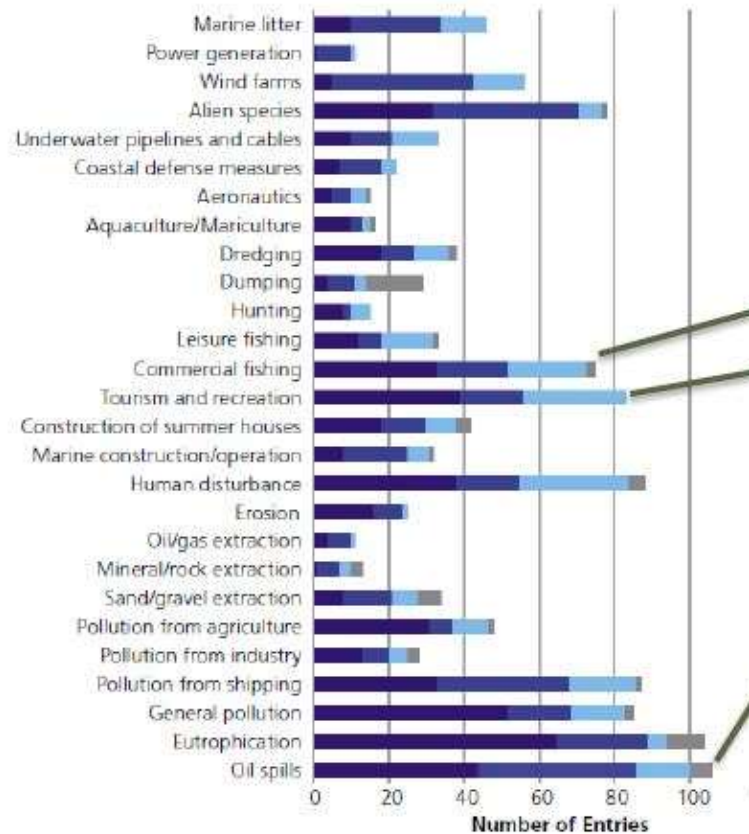
Managing problems

The Baltic Sea

History of finding solutions

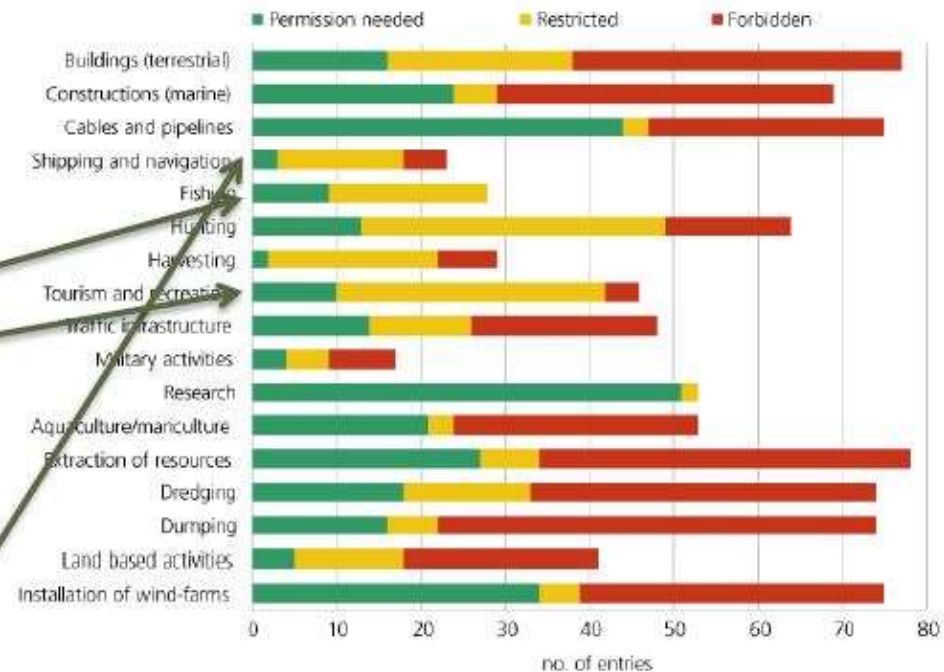
- Protection started 1972
- At the 14th Scandinavian Science Meeting in Copenhagen in 1892 was suggested an international co-operation between the various countries in order to conduct a rational investigation of the Baltic Sea.

Do the protected areas provide good protection? Are human pressures in the MPAs managed?



■ Existing threat
 ■ Potential threat in the future
 ■ Partly a threat
 ■ A threat in the past that is still effecting

Existing, potential or past threats in MPAs



Restriction of human activities in the MPAs

(Laamanen)

Managing problems

The Baltic Sea

Challenges of managing problems

- The successful protection politic of the Baltic Sea can't be done without balance between hydrogeographic measurements, co-ownership and economic differences of the countries around the Baltic Sea region
- The base of managing problems should be economic and political realism
 - None of the countries around the Baltic Sea is forced to reduce the load of nutrients
 - The moral responsibility won't bring far-reaching results
- To save and protect the Baltic Sea the humanistic aspects is also needed- the Baltic Sea and it's differents stages have been home and way to move for millions of people before us
- The Baltic Sea is inland sea in EU, there is possibilities to cooperation between surrounded states



Managing problems

The Baltic Sea

Where to start?

- Environmental technology, applications, renewable energy
- Seven steps according to WFF: **1)** Ban all uses of phosphates in detergents **2)** introduce a tax on N and P in mineral fertilizers **3)** ban fishing of eel until the stock is recovered and restore inland migration routes **4)** ratify the Ballast Water Convention **5)** clean up remaining Helcom hotspots **6)** provide adequate port reception facilities for cruise ship sewage **7)** establish a network of marine protected areas

Managing problems

The Baltic Sea, some international cooperation

- Baltic Sea Parliamentary Conference (BSPC)
- Baltic 21 - An Agenda for the Baltic Sea Region
- Baltic Farmers' Forum on Environment (BFFE)
- Baltic Operational Oceanographic System – BOOS
- Baltic Ports Organisation (BPO)
- Baltic Sea Forum (BSF)
- Baltic and International Maritime Council (BIMCO)
- BONUS Baltic Organizations' Network for Funding Science (BONUS EEIG)
- Coalition Clean Baltic (CCB)
- Conference of Peripheral Maritime Regions of Europe - Baltic Sea Commission (CPMR)
- Helsinki Commission (HELCOM)
- Union of the Baltic Cities (UBC)
- **EU** Strategy for the Baltic Sea Region
- Scientific cooperation: ICES; ESF Marine Board; Joint Programming; EU R&D



Managing problems

The Baltic Sea

What has been done?

Much work have been done so the deteriorations has slowed.

- The Baltic Marine Environment Protection Commission (HELCOM since 1974)
 - Several different programs and plans: Baltic Sea Action Plan BSAP (Backer et al. 2010).
- Council of the Baltic Sea States (CBSS)
- International Maritime Organisation (IMO)
- EU Strategies for the Baltic Sea Region (EUSBSR macro area strategy)
- BalticSTERN- international research network
- Surveillance flight supervise oil spills from ships
 - Detect spills, identify of a polluter



Managing problems

The Baltic Sea
HELCOM

The Baltic Marine Environment Protection Commission, usually referred to as HELCOM, is an intergovernmental organization of the nine Baltic Sea coastal countries and the European Union working to protect the marine environment of the Baltic Sea from all sources of pollution and to ensure safety of navigation in the region. Since 1974, HELCOM has been the governing body of the 'Convention on the Protection of the Marine Environment of the Baltic Sea Area', more commonly known as the Helsinki Convention.

(HELCOM)



Avoid climate change

Overview

"Climate change is natural term because changes in climate may result from internal dynamics, natural external factors, or anthropogenic pressures" (HELCOM 2013)

"The term "climate change" does not refer only to anthropogenic climate change, but is a broader term, including changes due to internal dynamics and natural external actors, as well as anthropogenic pressures" (HELCOM)

- The trend of the global mean temperature show an increase of 0,05 °C per decade for period 1861 to 2000.
- Also the daily temperature cycle is changing and temperature extremes has been increasing.



Avoid climate change

How it affects? The Mediterranean Sea

- Extreme events (Storms, gales, floods, thermal anomalies)
 - Massive habitat destruction
 - Scarce endemic species mortality
 - Stress induced epidemics
- Sea level rise
- Temperature increase → Migration Migration towards the North
 - Marine turtles:
 - Prompt nidification and short laying intervals
 - Low clutch success
 - Changes in distribution and abundance of the species
 - Migration routes modifications
 - Reduction of breeding beaches

Avoid climate change

How it affects? The Mediterranean Sea: Biodiversity

- Sesile invertebrates:
 - Risks of local populations extinction, loss of genetical diversity
- Fishes:
 - Physiological modifications and effects on reproduction
 - Migration alterations
 - Effects on growth rates and population dynamics
- Alien species:
 - Boosting of colonization and expansion towards the North
 - New arrived toxic phytoplankton species
- Birds:
 - Phenological changes (included migration)
 - Changes in distribution and geographical range
 - Impact on demographical parameters (performance of reproduction, eggs' size, laying dates, breeding success...)



Avoid climate change

How it affects? The Mediterranean Sea

Threatened coastal and marine habitats

- **Wetlands** (submersion by sea-level rise)
- **Sea grass beds** (changing sediment flux)
- **Coraligenous calcareous formations** (lack of opportunity for northwards migration after temperature increase)
- **Pelagic waters planktonic fringes** (Sea acidification by CO₂, altered nutrients load and water transparency)



Avoid climate change

How it affects? The Mediterranean Sea

Threatened coastal and marine species

- **Isolated populations**

- Closed sea
- Not a migration pathway
- Most affected habitats of the coolest aeries

- **New warmer-waters species**

- Extinction of local populations
- Disease transmission
- Direct predation

- **High species biodiversity vs. Low population numbers** → High niche specialization =>

- extinction vortex and
- possibly limited resilience to climatic change



(Dr. Daniel CEBRIAN, 2008)



Avoid climate change

How it affects? The Baltic Sea

- There are major differences between north and south, west and east regions in the Baltic Sea Basin
- For period 1861-2000 annual mean temperature trends show an increase of 0.11 °C per decade north of 60°N and 0.08 °C south of 60°N surface waters have warmed
- The daily temperature cycle is also changing and there has been an increase in temperature extremes
- Changes in the seasons: the length of the growing season has increased, whereas the length of the cold season has decreased
→ large change in the length of ice season
- Model simulations project generally continuing increasing (HELCOM)

Avoid climate change

How it affects? The Baltic Sea

- Changes in large scale variations- storms and strong winds- big impact to ecosystem
- Increasing precipitation- increasing runoff surface water- increasing inputs of nutrients
- Future changes on the biochemical cycles
- Increasing areas of anoxia and hypoxia
- Changes in salinity

Avoid climate change

How it affects? The Baltic Sea

- Changes in the composition of the spring bloom community - influence the benthos and zooplankton community composition - potential negative consequences for the food conditions and growth of the main plankton-eating fish, Baltic herring and sprat.
- Changes in seasonal succession of both phytoplankton and zooplankton and potentially increase the temporal mismatch between these groups in the spring.
- Changes in the composition of the spring bloom – also benthos
- Some aspects may have positive effects on littoral vegetation (HELCOM)

Avoid climate change

What can be done? The Baltic Sea

- Human pressures should be decreased to mitigate impacts on biodiversity
 - Decrease of inputs of nutrients, pollutants, hunting pressure, habitat disturbance, fishing and noise
 - Additional pressure of climate- sustainable actions
- Plan nutrient reduction measures, changes in land use and agriculture
- Ecologically coherent network of protected areas
 - Possible changes in the distribution of habitats and species
- Better knowledge
 - Monitoring, measurements
 - Data assimilation
 - Research
 - Communication plan

(HELCOM)

Presenting an argument

Basic steps

1) Introduce the argument to the reader

e.g. why it is a particularly relevant topic nowadays
or refer directly to some comments that have been voiced on it recently.

2) Reasons against the argument

State the position, the evidence and the reasons.

3) Reasons in favour of the argument

State the position, the evidence and the reasons.

4) After summarising the two sides

state your own point of view, and explain why you think as you do.

(<http://www.uefap.com/writing/function/argue.htm>)



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Toxics and human wastes of the ships- Case study

Module 4 from course: Current state and future of the Baltic and Mediterranean Area in an interdisciplinary perspective.

Katerina Plakitsi University of Ioannina & Noora Kivikko University of Helsinki



Contents

- Course objects
- Case study research
 - Data
- Toxics and human waste of ships
 - Example
- Evaluation
- Dissemination

Course objects

- Understands steps of case study research
- Put in a practice all topics covered in earlier studies
- Analyses and applicate earlier information in case study
- Evaluate researches validity
- Understanding of importance of dissemination

Case study research

Overview

- Empiric research
- Useful tool to investigate trends and specific situations
- One of the most popular strategy to collect qualitative data
 - Is an in depth study of a particular situation, very broad field of research
 - Especially: Social science, psychology, anthropology and ecology
- Test theoretical models in real world
- Will give indications, hypothesis creation and allow further elaboration
- Realistic responses (real world vs. computer model)



Case study research

Desinging

- Single- case or Multiple- case
- Focus on specific case
- Attempt to test a theory
- Is the subject relevance?
- Plan and design: how study is addressed and how collected data is relevant?
- Be passive in your research- be observer
- Case must be treated individually



Case study research

Results

- Analyzing the results: opinion based
- Emphasis is placed on exploration and description.
- Judge trends not analyze all data
- No right or wrong answer in case study

Data

There are six types of data collected in case studies:

- Documents.
- Archival records.
- Interviews.
- Direct observation.
- Participant observation.
- Artifacts.
- Evaluation

(Colostate)

Good to know:

Case studies are to be much more convincing and accurate if they are based on several different sources of information

Case studies in sea regions

- Mapping the impact of alien species on marine ecosystems: the Mediterranean Sea case study (*Katsanevakis, Tempera, Teixeira*)
- Coexist-project:
 - Case study 1: Hardangerfjord
 - Case study 2: Atlantic coast areas
 - Case study 3: Algarve coast
 - Case study 4: Adriatic Sea coast
 - Case study 5: Coastal North Sea
 - Case study 6: Baltic Sea

Seven research themes according to BONUS

- Linking science and policy
- Understanding climate change and geophysical forcing
- Combatting eutrophication
- Achieving sustainable fisheries
- Protecting biodiversity
- Preventing pollution
- Integrating ecosystem and society

(Sirola)

All examples can be done through case study research

Toxics and human wastes of the ships- Case study example

- Case study in the Baltic Sea in VECTORS investigated the mechanisms and identified impacts of selected key drivers on the Baltic ecosystem components, its goods and services, related socio - economic consequences, including governance and policy aspects
- VECTORS developed and improved models to understand the eutrophication effects and interactions with climate and alien invasions, and performed scenario simulations of potential future developments
- In this study shipping was a major vector of introduction of non - indigenous species to the ecosystem
- Involved experimental case studies, applications, field investigations, statistical analyses and modelling approaches.

(Austen)

Toxics and human wastes of the ships

In this case study you do research about toxics and human wastes of the ships. Idea is connect these themes to some another area/field what you find interesting.

Example:

- 1) Select one harbour from World port source:
http://www.worldportsource.com/waterways/systems/maps/Baltic_Sea_Region_21.php*
- 2) Get information about pressures and activities around this port region*
- 3) Then select indicators which reflects toxics/pollution from HELCOM Mpas "Species"
<http://mpas.helcom.fi/apex/f?p=103:1::::::>*
- 4) Get familiar with refereces about this issue and around of it.
Try this: http://havsmiljoinstitutet.se/digitalAssets/1506/1506887_sime_ais_report_2014_5.pdf*
- 5) Select interesting variables from HELCOM Mpas (try: europication, oil spils etc.)*
- 6) Try to find connections between variables and indicators in this spesific port region whit selected methods and applications. Methodology may be applied to this specific case study from widely applicable methodology*



Aspects of dissemination

- Lectures
- Social media
 - Facebook updates, Instagram publications, blog posts
- News, articles
 - Local news, national news, magazines,
- Posters
- Actions
- Workshops

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REGIONAL ACTION PLAN FOR MARINE LITTER IN THE BALTIC SEA

#6GREENmasketeers

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époque

CONTEXT

- Regional Action Plan
- Types of Actions
- Regional Actions
- Voluntary National Actions
- References

1.REGIONAL ACTION PLANS

- Why?

Marine litter can **damage** the environmental as well as human health. Small organism mistake the tiny, maybe toxic particles of plastic litter for food and eat them. The particles can then transfer along the food chain to other marine animals and also to humans. Marine litter mostly non-degradable items (mainly plastics).

Marine litter is also causing socio-economic losses to fishing, shipping, coastal tourism and cooling water systems

✓ Input from:

- I. housholde related/municipal solid waste activities,
- II. coastal-based recreational and tourism activities,
- III. transport & waste collection/dumping,
- IV. fishing activities,
- V. land-based activities involving the use and generation of micro-particles

1.REGIONAL ACTION PLANS

Both national and international earlier legislations and recommendations are recalled in this HELCOM recommendation (E.g. Prevention of Pollution from Ships, Annex V MARPOL, HELCOM Baltic Sea Action Plan).

The Action Plans aims:

- By 2025 a significant quantitative reduction of marine litter compared to 2015
- Prevention of further introduction from land- and sea-based sources and reduction of litter already present in the marine environment
- Enhanced coordination, cooperation and coherent implementation, utilising the regional and voluntary national actions

1.REGIONAL ACTION PLANS

Recommends:

- ✓ By mid 2016 finalize common indicators and associated definition of Good Environmental Status (GES) related to marine litter
- ✓ By 2016 identify established coordinated monitoring programs for the common litter indicators (including data collection for regular assessment)
- ✓ Report on the implementation of actions for the first time by 2018
- ✓ Engage in a dialogue and enhanced cooperation with the business and industry, sea users, local communities and other groups to promote the removal of marine litter in a practical, feasible and environmentally sound manner.

2.TYPES OF ACTIONS

In line with HELCOM Recommendation 36/1 “The Regional Action Plan on Marine Litter (RAP ML)” the Contracting Parties agreed to start implementation of actions on marine litter.

Intention= to develop appropriate actions to *prevent and reduce* marine litter, in a cost-effectiveness way.

The final actions are divided into:



- regional**
- voluntary national**

2.TYPES OF ACTIONS

Both types of actions are divided into three themes:



The list of actions has been developed through a *bottom-up approach* whereby a wide array of experts and stakeholders were consulted.

2.1 REGIONAL ACTIONS

Regional Actions:

- I. require a joint approach by Contracting Parties and of a large-scale
- II. have a widespread and transboundary character.

For instance: The joint approach could be to address **other** organizations or institutions having the specific competence to act

2.2 VOLUNTARY NATIONAL ACTIONS

Voluntary national actions:

- I. are primarily of national concern and responsibility of the Contracting Parties
- II. are presented in the format of a pick list for the Contracting Parties to voluntarily select for their implementation according to national relevancy.
- III. are part of the list with the aim to exchange information and coordinate measures

3. REGIONAL ACTIONS

Regional action *addressing land-based sources of marine litter*

- I. Provide guidelines on best practice routines with regard to cleaning and collection system to prevent litter from land entering the aquatic environment.
- II. Establish a dialogue and negotiate on solution with business and industry to reduce the impact of products entering the marine environment, reduce over-packaging and promote wise-packaging.
- III. Evaluate products and processes that include both primary and secondary micro plastics, such as fibres from clothing, assess if they are covered or not by legislation, and act, if appropriate, to influence the legal framework, or identify other necessary measures.

3. REGIONAL ACTIONS

- IV. Investigate and promote best available techniques as well as research and develop additional techniques in waste water treatment plants to prevent micro particles entering the marine environment.
- V. Assess the importance of the contribution of upstream waste flows to the marine environment and, if needed, identify suitable actions and engage with industry to make proposals for alternative solutions (e.g. use of other materials, establishment of deposits, return and restoration systems, over packaging reduction).
- VI. Define and implement appropriate instruments and incentives to reduce the use of plastic bags, including the illustration of the associated costs and environmental impacts.

3. REGIONAL ACTIONS

Regional actions

addressing sea-based sources of marine litter

- Actions addressing shipping related waste : work on implementation and harmonization of the no-special-fee system in ports of the Baltic Sea countries, addressing: □ gaps in existing regulations, □ enforcement and practices concerning shipping, □ port reception facilities auditing to assess adequacy of garbage collection, □ fair waste burden sharing between ports.
- Actions addressing waste delivery in ports/marinas: Promote and disseminate best practice in relation to all relevant aspects of waste management within the fishing sector (including e.g. waste management on board, waste management at harbors and operational losses/net cuttings).
- Identify the options to address key waste items from the fishing and aquaculture industry, which could contribute to marine litter, including deposit schemes and extended producer responsibility.
- Remediation and removal measures: Mapping of historic dumping grounds and a risk assessment for identifying where accumulation of ghost nets pose a threat to the environment and should be removed. Encourage implementation of passive Fishing for Litter schemes, to collect litter caught in fishing nets during normal fishing activities.

3. REGIONAL ACTIONS

Regional actions

addressing education and other outreach on marine litter

- General improved waste prevention and management :
prepare information sheets to assist Contracting Parties in developing material for education programs, especially for professional seafarers including fishermen, highlighting the marine litter problem. Develop a communication strategy for this Regional Action Plan linked in a coherent way with relevant organization

4. VOLUNTARY NATIONAL ACTIONS

Aim of the actions:

- Information exchange and coordination but are primarily of national concern and in the responsibility of the Contracting Parties
- Pick list for possible actions which can be chosen according to national findings

4. VOLUNTARY NATIONAL ACTIONS

Proposed National Actions

- I. General improved waste prevention and management (e.g. include a reference to marine litter, include an element highlighting the impacts of marine litter, consider the cleaning and cleansing provision/infrastructure in municipalities by the coast or rivers)
- II. measures to tackle top items (e.g. Encourage voluntary reporting of companies on their products formulas, Support local pilot projects phasing out, replacing, and reducing single-use plastic bags, Establish deposit refund systems for bottles, containers and cans)
- III. remediation and removal measures (Map and highlight landfills or dumpsites)

4. VOLUNTARY NATIONAL ACTIONS

Proposed National Actions

Voluntary National Actions Addressing Land-Based Sources Of Marine Litter

- I. General improved waste prevention and management (e.g. include a reference to marine litter, include an element highlighting the impacts of marine litter, consider the cleaning and cleansing provision/infrastructure in municipalities by the coast or rivers)
- II. measures to tackle top items (e.g. Encourage voluntary reporting of companies on their products formulas, Support local pilot projects phasing out, replacing, and reducing single-use plastic bags, Establish deposit refund systems for bottles, containers and cans)
- III. remediation and removal measures (Map and highlight landfills or dumpsites)

4. VOLUNTARY NATIONAL ACTIONS

Proposed National Actions

Voluntary National Actions Addressing Sea-Based Sources Of Marine Litter

- I. general improved waste prevention and management (e.g. Ensure the full implementation of HELCOM Convention Article 8, especially Regulation 6; in line with related international agreements such as MARPOL V and related EU legislation (59/2000/EG) with regard to discharge of wastes to port reception facilities, and Article 9 on adequate reception facilities for pleasure crafts)
- II. actions addressing shipping related waste including waste delivery in ports/marinas (e.g. Promotion of garbage collection for pleasure crafts by marinas)
- III. Actions addressing waste related to fishing and aquaculture (e.g. Enhance resource efficiency by facilitating markets and applications for plastic waste from the fishing, aquaculture and shipping industry)
- IV. Remediation and removal actions (e.g. Promote removal of lost fishing gear, Encourage fishing vessels to be involved in passive Fishing for Litter schemes, where they are available)

4. VOLUNTARY NATIONAL ACTIONS

Proposed National Actions

Voluntary National Actions Addressing Education And Outreach Of Marine Litter

- I. Promote education activities on marine litter in synergy with existing initiatives in the field of sustainable development
- II. Identify and promote curricula for marine related education
- III. Promote the “Adopt a beach” system
- IV. Raising public awareness

REFERENCES

✓ Article's link: "Baltic Marine Environment Protection Commission: *Marine litter action plan*"

<http://www.helcom.fi/Lists/Publications/Regional%20Action%20Plan%20for%20Marine%20Litter.pdf>



Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2 Course III

Entrepreneurship-Intelligent energy



Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2 Course III

Applied Energy management systems in/for
organisations (including schools)

Course Description & Outline



Course Description

COURSE TITLE: Entrepreneurship-Intelligent energy
PARTICIPATING ORGANIZATIONS: BEST Institute and Hellenic Open University
DESCRIPTION: Entrepreneurship is the capacity and willingness to develop, organise and manage a business venture along with any of its risks in order to make a profit. The most obvious example of entrepreneurship is the starting of new businesses. In economics, entrepreneurship combined with land, labour, natural resources and capital can produce profit. Entrepreneurial spirit is characterised by innovation and risk-taking, and is an essential part of a nation's ability to succeed in an ever changing and increasingly competitive global marketplace. As energy sector is changing and focusing more on renewable energy sources, while increasingly integrating digital technologies throughout all stages of the energy value chain, a new branch of entrepreneurship has emerged that is called green entrepreneurship. Green businesses are businesses that are committed to reduce their impact on the environment or, on a larger scale focus on sustainability. Towards this direction, during the last decade, the concepts of “Intelligent Energy” and “Smart Grid” are widely implemented, in order to provide an advanced infrastructure that will facilitate a more sustainable and effective use of energy, the active consumer participation and an increased integration of renewable energy sources. Green entrepreneurship has already found its pace and currently expands in various application domains, such as smart cities and transport. Motivation, scope and impact of green approaches vary along these domains, where several ICTs are combined to achieve efficient and sustainable use of energy. This course describes the basic principles of entrepreneurship, as well as the concept of Intelligent Energy. It then provides an overview of green entrepreneurship along with various application sectors and presents a relative business plan to provide learners with a case study of how green entrepreneurship is actually realized.

Module	Content	Teaching method
Module 1: INTELLIGENT ENERGY 3 ECTS	Topic 1: Introduction to intelligent energy Topic 2: The smart grid concept Topic 3: Smart Grid Components and Technologies	eLearn
Module 2: GREEN ENTREPRENEURSHIP 3 ECTS	Topic 4: What is entrepreneurship: an introduction Topic 5: CSR principles, environmental pillar and what is a green business? Topic 6: Generate and analyse your green business idea Topic 7: Green marketing plan Topic 8: Complying with the rules and regulations to start your green business Topic 9: Starting the green business – business plan following PDCA	Face-to-face/Team activities
Module 3: GREEN ENTREPRENEURSHIP APPLICATION SECTORS 3 ECTS	Topic 10: Smart Energy Cities Topic 11: Smart Energy in Buildings Topic 12: Smart Energy in Transport	eLearn
Case study 6 ECTS	CASE STUDIES ON GREEN ENTREPRENEURSHIP: Topic 13: Philips Lighting Topic 14: Yalumba Wine Topic 15: Elvis & Kresse Topic 16: Royal mosa Topic 17: Eastex Material Topic 18: Siemens Building Technologies	Project work



COURSE III. Entrepreneurship-Intelligent energy

Module 1 – INTELLIGENT ENERGY

Title	Description
Level (EQF)	7
ECTS	3 (90 hours)
Teaching language	English
Number of lectures	3
Number of labs	-
Homework	<p>Assignment 1: Learners will be asked to elaborate on an extended list of the drivers leading the adoption of the Intelligent Energy concept, and one highlighting its impact, classified in various fields (e.g. environment, society, economics, energy management, etc.)</p> <p>Assignment 2: Learners will be asked to write about smart grid opportunities in their countries</p> <p>Assignment 3: Based on the presented generic architecture of a smart grid and their knowledge upon university settings and needs, learners will be asked to design a smart grid architecture for a large university campus integrating renewable energy resources and define an energy management policy to achieve sustainability and maximize efficiency of energy consumption.</p>
Meetings/tutorial	One meeting per assignment may be requested
Course objectives	<p>Knowledge</p> <ul style="list-style-type: none"> - Have knowledge on the current global energy status and the associated limitations and challenges - Have knowledge on the intelligent energy concept - Have knowledge on the concept, generic architecture, defining traits and benefits of the smart grid - Have knowledge on the smart grid's components - Have knowledge on the smart grid's fundamental technologies <p>Skills</p> <ul style="list-style-type: none"> - Can explain the drivers of intelligent energy's emergence - Can indicate the differences between the conventional and the smart grid - Can understand the reasons and benefits of implementing smart grids - Can distinguish the smart grid's functional components across the energy value chain - Can identify the required technologies for differentiated smart grid



	<p>deployments</p> <p>Competences</p> <ul style="list-style-type: none"> - Able to argue and provide motivation to potential customers to purchase intelligent energy products - Able to select the most appropriate technologies for diverse applications and suggest alternative solutions - Can assess the needs of adopting smart grids in given settings - Is insightful and creative
Course contents	<ul style="list-style-type: none"> • Introduction to intelligent Energy • The smart grid concept • Smart grid components and technologies
Assessment	Evaluation of the assignments



COURSE III. Introduction to Green Entrepreneurship
Module 2

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	3
Number of labs	-
Homework	Written assignments (summary, draft of business/marketing plan), self-assessment, further reading, additional videos
Meetings/tutorial	-
Course objectives	<p>Knowledge</p> <ul style="list-style-type: none"> - Learners will recall the provided definition of CSR - Learners will paraphrase the idea of green entrepreneurship in own words - Learners will label relevant documents in relation to environmental CSR - Learners will identify ideas for a green business - Learners will recognise aspects to include in a business plan - Learners will name the basics of green marketing - Learners will state existing rules and regulations <p>Skills</p> <ul style="list-style-type: none"> - Learners will adapt CSR principles to different contexts - Learners will relate obstacles and potentials of starting a green business - Learners will demonstrate measures regarding aspects of documents in relation to environmental CSR - Learners will practice idea development following steps of idea development - Learners will select relevant topics for the elaboration of business plan - Learners will develop a draft of a marketing plan considering relevant aspects



	<ul style="list-style-type: none"> - Learners will adapt rules and regulations to national and economic contexts <p>Competences</p> <ul style="list-style-type: none"> - Learners will compare CSR principles in their application in practice - Learners will comprehensively research a field for a green business - Learners will manage measures of environmental CSR under supervision - Learners will evaluate green business ideas based on an applied method of idea development - Learners will determine structure of green businesses and the fields they operate - Learners will compare their draft of a marketing plan with appropriate examples and make necessary adaptations - Learners will independently gather information regarding national regulations in connection with green businesses
Course contents	<ul style="list-style-type: none"> - Introduction to entrepreneurship - CSR principles, environmental pillar - Definition of green businesses - Collection and development of green business ideas - Preparation to start a green business/business plan - Green marketing plan - Complying with the rules and regulations to start your green business
Assessment	Written assignments (summary, draft of business/marketing plan), self-assessment



MODULE 3 – GREEN ENTREPRENEURSHIP APPLICATION SECTORS

Title	Description
Level (EQF)	7
ECTS	3 (90 hours)
Teaching language	English
Number of lectures	3
Number of labs	-
Homework	<p>Assignment 1: Learners will be asked to identify the implemented technologies and required system components for the realization of intelligent street lightning</p> <p>Assignment 2: Learners will be asked to describe the concept of green Heating Ventilating and Air Conditioning (HVAC) systems, their basic components and the main technologies used for their realization.</p> <p>Assignment 3: Learners will be asked to provide an overview of the existing electric vehicle charging infrastructure and describe the perspectives of its evolution.</p>
Meetings/tutorial	tbd
Course objectives	<p>Knowledge</p> <ul style="list-style-type: none"> - Familiarize learners with real world applications of green entrepreneurship - Provide an overview of the current energy status in a city level and introduce the smart city concept <p>Skills</p> <ul style="list-style-type: none"> - Present the implementation of intelligent energy in street lighting and district heating and cooling - Describe the application of intelligent energy in buildings - Describe the application of intelligent energy in transport and electric vehicles
Course contents	<ul style="list-style-type: none"> • Smart energy cities • Smart energy in buildings • Smart energy in transport
Assessment	Evaluation of the assignments



COURSE III. Introduction to Green Entrepreneurship
Module 4

Title	Description
Level (EQF)	7
ECTS	3
Teaching language	English
Number of lectures	-
Number of labs	-
Homework	Written assignments, further reading
Meetings/tutorial	-
Course objectives	<p>Knowledge</p> <ul style="list-style-type: none"> - Learners will define the importance of long-term relationships - Learners will recognise the role of clients and customer for a small company - Learners will recognise drivers and barriers of the company for changing the business model and effects of sustainable businesses on economy and environment - Learners will list the basics of the recycling concept and related business risks demonstrated with the case study example - Learners will describe a product's life cycle - Learners will recognise the relation of energy saving and society



	<p>Skills</p> <ul style="list-style-type: none"> - Learners will differ between types of relationships - Learners will explain the impact of external promotion for a company - Learners will highlight the key issues of changing the business model towards sustainability - Learners will calculate to balance between benefits and barriers of a risky business strategy - Learners will identify processes of product life cycles - Learners will give examples of how low-risk and self-financed solutions can be provided to the customer <p>Competences</p> <ul style="list-style-type: none"> - Learners will independently list strategies for stakeholder relationships and how to handle them - Learners will find different solutions in accordance to external requirements - Learners will independently identify impacts of CSR measures on different parts of a business - Learners will make judgements for business decisions from an environmental and economic point of view - Learners will explain the cradle-to-cradle concept - Learners will confidently paraphrase technical and economic terms in the area of energy saving and sustainability
Course contents	<ul style="list-style-type: none"> - Customer relation, change of payment scheme, Stakeholder involvement - Benefits and impacts of a business model regarding environment and economy - Business model: manufactures products from waste streams - Business model: Cradle to cradle - Business model: funded platform for company's sustainable exchange of material - Business model: low-risk and self-financed energy saving solutions
Assessment	<p>Written assignments including key findings oriented towards reflecting questions on: the presented business model, benefits and impacts/ drivers and barriers in relation with the business model</p>

Handouts

COURSE III. ENTREPRENEURSHIP – INTELLIGENT ENERGY

MODULE 1 (INTELLIGENT ENERGY) - HANDOUT

Introduction	<p>The energy sector is changing and focuses on renewable energy sources, while increasingly integrating digital technologies throughout all stages of the energy value chain. Towards this direction, during the last decade, the concepts of “Intelligent Energy” and “Smart Grid” are widely implemented, in order to provide an advanced power infrastructure that will facilitate a more sustainable and effective use of energy, the active consumer participation and an increased integration of renewable energy sources.</p> <p>Contextualized in the above framework, this module aims at familiarizing learners with the current energy status and introduces the fundamentals of the Intelligent Energy concept. It then presents various aspects of the Smart Grid providing a comparison between the traditional and the smart grid to help learners identify the fundamental characteristics that drive the evolvment towards a more intelligent grid. A main scope of this module is to provide learners with information concerning a smart grid’s architecture, components and major technological areas, in order to make them competent in designing smart grids for given settings and selecting the most appropriate technologies for their realization.</p>
Task description	<p>Face-to-face Lecture: Introduction to energy focusing on energy sources, current global energy status, projections and prospects of future energy status, as well as energy problems and challenges. Description of the Intelligent Energy concept and its expected impact. Presentation of the existing electricity/power grid, its limitations and the needs to adopt a more “intelligent” approach. Detailed description of the smart grid fundamentals and more especially of its defining traits, architecture and conceptual model, major components, as well as the technological areas being implemented throughout the energy value chain within a smart grid. Discussion of the smart grid’s objectives, key success factors and benefits over the traditional grid. Brief description of relative European and international initiatives.</p> <p>Assignment 1: Learners will be asked to elaborate on an extended list of the drivers leading the adoption of the Intelligent Energy concept, and one highlighting its impact, classified in various fields (e.g. environment, society, economics, energy management, etc.)</p> <p>Assignment 2: Learners will be asked to write about smart grid opportunities in their countries.</p> <p>Assignment 3: Based on the presented generic architecture of a smart grid and their knowledge upon university settings and needs, learners will be asked to design a smart grid architecture for a large university campus integrating renewable energy resources and define an energy management policy to achieve sustainability and maximize efficiency of energy consumption.</p>

References	<p>U.S. Energy Information Administration (2014). <i>International Energy Outlook</i>, Report, DOE-EIA-0484(2014)</p> <p>European SmartGrids Technology Platform (2006). <i>Vision and Strategy for Europe's Electricity Networks of the Future</i></p> <p>International Energy Agency (2011). <i>Technology Roadmap, Smart Grids</i>.</p> <p>International Energy Agency (2008). <i>World Energy Outlook</i>. OECD/IEA</p> <p>Faranghi, H. (2010). The Path of the Smart Grid, <i>IEEE power and energy magazine</i>, 8(1), 18-28</p> <p>Wakefield, M., Nowaczyk, J., and Handley, J. (2014). From Research to Action: Communication Research and Actions to Enable the Future Electric Power System. <i>Electric Energy T&D</i>, 97, 772</p> <p>Brown, M. and Zhou, S. (2012) Sustainable Smart Grids, Emergence of a Policy Framework. <i>Encyclopedia of Sustainability Science and Technology</i>, 10.1007/978-1-4419-0851-3_767</p> <p>Dolezilek, D. and Schweitzer, S. (2009). <i>Practical Applications of Smart Grid Technologies</i>. Schweitzer Engineering Laboratories</p>
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MODULE 2 (GREEN ENTREPRENEURSHIP) - HANDOUT

Introduction	<p>Entrepreneurship is the capacity and willingness to develop, organise and manage a business venture along with any of its risks in order to make a profit. The most obvious example of entrepreneurship is the starting of new businesses. In economics, entrepreneurship combined with land, labour, natural resources and capital can produce profit. Entrepreneurial spirit is characterised by innovation and risk-taking, and is an essential part of a nation's ability to succeed in an ever changing and increasingly competitive global marketplace.</p> <p>Green businesses are businesses that are committed to reduce their impact on the environment or, on a larger scale focus on sustainability.</p> <p>Sustainability includes not only the consideration of environmental issues, but comprises of the social, economic and environmental consideration, also known as the three pillars of sustainability.</p> <p>A strategy to implement values such as human rights, social equality and, naturally, environmental protection, in business is the concept of Corporate Social Responsibility (CSR).</p>
Task description	<p>e-learning sessions on:</p> <ol style="list-style-type: none"> 1. What is entrepreneurship: an introduction 2. CSR principles, environmental pillar and what is a green business? 3. Generate and analyse your green business idea 4. Are you ready to start your green business? 5. Green marketing plan 6. Complying with the rules and regulations to start your green business 7. Starting the green business – business plan following PDCA <p>Assignments 1: Identification of good practices in the field of Green Business and elaborate on the principles of environmental CSR that they address, as well as the principles of entrepreneurship</p> <p>Assignment 2: Develop a marketing plan, per good practice identified in Assignment 1</p> <p>Assignment 3: Elaboration of a business plan for a green business idea.</p>
References	<ul style="list-style-type: none"> • Devine, Diane/Mizusawa, Lee/Gittell, Ross 2012: Sustainable business marketing. • Pascual, Oriol/van Klink, Arjen/ Rozo/Grisales, Julio Andrés: Create Impact! Handbook for Sustainable Entrepreneurship. Envia-innovators in sustainability 2011 • Pott, Oliver/Pott, Andre (2012): Entrepreneurship: Unternehmensgründung, unternehmerisches Handeln und rechtliche Aspekte. Springer: Berlin, Heidelberg. <p>Online references</p> <ul style="list-style-type: none"> • http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html [09.06.2015] • http://www.businessdictionary.com/definition/entrepreneurship.html [08.06.2015] • http://www.businessdictionary.com/definition/green-business.html

	<p>[08.06.2015]</p> <ul style="list-style-type: none">• https://www.changemakers.com/g20media/greenSMEs [08.06.2015]• http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-socialresponsibility/index_en.htm [09.06.2015]• http://www.greenonlinebusiness.net/starting-a-green-business/ [09.06.2015]• Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final */. In: http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366 [07.06.2015]• http://oin.at/_publikationen/PublikationenALT/Fachartikel/Strigl%2004%20cs%20in%20austria.pdf [07.06.2015]• http://www.sustainability4success.com/plan-do-check-act.html [08.06.2015]• sustainabletx.org/.../116-green-business-plan-guide [07.06.2015] http://www.wbcsd.ch/eurint/eeei.htm [07.06.2015]
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MODULE 3 (GREEN ENTREPRENEURSHIP APPLICATION SECTORS) – HANDOUT

Introduction	<p>Green entrepreneurship refers to businesses that target products, services or processes with an ultimate objective of benefiting the environment. The term “green” focuses on various aspects, such as creating and consuming energy without polluting the environment, integrating renewable energy sources and minimizing the use of fossil fuels and managing energy as efficiently as possible towards a sustainable consumption and exploiting produced energy at the maximum level while implementing low-waste processes.</p> <p>Green entrepreneurship has already found its pace and currently expands in various application sectors, such as smart cities and transport. Motivation, scope and impact of green approaches vary along these domains, where several ICTs are combined to achieve efficient and sustainable use of energy.</p> <p>In light of the above, this module aims to provide an overview of some main green entrepreneurship application sectors along with the basic features of intelligent energy implementation.</p>
Task description	<p>Face-to-face Lecture: Presentation of three major green entrepreneurship application sectors, namely smart energy cities, buildings and transport. Description of the main characteristics, challenges and opportunities of each sector and insight in how intelligent energy is implemented to achieve green solutions.</p> <p>Assignment 1: Learners will be asked to elaborate on a green solution for the neighbourhood they live in, describing the motivation, objectives, expected impact and applications/ICTs of their proposal.</p> <p>Assignment 2: Learners will be asked to describe the concept of green Heating Ventilating and Air Conditioning (HVAC) systems, their basic components and the main technologies used for their realization.</p> <p>Assignment 3: Learners will be asked to provide an overview of the existing electric vehicle charging infrastructure and describe the perspectives of its evolution.</p>
References	<p>Dincer, I. and Rosen, M. A. (2007). Exergy: energy, environment and sustainable development, Elsevier, Oxford, UK</p> <p>Rosen, M.A., Le, M.N., and Dincer, I. (2005). Efficiency analysis of a cogeneration and district energy system. Appl Thermal Eng, 25, 147–159</p> <p>Gustafsson, J., Delsing, J. , and Deventer, J. (2010). Improved district heating substation efficiency with a new control strategy Appl Energy, 87, 1996–2004</p> <p>Frost and Sullivan (2011). The Key to Cost-Effective and Sustainable Buildings: Intelligent Energy.</p> <p>European Commission (2010). ‘EU energy and Transport in Figures - Statistical Pocket Book 2010’.</p> <p>Institute for building efficiency (http://www.institutebe.com/)</p> <p>http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-</p>

	<p>Energy-Smart-Buildings.pdf</p> <p>Grob, G.R. (2009). Future Transportation with Smart Grids & Sustainable Energy SYSTEMICS, CYBERNETICS AND INFORMATICS, 7(5), 50-54</p>
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Module 4 (CASE STUDY ON GREEN ENTREPRENEURSHIP) - HANDOUT

Introduction	<p>“Philips” is a worldwide leading company and successful in areas of healthcare, lifestyle and lighting. The example described below is the business model in context of Philips Lighting. The objective is to generate understanding how the model works, how it is implemented in the company and what impacts it has for the customer, the company and the environment.</p>
Task description	<p>Face to face Lecture:</p> <p>In the case study the environmental lightning service of the company Philips is described, focusing on its business model regarding energy efficiency, recycling and long-term customer relationships.</p> <p>In this business model the company produces, installs, perpetuates, monitors, takes back and, to a certain extent, reuses materials from the lighting system. The customer only pays a service charge over an agreed period and for the function and quality wished for. Through this model, three aspects differ from a traditional business model:</p> <ol style="list-style-type: none"> 1) The customer receives not only a product, but a service; 2) The relation between customer and company changes from a sales relation to a trusted service partnership that supplies and perpetuate lighting systems; and 3) The business model has an effect on the transfer of funds, which changes from a selective payment to a continuing payment scheme. <p>Laboratory:</p> <p>The students are invited to discuss individual or in group following questions:</p> <ul style="list-style-type: none"> • What aspects change through the implementation of the business model? Explain the key challenges and how they are addressed. • Is there a win-win situation for the company and why/why not? • How can the motivation for implementing this model be described and what are possible differences in comparison to a green SME start-up? • Explain what an entrepreneur has to do well to have a successful business venture while changing the business model. <p>Assignment:</p> <p>To visit the website of the company to identify the indicators of the ecological and social values and how the business model reflects those values. It is also required to find out what environmentally friendly fields cover these measures and which areas of the company they affect.</p>
References	<p>APA style:</p> <p>Henriksen, Kristian/Bjerre, Markus/Damgaard Grann, Emil/Lindahl, Mattias/Suortti, Tuomo/ Friðriksson, Karl/ Mühlbradt, Tor/ Sand Henrik (2012): Green business model innovation. Business case study compendium. Nordic Innovation report. Oslo: Nordic Innovation</p>

Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2

Course III

Entrepreneurship-Intelligent energy

Course Contents – PPTs



***ÉPOQUE: ENVIRONMENTAL PORTFOLIO FOR QUALITY IN
UNIVERSITY EDUCATION***

COURSE III

ENTREPRENEURSHIP – INTELLIGENT ENERGY

MODULE 1

INTELLIGENT ENERGY

OUTLINE

TOPIC 1: Introduction to Intelligent Energy

TOPIC 2: The Smart Grid Concept

**TOPIC 3: Smart Grid Components &
Technologies**

OUTLINE

TOPIC 1: Introduction to Intelligent Energy

TOPIC 2: The Smart Grid Concept

TOPIC 3: Smart Grid Components &
Technologies

ENERGY TODAY

- Industry, transport and buildings (residential and commercial) are the main energy sectors
- Energy needs are currently met mainly from fossil fuels accounting for about 82% of the world's primary energy use in 2011
- Gradual but rather slow integration of renewable energy - fossil fuel consumption's increase rate remains bigger
- Energy consumption is constantly growing due to industrialization and increasing wealth of growing markets and the growing population trend

ENERGY SOURCES

■ Fossil

- Coal
- Petroleum
- Natural gas

■ Nuclear

■ Renewable

- Hydropower
- Wind
- Solar
- Geothermal



RENEWABLE ENERGY

Can be found almost everywhere – fossil fuels are found in very small areas



Environment friendly tackling climate change and global warming concerns



It is constantly and naturally replenished as opposed to conventional fuels

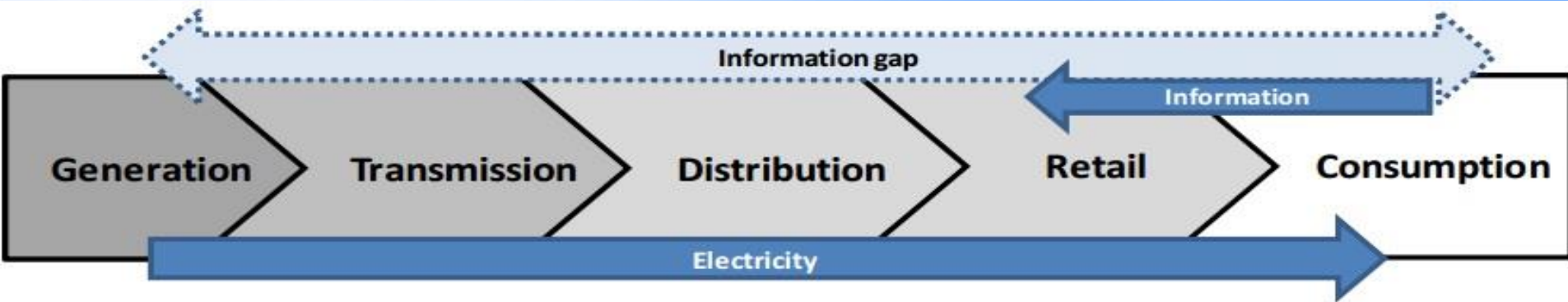


Wind, solar, biomass, hydro, geothermal energy the main renewable sources



The terms “clear energy” and “green energy” are used alternatively

ENERGY VALUE CHAIN



- **Generation** is conversion of primary energy sources to electricity
- **Transmission** is the first step in the transportation of energy, encompassing high voltage transmission lines
- **Distribution** refers to power delivery to the point of consumption
- **Retail** and value-added services refer to the commercialization of electricity to final customers
- **Consumption** covers all electricity-using activities that take place on the customer's account or premises

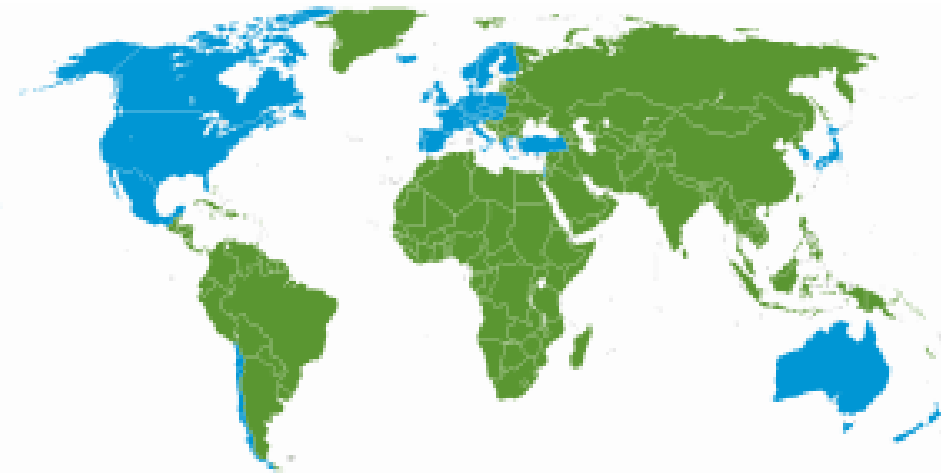
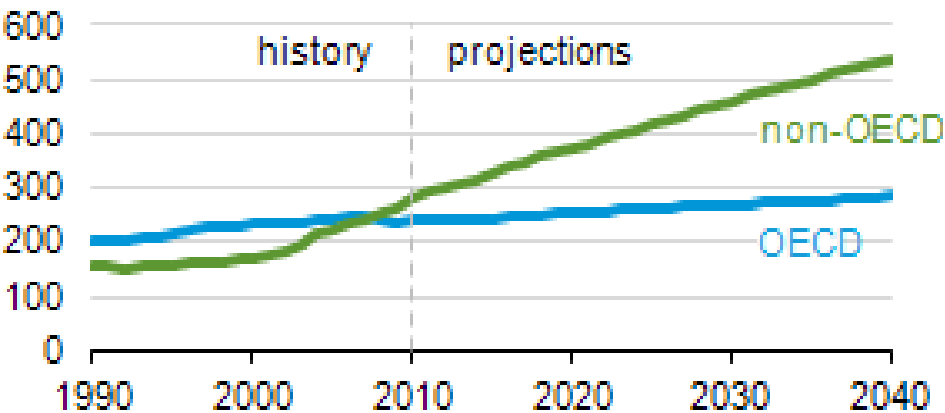
WORLD ENERGY PROJECTIONS

- World energy consumption will grow by 56% between 2010 and 2040
- Renewable energy and nuclear power will each increase 2.5% per year
- Fossil fuels will continue to supply nearly 80% of world energy use through 2040
- Carbon dioxide emissions will have in 2040 a 46% increase from 2010

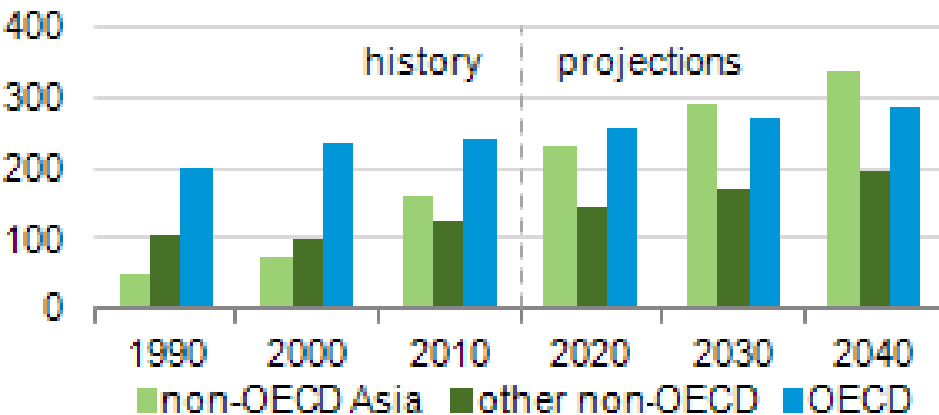
CONSUMPTION PROJECTIONS

Source: U.S. Energy Information Administration, International Energy Outlook 2013

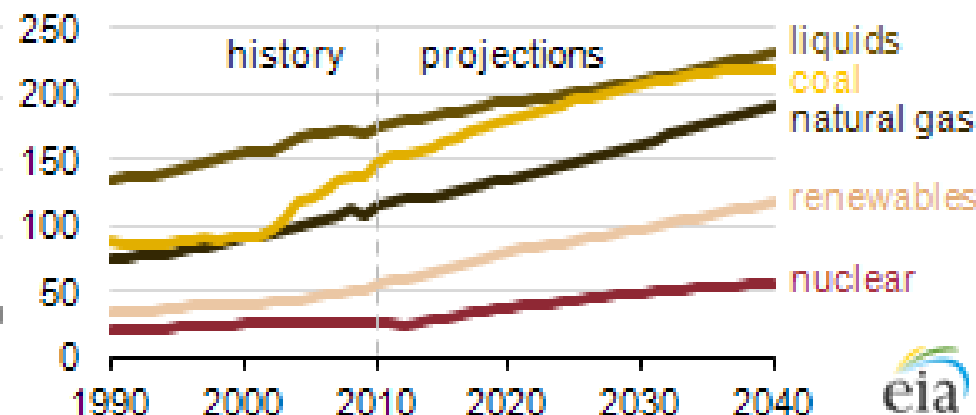
World energy consumption
quadrillion Btu



World energy consumption
quadrillion Btu



World energy consumption by fuel
quadrillion Btu



OECD: Organization for Economic Cooperation and Development

PROBLEMS

- Costs rise and demands grow faster than supply putting pressure on global fossil fuel mining
- Fossil fuels still represent the cheapest energy means
- High environmental degradation
- Existing energy systems (buildings, electric grids, legal issues) are not flexible in integrating renewable sources
- Lack of common ground in energy policy hindering cohesive energy planning
- Several factors (economic, political, etc.) prevent the fast and wide deployment of renewable energy sources

CHALLENGES

- Evolvment to meet agreed environmental and geopolitical goals
- Sustainable and more efficient production, distribution, and consumption of energy
- Smooth integration of renewable energy sources addressing the introduced intermittency and fluctuation
- Effective and affordable solutions for managing energy consumption and costs
- **Emergence of the intelligent energy concept**

INTELLIGENT ENERGY

Integration of digital intelligence by implementing appropriate ICTs throughout the production, transmission, distribution and management processes of the energy system



OUTLINE

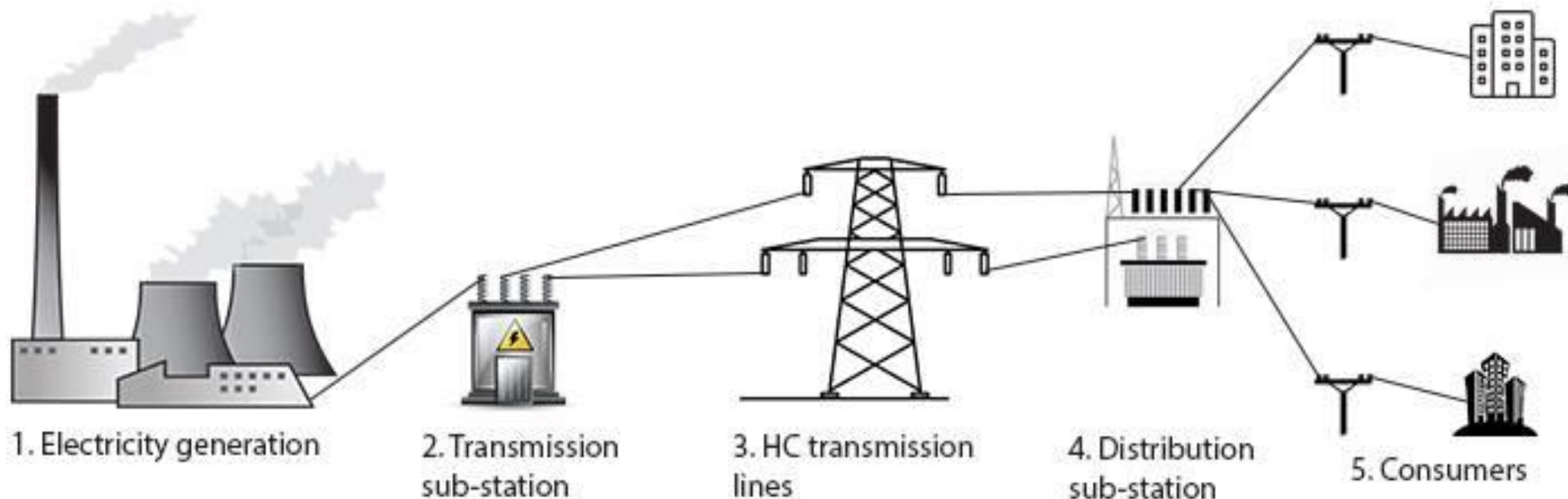
TOPIC 1: Introduction to Intelligent Energy

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Technologies

EXISTING ELECTRICITY/POWER GRID

- It is a network delivering electricity from suppliers to consumers
 - Electricity providers running **power** generating **stations** (1)
 - **Sub-stations** transforming voltage upwards and downwards (2, 4)
 - **Transmission lines** to carry high voltage electrical power (3)
 - **Distribution lines** to connect consumers with the electricity grid (5)



CURRENT GRID'S LIMITATION

- Ageing infrastructure without recent evolvments – slow response times due to mechanical parts
- Energy efficiency, environmental issues and consumers' needs are not central in its design
- Very limited visibility and flexibility
- Lack of situation-awareness and automated analyses of operational conditions
- One-way communication between supply and demand
- Inefficient power supply security
- Inability to store generated energy

DRIVERS FOR AN “INTELLIGENT” APPROACH

- Electricity demands will rise heavily (heat pumps, electric vehicles) and current grid has almost reached its limit
- Flexible architectures to integrate new energy sources and technologies for energy storage and balancing demand with supply
- Renewable energy sources (especially wind) are fluctuating and require enhanced management and control capabilities of the energy system
- Need to provide energy storage capabilities, improve the security of supply and to lower carbon emissions

SMART GRID

“A smart grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.”

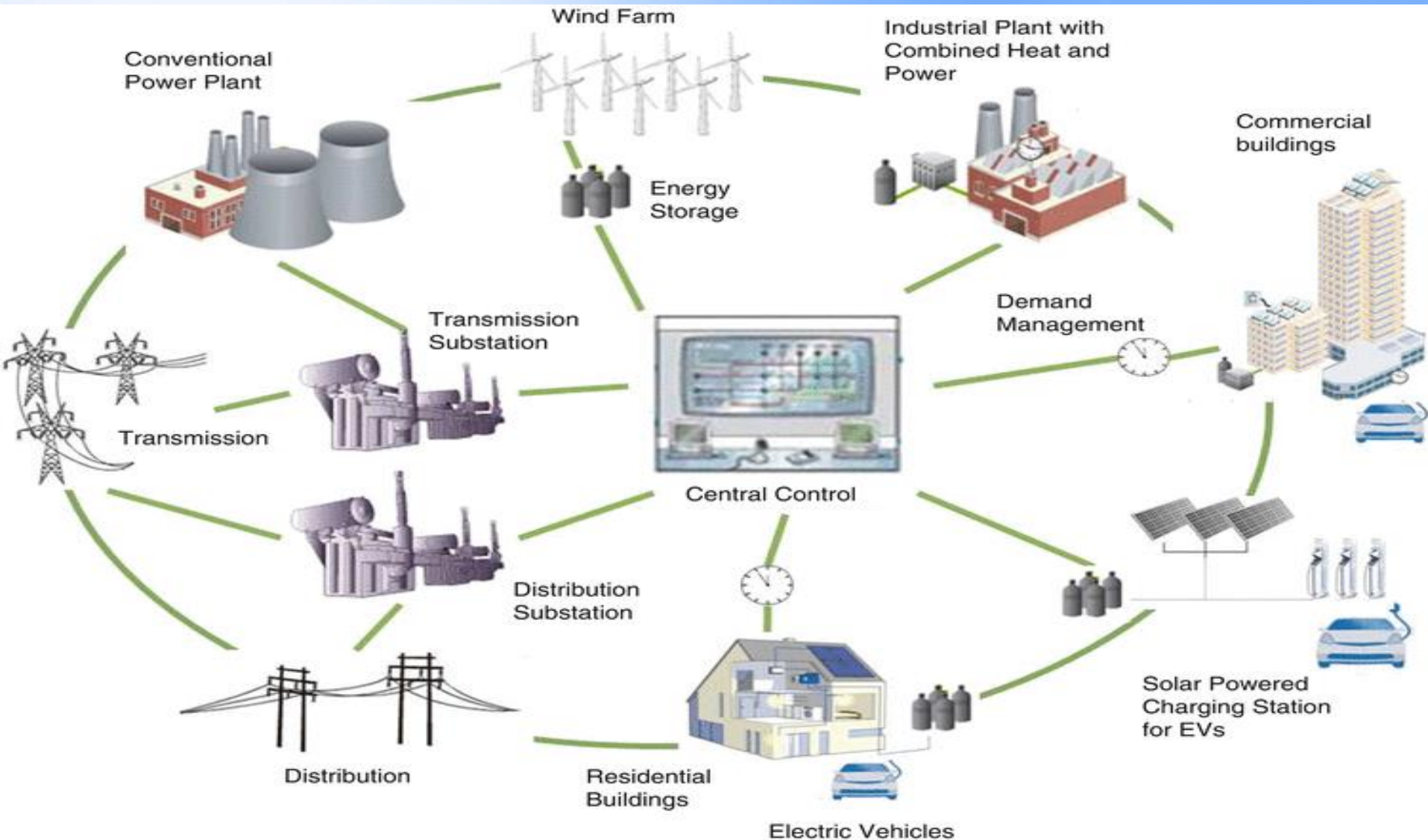


DEFINING SMART GRID

A smart grid is an electricity network that uses digital and other advanced technologies to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users.

Smart grids co-ordinate the needs and capabilities of all generators, grid operators, end-users and electricity market stakeholders to operate all parts of the system as efficiently as possible, minimizing costs and environmental impacts while maximizing system reliability, resilience and stability.

SMART GRID ARCHITECTURE



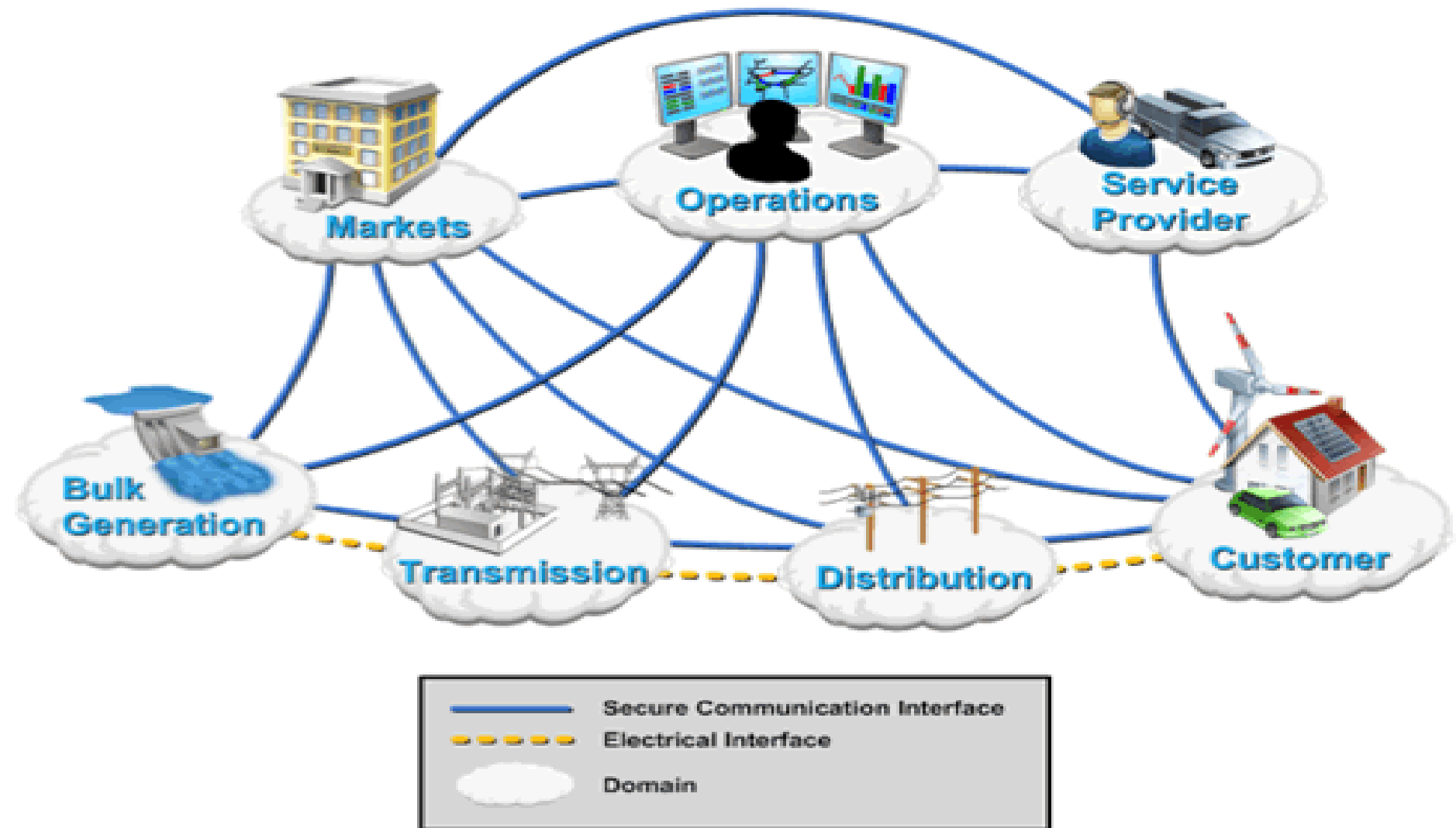
INTELLIGENT VS CONVENTIONAL GRID

Existing grid	Intelligent grid
Electromechanical	Digital
One-way communication	Two-way communication
Centralised generation	Distributed generation
Hierarchical	Network
Few sensors	Sensors throughout
Blind	Self-monitoring
Manual restoration	Self-healing
Failures and black-outs	Adaptive and islanding
Manual check/test	Remote check/test
Limited control	Pervasive control
Few customer choices	Many customer choices

SMART GRID'S OBJECTIVES

- Overcome the limits on the development of distributed generation and storage
- Increase efficiency of the electricity grid and reduce electricity grid wastage
- Ensure interoperability, robustness and security of supply even under the instance of emergency issues including self-healing abilities
- Provide accessibility for all the users to a liberalized market
- Reduce the impact of environmental consequences of electricity production and delivery

SMART GRID CONCEPTUAL MODEL



SMART GRID DOMAINS & ACTORS

Domain	Actors in the Domain
Customers	The end users of electricity. May also store, and manage the use of energy. Traditionally, three customer types are discussed, each with its own domain: residential, commercial, and industrial.
Markets	The operators and participants in electricity markets.
Service Providers	The organizations providing services to electrical customers and utilities.
Operations	The managers of the movement of electricity.
Bulk Generation	The generators of electricity in bulk quantities. May also store energy for later distribution.
Transmission	The carriers of bulk electricity over long distances. May also store and generate electricity.
Distribution	The distributors of electricity to and from customers. May also store and generate electricity.

SMART GRID'S KEY SUCCESS FACTORS

Reliable – provides power dependably, warns for and withstands failures, takes timely corrective actions

Secure – resists to physical and cyber attacks and it is less vulnerable to natural disasters

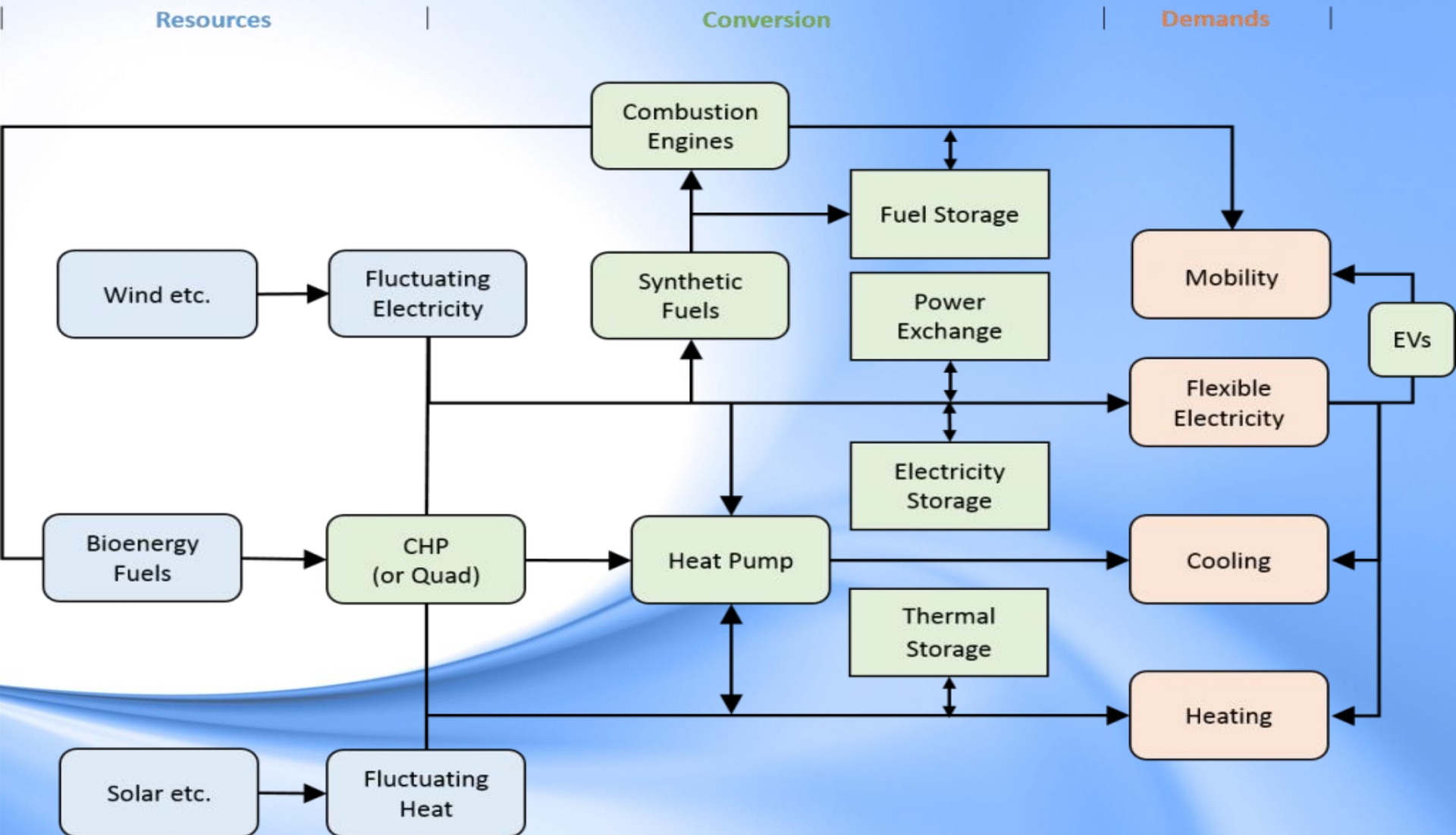
Economic – fair prices and adequate supply

Efficient – cost control, reduced transmission and distribution losses, more efficient power production

Environmentally friendly – reduces environmental impacts in every part of the energy system

Safe – does no harm to the public or to grid workers

INTELLIGENT ENERGY CHAIN



SMART GRID'S DEFINING TRAITS

1. Operates resiliently to disturbances, physical attacks and natural disasters
2. Enabling active consumer participation in demand response
3. Providing power quality for the 21st century needs
4. Accommodating all generation and storage options
5. Enabling new products, services, and markets
6. Optimizing assets and operating efficiently

SELF-HEALING GRID

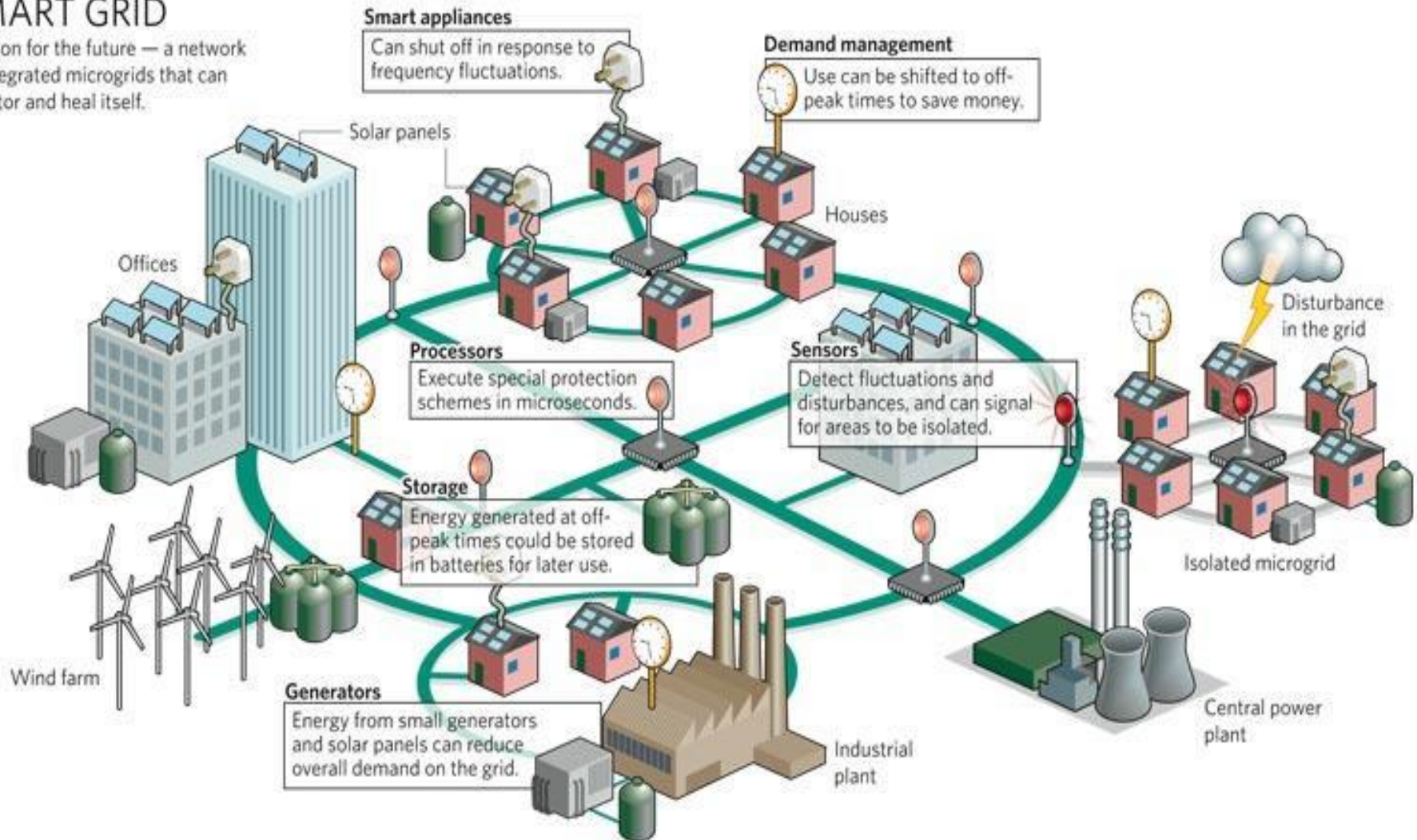
A self-healing grid is expected to respond to threats, material failures, and other destabilizing influences by preventing or containing the spread of disturbances through:

- Constantly monitoring its components and tunes itself to run at an optimum state
- Probabilistic risk assessments based on real-time measurements to identify potential components to fail
- Real-time contingency analyses to determine overall grid health
- Communications with local and remote devices to identify grid conditions and take control actions

ISOLATING PROBLEMS

SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.



GRID RESILIENCY

- Reduced system vulnerability to physical or cyber attack
- Identification of threats and vulnerabilities – Enhanced critical threat information with closer ties between system operators and government
- Protecting the network – Implementation of security technologies, such as authorization, authentication, encryption and intrusion detection
- Inclusion of security risk in system planning – Anticipating the effects of a coordinated terrorist attack in system-wide planning

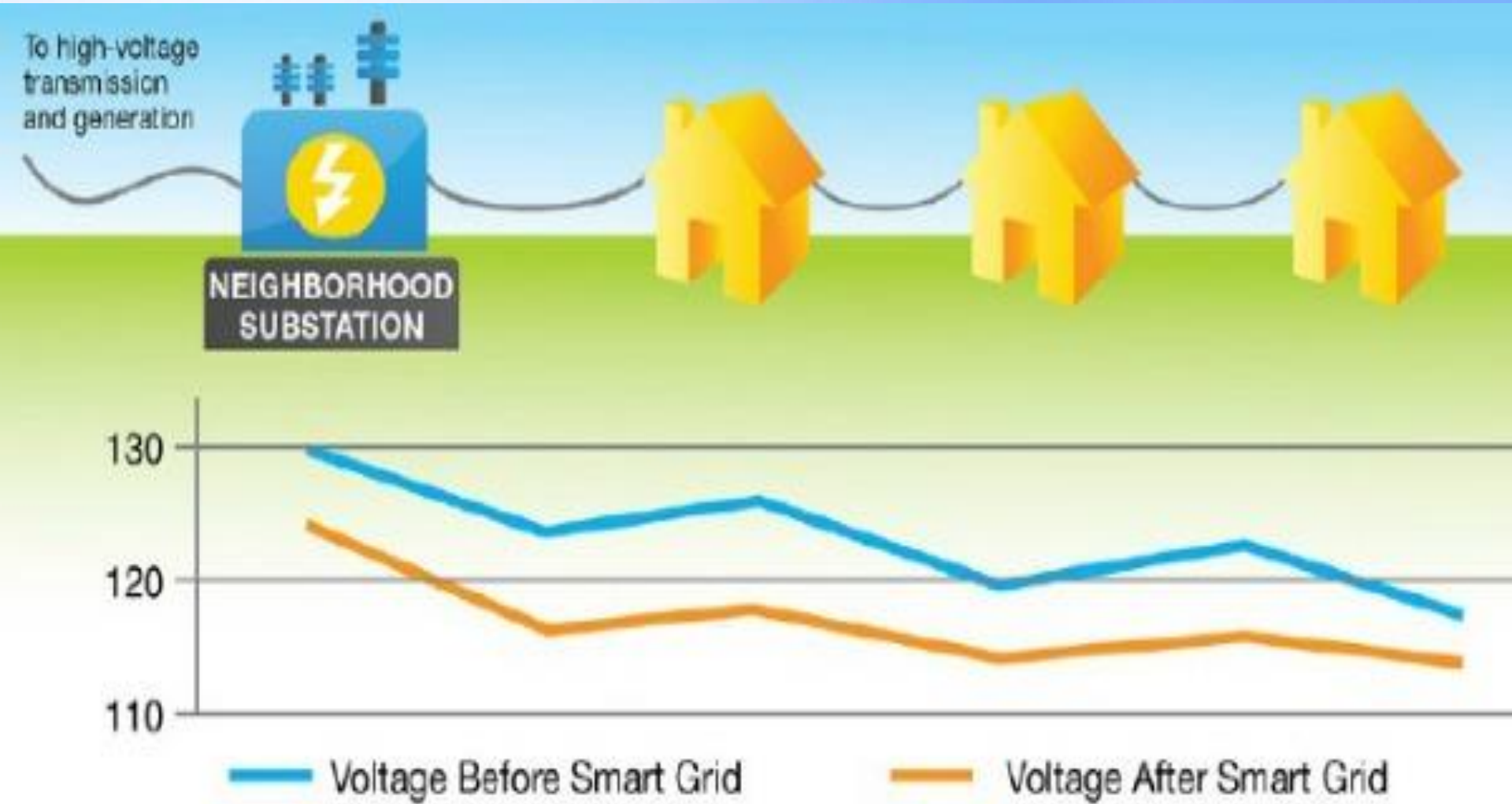
ACTIVE CONSUMER PARTICIPATION

- Consumers choose when, where, and how much electricity they consume, generate, and store
- The new term “energy prosumer” is an energy market participant who both produces and consumes energy.
- System elements that inform the customer about the cost and value of their consumption in real time
- Improved control over home energy bills
- Incorporate their Plug-in Hybrid Electric Vehicles (PHEV) and Electric Vehicles (EV) into the home, office, etc.

HIGH QUALITY POWER

- Technologies and devices on the distribution grid to manage the delivered voltage and power
- Voltage personalizes optimization for each consumer—supply based on actual consumer voltages
- Limiting/buffering voltage sags and surges on the grid
- Modern switching and advanced maintenance that help service providers prevent momentary power fluctuations from reaching users of digital devices
- Voltage imbalances reported by networked meters to service providers for immediate repair

HIGH QUALITY POWER



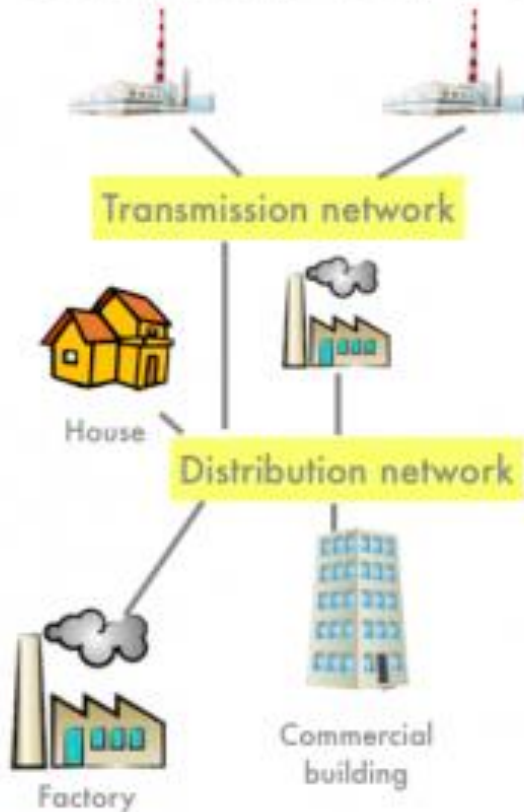
MULTIPLE GENERATION & STORAGE OPTIONS

- Enables "plug-and-play" interconnection to multiple and Distributed Energy Resources (DER)
- Improved interconnection standards to enable a wide variety of generation and storage options
- Easier and more profitable for commercial users to install their own generation and storage facilities.
- Large environmentally-friendly central plants will be readily integrated into the transmission system and fossil fuel usage will be reduced
- Decentralized model that includes a balance of large, centralized generating plants as well as DER

DECENTRALIZED POWER GRID

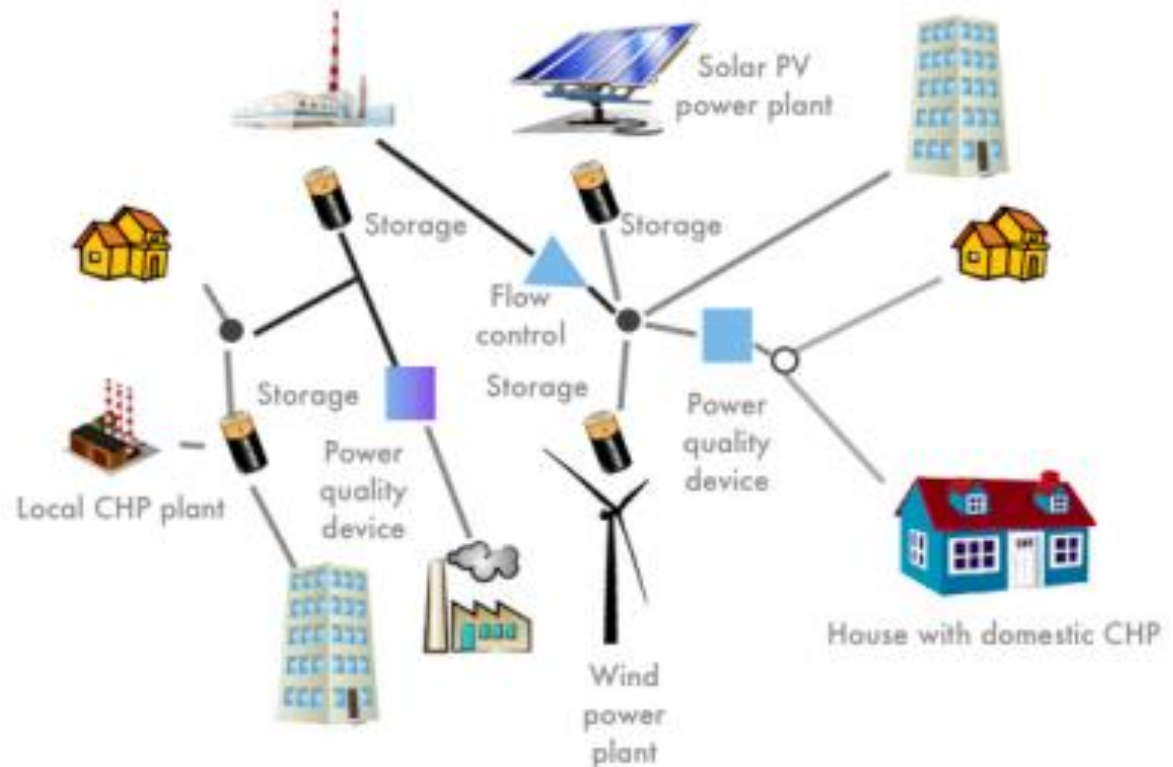
Yesterday

Centralized Power



Tomorrow

Clean, local power



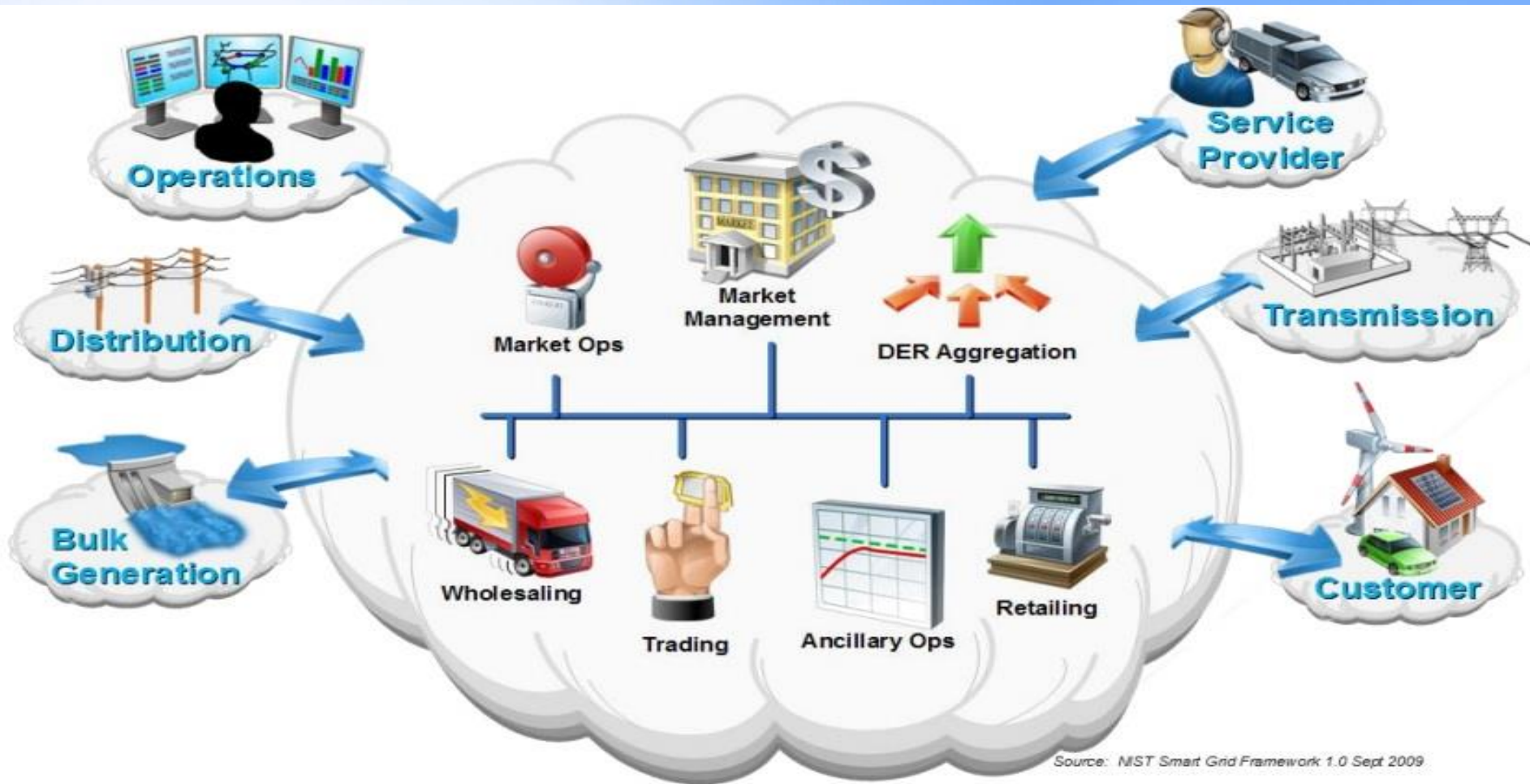
ENABLES MARKETS

Modern grid will enable more market participation through:

- increased generation paths
- more efficient aggregated demand response initiatives
- placement of energy storage and resources within a more reliable distribution system

- Brokers, integrators, aggregators and enabled consumers will interact in real time with the electricity market
- By reducing congestion, the modern grid expands markets; it brings together more buyers and sellers
- New electricity markets will emerge by the introduction of new commercial goods and services (e.g. clean energy)

OVERVIEW OF THE MARKETS DOMAIN



OPTIMIZING ASSETS AND OPERATING EFFICIENTLY

- Assets will be managed to deliver only what is needed and only when it is needed
- Integration of near real-time data with advanced algorithms to improve decision-making and optimize both the capacity and the quality of electrical services
- With near real-time data, condition-based maintenance will dramatically improve equipment failure rates and reduce their maintenance costs
- Advanced Outages Management Systems (OMS) will significantly reduce the time to detect, locate, and diagnose outages

SMART GRID BENEFITS

Defining trait	Benefit
Self-healing	Enhances cost savings, reliability and the profitable marketing of surplus power.
Active consumer participation	Consumers use more wisely, helping utilities produce more efficiently resulting in a wide range of environmental benefits
Resists attack	The grid deters or withstands physical or cyber attack
High quality power	Avoids productivity losses of downtime, especially in digital device environments
Multiple generation & storage options	Diverse resources with “plug-and-play” connections multiply the options for electrical generation and storage including new opportunities for more efficient, cleaner power production
Enables markets	The grid’s open-access market reveals waste and inefficiency and helps drive them out of the system while offering new consumer choices such as green power products.
Optimizes assets & operates efficiently	Desired functionality at minimum cost guides operations and the use of assets

OUTLINE

TOPIC 1: Introduction to Intelligent Energy

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**TOPIC 3: Smart Grid Components &
Technologies**

SMART GRID COMPONENTS

- Intelligent appliances
- Smart power meters
- Smart substations
- Smart generation
- Smart distribution

INTELLIGENT APPLIANCES

- Intelligent appliances are providing residential power consumers with insight into their energy consumption, facilitating energy-efficient and eco-friendly behavior
- Enable monitor of their usage and support remote management
- Capable of deciding when to consume power based on pre-set customer preferences
- Best candidates are the appliances consuming a lot of power and can be used with discretion, such as the HVAC (Heating Ventilation A/C) system, washers and dryers
- Consumers can save up to 25% on their energy usage

INTELLIGENT APPLIANCES - EXAMPLES



SMART POWER METERS

- Digital devices for measuring various features relative with electricity consumption
- Provide data on electricity price and consumption, CO2 emissions and show comparisons of energy usage on a given time frame basis
- Support two-way flow of information between them and electricity provider
- Enable demand response – that is actions taken to reduce the energy demand by end users



SMART GENERATION

- Optimize the production of electricity utilizing different energy sources efficiently, flexible, fast and with cost-effectively
- Balance multiple energy sources to meet network requirements and consumption needs – balancing supply and demand
- Maintain voltage, frequency and power factor standards based on feedback from multiple points in the grid
- Each generator runs independently of the others (all run in parallel) and runs only when needed (based on load)

SMART DISTRIBUTION

- Supports distributed energy resource deployment
- Enables self-healing, self-balancing and self-optimizing and autonomous restoration
- Utilizes the bi-directional flow of information to optimize distribution grid operations
- Enhances security of supply and power quality
- Automated monitoring and analysis tools capable of detecting or even predicting cable and failures based on real-time data about weather, outage history

SMART SUBSTATIONS

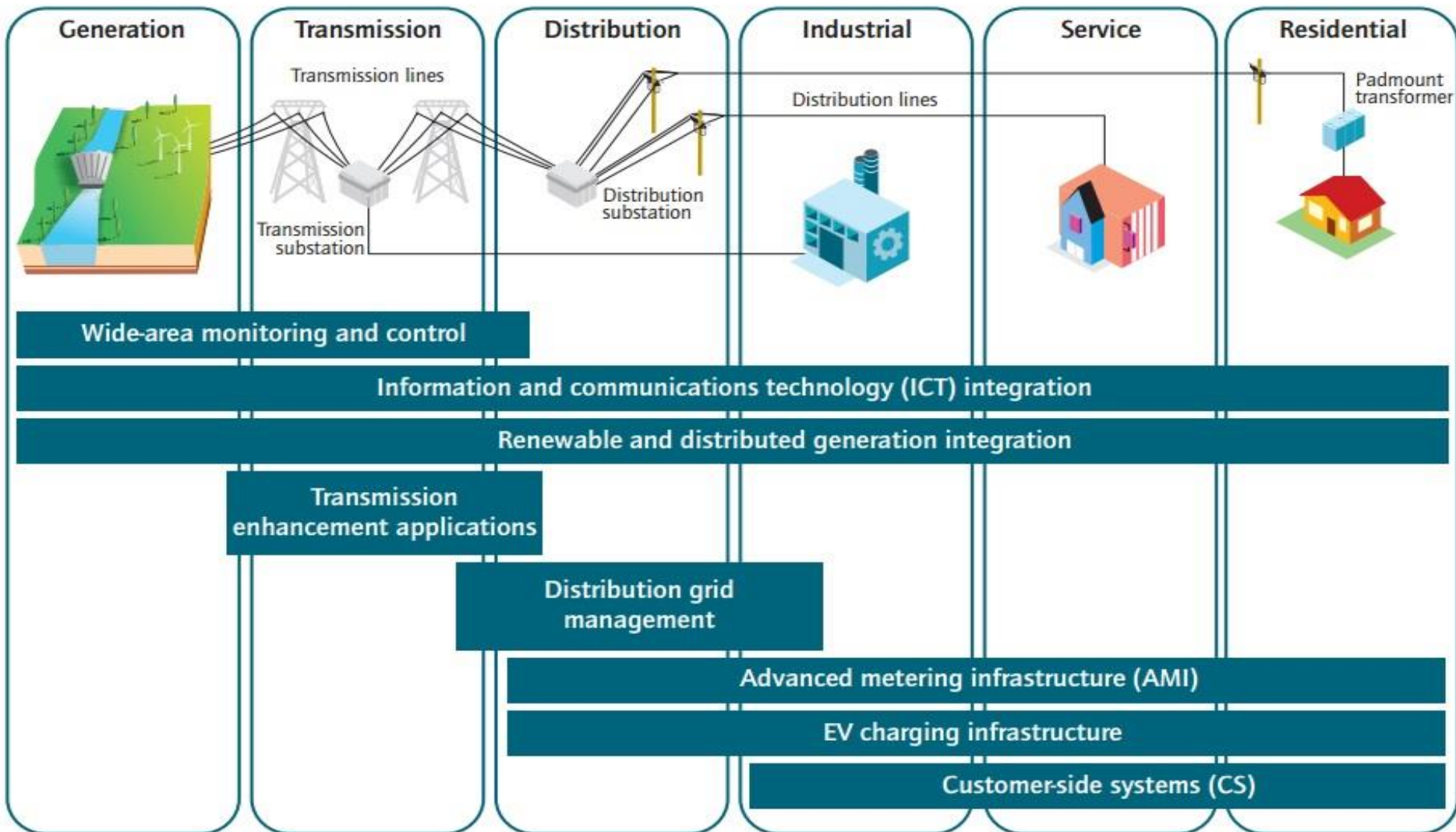
- Achieve the intelligent management of substation equipments by advanced data analysis processing methods based on advanced sensor technologies
- Support a series of sophisticated functions such as intelligent alarm and analysis, substation load transfer, device status visualization, battery monitoring, etc.



SMART GRID TECHNOLOGICAL AREAS

- Wide area monitoring and control
- Renewable and distributed generation integration
- ICT integration
- Transmission enhancement applications
- Distribution grid management
- Advanced metering infrastructure (AMI)
- EV charging infrastructure
- Customer-side systems (CS)

TECHNOLOGY SPAN IN THE SMART GRID



WIDE AREA MONITORING AND CONTROL

- Real-time monitoring and display of power system components and performance
- Advanced system operation tools to avoid blackouts and facilitate the integration of renewable energy resources
- Monitoring and control technologies along with advanced system analytics:
 - Supervisory control and data acquisition (SCADA)
 - Wide-area situational awareness
 - Wide-area monitoring systems
 - Wide-area adaptive protection, control and automation

MONITORING THE GRID



RENEWABLE AND DISTRIBUTED GENERATION INTEGRATION

- Challenges for their dispatchability and controllability and for operation of the electricity system
- Energy storage systems can decouple the production and delivery of energy
- Automation of control of generation and demand to ensure balancing of supply and demand
- Power conditioning equipment for bulk power and grid support
- Communication and control hardware for generation and enabling storage technology

ICT INTEGRATION

- Create a dynamic, high-speed interactive infrastructure for real-time information and power exchange
- System control software and enterprise resource planning (ERP) software to support the two-way exchange of information between stakeholders

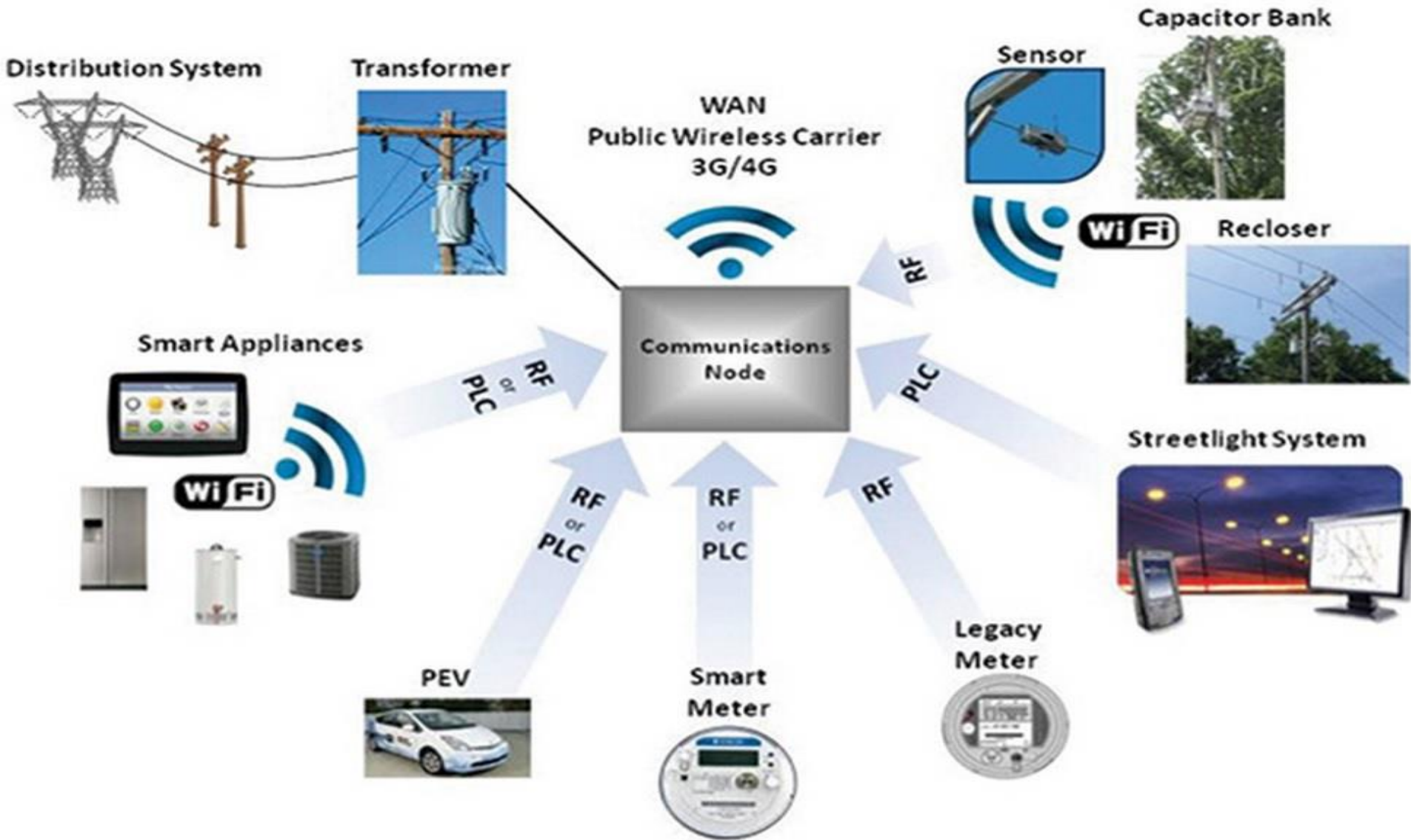
Wireless technologies :

- *IEEE.802.11 (WiFi)*
- *IEEE.802.16 (WiMax)*
- *GSM/GPRS*

Wired technologies:

- Fiber optics
- xDSL
- Power Line Communication

COMMUNICATION TECHNOLOGIES



TRANSMISSION ENHANCEMENT APPLICATIONS

- Flexible AC transmission systems (FACTS) are used to enhance the controllability of transmission networks and maximize power transfer capability
- High voltage DC (HVDC) technologies are used to connect offshore wind and solar farms to large power areas
- Dynamic line rating (DLR), can optimize utilization of existing transmission assets, without causing overloads
- High-temperature superconductors (HTS) can reduce transmission losses and enable economical fault-current limiting with higher performance

DISTRIBUTION GRID MANAGEMENT

- Distribution and sub-station sensing and automation can:
 - reduce outage and repair time
 - maintain voltage level
 - improve asset management
- Sensor technologies enable condition- and performance-based maintenance of network components
- Geographic Information System (GIS), Distribution Management System (DMS), Outage Management System (OMS), Workforce Management System (WMS)

DISTRIBUTION GRID MANAGEMENT SYSTEM



ADVANCED METERING INFRASTRUCTURE

- Remote consumer price signals, which can provide time-of-use pricing information
- Collect, store and report customer energy consumption data for any required time intervals or near real time
- Improved energy diagnostics from more detailed load profiles
- Ability to identify location and extent of outages remotely via a metering function that sends a signal when the meter goes out and when power is restored
- Losses and theft detection

EV CHARGING INFRASTRUCTURE

- Handles billing, scheduling and other intelligent features for smart charging (grid-to-vehicle)
- large charging installation will provide power system ancillary services, such as capacity reserve, peak load shaving and vehicle-to-grid regulation



CUSTOMER-SIDE SYSTEMS

- Help manage electricity consumption at the industrial, service and residential levels
- Include energy management systems, energy storage devices, smart appliances and distributed generation
- Energy efficiency gains and peak demand reduction can be accelerated with in-home displays/energy dashboards, smart appliances and local storage
- Automated, price-responsive appliances and thermostats connected to an energy management system or controlled from the utility or system operator

SMART GRID - SUMMARY

- Evolves traditional power system through monitoring and control, self-healing, automation, security etc.
- Provides consumers with information related to their energy usage (e.g. cost, alternative options etc.)
- Integrates renewable energy sources
- Adds energy storage abilities into the system

These lead to an energy system that is more **reliable**, **sustainable** and **resilient**.

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THANK YOU FOR YOUR ATTENTION!





O2 - Environmental portfolio

Course 3 - Entrepreneurship-
Intelligent energy

Module 2 – Introduction to
Green Entrepreneurship

Week 10

Developed by: **BEST**

Best-Institut für berufsbezogene
Weiterbildung und Personaltraining

BEST



époque

OBJECTIVES

- To get introduced to the history of entrepreneurship
- To define CSR
- To know the principles of green entrepreneurship

TABLE OF CONTENTS

1. What is entrepreneurship: an introduction
2. CSR principles, environmental pillar and what is a green business? – part 1

References

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

General introduction to entrepreneurship

For a first introduction of what is “Entrepreneurship”, the definition of the online business dictionary covers many aspects and describes it as follows:

“Entrepreneurship is the capacity and willingness to develop, organise and manage a business venture along with any of its risks in order to make a profit. The most obvious example of entrepreneurship is the starting of new businesses. In economics, entrepreneurship combined with land, labour, natural resources and capital can produce profit. Entrepreneurial spirit is characterised by innovation and risk-taking, and is an essential part of a nation's ability to succeed in an ever changing and increasingly competitive global marketplace.”

<http://www.businessdictionary.com/definition/entrepreneurship.html>

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Historical overview on entrepreneurship

Although the term “Entrepreneurship” is French, the origin, first developments can be located in the Anglo-American region. In fact, elementary structures of entrepreneurship existed since the middle age and developed through the centuries gaining complexity, in line with social and economic structures.

In the late 19th and early 20th centuries the focus of entrepreneurship lay on the economic perspective. E.g.: Andrew Carnegie, who built the American steel industry was characterised by his competitiveness rather than his creativity.

In the middle of the 20th century, the view changed and an entrepreneur was rather recognised as an innovator. E.g.: Edward Harriman, who reorganised the Ontario and southern railroad through the northern pacific trust.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Historical overview on entrepreneurship

The economist Joseph Schumpeter plays a key role in the entrepreneurship research. In the 30s of the 20th century he described the performance of an entrepreneur as not to invent something new but to explore it in a new way and successfully introduce it to the market. In this definition the focus shifts on the successful marketing of a, not necessarily new invented, product. However, the process of marketing itself requires creativity and inventive and entrepreneurial spirit.

This change of focus had a huge impact on the modern definition of entrepreneurship. In this sense companies such as Red Bull can be traced back to entrepreneurial ambition.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Entrepreneurship education

In 1947, the first entrepreneurship course was offered at Harvard University with the aim of supporting veterans in starting their own business. In the 1950s and 1960s, entrepreneurship education has been offered in many business schools, and the audience shifted to young people. In the 1970s, there has been a significant growth in this area due to the high demand for entrepreneurship courses.

In the 1980s the subject Entrepreneurship was connected with other areas. At this time also the first conferences and meetings were held.

In the 1990s veritable boom of entrepreneurship education can be registered.

In Europe, this development started later. In Germany, for example, the number of courses increased until the second half of the 1990s. A milestone in German history of entrepreneurship was the founding of EXISTProgramms in 1998. Through this funding start-up climate at universities should be improved.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Entrepreneurship education

In recent years, the importance of entrepreneurship and entrepreneurship education increased significantly. One reason was mainly the financial crisis of 2008. The crisis led to negative economic growth, high unemployment and poor career opportunities for young people. As a result, policy called to promote entrepreneurship, and students called for education in the field to compensate deficiencies in the area.

The European Commission responded to the economic crisis of 2008, e.g. with the action plan female entrepreneurship 2020. It intends to boost competitiveness and to achieve sustainable growth.

This action plan focuses on promotion of entrepreneurial education, improvement of the necessary business environment and to promote a generation of young entrepreneurs.

Another field of entrepreneurship is the so called “eco-preneurship” or “green entrepreneurship”, which will be described on the following slides.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Specific introduction to business and sustainability

Green businesses are businesses that are committed to reduce their impact on the environment or, on a larger scale focus on sustainability.

Sustainability includes not only the consideration of environmental issues, but comprises of the social, economic and environmental consideration, also known as the three pillars of sustainability.

A strategy to implement values such as human rights, social equality and, naturally, environmental protection, in business is the concept of Corporate Social Responsibility (CSR).

CSR is no uniform concept, but based on several principles and guidelines. The concept differs from country to country and even from company to company. For green businesses these principles can be a good foundation to ensure sustainability within the business.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Main obstacles in starting a green business

Starting a business in general, and a green business specifically, bears risks, but also opportunities. In the big picture, it is more difficult for SME start-ups, which build their business model on sustainable principles than for a large business that implements certain sustainable measures in their policies.

Lack of resources, insufficient management or economic depression are possible internal or external obstacles for new businesses.

On the other hand a quick reaction on market changes is possible due to the smaller size and therefore less complex structure of the business.

1. WHAT IS ENTREPRENEURSHIP: AN INTRODUCTION

Potentials of starting a green business

There are many potential in green starter businesses. The focus on sustainability fits the entrepreneur as it can be seen in connection to individual worldviews, values and ideals. This view transports authenticity and intrinsic motivation of the product/service.

The afore mentioned obstacle, namely the risk, can be identified as potential of a new green business. As described before, taking risks is a key characteristic of any entrepreneur and associated with entrepreneurial spirit, as well as to show creativity and innovation.

Regarding to the business, green entrepreneurs prepare innovative solutions that fit the consumers needs and reflects the zeitgeist. This approach is typical for start-ups and can indeed be seen as a positive aspect compared to regular large business structures. Investing in sustainability covers some of these requirements and mark a change in doing business.

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

Definition of corporate social responsibility

First, it has to be noted that there is no common definition of corporate social responsibility (CSR). “Most definitions of corporate social responsibility describe it as a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis.”

<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52001DC0366>

The European Commission defines CSR as “the responsibility of enterprises for their impacts on society” (COM (2011) 681). The Commission encourages that enterprises “should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders”.

http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index_en.htm

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

CSR principles and guidelines

The commission promotes the implementation of CSR on national level and developed a strategy for advancing CSR in enterprises based on the listed guidelines and principles below. This list is based on internationally recognised CSR guidelines and principles, which have been identified and adopted by the European Commission in 2011:

- United Nations Global Compact (2000)
- United Nations Guiding Principles on Business and Human Rights (2011)
- ISO 26000 Guidance Standard on Social Responsibility (2010)
- International Labour Organization Tripartite Declaration of Principles concerning Multinational Enterprises on Social Policy (1977/1991/2001/2014)
- OECD Guidelines for Multinational Enterprises (2008/2011 Updated)

http://ec.europa.eu/enterprise/policies/sustainable-business/corporate-social-responsibility/index_en.htm

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Thank you!



O2 - Environmental portfolio

Course 3 - Entrepreneurship-
Intelligent energy

Module 2 – Introduction to
Green Entrepreneurship

Week 13

Developed by: **BEST**

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Weiterbildung und Personaltraining

OBJECTIVES

- To get introduced to the basic principles of environmental CSR
- To be able to develop an idea based on the principles of green entrepreneurship
- To be able to draft a business plan for the Green Business Idea

TABLE OF CONTENTS

2. CSR principles, environmental pillar and what is a green business? – part 2
3. Generate and analyse your green business idea
4. Are you ready to start your green business?

References

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

The environmental pillar of CSR

The afore described principles and guidelines are fundamental aspects for integrating CSR strategies in business. With focus on the environmental pillar, the European Commission presented the GREEN PAPER in 2001 promoting a European framework for corporate social responsibility, which suggests following procedures:

- Management of environmental impacts and natural resources on the internal dimension
- Global Environmental concerns on the external dimension

Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final

These procedures regarding to the environmental CSR are described below as part of green business, as they can be seen in connection to economic issues.

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

- Management of environmental impacts and natural resources on the internal dimension

To manage environmental impact of businesses there are measures that can be easily carried out, such as waste management. In general, reducing the consumption of resources and polluting emissions can lead to a lower environmental impact. Reducing energy and waste disposal bills businesses can decrease their input and de-pollution costs.

see Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final

The reduction of usage can increase a businesses` profitability and competitiveness. Profitable investments in sustainability are known as “win-win” situations - good for business and good for the environment.

see <http://www.wbcsd.ch/eurint/eeeei.htm>

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

- Global Environmental concerns on the external dimension

Through the trans boundary effect of many business-related environmental problems, and their consumption of resources from across the world, companies are also actors in the global environment. They can therefore pursue social responsibility internationally as well as in Europe. For example, they can encourage better environmental performance throughout their supply chain within the IPP approach and make larger use of European and international management and product-related tools. Investment and activities of the companies on the ground in third countries can have a direct impact on social and economic development in these countries.

see Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final

2. CSR PRINCIPLES, ENVIRONMENTAL PILLAR AND GREEN BUSINESS

Definition of green business

“Green business is a business functioning in a capacity where no negative impact is made on the local or global environment, the community, or the economy. A green business will also engage in forward-thinking policies for environmental concerns and policies affecting human rights.”

<http://www.businessdictionary.com/definition/green-business.html>

Green business strategies are often associated with large business due to their resources and name recognition. Therefore it is understandable that ratings of top green businesses include brands like Deloitte, IKEA or Apple. But also SMEs are promoted to implement sustainable measures in their business strategies or even are build up on such ones. E.g. (from www.changemakers.com): the Ugandan SME “the Solar Sisters” employs women to sell solar-powered LED lamps for residential use, which increased women’s employment on the one hand and reduced dependence on polluting and inefficient forms of lighting on the other hand.

<https://www.changemakers.com/g20media/greenSMEs>

3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

Process of idea generating

The “Create Impact! Handbook for Sustainable Entrepreneurship” defines the following five steps for generating and analysis a business idea:

1. Getting to know the user

To understand the users` needs and in order to develop solutions that fit those needs, it is important to identify characteristics and elements that others may overlook. Observation skills can be practiced in every day activities; for instance, by identifying situations which evoke certain feelings, such as frustration.

Identifying products, activities and situations that could be made in a simpler, friendlier, or more efficient way and recording these observations is a useful practice for idea finding, when trying to solve a specific problem.

see Pascual et al. 2011, p.31

3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

2. Idea generation

As described before, to have and generate an idea is a good foundation of starting a green business. New ideas often arise from simple questions like 'What is this?', 'What is it for?' or 'What could it be for?' Questioning the basic uses of utensils in everyday life give space to new opportunities. Therefore, looking at things from another point of view is the first step to solutions and innovations. This activity empowers creativity and supports the creation of ideas.

see Pascual et al. 2011, p.31

3. Development of ideas

The activities of the steps of getting to know the user and idea generation support the development of ideas. The goal is to develop as many ideas as possible. This work is more productive in a group with a variety of personalities and different fields of expertise. Therefore brainstorming session where participants actively contribute with ideas can be promoted and the following aspects should be considered: the goal is to collect as many ideas as possible and to write them down; every idea is welcome; they can be clustered and further developed.

see Pascual et al. 2011, p.31

3. GENERATE AND ANALYSE YOUR GREEN BUSINESS IDEA

4. Prototyping solutions

As soon as solutions are shared with others, better. The goal is to detect failures and possibilities for improvement in a early stage. It is very expensive and complicated to make changes once a design is taken for a finished product/service that has been placed into the market. The task for this phase is to visualise the idea as soon as possible using available materials. The goal is to get along without complex and costly resources, but instead use creative thoughts. Prototyping can be seen as a good practice for developing new ideas, and for exploring different directions.

see Pascual et al. 2011, p.32

5. Iterations

After validation of prototypes by the target group. With the creation of a tool, such as an object or a video that can be iterate at low costs, the iterative process begins. It includes several passes of testing, modifying and repeating phases until the solution is completely validated by the member of the target group. Therefore it is also important to develop prototypes fast.

see Pascual et al. 2011, p.32

4. ARE YOU READY TO START YOUR GREEN BUSINESS?

Business model

To start a green business there are several issues that have to be considered. First, a business idea is to develop and to draft as business model. If the same or a similar idea or model already exists, the barriers to entry and competition are high as well as the financial expenses.

Ideally, the business model fulfils 3 criteria:

- Innovative nature
- Creation of a specific customer benefit
- High earning potential

see Pott&Pott, 2012, p.63



Fig.1: Are you ready to grow.
(marketingwithheart.co)

4. ARE YOU READY TO START YOUR GREEN BUSINESS?

Benefits of new ideas

The main benefit of starting a business based on a new idea is the (current) monopoly. Due to this monopoly prices can be set on a high level and demand and potential can be exploited, thereby growth is accelerated. This results in cost advantages. Also valuable market experience can be collected in this process. Good relationships with suppliers and customers are necessary to benefit against competitors.

see Pott&Pott, 2012, p.63

Disadvantages of new ideas

Initial investments have to be taken in order to increase the level of awareness and to overcome scepticism among customers. Additional costs for lack of infrastructure and to develop a product can occur. Therefore a financial calculation and planning for avoiding mistakes is recommended.

see ibid.

7. STARTING THE GREEN BUSINESS – BUSINESS PLAN FOLLOWING PDCA

What is a business plan?

A business plan is the basis of business creation and contains at least the following information:

- A description of the product/service, considering the market and competition
- Marketing and sales strategy
- Description of the business model and organisation, its distribution and strategies
- Introduces the entrepreneur and the key staff
- Presents a structured implementation schedule of the main activities and budget
- It is recommended to list opportunities and risks as conclusion

see Pott&Pott 2012, p.192

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- Green paper - Promoting a European framework for corporate social responsibility. /* COM/2001/0366 final */. In: <http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52001DC0366> [07.06.2015]

3. Generate and analyse your green business idea

NB: No online references

4. Are you ready to start your green business?

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Thank you!



O2 - Environmental portfolio

Course 3 - Entrepreneurship-
Intelligent energy

Module 2 – Introduction to
Green Entrepreneurship

Week 16

Developed by: **BEST**

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OBJECTIVES

- To get introduced to the basics of green marketing
- To be able to draft a marketing plan for the Green Business Idea
- To know the rules and regulation of Starting Your Green Business
- To be able quality management tools for the Green Business

TABLE OF CONTENTS

- 5. Green marketing plan
- 6. Complying with the rules and regulations to start your green business
- 7. Starting the green business – business plan following PDCA

References

5. GREEN MARKETING PLAN

Marketing plan

According to the publication “sustainable business cases” (2012) “a marketing plan is derived from the company’s vision and integrates an organisation’s overall goals and marketing objectives (what goals they want to achieve) and strategies (how they are going to achieve them) into a cohesive plan, typically on an annual basis. The green marketing plan focuses on the ideal marketing mix to achieve maximum profit potential while adhering to sustainability principles.”

Devine et al. 2012, <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html>

For a successful use of marketing strategies the 4 Ps of conventional marketing can be followed and easily implemented into the different areas of a company, aiming to show it commitment and sustainability.

see ibid.

5. GREEN MARKETING PLAN

The 4 Ps of marketing

The four Ps of marketing (Product, Price, Place and Promotion) are also known as the 'Marketing Mix'. The Marketing Mix is a crucial tool in determining a product's offering to the customer.:

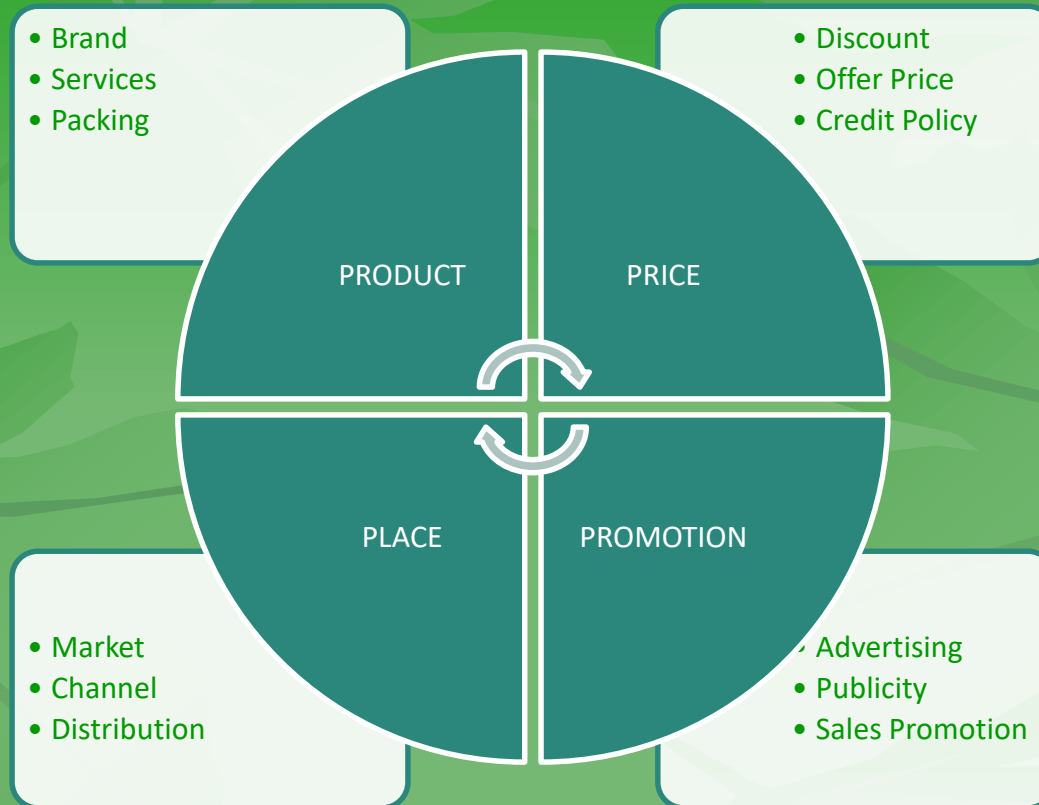


Fig.2: The 4 Ps of Marketing
<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

5. GREEN MARKETING PLAN

Product

The product can either be tangible, which have independent physical existence (from needle to motor parts) or intangible service (like in IT and tourism industry). Launching the right kind of product with appropriate number of variants is one of the critical decisions for marketing managers.

Price

The price of a product determines the offering which the customers are willing to give to buy that product. The price can neither be too low that the seller incurs losses, nor be too high that the consumers cannot afford the product.

The price of a product or a service depends on its demand, which is determined by demand elasticity. A product is said to be elastic if raising its price reduces the demand considerably (e.g. coffee, people will switch to tea) and the product/service is inelastic if its demand is not affected even after raising the price (e.g. petrol).

<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

5. GREEN MARKETING PLAN

Place

The market where the product is sold is known as the place. The markets should be convenient for the consumers to access. Distribution network for a product determines its availability in shops/outlets.

Promotion

The method of communication by which the marketer provides information about the product is known as promotion. It included advertisements, personal selling, word of mouth publicity etc.

<http://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/6778-4-ps-of-marketing.html>

5. GREEN MARKETING PLAN

To achieve these goals, the following aspects that any good marketing plan should includes are:

- **Corporate goals**

They represent the companies general goals and harmonise with its strategic plan and vision on a long range.

- **Objectives**

From the corporate goals, marketing objectives can be settled and have to be specified, such as to grow to 5% market share.

- **Strategies**

After the objectives are determined, the strategies for achieving these need to be developed (e.g. conversion of all product ingredients to those that are locally sourced to help meet the objective of minimising the company's carbon footprint).

Devine et al. 2012, <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html>

5. GREEN MARKETING PLAN

- Tactics

Tactics are the ways established to achieve the strategies , including the four Ps (e.g. identification of the local suppliers and costs to achieve a buy local strategy).

- Market

Implies the determination of the targeted market and analysis of the current stage of the products life cycle: development, introduction, growth, maturity, etc. For green products especially, there may be opportunity to add a new dimension to a mature category with a new product benefit.

- Consumer target audience

Identification of the target group and definition of segments. The aim is to identify the optimal target to achieve marketing objectives.

Devine et al. 2012, <http://2012books.lardbucket.org/books/sustainable-business-cases/s10-sustainable-business-marketing.html>

6. COMPLYING WITH THE RULES AND REGULATIONS TO START YOUR GREEN BUSINESS

Starting a green business

The precondition to start a green business vary from country to country and depends on the legal situation regarding to the business foundation and environmental framework. Besides these factors, the nature of the business needs certain consideration of laws. Depending on these factors, legal requirements need to be discovered towards:

- Legal form of business
- Commercial law
- Plant permit law
- Social security act
- Environmental laws and regulations
- Etc.

7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

The deming/PDCA cycle

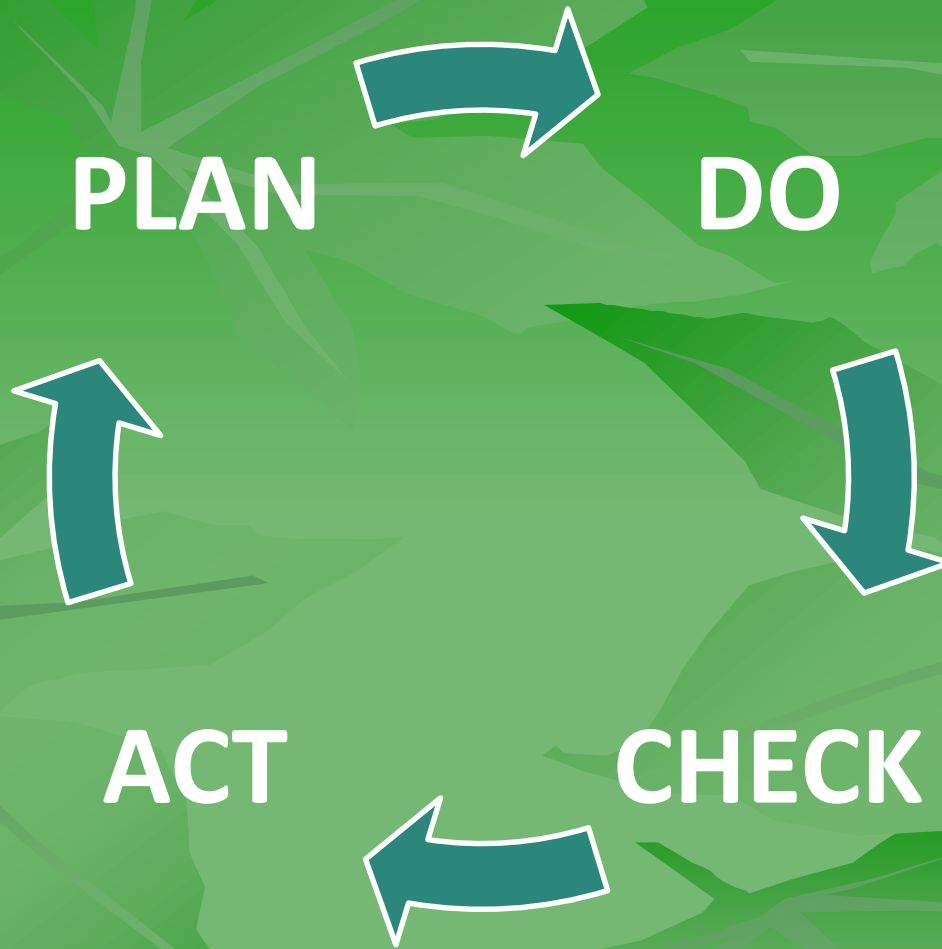


Fig.3: The deming/PDCA cycle

7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

Plan

The planning starts with the definition of measureable and written goals, which can be applied to relevant policies (e.g. for receiving environmental certification, specific requirements have to be considered). For each step, the responsibilities needed to achieve those goals are defined (e.g. the overarching goal is to reduce energy use in the office by 5% in the next two years; a timeline including deadlines for tasks and responsibilities is set up).

Do

This phase includes the implementation of the plan. A selected person selected for the purpose will be responsible for the status of the individual tasks and collecting data. Once again, the timeline is to be considered.

<http://www.sustainability4success.com/plan-do-check-act.html>

7. STARTING THE GREEN BUSINESS – QUALITY MANAGEMENT FOLLOWING PDCA

Check

At this point, the achievement of the goals within the set timeline is evaluated. If the evaluation shows that the goals are achieved, further goals are set and standards become higher. If not, it will be needed to analyse the failure(s) and modify the goals, taking into consideration question as: Why were not all results from energy audit put into practice? What needs to be put in place to save those 5% of energy?

Act

Aims to work and improve insufficient results due to their weak evaluation. The change of strategies to improve the performance of the company must be considered (e.g. set an application for a governmental grant for the implementation of low-energy light bulbs, due to the energy auditor advise).

<http://www.sustainability4success.com/plan-do-check-act.html>

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6. Complying with the rules and regulations to start your green business

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]

7. Starting the green business – business plan following PDCA

- <http://www.sustainability4success.com/plan-do-check-act.html> [08.06.2015]



Thank you!

***ÉPOQUE: ENVIRONMENTAL PORTFOLIO FOR QUALITY IN
UNIVERSITY EDUCATION***

COURSE III

ENTREPRENEURSHIP – INTELLIGENT ENERGY

MODULE 3

GREEN ENTREPRENEURSHIP

OUTLINE

TOPIC 1: Smart Energy Cities

TOPIC 2: Smart Energy in Buildings

TOPIC 3: Smart Energy in Transport

GREEN ENTREPRENEURSHIP APPLICATION SECTORS

Smart cities



Transport



Smart buildings



OUTLINE

TOPIC 1: Smart Energy Cities

TOPIC 2: Smart Energy in Buildings

TOPIC 3: Smart Energy in Transport

ENERGY IN CITIES

- Today, more than half of the population is living in urban environments
- By 2030, 60% of the population worldwide will live in a city, and by 2050, this proportion will reach 70%
- Within the EU, cities are responsible for about 70% of the overall primary energy consumption, which will rise to 75% by 2030
- Consequently, cities are responsible for a significant share of the world's greenhouse gas emissions
- Cities are complex and dynamic ecosystems where the majority of the energy services are provided

CHALLENGES AND OPPORTUNITIES

- Address the growing energy needs of rising population in urban environments
- Reduce greenhouse gas emissions and become more environment-friendly
- Reduce fossil fuel usage for security and climate
- Implement cost-effective solutions for sustainability
- Efficient balancing of energy supply and demand
- Promote the use of locally available renewable energy resources

The smart city concept has emerged

SMART CITY



SMART ENERGY CITY CONCEPT

According to relative research in the context of the EU-FP7 TRANSFORM project (www.transformproject.eu), the smart energy city is defined as:

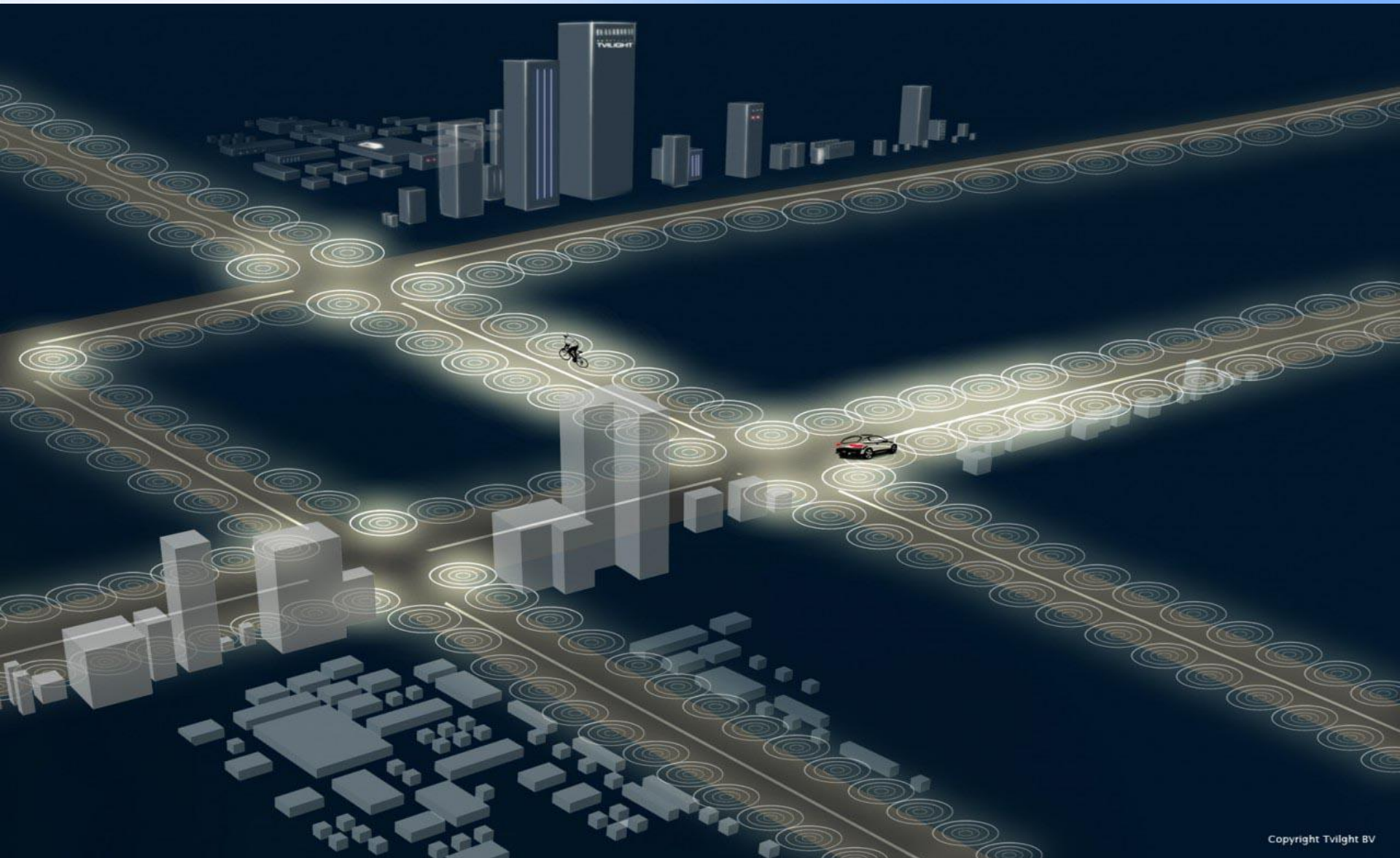
“highly energy and resource efficient; increasingly powered by renewable energy sources; relies on integrated and resilient resource systems, as well as insight-driven and innovative approaches to strategic planning. The application of information, communication and technology are commonly a means to meet these objectives.

It provides its users with a liveable, affordable, climate-friendly and engaging environment that supports the needs and interests of its users and is based on a sustainable economy”

INTELLIGENT STREET LIGHTING

- Cameras and/or sensors enable lights to detect movement and activate
- Lights are interconnected and communicate
- Remote monitoring enables efficient control – defection warnings, dimming times, brightness, etc.
- Decreased energy usage and CO₂ emissions
- Reduction of light pollution
- Maintenance cost reduction – lights operational duration is increased

INTELLIGENT STREET LIGHTING – HOW IT WORKS



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DISTRICT HEATING AND COOLING (DHC)

- Heating represents the largest energy end-use in Europe
 - about 50% of total final energy consumption

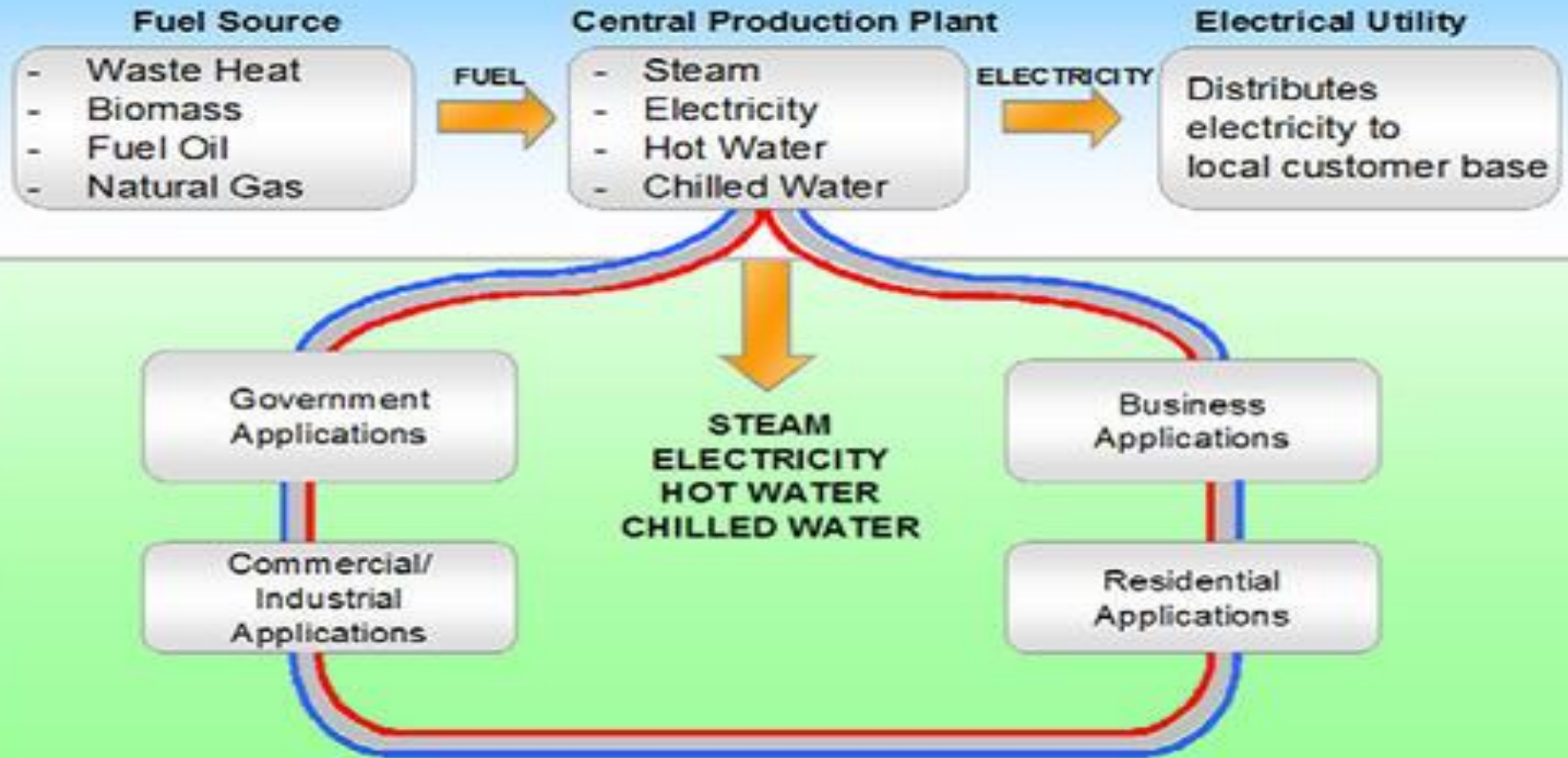
DHC is an integrative technology that utilizes various environment-friendly sources to provide heating and cooling to consumers from a central plant through underground piping



- Circulates hot/chilling water or low-pressure steam
- Potential sources include:
 - Combined Heat and Power (CHP) plants
 - biomass or biomass/coal co-firing
 - industrial waste heat

DHC SYSTEM ARCHITECTURE

Typical District Energy System



DHC SUBSYSTEMS

- Energy production: heat plants or cogeneration plants (Combined Heat and Power - **CHP**).
 - In CHP electricity and useful heat are simultaneously produced by capturing waste heat
- Transportation and distribution piping network: Heat from thermal plants is transferred to consumers through a heat carrying fluid in supply pipes that returns to the source through return pipes after delivering the energy
- Consumers: domestic buildings, commercial buildings, industrial facilities, offices, and hospitals

DHC BENEFITS

- District energy allows for a transition away from fossil fuel use and can result in a 30–50% reduction in primary energy consumption – reduction in GHG emissions
- Reductions in indoor and outdoor air pollution and the associated health impacts
- Greatly improves the operational efficiency of new or existing buildings
- Allow exploitation of local and renewable energy resources
- Higher fuel efficiency and more effective heat transfer capacity

SMART DHC

- Intelligent management of the supply side with appropriate control mechanisms of integrated:
 - Thermal storage
 - Absorption refrigerators

- Balance of available heating/cooling with current demand considering:
 - Availability of stored energy
 - Waste heat from industry
 - Heat from CHP plants
 - Solar heat



OUTLINE

TOPIC 1: Smart Energy Cities

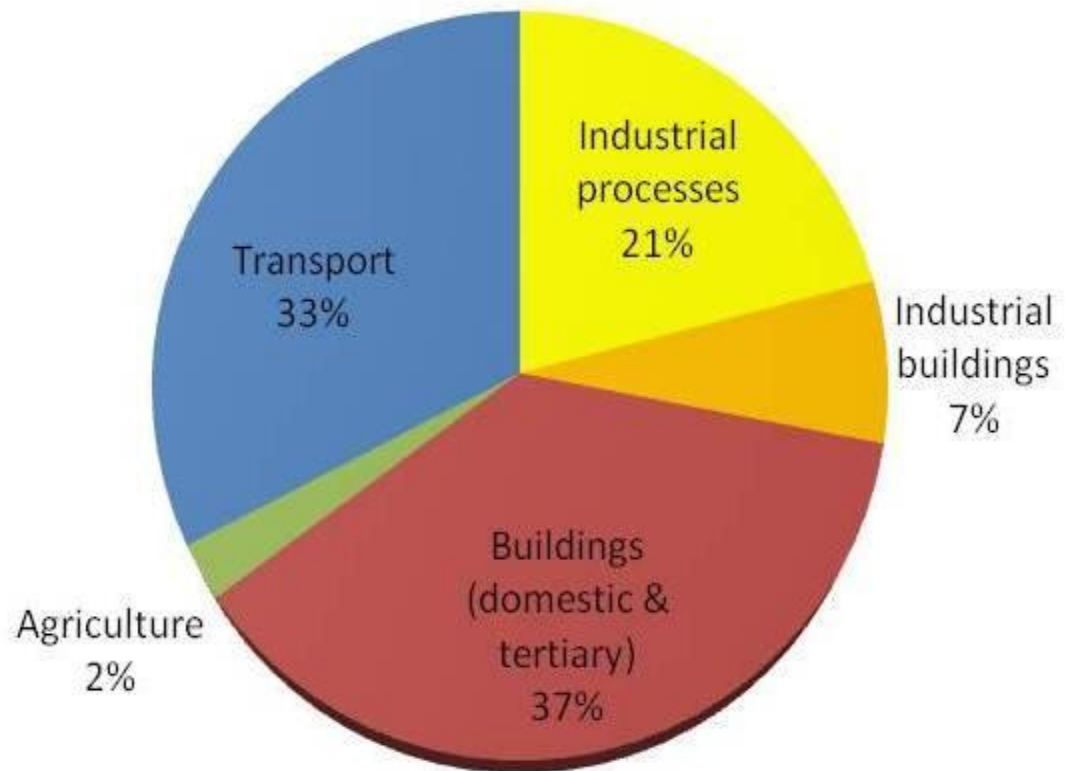
TOPIC 2: Smart Energy in Buildings

TOPIC 3: Smart Energy in Transport

ENERGY AND BUILDINGS

- Buildings consume more than 40% of the world's total energy
- Heating, cooling and lightning are responsible for about 25% of the world's CO₂ emissions

Share of total EU energy consumption



NEED FOR ENERGY-EFFICIENT BUILDINGS

- About 50% of the energy used is wasted due to inefficient lightning, HVAC and power infrastructures
- Energy demand is growing and the fastest growing energy demand sector is commercial buildings
- Green energy integration to achieve sustainability
- Studies suggest that massive energy savings can be achieved through ICT implementation:
 - Up to 75% for lightning – 5% of total building energy consumption
 - Up to 10% for heating, cooling – 7% of total building consumption
 - Up to 30% in public buildings

SMART BUILDINGS

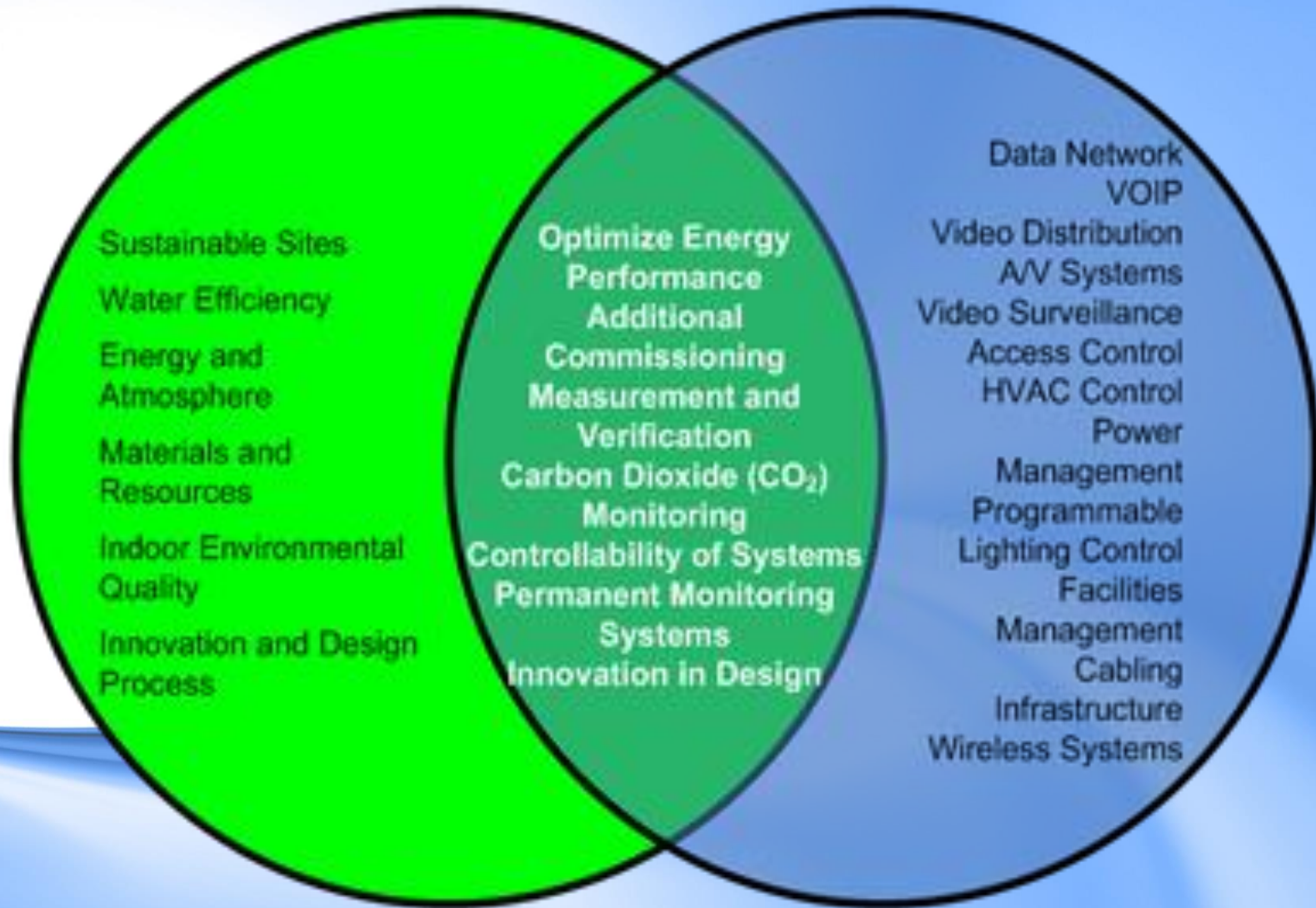
“Smart buildings focus on minimizing energy usage and impacts in environment, while maximizing comfort, health, and safety.

They leverage technology to provide enhanced performance and are connected and responsive to the smart grid”



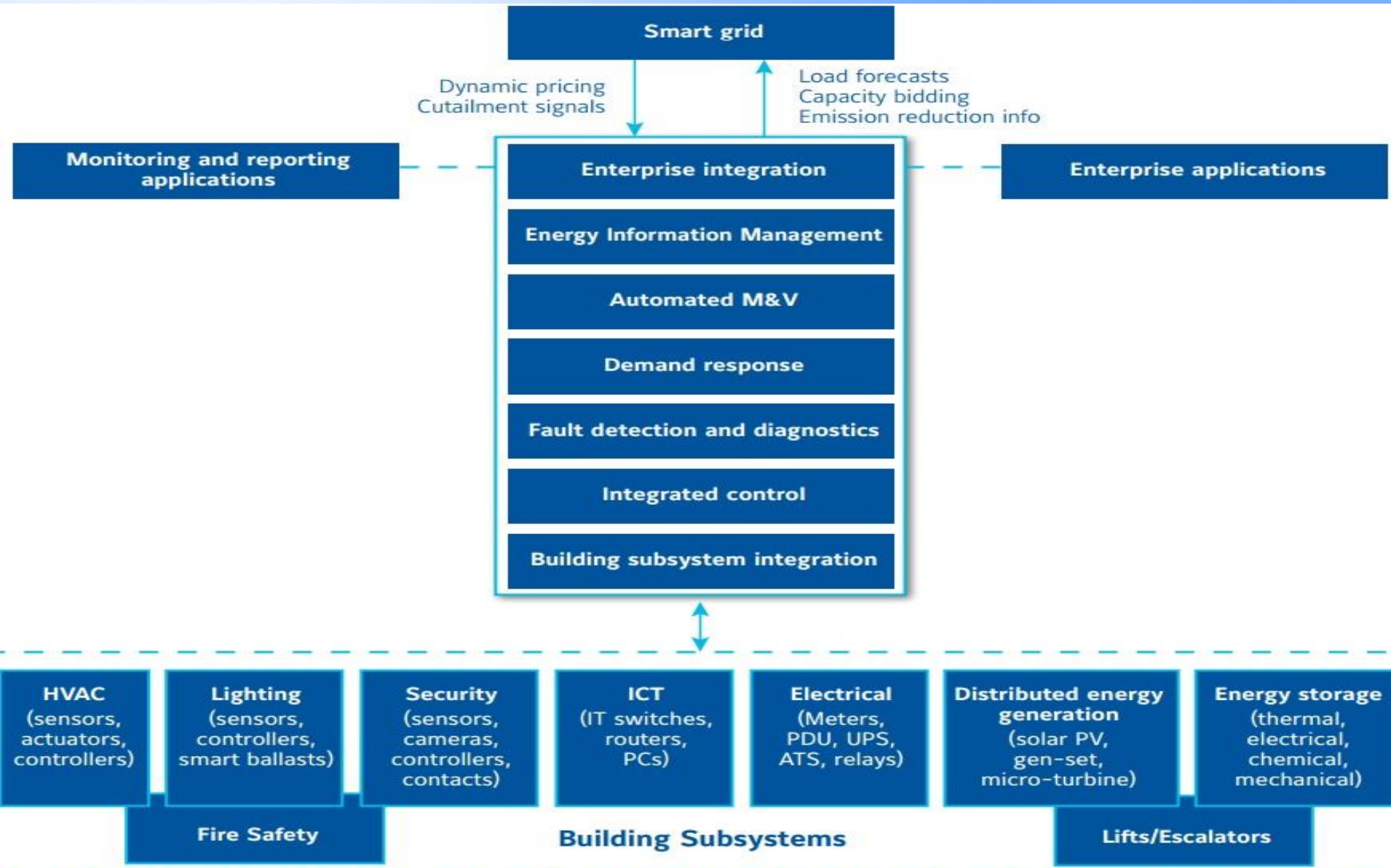
THE COMMONALITY OF SMART AND GREEN BUILDINGS

GREEN BUILDINGS



SMART BUILDINGS

ICTS FOR SMART BUILDINGS

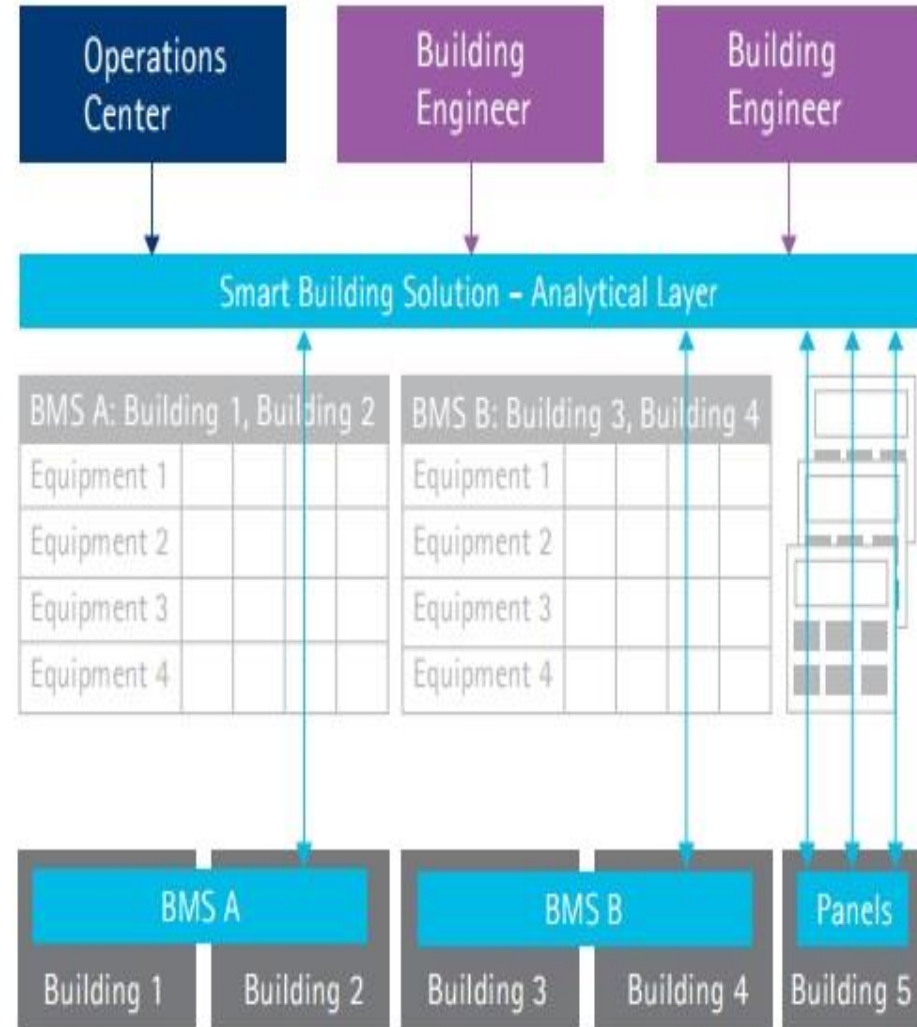
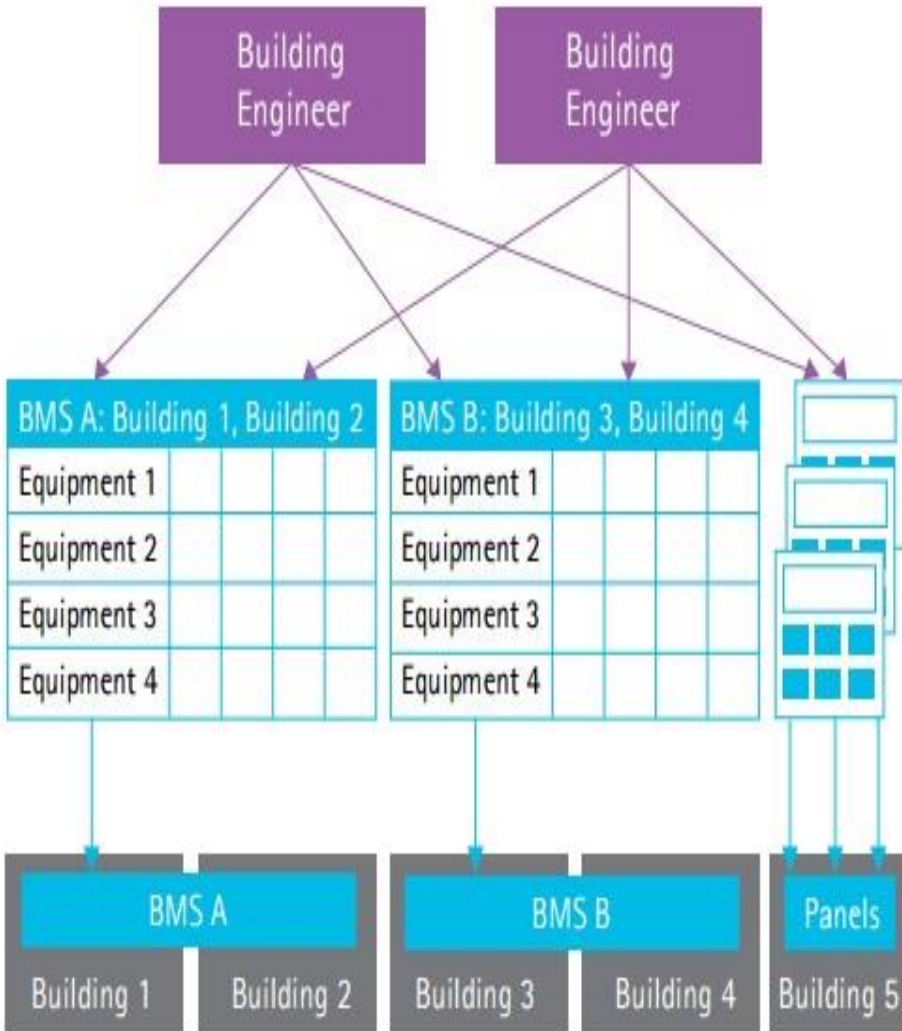


BUILDING ENERGY MANAGEMENT SYSTEMS

- Integrated systems of software, hardware and services that control energy use through information and communication technology
- Monitoring, automating, and controlling building systems such as heating, ventilation, air conditioning, thermostats, and lighting
- Increase building energy efficiency and improve daily living comfort



CONVENTIONAL VS INTELLIGENT BUILDINGS



APPLICATIONS



OUTLINE

TOPIC 1: Smart Energy Cities

TOPIC 2: Smart Energy in Buildings

TOPIC 3: Smart Energy in Transport

ENERGY AND TRANSPORT

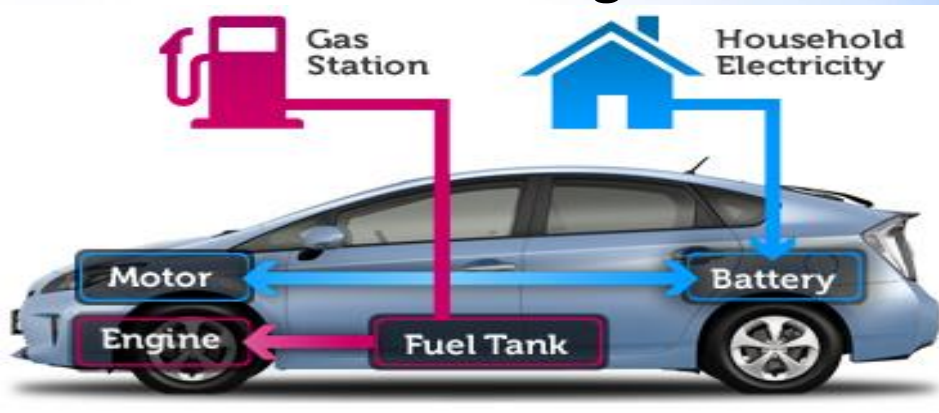
- 80% of the population living in urban areas
- Rising standards of living leading to increased individual mobility and, consequently, more vehicles
- Globalization of trade resulting in a constantly increasing international transport volume
- Demand for transport is dominated by fossil fuels
- Responsible for 31% of the energy consumption and for 21% of the GHG emissions
- Transport pollution up to 40% of GHG in the cities

THE NEED FOR CHANGE

- Polluting combustion engines have to be replaced
- Renewable energy resources must be utilized
- New transportation infrastructures and methods are needed to reduce energy usage and associated pollution
- Intelligent energy is a crucial driver of the evolution of the transport sector
 - Non-polluting and highly-efficient vehicles: the **Electric Vehicles**
 - Vehicle energy **supply** will be provided via **smart grids** from clean and sustainable energy sources

EV TYPES

Hybrid EV with internal combustion engine



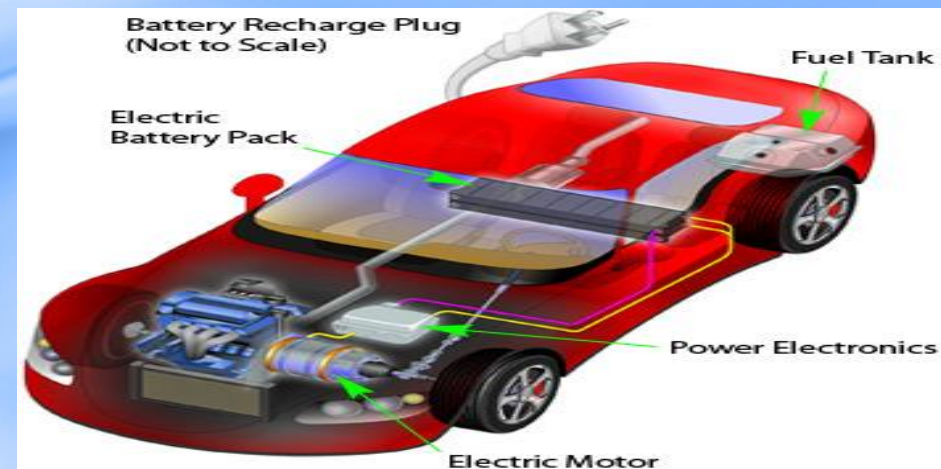
On-Line Hybrid EV



Plug-in EV

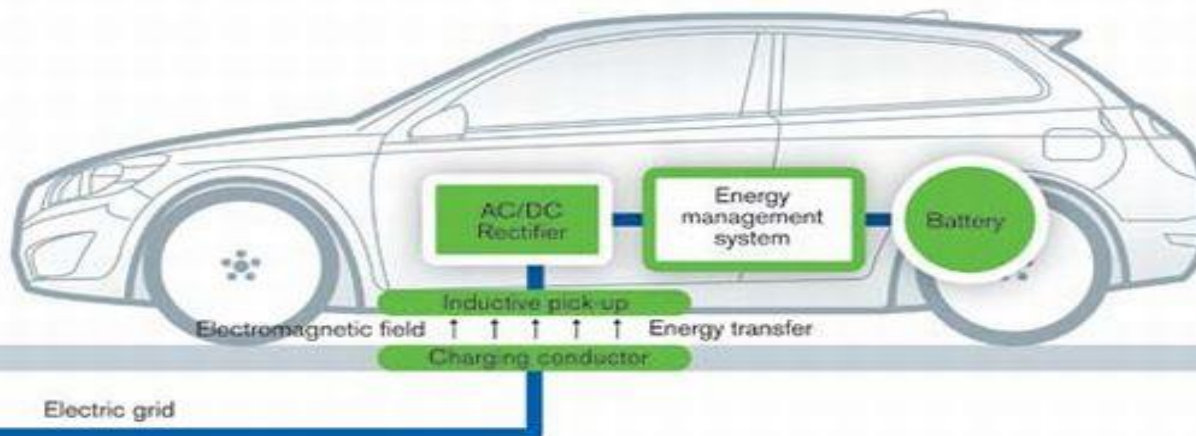


Plug-in Hybrid EV



CHARGING METHODS

**Via electric
cable**



**Wireless
charging –
electromagnetic
field**

BARRIERS FOR ADOPTION

- Charging points' network is currently extremely limited both in terms of numbers and regional coverage
- Required time to charge vehicles is long – much longer when compared to gasoline
- The electricity charging infrastructure in its current form has inherently limited range
- EV and associated charging infrastructure deployment cost is high
- Reliability has not yet been thoroughly tested

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THANK YOU FOR YOUR ATTENTION!





O2 - Environmental portfolio

Course 3 - Entrepreneurship-
Intelligent energy

Module 4 – Green Entrepreneurship
case study

Week 28-30

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und Personaltraining

CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

The business model

“Philips” is a worldwide leading company and successful in areas of healthcare, lifestyle and lighting. The example described below is the business model in context of Philips Lighting. In this business model the company produces, installs, perpetuates, monitors, takes back and, to a certain extent, reuses materials from the lighting system. The customer only pays a service charge over an agreed period and for the function and quality wished for. Through this model, three aspects differ from a traditional business model:

- 1) The customer receives not only a product, but a service;
- 2) The relation between customer and company changes from a sales relation to a trusted service partnership that supplies and perpetuate lighting systems; and
- 3) The business model has an effect on the transfer of funds, which changes from a selective payment to a continuing payment scheme.

Henriksen et al. 2012., p. 62f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

Benefits and impacts

The environmental impacts of the business model can be traced to the type of lighting as it is an energy efficient LED system. Furthermore the system is monitored and metered, this means, that it can be optimised to fit the customer's needs. Finally the model solves the problem for closing materials loops - the return - logistics and finances.

The financial impacts of the described model is a “win-win” situation for both sides, the customers and the company. The customer benefits from the tailored service and stable costs, while at the same time reducing the down-payment needed for the installation of newest lightning systems. The company benefits from the long-term partnership with the customer. Furthermore the company gets back valuable raw materials in the product for reuse or selling.

Henriksen et al. 2012., p. 63

CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

Drivers and barriers

At Philips, sustainable innovation is mainly driven by the conviction that healthy and sustainable living requires social, economic and environmental preconditions. Furthermore, due to increasing environmental pollution companies have to respond to market requirements with a long-term commitment to sustainability.

From an economic point of view, a barrier is that the model only works with long-term relationships and financial focus as well as the commitment to the supplier from side of the customer.

From an environmental point of view, there are several barriers regarding actual closing of the material loop. Philips receives the materials, but material streams are not actual loops. Furthermore there are some technical challenges due to a lack of precise information about the actual contents of the recycled materials. Attached to this barrier is the fact that for many materials the cost of brand new ones is lower than the cost of collecting and recovering them.

Henriksen et al. 2012., p. 63

CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

Reflection questions

- What aspects change through the implementation of the business model?
- Explain the key challenges and how they are addressed.
- What environmentally friendly fields cover these measures and which areas of the company they affect?
- Is there a win-win situation for the company and why/why not?
- How can the motivation for implementing this model be described and what are possible differences in comparison to a green SME start-up?
- Discuss the ecological and social values and how the business model reflects those values.
- Explain what an entrepreneur has to do well to have a successful business venture while changing the business model.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Philips Lighting

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Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



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Course 3 - Entrepreneurship-
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Module 4 – Green Entrepreneurship
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Week 31-33

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CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

The business model

Yalumba is a South Australian wine company with 200 local and 600 international employees. Its activities include grape growing, winemaking, packaging, distribution, marketing and sales. Yalumba's environmental management system is ISO certified and continuously focusing on reducing and monitoring its lifecycle impacts that may result from its business activities. The aim of environmental citizenship is to effectively communicating Yalumba's mindset, approach and commitment to sustainable winemaking to its stakeholders so that they will be effectively engaged.

Yalumba is using supply chain management working closely with its suppliers to help and encourage them to minimise their environmental impacts through adopting clean technology and best practice procedures. The company also takes an active part in the local community. The company keeps innovating by constantly evaluating and revising its production processes, supplier channels, packaging etc. to find the best solutions to a sustainable wine production and to encourage their customers to dispose the product packaging in a responsible manner.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

Benefits and impacts

Yalumba is very focused on minimising its materials use, carbon emissions and waste from packaging. They attempt to use alternative fuels, such as biodiesel, and renewable energy, such as solar power. In addition, Yalumba has developed its own specialised LCA, which is now used as standard for LCA in the New World wine industry.

Economic benefits and impacts are that Yalumba seek to balance its concerns for the environment and its social relations while still ensuring sufficient cash flow and profitability by producing a persistent above average return to shareholders.

Henriksen et al. 2012., p. 74f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

Drivers and barriers

Main drivers are that the winery's targeted focus on sustainability started with an in-house PhD thesis on the environmental impact of the company's organisational culture. This led to the recognition that Yalumba could achieve the greatest impact from strengthening their efforts on the social aspect of sustainability - by changing people's minds and behaviour. The greatest barrier has been people's lack of awareness about what it means to act in a sustainable way.

Henriksen et al. 2012., p. 74 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

Reflection questions

- What is the success of the business model?
- What has been changed in the business model in order to guarantee sustainability?
- What is needed within a company in order to re-structure the business model in regard to sustainability and guarantee economic benefits?
- Think of ways to raise people's awareness regarding sustainable acting in business.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Yalumba Wine Company

References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



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week 34-36

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CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

The business model

Elvis & Kresse's value proposition is to provide its customers with fashionable and durable life-style accessories with social and environmental meaning.

The innovativeness of Elvis & Kresse's business model lies in the fact that the company manufactures their products from waste streams that traditionally are not recyclable. This brings a deeper meaning to the products as they help to solve niche waste problems. In addition, the company donates 50% of all profits made on products from each of their associated waste streams to a charitable organisation associated with the waste. The company currently manufactures products from 10 waste streams, with the most important products being durable belts and bags in timeless designs and reusable and compostable shopping bags. Today the company also sells its products through major retailers and boutiques, as well as high-end retailers. Elvis & Kresse are characterised to have developed a special relationship with some of their customers.

Henriksen et al. 2012., p. 22f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

Benefits and impacts

The environmental benefits of Elvis & Kresse's business model stem from the fact that it reduces the amount of waste going to landfill. Since 2005 the company has prevented some 160 tonnes of waste from going to landfill.

In terms of finances, the business model and partnership structure have also lead to large benefits; both for Elvis & Kresse, but also for their waste, charity and sales partners. The waste generating partners save money because of not having to dispose of their waste. The waste associated charity partners benefit from Elvis & Kresse's profits, and sales partners benefit from the sales of Elvis & Kresse's products in their stores, e.g. Sainsbury currently sells 1,000 of Elvis & Kresse's shopping bags every week. All involved enjoy the associated PR value from upcycling waste to products and donating money to a charity, and Elvis & Kresse gain enormous marketing value in the process.

Henriksen et al. 2012., p. 22 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

Drivers and barriers

One of the two main drivers behind the success of Elvis & Kresse's business has been the waste partnerships. The other main driver behind the success of Elvis & Kresse has been the founders' personal commitment and motivation to avoid that waste goes to landfill.

One of Elvis & Kresse's main barriers was the almost immediate success of their business. When sales of their belts took off they were completely unprepared to meet the demand. Also, space for storing raw materials for new products was extremely limited and still poses a challenge for Elvis & Kresse's growth. Looking ahead towards the establishment of the Elvis & Kresse brand, another barrier was their limited knowledge about fashion, design and manufacturing. In all of these areas, Elvis & Kresse have literally relied on learning by doing.

Henriksen et al. 2012., p. 22 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

Reflection questions

- What are the strengths of the company?
- How do these affect the company's business model (positive and negative)?
- On a larger scale, how is risk taking linked to entrepreneurship?
- What can an entrepreneur do in order to take control of risks or support decision making?

CASE STUDY ON GREEN ENTREPRENEURSHIP: Elvis & Kresse

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Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



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Module 4 – Green Entrepreneurship
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week 37-39

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CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal Mosa

The business model

Royal Mosa provide its customers with innovative high-quality ceramic products produced with high emphasis on design and sustainability through implementing the cradle to cradle philosophy. The company's innovation is thus reached by having a special Mosa design team with people directly from the design team working closely together with architects in developing new collections. As Mosa focus their business model on the professional markets, the two main focus groups are architects and corporate companies. In some countries, they also focus on housing companies.

They also continue to develop and implement Cradle to Cradle principles within the company's products and processes. CTC differentiates between a biological cycle and a technical cycle. In the biological cycle, products are produced from natural materials, which serve as food for organisms at the end of their use. However, as many products are not compostable and they are primarily suited to the technical cycle, Mosa has succeeded in making them unhazardous to the environment. Mosa use Lifecycle analysis to determine their products' lifecycle impact on the environment and where to reduce that impact.

Henriksen et al. 2012., p. 77 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

Benefits and impacts

Mosa have made significant impacts regarding materials and recipes as their tiles do not release any harmful compounds and do not damage the environment should they be dumped after use, and they are also recyclable.

Through a modernisation programme Mosa have succeeded in reducing their CO2 emissions with 48 percent as well as their particulate emissions with 91 percent. Mosa have also succeeded in closing a cooling water cycle resulting in a reduction of more than 60 percent of groundwater consumption. Besides making efforts to use as little energy as possible Mosa have also shifted to almost entirely using sustainable energy.

On short-term the company has in general broken even as a result of its green business model innovation. It is expected that the new activities will constitute a larger share of the turnover in the future and the companies now also benefits from being a more sustainable company and are better prepared for the future. Furthermore the new business model has led to the creation of five new jobs.

Henriksen et al. 2012., p. 77 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

Drivers and barriers

A driver for Mosa was the belief that only sustainable companies will survive in the long run and that they would like to be a profitable company in the future as well.

Mosa still see Cradle to Cradle as relatively unknown. There is much emphasis on CO2, but the public are not wholly aware of the whole shortage of resources and the impact materials besides CO2 have on the environment. The financial crisis has resulted in some of Mosa's potential consumers to have a more short-term approach and only look at the price.

It has as well been a challenge to redevelop the products to live up to the C2C standards. It took more than two years of extended research and product development as well some out-of-pocket investments for tests, research and consultancy.

It has also proven difficult to make really valuable technical cycles, which Mosa are still working on and requires a lot of investment. This process needs involvement of all relevant actors and also requires almost accurate scientific calculations of the best solutions for creating sustainable products.

Henriksen et al. 2012., p. 77 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

Reflection questions

- How are the products proceeded in order to explain the cradle to cradle approach of the business model?
- What are the (positive and negative) impacts of this sustainable business model?
- How are they related to economic success of the company?
- From an economic point of view, are the environmental benefits larger than the economic ones?
- What can be done in order to balance or guarantee success on both sides?

CASE STUDY ON GREEN ENTREPRENEURSHIP: Royal mosa

References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



O2 - Environmental portfolio

Course 3 - Entrepreneurship-
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Module 4 – Green Entrepreneurship
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week 40-42

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CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

The business model

The Eastex Material Exchange is a web-based platform that facilitates the exchange of surplus materials between different parties. The value proposition of the Eastex Material Exchange is to make it possible for SME to find cheaper raw materials and equipment, or to exchange their surplus materials while contributing to lower waste generation.

The platform is free of charge to all members; a service which has mainly been financed through local government funding. Management was however handed over to a private community interest company called Bright Green in December 2010, with the aim of making the platform self-sustained.

The platform can also be used by public organisations, as well as social enterprises, charities and other types of organisations. In terms of key resources, the Eastex Materials Exchange platform has benefitted greatly from local government grants as well as cooperative efforts between the different counties that were involved with the project.

Henriksen et al. 2012., p. 65 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

Benefits and impacts

The environmental impact of the Eastex Material Exchange stems from the material exchanges occurring through the platform and thereby material reuses.

In terms of finances, the material exchange helps its members to avoid waste disposal costs, including transportation costs and landfill taxes. Allowing platform members to obtain raw materials at cheaper prices compared to what would otherwise have been the case also saves money.

Henriksen et al. 2012., p. 65 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

Drivers and barriers

The main driver for pursuing the Eastex Materials Exchange was the British government's focus on improving resource efficiency.

There have been three main barriers with regards to setting up the Eastex Material Exchange. The first was related to educating businesses to make use of the platform and explaining its potential. The second barrier was to make companies use the platform on a continued basis, which required several marketing campaigns. The third barrier has been that once companies joined as members in the material exchange and established a profitable relationship with a 'waste' partner, there would be a tendency for the companies to leave the platform.

Henriksen et al. 2012., p. 65 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

Reflection questions

- Think of different dimensions, the model has a positive impact on the environment.
- If the model wasn't relying on public funding, what alternative funding options are there?
- How is the relationship between Eastex material exchange and companies?
- Please describe the importance of stakeholder involvement, especially for small Start-ups.
- What strategies are there in order to get relevant stakeholder on board and to guarantee a long-term relationship?

CASE STUDY ON GREEN ENTREPRENEURSHIP: Eastex Material Exchange

References

Henriksen et al. (2012): Green business model innovation. Business case study compendium. Nordic Innovation publications.



Thank you!



O2 - Environmental portfolio

Course 3 - Entrepreneurship-
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Module 4 – Green Entrepreneurship
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CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

The business model

The value proposition of Siemens Building Technologies' performance contracting services is to provide customers with low-risk and self-financed energy saving solutions for large buildings and ships. The energy savings lead both to less money spent on energy consumption and lower CO2 emissions. The innovative part of the business model is twofold. First of all, Siemens can provide its customers with a guarantee of meeting very specific energy saving targets by basing their solutions on proven technologies and specific knowhow in the area. If these savings are not met, Siemens will pay the difference to their customers. The investment therefore only carries a very small risk for the customer. And secondly, if savings are higher than estimated, the additional benefit is shared between Siemens and the customer. This creates an incentive for Siemens to strive for over-performance, and it motivates the customer to play an active role in helping to reduce energy consumption as much as possible to reap even larger benefits. As such, the performance contract also helps to facilitate close cooperation between Siemens and its customers, which is necessary for realising energy savings.

Henriksen et al. 2012., p. 58 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

Benefits and impacts

Siemens' energy saving solutions lead to significant economic gains in terms of increasing building values. For instance, a building which has much lower operation costs than similar buildings is of much more value to potential renters. For this reason, building owners may set higher net rents, hence increasing the net revenue and financial efficiency of invested capital. In addition, energy saving solutions can increase a company's environmental image and CSR profile. Up until recently, the value derived from this source has mostly been seen as a spillover effect, but its merit and importance is increasing significantly.

Henriksen et al. 2012., p. 58 f.

CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

Drivers and barriers

The overall driver of Siemens' energy saving solutions relates to what the company refers to as a specific 'megatrend'; namely, the ongoing population growth coupled with the increase in urbanisation and the rising demand for energy. Today, cities represent 80 per cent of the world's CO2 emissions but only 50 per cent of the world's population. In the future, the city populations will grow, as well the need for energy, and this means a growing market for the performance contracting services that Siemens offers. Likewise, rapid technological developments make it possible to deliver solutions with higher and higher energy savings, providing a foundation for energy savings services of a more continuous nature, i.e. cycles over a 10-year period for a given building.

Obstacles may arise from diverting interests between owners and renters of the building to which the energy saving solution is applied. The benefits of lower energy consumption will be reaped by the renters, leaving the obvious question; who should take on the investment, the owner or the renter?

CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

Reflection questions

- What is the company's ambition to introduce this change of business model?
- How can its introduction be managed internally?
- What are the resources of the company?
- How is the external view of the company concerned?
- What are the impacts of this external views and internal recourses in view of the business model?
- What are the main differences in comparison to an SME?
- How is the owner-renter discrepancy addressed?

CASE STUDY ON GREEN ENTREPRENEURSHIP: Siemens Building Technologies

References

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Thank you!



Sustainability of food systems

Authors: Sempre Viva

Flavia Marciano, Evi Gkogkou, George Efthimiou, Mpampis Trikkas &
Riina Koivuranta

Contents

- What are food systems?
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 - Some have too much, some don't have enough
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 - examples: biodiversity loss and eutrophication
- How could we make food systems more sustainable?
 - Is organic the answer?
 - Examples of international policies and regulations
- *Instructions for a final individual task regarding food systems sustainability*

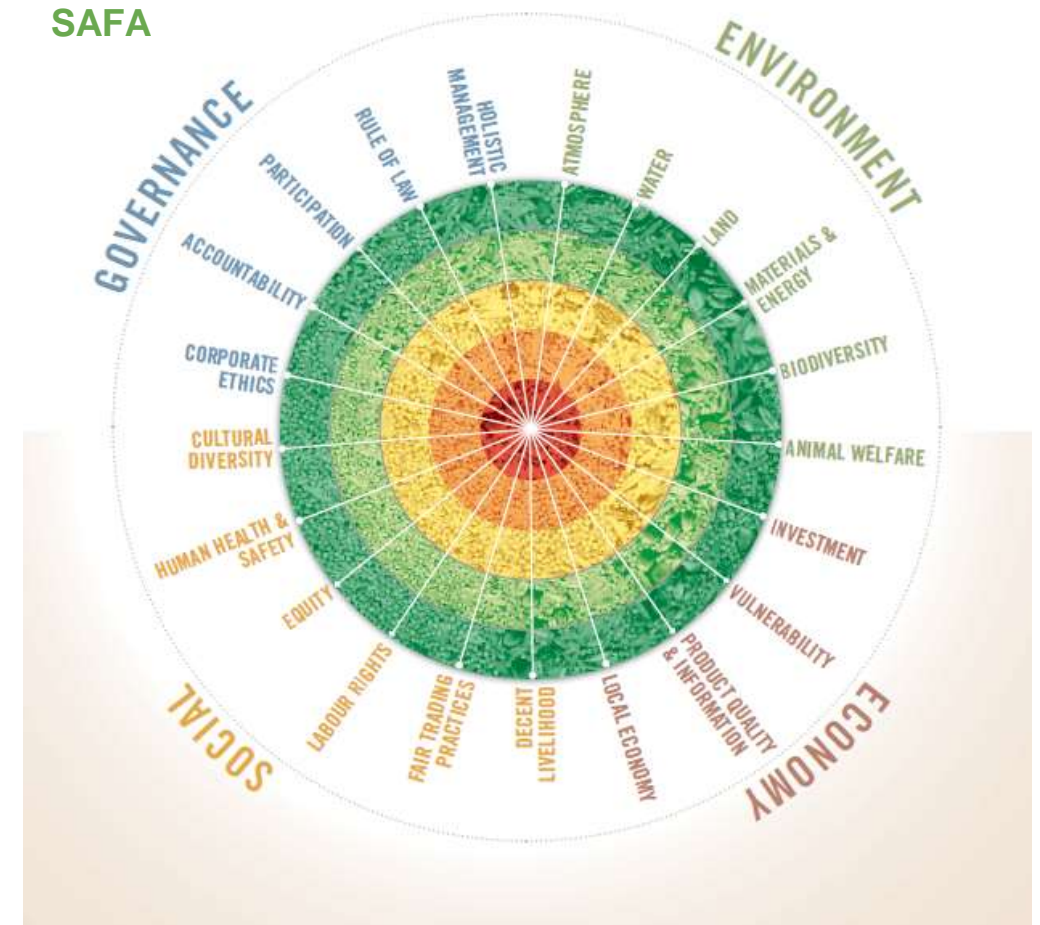
What are food systems?

- Rastoin et al. (2010) have defined a food system as *“an interdependent network of stakeholders (companies, financial institutions, public and private organisations) localised in a given geographical area (region, state, multinational region), participating directly or indirectly in the creation of a flow of goods and services geared towards satisfying the food needs of one or more groups of consumers, both locally and outside the area considered”*
- This means that food systems include the **activities, interactions and outcomes of food production and consumption**. Food systems include everything from production, to processing, to distribution and to consumption.
- In the food system products can go through a number of processes such as harvesting, transportation and processing. These processes and their interactions can affect the quality of the products.
- The outcomes of the food system activities and the activities themselves contribute to environmental security and social welfare.
- Nowadays food systems are characterized eg. by intensification of food production, processing and packaging of food products, corporate concentration and the rising number of urban consumers. Modern-day food systems are predominated by few crops, with processed foods with recognisable brand names being available around the globe. More and more animal products are consumed which has been seen as a cause to many chronic dietary diseases as well as environmental effects.

How to measure the sustainability of food systems?

- According to FAO (2010) “a **sustainable food system** will protect and respect biodiversity and ecosystems, be culturally acceptable, economically fair and affordable, nutritionally adequate, safe and healthy, while optimising the use of natural and human resources.”
- Multiple frameworks have been created to assess the sustainability of food systems. These frameworks differ in perspectives, some emphasizing more the point of view of the consumer whereas some are targeted for the use of corporations.
 - **Sustainability Assessment of Food and Agriculture systems (SAFA)** is a holistic global framework created by FAO. The target audience of a SAFA assessment are companies, organizations and other stakeholders that participate in crop, livestock, forestry, aquaculture and fishery value chains. SAFA can also be used to assess governmental strategies, policy and planning. SAFA is based on the vision that food and agriculture systems are characterized by four dimensions of sustainability. These dimensions are good governance, environmental integrity, economic resilience and social well-being. For each of these four dimensions the SAFA framework outlines essential elements of sustainability.
- Other sustainability assessment programmes often use a Life Cycle Analysis (LCA) approach. These programs focus on products and their environmental lifecycle impact. SAFA covers these aspects but gives more comprehensive consideration to the good governance and social well-being components of sustainability.

SAFA



Challenges with modern day food production

Challenge 1: Some have too much, some don't have enough

Food has a geography!

- According to FAO “**Food security** exists when all people at all times have physical or economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. (World Food Summit, 1996)

- There are 4 dimensions of food security:

- **Availability**= sufficient quantities of food available on a consistent basis

- **Access**= ability to produce or buy food, affordability and allocation of food

- **Utilization** = safety and nutritional value of food

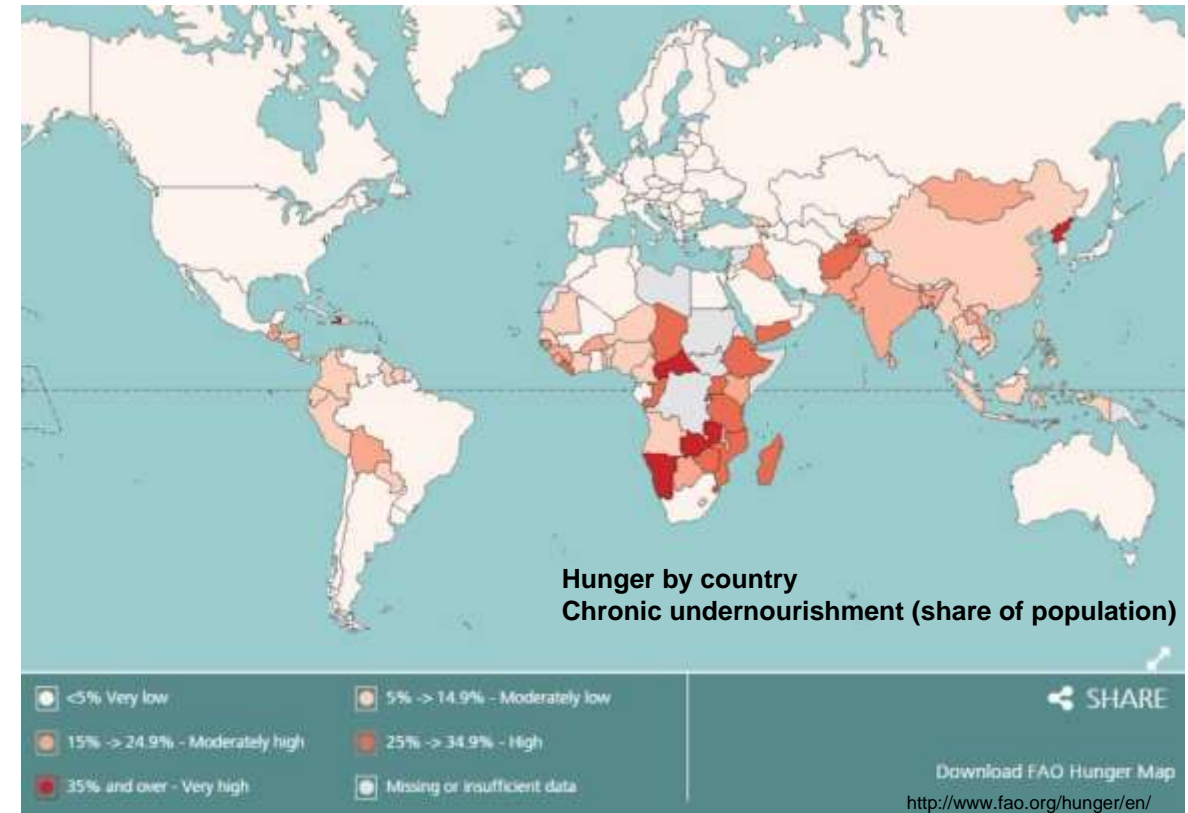
- **Stability**= Ability to obtain food over time. Food insecurity can be transitory, seasonal, or chronic

- Approximately 795 million people in the world do not have enough food to lead a healthy and active life. That means every ninth person in the world. The majority of the world's hungry people live in developing countries, where 12,9 % of the population is undernourished.

- Every year 3,1 million children die because of poor nutrition and poor nutrition causes 45 % of deaths in children under five.

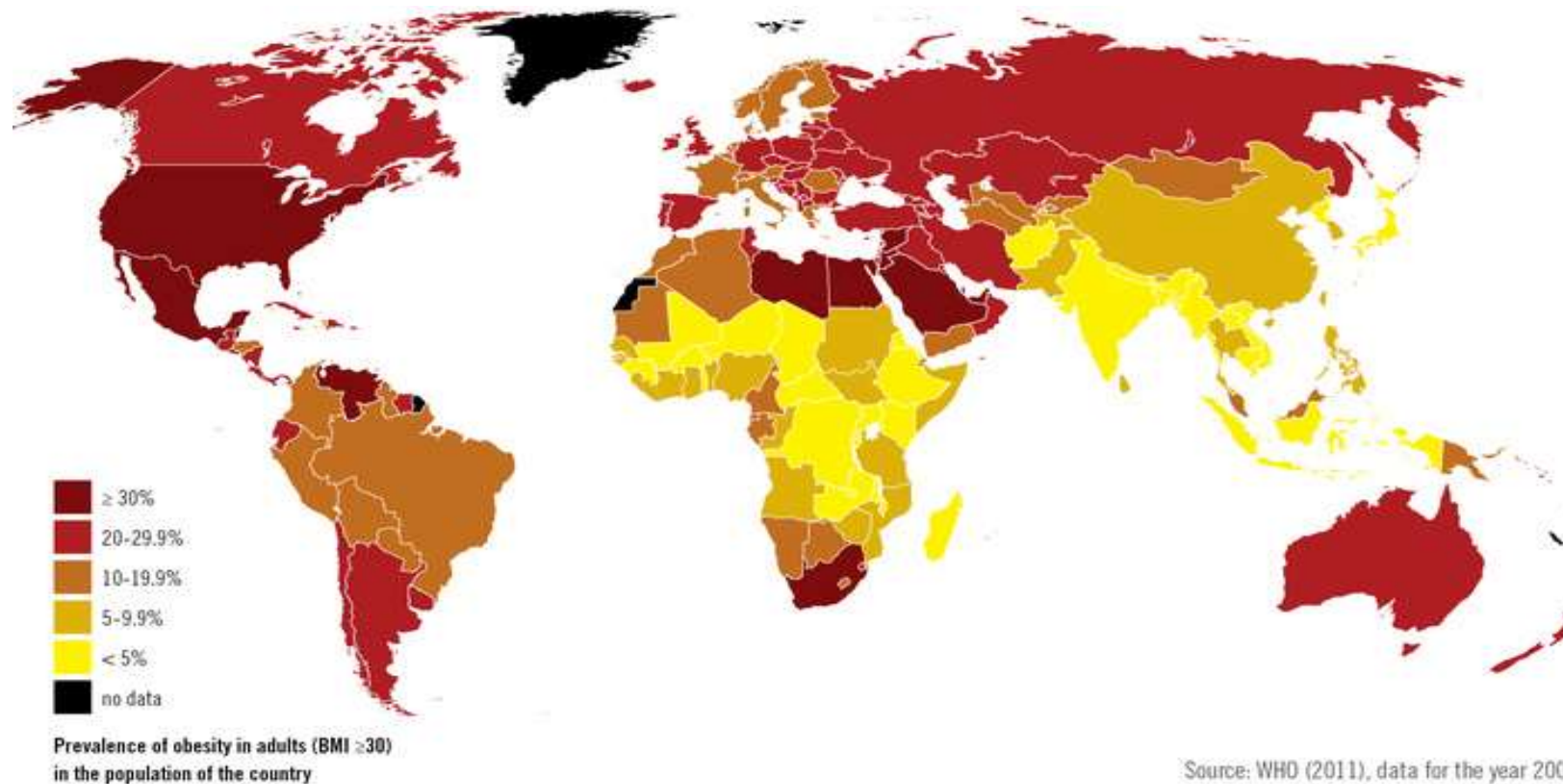
- There is also **hidden hunger** that is lack of vitamins and minerals. Hidden hunger occurs when the quality of food does not meet nutrient requirements. In low income countries especially lack in vitamin A and iron limit growth, development, health and working capacity.

- According to FAO, it is estimated that if women farmers had the same access to land and resources as men, the number of hungry in the world could be reduced by up to 150 million.



- Although the majority of the undernourishment problem occurs in the developing countries, there are food security issues also in industrialized countries .
- <https://www.youtube.com/watch?v=PE1-RYPJNdg>
- *Watch the video of food security issues from Canada and think about the following questions:*
 - *What kind of aspects affect food security?*
 - *What is the situation of food security in your own country/city?*
 - *What are factors that can lead to food insecurity in your country/city?*

- In addition to the undernourishment problem there is a growing problem of **obesity**. Globally, around 39% of adults aged 18 and over were overweight in 2014 and since 1980 obesity has more than doubled worldwide. This is mainly due to dietary transition with economic growth; with higher income comes higher consumption of foods of animal origin. The western diet commonly refers to a diet which is high in processed red meat, processed cereals, sugary desserts and refined grains. This has led to the fact that at the moment majority of the world's population lives in countries where overweight and obesity kills more people than underweight. There is also a term called “**double burden**” which means that both obesity and hunger affect people within the same population. This is especially common in countries that are going through fast economic growth, also known as the nutrition transition.
- *All in all; it is not that we don't have enough food in the world, the food that we have is just not distributed in a healthy and sustainable way!*





Picture: www.enterrasolutions.com

Challenge 2: Food loss and waste

Watch the video:

<https://www.youtube.com/watch?v=loCVrkcaH6Q>

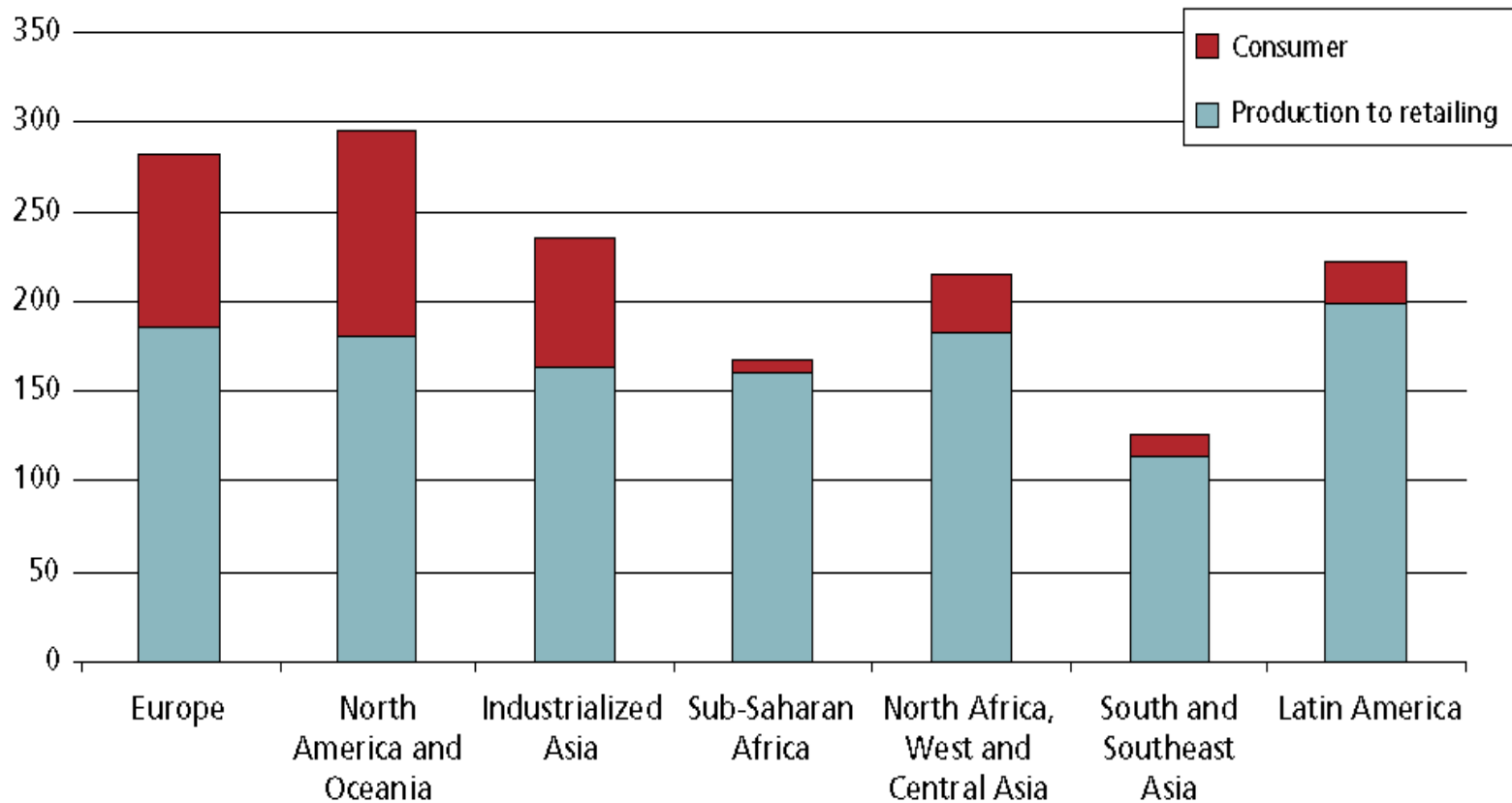


Picture: Reuters

FOOD LOSS AND WASTE: DEFINITION, EXTENT AND IMPACTS

- Food loss and food waste refer to accidental or intentional decrease of food that is intended for human consumption.
- When food gets spilled or spoiled before it reaches its retail stage it is called **food loss**. This means that for example apples that fall off a truck post-harvest are considered food loss.
- Food that is fit for human consumption but is left to spoil or discarded by retailers or consumers is called **food waste**. For examples brown-spotted bananas that are discarded whilst still perfectly edible, is considered food waste.
- Food waste or loss does not include planned production of feed and parts of products that are not edible. Food that was initially intended for human consumption, but fortuity gets directed to a non-food use (feed, bioenergy) is considered food loss or waste.
- **Approximately one-third** of the edible parts of food produced for human consumption, **gets lost or wasted globally**, This means about 1.3 billion ton of food per year.
- Food loss and waste have **multiple impacts on food security, food quality and safety, economic development and the environment**.
- Except for food, other precious resources such as land, water and energy are wasted because of non-consumption of food products. Food loss and waste also lead to unnecessary CO2 emissions. Especially for many smallholders who live on the edge of food insecurity, food losses can represent an immediate and significant danger.

THE EXTENT OF FOOD LOSS AND WASTE



This figure shows that the per capita food loss in Europe and North-America is 280-300 kg/year.

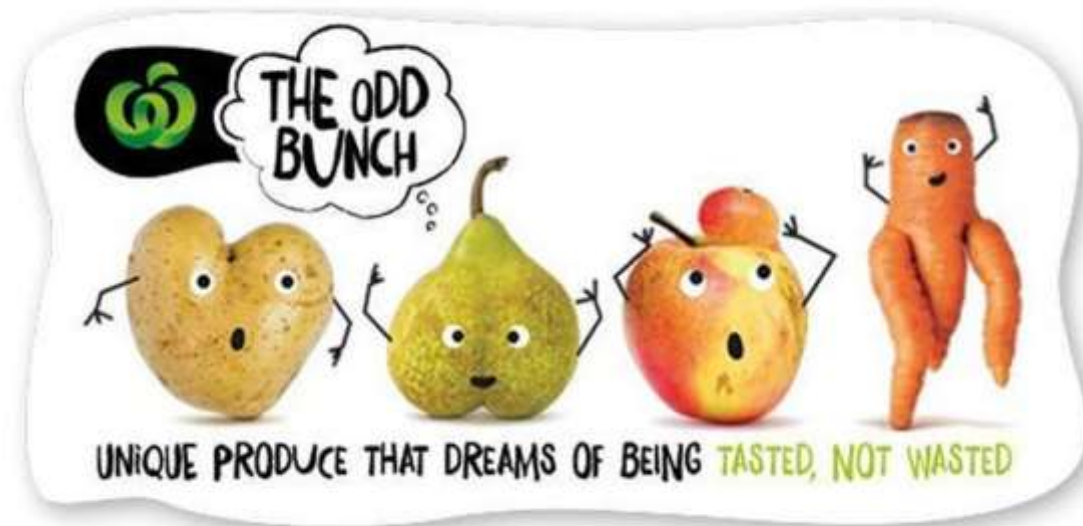
In sub-Saharan Africa and South/Southeast Asia it is 120-170 kg/year. Per capita food wasted by consumers in Europe and North-America is 95-115 kg/year, while this figure in sub-Saharan Africa and South/Southeast Asia is only 6-11 kg/year.

Food losses in industrialized countries are as high as in developing countries, but in developing countries more than 40% of the food losses occur at post-harvest and processing levels, while in industrialized countries, more than 40% of the food losses occur at retail and consumer levels. Food waste at consumer level in industrialized countries (222 million ton) is almost as high as the total net food production in sub-Saharan Africa (230 million ton).

CAUSES OF FOOD LOSS AND WASTE

Causes differ in high and low income countries

- **Common causes of food loss and waste in high income countries**
 - In developing countries **production often exceeds demand**. Farmers plan production so that pest attacks or bad weather won't ruin the entire harvest - > this may cause excess production. However in many cases surplus products can be sent to feed livestock.
 - Industrialized food processing causes many ways in which food is lost. **Produce that visually does not meet our standards** gets automatically thrown away. Strange shape, wrong size, damaged packages or small blemishes are a cause of food products to be thrown away, although these errors would not influence safety, taste, or nutrient value of food. The trimmings of industrialized food production are not used for human food, but discarded, even though these parts could be used for human consumption.
 - **Consumers' attitudes** have a big influence. In high income countries people can afford to waste food. There are also misconceptions regarding about 'use by' and 'best before' dates. Marketing campaigns where a buyer "pays one, gets other for free" can also lead to people buying produce they do not need and in the end won't consume.
 - There may be industry or government standards that make it hard or impossible to use all the food that is produced.



An example of carrot quality standards

Carrot quality standards, by the supermarket chain Asda

As research for the book 'Waste – understanding the global food scandal' (2009), Tristram Stuart visited several British farms in order to understand how quality standards affect the level of food waste. Among others, Stuart visited M.H. Poskitt Carrots in Yorkshire, a major supplier to the supermarket chain Asda. At the farm, the author was shown large quantities of out-graded carrots, which, having a slight bend, were sent off as animal feed. In the packing house, all carrots passed through photographic sensor machines, searching for aesthetic defects. Carrots that were not bright orange, had a bend or blemish or were broken were swept off into a livestock feed container. As staff at the farm put it: "Asda insist that all carrots should be straight, so customers can peel the full length in one easy stroke" (Stuart, 2009). In total, 25-30% of all carrots handled by M.H. Poskitt Carrots were out-graded. About half of these were rejected due to physical or aesthetic defects, such as being the wrong shape or size; being broken or having a cleft or a blemish.

Gustavsson, Jenny, et al. 2011. Global food losses and food waste. Extent, causes and prevention. Food and Agriculture Organization of the United Nations

- Answer the following questions:
 - Are these esthetic quality standards needed? Why/why not?
 - If these standards are not needed, what could be done to change them?



Common causes of food loss and waste in low income countries

- In low income countries food loss and waste occurs mainly during production and post harvest. There is ***little to none waste at consumption level***, since there is a food culture of 'buy today, eat today'.
- ***Biological spoilage*** occurs both in production phase and post harvest. This can occur due to damage by birds, rodents, insects etc.
- ***Poor or lack of storage*** are a especially problem in hot climates where fresh products, such fruits, vegetables, meat and fish, can be spoiled before meeting the market. In colder climates households depend on sunlight to dry crops before storage.
- Due to personal reasons and sudden need for income farmers may ***harvest prematurely*** which leads to reduction of output.
- ***Inadequate market systems*** such as lack of wholesale and retail facilities can cause that products cannot reach consumers efficiently



REUTERS

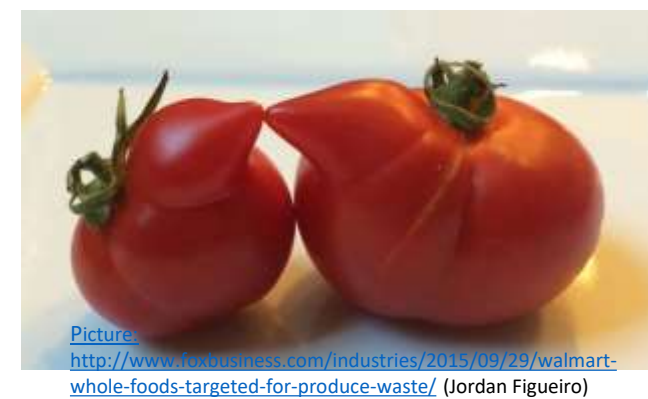
Causes that occur both in high and low income countries

- For example contaminated water and pesticides can lead to food quality that is below certain government and industry standards.
- Seasonal factors bring about more food wasted in summer, because high temperature in summer accelerates biological spoilage of fresh fruits, vegetables, meat, and so on.
- Socio-demographic factors also have an effect on food waste. Generally, more food is wasted among younger people, females, single persons, and higher income households



*Food that is rejected in Nairobi as it is not "easy on the eye" for European markets
(Photo: mgafrica.com)*

OPTIONS TO REDUCE FOOD WASTE



- **High income countries**

- In high income countries the cost of food may not be an important enough reason for consumers to save food. Thus **educating and raising awareness among consumers** about the influences of food loss and waste is important. This means for example information about proper storage of food and the difference between best before and use-by dates.
- Quality standards regarding the appearance of products should also change. **Creating sub-standard markets could reduce food waste.**
- **Retailers could help by changing sales campaigns and selling near expire date-food at a lower cost.**
- In cafeterias and restaurants **price for smaller portions could be reduced. Paying for the weight of food you take** could also reduce food waste.
- **Food redistribution of low quality harvest** that does not meet industry's demand **or best before expired but edible food**, can be promoted for example by tax deduction and improving needed infrastructure.

- **Low income countries**

- In low income countries using a mix of **local varieties** that are adapted to local conditions to improve harvest preservation.
- In addition to individuals initiatives, **communication and cooperation between farmers** would could reduce surplus production and enable mutual investing to better storage.
- Also **new technologies that prevent food spoilage** are needed, such as drying, salting, thermal treatment. Methods need to be affordable for small-scale companies.
- There is also a need for **local investment in infrastructure**. Good condition of roads and communication methods such as cell phones enable fresh food to arrive more quickly to market. Improving storage facilities would also decrease food loss.
- In low income countries there is also need for **education** concerning food loss. This means that instruction concerning eg. hygiene (unsafe food is lost food!) and good production practices might reduce food loss.
- **Policies and credits to invest** create the working environment of farmers and thus have a key role in decreasing food waste.

An example from Finland: In 2013 Vaajakumpu school in Jyväskylä, Finland made an experiment that targeted overproduction of school lunch. The school decided to sell leftover food to outsiders at a bargain price (1,5€). The trial was a success and other municipalities followed Jyväskyläs lead. Today over 20 towns sell food after lunch. It has been estimated that there is a possibility to save 2 million portions of school lunch/year in Finland.



Challenge 3: Environmental impacts of current food systems





- Food products and medicine has the highest environmental impact by the measure of use of money.
- Environmental impacts of food are highly externalized. This means that they are not included in the price of food.
- Agriculture uses a vast number of resources:
 - Agriculture occupies already about 38% of Earth's terrestrial surface.
 - Approximately 70% of worlds freshwater is used for agricultural production and irrigation is used on 24% of cropland .
 - Globally 62% of crop production is used for food and 35% for feed. Approximately 3% of the produced drops go for energy and other industrial uses.

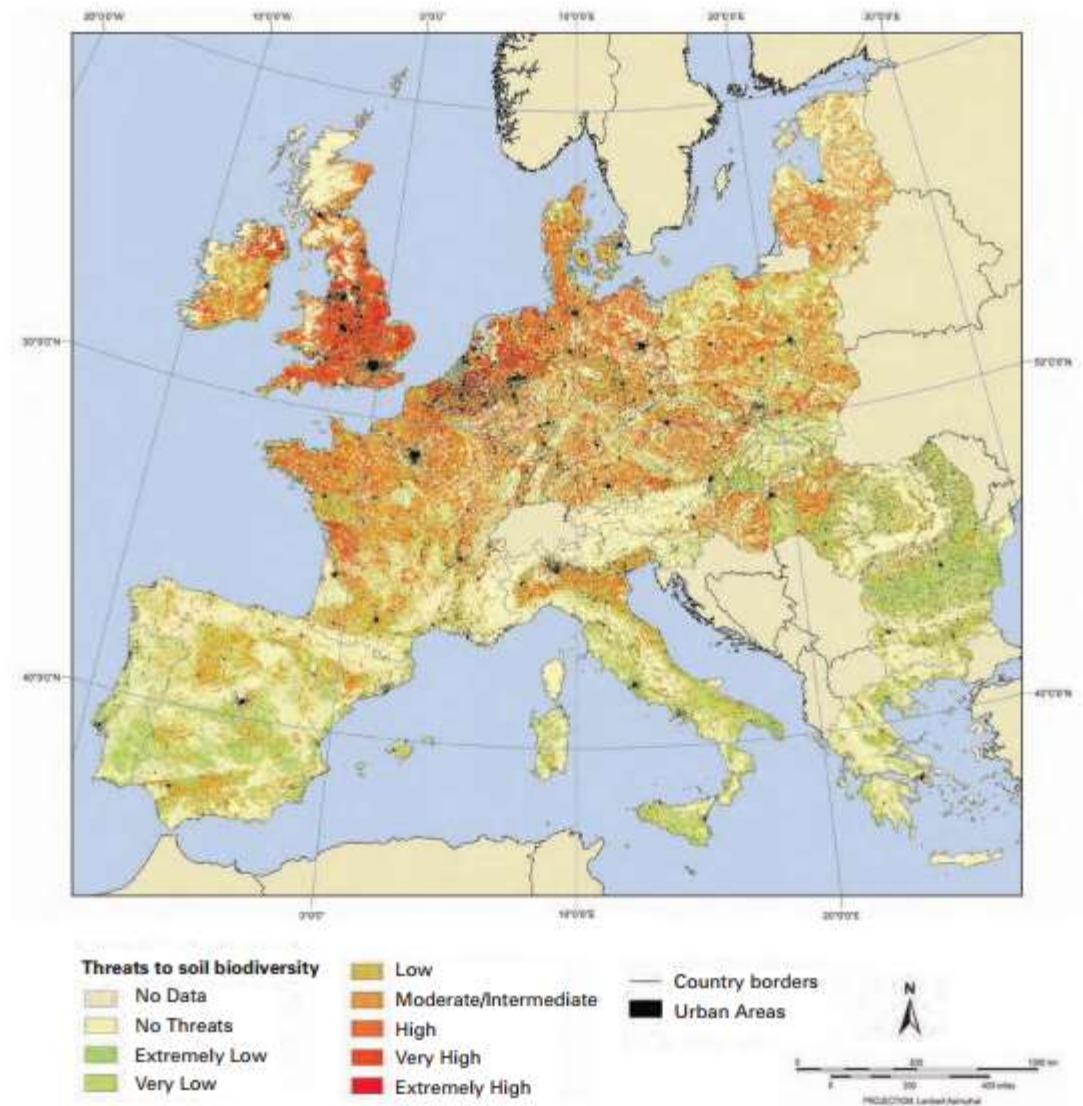


Biodiversity loss

- One of the major threats of modern-day food production is **habitat loss**. Each year, an estimated 13 mln ha of tropical forests are destroyed, causing the loss of 14,000–40,000 species. Vast areas of forest in the tropics are transformed into monocultures of soya and maize used to feed cattle.
- Biodiversity is also lost due to **deterioration of habitat quality within farmland**. In some parts of Germany, more than one-third of the entire flora in farmland is categorised as extinct, endangered or rare (Schneider et al., 1994). There is also deterioration of productive species. Through history, it has been estimated that 10 000 species have been used for human food and agriculture. In modern agriculture some twelve plant species provide approximately 75% of our total food supply, and only fifteen mammal and bird species make up more than 90% of global domestic livestock production
- Biodiversity is lost also due to **pollution by nutrients and biocides** Agriculture causes also **GHG-emissions** that cause climate change and thus lead to changes in diversity. As agriculture uses a multitude of resources (eg. water) it also **distracts resources** from other ecosystems.
- Over-fishing has reached crisis proportions in the world's oceans, with the FAO estimating that about 70% of commercial marine fisheries are being fished unsustainably. The by-catch of other organisms from these operations, such as other fish, dolphins, and sea turtles is especially destructive to the marine food chain. Industrial fishing practices have reduced the total mass of large predatory fish in the oceans to only 10% of what it was 40-50 years ago.

FIGURE 3

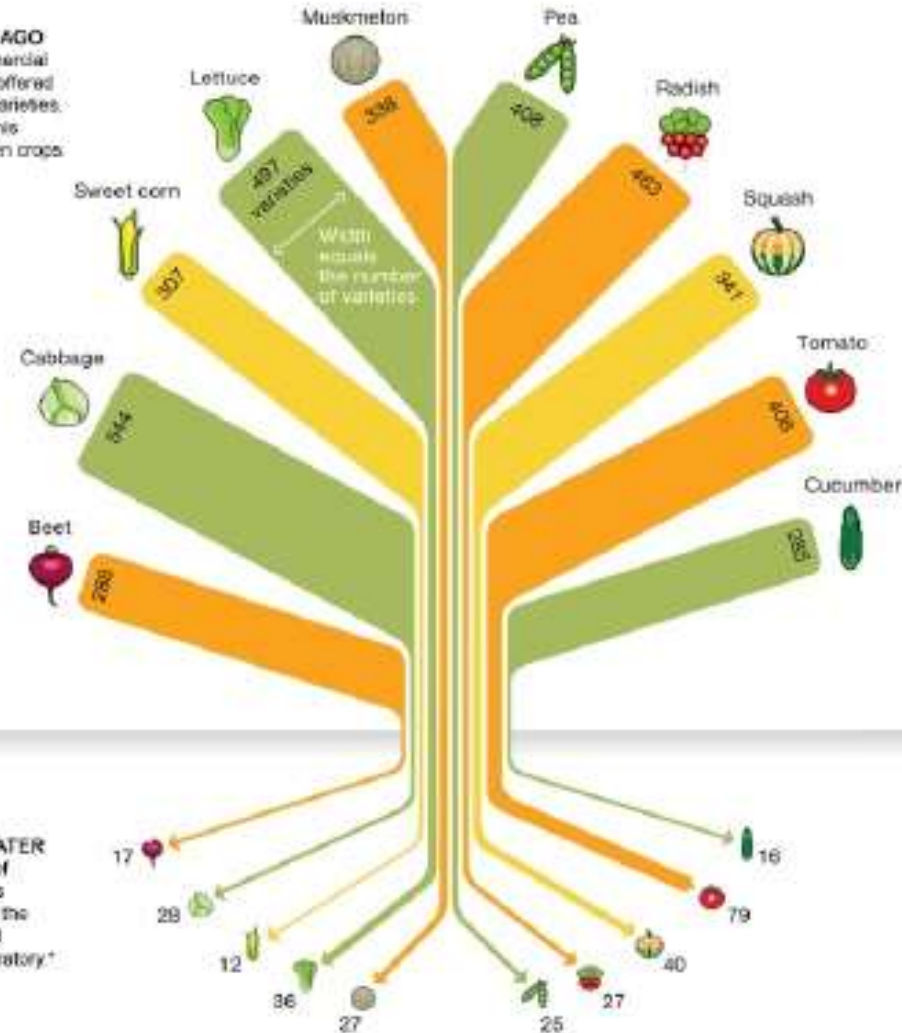
Map of threats to soil biodiversity in Europe (Jeffery et al., 2010)



Loss of agricultural biodiversity



A CENTURY AGO
In 1903 commercial
seed houses offered
hundreds of varieties,
as shown in this
sampling of ten crops.



80 YEARS LATER
By 1983 few of
those varieties
were found in the
National Seed
Storage Laboratory.*

* CHANGED ITS NAME IN 2011 TO THE NATIONAL
CENTER FOR GENETIC RESOURCES PRESERVATION

JOHN TOMMIO, NSM STAFF FOOD ICONS: QUICKHONEY
SOURCE: RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

However agriculture does not only reduce biodiversity, but also creates diverse habitats. Thus arable land in some cases is a cradle for diversity. For example 3,600 of the world's 10,000 bird species are “farmland species” and in Europe 173 bird species have agricultural lands as their prime habitats. In Northeast Germany, 14% of all vascular plants are strictly limited to arable land.

In Europe there is a concept of High Nature value Farmland (HNV). These areas are rich in biodiversity and vary from country to country. Examples of HNV-farmland are for example coastal meadows in Finland, dehesas in Spain and machair in Scotland.

Diversity is also linked to the health of the soil. Watch the video about soil carbon cowboys:

<https://vimeo.com/80518559>



“The struggle to maintain biodiversity is going to be won or lost in agricultural systems... most terrestrial biota will eventually have to coexist with... agriculture” (McIntyre et al., 1992).

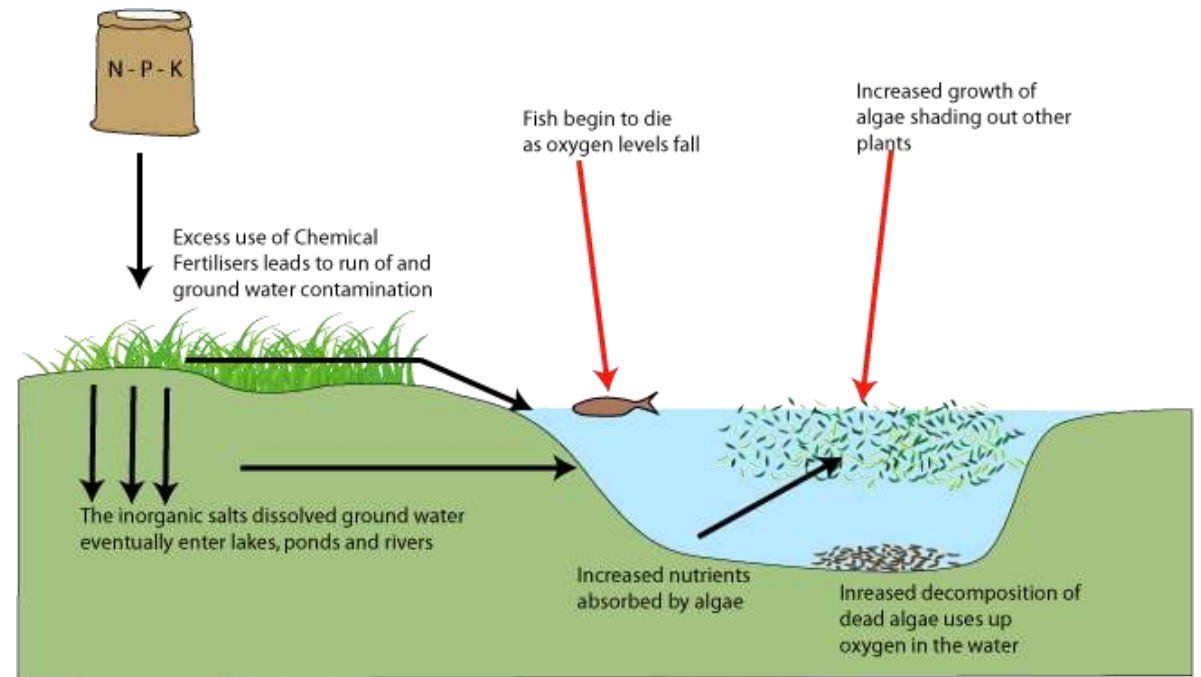
Farmland Birds Across the World, Lynx Edicions, Tucker, 1997 ; Glemnitz et al., 2001; McIntyre, S. et al. 1992. Species triage - Seeing beyond wounded rhinos. Conservation Biology 6: 604-606.

Eutrophication

Eutrophication (or more precisely **hypertrophication**), is the ecosystem's response to the addition of artificial or natural nutrients, mainly phosphates, through detergents, fertilizers, or sewage, to an aquatic system.

The primary limiting factor for eutrophication is phosphate. The availability of phosphorus generally promotes excessive plant growth and decay, favouring simple algae and plankton over other more complicated plants, and causes a severe reduction in water quality. Phosphorus is a necessary nutrient for plants to live, and is the limiting factor for plant growth in many freshwater ecosystems. Phosphate adheres tightly to soil, so it is mainly transported by erosion. Once translocated to lakes, the extraction of phosphate into water is slow, hence the difficulty of reversing the effects of eutrophication.

Agriculture is one of the primary causes of eutrophication as nutrients from fertilizers and pesticide residues leak from the food system. According to studies 59,7 % of eutrophication in EU-25 is caused by food production, especially the production of meat and dairy.



Consequences of eutrophication

Many ecological effects can arise from eutrophication, but there are three particularly troubling ecological impacts:

- 1.decreased biodiversity
- 2.changes in species composition and dominance
- 3.toxicity effects

One of the most known examples of the consequences of eutrophication are the algae blooms (the increase of phytoplankton in a water body as a response to increased levels of nutrients). Other negative environmental effects include hypoxia, the depletion of oxygen in the water, which may cause death to aquatic animals.

How could we make food
systems more sustainable?

Does going organic help?

- There is much debate whether or not organic farming is the answer in making food systems more sustainable
- The benefits of organic farming are:
 - Reduces pollutants in groundwater and creates richer soil that aids plant growth while reducing erosion
 - Decreases pesticides that can end up in your drinking glass.
 - Organic farming uses 50 percent less energy than conventional farming methods.
 - The length of time that the soil is exposed to erosive forces is decreased, soil biodiversity is increased, and nutrient losses are reduced, helping to maintain and enhance soil productivity.
 - Organic agriculture reduces non-renewable energy use by decreasing agrochemical needs.
 - Organic farmers are both custodians and users of biodiversity at all levels (genes, species, ecosystem).
 - The use of GMOs within organic systems is not permitted during any stage of organic food production.
 - The impact of organic agriculture on natural resources favours interactions within the agro-ecosystem that are vital for both agricultural production and nature conservation.
 - Organically grown plants are more drought tolerant.



- What are the possible challenges of organic farming?
 - Organic is a certification used by people interested in sustainable production, yet it is unnecessary to be sustainable in order to be certified organic.
 - Ammonia emissions, nitrogen leaching and nitrous oxide emissions per product unit can be higher from organic systems.
 - Organic systems have lower energy requirements, but higher land use, eutrophication potential and acidification potential per product unit.
 - Organic methods produce 25 percent less food than conventional farming on the same land area.
 - It is inherently more labor intensive than chemical/mechanical agriculture.
 - It is very difficult to truly tell if an organic seed has not been affected by GMO's.
 - Organic agriculture is hardly contributing to addressing the issue of global climate change. It does reduce CO2 emissions to a certain extent, but there is no dramatic contribution.
 - Denis Avery of the Hudson Institute publicized the increased risk of E. coli infection by the consumption of organic food.

Final task; other possibilities to make food systems more sustainable

- Make a ppt presentation of approximately 10 slides about one suggested improvement for modern-day food systems
- Topics and possible sources of information can be found on the next slides. Feel free to use also additional information sources.
- In your presentation answer the following questions:
 - Why is the topic of your choice suggested as a future possibility of food systems?
 - What are the problems that it solves and what are the possible benefits of it?
 - Are there any issues that this topic does not consider?
 - What is your own point of view considering this suggestion? Do you think it is a real possibility, why/why not?

- **Topic 1: Urban Farming:**

- FAO 2008. Urban Agriculture: For Sustainable Poverty Alleviation and Food Security. http://www.fao.org/fileadmin/templates/FCIT/PDF/UPA_-WBpaper-Final_October_2008.pdf
- Van Veenhuizen, René. Introduction to urban Agriculture. RUAF Foundation: Resource centers on urban agriculture and food security. Available: <http://www.ruaf.org/sites/default/files/Introduction%20final.pdf>
- Bryld, E. 2003. Potentials, problems, and policy implications for urban agriculture in developing countries. Agriculture and human values 20: 79-86.
- Bakker, N., Dubbeling, M., Gundel, S., Sabel-Kochella, U., and de Zeeuw, H. (eds) 2000. Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. A Reader on Urban Agriculture. German Foundation for International Development (DSE), Feldafing, Germany

- **Topic 2: Insects as a future protein source for humans**

- FAO 2013: Edible insects. Future prospects for food and feed security: Food and Agriculture Organization of the United Nations: Vol. 171
- Ramos-Elorduy, J. 1997: Insects: A sustainable source of food? — Ecology of Food and Nutrition 36: 247–276.
- van Huis, A. 2011: Potential of Insects as Food and Feed in Assuring Food Security — Annual Review of Entomology 58: 563–583.
- Verbeke, W., Sprangers, T., De Clercq, P., De Smet, S., Sas, B., & Eeckhout, M. 2015: Insects in animal feed: Acceptance and its determinants among farmers, agriculture sector stakeholders and citizens — Animal Feed Science and Technology 204: 72–87.

•**Topic 3: Climate smart agriculture**

- FAO 2013. Climatesmart agriculture - Sourcebook Available: <http://www.fao.org/docrep/018/i3325e/i3325e.pdf>
- Climate-Smart Agriculture Concerns, Don't be fooled! Civil society says no to "Climate-Smart Agriculture" and urges decision-makers to support agroecology. 2015. <http://www.climatesmartagconcerns.info/english1.html>
- Neufeldt et al. 2013. Beyond climate-smart agriculture: toward safe operating spaces for global food systems. Agriculture & Food Security.

•**Topic 4: Localized food production**

- Feenstra, Gail W. "Local food systems and sustainable communities." *American journal of alternative agriculture* 12.01 (1997): 28-36.
- Hardesty, Shermain D. "The growing role of local food markets." *American Journal of Agricultural Economics* 90.5 (2008): 1289-1295.
- Chantal Blouin, et al. (2009). *Local food systems and public policy: A review of the literature*. 4, 18-39.
- Feldmann and Hamm, 2015 - Consumers' perceptions and preferences for local food: A review

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Biodiversity

What is biodiversity?

- “Biodiversity is the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.” (MEA, 2005b)



An example of biodiversity (Cumming, 2015).

Biodiversity

Three dimensions of biodiversity (e.g. MEA, 2005b):

- **Genetic diversity** refers to the variety of genes within a species. (e.g. differences in genotypes)
- **Species diversity** refers to the variety of species within a specific and defined region or ecosystem. (e.g. a tropical rainforest or a meadow)
- **Ecosystem diversity** refers to the variety of ecosystems in a given place. (e.g. the variation of different ecosystems on Earth)



Genetic diversity: It is difficult to find two exactly looking identical individuals from a flock of pigeons. (Photo by J. Stolze)

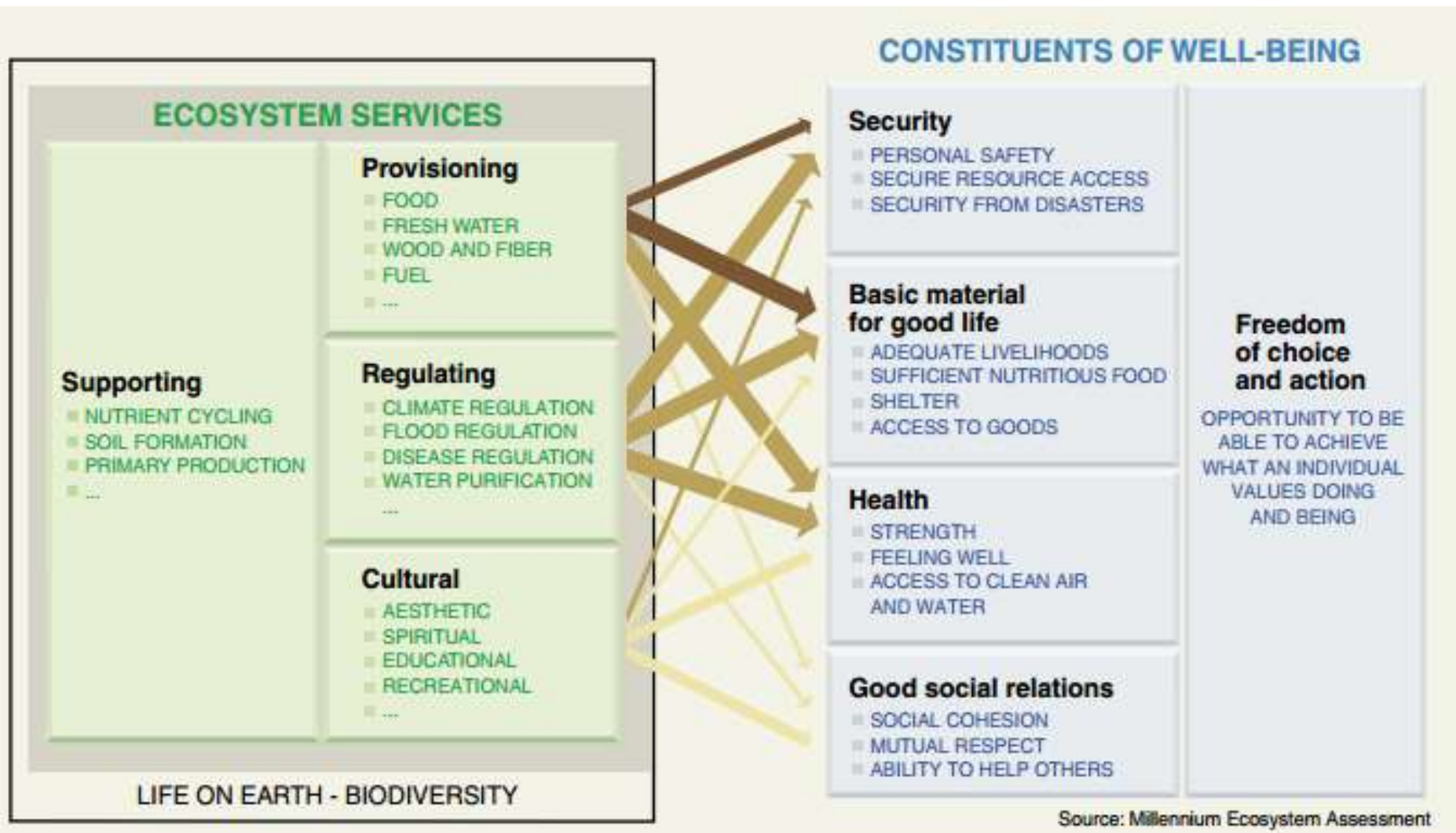
Ecosystem services

- Includes all benefits provided by ecosystems (MEA, 2005b)
- Usually divided into 4 categories:
 1. Provisioning services, e.g. food and water
 2. Regulating services, e.g. regulation of climate and floods
 3. Supporting services, e.g. soil formation and nutrient cycle
 4. Cultural services, e.g. recreation and spiritual fulfilment

More to read:

Juniper T. (2013) What has the nature ever done for us? 1st ed. London: Profile Books.

“Biodiversity contributes directly and indirectly to many constituents of human well-being.” (MEA, 2005b)



Current trends in biodiversity

- During the lifecycle of Earth 5 major mass extinctions and several minor events have led to large and sudden drops in biodiversity
- Rapid environmental changes typically also cause mass extinctions (Algeo & Scheckler, 1998; Bond & Wignall, 2008; Cockell, 2006)
- More than 99% (over 5 billion) of all species that ever lived on Earth are estimated to be extinct (Novacek, 2014; Stearns, et al., 2000)
- Current sixth mass extinction is called **Holocene extinction**
- This extinction is primarily caused by human impacts, particularly habitat destruction (Sala et al., 2009)
- During the past 50 years, changes in biodiversity due to human actions have been the fastest than ever before (MEA, 2005a & 2005b)

Models for biodiversity

- Models seek to explain why a vast variety of life forms, environments, types of interactions, are encountered
- Numerous models, including both mathematical and theoretical models, haven been developed to explain the emergence and the maintenance of biological diversity
 - See e.g. DeAngelis & Mooij, 2005; Engen, 1978; Ewens, 1979; Gause, 1934; Hubbel, 2001; Huston, 1994; MacArthur & Wilson, 1967; Ricklefs & Schuler, 1993; Rosenzweig, 1995; Tilman, 1988
- Patterns of diversity greatly vary among ecosystems and across scales and they call for a broad array of explanations
- Models of biodiversity have long remained illustrative tools with rather crude and bold assumptions based on a fairly unsophisticated mathematical background
- Partly this is explained by the poor performance of these models as predictive tools
- On the other hand this has fueled the critiques of advocates of a purely empirical ecology, based upon long observations of one or a few ecosystems or communities

Models for biodiversity:

Description of the biological diversity (Chave & Thebaud, 2007)

- Access to biodiversity data: Hierarchical classifications using morphological similarities among organisms are the most efficient method for sorting biodiversity.
- Measures of biological richness: No single objective measure of diversity is possible due to the three dimensions and thus synthetic measures should be manipulated with caution.
 - Indices of diversity: Measurement of diversity generally concerns a finite population (N) of organisms, grouped into classes (S) which refers to a group of biological objects (e.g. taxa, species, genera). The number of classes is the most basic measure of biodiversity in ecology, however it tells nothing about the relative abundance and the commonness of classes within the sample. A simple measure of diversity is the probability of two randomly chosen organisms belonging into different classes (Simpson's index of diversity or Nei's index of heterozygosity).
 - Species-area curves: The relation between sampled area and species richness has been quantified. Experimental work has consistently shown that the average number S of species increases with the area A, raised to a certain power. Note that in saturated areas the number of species is proportional to the area.
 - Abundance Models: More refined statistical models of diversity involve the information of the entire probability distribution of all N_i (Bramson et al., 1998).
- Measures of Ecosystem Complexity: The relative abundance of species isn't an efficient measurement tool for biodiversity as it doesn't include interactions between species (complexity of ecosystem). The complexity is defined based on Shannon and Wiener's theory of information as the "entropy" of the ecosystem.

Models for biodiversity:

Dynamic models of diversity

- Generation of diversity: Ecological communities consist of assemblages of species coexisting at a certain point in time and in space. However, ecological processes (e.g. competition for resources among these species) do not explain where the species come from in the first place.
 - Speciation: Speciation is the fission of a single 'gene pool' into two or several gene pools, each of which then evolves along its own evolutionary path. Observation requires long timescales.
 - Extinction: Paleodata can be used to estimate the size of avalanches, whereas the frequency distribution of them can be approximated by a power-law.
- Competitive exclusion and niches (DeAngelis & Mooij, 2005)
 - Lotka-Volterra model: The model assumes a simple interaction form amongst populations and investigates the temporal change of the density of organisms in these populations.
 - Niche models: The models assume every species to occupy a certain domain in order to restore the limitations of the Lotka-Volterra model
 - Tradeoff models: Basic assumption is that species vary in their life strategies
 - Models of density dependence: Other niche-based models are often invoked to explain the large diversity observed in tropical plant communities and others: abundant species have a lower performance than rare species. This can be due to many factors, which reduce their fecundity or increase their mortality.

Models for biodiversity:

Dynamic models of diversity

- Stochasticity and dispersal

- The concept of niche has been long defended as the overarching concept for the maintenance of biological diversity and its variation, both in space and time. However, it is evident that chance also plays a fundamental role in shaping ecosystems. This has led to a rapid development and sophistication of the statistical techniques to detect patterns from ecological data.

- Relevance of space simulations

- Dispersal events permit gene flow among populations and tend to oppose the effects of processes that cause population divergence (e.g. selection, drift). They also permit founder events, through long-distance dispersal, that may favor rapid species diversification. Clearly, dispersal is therefore a fundamental process in biogeography and currently many models take it into account.

Drivers of biodiversity loss

- Human actions
- Overexploitation
- Habitat changes
- Desertification
- Pollution
- Climate change

GOOD TO REMEMBER:

Ecosystems, including biodiversity and ecosystem services, are changing also due to natural causes, such as floods or population variations.

HOWEVER, the current change is mainly driven by anthropogenic reasons. (MEA, 2005b)

Drivers

Human actions (MEA, 2005b)

- Have altered all of Earth's ecosystems
- Are fundamentally changing life on Earth
- Humans are increasing species extinction rates
- The IPAT Identity (e.g. Chertow, 2001)

Overexploitation

- Population growth has resulted in overexploitation of several natural resources (Ehrlich & Holdren, 1971)

- The evolution of hunting and fishing practices led to the reduction of communities
- 40% of the surface of the land reserved for agricultural activities destroying natural biomes
- Agricultural activities are responsible for the excessive concentration of nutrients in the waters (N & P) resulting to eutrophication
- Some of the effects of eutrophication:
 - appearance of toxicity
 - lack of oxygen
 - excessive algae growth

Drivers

Loss of habitat

- Land-use change due to agricultural expansion, transportations, urbanization
- Destroying habitats is a result the natural ecosystem
- Loss of habitats will lead of rapid population growth
- The need for timber led to the destruction of large forest areas
- Crops and overgrazing are destroying to the disappearance of animals, plants, fungi

Desertification

- Desertification is the degradation of land and is the result of many factors such as climate change and human activities
- Desertification affects 41% of all terrestrial areas
- Affects at least 100 countries
- The land usually converts inhospitable to vegetation
- Desertification because of reduced availability of water resources (ecosystems are very sensitive to these changes)

Drivers

Pollution

- Air, soil and water pollution as well as waste from various industries are a major threat to biodiversity
- Pollution directly affects many species
- There is a risk of extinction of wildlife
- Some pollutants accumulate in food chains causing greater risk to the top of the chain (usually top predators)
- Air pollution is responsible for the destruction of many plant species, causing e.g. acid rain
- Acid rain affects both plant and animal species as well as decomposers found in soil
- Acid rain reduces the pH of the water and reduces the fertility of fish



Causes of acid rain in Poland
(National Geographic, 2016).

Drivers

Climate change

- Climate change will become the major driver at the end of this century
- New climate conditions will alter current biomes and vegetation zones
- Changing conditions will alter species distribution and relations
- Great danger is posed to mountain plants, freshwater fish and species in coastal areas
- Raising temperatures will offer an opportunity for invasive species to move further up north
- Invasive species have great impacts on ecosystems and endemic species
- Rapidly changing conditions will challenge species with precise and

narrow life requirements

- Marine environments will be altered through e.g. raising water temperatures and sea levels
- Southern invasive species has already been detected e.g. in the Mediterranean Sea



Consequences of biodiversity loss

1. Ecological consequences: Species richness and evenness
2. Ecological consequences: Species composition
3. Ecological consequences: Species interactions
4. Social consequences
5. Economic consequences

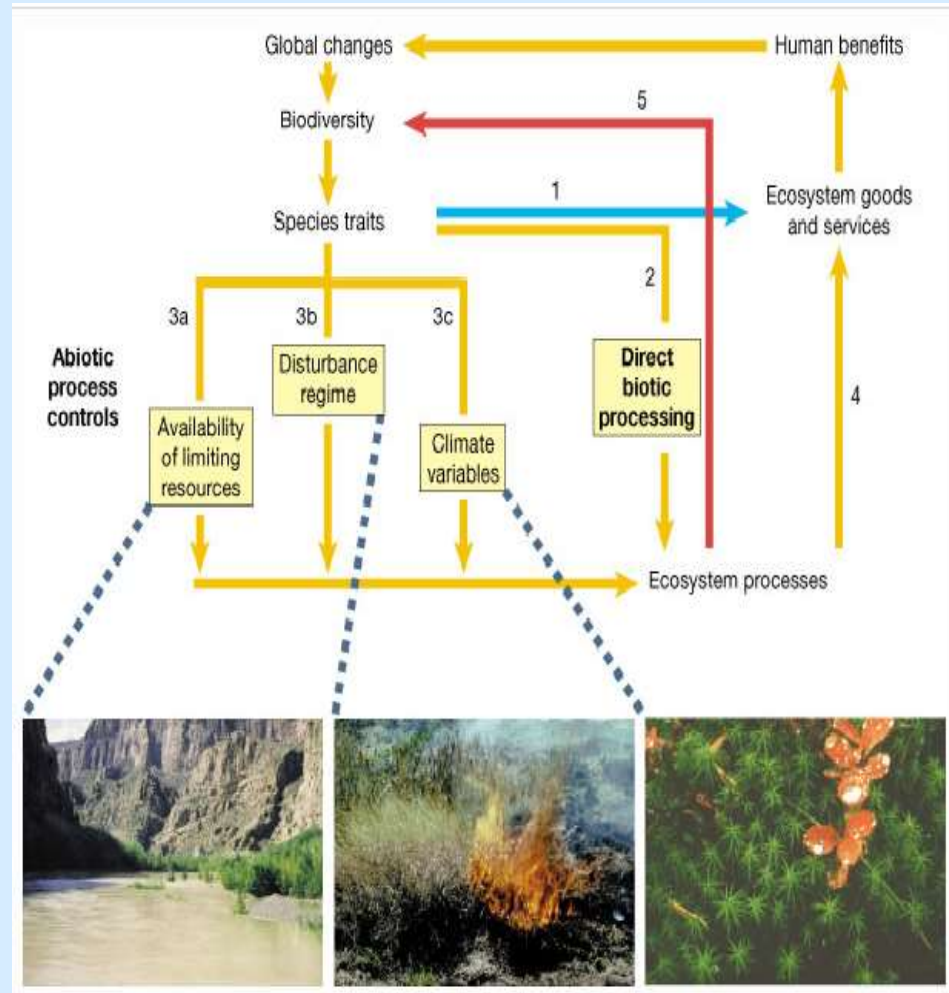
Ecological consequences

Species richness and evenness

- The absence of a simple relationship between species richness and ecosystem processes is likely when one or more species have strong ecosystem effects.

Species composition

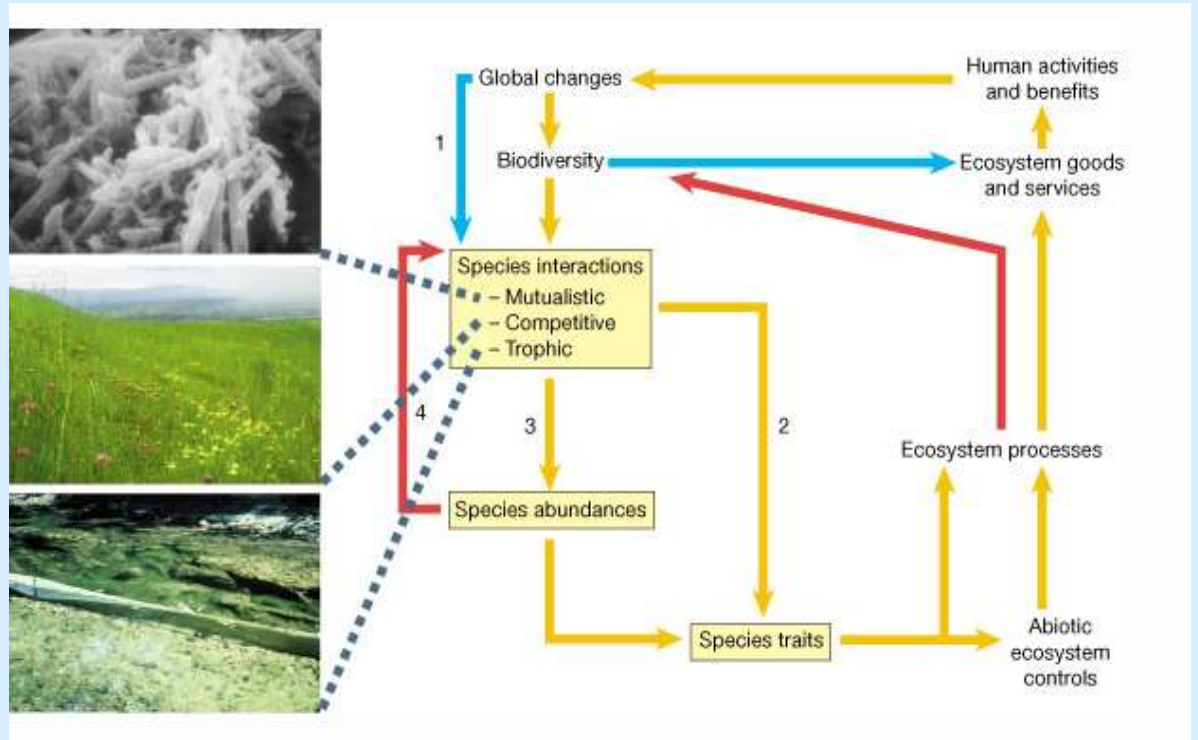
- Species' alteration of the availability of limiting resources, the disturbance regime, and the climate can have particularly strong effects on ecosystem processes. Such effects are most visible when introduced species alter previous patterns of ecosystem processes



Ecological consequences

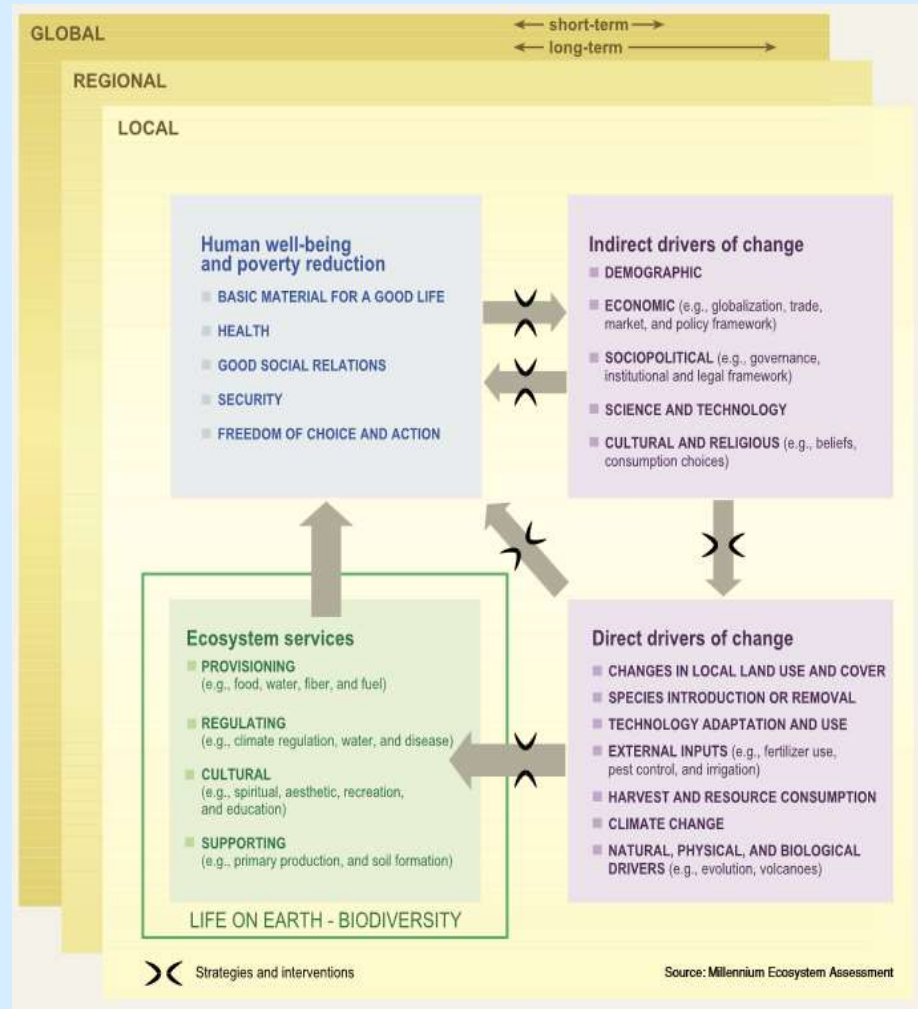
Species interactions

- Most ecosystem processes are non-additive functions of the traits of two or more species, because interactions among species, rather than simple presence or absence of species, determine ecosystem characteristics.
- Species interactions, including mutualism, trophic interactions (predation, parasitism and herbivory) and competition may affect ecosystem processes.



Social consequences

- Biodiversity affects human well-being through various ecosystem services
- In the Millennium Ecosystem Assessment (2005a) these services include
 1. Basic material for a good life
 2. Health
 3. Good social relations
 4. Security
 5. Freedom of choice and action
- The loss of biodiversity and ecosystem services influence developing countries more than industrial countries (MEA, 2005a)
 - Increases inequities between people
 - Sometimes the main factor causing poverty and social conflicts



Economic consequences

- Economic impacts through the provision of ecosystem goods and services to society
 - Current biological knowledge pertinent to economic modeling is inadequate to reconstruct total economic losses in agriculture from the loss of pollinators. (e.g. the economic burden of reduced yields and crop production cost increases resulting from declination of honey bee has been estimated at \$5.7 billion a year)
 - Increasing unemployment (National economic activity include timber \$400 billion), marine fisheries (around \$80 billion in 2000), marine aquaculture (\$57 billion in 2000), recreational hunting and fishing)
- Changes in diversity can directly reduce sources of food, clean water and stable climate
 - Crop failures coincident with cold winter weather or drought may in fact be a function of adverse weather effects on pollinators. On average, for a 50% reduction in biodiversity, there will be a 10% – 20% loss of productivity
 - Purification of water
 - Regulation of floods

Solutions to biodiversity loss

1. Ecological restoration and reclamation
2. Enactment and enforcement of legislation and prevention of species introduction
3. Promotion of awareness



Artificial coral reefs by Jason deCaires Taylor
(Jobson, 2012).

Ecological restoration and reclamation

- Establishing protected areas
- Restoration of damaged ecosystems
- Recovery of endangered species
- Permanent funds for biodiversity
- Managing sensitive areas, e.g. marine protected areas (MPA)



A Marine Protected Area sign encouraging locals and visitors to take care of the marine environment (Struik Nature, 2012).

Sounds good but...is it only a utopia?

The case of Instituto Terra:

“Do you know what is possible to do in 15 years?”

- **Instituto Terra** is a project launched by the Brazilian photographer Sebastião Salgado and his wife in 1998.
- By reforestation, they re-converted in a natural state of subtropical rainforest around 1 754 acre of the Bulcão Farm (1 502 acres of which have been declared a Private Natural Heritage Reserve)



The change in the landscape of PNHRR Bulcão Farm leaves no doubt.

You can restore the Atlantic Forest!



PNHR Bulcão Farm – 2000



PNHR Bulcão Farm – 2006



PNHR Bulcão Farm – 2012

Enactment and enforcement of legislation

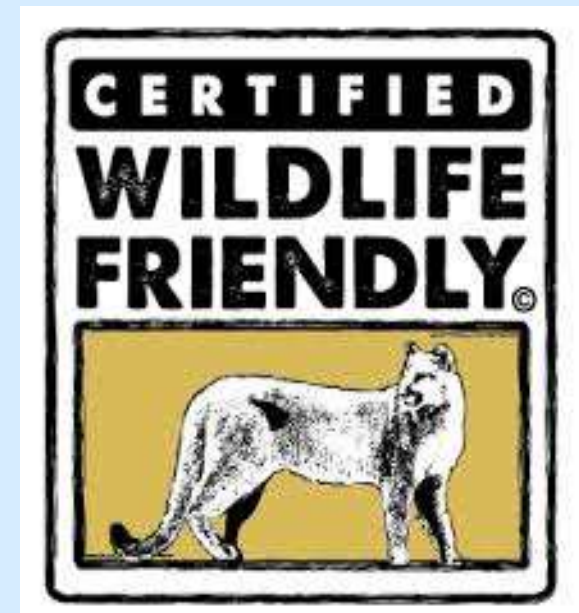
Examples from the United Nations Environment Programme: Payment for Ecosystem Services (PES)

People who manage or interact in some way with ecosystems receive payments for the benefits provided by the ecosystem to the wider community. Some examples:

- In Costa Rica, payments to farmers who conserve forests on their land rather than destroy them for low-earning pasture have become a national environment program
- In India, ecological restoration and water harvesting is paid for by a national rural employment guarantee scheme, employing millions.
- In San Francisco and New York, ecological infrastructure is the reality: reservoirs and lake watersheds surrounded by well-managed forests provide cities with a freshwater supply.
- On the island of Lombok in Indonesia, the local community pays \$0.60 per household per month to a special fund that ensures the sustainable management of their watershed forests so as to protect vital water supplies.

Promotion of awareness

Join and follow Non Profit Organization which ensures wildlife conservation through the promotion of events and certification of responsible production practices, tourism, enterprise development, education and branding.



Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2

Course IV

Applied Energy management systems in/for
organisations (including schools)



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Intellectual Output 2 Course IV

Applied Energy management systems in/for
organizations (including schools)

Course Description & Outline



Course Description

COURSE TITLE: Applied Energy management systems in/for organizations (including schools)

PARTICIPATING ORGANIZATION: Projects in Motion

INTRODUCTION: In view of the world's growing dependence on energy availability, the need for energy management is now felt more than ever. It is essential to save on energy use in order to:

- reduce the damage that we're doing to our planet
- reduce our dependency on fossil fuels that are limited in supply

Energy management is the key to saving energy. Much of the importance of energy saving stems from the global need to save energy - this global need affects energy prices, emissions targets, and legislation, all of which lead to several reasons why an organisation should do its utmost to reduce its energy consumption.

Reducing on energy consumption also has other benefits directly related to the organisation itself. These are:

- cost and energy reduction
- decreased carbon emissions and the environmental damage that they cause while promoting a green, sustainable image of the organisation
- risk reduction due to the possibility of increased energy prices or energy supply shortages that could seriously affect an organisation's profitability and survival

Energy management systems (EnMS) are key to controlling energy consumption and to reach energy efficiency targets. By the end of this course the learner will be able to promote and implement EnMS systems within any organisational setup. Considering the shift towards more energy efficient modes of operation within industry, public buildings, offices, etc. this course aims to enable the learner to enter the workforce with the required skills for EnMS management.

DESCRIPTION: An EnMS is an ongoing process of identifying, planning and implementing improvements in the way an organisation uses energy. A holistic EnMS builds business value by acknowledging the importance of energy conservation as an essential business principle, and by establishing lasting processes to monitor and achieve best practices in the use of energy resources.

The implementation of an effective EnMS will provide the framework to deliver on an organisation's energy objectives. EnMSs are ongoing processes and need to be treated as such. Consequently, continual monitoring and updating of the implemented measures is a must.

This course is based on the the ISO 50001:2011 framework and aims to empower the learner with the necessary skills to be able to argue in favour of energy conservation through energy management, to assess the performance characteristics of a building/organisation, and to develop policies and structures. These are necessary steps for an effective EnMS.

The course is divided into 4 modules:

- **Module 1: ENERGY**
This module is an introduction to the various sources of energy available together with their effects in a global scenario. The state of energy consumption trends in Europe will be discussed and analysed in the light of the EU's energy priorities and targets.
- **Module 2: ENERGY POLICIES & STANDARDS**
The various major energy regulating/guideline documents will be covered in this module together with a highlight on the major benefits obtained by an organisation when investing in itself by controlling, reducing and monitoring its energy consumption. Amongst others, the documents covered are:
 - ISO14001:2001 – Environmental Management Systems
 - ISO 9001:2008 – Quality Management Systems

- EMAS – Eco-Management and Audit Scheme
- ISO 50001:2011 – Energy Management Systems
- **Module 3: ENERGY MANAGEMENT SYSTEMS**
Based on the framework provided by the ISO50001 standard, this module will prepare the learner to design and implement of an EnMS for an organisation/building. Students will be taught the necessary skills required to collect and interpret data of energy consumption, identify and quantify opportunities to save energy, target those opportunities and track any energy savings.
- **Module 4: FIELD WORK**
Putting in practice all the topics covered in Modules 1,2 and 3 through the development of an EnMS within a school environment.

Module	Content	Teaching method
Module 1: BUILDING / ORGANISATION ENERGY 3 ECTS	Topic 1: Definitions of common energy terminology and Energy sources Topic 2: Energy trends within the EU Topic 3: EU energy priorities and energy saving strategies	eLearn
Module 2: ENERGY STANDARDS & DIRECTIVES 3 ECTS	Topic 1: Energy directives Topic 2: Energy standards and Benefits from energy management systems implementation	eLearn
Module 3: ENERGY MANAGEMENT SYSTEMS 3 ECTS	Topic 1: Plan-Do-Check-Act process Topic 2: Energy monitoring / planning / management skills and techniques and Energy Efficiency Knowledge Transfer Framework Topic 3: Implementing an EnMS within an organisation	Face-to-face
Field Work 6 ECTS	Design of an EnMS structure within a school environment	Project work



COURSE IV Applied Energy management systems in/for organizations (including schools)

Module 1 – BUILDING / ORGANISATION ENERGY

Title	Description
Level (EQF)	7
ECTS	3 (90 hours)
Teaching language	English
Number of lectures	1
Number of labs	nil
Homework	<p>Assignment 1: Comparison of energy trends amongst member states. Energy consumption, dependency on non-renewable fuels, percentage of renewable sources, efficiency measures implemented, etc.</p> <p>Assignment 2: Analysis on the status in each member state as per EU energy priority area for energy efficiency.</p>
Meetings/tutorial	One meeting per assignment may be requested.
Course objectives	<p>Knowledge During the course, the student will gain knowledge on:</p> <ul style="list-style-type: none"> - common energy terminology - renewable and non-renewable energy sources and their effects on society - energy trends within the EU - EU energy priority areas - EU energy saving strategies across all member states <p>Skills The following are the skills gained by the student:</p> <ul style="list-style-type: none"> - Interpretation of energy data - Ability to calculate energy consumption and carbon footprints - Ability to identify areas requiring action for energy reduction. <p>Competences The student will be able to demonstrate an understanding of curriculum development by:</p> <ul style="list-style-type: none"> - discussing non-renewable energy sources and their effects on society - being able to instill and promote awareness of renewable energy technologies - being able to discuss and compare EU energy saving strategies across member states.



Course contents	<ul style="list-style-type: none"> • Definitions of energy terminology. • Energy sources (renewable and non-renewable). • Energy consumption trends within the EU. • Europa 2020 targets and supporting frameworks.
Assessment	<p>Final Assignment:</p> <p>Identification and discussion of best practices in the EU Member States to contribute to the achievement of the objectives set by the EC within the energy efficiency priority area.</p>



COURSE IV Applied Energy management systems in/for organizations (including schools)

Module 2 – ENERGY STANDARDS & DIRECTIVES

Title	Description
Level (EQF)	7
ECTS	3 (90 hours
Teaching language	English
Number of lectures	1
Number of labs	nil
Homework	<p>Assignment 1: Report on the status of implementation for the key measures of the 2012 Energy Efficiency Directive across four Member States of your choice, highlighting at least one member state that has gone beyond the energy efficiency requirements stated by the directive.</p> <p>Assignment 2: Report on the status of implementation for the Renewable Energy Directive across three Member States of your choice. Identify any best practices leading to the devolution of the directive.</p>
Meetings/tutorial	One meeting per assignment may be requested.
Course objectives	<p>Knowledge During the course, the student will gain knowledge on:</p> <ul style="list-style-type: none"> - Various energy directives and standards together with their benefits. <p>Skills The following are the skills gained by the student:</p> <ul style="list-style-type: none"> - Ability to identify the requirements of the ISO 50001 standard as applied to a particular ambience - Ability to argue in favour of EnMS systems. <p>Competences The student will be able to demonstrate an understanding of curriculum development by:</p> <ul style="list-style-type: none"> - Explaining the purpose and benefits of implementing an EnMS system in an organization or building - Identifying which directives / standards are applicable to any given scenario - Identifying ways of implementing and abiding to the energy standards and directives.
Course	<ul style="list-style-type: none"> • 2012 Energy Efficiency Directive



contents	<ul style="list-style-type: none"> • EU Energy Labelling Directive • Ecodesign Directive • 2010 Energy Performance of Buildings Directive • Renewable Energy Directive • ISO14001:2001 – Environmental Management Systems • ISO 9001:2008 – Quality Management Systems • EMAS – Eco-Management and Audit Scheme • ISO 50001:2011 – Energy Management Systems • EMS benefits to the organisation
Assessment	<p>Final Assignment:</p> <p>Discussion on the different directives and standards presented; their applicability, pros and cons, complementarities and differences.</p>



COURSE IV Applied Energy management systems in/for organizations (including schools)

Module 3 – ENERGY MANAGEMENT SYSTEMS

Title	Description
Level (EQF)	7
ECTS	3 (90 hours)
Teaching language	English
Number of lectures	2
Number of labs	nil
Homework	<p>Assignment 1: Description of the PDCA process for implementation of an EMS in a generic scenario.</p> <p>Assignment 2: Write a proposal addressed to the top management of an organisation to advocate for the implementation of an EnMS. Describe all the benefits the organisation might take advantage of, the opportunities it presents in terms of competitive advantages and why you should be appointed as the energy manager for taking the EnMS from design to implementation and operation.</p>
Meetings/tutorial	
Course objectives	<p>Knowledge During the course, the student will gain knowledge on:</p> <ul style="list-style-type: none"> - EnMS systems based on the ISO 50001 standard - Energy monitoring, measurement and control - Knowledge transfer frameworks <p>Skills The following are the skills gained by the student:</p> <ul style="list-style-type: none"> - identifying and measuring the energy performance characteristic for a particular building / area - policy making for efficient use of energy - setting reachable targets and objectives - auditing and energy planning - designing energy efficiency knowledge transfer frameworks. <p>Competences The student will be able to demonstrate an understanding of curriculum development by:</p> <ul style="list-style-type: none"> - Assessing the energy performance characteristics for a particular building/area - Developing a policy for more efficient use of energy within the



	<p>building/area</p> <ul style="list-style-type: none"> - Fixing targets and objectives to assist in meeting the policy - Using data to better understand and make decisions about energy use and energy conservation - Monitoring and measuring the energy consumption and energy savings - Making a review how well the designed policy works - Designing energy efficiency knowledge transfer frameworks.
Course contents	<ul style="list-style-type: none"> • Plan-Do-Check-Act process. • Energy monitoring techniques. • Energy planning for reducing consumption. • Energy management documentation skills. • Energy Efficiency Knowledge Transfer Framework. • Steps to implement an EMS.
Assessment	<p>Final assignment:</p> <p>Discussion on the main requirements for a successful EnMS implementation considering the aspects of monitoring, planning, documentation and knowledge transfer. Identify vital characteristics of good operation together with the benefits they each present.</p>



COURSE IV Applied Energy management systems in/for organizations (including schools)

Module 4 – FIELD WORK

Title	Description
Level (EQF)	7
ECTS	6 (180 hours)
Teaching language	English
Number of lectures	nil
Number of labs	nil
Homework	nil
Meetings/tutorial	One interim meeting to check progress and obtain feedback and further guidance if necessary.
Course objectives	<p>Knowledge During the course, the student will gain knowledge on:</p> <ul style="list-style-type: none"> - Practical implementation of all topics covered in Modules 1,2 & 3 within a school ambience <p>Skills The following are the skills gained by the student:</p> <ul style="list-style-type: none"> - identifying and measuring the energy performance characteristic for a particular building / area - policy making for efficient use of energy - setting reachable targets and objectives - auditing and energy planning - designing energy efficiency knowledge transfer frameworks. <p>Competences The student will be able to demonstrate an understanding of curriculum development by:</p> <ul style="list-style-type: none"> - Assessing the energy performance characteristics - Producing the necessary documentation, analysis reports, monitoring tools, knowledge transfer frameworks and time plans for the implementation of an EnMS structure within the school.
Course contents	Field work
Assessment	Field work

Handouts

COURSE IV - Applied energy management systems in/for organizations (including schools)

Module 1: Building / Organisation Energy

Introduction	<p>The aim of this module is to provide the learner with a general background on the issues and factors that are the driving force behind energy efficiency and energy saving measures. This knowledge is necessary to be in a position to advocate for the implementation of Energy Management Systems within any organisation or building scenario.</p> <p>Amongst others, dependency on fossil fuels for energy generation, greenhouse gas emissions, sources of energy and their effects on our planet, the EU energy system statistics as well as the EU 2020 strategy with particular emphasis on the energy related policies are presented and discussed.</p>
Task description	<p>Module 1 is divided into three topics dealing with a general background on energy consumption, energy terms, current status of energy trends within the EU member states and the way forward towards reducing greenhouse gas emissions as dictated by the EU 2020 strategy.</p> <p>Topic 1: Definitions of common energy terminology and Energy sources</p> <p>When dealing with energy efficiency and energy saving efforts, one must first understand the basic terminology used when referring to energy consumption, energy efficiency, energy intensity, energy use intensity, energy conservation and energy management. This topic explains each of the terms as applicable to Energy Management Systems implementation.</p> <p>Within this topic, energy sources are classified into Renewable and Non-Renewable, with each energy source explained. Non-renewable sources are promoted and the learner is also provided with the necessary skills to be able to choose the best energy sources for a particular scenario.</p> <p>Topic 2: Energy trends within the EU</p> <p>Since each of the EU28 member states have their own energy consumption trends and each depend on different configurations of energy sources, they cannot be treated as one complete block when it comes to energy saving efforts. This topic presents the energy consumption trends for each member state, their individual share of renewable energy sources and the overall greenhouse gas emissions.</p> <p>Topic 3: EU energy priorities and energy saving strategies</p> <p>By 2020, the EU aims to reduce its greenhouse gas emissions by 20%, increase the share of renewable energy to at least 20% of consumption, and achieve energy savings of 20% or more. All EU countries must also achieve a 10% share of renewable energy in their transport sector.</p> <p>Through the attainment of these targets, the EU can help combat climate change and air pollution, decrease its dependence on foreign fossil fuels, and keep energy affordable for consumers and businesses. This topic presents the EU 2020 energy</p>

	policy in detail together with an insight on the Effort Sharing Decision involving all Member States.
References	<p>Depository of all NEEAPs for EU Member States - https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans</p> <p>Europa 2020 – official website http://ec.europa.eu/europe2020/index_en.htm</p> <p>Renewable Energy Technology Roadmap 20% by 2020 published by EREC, European Renewable Energy Council http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pdf</p>

Module 2: Energy Standards & Directives

Introduction	<p>The largest portion of Europe's energy sources come from fossil fuels that is the leading source of air pollution and carbon emissions. This implies that a large budget from each country is allocated to importing fuels making EU electricity prices amongst the highest in the world.</p> <p>The cheapest and cleanest way to meet Europe's energy needs is by making our infrastructure and products more energy efficient. This is the aim behind the EU directives and standards that drive energy efficiency and reduced energy utilisation as a pathway to increase European competitiveness and energy supply independence while affordably reducing greenhouse gas (GHG) emissions and protecting human and environmental health.</p> <p>The EU directives are legal acts which require member states to achieve a particular result without dictating the means of achieving that result. Directives normally leave member states with a certain amount of leeway as to the exact rules to be adopted by means of a variety of legislative procedures depending on their subject matter.</p> <p>A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose.</p>
Task description	<p>Module 2 introduces the various EU directives and standards related to energy management and utilisation.</p> <p>Topic 5: Energy directives</p> <ul style="list-style-type: none"> ▪ 2012 Energy Efficiency Directive ▪ 2010 Energy Performance of Buildings Directive ▪ EU Energy Labelling Directive ▪ Ecodesign Directive ▪ Renewable Energy Directive <p>Topic 6: Energy standards and Benefits from EnMS implementation</p> <p>Standards:</p> <ul style="list-style-type: none"> ▪ ISO 9001:2008 Quality Management Systems ▪ EMAS Eco-Management and Audit Scheme ▪ ISO 14001:2004 Environmental Management System ▪ ISO 50001:2011 Energy Management System <p>This topic presents the overall advantages to be experienced by an organisation following implementation of energy and environmental management systems guided by the ISO 50001:2011 and ISO 14001:2004 standards.</p>
References	<p>Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance</p> <p>http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027</p>

	<p>Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. http://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3TjwD8QS3pqdkhXZbwqGwlgY9KN!2064651424?uri=CELEX:32010L0031</p> <p>Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products. http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010L0030</p> <p>DIRECTIVE 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:285:0010:0035:en:PDF</p> <p>Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028</p>
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Module 3: Energy Management Systems

Introduction	<p>Using energy efficiently helps organizations save money as well as helping to conserve resources and tackle climate change. This course explains the development of an energy management system (EnMS) as specified within the ISO 50001 standard. This standard is applicable to all organisations in all sectors of operation and makes it possible for the organisation to integrate energy management into their overall operational efforts to improve quality and environmental management.</p> <p>Using a step-by-step process, this course provides guidance on how to implement an ISO 50001 EnMS. The course enables organizations to establish the systems and processes necessary to improve energy performance, energy efficiency, and help reduce energy consumption and costs.</p> <p>The requirements of the standard will be reviewed, while covering a step-by-step implementation approach. The course includes guidance on developing an implementation plan, creating necessary documentation, monitoring an energy management system and achieving continual improvement in energy performance.</p>
Task description	<p>Topic 8: Plan-Do-Check-Act process</p> <p>ISO 50001 focuses on a continual improvement process to achieve the objectives related to the environmental performance of an organisation / building. The process follows four phases of the Plan–Do–Check–Act (PDCA) approach. Each phase is explained in detail with guidelines for implementation.</p> <p>Topic 9: Energy monitoring / planning / management techniques and EE Knowledge Transfer Framework</p> <p>Monitoring activities are the heart of the EnMS to help the energy managers be in a position to evaluate energy performance and improve it. This topic provides guidelines and requirements for a sound monitoring activity that will allow for successful implementation of the EnMS.</p> <p>This topic gives a set of guidelines and essential components that are required for adequate planning procedures for operation control, procurement of energy consuming services/products, design of new products and dealing with non-conformities.</p> <p>The ISO 50001 standard lists a set of twelve documents that are key to ISO certification. The documents are presented together with guidelines for their creation and maintenance within the organization.</p> <p>The success of a proposed EnMS action plan depends on effective implementation by all the energy management team and support of the whole organisation. This topic discusses setting up of a knowledge transfer framework to assist in the transfer of knowledge throughout the organisation including communication with outside bodies.</p> <p>Topic 10: Implementing an EMS within an organization</p> <p>Like all other standards, certification is possible but not obligatory. This module presents the benefits of formal certification and what is required in order to be able to reach the certification status.</p>

References	<p>ISO 50001:2011 Energy management systems -- Requirements with guidance for use http://www.iso.org/iso/home/standards/management-standards/iso50001.htm</p> <p>Inside Energy: Developing and Managing an ISO 50001 Energy Management System, C. Eccleston, F. March & T. Cohen - ISBN: 13: 978-1-4398-7671-8</p>

Module 4: Field Work

Introduction	<p>During the final stage of the EPOQUE Course IV, the students will go through an internship period of one month during which they are required to develop an EnMS for an enterprise or school.</p> <p>Using all of the topics and information covered in Modules 1, 2 & 3 the student is to carry out the below described tasks associated with this module.</p>
Task description	<p>The student is to produce the necessary documentation, analysis reports, monitoring tools, knowledge transfer frameworks and time plans for the implementation of an EnMS structure within the ambience detailed in the case study. Features to be covered by the student throughout the implementation of the internship phase are:</p> <ul style="list-style-type: none"> • Create an Energy Policy: top management's official statement of the organisation's commitment to managing energy. • Formulate an Energy Management Plan that requires measurement, management, and documentation for continuous improvement for energy efficiency. • Appoint a cross-divisional management team led by a representative who reports directly to management and is responsible for overseeing the implementation of the strategic plan. • Define operating controls and procedures to address all aspects of energy purchase, use, and disposal. • Establish a baseline of the organisation's energy use. Progress will be measured against this deadline. • Identify energy performance indicators that are unique to the organisation and are tracked to measure progress. • Define energy objectives and targets for energy performance improvement at relevant functions, levels, processes or facilities within the organisation. • Draw up action plans to meet those targets and objectives. • Create all required manuals/reports, these living documents evolve over time as additional energy saving projects and policies are undertaken and documented. • Establish periodic reporting of progress to management based on these measurements. • Set up a Knowledge Transfer Framework to be the basis of all planning and operations.
References	<ul style="list-style-type: none"> ▪ ISO 50001 Case Study - Aviva Stadium https://www.linkedin.com/pulse/iso-5001-case-study-aviva-stadium-adam-faughnan?trk=seokp_posts_primary_cluster_res_title ▪ Simulation to Support ISO 50001 Energy Management systems and Fault Detection and Diagnosis: Case Study of Malpensa Airport, CONFERENCE PAPER · AUGUST 2013 http://www.researchgate.net/profile/Luis_Blanes_Restoy/publication/256839494_Simulation_to_Support_ISO_50001_Energy_Management_systems_and_Fault_Detection_and_Diagnosis_Case_Study_of_Malpensa_Airport/links/00b7d53c7e5b08590f000000.pdf

	<ul style="list-style-type: none">▪ Energy Management in Large Enterprises: A Field Study http://cel.mie.utoronto.ca/wp-content/uploads/CEL09-01-EM-in-Large-Enterprises.pdf
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Environmental Portfolio for Quality in University Education

2014-1-EL01-KA200-001373

Intellectual Output 2 Course IV

Applied Energy management systems in/for
organizations (including schools)

Course Contents – PPTs





Course Portfolio:
Applied Energy Management Systems in/for organisations
(including schools)



O2: Environmental Portfolio
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- Those interested in improving energy performance and energy efficiency
- Individuals who want to learn more about ISO 50001.
- Individuals who want to implement an ISO 50001 EMS.
- Energy managers and energy coordinators (engineers, plant managers, etc.)

Pre-requisites

- There are no formal prerequisites for this course

Module 1

Building / Organisation Energy

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Topic 1

DEFINITIONS OF COMMON ENERGY TERMINOLOGY

- **Energy Consumption**

The amount of energy used by a process or system, or by an organization or society, in order to achieve a desired output.

- **Energy Efficiency**

Refers to the reduction in the amount of energy required to provide a given product / service using less energy.



- **Energy Intensity**

The measure of the energy efficiency of a country calculated as units of energy per unit of GDP

- **Energy Use Intensity (EUI)**

The measure that determines a building's energy performance, i.e. the quantity of energy consumed by a building relative to its size expressed in kWh/m²/year

EUI could also be used to quantify the performance of smaller target areas, e.g. for an appliance in kWh/appliance/year

- **Energy Conservation**

The reduction in the amount of energy consumed in a process or system, or by an organisation or society, through economy, elimination of waste and rational use.

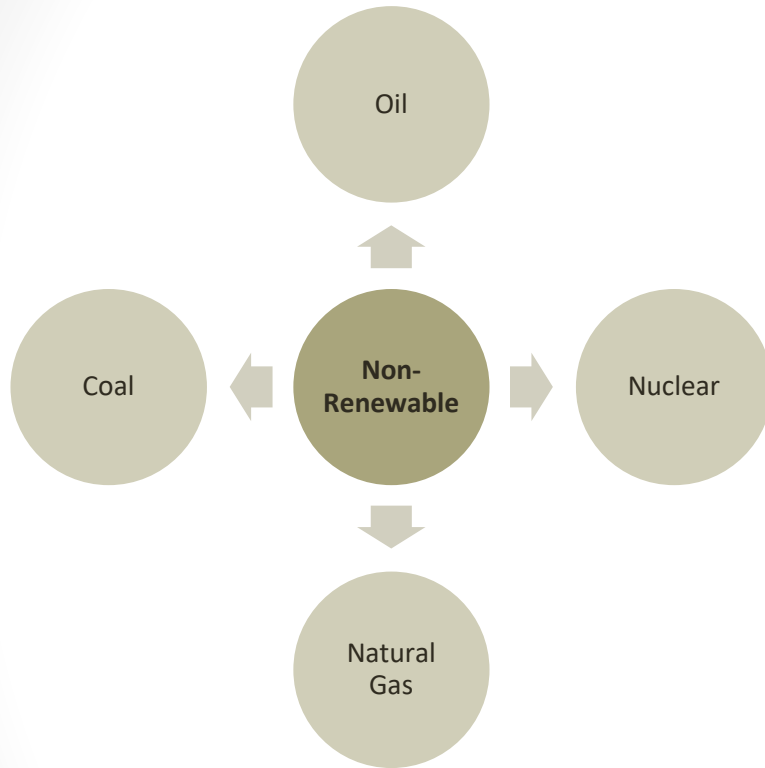
- **Energy Management**

The discipline and measures executed to achieve the minimum possible energy use while meeting the true needs of the activities occurring within a facility. The objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need.

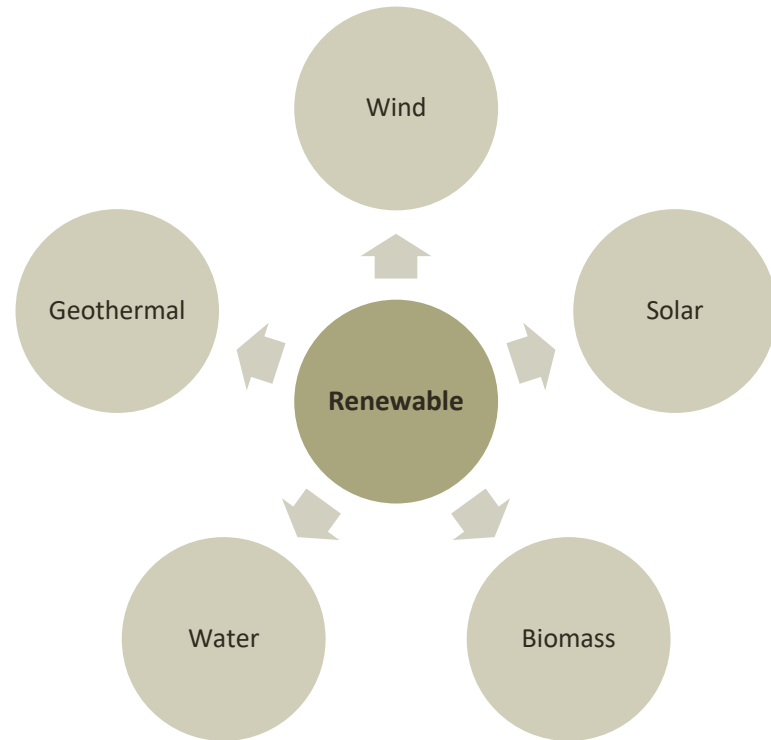
Topic 2

ENERGY SOURCES

Renewable & Non-Renewable Sources of Energy



- Fossil fuels and nuclear materials
- Many years to replenish
- Pollution created during gathering and utilisation



- No depletion
- Generate much less pollution both in gathering and production
- Available at no cost

Pros & Cons for Non-Renewable Energy Sources

		Pros	Cons
Non-Renewable Sources		<ul style="list-style-type: none"> Easier to store and transport than renewable sources. 	<ul style="list-style-type: none"> Global warming.
	Oil	<ul style="list-style-type: none"> High energy density Availability is widely distributed Infrastructure is already existent Constant power source 	<ul style="list-style-type: none"> Release harmful GHG. Risk of oil spills. Political issues and price spikes. Toxic materials released during refining. Limited in supply.
	Coal	<ul style="list-style-type: none"> Most abundant in supply. Stable price Produces high energy upon combustion 	<ul style="list-style-type: none"> Mining process is dangerous and causes damage to the environment. Coal sources are fast depleting. Produces carbon dioxide in large quantities.
	Nuclear	<ul style="list-style-type: none"> Lower cost of generation than fossil fuels. Continuous production of electric energy. 	<ul style="list-style-type: none"> Dangers associated with production process. Risk of nuclear accidents may be disastrous. Management of nuclear waste. Nuclear plants have a limited lifetime and complex dismantling. Risk of warfare.
	Natural Gas	<ul style="list-style-type: none"> Burns completely, leaves no residue. Can be safely stored Suitable for residential supply. Can be used as fuel for vehicles. Lighter than air so dissipates on leakage. Versatile 	<ul style="list-style-type: none"> Toxic and flammable. Releases GHG when burned. Complex processing for use as a fuel Expensive infrastructure, e.g. pipelines, tanks

Pros & Cons for Renewable Energy Sources

		Pros	Cons
Renewable Sources		<ul style="list-style-type: none"> • Sources are readily available in unlimited abundance. • Reduced cost of operation. • Much less polluting than non-renewable • Sustainable. 	<ul style="list-style-type: none"> • Difficult to generate the quantities of electricity as produced by fossil fuel generators.
	Solar (PV)	<ul style="list-style-type: none"> • Unit size is flexible and adaptable to many scenarios. • May be installed on roofs. • Facilities require less maintenance than traditional generators. 	<ul style="list-style-type: none"> • Requires storage to contain the energy between production and consumption. • Supply is unreliable.
	Wind	<ul style="list-style-type: none"> • One of the lowest priced renewable energy technologies per kWh • High efficiency. 	<ul style="list-style-type: none"> • Occupy large tracts of land. • Wind speed stability. • Good wind sites are often located in remote locations. • Noise and aesthetic pollution. • Interference with bird migration.
	Biomass	<ul style="list-style-type: none"> • Sustainable harvesting of readily available sources obtained through scrap of other production processes 	<ul style="list-style-type: none"> • Cost of transportation of the biomass source. • Requires control over harmful gasses released.
	Water	<ul style="list-style-type: none"> • Hydroelectric plants can produce large quantities of electricity. 	<ul style="list-style-type: none"> • Require land area for water storage reservoirs. • Dams may alter the ecosystem • Flow creates downstream erosion and sediment build-up.
	Geothermal	<ul style="list-style-type: none"> • Economical production of electricity 	<ul style="list-style-type: none"> • Sources tend to decline • Create waste sludge

Choosing energy sources

- The choice of which energy source to use depends on:
 - Where the energy is used (at home, in industry, etc.)
 - The economical cost impact.
 - Environmental impact.
 - Production of waste including carbon dioxide.
- The advantages of renewable energy are:
 - Environmentally cleaner.
 - Infinite availability (will not run out)
 - Less cost in transporting fuels.
 - Reduced dependency on fuel suppliers.
 - Energy security.

Carbon footprints

- The amount of carbon-containing greenhouse gasses (GHG) released into the environment by an activity, process, individual or group of persons.
- All activity data is to be included, e.g. distance travelled, litres of fuel used or tonnes of waste disposed
- Expressed in kg of carbon dioxide
- Usually calculated for the period of a year.
- $\text{GHG emissions} = \text{activity data} \times \text{emission conversion factor}$
- Emission conversion factors can be obtained from:
<http://www.ukconversionfactorscarbonsmart.co.uk/>

Key data for the World's 10 largest CO₂ Emitters

Country	CCPI Rank		Share of Global GDP	Share of World Population	Share of Global CO ₂ Emissions*	Share of Global Primary Energy Supply
	2015	2014				
Germany	22	22	3.44%	1.16%	2.23%	2.34%
Indonesia	23	26	2.35%	3.51%	2.31%	1.60%
India	31	36	6.72%	17.57%	5.70%	5.89%
United States	44	44	17.17%	4.47%	14.69%	16.01%
China	45	46	16.03%	19.30%	23.43%	21.76%
Brazil	49	35	3.05%	2.82%	4.17%	2.11%
Japan	53	52	4.82%	1.81%	3.61%	3.38%
Korea	55	55	1.69%	0.71%	1.75%	1.97%
Russian Federation	56	56	2.63%	2.04%	4.87%	5.66%
Canada	58	58	1.56%	0.50%	1.57%	1.88%
Total			59.45%	53.89%	64.32%	62.59%

*energy-related emissions and emissions from deforestation

© Germanwatch 2015

Performance ■ Very good ■ Good ■ Moderate ■ Poor ■ Very poor

Source: J. Burck, F. Marten, C. Bals - The Climate Change Performance Index Results 2015, Climate Action Network Europe

<https://germanwatch.org/en/download/10407.pdf>

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Pre-requisites

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Module 1

Building / Organisation Energy

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Topic 2

ENERGY TRENDS WITHIN THE EU

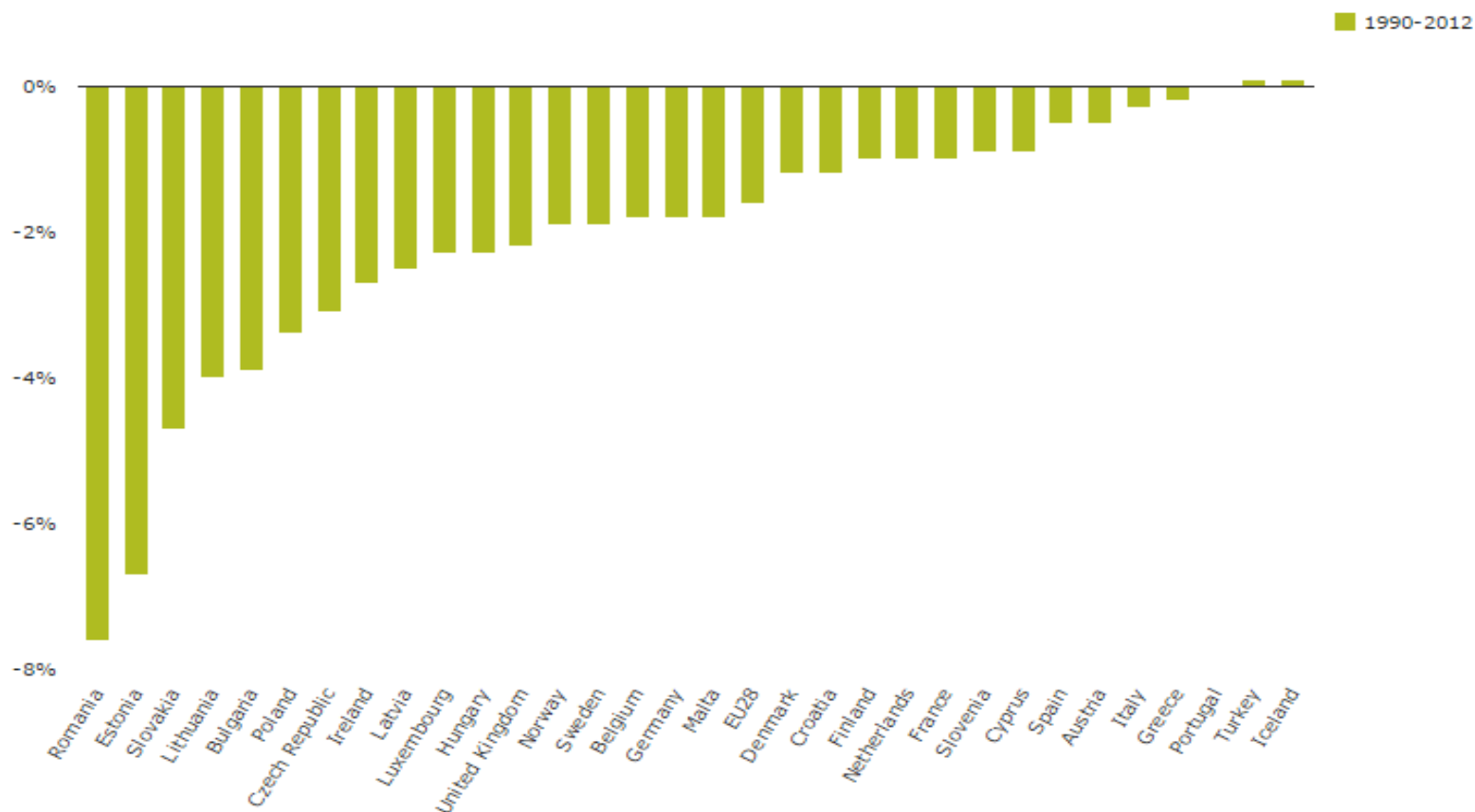
European Environment Agency indicator for final energy consumption in EU28 (ENER 021)

(Published 21 Jan 2015)

From **2000 to 2015**, the EU28 final energy intensity has decreased by 16% at an annual average rate of 2%/year.

From **2005 to 2015**, the final energy intensity decreased by 11.9% at an annual rate of 1.8%/year, showing an absolute decoupling, between economic growth and final energy consumption.

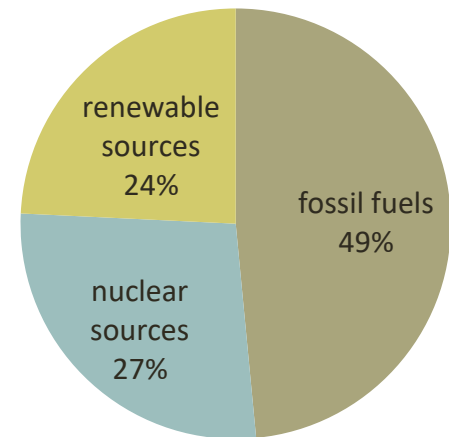
Chart — Compounded annual change rate



The European Energy System

- The EU28 is still heavily dependent on fossil fuels of which 53% are imported from non-EU countries.
- Energy sources of the total electricity generation in 2012: 48% from fossil fuels; 27% from nuclear sources; 24% from renewable sources.
- The electricity produced from renewable sources increased by 144% between 1990 and 2012 at an average annual rate of 4.1% and at a faster rate of 7.1%/year since 2005.
- In 2012, 46% of the renewable electricity generated was from hydro, 26% from wind, 19% from biomass, 9% from solar and 1% from geothermal.

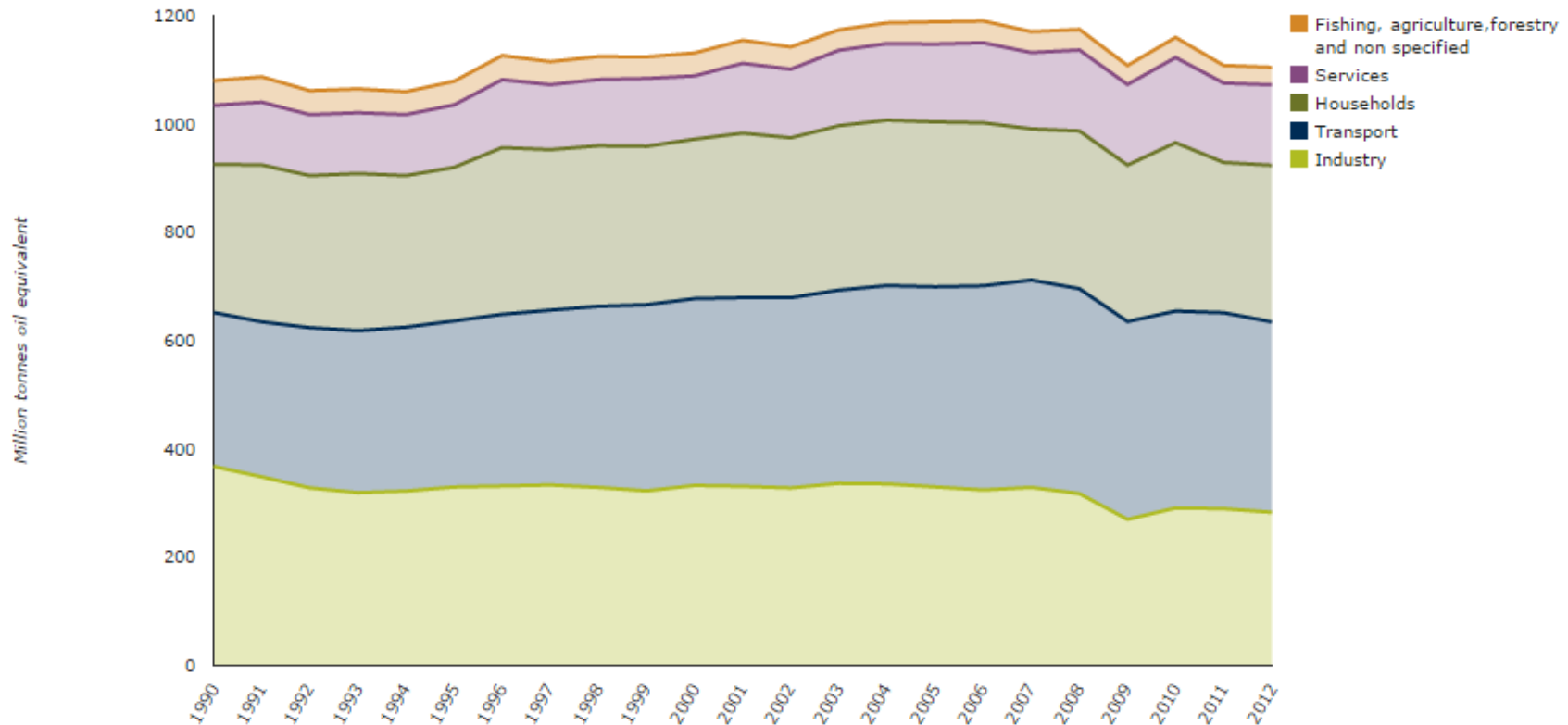
Energy sources (2012)



Final energy consumption by sector and fuel (CSI 027/ENER 016) - Assessment published Jan 2015

- 1990 to 2012 – EU28 final energy consumption increased by 2.3%
- 2005 to 2012 – EU28 final energy consumption decreased by 7.1%. The services sector is the only sector where the energy consumption increased by 3.5% over this period. Energy consumption dropped by 14% in industry, 5.1% in transport and 4% in households. The implementation of energy efficiency policies and the economic recession played an important part in the reduction of energy consumption.

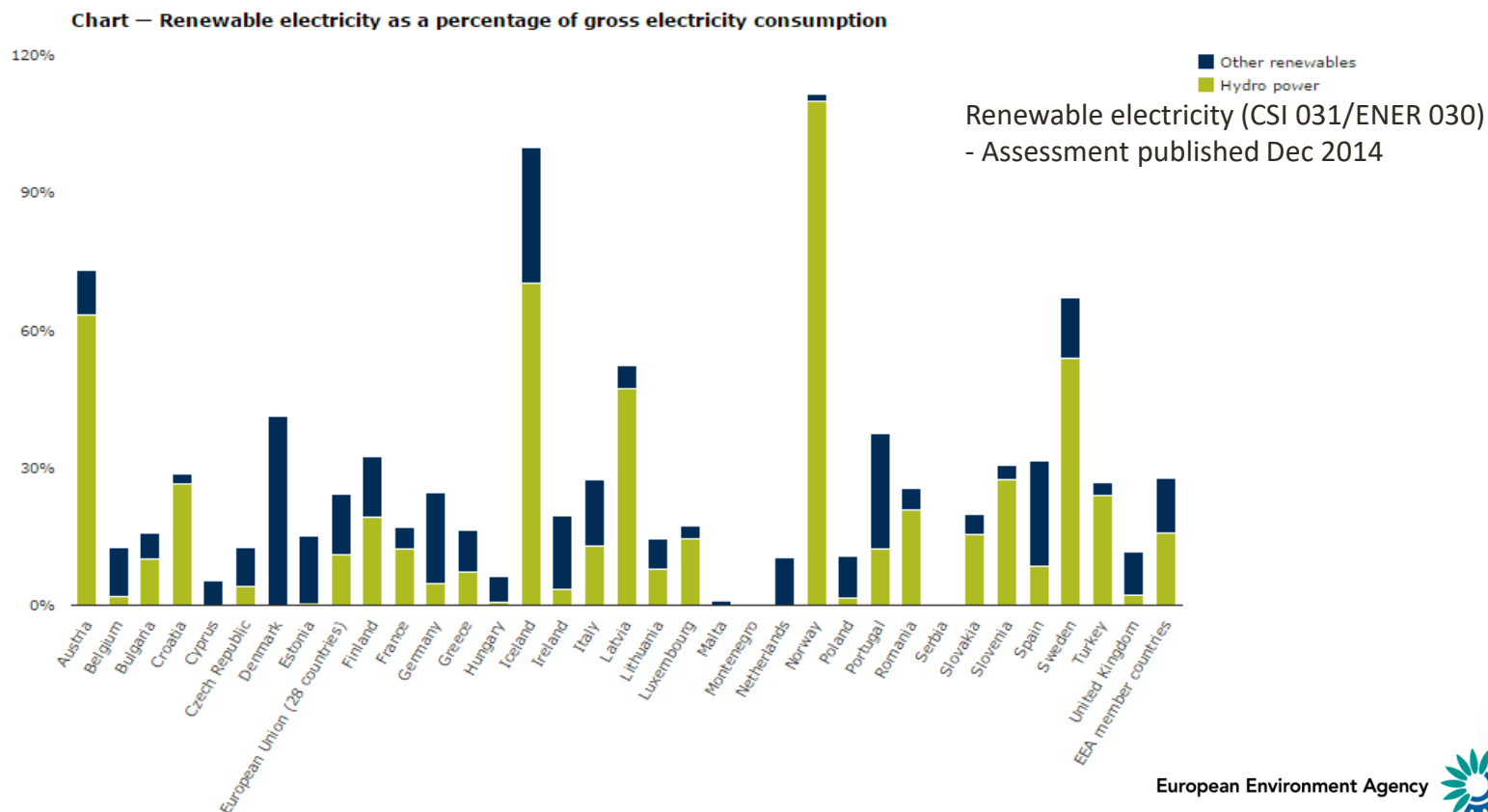
Chart – Final energy consumption by sector



Renewable Energy Use in EU28

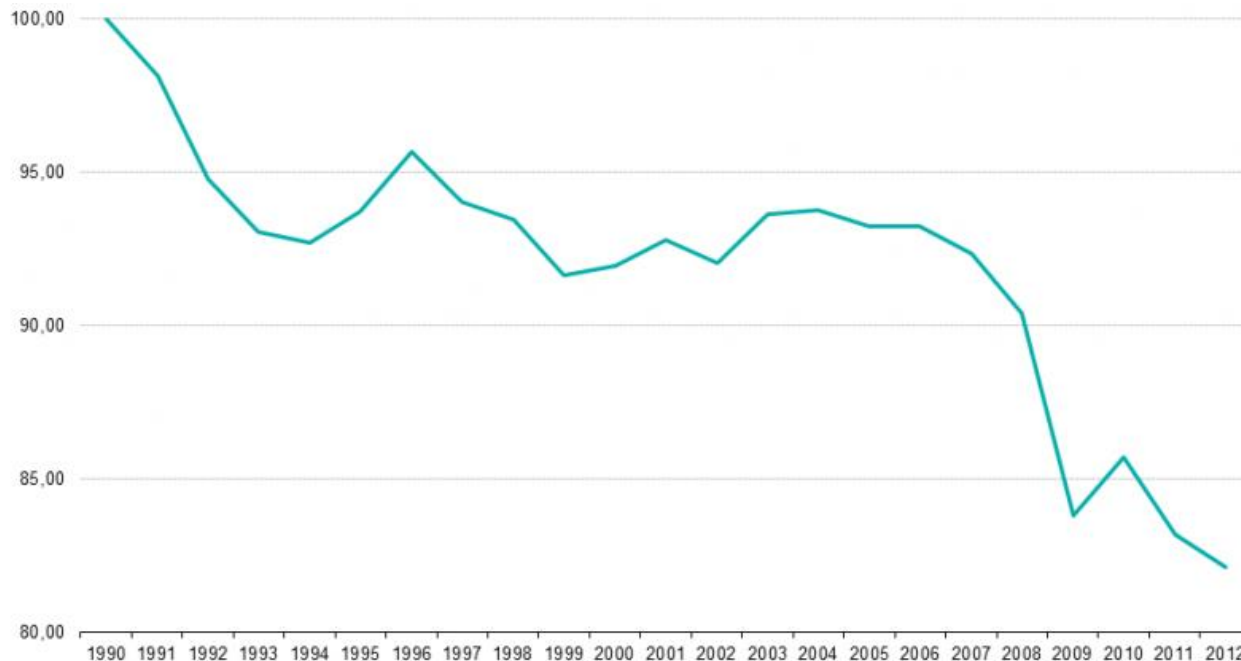
The graph shows the share of renewable electricity expressed as a ratio between electricity produced from renewable energy sources and gross national electricity consumption.

In 2012, the share of renewable electricity in gross electricity consumption in the EU28 was 24.1%. Hydropower accounted for 11% of all electricity generation, followed by wind (6%), biomass and wastes (3%), solar power (2%), and geothermal and other renewables (2%).



Greenhouse gas emissions

Greenhouse gas emissions trend, EU-28, 1990 – 2012 (Source: eurostat)

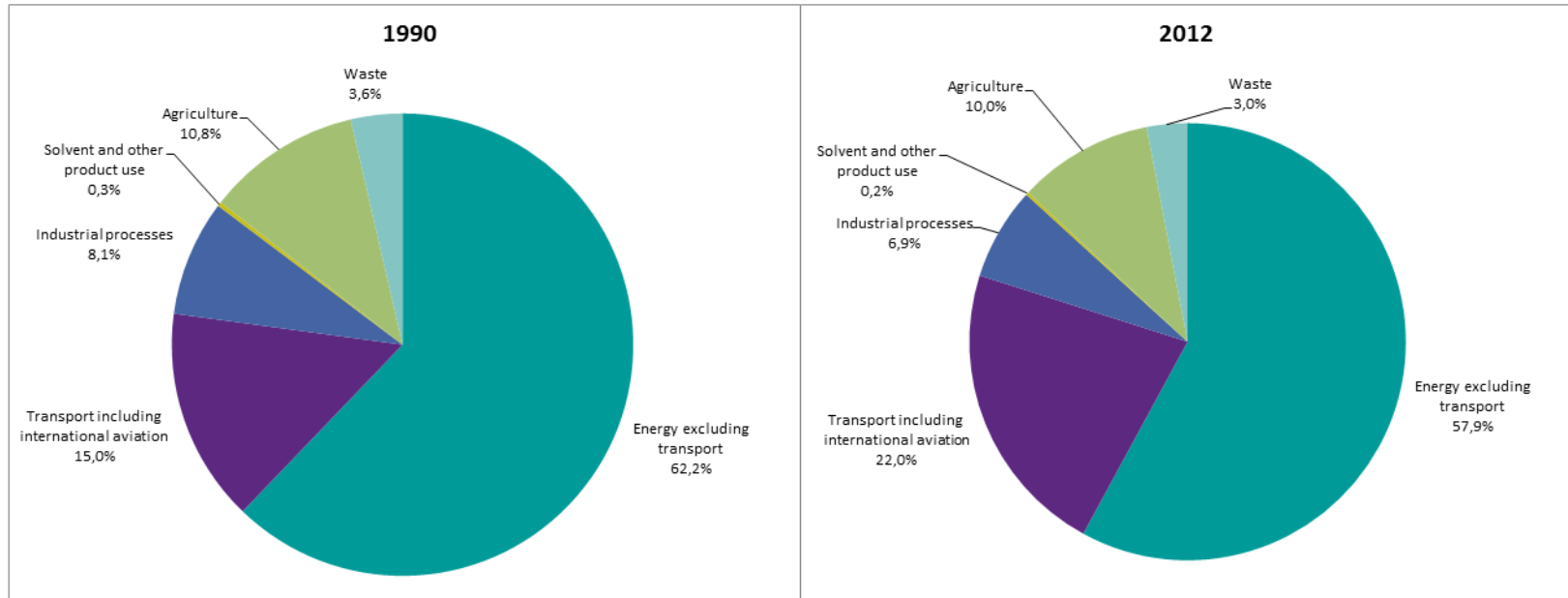


The list of Greenhouse Gasses (GHG) as defined in the Kyoto Protocol are:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur hexafluoride (SF₆)

Greenhouse gas emissions sources

Greenhouse gas emissions, analysis by source sector, 1990 and 2012 (Source: eurostat)



The European Environment Agency (EEA) compiles an annual greenhouse gas inventory report on behalf of the EU. Estimates of greenhouse gas emissions are produced for a six main sectors which are delineated in sectors primarily according to the technological source of emissions.

- energy (fuel combustion and fugitive emissions from fuels) – which also includes transport;
- industrial processes;
- solvent and other product use;
- agriculture;
- land use, land use change and forestry (LULUCF)
- waste.

Module 1: Assignment #1

Compare energy trends amongst the EU28 member states.

Topics to be covered include: energy consumption, dependency on non-renewable fuels, percentage of renewable sources, efficiency measures implemented, etc.

Use actual data to substantiate the analysis.

Expected time employed: 40 hours

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Module 1

Building / Organisation Energy

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Topic 3

EU ENERGY PRIORITIES AND ENERGY SAVING STRATEGIES

An extensive EU legal framework

Overarching

- Energy end-use efficiency and energy services Directive
- Effort Sharing Decision

Buildings

- Energy performance of buildings Directive (recast and original) 2002/91/EC and 2010/31/EU
- RES Directive
- Construction products regulation

Products

- Ecodesign Directive (recast and original)
- Energy Labelling Directive (recast and original)
- Regulation of Energy Star labelling for office equipment

Europe 2020

Europe 2020 is a 10-year strategy proposed by the European Commission on 3 March 2010 aiming at "smart, sustainable, inclusive growth" with greater coordination of national and European policy.

The strategy contains five main targets:

- To raise the **employment** rate of the population aged 20–64 from the current 69% to at least 75%.
- To achieve the target of investing 3% of GDP in R&D in particular by improving the conditions for R&D investment by the private sector, and develop a new indicator to track **innovation**.
- To reduce greenhouse gas emissions by at least 20% compared to 1990 levels or by 30% if the conditions are right, increase the share of renewable energy in final energy consumption to 20%, and achieve a 20% increase in **energy efficiency**.
- To reduce the share of early **school** leavers to 10% from the current 15% and increase the share of the population aged 30–34 having completed tertiary from 31% to at least 40%.
- To reduce the number of Europeans living below national poverty lines by 25%, lifting 20 million people out of **poverty**

http://ec.europa.eu/europe2020/index_en.htm

http://ec.europa.eu/clima/policies/package/index_en.htm



2020: Energy Efficiency policies in more detail

The EU has adopted a number of measures/policies to improve energy efficiency in Europe. They include:

- an annual reduction of 1.5% in national **energy sales**
- EU countries making energy efficient **renovations** to at least 3% of buildings owned and occupied by central governments per year
- mandatory energy efficiency **certificates** accompanying the sale and rental of buildings
- minimum energy efficiency standards and **labelling** for a variety of products such as boilers, household appliances, lighting and televisions (EcoDesign)
- the preparation of **National Energy Efficiency Action Plans** every three years by EU countries
- the planned rollout of close to 200 million **smart meters** for electricity and 45 million for gas by 2020
- large companies conducting **energy audits** at least every four years
- protecting the rights of consumers to receive easy and free access to **data** on real-time and historical energy consumption.

2020: Energy Efficiency policies in more detail

Other EU-wide measures/policies include:

- Developing and implementing the **EU Emissions Trading System**, with the ultimate aim of building an international carbon trading market, including aviation;
- Monitoring the implementation of Member States' emission reduction targets in the **sectors outside the EU ETS** ("Effort Sharing Decision");
- Implementing the legislation to raise the share of energy consumption produced by **renewable energy sources**, such as wind, solar and biomass, to 20 % by 2020;
- A target to increase Europe's energy efficiency by 20 % by 2020 by improving the energy efficiency of **buildings** and of a wide array of **equipment** and **household appliances**;
- Binding targets to reduce CO2 emissions from **new cars and vans**;
- Supporting the development of **carbon capture and storage (CCS) technologies** to trap and store CO2 emitted by power stations and other major industrial installations.

Support measures and networks

EPBD implementation support

- Concerted action EPBD
- EPB Committees

- CEN EPBD standards



Financial & fiscal instruments

- Cohesion policy funds
- ELENA
- EEE-F

- Possibilities for
- State Aid
- VAT reduced rates

- IEE programme
- Research FP
- EU CONCERTO initiative

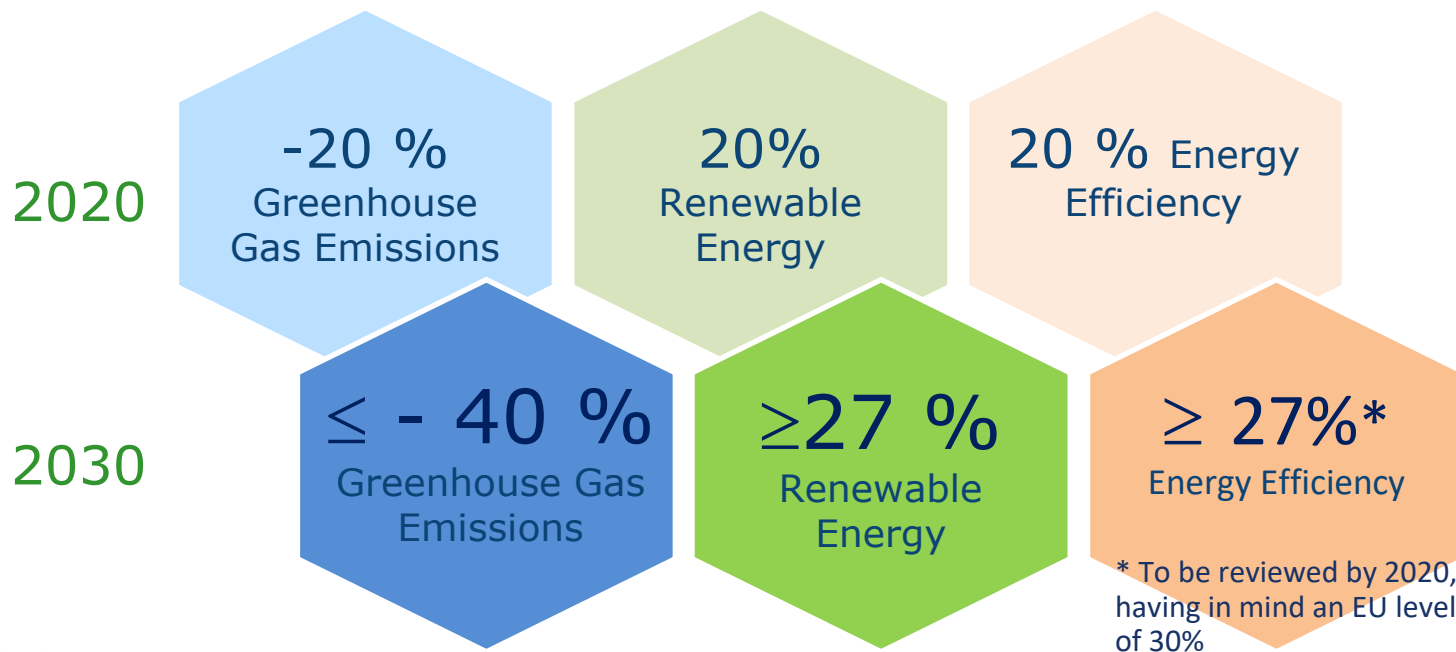
Networks



- Sustainable Energy Europe Campaign

- ManagEnergy network

2030 framework for climate and energy



The 2030 Framework for Climate & Energy: Agreed Headline Targets

- A binding EU target of **at least 40%** domestic reduction in **GHG emissions** compared to 1990, delivered collectively with reductions in
 - ETS sectors: 43% by 2030 compared to 2005
 - non-ETS sectors: 30% by 2030 compared to 2005.
- An EU-wide **binding** target of **at least 27%** for the share of **renewable energy** consumed in the EU by 2030.
- A non-binding EU target of **27% energy efficiency** improvements against future energy consumption projections; will be **reviewed by 2020**, having in mind an EU level of 30%.

Energy efficiency - Policy at EU level

- March 2010: Europe 2020: A strategy for smart, sustainable and inclusive growth – COM(2010) 2020
- Confirmation of three 20% targets for 2020
- March 2011: A Roadmap for moving to a competitive, low carbon economy in 2050 – COM(2011) 885
- Reduce GHG emissions by 80-95% by 2050 compared to 1990
- A fully decarbonised Power Sector
- January 2014: A policy framework for climate and energy in the period from 2020 to 2030 – COM(2014) 15
- Reduce GHG emissions by 40% below the 1990 level by 2030

European Energy Union with forward-looking climate change policy

- Secure, sustainable, competitive, affordable energy in **5 dimensions**:
 - security of supply
 - deeper integration of EU national energy markets
 - reducing EU energy demand
 - decarbonisation and
 - research and development
- € 315bn **Investment Package**

Module 1: Assignment #2

The EU Energy Challenge is designed to support the transition to a reliable, sustainable and competitive energy system. The Energy Challenge is structured around seven specific objectives and research areas:

- Reducing energy consumption and carbon footprint
- Low-cost, low-carbon electricity supply
- Alternative fuels and mobile energy sources
- A single, smart European electricity grid
- New knowledge and technologies
- Robust decision making and public engagement
- Market uptake of energy and ICT innovation.

Analyse and discuss the status of each member state as per EU 2020 energy efficiency priority area for Climate Change and Energy Sustainability

- **greenhouse gas emissions 20% lower than 1990**
- **20% of energy from renewables**
- **20% increase in energy efficiency**

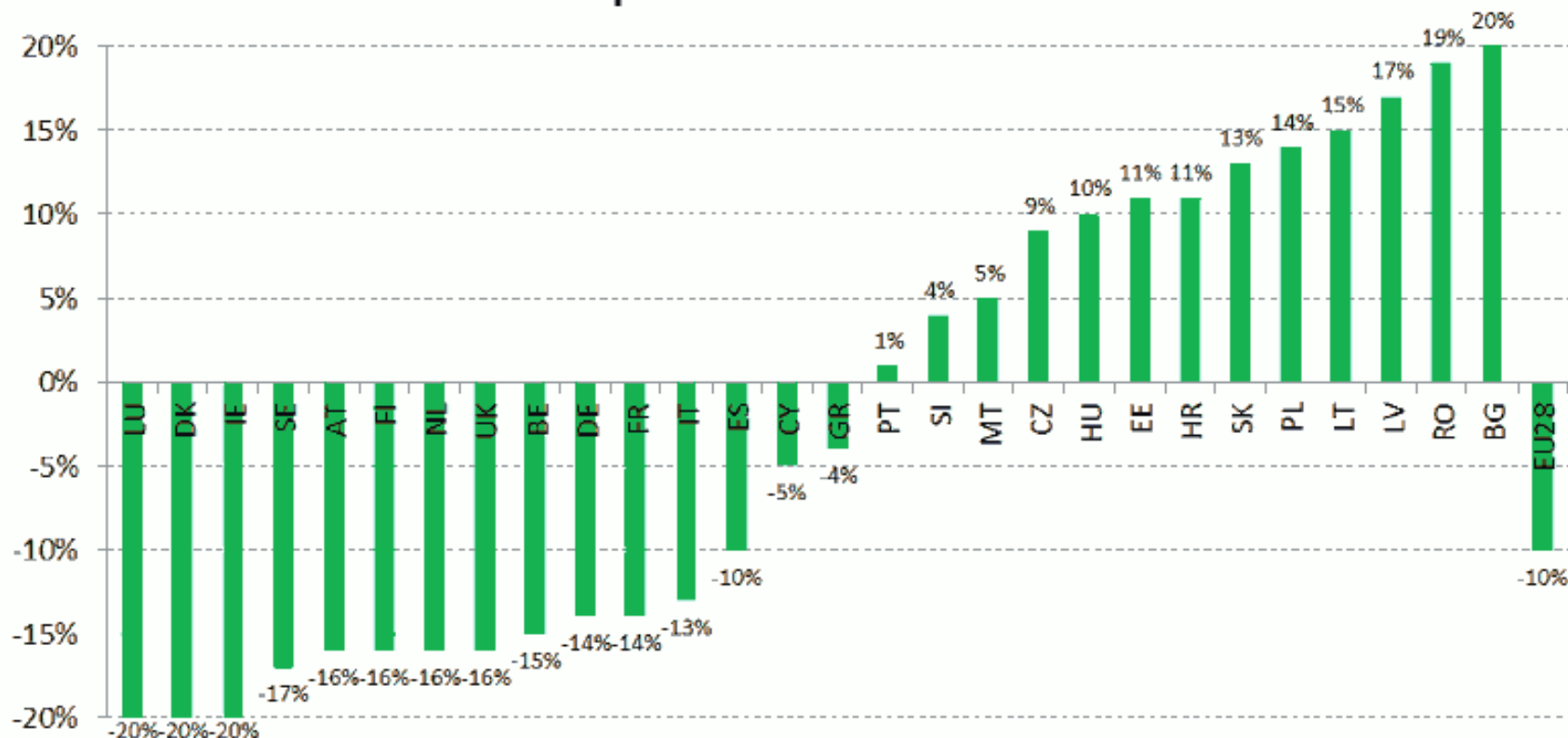
Use actual data to substantiate the analysis.

Expected time employed: 40 hours

Effort Sharing Decision

The Effort Sharing Decision sets national emission targets for 2020, expressed as percentage changes from 2005 levels. They have been set on the basis of Member States' relative wealth (measured in GDP/capita), and range from a 20% emissions reduction by 2020 (from 2005 levels) for the richest Member States to a 20% increase for the least wealthy one, Bulgaria. Croatia, which joined the EU on 1 July 2013, is allowed to increase emissions by 11%.

**Member State greenhouse gas emission limits in 2020
compared to 2005 levels**



Source: European Commission – Climate Action – Effort Sharing Decision

Module 1: Final Assignment

Identification and discussion of best practices in the EU Member States to contribute to the achievement of the objectives set by the EU 2020 within the energy efficiency priority area.

Following the analysis carried out in Assignment #2, highlight any best practices encountered for each of the energy efficiency targets, giving further detail of their performance and reasons for success. Analyse the scenario in which they are implemented and advocate whether these best practices could also be applied to other member states.

Expected time employed: 10 hours

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THANK YOU

(18)



Course Portfolio:
Applied Energy Management Systems in/for organisations
(including schools)



O2: Environmental Portfolio
Course developed by: Projects in Motion (Malta)

Project Coordinator: University of Ioannina (Greece)

Project Partners

- Helsingin Yliopisto (Finland)
- Hellenic Open University (Greece)
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 - Topic 13: Implementing an EnMS within an organisation
- Module 4 – Case Study

Who Should Attend?

This course is targeted to:

- Managers of SMEs with schools as a primary focus.
- Employees responsible for energy management
- Those interested in improving energy performance and energy efficiency
- Individuals who want to learn more about ISO 50001.
- Individuals who want to implement an ISO 50001 EMS.
- Energy managers and energy coordinators (engineers, plant managers, etc.)

Pre-requisites

- There are no formal prerequisites for this course

Module 2

Energy Standards & Directives

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Definitions

ENERGY DIRECTIVE

- Directives are legal acts.
- They require member states to achieve a particular result without dictating the means of achieving that result.
- The exact rules to be adopted are not specified by the directives.
- Member states are allowed a certain amount of leeway as to the exact rules to be adopted by means of a variety of legislative procedures.

ENERGY STANDARD

- Standards are documents providing:
 - Requirements
 - Specifications
 - Guidelines
 - Characteristicsthat can be used consistently to ensure that materials, products, processes and/or services are fit for their purpose.
- Adhering to and implementing a standard is non-obligatory

Topic 5

ENERGY DIRECTIVES

2012 Energy Efficiency Directive

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance

Directive 2012/27/EU establishes a common framework of measures for the promotion of energy efficiency within the EU in order to ensure the achievement of the 2020 20% target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.



The directive applies the minimum rules. However, member states may choose to go further in their requirements for energy efficiency.

Key measures cover:

- reduction of energy sales
- renovation of public buildings
- roadmaps for the entire building sector
- energy audits, management plans and deployment of combined heat and power generation (CHP) and public procurement

Module 2: Assignment #1

Write a report on the status of implementation for the key measures of the 2012 Energy Efficiency Directive across four Member States of your choice.

Highlight and detail at least one member state that has gone beyond the energy efficiency requirements stated by the directive.

Expected time employed: 30 hours

2010 Energy Performance of Buildings Directive

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

- Buildings are responsible for 40% of energy consumption and 36% of CO2 emissions in the EU.
- The Energy Performance of Buildings Directive specifies:
 - energy performance certificates are to be included in all **advertisements** for the sale or rental of buildings
 - EU countries must establish **inspection schemes** for heating and air conditioning systems or put in place measures with equivalent effect
 - all **new buildings** must be nearly zero energy buildings by 31 December 2020 (public buildings by 31 December 2018)
 - EU countries must set **minimum energy performance requirements** for new buildings, for the major renovation of buildings and for the replacement or retrofit of building elements (heating and cooling systems, roofs, walls, etc.)
 - EU countries have to draw up lists of **national financial measures** to improve the energy efficiency of buildings



EU Energy Labelling Directive

Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

- Energy labelling help consumers choose energy efficient products.
- Labelling requirements are detailed for individual product groups.
- The directive covers all energy-related products, except vehicles, that are placed on the EU market.



Ecodesign Directive

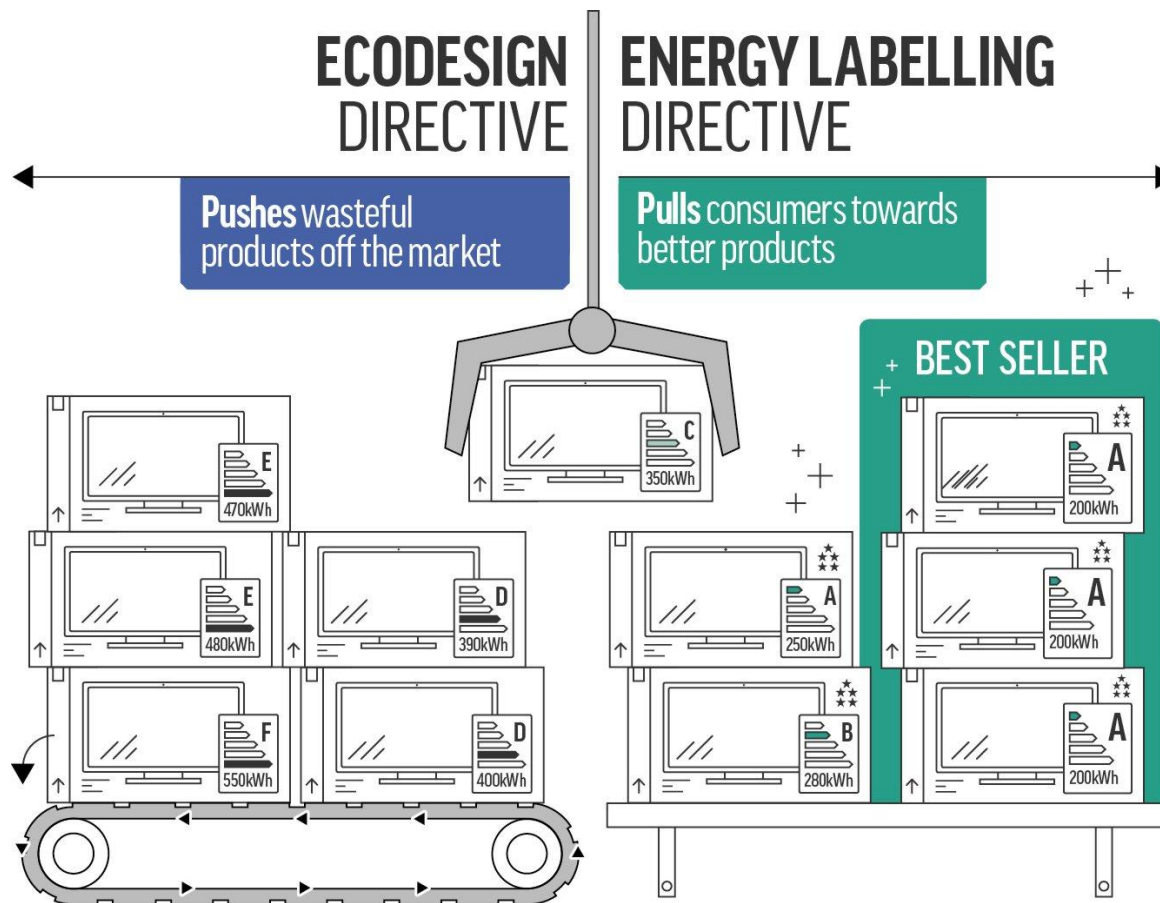
Directive 2009/125/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast)

- Ecodesign directive establishes minimum energy efficiency standards for manufacturers to decrease the energy consumption of their products.
- Standards are set at a European not National level.
- The directive includes energy-using as well as energy-related products.
- The philosophy is to design products to comply with the principles of economic, social and ecological sustainability.
- It is estimated that over 80% of all product-related environmental impacts are determined during the design phase of a product so eco-design aims to consider these aspects at an early stage.



Ecodesign & Energy Labelling

The Ecodesign and Energy Labelling Directives are complementary, as they respectively push the market and pull it towards more efficient products.



Source: www.coolproducts.eu/ecodesign-for-dummies

Renewable Energy Directive

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

- The Directive establishes as overall policy for the production and promotion of energy from renewable sources in the EU.
- Through individual national targets and national action plans the aim is to fulfil at least 20% of total energy needs with renewables by 2020.
- All EU countries must also ensure that at least 10% of transport fuels come from renewable sources by 2020.
- Progress towards meeting the national targets is measured every two years when the EU countries publish their national progress reports.



Module 2: Assignment #2

Write a report on the status of implementation for the Renewable Energy Directive across three Member States of your choice.

Identify any best practices leading to the widespread devolution of the directive.

Expected time employed: 30 hours

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THANK YOU

(15)



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Topic 6

ENERGY STANDARDS



- **ISO 9001:2008 Quality Management Systems** consists of generic requirements that are intended to be applicable to a quality management system for any organisation which:
 - needs to demonstrate its ability to consistently provide product that meets customer and applicable statutory and regulatory requirements, and
 - aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.



- **EMAS : Eco-Management and Audit Scheme*** is an environmental management tool that assists an organisation aiming to:
 - improve its environmental and financial performance, and
 - communicate its environmental achievements to stakeholders and society in general.

*The revised Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS III) entered into force on 11 January 2010.

ISO 14001:2004 – Environmental Management System is applicable to any organisation that wants to:



- establish, implement, maintain and improve an environmental management system,
- assure itself of conformity with its stated environmental policy, and to
- seek environmental conformance with other external organisations.

ISO 50001:2011 – Energy Management System provides a framework for organisations to:



- develop a policy for more efficient use of energy
- fix targets and objectives to meet the policy
- use data to understand & make decisions about energy use
- measure the results
- review how well the policy works, and
- continually improve energy management.

ISO 50001:2011 in relation to ISO 14001:2004



ISO 14001:2004

Environmental Management System

• Waste

• Water

• Emissions

• Energy

• Fuel

• Recycling



ISO 50001:2011

Energy Management System

Module 2: Final Assignment

Write a report discussing the different directives and standards presented in Module 2.

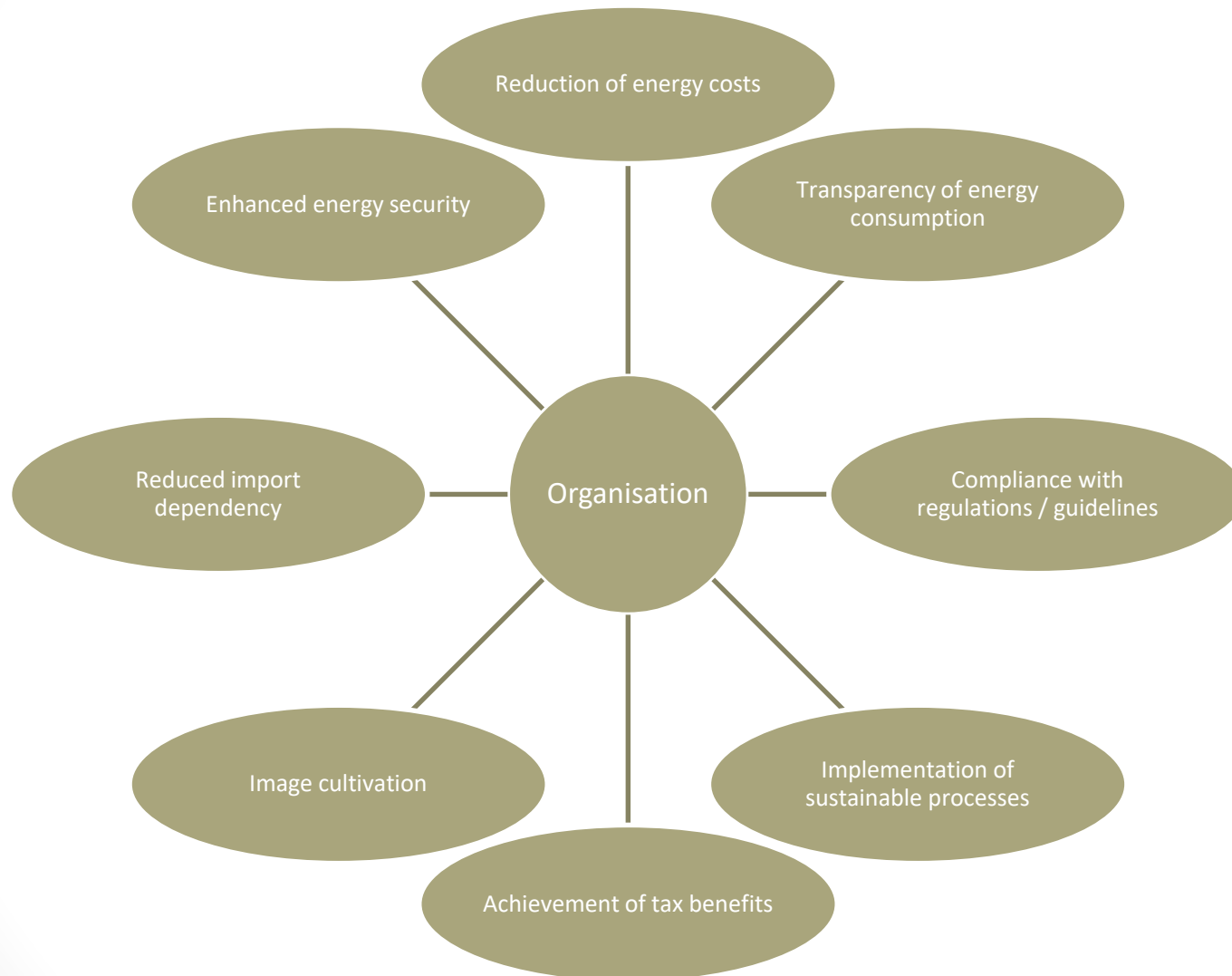
The report should cover each of their applicability, pros and cons, complementarities and differences.

Expected time employed: 30 hours

Topic 7

BENEFITS FROM ENERGY MANAGEMENT SYSTEMS IMPLEMENTATION

Benefits of implementing an EnMS



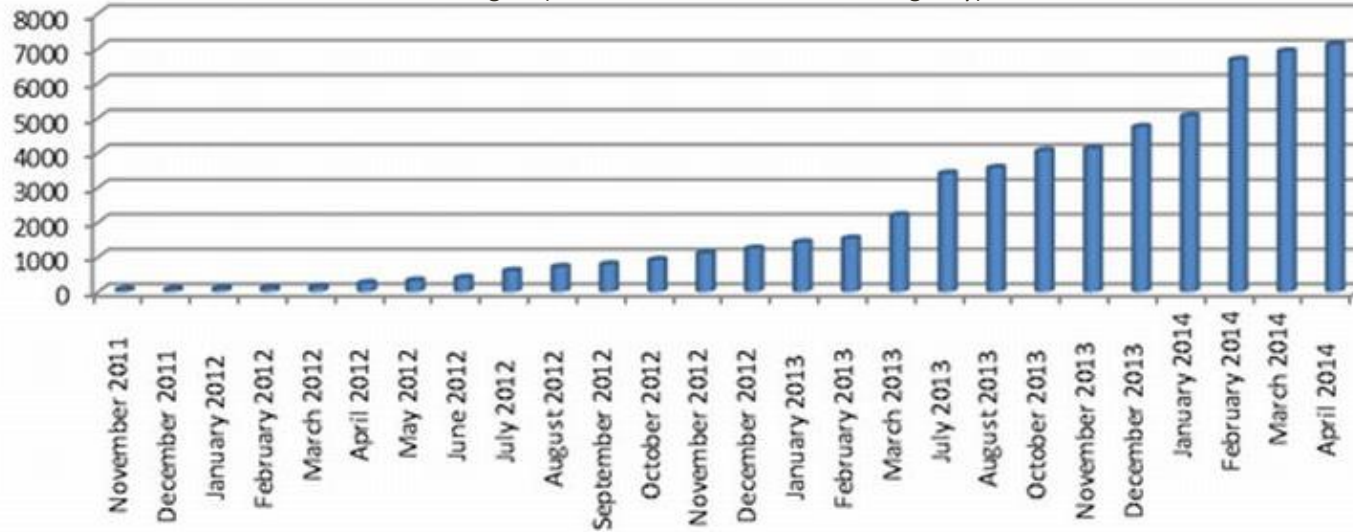
Drivers for implementing an EnMS

- Legislation (may vary by country)
- Fiscal incentives
- Reduced costs
- Customer supply chain
- Shareholders
- Public perception

ISO 50001 Uptake

Number of ISO 50001 certified sites worldwide

Source: R. Peglau (German Federal Environment Agency), 2014



ISO 50001
Certificates in
2013 = 4,826

ISO 50001
Certificates in
2012 = 2,236

Increase of
+116%

Source: ISO

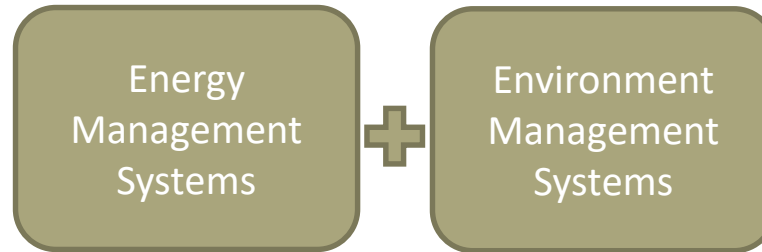
7,100 certified sites worldwide as of April 23, 2014

The number of global ISO 50001 certified sites has increased by 214% over the past year (March 2013 to March 2014).

Up to the end of December 2013, at least 4,826 ISO 50001:2011 certificates, a growth of 116% (+2,590), had been issued in 78 countries and economies, 18 more than in the previous year.

The top three countries for the total number of certificates and growth in number of certificates in 2013 were Germany, the UK, and Italy.

Integration of ISO 50001 & ISO 14001



- Why integrate ISO 50001 and ISO 14001?
 - Internal budget restrictions
 - Return-on-investment (ROI)
 - Commitment to the environment
 - Designed to be integrated
 - International recognition
 - Scope of interest

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THANK YOU

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Module 3

Energy Management Systems

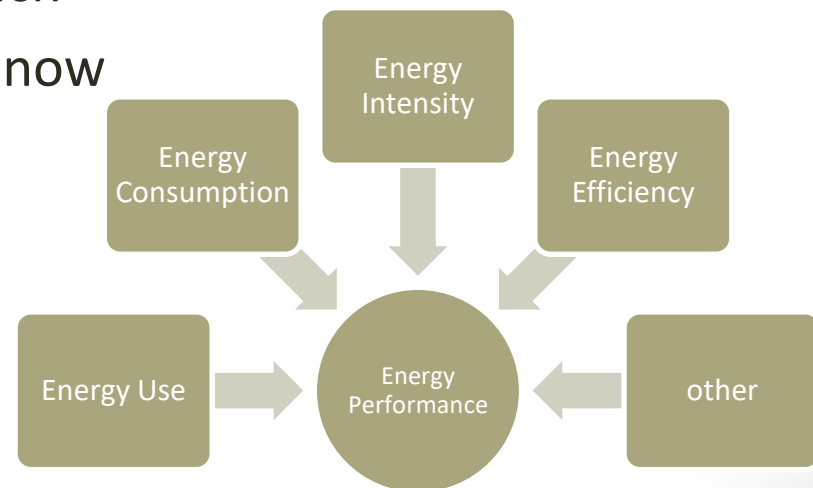
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Module 3 - Overview & Goals

- This course is based on the the ISO 50001:2011 framework and aims to empower the learner with the necessary skills to be able to:
 - design and implement an EnMS for an organisation/building
 - argue in favour of energy conservation through energy management
 - collect and interpret data of energy consumption to assess the performance characteristics of a building/organisation
 - identify and quantify opportunities to save energy
 - target those opportunities and track any energy savings
 - develop policies and structures to structure an effective EnMS.

ISO 50001 – Terms Used

- Energy – all types of energy consumed within the organisation / building
- Energy use – the how of energy use
- Energy consumption – total quantity being used
- Energy baseline – the starting point
- Energy performance indicator (EnPI) – indicator of progress
- Energy performance – how much
- Energy review – where we are now



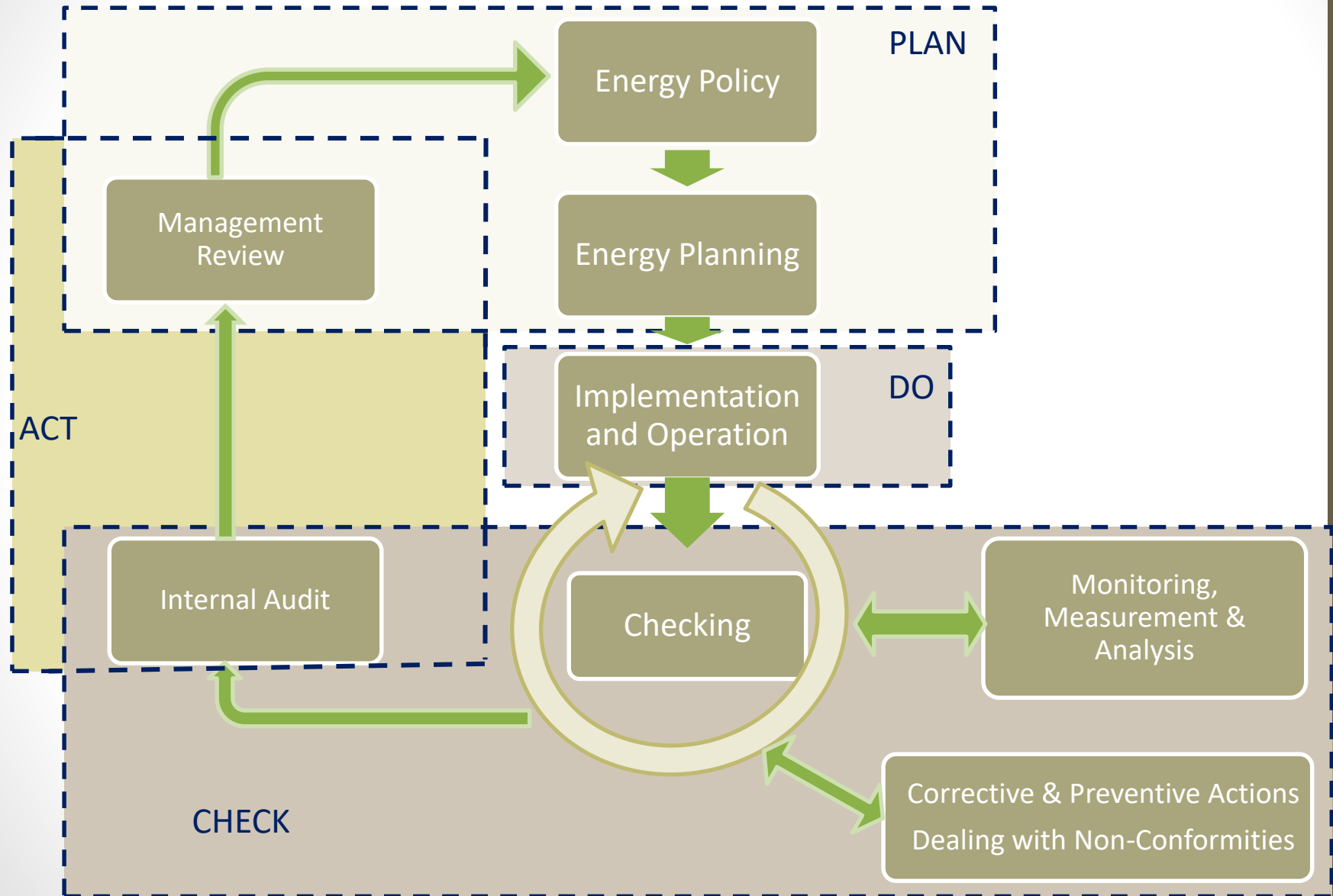
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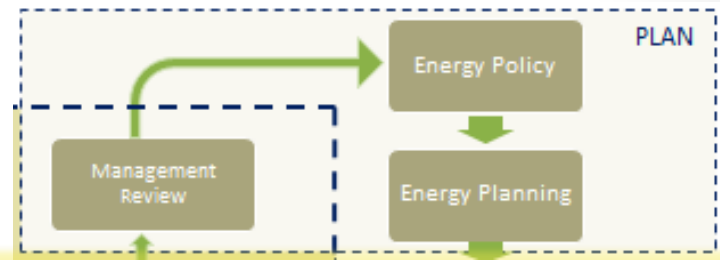
Topic 8

PLAN-DO-CHECK-ACT PROCESS

Overview of an EnMS – PDCA Process



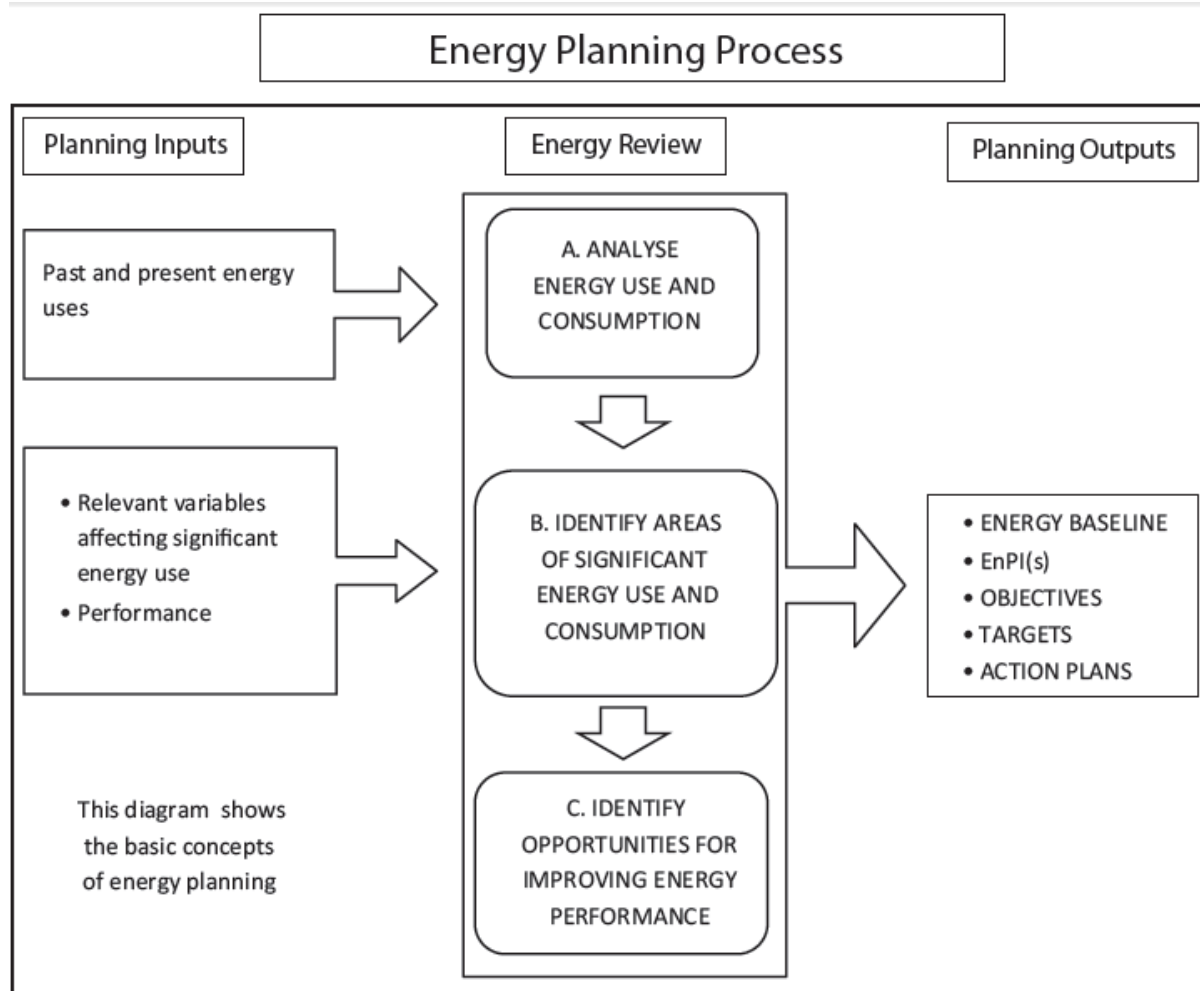
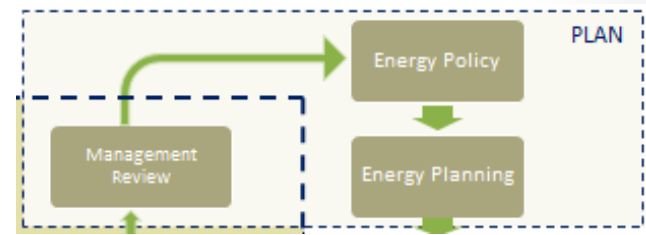
PLAN



Conduct an energy review and establish the baseline, benchmark against similar sites, set objectives and targets, develop resources and action plans necessary to deliver results in accordance with the organisation's energy policy.

- Top management must be actively involved.
- Energy team led by an energy officer must be appointed.
- Team is to decide on the energy policy that must take the form of a written statement.
- The policy must be communicated to all the organisation.
- The planning stage will identify the significant energy users and prioritise the opportunities for energy performance improvement.

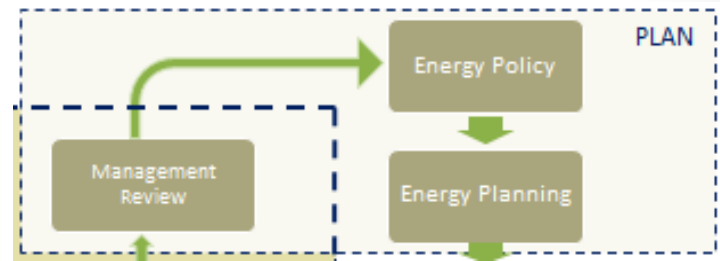
PLAN - general



Source: IS/ISO 50001:2011

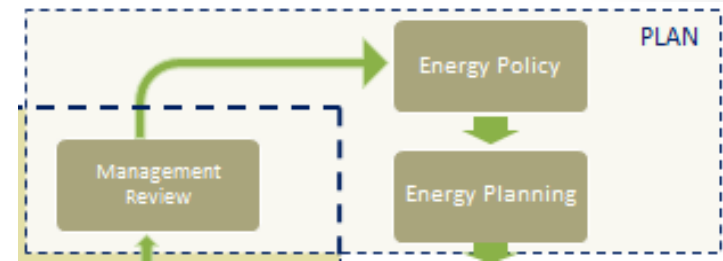
Energy planning process concept diagram

PLAN – energy policy



- The energy policy must be tailor-made to the nature and scale of the organisation's energy use and consumption patterns
- Continually improve the energy performance of the organisation.
- Legal and other requirements to be met.
- Suitable framework of energy management.
- Provide framework for purchasing and design of energy efficient products & services.

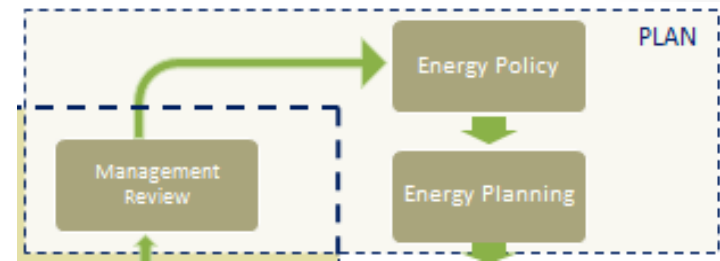
PLAN – management review



The methodology and criteria used to develop the energy review are to be documented. The review is to include:

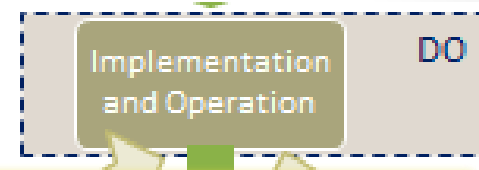
- Energy sources: past and present energy uses, energy consumption and energy sources
- Identify areas of significant energy use: facilities, equipment, systems, processes and personnel.
- Identify areas for possible improvements
- Prioritise those areas.
- Repeat the review at defined intervals.

PLAN – energy planning



- Step 1: Define the energy baseline
 - Based on management review
 - Adjust the energy baseline when needed
- Step 2: Define the EPIs
 - Allow for measuring and monitoring
 - Easy to interpret
 - Regularly reviewed in relation to the baseline
- Step 3: Define objectives and targets
 - Consistent with the energy policy
 - Inline with energy performance opportunities
 - Action plan with timeframes
 - Consistent with legal and business requirements

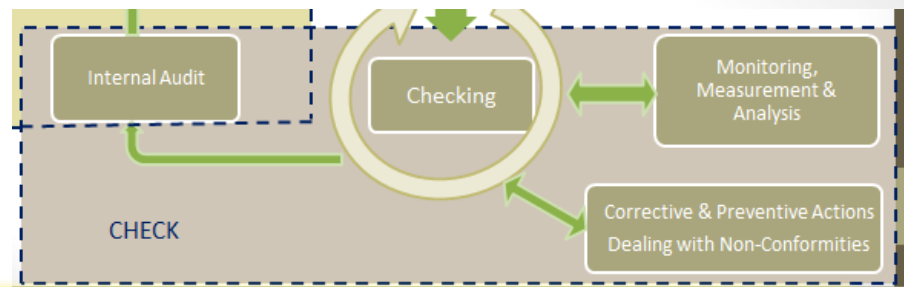
Do - Implementation and operation phase



Implement the energy management action plans.

- Resources must be made available
- Roles, responsibilities and authorities established
- All persons made aware of EnMS plans
- All persons must be capable of carrying out their roles
- Training and awareness for all involved
- Knowledge transfer framework
- Documentation and document control
- Operational control
 - Developing criteria for effective operation and maintenance
 - Operating and maintaining in accordance with criteria
 - Communicating operational controls to personnel
- Plans for emergency situations
- New designs to use EnMS as their basis
- Procurement of energy services, products, equipment and energy supply
 - Inform suppliers / establish criteria / define and document

CHECK

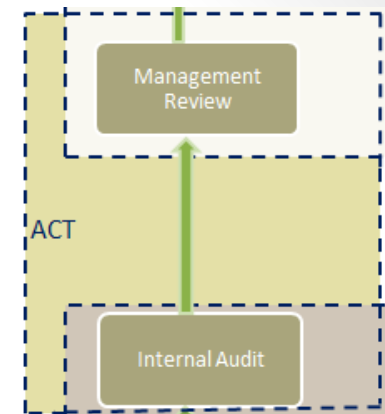


Monitor and measure processes, review the level of target achievement and the effectiveness of the EnMS against the objective of the energy policy.

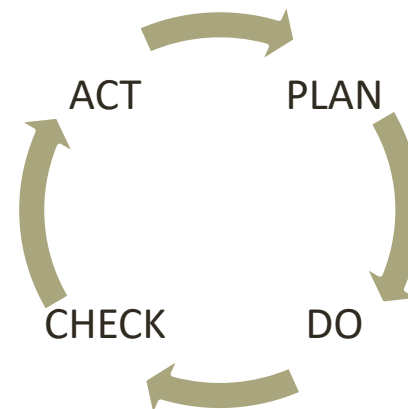
- Monitoring and measurement
 - Operating procedures
 - Calibration of measuring equipment
- Analysis: Evaluation of compliance
 - Investigate any significant deviations to the energy performance
- Dealing with non-conformities: corrective and preventive actions
- Internal audits to verify EnMS functionality and performance
- All checking activities and outputs are to be recorded and documented
- The control of documents and records is also to be performed at this stage.

ACT

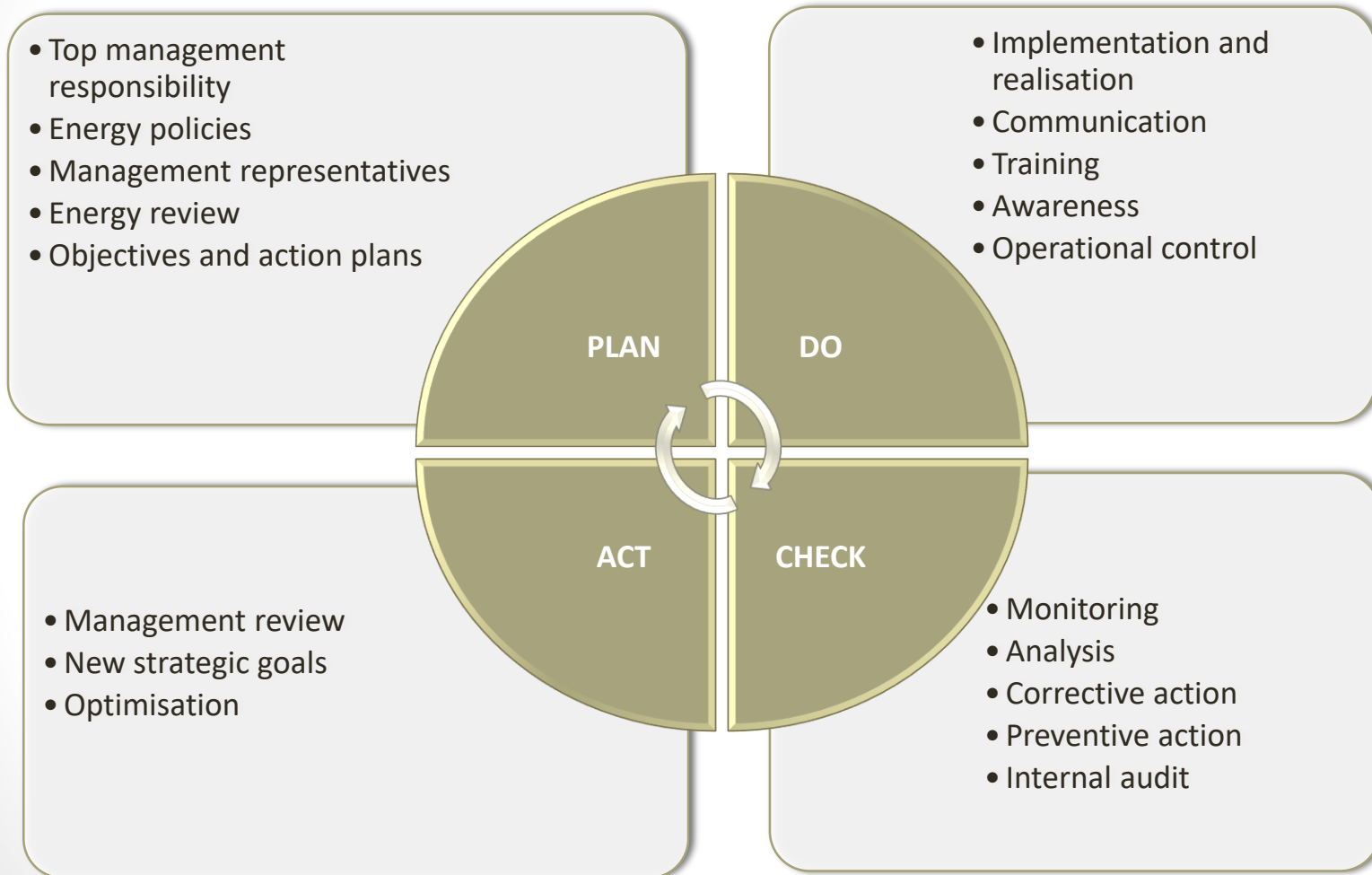
Recognise achievements, take action to continually improve energy performance and the EnMS, derive new objectives.



- Valuation report from top management
- Corrective or preventive actions initiated
- Processes optimised
- New targets/goals derived
- PDCA process starts again



Summary of the PDCA process



Module 3: Assignment #1

Describe the PDCA process for implementation of an EnMS in a generic scenario.

Expected time employed: 15 hours

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THANK YOU

(17)

Module 3

Energy Management Systems

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Topic 9

ENERGY MONITORING TECHNIQUES

You cannot manage what you cannot measure!

- Monitoring techniques provide **feedback** to the energy managers on:
 - operating practices,
 - results of EMS actions,
 - peak energy usage periods and their causes, and
 - more importantly give early warnings of unexpected excess consumptions caused by equipment malfunctions, operator errors, unwanted behaviours, lack of maintenance, etc.
- Each organisation should ensure that all **key characteristics** of its operation are monitored, measured and analysed at planned intervals. The key areas to cover include minimally:
 - Significant energy users and other outputs of the energy review
 - Relevant variables related to significant energy uses
 - EnPIs
- The availability of monitoring data will allow for:
 - Checking the effectiveness of the action plans in achieving objectives and targets
 - Evaluation of actual versus expected energy consumption

Monitoring – important points

- Recording of data: All monitoring and measurement results for the key characteristics are to be recorded.
- Energy measurement plan defined and implemented.
- Measuring equipment are various and wide-ranging in outputs and complexity.
- Continually review the measurement plan.
- Equipment certified to provide accurate and repeatable data.
- Calibration records to be filed.
- Immediate investigation and response to significant deviations in the energy performance.

Monitoring – compliance & auditing

Monitoring does not only refer to the actual data monitoring of the energy consumers but also includes:

- Evaluation of **compliance** with legal and other requirements
- **Internal auditing** of the EnMS, checking for:
 - Conformity to EnMS plans
 - Conformity to energy objectives and targets
 - Implementation and maintenance of the EnMS
 - Improvements to the energy performance

Topic 10

ENERGY PLANNING FOR REDUCING CONSUMPTION

Tips for Effective Energy Planning

- Operational control of significant energy uses
 - Criteria for effective operation and maintenance
 - Operation and maintenance in accordance with criteria
 - Communication to all personnel involved
- New Designs
 - Including energy performance improvement opportunities in design operations.
- Procurement
 - Establish criteria for evaluation of procurement of energy services, products and equipment.
- Dealing with non-conformities

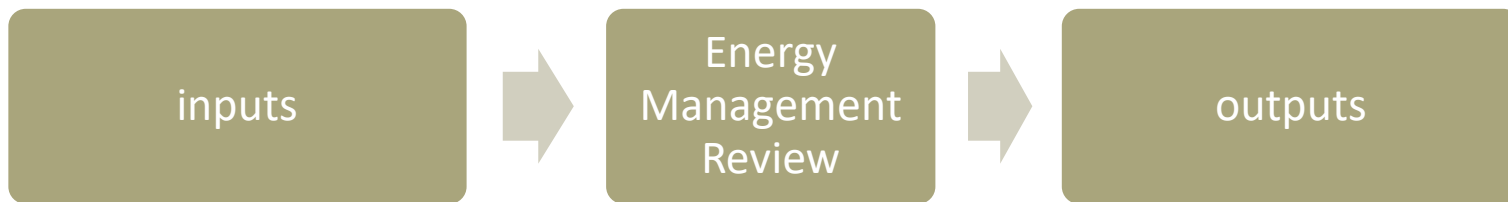
Energy Management Plan

The most effective energy management action plans are comprised of 8 essential components:

1. Measure energy usage
2. Energy use profile
3. GHG emissions inventory
4. Teams & leadership
5. Targets & goals
6. Implementation
7. Track, measure and report
8. Train, educate and celebrate

Management Review

The energy management review is to be done at planned intervals, involving all the energy team to ensure suitability, adequacy and effectiveness of the energy management plan.



- Follow-up on actions from previous review
- Review of the energy policy
- Review of energy performance and EnPIs
- Evaluation results
- Status to meet objectives and targets
- EnMS audit results
- Status of corrective and preventive actions
- Projected energy performance for the next period
- Recommendations for improvement

- Changes to the energy performance
- Changes to the energy policy
- Changes to the EnPIs
- Changes to objectives & targets
- Changes to allocation of resources

Topic 11

ENERGY MANAGEMENT DOCUMENTATION SKILLS

ISO 50001 documentation required

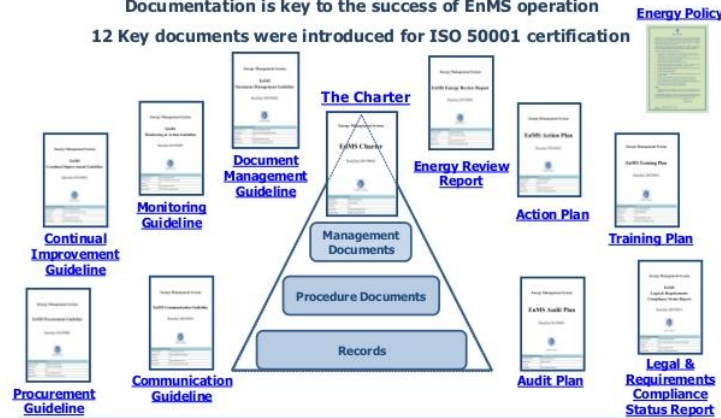
If it isn't documented, it didn't happen.



Summary of Documentation

Documentation is key to the success of EnMS operation

12 Key documents were introduced for ISO 50001 certification



"EnMS Charter" Guidebook +t (EnMS-Charter-M01E)

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Energy Policy

Energy Policy



- Contents: Statement of the organisation's commitment to achieving improve in energy performance
- Aim: To commit the organisation to achieving broadly stated operational and performance goals and objectives for its EnMS while defining the means for doing so.

http://www.energyimprovement.org/tools/2_Plan/2.1/FacilityEnergyPolicy-Example.pdf

- The Energy Policy document is to be communicated throughout the organisation.
- The Energy Policy must also conform to ISO 9001 & 14001 standards assuming they are implemented within the organisation.
- The Energy Policy must also be in line with federal, state and local requirements, private sector professional standards and guides respecting environmental, safety and health requirements.
- The Energy Policy must meet eight criteria defined in the ISO 50001 standard:
 1. Policy appropriate to energy use.
 2. Commitment to energy performance improvement.
 3. Commitment to ensure availability of information and resources.
 4. Commitment to comply with requirements.
 5. Provide framework for setting and reviewing energy targets & objectives.
 6. Support energy efficiency in products, services and designs.
 7. Ensure all EnMS documentation is regularly reviewed and updated.
 8. Policy is communicated, documented and understood within organisation.

EnMS Charter

Functions: of the energy management representative(s), the energy management team, their roles and responsibilities and the management reporting mechanism.

Aim: To provide the formal structure, resources and actions by which energy performance can be improved.

- **The EnMS Charter should include:**
 - Scope and boundaries of the EnMS
 - Roles, responsibilities, accountabilities and authorities of all the members of the energy team
 - Operation control methods
 - Energy policy for the organisation
 - Competence, training and awareness procedures
 - Document management requirements
 - Management review procedures



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- 3. Structure & Organisation**
- 4. Guideline & Provisions**
 - 4.1 General Requirements**
 - 4.2 Management Commitments**
 - 4.3 Energy Policy**
 - 4.4 EnMS Action Plan**
 - 4.5 Implementation and Operation**
 - 4.6 Checking Performance**
 - 4.7 Management Review**
- 5. EnMS Operational Management Guideline Supplements**

Document Management Guideline



Document
Management
Guideline

Contents: Procedures for document control.

Aim: To maintain the documents considered necessary for ensuring planning, operation and control of the EnMS.

- Although ISO 50001 requires specific documents, the organisation may also value other documents as being necessary too.
- Documents pertaining to the EnMS include:
 - Documents that provide information, both internally and externally, about the EnMS
 - Energy plans that describe how the EnMS is specifically applied to the organisation
 - Specification documents that state requirements
 - Guideline documents that provide recommendations for improving energy performance
 - Requirement documents that provide information about how to perform activities and processes consistently.
 - Records that provide objective evidence of activities performed or energy results achieved.
- Documentation procedures to be defined include:
 - Approval of documents before initial publication
 - Periodic review and updating
 - Identify changes and correct revisions
 - Ensure that relevant document versions are available where needed
 - Ensure that documents are legible and readily identifiable
 - Control of external documents
 - Prevent the unintended use of obsolete documents

Energy Review Report



Energy Review Report

- Contents:** A methodology and criteria for the energy review activity that is documented and uses readily available data, e.g. energy costs, major equipment list and their condition, etc.
- Aim:** To target opportunities to be developed in later planning stages such as energy technologies and source substitutions, including renewables, electronic control applications, material substitutions, and replacement of selective system components and logistical considerations.
- The Energy Review serves to provide the energy planning process with a good sense of target opportunities for energy reduction.
 - It provides inputs to guide the energy baseline and selection of EnPIs.
 - The review must be done by qualified energy engineering auditors.
 - The contents of the report should include:
 - Planning for review operations.
 - Identification of any data gaps to be addressed.
 - Statements of strategic purpose and direction to guide the implementation of the Energy Policy.
 - Steps to be followed to produce the performance evidence.
 - Clear statements of management expectations for validating and recording performance documented by a schedule of progress reports to management.

Action Plan



Contents: A methodology and criteria for the energy review activity that is documented and uses readily available data, e.g. energy costs, major equipment list and their condition, etc.

Aim: To target opportunities to be developed in later planning stages such as energy technologies and source substitutions, including renewables, electronic control applications, material substitutions, and replacement of selective system components and logistical considerations.

- The planning process must be grounded on the realities of the system environment that it seeks to alter. A realistic plan is more likely to be successful.
- All plans must be in line with the Energy Policy.
- Evidence supporting the planning process is required.
- The energy management action plans shall include:
 - Designation of responsibilities
 - Means and timeframes by when individual targets will be achieved
 - Statements of the methods by which improvements in energy performance are verified
 - Statements of the methods of verifying the results of the action plan.

Training Plan



Contents: Training plans for proper EnMS operation by all employees.

Aim: Aims are to:

- Ensure any person(s) whose work is related to significant energy uses are competent on the basis of appropriate education, training, skills, or experience.
 - Identify training needs associated with the control of its significant energy uses and the operation of its EnMS.
 - Provide training or take other actions to meet these needs.
 - Maintain associated records.
- Persons requiring training can be split into groups:
 - Management level
 - Energy management team
 - All persons working in the boundaries
 - All persons working for the organisation
 - All persons working on the organisation's behalf
 - Others
 - The training should include:
 - Awareness of the importance of conformity with the energy policy, procedures and with the requirements of the EnMS
 - roles, responsibilities and authorities in achieving the EnMS requirements
 - the benefits of improved energy performance
 - the impact, actual or potential, with respect to energy consumption, of the learners activities and how their activities and behaviour contribute to the achievement of energy objectives and targets, and the potential consequences of departure from specified procedures

Audit Plan



The **Content** objectives and coverage also assigning responsibility and ensuring that necessary resources are available.

To **define** the plan, scope and execution of the internal audits performed by the organisation.

- The term “internal” audit means that they are done internally within the organisation. They may be performed by employees as well as by independent auditors.
- Staff should not audit their own work, processes or areas for which they are responsible.
- An audit program manager is appointed. Responsibilities include scheduling audits, evaluating auditors, selecting audit teams, directing audit activities and maintaining records.
- When auditing an EnMS, the auditor asks the following questions in relation to each process:
 - Is the process identified and appropriately defined?
 - Are roles, responsibilities, authorities, and accountabilities assigned?
 - Are the procedures being implemented and maintained?
 - Is the process effective in achieving the organization’s desired results?

Monitoring Guideline



Contents
Requirements and methodology for checking the performance of the EnMS within the organisation.

Aim:
To ensure that the key characteristics of the organisation's operation determining energy performance are monitored, measured and analysed at planned intervals.

- The key characteristics to be monitored include, at a minimum:
 - The outputs of the energy review
 - Significant energy uses
 - Relationship between significant energy use and consumption
 - Energy performance indicators (EnPIs)
 - Effectiveness of the action plans in achieving objectives and targets
- Equipment used for monitoring and measuring should provide data which is accurate and reliable. Calibration records are to be maintained.
- The organisation shall also monitor compliance with legal and other requirements at planned intervals.

Communication Guideline

Guideline for internal and external communications.

Aim: To promote awareness of the energy policy and objectives at all levels of the organisation via structured communication controls and procedures.



- The communication guideline should discuss the following elements:
 - Background of the energy-related communication
 - Purpose of communicating energy performance and the EnMS
 - Assessment of the organisation's communications culture
 - Stakeholders for improving energy performance
 - Goals and objectives of energy performance-improvement activities
 - Audiences to receive messages
 - Key messages to be communicated
 - Communication channels within the organisation
 - Communication products to be developed
 - Communication activities to be implemented
 - Evaluation of communication effectiveness
- One output of the communication plan is a communications package that includes:
 - Communications responsibilities
 - Overview of the organization's energy performance
 - Energy improvement snapshot and briefing notes
 - Improvement summary and schedule
 - Questions and answers
 - Answer the question, "What does this mean to me?"
 - Specific actions required from personnel

Continual Improvement Guideline



Continual
Improvement
Guideline

Contents:

Procedures for dealing with actual and potential nonconformities, corrections, taking corrective action, and taking preventive

Aim:

Capability to identify and eliminate a nonconformity and its cause and eliminate the cause of problems that could potentially occur.

- Definitions:
 - Corrective action: to ensure that a problem does not occur again
 - Preventive action: to prevent non-conformities from occurring
 - Root-cause analysis: to determine the cause of an incident or non-compliance
 - Non-conformance: a deviation from the EnMS requirements
 - Non-compliance: a deviation from government laws or regulations
- The guidelines should include clear, written instructions on how to deal with actual and potential problems.
 - reviewing nonconformities or potential nonconformities
 - determining the causes of nonconformities or potential nonconformities, e.g. through Failure Mode and Effects Analysis (FMEA)
 - evaluating the need for action to ensure that nonconformities do not occur or reoccur
 - determining and implementing the appropriate action needed
 - maintaining records of corrective and preventive actions
 - reviewing the effectiveness of the corrective or preventive action taken
- All corrective and preventive actions are to be documented.

Procurement Guideline



**Procurement
Guideline**

Contents: Guidelines for procurement evaluation on the basis of performance for services, products and equipment.

Aim: To inform prospective suppliers about energy-related purchasing criteria.

- Procurement of energy services, products and equipment represents an opportunity to directly improve energy performance through the use of more energy-efficient products and services.
- It also promotes partner relationships with the supply chain and influences their energy behaviours.
- The Procurement Guidelines should include criteria for energy procurement as well as product, service and equipment procurement.
- The guidelines also include criteria for assessing energy use over the planned or expected operating lifetime of energy-using products, equipment and services.
- The guidelines should also include contingency and emergency planning for potential disasters relating to equipment to ensure the availability of the needed energy or replacement of equipment. Benefits of the contingency planning include:
 - Minimised business interruption, downtime.
 - Minimised financial impact of the interruption to operation.
 - Increased job security, improved productivity.
 - Increased ability to avoid business interruptions.
 - Improved organisational resilience to adverse conditions.

Legal & Regulatory Compliance Status



Legal & Requirements Compliance Status Report

Contents
The context for evaluating compliance with legal and other requirements to which the organisation subscribes and that are relevant to energy use.

Aim
To monitor progress against planned milestones and avoid violations of laws and regulations, as well as lawsuits.

- Ensure that applicable milestones related to legal and other requirements are included in the management of objectives, targets and action plans.
- Identify applicable legal and other requirements to which the organisation subscribes
- Compliance is to be checked at regular, planned intervals.
- Records of compliance are to be kept.
- Significant deviations from planned performance expectations are highlighted to the management team.

Topic 12

ENERGY EFFICIENCY KNOWLEDGE TRANSFER FRAMEWORK

The Knowledge Transfer Framework Concept

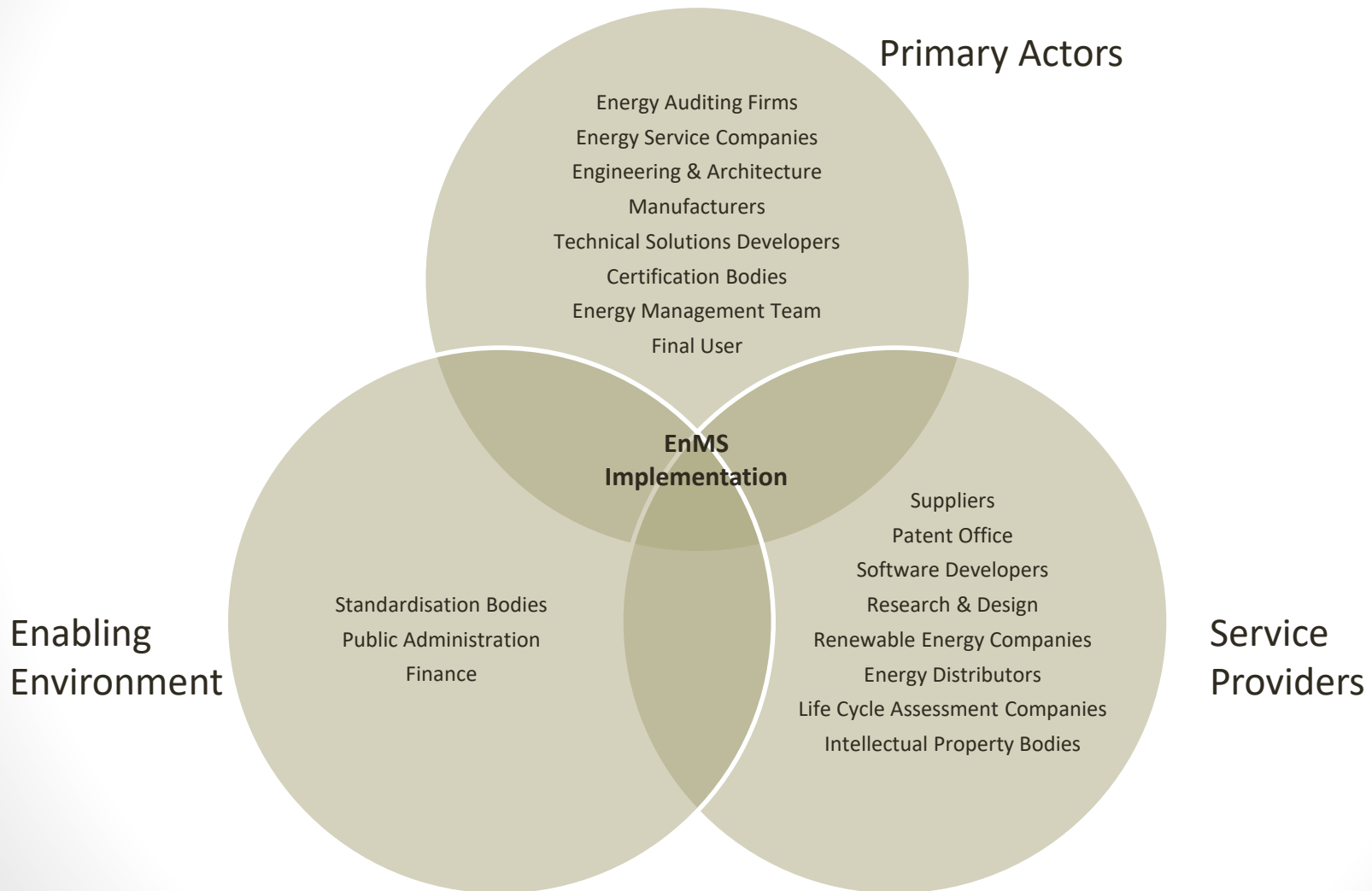
- The Knowledge Transfer Framework (KTF) is a conceptual framework showing the translation of knowledge into action.
- The KTF describes the complete set of processes and activities required from concept to design and implementation.
- It includes all the primary activities as well as the interacting and supporting channels that are able to influence the task at hand.
- Components of the framework are:
 - the primary actors
 - the enabling environment
 - the service providers

KTF Key Players in the EnMS Scenario

Example of key players categorised into groups:

- Public Administration
 - National authorities
 - Regional authorities
 - Local authorities
- Finance
 - Banks
 - Financial Agents
 - Promoters
 - Subsidisers
- Energy Auditing Firms
- Energy Service Companies
- Energy Distributors
- Renewable Energy Companies
- Energy Management Team
- Final Users
- Engineering & Architecture
- Research & Design
 - In-house design department
 - Universities, external sources
- Technical Solutions Developers
- Manufacturers / Suppliers
- Software Developers
- Standardisation Bodies
- Certification Bodies
- Life Cycle Assessment Companies
- Intellectual Property Bodies
- Patent Offices

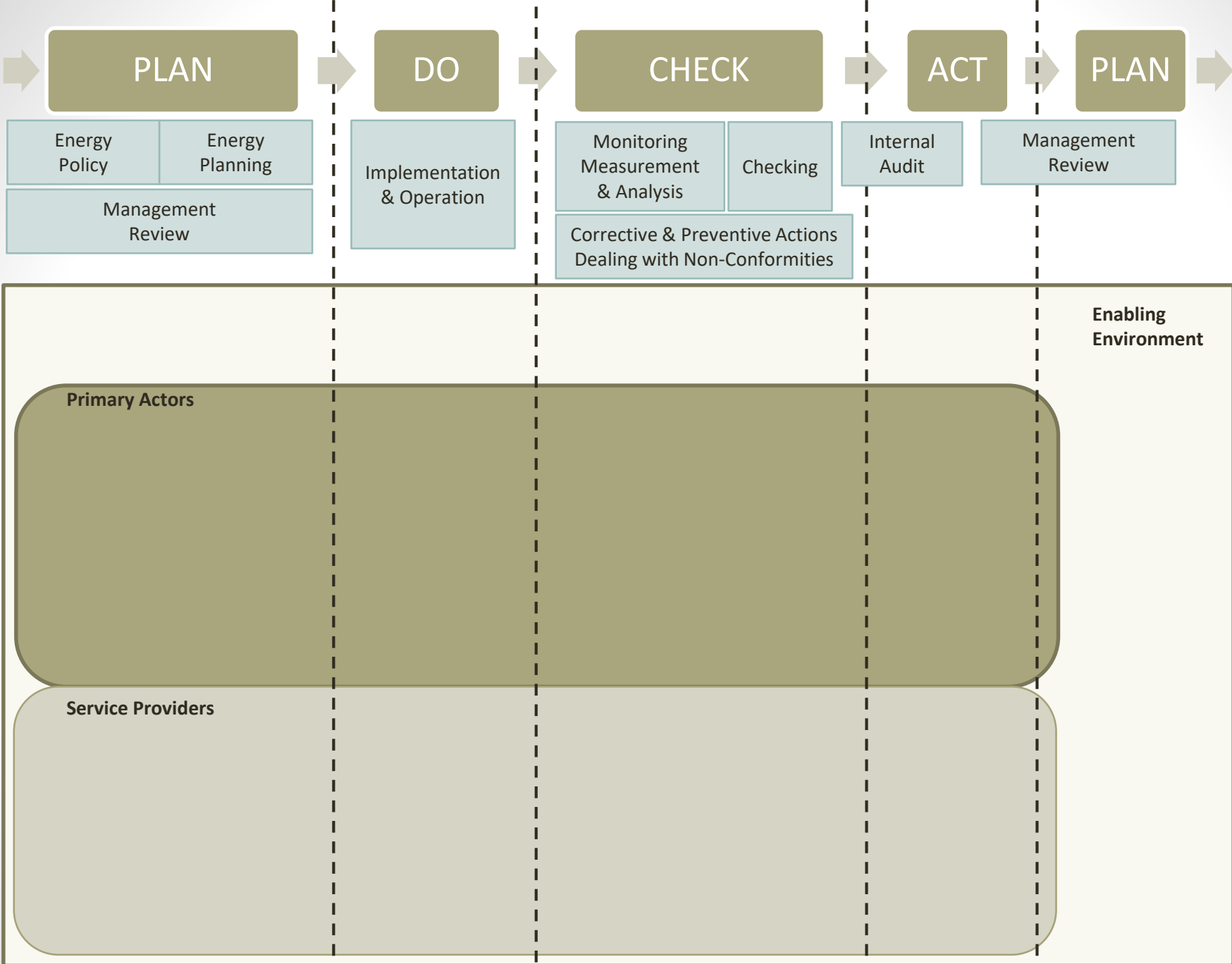
Interactions between the KTF players

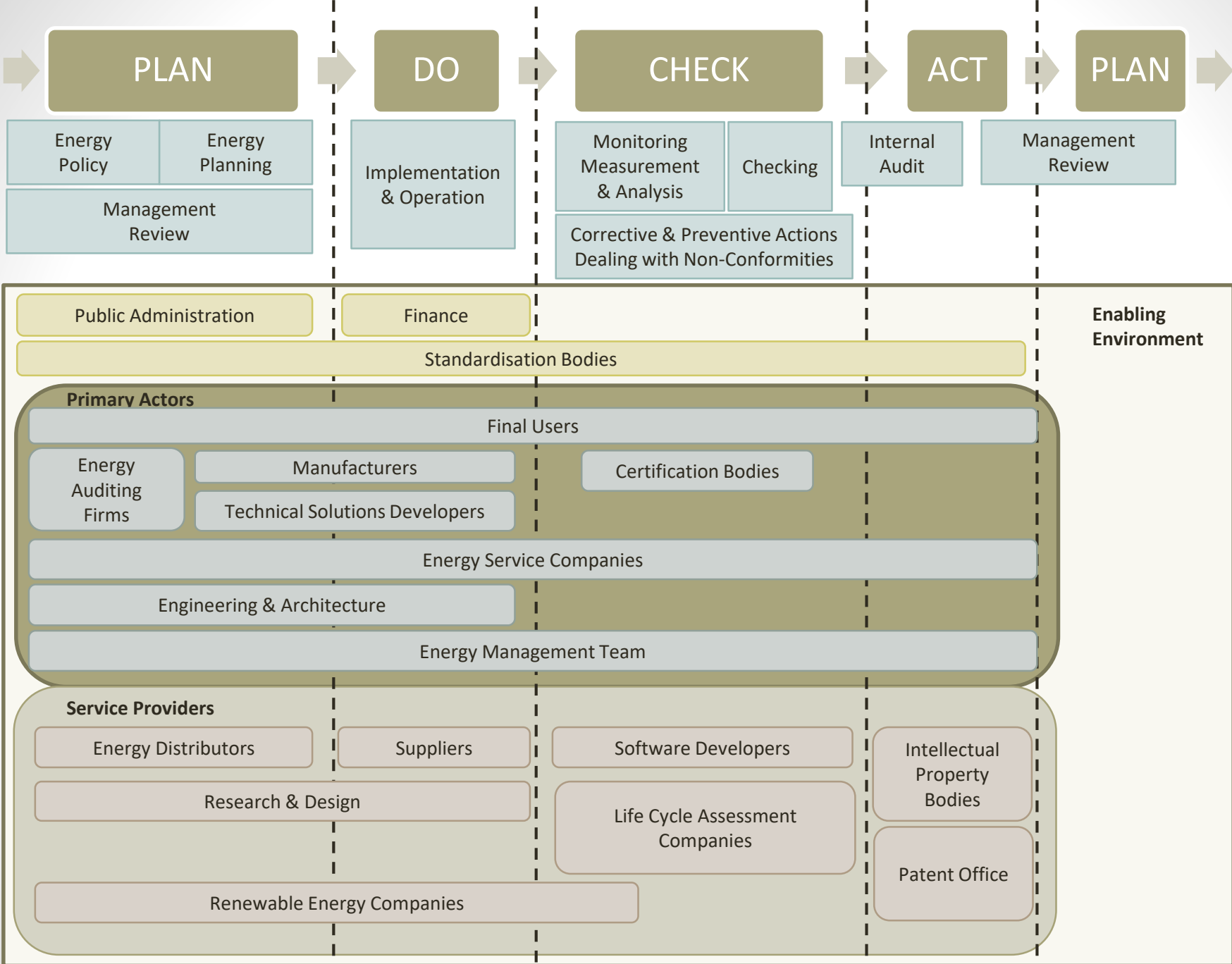


Drawing up the framework

Drawing up the KTF conceptual diagram:

- Start off with the blank framework (next slide)
- The primary actors, enabling environment and service providers are shown in separate blocks.
- Assign each of the key players to the steps of the PDCA process according to the role they play.
- Each of the key players may have roles to play in more than one PDCA process.
- An example of the KTF is shown in the next slides.





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Module 3

Energy Management Systems

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Course Content

- Module 1 – Building / Organisation Energy
 - Topic 1: Definitions of common energy terminology
 - Topic 2: Energy sources
 - Topic 3: Energy trends within the EU
 - Topic 4: EU energy priorities and energy saving strategies
- Module 2 – Energy Standards & Directives
 - Topic 5: Energy directives
 - Topic 6: Energy standards
 - Topic 7: Benefits from energy management systems implementation
- Module 3 – Energy Management Systems
 - Topic 8: Plan-Do-Check-Act process
 - Topic 9: Energy monitoring techniques
 - Topic 10: Energy planning for reducing consumption
 - Topic 11: Energy management documentation skills
 - Topic 12: Energy Efficiency Knowledge Transfer Framework
 - Topic 13: Implementing an EnMS within an organisation
- Module 4 – Case Study

Topic 13

IMPLEMENTING AN ENMS WITHIN AN ORGANISATION

Demonstrating conformity to ISO 50001

- The energy performance requirements for each organisation are not established by the ISO 50001 standard but by the organisation itself.
- Demonstration of conformity to ISO 50001 can be done via:
 - Certification by an external organisation
 - Self-evaluation and self-declaration



Benefits of certification

- Certification involves an independent assessment of the organisation's implementation of the EnMS.
- Benefits from certification include:
 - Competitive advantage
 - Supply chain requirements
 - Financial benefits, cost savings, insurance audits
 - Certified businesses outperform
 - Rigour and independence of audits
 - Consistency across multiple sites
 - Protect brand and reputation
 - Drive continuous improvement



The ISO 50001 Certification Process



Top management role for EnMS implementation

Top management must be involved immediately from the first stages of EnMS implementation.

- defining, establishing, implementing and maintaining an **energy policy**
- appointing a **management representative** and approving the formation of an energy management team
- providing the **resources** needed to establish, implement, maintain and improve the EnMS and the resulting energy performance
- identifying the **scope and boundaries** to be addressed by the EnMS
- **communicating** the importance of energy management to those in the organization
- ensuring that:
 - energy **objectives and targets** are established
 - **EnPIs** are appropriate to the organization
 - results are **measured and reported** at determined intervals
- considering energy performance in **long-term planning**
- conducting **management reviews**

Duties of the energy manager

The appointed person must have the appropriate skills and competences and will be given the responsibility and authority to:

- ensure the EnMS is established, implemented, maintained, and continually improved in **accordance with ISO 50001 standard**
- Identify **supporting person(s)**, authorized by an appropriate level of management, to work with the management representative on the EnMS
- **report** to top management on energy performance and on the performance of the EnMS
- ensure that the **planning of energy management activities** is designed to support the organization's energy policy
- define and communicate **responsibilities and authorities** in order to facilitate effective energy management
- determine **criteria and methods** needed to ensure that both the operation and control of the EnMS are effective
- promote **awareness of the energy policy and objectives** at all levels of the organization.

Module 3: Assignment #2

Write a proposal addressed to the top management of an organisation to advocate for the implementation of an EnMS.

Describe all the benefits the organisation might take advantage of, the opportunities it presents in terms of competitive advantages and why you should be appointed as the energy manager for taking the EnMS from design to implementation and operation.

Expected time employed: 20 hours

Module 3: Final Assignment

Write a report discussing the main requirements for a successful EnMS implementation considering the aspects of monitoring, planning, documentation and knowledge transfer.

Identify vital characteristics of good operation together with the benefits they each present.

Expected time employed: 50 hours

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Course Portfolio:
Applied Energy Management Systems in/for organisations
(including schools)



O2: Environmental Portfolio
Course developed by: Projects in Motion (Malta)

Project Coordinator: University of Ioannina (Greece)

Project Partners

- Helsingin Yliopisto (Finland)
- Hellenic Open University (Greece)
- Università degli Studi di Napoli Federico II (Italy)
- BEST Institut für berufsbezogene Weiterbildung und Personaltraining GmbH(Austria)
- Projects in Motion (Malta)

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 - Topic 12: Energy Efficiency Knowledge Transfer Framework
 - Topic 13: Implementing an EnMS within an organisation
- Module 4 – Field Work

Who Should Attend?

This course is targeted to:

- Managers of SMEs with schools as a primary focus.
- Employees responsible for energy management
- Those interested in improving energy performance and energy efficiency
- Individuals who want to learn more about ISO 50001.
- Individuals who want to implement an ISO 50001 EMS.
- Energy managers and energy coordinators (engineers, plant managers, etc.)

Pre-requisites

- There are no formal prerequisites for this course

Expected Learning Outcomes

After course completion, the learner will be able to:

- Discuss and explain the **purpose and benefits** of an EnMS.
- Understand the requirements of **ISO 50001**.
- **Assess** the energy performance characteristics for a particular building/area.
- Develop a **policy** for more efficient use of energy within the building/area.
- Fix **targets** and **objectives** to assist in meeting the policy.
- Use **data** to better understand and make decisions about energy use and energy conservation.
- **Monitor** and **measure** the energy consumption and energy savings.
- **Review** how well the designed policy works.
- Continually **improve** energy management policies, targets and monitoring systems.

Module 4

Field Work

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Module 4: EnMS Field Work

To put in practice all the topics covered in Modules 1, 2 & 3 via the analysis of an energy system within a school ambience.

The student is to produce the necessary documentation, analysis reports, monitoring tools, knowledge transfer frameworks and time plans for the implementation of an EnMS structure within the school.

Expected time employed: 180 hours

Module 4: EnMS Field Work

Features to be covered in the field work are:

- **Create an Energy Policy:** top management's official statement of the organisation's commitment to managing energy.
- **Formulate an Energy Management Plan** that requires measurement, management, and documentation for continuous improvement for energy efficiency.
- **Appoint a cross-divisional management team** led by a representative who reports directly to management and is responsible for overseeing the implementation of the strategic plan.
- **Define operating controls and procedures** to address all aspects of energy purchase, use, and disposal.
- **Establish a baseline** of the organisation's energy use. Progress will be measured against this deadline.
- **Identify energy performance indicators** that are unique to the organisation and are tracked to measure progress.
- **Define energy objectives and targets** for energy performance improvement at relevant functions, levels, processes or facilities within the organisation.
- **Draw up action plans** to meet those targets and objectives.
- **Create all required manuals/reports**, these living documents evolve over time as additional energy saving projects and policies are undertaken and documented.
- **Establish periodic reporting of progress** to management based on these measurements.
- **Set up a Knowledge Transfer Framework** to be the basis of all planning and operations.

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Energy Management Systems (EnMS)



Best practices &
implementation barriers

Authors: E2

Panagiotis Kafkalias

Sanna Uolamo

Bruno Conetta

Evangelia Aslanidou

Pavlos Pangiotakopoulos

Liu Xia

Best practices

- **Establish a Baseline**

- Fully understand the company's current usage (current as-is energy expenditures on gas, electricity and water, current as-is carbon emissions measurement by energy type and by production process, per unit-of-production energy cost analysis).

- **Target Capital Equipment With a Compelling ROI (return on investment)**

- Identifying the biggest energy-offending capital equipment and upgrading, repairing or replacing it, can achieve a 6 to 10 percent savings on energy usage. Companies need a way to predetermine the (ROI) and length of payback to repair or replace capital equipment with much certainty.

- **Determine the target goals**

- What is the reasonable target for energy usage-per-point of product manufactured?

Best practices

- **Sensor location**

- Proper sensor locations within the facility can have a huge impact on the performance of EnMS routines. Sensors are often found to be in less than optimal locations within facilities that are not performing efficiently. Review and verify that system sensors are placed in optimal locations, and reflective of actual conditions being controlled. Test and maintain EMS sensor calibrations routinely to ensure the integrity of the sensors is not compromised and that equipment and sequences will perform as expected.

- **Focus First on Low- or No-cost Opportunities**

- Start with projects that enable quick improvements. These typically involve only process or behavioral changes that can provide measureable and immediate payback with little or no investment and without affecting production.

- **Proper Maintenance**

- Periodic recommissioning of the EMS is not always performed at a reasonable frequency; Energy saving control algorithms can become out-of-date and out-of-sync with current operating standards of efficiency, or out-of-sync with actual site conditions. These all lead to a higher cost of operation. Implement a schedule for periodic backup of the configuration and program files for the EMS at every site to guarantee long life-span of the system.

Best practices

- **Smart monitoring**

- Monitor your systems so you know when they have been overridden and are not operating according to the rules. Manage EnMS alarm notifications and ensure corrective action is taken in time depending on the severity of the alarm. It is important to develop and maintain a protocol that escalates the most critical alarms and prioritizes less critical alarms that require a different response time.

- **Build the team**

- Strategic energy management starts with an effective team. the energy team's responsibilities will range from data analysis to project management to communicating energy goals with employees. Hire an expert professional services team, trained in the energy-consuming systems and knowledgeable about your business, which can dig into your operations with deep-dive assessments and deliver quantified recommendations for improving performance. Establish proper levels of access by authorized, knowledgeable personnel. Use a mix of software and people to get the job done.

Best practices

- **Establish and document standard configuration settings for system sequences of operation.**
 - This should include some level of ongoing system audit or data-based analytical review. With a record of proper configuration standards, it's more likely that individuals won't make efficiency-compromising adjustments over time. Implement a schedule of periodically backing-up the configuration and program files for the EMS at every site.
- **Use energy intelligence software**
 - To help you make sense of your data. These tools allow a problem to be identified, diagnosed and rectified in a matter of hours and thus avoid months or even years of energy over-consumption.
- **Communicate your success**
 - Make sure to get credit for your work. Third-party certification under ISO 50001 is one way to demonstrate the results. Companies operating in the U.S. can go beyond ISO 50001 to achieve Superior Energy Performance designation offered by the DOE for those elite firms who make significant and lasting energy improvements at their facilities.

Best practices

- **Case studies**

- At Charing Cross Hospital energy meters were installed in all the main plant rooms and were monitored by the Trend BEMS software. The resulting data allowed them to identify and eliminate energy wastage in many ways, yet without causing staff and patients to suffer – in fact they did not even notice the changes. The hospital operates 24/7, but some areas such as offices are not used overnight. Maximum savings were made by providing heating and ventilation only when they are occupied. Using the BEMS they can see what's running when it should be switched off. They examined all areas of the buildings and were able to match heating times closely with periods of occupation, so saving energy
- In Aquascalientes a major upgrade of public outdoor lighting yielded cumulative savings of 55 million kWh of electricity, or 16.34% of the City's total consumption over a nine-year period. The project includes the installation of dimmers in street lamps and low cost ballasts, as well as a diagnostic to detect and repair electricity losses.
- Burlington's home and business energy efficiency program, overseen by the local energy utility, has yielded a reduction of 52,500 tons of CO2 emissions per year in 2006, exceeding the 20,000-ton target set in 2000 by 62%.
- Over 50 energy efficiency upgrade projects in municipal buildings have yielded a 20% decrease in energy use
- The City of Saint-John intends to set up a district heating and cooling system in its downtown core that will use water from the nearby Bay of Fundy to provide heating in the winter and cooling in the summer. The system will link several municipal buildings and some neighboring private buildings.
- Hawaii's OHANA Waikiki Beachcomber will receive Energy Star designation by the Environmental Protection Agency for its superior energy efficiency and environmental protection. The Energy Star is awarded to qualified commercial and industrial buildings that rate in the top 25 percent of facilities in the nation for energy efficiency. The Hawaii property earned certification by replacing the building's original chillers with variable frequency drive chillers, installing a guestroom air-conditioning energy management system, replacing light bulbs with energy-efficient T-8 bulbs, and installing motion sensors to shut off back-of-house lighting. By earning the Energy Star, the property will use about 40 percent less energy than a typical building and release about 35 percent less CO2, saving money, reducing the carbon footprint, and earning national recognition through the EPA.

Barriers

- Need for a well planned and adequately funded program
- Complex and overlapping issues
 - Financial factors
 - Management factors
 - Behavioral factors



Barriers

- Financial factors
 - Insufficient resources
 - Cost of energy management projects (training, audit fees)
 - Cost of command & control
 - Time-consuming
 - No short-term increase in production capacity and revenue
 - Ambiguity about financial viability
 - Performance of certified systems vs. informal practices
 - Low/subsidized energy prices
 - Companies may not pay the full cost of their energy use→ less incentive to reduce consumption

Barriers

- Technical factors
 - Perceived technical and operational risks
 - Unfamiliarity with energy-efficient practices relatively to core business projects
 - Standard protocols (i.e. ISO 50001, EMAS) are inflexible
 - Need for performance-driven, not process-driven changes
 - Room for creative personalized solutions

Barriers

- Technical factors
 - Added bureaucracy
 - Information management
 - Lack of energy data
 - Hardware/software for detailed monitoring in energy usage
 - Person/team for collection, analysis and report of energy information
 - Problems in communication between employees- managerial staff



Barriers

- Management factors
 - Lack of organizational commitment
 - Requires constant attention
 - Bottom-up approaches prove ineffective → Need for active involvement of senior management
 - Shifting priorities
 - “Crisis problem” mentality
 - Need for stable, committed staff
 - Correction of symptoms, not problems
 - Lack of emphasis on root cause problems



Barriers

- Management factors
 - Lack of drivers and incentives
 - Reward-penalty systems
 - Narrow focus
 - Need for wide implementation
 - Significant variation in management quality across firms
 - Capacity of different firms to identify and exploit opportunities which increase productivity and profitability

Barriers

- Behavioral factors
 - Lack of general awareness of energy efficiency and its benefits
 - Unavailable access to information about, new and existing, energy-saving methodologies
 - Poor understanding of support-creation processes
 - Perceived professional and functional boundaries within the organization
 - Lack of support from internal and external stakeholders

Barriers

List of expected and experienced impediments in Australasian organizations (Zutshi and Sohal, 2004)

Documentation (costs, time for preparation)	2.98		3.14	
External auditors/consultants costs	2.80		2.79	
Training of employees	2.75		2.73	
Internal audit costs	2.48		2.66	
Communicating envi. issues to contractors	2.32		2.63	
Training of contractors	2.47	During planning	2.58	During application
Resistance from the employees due to changes in operating procedures	2.52		2.34	
Internal audit costs	2.48		2.66	
Time lost by employees	2.44		2.42	
Communicating envi. issues to contractors	2.32		2.63	
Resistance from the employees	2.25		2.19	
Resistance from the suppliers due to lack of information regarding EMS	1.68		1.73	
Disclosure of confidential information to a third party	1.69		1.67	

Measured in Likert scale (range 1-5)

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- Post J.E., Altman B.W., 1994. Managing the environmental change process: barriers and opportunities. *Journal of Organisational Change Management* 7 (4), 64–81.
- Zutshi A., Amrik S., 2004. "Environmental Management System Adoption by Australasian Organisations: Part 1: Reasons, Benefits and Impediments." *Technovation* 24, no. 4: 335–57.



Energy Management Systems (EnMS)

Best Practices

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Establish a Baseline

fully understand the company's current usage (current as-is energy expenditures on gas, electricity and water, current as-is carbon emissions measurement by energy type and by production process, per unit-of-production energy cost analysis.

Target Capital Equipment With a Compelling ROI (return on investment)

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Determine the target goals

What is the reasonable target for energy usage-per-point of product manufactured?

Sensor location

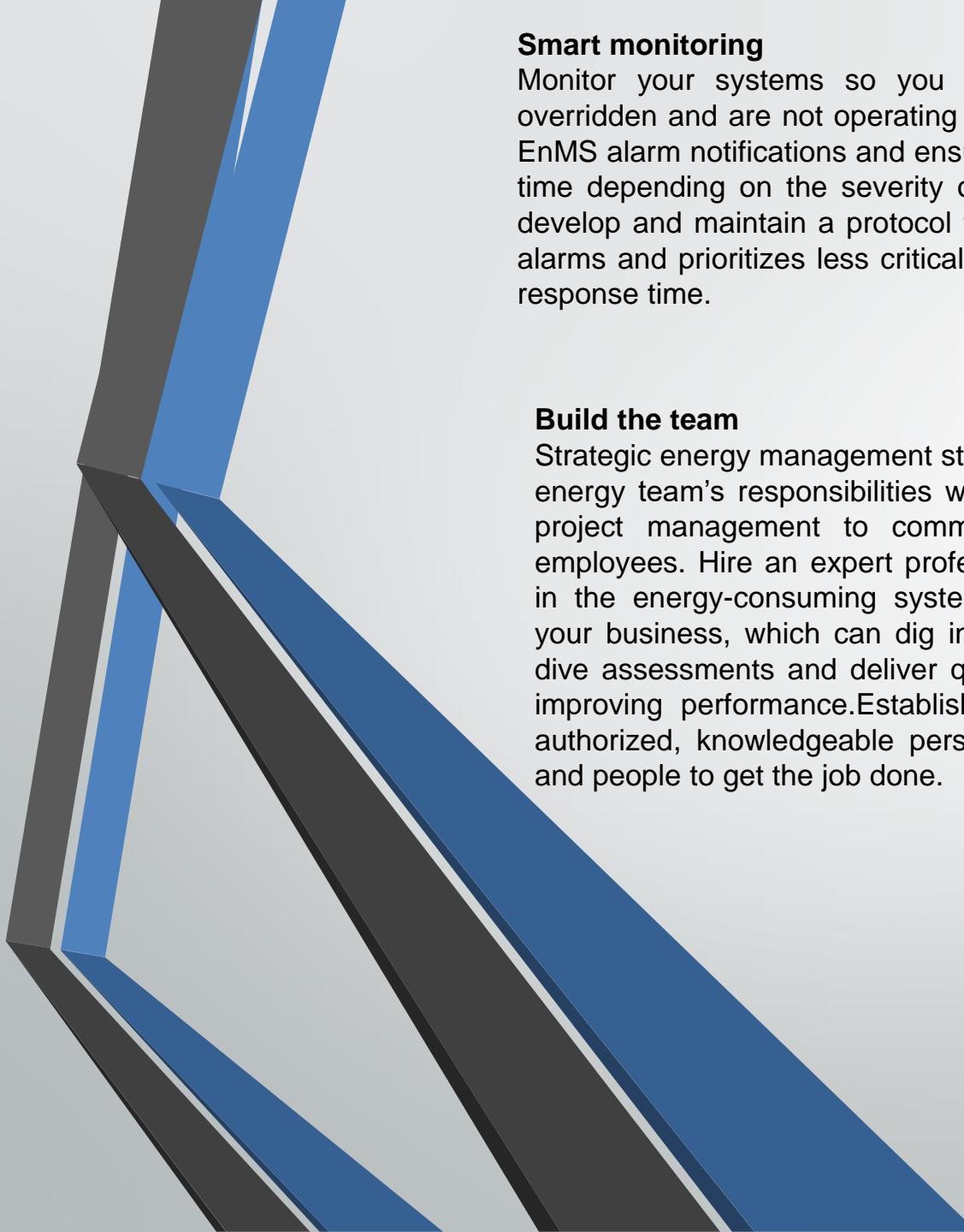
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Start with projects that enable quick improvements. These typically involve only process or behavioral changes that can provide measureable and immediate payback with little or no investment and without affecting production.

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Monitor your systems so you know when they have been overridden and are not operating according to the rules. Manage EnMS alarm notifications and ensure corrective action is taken in time depending on the severity of the alarm. It is important to develop and maintain a protocol that escalates the most critical alarms and prioritizes less critical alarms that require a different response time.

Build the team

Strategic energy management starts with an effective team. The energy team's responsibilities will range from data analysis to project management to communicating energy goals with employees. Hire an expert professional services team, trained in the energy-consuming systems and knowledgeable about your business, which can dig into your operations with deep-dive assessments and deliver quantified recommendations for improving performance. Establish proper levels of access by authorized, knowledgeable personnel. Use a mix of software and people to get the job done.

Establish and document standard configuration settings for system sequences of operation.

This should include some level of ongoing system audit or data-based analytical review. With a record of proper configuration standards, it's more likely that individuals won't make efficiency-compromising adjustments over time. Implement a schedule of periodically backing-up the configuration and program files for the EMS at every site.

Use energy intelligence software

to help you make sense of your data. These tools allow a problem to be identified, diagnosed and rectified in a matter of hours and thus avoid months or even years of energy over-consumption.

Communicate your success

Make sure to get credit for your work. Third-party certification under ISO 50001 is one way to demonstrate the results. Companies operating in the U.S. can go beyond ISO 50001 to achieve Superior Energy Performance designation offered by the DOE for those elite firms who make significant and lasting energy improvements at their facilities.



Examples

At Charing Cross Hospital energy meters were installed in all the main plant rooms and were monitored by the Trend BEMS software. The resulting data allowed them to identify and eliminate energy wastage in many ways, yet without causing staff and patients to suffer – in fact they did not even notice the changes. The hospital operates 24/7, but some areas such as offices are not used overnight. Maximum savings were made by providing heating and ventilation only when they are occupied. Using the BEMS they can see what's running when it should be switched off. They examined all areas of the buildings and were able to match heating times closely with periods of occupation, so saving energy

In Aquascalientes a major upgrade of public outdoor lighting yielded cumulative savings of 55 million kWh of electricity, or 16.34% of the City's total consumption over a nine-year period. The project includes the installation of dimmers in street lamps and low cost ballasts, as well as a diagnostic to detect and repair electricity losses.

Burlington's home and business energy efficiency program, overseen by the local energy utility, has yielded a reduction of 52,500 tons of CO2 emissions per year in 2006, exceeding the 20,000-ton target set in 2000 by 62%. Over 50 energy efficiency upgrade projects in municipal buildings have yielded a 20% decrease in energy use

The City of Saint-John intends to set up a district heating and cooling system in its downtown core that will use water from the nearby Bay of Fundy to provide heating in the winter and cooling in the summer. The system will link several municipal buildings and some neighboring private buildings.

Hawaii's OHANA Waikiki Beachcomber will receive Energy Star designation by the Environmental Protection Agency for its superior energy efficiency and environmental protection. The Energy Star is awarded to qualified commercial and industrial buildings that rate in the top 25 percent of facilities in the nation for energy efficiency. The Hawaii property earned certification by replacing the building's original chillers with variable frequency drive chillers, installing a guestroom air-conditioning energy management system, replacing light bulbs with energy-efficient T-8 bulbs, and installing motion sensors to shut off back-of-house lighting. By earning the Energy Star, the property will use about 40 percent less energy than a typical building and release about 35 percent less CO2, saving money, reducing the carbon footprint, and earning national recognition through the EPA.