

WiSE Widening
Interdisciplinary
Sustainability
Education

WISE Handbook

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PREFACE

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The final document of the United Nations Conference on Sustainable Development in 2012 (Rio+20) starts with words “The future we want: our common vision”, followed by the commitment to sustainable development ensuring sustainable future for our planet and for present and future generations. This document reaffirmed and renewed previous political commitments and declarations of global society towards sustainable development (SD)¹. It’s been decades since it occurred obvious that environmental issues are not imaginary problems, but it is deeply rooted in economic, political, social day to day human actions.

Seven years before Rio+20, in 2005, education and environment Ministers from across the UNECE (United Nations Economic Commission for Europe) region adopted the UNECE Strategy for Education for Sustainable Development (ESD). The Strategy aims to ensure that policy frameworks enable such education on all levels of formal and non-formal education, provide support for educators in the field of sustainable development and facilitate access to adequate teaching aids and educational materials needed for education for sustainable development. “Learning from each other” approach and collection of “Good Practices in ESD” are fundamental in the Strategy. These good practices and shared experiences described in the Strategy are concrete examples of successful implementation of ESD in different fields and sectors in Europe, from the political to the school level, and including formal, non-formal and informal learning situations. However, in order to fully implement the Strategy much more is needed. The “Learning from each other” approach was the guiding principle in Widening Interdisciplinary Perspective in Sustainability Education (WISE) project that results are presented in this handbook.

In January 2016 the WISE project participants – university teachers and researchers from five different European countries (Czech Republic, Greece, Poland, Portugal, Sweden) and representing several different disciplines – met in Warsaw to get to know each other and discuss the implementation of ESD Strategy within the project. Even if we all had a common vision: to produce teaching materials (i.e. WISE handbook), during the project we have struggled with our various professional languages, perspectives and disciplinary driven paradigms. That was a challenge we experienced, discussed and treated as a good practise to work within multidisciplinary group. Together – with a great will to cooperate and openness to learn from each other – after (only) 2 years we got to this final output.

The most important recommendation in ESD is to mainstream sustainability into the curriculum at all levels of education. As representatives of academic faculty, we believe that particular attention should be given on raising awareness of ESD among university employees.

¹ *The future we want* (2012), Resolution adopted by the General Assembly on 27 July 2012, United Nations. A/RES/66/288. http://www.un.org/disabilities/documents/rio20_outcome_document_complete.pdf.

The WISE handbook is to contribute to those needs, by raising the general capacity of the academic teachers and trainers to conduct interdisciplinary education focused on sustainability. To address complex environmental issues, such as climate change, pollution, depletion of natural resources or biodiversity decline, as well as economic and social dimensions of sustainability, we need to teach students an interdisciplinary thinking and insights through courses and programmes that derive from many different disciplines. We believe that, interdisciplinary way of teaching is required for ESD as it refers to the integration of information, data, techniques, tools, perspectives and theories from natural and social sciences.

Since sustainability is rather a meta-discipline (or way of thinking?) drawing on nearly all of existing human knowledge and interdisciplinary education that supports an understanding beyond the scope of one single discipline.

Among very many handbooks on sustainability and education for sustainable development published last 10 years that we are aware of, WISE handbook is appearing special in several aspects. It covers not as much knowledge and information on sustainability itself, however each chapter presents crucial background of interdisciplinary perspectives on sustainability. Instead the wealth of academic knowledge provided by many other academic books, WISE handbook simply gives instructions and useful educational materials with suitable recommendations, how to deal with the classroom and how to teach toward better understanding of the world's complexity in a sustainability perspective. It also gives suggestions (procedures) with tips and step-by-step instructions, how to conduct each lesson plan.

Moreover, a unique characteristic of WISE handbook is its usefulness for a wider audience (not only academics, who are focused on environmental problems). The handbook is based on the case method (cased based methodology – CBM) which aim is to engage participants in solving complex problems. The attention is put on building skills in the core competencies required for successful engagement with broad sustainability issues. That is why we believe it can be treated as a manual for all kinds of teachers (trainers) who would like to introduce the case studies and problems connected to sustainability in their classes. Additionally, we envision the handbook work as an open project meaning that particular cases (most of them are based on real-world situations) can be modified, re-used or partially divided. We also believe that it is on-going project and there are many new cases to be added. We are happy to continue the work in future so please do not hesitate to contact me with feedbacks or ideas.

The book is composed of three parts. The first introductory chapters are to delineate the interconnections and interrelations between the “three pillars” of sustainable development. Chapter “Sustainability and historical context” by Alex Koutsouris gives background information on history and definitions on sustainability, sustainable development and ESD. The next chapter “Sustainability and social dimensions of planning” by Katarzyna Iwińska and Michael Jones touches the problem of environmental democracy and a demand for citizen participation. As we know the complexity of the wicked problems in SD are strongly connected to different groups, stakeholders and interests. To change the paradigm of thinking is also a challenge for educators. The context of ESD is presented

in chapter titled: “Sustainability and an educational perspective: roots in environmental education” by Jan Činčera and Peter Aspengren. Next, Natalie Jellinek focuses on teachers’ roles, their capabilities and competencies in sustainable development. Final introductory chapter is written by Clara Vasconcelos *et al.* to present the idea of CBM used as a main strategy in the next chapters.

The second part consists of 13 cases described in a form of lesson plans with background information, additional sources, questions to solve and literature for further reading. We divided them along the 5 competencies and teaching techniques, then we added also the sustainable development goals that we assume the cases cover. As mentioned earlier, these cases/lesson plans can be used exactly in the way described below or modified to stress other aims (or SD goals).

The third part aims to show WISE experiences and testing phase. Most cases were conducted among university partners, some of them were tested also on different groups of students (interdisciplinary) – some of the conclusions are drafted.

The last chapter “Integrating education for sustainable development at the program level...” by Peter Aspengren shows a successful story of ESD implementation in SLU. This gives us also some tips and guidance for development of programmes and courses in other countries.

Overall, even if there has been lots of literature on the broad topic of sustainable development, this WISE book is focused on education and the special type of contact with people (students/workshop participants/pupils) that make them think out of the box and think about possible innovations. We specially recommend this book to all whose aim is to empower new agents of change and develop students’ generic competencies for our common future.

We would like to express our gratitude to several persons and institutions that directly or indirectly helped us during the project and with preparation of the handbook. We thank the administrative staff of our universities for their kind help. We would like to thank Francisco de Calheiros and his daughter, Cristina Calheiros for hosting us at lovely mansion Paço de Calheiros and sharing with us their thoughts on sustainability. We are grateful to managers of Kapraluv mlyn Scout Environmental Education Centre for providing an inspiring working environment and Codogni Company employees for showing us their working place and for interesting discussion on sustainable entrepreneurship. We also thank all the invited lecturers for their insightful talks. Thank you ALL for sharing with us your experiences.

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PART I

Chapter 1

Sustainability: a short introductory note

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Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- *the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs¹.*

The way of thinking about nature and the relation between humans and nature, or humans and their environment, has created conditions for the achievements of our time, but has also created the current problems. For example, it is nowadays clear that modern (productivist) agricultural systems which have been developed on the basis of the profligate use of water, energy and agrochemicals, have resulted through pollution of waters and air, erosion and desertification, etc. in the disturbance and disruption of delicate balances. Modern agriculture is at the same time a major source of pollution and a victim of pollution.

The Brundtland Commission (World Commission on Environment and Development) identified unequal development as the root cause of environmental problems and recommended the revival of economic growth with a change in its quality. The Commission called for basic needs to be met, for populations to be stabilised, for resources to be enhanced and conserved and for technology to be reoriented, but its attempts to reconcile the environment and development and the perspectives of the North and South had limited success.

Indeed, in the era of late ('reflexive') modernity there is a growing conviction that sustainability is an idea whose time has come; the concern for sustainability has become global. Parallel, sustainability has become a highly controversial theme of our times; it is a powerful but vague and contested concept that is complex and full of contextual contradictions. Thus many definitions of sustainability have emerged as a result of the fact that, on the one hand, weighing up parameters (i.e. social, ecological and economic parameters of systems, entities, or phenomena) will always be

¹ Our Common Future (Brundtland Commission): <http://www.un-documents.net/ocf-02.htm>.

a matter for negotiations and trade-offs and, on the other hand, it is unavoidably related to various environmental ethics (Carley & Cristie 1992).

According to UNESCO (1997) the present unsustainable global situation may be well defined as a civilisation crisis; a crisis that has built up from values and knowledge which have narrowly served the maximisation of economic benefits and technical efficiency on the expense of nature, complexity and diversity². Therefore, sustainability calls for the close examination of the dynamic balance among many factors such as political, technological, economic, ethical, cultural and environmental. Through the recognition that the present crisis is structurally anchored in society, answers are sought in working to transform the structures which perpetuate unsustainable practices.

Operationally, the list of SDG indicators agreed upon by the UN Statistical Commission in March 2016³ is as follows:

- Goal 1: No poverty
- Goal 2: Zero hunger
- Goal 3: Good health and well-being
- Goal 4: Quality education
- Goal 5: Gender equality
- Goal 6: Clean water and sanitation
- Goal 7: Affordable and clean energy
- Goal 8: Decent work and economic growth
- Goal 9: Industry, innovation and infrastructure
- Goal 10: Reduced inequalities
- Goal 11: Sustainable cities and communities
- Goal 12: Responsible consumption and production
- Goal 13: Climate action
- Goal 14: Life below water
- Goal 15: Life on land
- Goal 16: Peace, justice and strong institutions
- Goal 17: Partnerships for the Goals

² For example, as aforementioned, agriculture, in its present form is not sustainable. This is related to the so-called 'agricultural treadmill' (Cochrane 1958), i.e. on the assumptions of economics with respect to human rationality or to the exclusive focus of conventional agricultural development on techno-science and economic productivity at the expense of ethical and cultural considerations. This is so since agrarian sciences have until recently been dominated by instrumental rationalist knowledge, i.e. the (dominant) paradigm of experimental – reductionist science. Despite the fact that the achievements of positivism have been dazzling, alternative proposals have flourished, since the 1970s, based on the realization of the inadequacy of linear and mechanistic thinking in understanding the source and the solutions of problems. Nowadays it is understood that biophysical problems are not isolated but are likely to be associated with problems of social change and stress which, in turn, means that social and ecological systems have to be treated as a single coupled and dynamically complex system. Systems thinking is a way of seeing and understanding complexity and, thus, for understanding reality. Hence the call for a complex-systemic approach to both science and practice (Gallopín *et al.* 2001).

³ <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>.

Yet, sustainability is to be conceived as a process rather than a set of well-specified goals; a continuing process of questioning, discussion, participation, planning and engagement into appropriate action in order to modify processes in nature, the economy and society⁴.

Learning is often said to be a crucial key or the locus for creating a more sustainable future (UNESCO 2004)⁵. The issue of learning has been focal in ‘transition’ studies concerned with (radical) innovations aiming at sustainable development, such as Strategic Niche Management (Caniëls & Romijn 2006; Mourik & Raven 2006; Wiskerke & Ploeg 2004) and Bounded Socio-Technical Experiments (Brown & Vergagt 2008). In particular, ‘social (or societal) learning’ (SL) is defined as “the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelationships” (Keen *et al.* 2005, p. 4).

Social learning advocates an interactive (participatory) style of problem solving in which stakeholders create their vision, act and review changes, with outside intervention taking the form of facilitation (Leeuwis & Pyburn 2002) supporting multiple loop learning (Argyris & Schon 1996)⁶ or adaptive learning (Webler *et al.* 1995). Social learning denotes a form of network⁷ seen as an active, transformative process which allows stakeholders to engage in concerted actions that lead to sustainable development. For Roling (2002, p. 35) “social learning can best be described as a move from multiple to collective and/or distributed cognition”. That is, stakeholders, each with their own cognition, may develop ‘distributed’ cognition, i.e. a situation where ideas, values and aspirations need not be shared but overlap or are mutually supportive. Moreover, progress towards sustainable development depends ultimately on removing “inner constraints on our vision and values” (Reid 1995, p. 236).

In the same vein, Tilbury and Wortman (2004) describe the key abilities which students should acquire through education for sustainable development as follows:

- the ability to create visions – being able to imagine the future, assuming that if we know where we want to go, we will find it easier to plan how to get there;
- critical thinking and reflection – the ability to question the current belief system and to recognize the assumptions of knowledge, perspectives and opinions. This ability should facilitate learning how to study social structures, as well as environmental (local), economic and cultural ones, in the context of sustainable development;
- systems thinking – the ability to understand and seek links and synergism during problem-solving;

⁴ For a review of the concept see Buttel (1998) as well as Giddens (2011).

⁵ In 2013 the General Conference of UNESCO promoted the Global Action Programme (GAP) on ESD (as the follow up to the United Nations Decade of Education for Sustainable Development 2005-2014); see: <http://en.unesco.org/gap>.

⁶ Bateson (1972) distinguished three orders of learning and change. First order or basic learning deals with matters of everyday concern, and makes no difference to the dominant paradigm but uses adjustments or adaptations to ensure stability. Second order learning relates to systemic change; it concerns fundamental questioning and re-orientation of assumptions. Third order or epistemic learning relates to a complete change of worldview. Similarly, Kitchener (1983) distinguishes between cognition (learning level one), meta-cognition (learning level two) and epistemic cognition (learning level three).

⁷ In the same vein, Communities of Practice (CoPs), for instance, are described as people engaged in a process of collective learning in a shared domain of interest (Wenger *et al.* 2002).

- the ability to build partnerships, promote dialogue and negotiations – being able to cooperate;
- involvement in the decision process – “empowering people”.

With respect to agriculture, which has served above as an example of unsustainable systems, and regarding its transformation to sustainable farming Röling and Wagemakers (1998, p. 7) underline five interlocking dimensions:

- Agricultural practices, both at farm and higher system levels;
- Learning those practices;
- Facilitating that learning;
- Institutional frameworks that support such facilitation, comprising markets, science, extension, networks of innovation etc.; and, especially
- The management of change from conventional to sustainable agriculture along each of the dimensions.

In addition, they claim (*op. cit.*, p. 26) that sustainable agriculture further needs to pursue the following farming objectives systematically:

- The full participation of farmers and rural people in all processes of problem analysis, and technology development, adaptation and extension;
- A more equitable access to productive resources and opportunities, and progress towards more socially just forms of agriculture;
- A greater productive use of local knowledge and practices, including innovative approaches not yet fully understood by scientists or widely adopted by farmers;
- An increase of self-reliance amongst farmers and rural people;
- An improvement in the match between cropping patterns and the productive potential and environmental constraints of climate and landscape to ensure long-term sustainability of current production levels⁸.

It seems, therefore, necessary to rethink development in order to find new visions and new directions for change. Theoretical debates on Beck’s thesis of a ‘world risk society’ (Beck 1995) and critiques of ecomodernism (Lash *et al.* 1996), the constructivist ethos of sociology of science and technology (Funtowicz & Ravetz 1993; Gibbons *et al.* 1994; Jasanoff *et al.* 1995), along with questions related to local responses to globalisation (i.e. participation, innovation, management strategies, etc.) provide hints to such revision/ redefinition of the development process. The rise of reflexive modernisation means that people acquire the ability to reflect on social conditions and change them as a result. The possibility of a creative self-destruction of modern societies from which more sustainable alternatives could emerge should not be dismissed.

In this respect the reorientation of formal education to sustainability is a major issue; education is widely accepted as being a key policy instrument for starting the uphill climb towards sustainability (UNESCO 1997, p. 16). It is essential in providing a critical reflection of the world, promoting greater

⁸ See also the Convention on Biological Diversity summarized in the 12 principles of the Ecosystem Approach, <https://www.cbd.int/doc/publications/ea-text-en.pdf>.

consciousness and awareness, and inventing new techniques and tools thus enabling people to make informed and ethical choices. In other words, it increases people's concern over unsustainable practices as well as their capacities to transform their visions of society and confront and master change. Especially higher education has a dual role; it concerns both research and the training of specialists and leaders in all fields (*op. cit.*, p. 29).

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Chapter 2

Sustainability and social dimensions of planning

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When tackling the issue of sustainability we take into account three pillars in which ecological, societal and economic issues are treated equally. But nowadays, in the epoch called the Anthropocene (Crutzen 2002, Zalasiewicz *et al.* 2010), it is evident that human impacts on the biosphere have increased to the point where major changes threaten the future of humanity (Steffen *et al.* 2015).

The difficulties of managing environmental change were described by Rittel & Webber (1973) who coined the term “wicked problems” to define the complexity of the social dimensions of planning. Definitions of the problem and the solution for managing a particular issue are determined by culture, which shapes peoples beliefs, values and cognition. This constitutes the social complexity of sustainable development and leads to conflict in situations where stakeholders from different cultures are seeking solutions to an environmental problem. One way of dealing with social complexity are democratic regimes that introduce the new ways of understanding and dealing with the intertwined natural and human forces. The essence of some of these new ways are described by Wiek, Withycombe & Redman (2011) as the core competencies for sustainability.

Environmental / ecological democracy

A classical concept of democracy which is “a political system in which opportunity to participate in decisions is widely shared among all adult citizens” (Dahl 1963, p. 8), nowadays is still valid although not satisfactory for the civilizational and developmental challenges.

A strong focus in environmental democracy is put on “actions [that] are guided by understanding natural processes and social relationships within our locality and the larger environmental context” (Hester 2006, p. 4). It means that not only political processes of participation are important but also information and rights for stakeholders to act and influence the proposed changes in their local and regional landscape and environment.

The idea of environmental democracy is implemented by European environmental law (especially: Convention on Access to Information, Public Participation in Decision-making and Access to

Justice in Environmental Matters known as the Aarhus Convention) which includes 3 main public rights:

- to access to information,
- participation in decision-making
- and access to justice in environmental matters¹.

A matter of special importance is empowering minorities and underprivileged groups in democratic processes of decision making. Interested parties have the right to express their views on the protection of social security, cultural or natural heritage. Since environmental democracy protects the rights of a variety of minorities, a group that cares for local habits and locally based interests as well as the group of environmentalists (ecological NGO) preserving the elements of the natural world are equally heard. However, in the sites of European network of protected areas Natura 2000² ("Natura 2000"), the "louder" voice is on the side of ecological and natural heritage specialists. This does not mean, however, that the voice of the minority – local residence – is no longer counted. The Białowieża Forest case, which is described in Part II (lesson plan 2) is one of many examples that show how conflict between different local stakeholders escalate. Usually local conflicts have environmental consequences at regional or global scale.

In general, equal rights are crucial for all in the environment debate. The main aim of environmental democracy is to assure a political process in which different minorities and guardians of future generations can participate and deliberate for the welfare of all. A fundamental assumption is to communicate the views and voices of various social groups: community groups, advocates, industrial leaders, workers, ecological organizations, academics, experts and local authorities, but also a wide range of interested communities (including ordinary residents, whom we can call "experts on their area of living").

It is crucial to inform and engage the broadest possible decision-making community, involving primarily groups of people who may be affected by the proposed changes or project, investment or environmental change (Iwińska & Troszyński 2014, Maciejewska & Marszałek 2011, Mason 1999). In order to achieve this, more emphasis should be placed on multidimensional democracy education, conflict resolution skills and citizen science with the principles of environmental protection.

Participation and Empowerment

Participation is one of the democratic means of decision-making, which is increasingly recognized "as an essential means and end to the development of the social dimensions of sustainability" (Stiglitz 2002; Finger-Stich & Finger 2003, p. 1). This way of reasoning is the basis of Agenda 21 (see

¹ [http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_BRI\(2016\)571357](http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_BRI(2016)571357) (accessed 27.10.17).

² "Natura 2000 is a network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right" http://ec.europa.eu/environment/nature/natura2000/index_en.htm (accessed 27.10.17).

chapter 8: Integrating Environment And Development In Decision-Making)³ recommending that government action toward sustainability should be formulated at the lowest effective level and effective changes can be generated by smaller groups that exercise symbolic or actual power (Bourdieu 1989, p. 21)⁴ The description of the gender roles in Shinyanga (lesson plan 3) is an example of symbolic power and the outcome of participatory approaches began to change a situation that was disadvantageous to women. Although participation is of great importance it is also difficult to practice, because of the different and often conflicting values of many stakeholders.

Sherry Arnstein's (1969) classical typology identifies eight categories of non-participation, tokenism and participation that range from manipulation of or therapy for the disempowered, to citizen control. Partnership is the basic level for participation and empowerment in decision making processes. Effective partnership requires the establishment of new organisations such as boards and committees where power is evenly distributed, and the development of rules for managing conflict and effective decision making. A solution to socially and ecologically complex problem is negotiated on a "give-and-take" basis. Cultivating trust through development of rules, experiential and experimental learning about change process, building collaborative connections to policy makers, and understanding the role of power imbalances in creating conflict are important aspects of effective participation for collaborative management (Armitage *et al.* 2009).

Managing Conflict

Participation and empowerment cannot occur unless participants adopt facilitative behaviors, ideally with the support of a neutral facilitator who manages group process and conflict. Facilitation is a practice for effective group work that encourages participants to share responsibility for the outcome of a discussion, have a collaborative attitude, apply facilitative behavior to the group process, and to think strategically about ways of resolving conflict. Facilitation is based on three principles for effective group work and a set of supporting rules (Schwarz *et al.* 2005, p. 6).

1. Valid Information

- Share all relevant information in a way that others can understand it, and validate it independently.
- Continually seek new information to determine whether previous decisions should be changed.

2. Free and Informed Choice

- Individuals define their own goals and methods of achieving them
- Choice is made without coercion or manipulation and is based on valid information

3. Internal Commitment

- Individuals feel personally responsible for their decisions

³ <http://www.un-documents.net/a21-08.htm> (accessed 27.10.17).

⁴ Symbolic (or soft) power exists where the position of a dominator is maintained by the dominated in the exchange of social value between them.

- Decisions are intrinsically compelling or satisfying

In the event that conflict occurs, the facilitator first seeks to identify the issues that lead to the conflicting positions and then to identify common ground and ways of testing differences of opinion. This process is designed to change perspectives by drawing participants away from a defensive attitude with regard to their positions, towards a collaborative attitude for solving the problem on a give-and-take basis.

The principles for effective group work, together with their supporting ground rules and conflict negotiation approach, create an environment of trust within which stakeholders can speak openly, sharing perspectives and ideas that they would not otherwise mention for fear of social sanction. Good facilitation guards against disciplinary and professional hubris, which are manifestations of personal power and a mindset that is closed to the perspectives and knowledge of others. The first phase of development in the Shinyanga case and the highly undesirable social, ecological and economic outcomes are an example what can happen when “expert” knowledge is applied in an authoritarian manner. Subsequent restoration of Shinyanga was based on participatory processes in which local knowledge and the knowledge of technical experts was blended to create a new (and so far) successful approach to development.

Good sustainability practice can be seen as a participatory approach that transcends the boundaries of academic disciplines, professional silos and the experiential knowledge of local people, creating a social environment within which conflict is negotiated and innovation can arise. This is why, we believe the comprehensive key competency is problem-solving competency (Warburton 2003; Dale & Newman 2005), which is mainly practical and prevails over the five ESD competencies (described in next chapter: Sustainability from an educational perspective).

Changing Mindsets

Sustainability in the 21st Century requires a change in the industrial age mindset that led to both the enormous success of economic development, and to the unintended negative consequences of the Anthropocene (Steffen *et al.* 2015), together with growing inequity and decline in social justice on a global scale (Raworth 2017). Such changes are based on the double loop learning theories of Argyris (1976) in which current views and underlying assumptions are questioned and tested. Mindset change within individuals can occur almost instantly while in societies it is the most difficult change to create because it requires widespread change in large-scale and interconnected systems (Meadows 2008).

Education for sustainability has the potential to make a significant contribution to the change in mindset that is required for humanity to achieve sustainability in the 21st Century by training young professionals and academics in the approaches and competencies necessary to solve complex problems. Explicit recognition of social and ecological complexity, the adoption of a problem solving approach (Warburton 2003; Dale & Newman 2005), and development of the skills necessary to solve complex problems, is creating a paradigm shift in society. Creating participatory approaches that

build trust and empower all sectors of society is a significant departure from authoritarian, expert driven approaches to solving sustainability problems.

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Chapter 3

Sustainability and an educational perspective Roots in Environmental Education

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The increase in people's awareness of the worsening of various social and environmental problems has found its response in educational movements since the early 1970s. In the Tbilisi declaration (1977), one of the founding documents of environmental education (EE), it is stated that the purpose of EE should be to raise people's awareness of the economic, social, political, and ecological interdependence of things and to "emphasize the complexity of environmental problems (...) to develop critical thinking and problem-solving skills".

This effort was followed by the development of a large number of specific instructional strategies or methods for dealing with global and local environmental and social issues. In the context of EE or global (development) education, discussion activities, simulation games and role-playing games have become popular tools, and they have been described in many educational publications (e.g. Pike & Selby 1988; Jiménez-Aleixandre & Gallástegui-Otero 1995; Meadows *et al.* 2000; System Dynamic Society 2016).

Besides discussion-based activities, further instructional strategies have been developed. In the Issued Investigation and Action Training Model (IIAT) and in the Extended Case Study Model which were developed in the 1980s by Hungerford, Volk, Marcinkowski and others, students learnt to differentiate between environmental issues and the skills needed for their investigation. In the following stage, they practiced the acquired skills by investigating a real-life issue of their choice, presented their findings, and – if they were interested in doing so – prepared an environmental action project (Ramsey & Hungerford 1989; Hungerford & Volk 1990; Marcinkowski 2001; 2004; Bardwell, Tudor & Monroe 1994). Both these models have been repeatedly evaluated and confirmed as to their effectiveness in terms of students' intention to act, locus of control, perceived action skills, knowledge, and other variables (Hungerford & Volk 1981; Ramsey 1993; Culen 1994; Hsu 2004; Volk & Cheak 2005).

In the 1990s, Jensen, Schnack and other authors (Jensen & Schnack 1997; Mogensen & Schnack 2010; Breiting & Mogensen 1999) suggested replacing the prevailing behavioristic orientation of EE by the *action competence approach*. The authors suggested that EE focus primarily on empowering students by teaching them the competence they would learn and practice through taking action, i.e.

students should not only learn *about* environmental issues but should do so *through* participating in actions intended to change something in the real world, through the process of learning by experience.

The concepts of the competence approach and of action-based education have become the core of the emerging concept of education for sustainable development (ESD).

Education for Sustainable Development

Education for Sustainable Development is a vision of education that “seeks to empower people to assume responsibility for creating a sustainable future” (UNESCO Jakarta 2016). Although the concept of ESD has been discussed (McKeown & Hopkins 2003) and criticized by some scholars (Robbottom 2007; Kopnina 2012), it has evolved into an educational approach that is now used worldwide.

Although the goals, content and methods of ESD are not strictly defined, some features tend to dominate in its theoretical reflection and practice. ESD seeks to achieve societal transformation and meet global challenges, including climate change, the loss of biodiversity, disaster risk and others (UNESCO 2016a, b). Rather than setting specific objectives, ESD promotes general competences relevant for empowering people to take responsible action. So far, the specification of ESD competences is still a matter of discussion, but several different lists of ESD competences exist (Wiek *et al.*, 2011; Rieckman 2014, 2015; Barth *et al.*, 2007).

However, as we could see from a comparison of some of the competences models, while there may be differences in highlighting particular competences in different lists, there are also many similarities. In addition, individual competences sometimes interact and overlap with some of the others (see Table 1).

De Haan "Gestaltungskompetenz" Shaping competence (Barth <i>et al.</i> 2007)	(Wiek <i>et al.</i> 2011)
Foresighted thinking (B)	A – Systems-thinking competence
Interdisciplinary work (A, C, D)	B – Anticipatory competence
Trans-cultural understanding and cooperation (C, E)	C – Normative competence
Participation (D, E)	D – Strategic competence
Planning and implementation (D)	E – Interpersonal competence
Empathy, compassion and solidarity (C, E)	
Self-motivation and motivating others (D, E)	
Reflection on individual and cultural models (A, C, E)	

Table 1. Comparison of de Haan's and Wiek's list of ESD competences

Although the ESD competences bring new insights into the field, in some cases their meaning is very close to the general competences that had already been recommended for HEI's without any "sustainability" connotations (e.g., critical thinking). We should also mention that the "competence approach" includes the necessity of subject knowledge (e.g., learning about sustainability).

In light of this, we call for a flexible approach in HEI's educational practice so as to focus more on the interpretation of the meaning of a particular competence and the way it shapes the educational unit rather than spending much time on looking for its precise definition.

Although ESD points to global issues, it is often based on local needs (UNESCO Jakarta 2016). Rather than awareness-based, it tends to be action-based. Students are encouraged to identify the unsustainable patterns in their community, to formulate a vision of the community's sustainable future, and to take action towards the vision's fulfillment. The difference between teachers and students becomes blurred: ESD resonates with concepts of the participative, emancipatory approach in which teachers become facilitators rather than truth-holders (Wals *et al.* 2008). ESD is also often connected with community-based programs that draw on the concept of social learning in which community members learn from one another in the process of seeking resilience (Wals *et al.* 2012). In practice, ESD is based on the concept of the three pillars of sustainability – environmental (or ecological), social and economic – and it is enhanced when education programs include activities with a local/global perspective in an interdisciplinary setting.

ESD at Higher Educational Institution

Higher educational institutions (HEI's) have become one of the leading drivers for the transformation of educational systems towards sustainability. International initiatives like the UNESCO Chair in "Re-orienting Teacher Education to Address Sustainability" or the UNESCO Chair of "Higher Education for Sustainable Development" have put a lot of effort into promoting networking among HEI's and organizing common projects and meetings (UNESCO 2016c). The process of the transformation of HEI's has been discussed by many scholars (e.g. Barth *et al.* 2014; Biberhofer *et al.* 2014; Dlouha *et al.* 2013; Mader *et al.* 2013; Ramos *et al.* 2015; Holm *et al.* 2015; Lozano 2014, 2016).

From the early stages when ESD tended to be rather an element that was incorporated into HEI curricula and organization, there has been a shift towards more integrative efforts. This effort encompasses "whole-of-university" approaches and "community outreach" (Barth *et al.* 2014). In community outreach, students merge their in-class lessons with service learning and community-based projects, typically identifying a local sustainability issue and learning through the process of tackling it. For example, at Leuphana University, all the Bachelor's-level students participate in an Education for Sustainable Consumption course. After a three-week phase of theoretical input and reflection, they are encouraged to find their own service-learning project with partners in the community (e.g. a coffee shop) and then reflect on the process and the results (Barth *et al.* 2014; Biberhofer *et al.* 2014).

The "whole-of-university" approach calls for a complex transformation of the HEI environment. Such a transition assumes that all the HEI's key players are engaged and share SD values, that the

HEI's vision, documents, and strategies are oriented towards ESD, the management and organizational structure support sustainability and are reasonably efficient (e.g. greening the campus, school cafeteria etc.), and the culture of collaboration is supported (Mader *et al.* 2013; Lozano *et al.* 2014). However, this shift has still not taken place at the majority of HEI's in the world as they continue to struggle with various barriers preventing them from adopting one of these approaches (Lozano, 2006). In light of these trends, the "cases" presented in this toolkit offer some help with a relatively moderate but still an important first step for transforming HEI's towards ESD. On the basis of our experience with the EE/ESD approaches described above, we encourage focusing on "the cases" rather than on transmitting issue-specific knowledge, and on developing competences that could be easily transferred into students' further academic and civic lives. Although our cases may provide a good opportunity for investigating a large variety of SDG-relevant issues, they could be also used as inspiration for original, locally-relevant instructional units allowing students to launch their own "outreach action" based on service learning or community-based projects. This can be the next step towards changing university culture and launching the "whole-of-university" approach.

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Chapter 4

Sustainability and teaching context: the role of university educators

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There is strong evidence of the importance of good quality and equitable education and learning in supporting social change, as well as the role of education as a cross-cutting means of advancing the 2030 Agenda (UNESCO, 2016).

Educators are powerful change agents, and higher education is an important platform through which we prepare today's students to become tomorrow's ethical leaders, decision makers, and professionals who will ultimately implement sustainable solutions to today's problems. In this context, Education for Sustainable Development (ESD), with its focus on both subject competence and teaching practice, plays a critical role in aligning today's educational programs to the goals of Agenda 2030.

Using education as a bridge between worldwide goals such as the Sustainable Development Goals (SDGs) and in-classroom practice opens up questions regarding the pedagogical consequences of incorporating these perspectives into teaching. What role can educators play, specifically through their teaching practice, in helping to achieve these goals? What kind of teaching will challenge today's students to become responsible problem solvers? How does ESD consciously translate into the teaching and learning aspects which shape the classroom? What kind of perspectives are important to consider and how do we foster an inclusive learning environment? These are some of the questions one can have in mind when embarking on a teaching and learning journey informed and inspired by the pillars of ESD. These are also some of the questions that I have chosen to address in this text: the first section discusses ESD and links it to the teaching context, including student competencies; the second section takes a closer look at the implications for teachers in terms of cross-cutting competences; the third section discusses teaching considerations and highlights student-centered teaching, the importance of the learning environment, and interdisciplinary – all while underlining the importance of a gender and intersectional approach.

It is important to note, however, that there are no easy answers nor is there a one-size-fits-all model; on the contrary, appropriate practices very much depend on the context and target groups they are aimed at and should therefore be developed and adapted with this in mind. The following discussion and reflection provides some guiding ideas and parameters which might be helpful in this process.

SDGs and Education for Sustainable Development: the teaching context

The pivotal role of education in creating a more sustainable world is highlighted in SDG 4, which calls for providing “inclusive and equitable quality education and promot[ing] lifelong learning opportunities for all.” Some of the more detailed targets within this goal outline actions by universities in particular, and several key points have direct implications for teaching and learning practices across higher education. In addition, and while education is the main focus of only one goal, education is very closely related to the other remaining sixteen outcomes and is an essential part of their successful implementation. This is because, as UNESCO argues, “quality education leads to improved development outcomes for individuals and, thus, communities and countries” (2011). These include but are not limited to “better access to gainful employment, better nutrition and health, reduction of gender disparities, greater resilience in disasters, more engaged citizens, and so on” (2011).

Educating for the implementation of the SDGs is intimately aligned with the broader and well-established field of education for sustainable development (ESD); much can be drawn from already existing experiences related to this field. There are various definitions and interpretations of the term; according to Waas *et al.* (2012), ESD is considered to be:

“...a transformative and reflective process that seeks to integrate values and perceptions of sustainability into not only education systems but one’s everyday personal and professional life; a means of empowering people with new knowledge and skills to help resolve common issues that challenge global society’s collective life now and in the future; a holistic approach to achieve economic and social justice and respect for all life; a means to improve the quality of basic education, to reorient existing educational programmes and to raise awareness...”

Several key points from this definition should be highlighted and further examined. One is the link and connection to personal and professional life: it is not enough to consider educational systems to be important for these policies; it is the integration of values and perceptions into the everyday decisions and individual doings that is vital. Secondly, students and their teachers should both be empowered to make a difference, that is, to develop their agency so that they seek to change and improve existing structures at the local, national, and global levels. Last but not least, and much of what is the focus of this chapter, is indeed the need for a reorientation of educational programs. This fundamental issue encompasses content and methodology and brings forth questions about how to raise awareness around critical issues for both our students and our university staff – notably, the competences that learners need to develop become of utmost importance.

The issue of learners’ competences are further discussed in target 4.7 of the SDGs, where Education for Sustainable Development is explicitly named:

“By 2030, ensure that all learners acquire knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development” (United Nations, 2014).

Higher education's engagement with Agenda 2030 goes therefore further than looking only at teaching about sustainable development challenges: it presents teachers with an opportunity to work with students as partners in analyzing how at the individual, local, national and international levels we can all become better in leading more sustainable lives. ESD is therefore about more than teaching about the content of the SDGs and instead about preparing today's students to tackle unresolved social, political, economic and environmental issues. Educators have a responsibility to engage students with today's global challenges, putting local issues in a global perspective in order to bring forward what could be considered a new way of "learning".

Students' competences from an ESD perspective

The type of learning outlined below should allow the learner not only to understand the content and context of the SDGs, but also critically reflect upon one's own choices and their possible impact on societies at both a local and global level. The upcoming section will address in more detail what working with these competencies at the student level might entail for those involved in teaching them.

UNESCO (2011) outlines what these new ways of learning could be seen as:

- learning to ask critical questions;
- learning to clarify one's own values;
- learning to envision more positive and sustainable futures;
- learning to think systemically;
- learning to respond through applied learning; and,
- learning to explore the dialectic between tradition and innovation.

The new ways of learning might in themselves not be new; yet, it is their combination and interdependency which makes them a key contribution the development of ESD. Clarifying one's own values for one's self is central to understanding others and empathizing their struggles. Asking critical questions about the world we live in is what will allow our students to propose new ways of doing and being, envisioning a more positive and sustainable future.

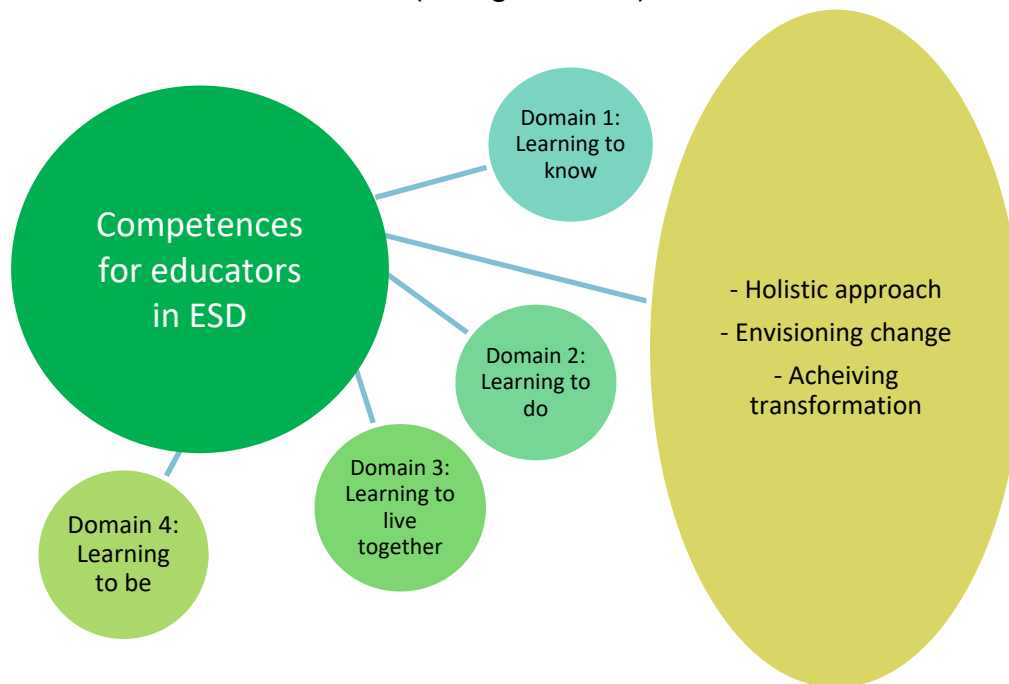
The risk of not exposing our students to such questions and such "learning" is too great. Otherwise, "through a lack of opportunity for learners to question their own lifestyles and the systems and structures that promote those lifestyles [students could be] reproducing unsustainable models and practices" (UNECE 2011).

In their work, and very much related in tune with the work of UNESCO, Wiek *et al.* (2011) compared different ways of describing what could also be considered key competencies for sustainability. As discussed in detail in Chapter 3 by Činčera and Aspengren, these key competencies are: systems-thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence. For a more detailed description of what each competence entails, see chapter 3. The meaning and implication of these competences is context dependent: therefore, their definitions and use should be adapted and interpreted to reflect the local, national

and/or university environments. One example of such an interpretation is an analysis by Lönngren *et al.* (2016) examining systems thinking competence as a tool to solve wicked problems in engineering education for sustainable development.

SDGs and cross-cutting competences for teachers

What competences do in turn educators need in order to work with students within the ESD paradigm? A United Nations Economic Commission for Europe (UNECE) expert group outlined in 2011 a useful framework for such competences, which includes four learning domains and three different key axes for educators involved in ESD (see figure below).



Adapted from *Learning for the future: Competences in Education for Sustainable Development* (UNECE, 2011).

The competences include the following domains:

Domain 1: **Learning to know**, is defined as “understanding the challenges facing society both locally and globally and the potential role of educators and learners”.

Domain 2: **Learning to do**, is defined as “developing practical skills and action competence in relation to education for sustainable development”.

Domain 3: **Learning to live together** “contributes to the development of partnerships and an appreciation of interdependence, pluralism, mutual understanding and peace”.

Domain 4: **Learning to be**, “addresses the development of one’s personal attributes and ability to act with greater autonomy, judgement and personal responsibility in relation to sustainable development” (2011).

These four domains are each subdivided and organized based on key characteristics of ESD:

1. Holistic approach;
2. Envisioning change; and

3. Achieving transformation, which serves to change in the way people learn and in the systems that support learning.

A holistic approach

Under this category, competencies sought are linked to integrative thinking and practice, inclusivity, and dealing with complexity. Integrative thinking includes having a systemic approach and being aware of the interdependence of generations. It also means being inclusive of different disciplines, cultures and perspectives while creating opportunities for exchange. Also important from an educators' perspective is allowing learners to connect their local and global spheres of influence while engaging them with conflicts and dilemmas. One such way of doing this in practice (as is the case with this handbook) is to work with real-life cases and problems, if possible from their local communities. By doing so, students are able to discuss the roles of likely stakeholders and apply a systems approach, highlighting how global decisions can have local impact.

Envisioning change: past, present and future

Under this category, competencies covered relate to three dimensions: learning from the past, inspiring engagement in the future, and exploring alternative futures. Key to creating awareness and action is an understanding of key concepts such as sustainable development, including their many facets and connections – for example, an appreciation of the root causes of unsustainable development. Given the urgency of the challenges at hand, educators should work towards raising students' awareness of their own unsustainable practices as individuals in order to improve them and engage others to do the same. In addition, students should be encouraged to use scientific evidence to seek new pathways for future development and problem solving.

Achieving transformation: people, pedagogy and education systems

In this category, the focus is on transformation: of what it means to be an educator, of pedagogy and approaches to teaching, and of the educational system as a whole. Key to changing what it means to be an educator is the expectation that teachers should increasingly become conscious reflective practitioners who are not afraid to admit they do not have all the answers, but on the contrary embark on a learning journey with their students. Transformative pedagogy entails engaging in open dialogue with students, empathizing with them, and building on their experience to develop content and methodologies. Much related to the upcoming section, it entails taking a critical look at the learning environment and its implications. Finally, this axis also focuses on change at the educational system level so that, as structures, they will support more sustainable models of development.

The UNECE framework is useful in presenting comprehensive competencies applicable to a variety of contexts and disciplines: it presents a meaningful set of categories that reflect a wide range of learning experiences. Many of the cross-cutting competencies discussed above manifest themselves

even more clearly when looking at decisions made inside the classroom – these are discussed in more detail in the section below, Teaching considerations.

Teaching considerations

Teachers make daily choices which impact what and how they teach. In this section, I have chosen to look at some the key factors at play shaping the many teaching and learning considerations and decisions faced by teachers.

First and foremost, it important to bear in mind what student-centered teaching entails and the consequences this concept has on the way teaching is designed and carried out. Secondly, decisions should be shaped by asking how we create a conducive learning environment that is characterized by respect and dialogue, but also by a transdisciplinary exchange. Finally, the consequences of applying a gender and intersectionality perspective, which permeates everyday practices, are discussed.

The learner at the center

Within this ESD paradigm, educators are expected to engage and activate students through a student-centered curriculum. As Biggs summarizes, social constructivism, “learners construct knowledge with their own activities, building on what they already know; teaching is not a matter of transmitting but engaging students in active learning, building their knowledge in terms of what they already understand” (2007, p. 21). Engaging students with real-world problems and allowing them the time and space to reflect and discuss issues makes for more active and involved learners. Working collaboratively, peer learning, and discussions allow for students to also learn from each other.

Another way of ensuring student voices are represented in the curriculum is to actively engage students in the co-creation of curriculum and educational materials that support learning on the SDGs (SDSN Australia/Pacific 2017). Promising practices regarding the inclusion of students as partners in the development of curriculum are available in the Uppsala University “Active Student Participation” page.

The learning environment

Much related to integrating a gender and intersectionality perspective into teaching is the broader issue of fostering an inclusive environment. Ensuring that the needs, opinions and voices of all students, independently of race, ethnicity, religion, sexual orientation or age, are heard and taken into account is imperative in promoting open and respectful exchanges among students,

Self-awareness and understanding of one’s own expectations and culture as an educator are the first step in being able to engage in a fruitful dialogue with students. Getting to know students and learning about their realities, challenges, and needs is useful not only in the design of curriculum in order to make sure it reflects all students’ experiences, but also in creating productive exchanges.

Learning must be a window towards knowledge for all students, providing an opportunity to explore and ask questions about things they are unfamiliar with (IGLYO 2015). As identified by the The International Lesbian, Gay, Bisexual, Transgender, Queer & Intersex (LGBTQI) Youth and Student Organisation, students often lack accurate knowledge on issues regarding sexual orientation, gender identity and gender expression. As discussed earlier, this may be a factor in students unintentionally reproducing unsustainable practices and patterns of behavior.

Working in and across disciplines

As is the case of this handbook, and is outlined by the competences highlighted above, approaches with ESD should attempt to break disciplinary silos in order to foment interdisciplinary, multidisciplinary or transdisciplinary dialogues (Lozano *et al.* 2014). In her internationalization framework, Leask (2016) discusses the importance of moving and in and across disciplines while also consciously reflecting upon dominant and non-dominant paradigms in one's own subject area and tradition. Indeed, today's global challenges increasingly require inter and multidisciplinary approaches in order to be successful. One such example is the development of courses and research across overarching themes and topics.

Applying a gender & intersectionality perspective

Gender inequalities are a persistent feature of education systems in Council of Europe member states (Council of Europe, 2014). Despite serious advances and strides in the fight for equality, movements such as the #MeToo campaign bear witness to the pervasive discrimination and harassment that women still face today, irrespective of geographic location. Figures on social inclusion and employment rates and job quality indicators show that women remain at greater risk of social exclusion, unemployment and low-quality jobs in the EU ("Education" 2017). Women also remain, on average, slightly more likely to be unemployed than men with the same level of education. In Sweden, a national governmental initiative launched in 2016 mandates all state-funded higher education institutions to report on their gender mainstreaming activities. The purpose of the initiative is for the higher education sector to contribute towards the nationally declared gender equality objective of women and men having equal power to shape society and their own lives.

Applying a gender perspective means looking at the world around us and the statistics discussed above and reflecting and problematizing what we take for granted: what information are we receiving and what information are we not? Who is talking and who is not? What notions of gender are disseminated consciously or unconsciously through the texts, pictures and opinions we are exposed to? Also facts need to be questioned: who decided on the facts? Facts according to whom? (*A gender perspective – what does it mean?* Swedish Secretariat for Gender Research 2017). Asking ourselves and others questions such as these helps bring to light the fact that the societal norms we take for granted are socially, are socially constructed, and as such, can be changed.

These relationships translate directly into the educational setting. Despite legislation and policies put in place at the national and local levels, often times at the university level as well,

gender stereotyping continues to influence the way we teach and select content. The narrative and norm presented to our students continues to build on stereotypes. A revision of the way we introduce and highlight the work of women and men, boys and girls is necessary in order for our students not to reproduce patterns of discrimination and exclusion.

As the European Institute for Gender Equality (2017) outlines: Studies show that many of the school textbooks used in European countries include stories and images that reflect a stereotyped portrayal of the role and activities of women and men, girls and boys. Men are still more often represented than women; vocabulary is in contradiction with the principle of gender equality; and the main characters are mostly males.

A gender perspective can be applied to different aspects of our lives: movies and TV shows, commercials, print media, daycare, images in metro stations, design of cities and transportation, clothing lines, to name a few. Yet, it is the educational system that is in a privileged position to change some of the statistics mentioned earlier and help students to unveil what we take for granted and challenge normative conceptions of gender. By asking ourselves questions, we can increase our own understanding of how we contribute to re-create gender (2017), while also with our actions directly contributing to the implementation of the SDGs.

Furthermore, similar questions can be asked in relation to ethnicity, class, or sexuality. As Nina Lykke writes, “the specific manner in which individuals “do” gender cannot be separated from the manner in which they “do” ethnicity, class or sexuality, for example. Our identity is not divided into different compartments: gender, ethnicity, class, sexuality, etc.” (2012). The word denoting the idea of looking at the crossroads of gender with other equally important aspects of identity was coined by Kimberlé Crenshaw (1995): the term “intersectionality” requires that we “pay attention to the interplay that is created when a “gender road” meets, for example, an “ethnicity road”” (2012). As a concept, intersectionality has been useful in civil society movements as an effective way to illustrate and address different types of inequality in today’s societies.

Educators interested in infusing ESD into their curricula must consider how gender and intersectionality aspects are reflected in the choices they make: what content they cover and how the teaching practice and methodology is conducive to *everyone’s* learning. Examining representation and lack thereof is an important aspect when encouraging students to reflect upon and question existing norms hindering everyone’s equal access to participation and enjoyment of human rights.

Beyond the classroom: Concluding thoughts

Higher education plays a vital role in stimulating critical and creative thinking and generating and disseminating knowledge for social, cultural, ecological and economic development (UNESCO, 2016). This chapter has discussed how in addition to covering content related to the SDGs, in order to successfully infuse curricula with ESD, educators must also consider the link to their pedagogy and teaching practice: not only what but also how are they teaching in order to develop the next generation of problem solvers.

In addition, creating long-lasting and substantive change requires a holistic approach at the curricular level. It is key to consider issues of progression when working with curricular development: how do courses link up to one another? How are competencies developed from one course to the other? Where in the program are competences assessed? One way to ensure these issues are taken up by course leaders is by engaging faculty at the program level. One such example is the SLU initiative which offered ESD-related training to program study directors and course coordinators. The university dictated that all program study directors and 75% of all course coordinators would take a course focused on the integration of Education for Sustainable Development (ESD) before the end of 2017. More information about the lessons learned from this initiative are detailed in part 3 of this handbook.

Educators can and should re-think their teaching strategies and more closely align them to the competencies we wish to develop in our students. Re-thinking the way we design programs brings us one step closer to further evaluating and holistically assessing the way higher education can contribute to the effective implementation of Agenda 2030 and therefore to the development of better and more just societies.

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Chapter 5

Sustainability and case-based methodology

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This chapter describes and provides a justification for the case-based method of Education for Sustainable Development as an alternative to transmissive teaching or problem-based learning. In contrast to transmissive teaching which is focused on what the teacher knows and passes on to students, the case-based method is focused on students, and strengthens their ability to learn for themselves using previously acquired knowledge to solve problems. The cases are based either on a real world situation and/or on things students have experienced as part of their daily life. This assumes some (even if only superficial) knowledge that is relevant to a situation, which allows a first approach to solving the problem. The strategies involved in solving the problems will lead students to develop new knowledge, to reflect on the previous familiar knowledge and to reconstruct original understanding in a new perspective on sustainability. Case-based teaching is intended to foster learning for competence, deep level understanding and provide opportunities for vertical and horizontal integration of any syllabus.

Although problem-based learning and case-based learning share the common goals of enabling students to solve real world problems, each methodology possesses specific characteristics. In problem-based learning the problem drives the learning process, whereas in case-based learning students are required to recall previously learned material so as to solve cases. While case-based teaching requires a prior knowledge of the subject, to develop the lesson, it does not require the teacher and student to build new knowledge before exploring a particular issue. Instead it provides students with the opportunity to effectively relate their previous knowledge to new real-life situations that are relevant to a specific subject. This methodology is based on the idea that new knowledge is built upon previous knowledge, by adding experience to it (Harrington & Garrison 1992, see also chapter 4).

Case-based teaching was initially implemented at law and business schools in Harvard University, about 100 years ago, when a newly appointed dean, Christopher Langdell, started to refer to real cases in his classes, breaking away from decades of a transmissive teaching. In science education case-based teaching was only implemented approximately 25 years ago (Çam & Geban 2016; Herreid 2013), but it was a significant revolution in teaching, that made the learning process much more active (Garvin 2003). The case-method is now established and has been widely implemented in various disciplines. A large majority of studies report favourable results in its application in

science, especially in areas such as biology (Pai 2009), chemistry (Yalçinkaya *et al.* 2012), engineering (Flynn *et al.* 2015), math (Kogan & Laursen 2014), interdisciplinary approaches of biology and geology (Vasconcelos & Faria 2017) and medicine (Bhardwaj *et al.* 2015; Datta *et al.* 2016).

The case-based method is a less time consuming approach to learning (at least in its initial stage) and it enables the development of thought and arguments. The 17 Sustainable Development Goals of the 2030 Agenda for Sustainable Development that were adopted and came into force on 1st January 2016, requires the adoption of a new learning framework that leads learners to be more active, more engaged with the future of the planet and to be more responsible and accountable. The aim of this handbook is to present cases that are both authentic and challenging, encouraging students to think critically, be more productive, and to have a deep understanding of action towards sustainability. Indeed, the case-method is expected to develop the ability of students to make a diagnosis of a situation, to evaluate and discuss different solutions, and to make a final decision, all of which are critical for any citizen in the 21st century. Additionally, this methodology is expected to promote curiosity, to improve motivation, and to develop self-directed learning, critical thinking and mutual respect among students.

It should also be noted that the use of real cases facilitates memorization by providing students with mental anchors for facts, concepts and principles that are meant to be studied and assimilated (McNaught *et al.* 2012).

The cases can be:

- (1) presented as examples;
- (2) presented as an opportunity to practice analysis, assimilate different perspectives and contemplate action; and
- (3) presented as a stimulus for personal reflection

According to Vasconcelos and Faria (2017), the design of the case must observe the following principles:

- The case is real (taken from real life or historical);
- The case rests on careful research and study;
- The case fosters the development of multiple perspectives;
- The case is meant to be interactively explored by students;
- The case directs students towards a conclusion by providing them the resources and the context to discuss issues dynamically.

Built on a constructivist epistemology, students are generally asked to work in groups so that they are exposed to several viewpoints and ideas. Students are also asked to evaluate each other's opinions. The exploration of a case generally finishes with a plenum discussion. This approach develops students' collaborative competences and their communication competences.

Teachers are the facilitators who promote class debates, ask questions and assess students at the end of the class. These actions help students to relate their knowledge with their decision-making competences (Giancalon 2016). The process of case-based methodology is illustrated in figure 1.

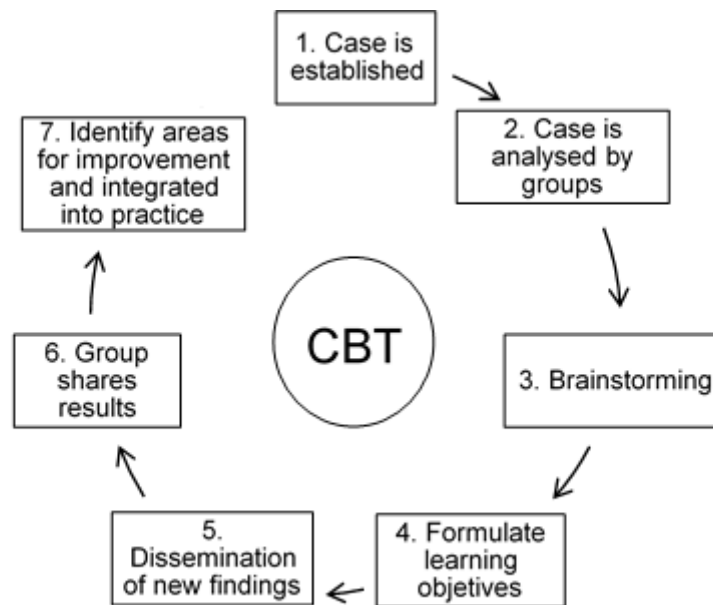


Figure 1: The case-based teaching process (adapted from Williams 2005, p. 578).

The teacher can resort to different strategies so as to explore the case. In order to better understand the use of these strategies the following propositions must be considered:

- (i) perspectives that deal with general philosophies of teaching (e.g. socio-constructivism);
- (ii) methodologies that deal with more practical issues and suggest a certain type of strategy (e.g., case-based method), while giving a theoretical background; and
- (iii) strategies that deal with specific actions (e.g. role-playing activities) and are the best plan chosen by the teacher to guarantee that students achieve success.

Among the strategies commonly used in case-based methodologies and reported in published papers are: modelling activities, field trips, laboratory work, computer work, practical work, debates and role-plays, simulation games project team works and follow-up discussions.

In addition, there are the teaching and learning strategies that are specifically designed to lead students through a case, involving suitable questions, time allocation to group discussion and appropriate assessments of both group and individual outcomes. They also provide students with insight to alternative solutions from various points of view.

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PART II

Cases for widening interdisciplinary sustainability education

Introduction

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The aim of this chapter and contexts of their own classrooms. The cases are interdisciplinary in nature: they move across the spectrum of different disciplines to target global challenges based on the interconnectedness of today's world.

Cases link up to the key 17 UN Sustainable Development Goals (SDGs) and to key competencies for sustainability (Wiek *et al.* 2011):

Systems thinking competency: the abilities to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty.

Anticipatory competency: the abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes.

Normative competency: the abilities to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions.

Strategic competency: the abilities to collectively develop and implement innovative actions that further sustainability at the local level and further afield.

Interpersonal competence: the ability to motivate, enable, and facilitate collaborative and advanced skills in communicating, deliberating and negotiating, collaborating, leadership, pluralistic and trans-cultural thinking, and empathy. The capacity to understand, embrace, and facilitate diversity across cultures, social groups, communities, and individuals is recognized as a key component of this competence participatory sustainability research and problem solving.

There are 13 cases prepared by research teams from WISE Partners Universities: Agricultural University of Athens – AUA (Greece), Collegium Civitas – CC (Poland), Masaryk University Brno – MU (Czech Republic), Swedish University of Agricultural Sciences – SLU (Sweden) and University of Porto – UP (Portugal).

Lesson plans can be used for different teaching aims and to develop main ESD competencies:

Name of the case	Spatial scale	Main activity	Competences to be developed				
			Systems-thinking	Anticipatory	Normative	Strategic	Interpersonal
1. Tropical forest: an analysis of social and economic reasons of environmental degradation	Global issue	Simulation game, follow-up project, discussion game, presentation	X		X	X	X
2. Dead wood in Białowieża Forest – unravelling complexity of biodiversity conservation	Local example (regional & global issue)	Presentation, individual / group work, debate	X	X	X	X	X
3. Sustainable development in the Shinyanga Region, Tanzania	Local	Small group discussion and role playing	X	X	X		X
4. Rural tourism development: the case of Plastiras Lake, Karditsa, Central Greece	Local / regional	Discussion method in conjunction with text analysis	X	X			X
5. Organic farming and public support in the EU – the Greek case	EU / national	Role playing, group debate			X		X
6. Remodelling an ancient farm in Portugal	Local example (global issue)	Role-play, group work, discussion	X	X	X	X	X
7. Transformation of a local production company into a sustainable business. Codogni company in Poland	Local	Presentation, discussion over a draft strategic plan based on a SWOT analysis	X			X	X
8. Castromil gold mines' geoethics dilemmas	Local example (global issue)	Group work, inquiry, discussion	X	X		X	X
9. Territorial ecological limits to the lignite surface mining in North Bohemia	Local example (regional issue)	Discussion, text analysis and follow-up discussion			X		X
10. Smog – high concentration of air pollutants in a large city. Example of Warsaw	Local example (regional & global issue)	Text analysis, presentation, project team work, possible to use flipped-classroom method	X	X			X
11. Local referendum about relocation of the railway station	Local	Role playing and follow-up debriefing		X		X	X
12. Urban greenery – how to include urban green areas in cities that are in desperate need of housing?	Local	Text analyses, Role playing, debate, reasoning, discussion	X			X	X
13. Sustainable food consumption – mitigating food waste	Global issue (individual persp.)	Open discussion, team work	X		X		X

All the cases relate to various aspects of sustainable development and concern the three sustainability pillars on different levels.

Firstly, we placed the cases that are rooted in the classic conflict between environment and human activity – tropical forest case and dead wood case. The leading question for those two is whether economic interest is more important than the survival of a nature. The consequences of such approach are being discovered by case participants. Next, there are three cases related to agriculture and organization of rural areas – story of Shinyanga Region in Tanzania, rural tourism case and organic farming, the last two from Greece. Those three cases are good examples of a struggle

which sometimes is undertaken by local communities to revive the region and increase the quality of life. Next two cases – remodelling an ancient farm in Portugal and local production company from Poland are cases where sustainability is analysed from the perspective of entrepreneur, hence micro-scale. On the contrary, the next two cases investigate the dilemmas of large investments, which inevitably lead to numerous actors involved, thus increased complexity of the problem. We have chosen Castromill gold mine in Portugal and lignite surface mining in Czech Republic to represent this category.

Further follow two cases from urban areas – issue of air pollution in Warsaw and location of Brno railway station. Similarly, urban greenery is a case on the verge of economics and environment, where two conflicting needs of inhabitants compete for a limited space within urban environment.

Finally, there is a case related to sustainable food consumption where participants have to negotiate with themselves and their own habits.

Lesson plans are also divided by SDGs, that they thematically cover:

Name of the case	Sustainable Development Goals																
	1. No poverty	2. Zero hunger	3. Good health and well-being	4. Quality education	5. Gender equality	6. Clean water	7. Affordable and clean energy	8. Decent work and economic growth	9. Industry, innovation and infrastructure	10. Reduced inequalities	11. Sustainable cities and communities	12. Responsible cons. and production	13. Climate action	14. Life below water	15. Life on land	16. Peace, justice and strong institutions	17. Partnerships for the goals
1. Tropical forest: an analysis of social and economic reasons of environmental degradation								X							X	X	
2. Dead wood in Białowieża Forest – unravelling complexity of biodiversity conservation			X				X	X			X				X		
3. Sustainable development in the Shinyanga Region, Tanzania	X		X	X	X		X				X			X	X		
4. Rural tourism development: the case of Plastiras Lake, Karditsa, Central Greece			X					X			X	X				X	X
5. Organic farming and public support in the EU – the Greek case			X			X					X	X	X		X		
6. Remodelling an ancient farm in Portugal			X						X		X				X		
7. Transformation of a local production company into a sustainable business. Codogni company in Poland					X			X	X	X		X					
8. Castromil gold mines' geoethics dilemmas			X			X		X			X	X			X		
9. Territorial ecological limits to the lignite surface mining in North Bohemia			X				X	X	X				X				
10. Smog – high concentration of air pollutants in a large city. Example of Warsaw			X	X			X				X		X				
11. Local referendum about relocation of the railway station									X		X						
12. Urban greenery – how to include urban green areas in cities that are in desperate need of housing?			X								X				X		
13. Sustainable food consumption – mitigating food waste	X	X	X							X		X					

Case 1:

**Tropical forest:
an analysis of social and economic reasons of environmental degradation**

Author:

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This case is based on an adaptation of an activity published in Pike, G. & Selby, D. (1994). *Globalni výchova*. Praha: GRADA. (Orig. Pike, G. & Selby, D. (1988). *Global Teacher, Global Learner*. London: Hodder & Stoughton). The original idea has been developed in cooperation with many of my friends and co-leaders. I would like to express my gratitude to Jiri Neustupa, Marek Coufal, Marta Vesela, Alena Kohoutova and others.

The HipBone Games are based on the concept of the *Glass Bead Game*, described by Hermann Hesse in his Nobel-winning novel, *Magister Ludi*. They are foremost among current attempts to implement Hesse's game concept (<https://boardgamegeek.com/boardgame/38371/hipbone-games>) In the Czech Republic, it has been described in Činčera, J. & Caha, M. (2005) *Výchova a budoucnost. Hry a techniky o životním prostředí a společnosti*. Brno: Paido.

Keywords: tropical forests, deforestation, nature protection

Relation to Sustainable Development Goals (SDGs):



Strategy: Simulation game, follow-up project, discussion game, presentation.

Time required for classwork (in minutes): 240.

Students preparation to the class (in minutes): 240.

Aim: To increase students' awareness of deforestation in tropical areas and to develop system thinking competence.

Learning outcomes:

After completing this case, students are able to:

- identify the social processes responsible for the deforestation of tropical forests, namely to identify the stakeholders and their mutual interconnection;
- compare the gaming scenario with real-world situation;
- investigate the issue and present their results.

Case description: Included into the role description.

Question to address:

- What social processes are responsible for the deforestation of tropical forests?

Data source:

Encyclopaedia Britannica. <https://www.britannica.com/science/tropical-rainforest>

Rainforest Alliance. <http://www.rainforest-alliance.org/>

Procedure

1. **The Hipbone Game.** The aim of this activity is to help students to focus on the interrelationships between tropical forests and their own consumer lives. The activity develops students' system thinking competence and frames the meaning of the main activity. For the rules for this part, see Appendix 1. This part takes about 30-40 minutes. A board with a game matrix and three markers are needed.

2. **The Simulation Game.** This is the main activity of the program. The aim of this activity is to help students to experience the social processes responsible for deforestation, e.g. agriculture, palm oil production, logging, and the effort for their protection, e.g. environmental campaigns, sponsorship by pharmaceutical companies, sustainable development. The activity may be highly emotional and demanding for some of the students. Two or three leaders are needed to run this 120-to-150 minute activity. You will need a big room allowing an arrangement of candles (in a 9 x 9 square), data projection, sitting around, walking, and being loud. For the rules, see Appendix 2.

3. **A Debriefing Session.** This activity helps students to reflect on and share their feelings and findings from the previous activity. One leader and approx. 20 minutes of time are needed.

- a. At the beginning, ask the groups to reflect on the experience from the perspective of their roles.
- b. Then, when all groups have shared their reflections, ask them to discuss in their teams which aspects of the game (role description, interaction among roles, emerging social processes) corresponded with reality and which did not. Write their ideas up on the board.
- c. Finally, ask students to formulate any questions about deforestation that have been inspired by this experience and that they would like to investigate further.

4. **A Follow-up Project.** This activity allows students to practice their own critical thinking and investigating skills. It is based on the students' questions that emerged during the debriefing session. Give students adequate time (a week, at least) to conduct their independent investigation.

5. **Presentations.** Students present their findings about the investigated aspects of deforestation. At the end, ask students to formulate what they have learned as part of this program. You may ask them to work in groups of 3-4 people, reflect on their learning, and then present for each of the groups. This activity takes about 40-90 minutes, depending on the number of students.

Props and arrangement for the simulation game

Sixty-one candles (in cups) of one colour and twenty of another colour, a bell, some plastic or some other kind of protection of the floor, matches, wooden skewers, two dices, play money, thirty cards white on one side (soil) and black on the other side (eroded soil), thirty cards with the picture of a palm tree, fifty pawn pieces, a recording with rainforest sounds, a presentation with photographs, a computer and a data projector, a name tag for each participant with the name of his or her particular group. Two or three instructors are needed to lead the game. The number of students should be between 13 and 30.

Arrange the candles in an area of about 1m² and in rows 9x9, with the rare "species trees", representing a forest with a particularly high conservation value, (taller candles) roughly in the middle (see Fig 1). The participants sit at one end of the room so as to be able to see both the Tropical Forest and the screen.



Figure 1. Arrangement of the Forest

Appendix 1

Tropical Forests: The Hipbone Game

Recommended procedure:

1. Divide the students into two groups. If there are more than 16 students participating, it would be better to split them into four groups and run the activity sequentially, with two groups playing at a time, or run it simultaneously in two different rooms, with two groups in each room.
2. Ask two volunteers to play the role of a jury.
3. Invite the students to the very old Hipbone Game – a game that was played by medieval alchemists. The alchemists had to be able to see invisible interconnections among different aspects in their world. This will be the students' task just now.
4. In the game, two groups of students compete with each other. The group that gets more points wins.
5. The points are given for each new interconnections that the students can identify and explain. For each of the new connections, they get 0-2 points. The classification is decided by the activity leader and the jury.
6. When a group takes a turn, it must put any word (or a concept expressed by 2-3 words) to any empty cell in the Game matrix (see Image 2). If the new concept is directly connected (by a line) with any of the words already in the filled cells, the group must explain all of the newly emerged interconnections (e.g., for the word put in the cell 1, three new interconnections may emerge). Each of the new interconnections is independently evaluated and classified by the jury.
7. The group has 30 seconds for discussing their move and 30 seconds for explaining each of the newly emerged connections. After classification by jury, the other group starts its move.
8. The group that starts the game will be given one extra move to the last filled cell (to provide the same number of evaluated moves as for the other group).
9. Each of the groups will be given one secret word. The group must use this word in the game or it will be penalized by 10 points. The classification of all of the interconnections with any of the secret words is doubled (that means that an interconnection of two secret words may bring up to 8 points). The secret words are "tropical forests" and "well-being".
10. The classification should emphasize non-trivial interconnections, adequate for university students. Obvious connections should be classified by 0 points. Only a really clever and hidden interconnection, well explained by students, should achieve 2 points.
11. When the game is over, calculate the points and congratulate each of the groups. Give them time for a short reflection – what interconnections did you find most interesting? Looking at the matrix as a whole system, what does it say about our world? Specifically, how are we connected with tropical forests?

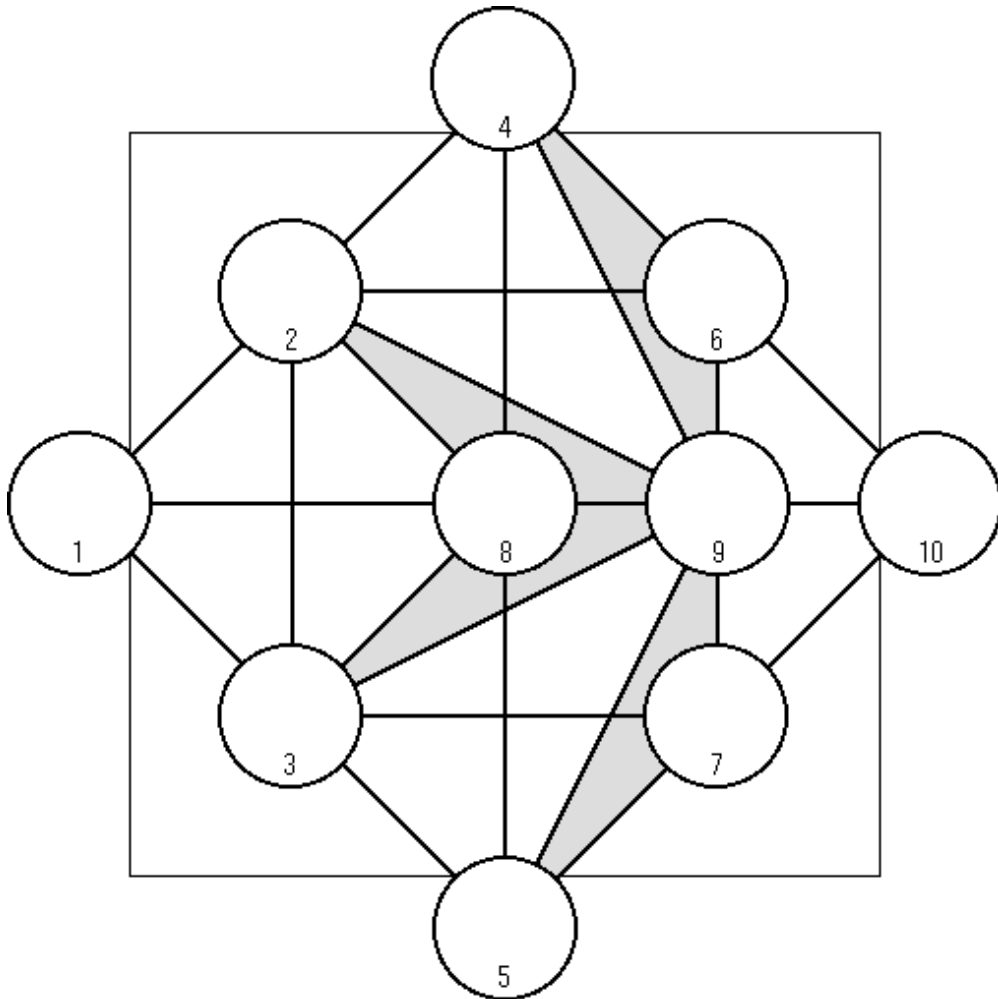


Image 1. The Hipbone Game Matrix

Appendix 2

Tropical Forests: The Rules of the Game

Welcome to the Tropical Forest. This Tropical Forest used to be vast and take up the whole space in the room we are in at the moment. Now all that is left of it is what you can see. Each burning candle is one living mature tree. In reality, it would not be just a single tree, but a whole forested area – but to keep it simple, let's think about the candles as trees. If it is burning, it is alive. When you blow it out, you cut down a tree and destroy all the living space provided by it.. In a Tropical Forest, there is of course a large variety of tree species, but again, to keep it simple, there are only two species here – a common species and a rare species which is represented by a different candle. Together, we will now try to create a simplified story of what happens in tropical forests. It is a certain kind of communal theatre play, and we will all be the actors.

You will have a particular role in the play. Please act as realistically as you can, regardless of whether or not you personally agree with the goals and the procedures that characterize this role. Most of the roles can be played in a group of several actors. **Your goal is to fulfil the goals of your role as well as possible.**

To make the theatre play go smoothly, we are going to follow some rules. Each group has its own set of rules. In addition, we are all going to follow some **common rules** that express the mechanisms that will help you achieve your goals:

1. **Time.** The stay in the Tropical Forest is divided into individual **rounds**. Each round has **three phases**. The duration of each phase is irregular and it is determined by the game leader. The players do not know how many rounds the game will have and the game leader will end the game based on her or his own assessment of the developments. The phases:
 - a. In the first phase, you can make plans, discuss things, and go talk to the other groups. This phase is the longest one. In this phase it is also possible to hold a governor election.
 - b. The second phase begins when the game leader gives the agreed upon signal. All players have to stop negotiating. Not following any set order, the game leader then calls on each group. The groups give reports on whether they are conducting any activities in the Tropical Forest in this round (cutting trees, planting new trees, establishing reserves, etc.). Simultaneously, the game leader implements the decisions (e.g., blowing out some candles). If the players' decisions have resulted in some side effects (e.g., a forest fire, the dying out of an indigenous tribe), the game leader announces these effects. At the end of this phase, the game leader also summarizes how many trees have been cut down and how many are left in the Tropical Forest.
 - c. In the third phase, one member of each group goes to the bank (which is supervised by the game leader or the assistant leader) to balance the group's obligations (mainly to deposit the living minimum and to withdraw the income for the activities in the Tropical Forest). At the end of this phase, the players can begin the next round.

2. **Money.** The groups have varying amounts of money and different options available to them. Unless the rules for the group state that the group is exempt, in the c) phase each group has to pay its **living minimum**. If the group is not able to pay, the game leader may impose some sanctions on it (e.g. revoke the group's logging licence, proclaim the group has been cancelled, etc.).
3. **Power.** The power of each group to pursue its goals depends on the group's strategy as well as on its resources. A key role is played by **the Governor** of the Tropical Forest area:
 - a. The Governor is one of the players who stands as a candidate and is elected by majority vote. Each group has a different number of votes.
 - b. When elected, the Governor is no longer a member of his or her original group and receives his or her own rules to follow. The Gubernatorial elections take place in every odd round (phase a).
 - c. The Governor can support or suppress particular groups or activities in the Tropical Forest, has his or her own financial resources, can employ players in the State Service, etc.
 - d. At any time in phase a), the Governor can announce her or his orders and regulations. If a group breaks these orders and regulations, the Governor can punish it (by a fine, revoking the group's licence, etc.).
4. **Natural resources.** Some of the groups can cut trees in the Tropical Forest. However, it is possible to only cut trees that are on the Tropical Forest's edge or that are accessible by a road. Any group can plant new trees. The price for planting a common species tree is 150 USD and for planting a rare species tree it is 500 USD. It takes a long time for the trees to grow and the tree planting does not affect the current state of the Tropical Forest (i.e. the number of mature trees).
5. **Information.** At the beginning of the game, the players do not know the available options and the goals of the other groups. Getting quickly oriented in the situation, finding potential allies, and forming shared-interest blocks can be essential for succeeding in the game.

The game is flexible, and in case something is not clear, the game leader decides what to do.

The Indigenous People

Group size: 2-3 players.

According to the myths passed on from generation to generation, your tribe has lived in the Tropical Forest "since the beginning of humankind". You have survived here thanks to your tribal knowledge and the skills of the tribal members to use the amazing natural resources in the Tropical Forest to obtain food, build shelters, and prepare medicine. 85% of your food is produced by crop rotation: You clear a suitable area by the river, and for a few years you grow there banana trees, maracuja, corn, beans, and manioc. When the soil becomes depleted and the yields are lower, you move to a new place and the abandoned fields are soon transformed into a Tropical Forest again. In a Tropical Forest, it is possible to farm only a few years in a row because the soil is poor and the layer of fertile soil is very thin. Most nutrients are preserved in the plants whose leaves and roots also protect the thin layer of soil from being washed away by regular heavy

rains. You cut down selected kinds of trees and you use their wood to build shelters and to make weapons and tools. However, you use most of the wood as fuel for heating and cooking.

Your relationship with the Tropical Forest is complex. The Tropical Forest is your home, and it provides your food, clothing, and construction material, but it also kills you. You believe that the Tropical Forest is inhabited by the feared spirit Kurupira who lives on human meat. More than thirty years ago, your tribe came into contact with the representatives of a civilization that has gradually been cutting or burning its way closer to your tribe's territory. At first, these representatives were scientists, explorers, and government ambassadors who brought you some of the achievements of their culture – medicine, weapons, tools. Some of you have even started to produce electricity from generators that run on petrol and you have started to use electrical appliances. These new tools have changed your way of life and they have pitted the younger generation against the older generation. The older ones, the upholders of tradition, the tribal leaders – they are afraid of the changes because they are afraid of losing their prestige. In contrast, the younger ones are fascinated by the new opportunities and yearn to discover the new, so very enticing world. Thanks to the new things that have appeared, in the last ten years the number of people belonging to your tribe has increased significantly (at present, about 80,000 people live in the Tropical Forest). Your life has become a bit easier, but you are now also more demanding in relation to your environment: the constant collecting of firewood have been depleting the Tropical Forest resources, especially near large settlements.

From time to time, groups of prospectors looking for precious metals or rare minerals, representatives of logging companies and other entrepreneurs come through the Tropical Forest, and sometimes you get into conflict with them. You do not trust these strangers – two years ago one of them shot dead a member of your tribe. Lately, you have started talking about the gradual disappearance of the Tropical Forest in your surroundings. More and more often when you hunt, you come upon new farmers or loggers, and more and more often you discover new logged areas, and the wild animals have started to disappear, too. You are not unified in what to do next: the older people want to proclaim war against the loggers, while the younger ones dream about leaving the Tropical Forest and experiencing the magic of civilization . . .

What your available resources and options are:

Money

- You do not have a regular yearly income or any money to start with.
- Every year, you have to cut down 1 tree to make a living or just to make up the 100 USD that you will pay to the bank.
- To survive, each member of your group needs a Tropical Forest consisting of 10 trees. If the number of the living trees in the Tropical Forest is smaller than the number of members in your group times ten, one of you has to either move to a different group or die of hunger.

Power

- In the elections, each member of your group has 1 vote. Any member of your group can stand as a candidate.

Changing groups

- Any member of your group can move to the Farmers' group if they accept him or her.
- Any member of your group can be employed by the Governor and become a State employee if he or she pays (or the group pays for him or her) 800 USD to take a requalification course and if the Governor approves the move.

State Employees

Number of players: 0 at the beginning of the game, later the Governor determines the number.

Promoting and implementing the Governor's policies requires competent and dedicated employees. Nature conservation in particular has become an important and dangerous area. Every year, conservation officers protecting endangered animal species die in their fight against poachers. Other employees try to fight against the wide-spread burning of the Tropical Forest to gain farming land. Actually, it is the forest fires that have become one of the main causes of deforestation. However, in some regions the State nature conservation officers are corrupt and focus more on protecting the interests of the large logging companies.

Your task is to help the Governor, and to fulfil the tasks you are assigned by the Governor as best you can.

Money

- Every year, you have to pay 400 USD as your living minimum. The Governor pays this amount for you. If this does not happen, you have to move to a different group that will accept you or you have to start a new company – Mining or Forest Forever.

Power

- In the elections, each member of your group has 1 vote. This is not a requirement, but it is expected that you will vote for the Governor if she or he runs again, and that you will not run against your Governor.

The National Logging Company

Number of players: 2-3 at the beginning of the game.

You are representatives of a prosperous logging company that employs 1,500 people and that supplies wood to USA, France and China. Especially the last of these countries keeps increasing its demands and requirements. These countries then use the wood mainly to make paper: the consumption of paper in the developed world keeps rising, but at the same time the level of the protection of their own forests has been going up. Thus the paper industry has to intensify its efforts to find suppliers in countries where the environmental protection by law is less strict. Apart from paper-making companies, your customers include some companies that produce disposable chop sticks, and several construction companies. In the last five years, the yearly sales have increased by 125%, but the profits have remained low, primarily due to the necessity to import heavy logging machinery from producers in the USA and other countries.

You do not care which kind of trees you cut down, you are paid "by size". Nevertheless, lately you have been pressured by the Government and by some international organizations toward more sustainable forms of logging. Even though you have your powerful supporters in the Government, you realize that it is not in your long-term interest to log out the whole Tropical Forest. The best scenario for you would be to transform the Tropical Forest into a "factory" for growing more timber – to plant new, fast-growing trees in the place of the cut down trees, and then harvest them again within a few decades (but sometimes it takes less than twenty years). You are also open to negotiations about the introduction of more advanced technologies that would decrease the amount of your "wood waste" – currently, this waste is one third of the wood from the cut down trees.

You do not get along very well with "the primitives" who live in the Tropical Forest and who steal your things, and you have already shot at several who were particularly bothersome. You also do not like to see other competing companies in the Tropical Forest.

Money

- At the beginning of the game, you have 300 USD in your account.
- The yearly operating costs for your company are 400 USD.
- For cutting down 1 tree, you will get 200 USD.
- During one round of the game, you can cut down a maximum of 5 trees.
- At any point, you have the option to buy new, technologically more advanced machinery that will allow you to get 300 USD for each tree. The introduction of new technology costs 1000 USD.

Power

- Your group has altogether 5 votes in the elections. Any member of your group can stand as a candidate.
- If your group fails to observe some of the Governor's orders and regulations (e.g., if you log in the reserve that the Governor has set up), the Governor can revoke your logging concession. If this happens, your group dissolves (it stops its activities in the Tropical Forest), and the members of your group have to (all together or individually) move to a different group or establish a new group.

Changing the group

Any member of your group or even your group as a whole can decide to take on one of these other roles:

- Farmers. You can move to this group if the Farmers' group agrees.
- Palm Oil Producers Alliance. Any member of your group can move to this Alliance if she or he pays the entry fee of 300 USD for establishing a new plantation.
- State employees. To take on this role, you need only the Governor's approval.
- A new branch of the National Logging Company. It costs 500 USD to start this company.
- Mining, a prospecting company that searches for precious metals and other raw materials in the Tropical Forest. It costs 200 USD to start this company.
- Forest Forever (Association for the Sustainable Use of the Tropical Forest). It costs 500 USD to start this association. This association establishes tree plantations (preferably with native species) in the Tropical Forest from which it harvests wood and other raw materials sustainably, in a way that does not lead to the destruction of the Tropical Forest.

Tropical Forest Conservation Society

Number of Players: 2 at the beginning of the game

You are representatives of an international non-government organization that is funded by donations from the general public and industrial companies. Your central interest is mainly to prevent the destruction of tropical forests. Your group has been given the task to try to persuade various groups living and working in the Tropical Forest to decrease their demand for wood and new agricultural land and support a program designed to reclaim the deforested areas.

Your campaign is based on the following opinions:

- The Tropical Forest is the inheritance of all people on Earth and its significance reaches beyond the borders of the state in which it is located. In the Tropical Forest, there live unique animal and plant species that will die without it. The Tropical Forest can be useful to people – it can become a source of valuable medicine as well as other important information about the natural world.
- The current burning of the Tropical Forest to obtain farming land as it is practiced by the Farmers is responsible for regular forest fires that destroy the Tropical Forest.
- Logging in the Tropical Forest should take place only on a limited scale and in a sustainable manner as it is done for instance by companies for sustainable tropical forest use that practice selective logging and compensate for it by planting new trees. The wood that is obtained in this way is then sold with one of the existing certifications (e.g. FSC).
- It is an unjustifiable luxury to log rare tree species, and these species should be unequivocally protected.
- Building roads through the Tropical Forest usually leads to the fragmentation of forest, to a faster encroachment of other business activities, and thus to a faster destruction of the Tropical Forest.

Money

- At the beginning of the game, you have 200 USD.
- Every year, you get an income of 100 USD.
- You do not pay any living minimum.
- In every round, you can ask (in the bank) for a grant (you will throw a dice). If it is 5-6, you will get 50 times the amount you have thrown.

Power

- You have two votes in the elections. Any member of your group can stand as a candidate.
- The Governor can decide to make your activities more complicated, for instance by requesting you to fill out various activity reports etc. If you do not comply, the Governor has the right to place a hold on your group's activities.

Changing groups

- Any member of your group can move to a different group if all the members of the other group agree.
- State employees. To take on this role you need only the Governor's approval.

Her or His Excellency, the Governor of the Tropical Forest Area

The number of players: 0 at the beginning of the game, the election takes place during the first round of the game, phase a).

Congratulations, you have just been elected Governor of the Tropical Forest Area. You have far-reaching powers. The state capital city is far away, and no one is likely to check on what you are doing. The only thing to worry about is losing your voters' support. Now you have the opportunity to promote and implement your ideas regarding the fate of the Tropical Forest. What is expected of you and what means do you have in your hands?

Duties

- Once in each round of the game, the Governor should publicly present her or his orders and regulations concerning the use of the Tropical Forest. The presentation does not necessarily have to include any special limitations.

Money

- You can collect money from the other groups through gubernatorial taxes.
- Every round of the game, you get 400 USD from the State budget.
- Every round of the game, you get 100 USD from international organizations to protect the Tropical Forest.
- You can ask for a special contribution from a grant agency. If the dice turns to 4-6, you will get a 100 times the amount thrown.

Power

- To set the maximum logging quota for each group, possibly to prohibit some or all of the groups from logging.
- To collect gubernatorial taxes, from some or all of the groups, possibly to introduce a tax for each cut-down tree.
- To block the activities of some of the groups, e.g. by revoking the logging concession (the National Logging Company, Wood International, Mining), obstructions (e.g. requesting reports from the Tropical Forest Conservation Society or from Medica, and, if they do not comply, banning all their activities), or taking some group members into prison for breaking the orders and regulations (the Indigenous People, the Farmers, the Palm Oil Producers Alliance). You can revoke a permit or a concession only if the given group breaks any of the Governor's orders and regulations.
- To hire State employees who will help you negotiate with the other groups. For each State employee, you have to pay the bank 400 USD every year.
- To financially support any groups you choose.
- To organize discussions, conferences, and to negotiate with the other groups.
- To plant new trees at a low cost – it costs 100 USD to plant a common species tree and 250 USD to plant a rare species tree.

You are elected to serve as Governor for two years – at the beginning of the next odd round of the game, there will be another election. You can run again in this election.

Wood International

Number of players: 2-3 at the beginning of the game.

You are representing a daughter company of a multinational company that has branches all over the world. You specialize primarily in the manufacturing of luxury furniture which you then sell to China, the United States, Europe, and other countries. You have branches in Africa, Southeast Asia, as well as South America. To make high-quality furniture, you need high-quality wood – and while you are able to use wood from common trees, you do not make as much profit from that.

You are convinced that the international market for wood should not be regulated in any way. People who have become rich thanks to their work deserve luxury and you are able to provide that for them. Moreover, your company is socially aware. At your branches, you give jobs to the local people and thus contribute to decreasing poverty. In the places your workers come from, you often establish schools, put in water and sewer lines, and you try to make your employees happy.

Since you consider your type of business to be important, you want to protect it from potential threats. In addition to your efforts to persuade the local people through investments and financial awards, you also try to gain the necessary political support, whether it be by legal means or by means that fit the complex regional context in which you can use your financial resources.

You regard the idea of “sustainable use of the natural resources” as rather a fashionable utopia – no resources can be used for ever, of course! While to manufacture goods that will be sold in environmentally more aware areas (the European Union) you use wood obtained through sustainable logging (and with the appropriate certification), for other, less environmentally aware customers with higher requirements for luxury goods you need to log “the classical way”. The Tropical Forest is just the place meant for the use of classical way of logging methods.

Money

- To start with, you have 2000 USD at your disposal.
- For your operation, you have to pay 900 USD every year.
- For 1 cut-down common-species tree, you will get 300 USD. For 1 cut-down rare-species tree, you will get 600 USD.
- You can cut down a maximum of 7 trees per 1 year.

Power

- Your group has 1 vote. Any member of your group can stand as a candidate.

Changing groups

- A new branch of Wood International. It costs 2000 USD to start a new branch. This scenario can be considered in case the existing branch loses its logging concession due to breaking one of the Governor’s orders or regulations.
- Forest Forever (Association for the Sustainable Use of the Tropical Forest). It costs 500 USD to start this association. This association establishes farms in the Tropical Forest from which it harvests wood and other raw materials sustainably, in a way that does not lead to the destruction of the Tropical Forest.
- Mining (A Prospecting Company). It costs 200 USD to start this company. The company focuses on searching for raw materials in the Tropical Forest. When they succeed, they announce the discovery to the Governor and, after the trees are logged out, the company receives a share of the profits.
- State employees. To take on this role, you need only the Governor’s approval.

Medico

Number of players: 1-2

You are representatives of a large company that was founded in the United States and that has branches in developed European and American cities. Your company specializes in manufacturing medicine. A number of pills that are commonly used today are based on the research of Tropical Forest plants. Many experts are convinced that it is among these plants that new effective medicine can be found for quite a few of the most serious illnesses, including cancer, heart diseases, and respiratory diseases. The discovery of the sources of these effective medicinal compounds would be a significant contribution to the world pharmaceutical sciences, and for your company it would mean substantial profits.

Your research team strongly protests against the logging of the Tropical Forest as thousands of known as well as still unknown species of plants are being destroyed and other sensitive forest ecosystems are being disturbed. Your company has provided you with the financial means to launch a campaign against the inconsiderate destruction of tropical forests. The aim of the campaign is to slow down the pace of the destruction until your research has been concluded.

Money

- You have a grant of 700 USD at your disposal.
- Your yearly income depends on the size (and thus the potential usefulness) of the Tropical Forest for the sponsors of your research. At the original size of the Tropical Forest, your yearly income is 200 USD. For every ten trees that are cut down, your income decreases by 50 USD.
- If a road is built through the whole Tropical Forest, your yearly income will decrease by half as the division of the Tropical Forest into two relatively isolated parts will cause large-scale dying out of plants and animals in both parts.
- In each round of the game, you can choose to ask the WHO for a special grant. Throw the dice: if the turn is 5 or 6, you can get fifty times the amount thrown.
- New trees are of no value to you because it will take hundreds of years for the original species diversity to return to the newly planted areas.

Power

- Your group has 1 vote in the election. Any member of your group can stand as a candidate.

The Farmers

Number of players: 3-5

You represent about 150,000 poor farmers who moved to the newly logged out area in the Tropical Forest five years ago. It was your choice to move because you lost possibility for farming in the place where you used to live due to ongoing military conflicts. The Government Officers for transmigration promised you enough land to make a living, and also job opportunities with the logging companies. At first, these promises were fulfilled, and it seemed that the piece of land you were allotted could feed your family. However, in most cases you have not been able to get a steady job – usually, you were offered only temporary work when the given company was short of labour force, and often this meant that the men had to leave their families for an extended period of time.

Many traders realized that this was a good opportunity to get rich quickly and they opened stores with groceries for inflated prices. In the first two years, you were able to get high yields on the recently logged out land, but then the yields

dramatically dropped and many of you fell into poverty again. Most of you try to get new land by burning the Tropical Forest. In this way, you obtain land that is very fertile for the first few years, but later its fertility sharply decreases and you have to move to a different place. Moreover, the burning can cause forest fires that spread and get out of control.

Money

- You can grow crops on the land that you have cleared by burning or that had been logged by someone else. For one cultivated field (in the area of one tree), you will get a yearly income of 100 USD. You have to have access to the fields that you cultivate.
- Please mark the cultivated fields by a white piece of paper. You can farm one field only for two years. After that, the quality of the soil sharply drops and it does not bring you any yields. Please place a black card on the place of the degraded soil. New tree seedlings can be planted in this spot. You can burn a maximum of 9 trees in 1 year.
- The living minimum for each member of your group is 200 USD a year.
- The burning of the forest can cause forest fires. The leader of the game determines the appearance and extent of these fires randomly in phase b). As a result of a forest fire, another 1-6 trees can die.

Power

- Each member of the group has 2 votes in the election. Any member of your group can stand as a candidate.

Changing groups

- Mining (A Prospecting Company). It costs 200 USD to start this company. The company focuses on searching for various raw materials in the Tropical Forest. When they succeed, they announce the discovery to the Governor and, after the trees are logged out, the company receives a share of the profits.
- State employee. Any member of your group can be employed by the Governor and become a State employee if she or he pays (or the group pays for him or her) 300 USD to take a requalification course and if the Governor approves the move.
- Leaving for the city. Any member of your group who pays 1000 USD can leave for the city and start her or his own business there. By this move, the player leaves the game, but he or she can support the Tropical Forest Conservation Society if they accept her or him in their group.
- Palm Oil Producers Alliance. Any member of your group who will pay the costs of 300 USD can establish her or his own palm plantation and join the Alliance.

A Representative of the Ministry of Defence

Number of players: 1.

You work for the Ministry of Defence, Department of Fighting against International Terrorism. For many years now, you have tried to build a road from East to West, through the centre of the Tropical Forest, for military purposes. This road is supposed to make faster the transport of army vehicles from your base to the border area of the country which is filled with tensions and in which the fundamentalist organization the Fist of God's Anger has been active for ten years.

In last few years, this organization has organized several terrorist attacks at various civilian targets in the country (at restaurants, hotels). At present, from 8 to 9 months out of the year, this border area can be accessed only by air. You are convinced that national security is an absolute priority, and nature conservation interests have to be subordinated to that priority.

Therefore, your goal is to create at least 1-tree-wide road through the whole Tropical Forest (from the upper right corner to the lower left corner). You believe that the road will bring also other benefits to the whole area. The area will become open to logging companies, which will attract more job opportunities and prosperity. Farmers will gain space for more fields and pastures. That is why it is to your advantage to support logging groups, farmers, and palm oil producers, or initiate the establishment of prospecting companies.

You are aware that there is a strong opposition against your road project from the local inhabitants as well as from international conservation groups that, in your opinion, do not understand the local context. Since the Defence Minister does not want to risk a drop in popularity before the election, your task is to proceed diplomatically and not to reveal your true aim to the public. Therefore, the best scenario would be if the space for the road was logged by other companies, and you could then just use the logged out area to build the road. People often do not know what is in their best interest, but in retrospect, they will certainly appreciate your efforts.

Money

- You have at your disposal financial resources of 3000 USD that have been approved by the Government.
- If things develop well and the outlook is promising, you can try to ask your Government for special support: throw the dice and if the turn is 4, 5, or 6, you will get a 100 times the amount thrown.

Power

- Since you are a registered citizen of a different province, you do not have any vote in the elections and you cannot stand as a candidate, either.

Mining, a Prospecting Company

The size of the group: 0 at the beginning of the game. The maximum number of players in the group: 1.

The goal of your company is to search for deposits of precious metals, oil, natural gas and other valuable raw materials. Previously unexplored parts of the Tropical Forest where there could be many of such rich deposits are especially attractive for you. Your job involves tough work full of danger, and it is suitable only for tough men and women who are not afraid to deter "the Indians" with a gun in hand and to fight your way through the jungle... The results are uncertain, but if things work out well, it is worth it...

Money

- To start a new Mining group, it costs 200 USD.
- The living expenses for one member (including the expenses for cutting down a tree) are 50 USD.
- In each round of the game, you can cut down 1 tree anywhere in the Tropical Forest. Then please throw the dice. If the turn is 6, there is a deposit of precious raw materials underneath

the cut down “tree”. The financial value of the deposit will be determined by your next throw of the dice – it is the number that you get times 300. When you get 6, you can throw again. However, you will get the money from the bank only after there is a road from the edge of the Tropical Forest to the discovery site (it can be also at the edge of a field, plantation, or logged out area).

Power

- You have 1 vote in the elections and you can stand as a candidate.

Changing groups

- You can move to the Indigenous People’s or the Farmers’ groups if they accept you.
- You can establish a new association, Forest Forever for the Sustainable Use of the Tropical Forest. It costs 500 USD to start this association.
- You can establish a new branch of the National Logging Company. It costs 500 USD to start this company.
- You can become a State employee, if the Governor employs you.

Forest Forever – Association for the Sustainable Use of the Tropical Forest

Number of players: 0 at the beginning of the game. The maximum size of the group: 2.

Your association establishes farms in the Tropical Forest from which it harvests wood and some other materials (oil for aroma-lamps, photographs of the Tropical Forest) in a sustainable manner which does not lead to the destruction of the Tropical Forest. An important source of your income is also eco-tourism – organizing trips for small groups into primeval nature. For your work, you need to set aside a sufficiently large area of undisturbed Tropical Forest in which no logging or prospecting will be taking place. Your work is a source of small but steady income for you.

Money

- You have to get the Governor to set aside for you (e.g. by using wooden skewers) an area of the Tropical Forest with as many trees as possible. This area has to be protected from logging or burning and all other activities that disturbs it (if any of the other groups cuts down one of your trees, you do not make any profit).
- The Governor will probably want you to pay for renting this protected area, the estimated rent should be around 10 USD for every rented tree. The maximum allowed size of the protected area is 10 trees.
- The profit from each rented tree is 50 USD a year.
- Your yearly operating costs are 250 USD a year.

Power

- You have 1 vote in the elections and you can stand as a candidate.

Changing groups

- You can move into the Indigenous People’s or the Farmers’ groups if they accept you.
- You can establish a new Mining company. It costs 200 USD to start this company.

- You can establish a new branch of the National Logging Company. It costs 500 USD to start this company.
- You can become a State employee if the Governor employs you.

Palm Oil – Palm Oil Producers Alliance

Number of players: 0 at the beginning of the game.

Your parents came years ago from the city to farm the fields and raise cattle at the edge of the Tropical Forest. Despite their efforts, they did not become rich and their life was filled with poverty and hard work. A better prospect has opened for you. The logged out areas of the Tropical Forest are suitable for palm trees from which you can harvest good-quality oil. You then sell this oil, with profit, to the European Union, the United States, Japan, Australia, and other countries.

Palm oil is well suited for use in cosmetics and also as a food ingredient (for instance in various children's treats and ice cream), and it can be used to fry chips etc. Further, palm oil is well suited for the production of biofuels which have started to become popular in some countries as a climate change mitigation measure. The growing of palm trees has dramatically increased your standard of living and it helps your whole community to grow in prosperity. Thanks to higher profits, you have recently built a school and a sewer system in the village.

This gives your children a chance to have a better childhood than you. Lately, you have detected a drop in your customers' interest that is related to some criticism of the use of palm oil. You think that this criticism is mainly due to lack of proper understanding of the poor people's living conditions at the edge of the Tropical Forest. You consider your palm woods as beautiful and natural in their own way, and you do not see why dangerous wilderness that brings no one any good should be preserved.

Money

- It costs 300 USD to start your group.
- The living minimum for each member of your group is 200 USD per 1 year.
- To establish a plantation, you need to cut down at least 4 trees next to one another. In their place, please put a palm symbol. For each palm tree, you will get 100 USD every year.
- Since the demand for the palm oil is predicted to increase and the more and more people have been growing palm trees, you have to extend your plantation by at least half in comparison with the previous year (that is, after starting a plantation, your plantation can have 4 palm trees, next year 6, next year 9, etc.).

Power

- Each member of your group has 1 vote and can stand as a candidate in the elections.

Changing groups

- You can move into the Indigenous People's or the Farmers' groups if they accept you.
- You can establish a new association, Forest Forever for the Sustainable Use of the Tropical Forest. It costs 500 USD to start this company.
- You can establish a new Mining company. It costs 200 USD to start this company.
- You can establish a new branch of the National Logging Company. It costs 500 USD to start this company.
- You can become a State employee if the Governor employs you.

Case 2:

**Dead wood in Białowieża Forest
– unravelling complexity of biodiversity conservation**

Authors:

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Keywords:

conservation conflict, sustainable forestry, environmental attitudes, Poland

Relation to sustainable development goals (SDGs):



Strategy: presentation, individual/group work, debate

Time required for classwork: 60 minutes (introductory meeting) + 120 minutes (final meeting).

Student's preparation to the class: 180 minutes during 1-2 weeks.

Aims:

- To develop students' awareness of complexity of biodiversity conservation.
- To develop skills in gathering the evidence needed for discussion of complex environmental issues.
- To improve communication skills through presentation activities and debate.

Learning outcomes:

After completing this lesson, students will be able to:

- Argue for the importance of ecological processes in achieving conservation goals in forest ecosystems using conservation of dead-wood as an example;
- Discuss dilemmas of forest biodiversity conservation in the frame of sustainability.

Case description

Introduction

The natural science perspective

Dead wood, also called coarse woody debris (CWD) is crucial component of natural forest ecosystems worldwide. Originating from dying trees, it provides substrate and habitat to a myriad of different species that are fully dependent on its presence. As such, dead wood is necessary to maintain biodiversity in forest ecosystems and thereby has an important role in securing ecological sustainability. However, the maintenance of high amounts of dead wood in productive forests is very difficult due to competing interests with timber production. Therefore, biodiversity linked to dead wood is usually threatened and forests with large quantities of dead wood are rare.

The ancient Białowieża Forest located on Polish-Belarus border is in this respect unique. There you can find a massive occurrence of large and old trees, high amounts of dead-wood and natural dynamics of forest stands. Large and old trees both as living specimens and as dead-wood are supporting thousands of different specialized species ranging from birds and mammals using cavities or building nests in the canopy to lichens, fungi and microbes dependent on different stages of tree life and its decomposition. It is not surprising that Białowieża Forest has been an invaluable reference area for biologists and other scientists interested in natural characteristics of European forests.



Figure 1. The old trees of Białowieża Forest

Photo: Grzegorz Mikusiński.

The social science perspective

In the very heart of this ancient Forest there are several villages inhabited by some 2500 people. The first settlements were founded in the 15th century; the permanent villages were located by the Polish kings about 400 years ago. The task of the settlers – orthodox Ruthenians and catholic

Mazovians – was to protect the forest and the animals for royal hunting and to produce charcoal, tar etc. Subsequent modernization and industrialization changes only supported the idea of “protecting”, “caring”, “looking after” the Białowieża Forest in the consciousness of the inhabitants, as well as the ethos of work connected with wood industry.

This specific “human” attitude towards the “natural” forest, (i.e. belief of human responsibility for nature as a part of it), connected with some sense of interdependence in isolated conditions (“in the middle of wilderness”), as well as the still multi-religious and multi-ethnic character of the local population make up the cultural heritage and cultural identity of the local community. Because of its unique natural (Białowieża Forest) and cultural (architecture, cuisine, ecumenism, historical buildings etc.) heritage the few villages are today also developing touristic centers.



Figure 2. People’s past and present in Białowieża

Photo: Xymena Bukowska.

The issue

There has been a long-term conflict about the fate of the Białowieża Forest, focused around the debate if this forest may maintain its value without human intervention. Foresters with support of majority of local population view the forest as their responsibility that require continuous care in form of silviculture measures that “protect” the forest from undesirable changes like accumulation of dead-wood, lack of desired regeneration and visible changes affecting forest appearance like dying trees perceived synonymously with dying forest.

These aesthetic and ethical arguments are accompanied by anxiety about the future of the local community – not only economic (dead-wood as firewood; dead-wood as danger/repulsive for tourists etc.), but also existential (in terms of potential “full ecologization” of the whole area of the Białowieża commune, inclusive villages). On the other hand, environmentalists and scientists praise

the value of the Białowieża Forest based on biodiversity values linked to natural processes that in large degree are based on ageing and death of trees.

The presence of dead wood in the managed part of the Białowieża Forest is one of the issues. The current outbreak of bark beetles killing old spruce trees gives foresters an argument for largely increased logging of this forest. The very limited cutting and removal of trees according to earlier regulations is proposed to be increased by the factor of 6 in order to stop the spread of the beetle and the increased creation of dead wood.

The actors and their messages

The ongoing conflict concerning the way how the Białowieża Forest should be managed and how to deal with the infestation of spruce trees by the bark beetle involves many actors. The “ecological side” includes majority of scientists, different pro-environmental NGOs, liberal media and international community including major newspapers like “The Guardian” or “Le Monde”. The message from this side of the conflict is clear – the ecological processes shall be allowed to act in Białowieża Forest so natural dynamics of the forest would be enhanced with long-term positive outcomes for its biodiversity and sustainability. The adversaries i.e. “foresters and allies” include State Forest Holding managing the area, part of the local population, the Ministry of the Environment and the conservative media. Their message is also quite clear – the Białowieża Forest must be protected against the infestation by the bark beetle using all possible means with logging and removal of attacked or threatened spruce trees as the most important silvicultural method.

The number of arguments supporting both ways of protecting Białowieża Forest is long on both sides and it seems that compromise is rather not readily available. Interestingly, some of the arguments of the opposing sides are just a different interpretation of the same phenomena (see Box 1).

Box 1. Arguments used in the discourse	
<i>Ecologists and allies</i>	<i>Foresters and allies</i>
• Uniqueness	• Uniqueness
• Forest must be saved	• Forest must be saved
• Species must be saved	• Species must be saved
• Forest must be left alone	• Forest must be helped
• Forest with a lot of dead wood is very valuable	• Forest with a lot of dead wood is simply dying
• Forest with a lot of dead wood is beautiful	• Forest with a lot of dead wood is horrible
• Priceless natural heritage	• Priceless cultural heritage
• Dead wood as opportunity	• Dead wood as waste
• Attraction	• Danger

Questions to address by students:

- 1) What are the most important/relevant arguments in the debate and why?
- 2) What stakeholders should have decisive voice concerning the fate of dead wood in Białowieża Forest and why?
- 3) How to manage dead wood in Białowieża Forest in the sustainable way?

Additional possible topics to considered by students

- How unique is the Białowieża Forest? What are the aspects of its uniqueness?
- How much dead wood is enough and why?
- Who is “right” in this discourse and why?
- Attitudes to the issue at local, national, European, global levels
- Short-term and long-term perspectives in conservation of Białowieża Forest
- May forest “take care” of itself and naturally regulate the amount of dead wood?
- “Sustainable” amount of dead wood in forests from the ecological, social, and economical perspectives
- Changing attitudes of people to forest values

Data sources

Internet resources

- <http://www.polishwolf.org.pl/bialowieza-forest>
- https://www.researchgate.net/publication/297737496_Why_the_Bialowieza_Forest_needs_dead_spruces
- http://www.nature.com/news/polish-scientists-protest-over-plan-to-log-in-bia%C5%82owie%C5%BCa-forest-1.19428?WT.feed_name=subjects_conservation
- <https://www.theguardian.com/environment/2017/may/23/worst-nightmare-europes-last-primeval-forest-brink-collapse-logging>
- <http://www.lasy.gov.pl/information/all-about-bialowieza-forest/the-foresters-to-ensure-safety-in-the-bialowieza-primeval-forest>
- <http://www.lasy.gov.pl/information/all-about-bialowieza-forest/10-facts-about-the-bialowieza-primeval-forest>
- <https://www.mos.gov.pl/en/news/details/news/action-programme-for-the-bialowieza-forest-signed>
- <https://www.mos.gov.pl/en/news/details/news/everyone-may-go-to-the-bialowieza-forest-and-see-what-it-is-really-like/>
- <http://www.santaopb.pl/bialowieza.html> (only in Polish)

Scientific papers

- Blicharska, M. & Angelstam, P. (2010) Conservation at risk: Conflict analysis in the Białowieża forest, a European biodiversity hotspot. *International Journal of Biodiversity Science, Ecosystems Services and Management*, 6, pp. 68-74.
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- Niedziałkowski, K., Blicharska, M., Mikusiński, G. & Jędrzejewska, B. (2014) Why is it difficult to enlarge a protected area? Ecosystem services perspective on the conflict around the extension of the Białowieża National Park in Poland. *Land Use Policy*, 38, pp. 314- 329.
- Niedziałkowski, K., Paavola, J. & Jędrzejewska, B. (2012) Participation and protected areas governance: the impact of changing influence of local authorities on the conservation of the Białowieża Primeval Forest, Poland. *Ecology and Society*, 17 (1), pp. 2.

Procedure

This exercise encompasses several steps allowing for achieving its aims. It may be performed with groups of 5-30 students and entails two meetings and independent work of students (individual or in small groups). Below, we suggest a possible scenario of the exercise.

1. **Opening the issue.** Introduce the main question of the case e.g.: “Should forest “take care” of itself and naturally regulate the amount of dead wood or should the amount of dead wood be strictly managed by humans?” Form group of students (per 3-5 students). Ask them to formulate 3-5 most important questions associated with your main question (e.g. What amount of dead wood is naturally manageable? What are the consequences of not-harvesting the dead wood?). After 5 minutes of work, ask them to present their ideas.
2. **Introduce the issue of Białowieża Forest** (based on teacher-prepared presentation according to info provided in the case). Be as neutral as possible. Finish with the main issue, i.e. “Should the dead wood from Białowieża Forest be removed or not?”
3. **Students’ independent investigation.** Provide students 1-2 weeks for their independent investigation (they can work in teams). Ask them to a) find their answers to any of their initial questions they find relevant for the Białowieża Forest case, b) on the basis of their findings, to formulate their evidence-based opinion on the issue;

4. **Briefly introduce the stakeholders of the issue and their opinions** (see box below). Prepare paper cards with their names and distribute them among the classroom. Ask students to take a chair close to the stakeholder card they share their opinion with. If the students group are too big for discussion, divide them into smaller teams.

5. **Ask students' teams** to discuss the following questions and then to present their answers to other teams:

- a. To formulate their statement and arguments for supporting the point of view of the stakeholder with whom they agree. They are supposed to clearly answer if the dead wood should be removed or not, and under what conditions.
- b. To identify the possible environmental, social, and economic consequences of their preferred solution. For both points, ask them to provide a good evidence-based argument.

6. After all of the presentations, **ask students to discuss in their teams** and let them present their answers:

- a. What arguments in the debate are the most important and why?
- b. What stakeholders should have decisive voice concerning the fate of dead wood in Białowieża Forest and why?
- c. How to manage dead wood in Białowieża Forest in a sustainable way? (for this questions, write the suggested options on the board and identify how they are supported by students).

You can finish with a wrap-up, summarizing the most frequently mentioned students' answers (for a and b) and the decision (c) with the prevailing support.

7. **Debriefing.** Ask students to discuss in pair and then to present:

- a. How difficult it was for you to analyse relevant information, prepare your own opinion, and communicate it with the others?
- b. How effective you have been in influencing other students by your arguments?
- c. What would you, on the basis of this experience, like to change in the way you analyse scientific information and communicate your opinion on complex issues with the others in the future?
 - Ecological NGO's requiring protection of forest from humans;
 - Ecologists (scientists) claiming necessity of maintenance of natural dynamics in Białowieża Forest;
 - Foresters (scientists) claiming necessity of human intervention in order to maintain the Białowieża Forest value;
 - Local foresters claiming that the Białowieża Forest values values originated from human work;
 - Inhabitants of settlements in Białowieża Forest interested in:
 - extended protection;
 - continued exploitation;
 - Decision-makers from the Ministry of Environment.

Learning outcomes assessment:

Short questionnaire to the students asking for list of new insight into different dimensions of sustainability.

Case 3:

Sustainable development in the Shinyanga Region, Tanzania

Author:

Mike Jones Swedish University of Agricultural Sciences – SLU (Sweden)

Key words: agricultural development, forest landscape restoration, local knowledge, participation, soil conservation, trypanosomiasis

Relation to Sustainable Development Goals (SDGs):



Strategy: Small group discussion and role playing

Time required for classwork: 120-360 mins depending on the ESD competencies to be addressed and student/teacher choice.

Student's preparation for the class: 60 minutes.

Aims: Introduce students to the complexity and uncertainty of rural development, and use a long term study of forest landscape restoration to introduce students to the application of core competencies for sustainability.

Learning outcomes:

After completing this case, students are able to:

- Describe change in a complex system over time (ESD Systems Thinking Competence).
- Analyze the ecological and economic trade-offs in the choice of ecosystem services to be produced from a landscape (ESD Normative Competence).
- Synthesize knowledge of change processes to develop scenarios of alternative futures (ESD Anticipatory Competence).
- Review and discuss their abilities to work effectively in small groups to complete the exercises in this lesson plan (ESD Interpersonal Competence).

Case description

Shinyanga Region

Shinyanga region covers approximately 50,000 km² of north-west Tanzania, on the southern shore of Lake Victoria. The population is more than 2.8 million people with an average annual growth rate of 2.8%. Per capita income is estimated at USD 180 per year and approximately 22% of the people live below the food poverty line. The high in relation to available resources population density (56 people per km²) combined with the people's agro-pastoral land use system of livestock production with subsistence and cash cropping, exacerbated already serious land use problems.

The area is predominantly semi-arid with an average annual rainfall of 600-800 mm. Rainfall is erratic and poorly distributed with high variability, meaning that arable farming is risky without access to irrigation, and the region is expected to suffer more extreme drought and rainfall events as climate change progresses. The natural vegetation in Shinyanga historically consisted of extensive Miombo and Acacia woodlands.

The area was inhabited by the Sukuma people who followed a subsistence agro-pastoralist lifestyle that was well adapted to the ecological conditions of the region. Land ownership and use rights were governed by customary law designed to set aside land in enclosures or "*Ngitili*" to ensure conservation of grazing land for drought years.

Development and Collapse

Development of the Shinyanga region began in the 1920s with a program that aimed to eradicate tsetse fly by clearing woodland to create better conditions for people, their livestock and arable agriculture. Tsetse flies are the vector of a debilitating and ultimately deadly *Trypanosome* parasite that infects people and livestock, limiting land use and human and livestock populations. Before the advent of measures to control tsetse fly, people avoided *trypanosomiasis* by avoiding tsetse fly infested areas. Most of the woodland clearing was done between 1925 and 1947.

As the woodlands were cleared agriculture changed from relatively limited and primarily subsistence farming of crops like millet and sorghum, to large scale cultivation of cotton and tobacco. Livestock numbers increased, and as cattle have a vital role as a source of status, exchange, draught power, milk, meat, and insurance against hard times, eventually led to severe overstocking. Loss of woodland resulted in a shortage of domestic fuelwood, meaning that women had to walk over 10km to harvest wood and increasingly made use of twigs, crop residue and animal manure for cooking and heating water. The supply of "minor forest products" such as medicinal plants, fruit, nuts, edible leaves declined drastically, removing an important source of supplementary food, which was particularly valuable when crops failed in times of drought.

The other major development intervention that added to the waves of change following woodland removal was the introduction of the *Ujamaa* Villagization Act of 1975. This legislation created new settlements around social service centers and required the relocation of people from their traditional homes. *Ngitili* and the traditional system of governing land use were abandoned, breaking

down established conservation practice that ensured sustainability in the long term. By the early 1980s, very few *Ngitili* remained.

The combined effects of woodland clearing, increases in livestock and the expansion of cash crops together with the breakdown in traditional land use practice led to a decline in soil fertility, soil erosion, and the ecological collapse of the Shinyanga region. The region was declared to be “*The Desert of Tanzania*” by the President of Tanzania in 1985.

Restoration and Development

Recognition of the degraded state of the Shinyanga ecosystem led to an extensive, long term forest restoration program under the name Shinyanga Soil Conservation Program or *Hifadhi Ardhi Shinyanga* (HASHI) in Swahili. The program was funded by the Government of Tanzania with support from the Government of Norway and ended in 2004 when the landscape was transformed to a mosaic of woodlands, savanna and agricultural land without tsetse fly. When HASHI started there were just 600 ha of *Ngitili*, when HASHI ended, there were more than 350,000 ha of woodland across 833 villages, and the benefits from restored woodlands were estimated as being worth an additional USD 14 per person per month to local incomes on average.

HASHI represented a change in policy from government imposition to acceptance of local knowledge stimulated by participatory processes and a long term (25 year) approach to restoration. HASHI depended on local knowledge of traditional land use practice and participatory planning that included women's groups, youth, village government and farmers, enabling adaptation and change. This was in marked contrast to earlier failed attempts by government to restore trees to the region. The government tree planting program was implemented in a top-down manner according to central government policy and offered exotic trees species that were unknown to local people.

One of the outcomes of the HASHI project was the development of 1,500 small nurseries for local trees species as small enterprises that supplied trees to farmers and village governments for restoration of *Ngitili*. As the forest returned, small enterprises based on herbal medicines, honey and fruit emerged contributing to improved diets and healthcare. Herbal medicine is critical in treating some diseases that are believed to be curable only by herbal medicine. Nitrogen fixing legumes are being used to restore soil fertility and as fodder for livestock. The water table has risen and dry season springs have returned making water more readily available. Timber and thatching grass are available for construction of homes, schools, general stores and public offices.

One villager said that “Trees gave birth to livestock,” as sales from tree products allowed him to buy livestock. A Sukuma lady described how her *Ngitili* saved many hours of work, “I now only spend twenty minutes collecting fuelwood. In the past I spent between two to four hours collecting fuel”.

The reduction in time taken to collect forest products were a major benefit to women and were in the region of:

- Fuelwood – 2 to 6 hours;

- Poles – 1 to 5 hours;
- Thatching grass – 1 to 6 hours;
- Water – 1 to 2 hours;
- Fodder – 3 to 6 hours.

On the negative side, vermin in form of wild animals has caused considerable damage to crops while some carnivores (mainly hyenas) have frequently killed livestock. Population growth and parallel growth in livestock numbers pose a risk for a second collapse if land use again exceeds the ecological potential of the restored land. The carbon market may be one way of avoiding this risk by providing farmers with an alternative to livestock and crops as an income source. It was estimated that *Ngitili* stored 23.2 million tons of carbon by 2011 with a value of approximately USD 213 million at that time.

During a poverty survey of Busongo village in Shinyanga in 2006, poor women revealed that wealthy men were rapidly acquiring land to create private *Ngitili*. Not enough land was being set aside for communal *Ngitili* to meet the needs of households with little or no land. Inequity was a problem before the HASHI project and was partially addressed by the creation of new *Ngitili* through reforestation and allowing preferential access to resource poor households. With economic growth, successful farmers are increasingly able to privatize common land. If left unchecked, this “*elite capture*” of the benefit of land improvement will lead to great inequity in a community that will come to consist of a relatively small number of farmers with relatively large landholdings, and a large number of landless people living in extreme poverty. This implies the need for new local institutions and governing bodies at village level that are accountable to village members. *Elite capture* of economies and the ever growing gap between rich and poor is a common and universal problem that is recognized as a system trap that keeps people locked in poverty.

Gender Aspects

Societal norms that stem from tradition and contribute to poverty include a patriarchal system, the custom of paying bride price (with cattle) by men, the expectation that women do household work and can be prevented from engaging in income generating activity. Decision-making power resides with the man in a household who has control over high value resources such as cattle and cash crops. Power may be enforced through beating.

Cultural norms and values determine the division of labour between men and women. Cultivation of high value crops is a shared responsibility but men market the crops and control the income. Male drunkenness after the sale of cash crops i.e., cotton and tobacco or the sale of cattle is a behavioral contributor to poverty.

Cultivation of low value crops is left to the women who are also responsible for household chores, including fetching water and collecting firewood.

A comparison of men’s ranked criteria for wealth with women’s criteria revealed major differences:

- money was ranked high by men; women do not rank money at all;

- a wife was ranked second highest by men; women did not rank a husband at all;
- household utensils were ranked highest by women; men ranked them less than 23;
- men ranked a plough, a cart, a milling machine, a shop, a sewing machine, a bicycle and a radio higher than household utensils; women did not list these items as important;
- men ranked cattle sixth while women ranked them second last.

The reason for the different ranking of cattle is that men decide how milk is used and when cattle can be slaughtered for consumption. Men also have power over goats, while women only have power over chickens. Women who defy men's authority over cattle may be beaten, driven from the household or killed.

Keys to Success

A critical factor in the success of HASHI was the program leader who deliberately adopted the new approach of participatory development to empower local people, as an alternative to the usual top-down and expert driven approach. The participatory approach enhanced the use and development of local rules and organization for their enforcement; it increased the trust and collaboration between villagers and development agents, and enhanced the adaptive capacity of those involved in the program. Primary stakeholders in the development process were the villagers, village level government officials, community groups and NGOs. Participatory processes with women's groups revealed major power, wealth and work load differences between men and women (see gender aspects described above) and in some cases resulted in the formation of new rules for relationship and the re-distribution of benefit and responsibility within the family.

Learning and Adaptation

Learning and adaptation was a central theme of the HASHI project, much of it related to the local knowledge and traditional rules for land use of the Sukuma people. Ownership of the program was put into the hands of local people who wanted to restore their land in their way, fostering a culture of learning by building on what they knew, and adapting as necessary.

The phases of development and learning were:

Phase 1: Woodlands are cleared to remove a major health hazard and impediment to economic development. Rapid changes in land use occur that exceed the ecological potential of the land and the system collapses.

Lesson learned: trees are important for ecologically healthy landscapes in this region of Tanzania.

Phase 2: The government of Tanzania attempts to restore tree cover under a command and control policy that requires villagers to plant mostly exotic trees. This fails as villagers resist the government program.

Lesson learned: Respect local people, their knowledge, rules and their desires for a better life.

Phase 3: HASHI support for natural restoration and tree planting using species people wanted, respecting local institutions, and ensuring that such knowledge and institutional systems are respected by government leads to successful restoration of land and livelihood for many people. The problems of elite capture that were never fully addressed re-emerge.

Learning: New rules and organizations are required to reduce the equity gap at village level.

Phase 4: Is currently unfolding and the outcome is uncertain.

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UNFCC Ngitili In Shinyanga, Tanzania http://www4.unfccc.int/sites/NWP/Pages/item.aspx?ListItemId=23433&ListUrl=/sites/nwp/Lists/MainDB_

Questions to address:

1. What role do global markets for cotton and tobacco have in promoting a cash crop economy in the developing south?
2. What are the consequences of cash crop farming on the long-term sustainability of ecosystem services and human wellbeing?
3. What do you think drove people to use land in the Shinyanga region beyond its ecological potential?
4. What changes to land use and human well-being do you think might occur if women had the same access to power and resources as men?
5. What kinds of land use rules do you think could be applied to prevent a second collapse of the Shinyanga region¹? Consider the potential for gender equity to form the new rules.

Procedure

Depending on student/teacher choice this case can be used in three different ways to develop four of the core competencies for sustainability (systems thinking, interpersonal, anticipatory and normative). The order in which the exercises are applied reflect a progression from an analysis of a complex sustainable development problem to the development of scenarios that describe plausible alternative futures for the people of the Shinyanga region.

1. Systems analysis of case evidence

Suggested procedure:

- a) After reading and discussing the case, groups of 4 or 5 students make a short presentation including a mental map or systemic chart that describes the main “drivers of change” that (a) led to the “desertification” of the Shinyanga Region; and (b) led to the restoration of woodlands and customary land use practice.
- b) The student groups consider which four of the SDGs are most important in the context of the Shinyanga region and which SDGs conflict with the four selected presenting arguments to support their choice.
- c) The student groups use the evidence in the case to present a reasoned argument for what they think will be the outcome of the fourth (current growth) phase of the economy in the Shinyanga region. Alternatively, students can complete a scenario analysis (below).

¹ Answers to questions 4 require some knowledge of reinforcing and balancing feedback that can be found in Ch 2. Meadows, D.H. (2008) *Thinking in Systems: A Primer*. Vermont: Chelsea Green.

- d) Students review and discuss their ability to work together, reach a common understanding of the problems of Shinyanga, and agree on an outcome of the current trends in the region.

2. Trade-off negotiation through role play

Students play roles to negotiate the trade-offs between the livelihood strategies of different stakeholders in a “typical” Shinyanga village and the sustainable use of ecosystem services? The aim of the role play is firstly to explore the extent to which self-interest and power struggle can lead to undesirable outcomes; and secondly, to find a land use solution that meets the livelihood and well-being needs of all the stakeholders over the long term.

Roles within the village community include:

Chair of the village council: seeks to balance conflicts within the village and develop rules for land and resource management that maintain this balance over the long-term. Depending on his ethics, the chair of the village council may use his position to further his personal wealth at the expense of the community as a whole. Long-term sustainability depends on his ability to balance the different interests in the village with the ecological potential of the land.

Agricultural marketing agent: buys cotton and tobacco from farmers, transports it to a central market, advances credit for seed, fertilizer, pesticides and herbicides. He is an agent for corporations that trade these agricultural commodities on the global market and earns a commission on all the transactions that he makes. He is an accomplished salesman and loyal to the corporations that he serves.

Wealthy farmer: seeks to increase his landholding for cash crops, livestock numbers and access to *Ngitili*, while resisting attempts by his wife to have more access to family income so that she can improve the quality of life in her household. He uses chemicals to increase cash crop production. He justifies his accumulation of wealth by claiming to provide employment to poor people in the community.

Wealthy farmer’s wife: wants a greater share of the family income to improve the quality of life for her herself and her household including: more children to assist with household chores, good food, good health, good clothes, schooling for her children, and good marriages for her elder children. She may use her position of relative power to form collaborative arrangements with other women in the community and advocate for social reform.

Poor farmer: has access to sufficient land and livestock to become successful but spends much of his income on women and alcohol. He is in debt to the agricultural marketing agent and blames others for his misfortunes, including his wife, his wealthier neighbours and the village council. Apart from indulging his vices, he seeks maximum gain for minimum effort.

Poor farmer’s wife: suffers from domestic conflict and seeks to improve her wellbeing through her children, support from her neighbors and access to *Ngitili* for minor forest products that she will use for food, medicine and selling.

Woman without land or husband: in many respects she is the poorest of the poor who is dependent on her children for help with household chores, wealthy neighbors for wage labour and access to *Ngitili* for minor forest products that she might use for handicrafts, traditional medicine and food. Although materially poor, she has control over her household and any income that she earns. She might be willing to engage in a social reform movement.

Suggested procedure:

- a) After reading the case and being assigned their roles, students are instructed on the difference between arguing to uphold a position, exploring the underlying issues that formed that opinion, and seeking ways of meeting their common interests. In the real world, people vary in their ability and willingness to seek solutions to meet common interests and students can decide what approach they wish to take to problem solving. Alternatively the teacher can assign negotiating styles to particular roles.
- b) After a discussion and negotiation round, the students step out of their roles and:
 - a. reflect on what if anything was resolved; and
 - b. the likely long term consequences of implementation of the new agreements and rules for governing village life and access to land.
- c) Students may then enter a second round of negotiation, where each strives to find ways of meeting their common interests, as opposed to getting only what they want regardless of the consequences of the other.
- d) At the end of this round, students reflect on what has been resolved, the long term consequences of implementation of new agreements and compare this outcome with the outcome of the first round of negotiation.
- e) In addition, students review and discuss changes in the manner in which they negotiated in the first and second rounds.

3. Alternative future for Shinyanga

After completing the role play exercise, students apply a simple qualitative approach to scenario planning² to develop two scenarios that illustrate alternative futures for the people of Shinyanga.

Suggested procedure:

- a) Ask the same student groups who participated in the role play to prepare a short presentation of two alternative futures for Shinyanga bearing in mind the current tensions between actors, ecosystem services and future uncertainties.
- b) Students use the outcome of the system analysis and role play negotiation to:

² Biggs, R. *et al.* (2010). Preparing for the future: teaching scenario planning at the graduate level. *Frontiers in Ecology and the Environment*, 8 (5), pp. 267-273. <https://doi.org/10.1890/080075>.

- a. Discuss and agree two alternative trajectories of future change. Use key uncertainties as a basis for thinking about alternative ways in which the Shinyanga could evolve.
 - b. Create stories that describe each scenario³. Each story should track key indicators such as poverty, land use change and rural economics in Shinyanga and should complement each other, forming a coherent, thought-provoking pair of alternatives.
 - c. Test the scenarios for consistency by comparing them with the negotiated needs of stakeholders defined during the role play. The dynamics of the stories must be plausible.
 - d. A set of 3 to 5 key policy recommendations for rural development agencies, based on the lessons the students learned from working through the Shinyanga case.
- c) The tendency towards land privatization by the emerging elite is the subject of one scenario.
- d) The second scenario is a reflection of the agreements negotiated in the role play.
- e) Additional factors to consider in both scenarios are:
1. growing human population;
 2. changing climate;
 3. return of tsetse fly and associated health risks for people and livestock.

Learning outcomes assessment

Ask students to review and discuss what they learned from the case in relation to the four core competencies for sustainability that this case and lesson plan illustrate and question aspects they had difficulty understanding.

Potential for wider use

The Shinyanga case is a good example of the application of adaptive management in response to the unexpected and undesirable changes that can occur in a complex system as a consequence of a development intervention that is unaware of the effects of ecological limits on economic development.

Further application

The Shinyanga case could be used to compare similar rural cases from the developing world and the developed world, to explore the effects of social and ecological context on development outcomes and future trajectories towards sustainability.

³ Students may create pictures instead of stories to illustrate the scenario if they prefer.

Case 4:

**Rural tourism development:
the case of Plastiras Lake, Karditsa, Central Greece**

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Keywords:

rural tourism, innovation, sustainable rural development, (local) conventions

Relation to Sustainable Development Goals (SDGs):



Strategy: The lesson comprises an initial group discussion, text analysis, and follow-up discussion aimed to reformulate students' initial conceptual understanding

Time required for classwork (in minutes): 90.

Students' preparation for the class (in minutes): No preparation to the class needed.

Aims: Development of anticipatory competence; integrating elements from different subjects or fields in analysing a situation.

Learning outcomes:

After completing this case, students are able to:

- Identify the social, economic, and environmental aspects of the issue;
- Reason that many problems (environmental, economic, socio-cultural) are created by people;
- Create a vision and plan for sustainable tourism;
- Develop communication and team skills.

Questions to address:

- What are the factors (or the challenges) that have to be taken into account when planning rural tourism with a view to sustainability?
- How can tourism development relate to the other sectors of the local economy?

Case description

Sustainable tourism is defined as the tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities.

The case of Lake Plastira represents an example of sustainable tourism development in central Greece over the previous decades. The Lake Plastira is located on a mountainous plateau in the Regional Department of Karditsa, about 350 km north of Athens. It is an artificial lake, which was constructed during the period 1958-1962 in order to produce electricity, irrigate the plain of Thessaly and supply with water the city of Karditsa and another 38 plain towns and communities. Moreover, under the European Union's Agricultural Policy, the region around Lake Plastira has been designated as a "Less Favoured Area", due to its geographical, topographical and socio-economic constraints.

The census data reveals that, during the period 1961-2001, the Lake Plastira area experienced a population decrease of 18.6%. In particular, from 1961 to 1971, the population displayed a significant decrease by 32.3%, that can be mainly attributed to emigration, as the lake's construction isolated villages that were previously close to each other, causing great travel distances, and also covered hectares of previous fertile agricultural land causing a decline in farming jobs. Thus, in the period 1971-2001, the number of farm holdings and cultivated land reduced by 50% and 60% accordingly. In general, the small and fragmented holdings as well as the steeply sloping land are the main causes of low productivity. Furthermore, the livestock sector in the area is characterised by traditional, labour intensive production methods with low rates of capital investment which mostly relies on EU subsidies.

As far as the secondary sector is concerned, only enterprises of traditional cafes, restaurants or even food stores (a type of mixed family businesses) were found in all villages, while some families run small-scale traditional businesses such as distilleries, weaving, carpentry and smithing.

Given the presence of the lake, the high mountain peaks, the prevailing forest species of fir, oak and chestnut trees, the alpine grasslands as well as a variety of rare, endangered and protected fauna and flora species, Lake Plastira area is considered a landscape of great scenic beauty and is a designated NATURA 2000 area. Nevertheless, the tourism sector was not developed in the region before 1987, when a local development project adopted by the Prefecture of Karditsa proposed sustainable tourism as the vehicle that would reinforce the local primary production and provide alternative sources of household income. After the completion of the first hostels (1992-93), the tourist demand progressively increased resulting in further investments in the tourism infrastructure mainly

funded by the local LEADER Programmes¹ (European Union initiative to support rural development projects). Nowadays, Lake Plastira area is one of the most renowned mountainous tourism places in Greece.

AN.KA, the Development Agency of Karditsa, played a significant role in the development of tourism sector in the Lake Plastira area. AN.KA., created by local authorities and cooperatives in 1989, aimed to co-ordinate initiatives and implement integrated development programmes taking into account sustainability, co-operation and self-governance. Moreover the Agency represented the Local Action Group (LAG) of the LEADER Community Initiative in the Prefecture of Karditsa that designed and applied local development programmes.

Although the rapid development of tourism in the Lake Plastira area was at first seen as an opportunity for improving the income and in general the residents' life quality, concerns about the environmental, socioeconomic and cultural consequences of such a (tourism) growth also arose. Within this context, AN.KA. supported an innovative organisational scheme, the Local Quality Convention (LQC).

The LQC comprised the common vision for 'quality tourism' envisaged by entrepreneurs through a series of meetings that were arranged and supported initially by the Agency. The overarching aim of the LQC was the improvement of the standards of living of local people through the protection of the anthropogenic and physical environment and the upgrading of tourism services.

Two distinguishable groups of entrepreneurs can be found in the area, the "new businessmen" (largely, the quality tourism entrepreneurs) and the local ones. The first group is characterised by higher educational level, great entrepreneurial knowledge acquired mostly outside the region and is concerned about the long-term viability of enterprises, along with environmental protection and the prosperity of local society in general. On the other hand, the local entrepreneurs are the local people who entered into the tourism sector but who lack entrepreneurial spirit, have showed primary interest in their own short-term profit and can hardly understand notions like innovation and sustainable development.

During the first meetings, AN.KA. acted as animator and facilitator encouraging participants to share their concerns, identify problems, as well as to recommend ideas and potential solutions. Afterwards, the entrepreneurs took the lead, set out the LQC's rules and submitted new proposals for funding from the Leader Programme. The LQC gained more members and was considered as a great example of successful innovation.

On a later stage local entrepreneurs also joined LQC. Nevertheless, personal interests and different perspectives on the LQC and the type of tourism to be promoted created conflicts and disagreements among tourism entrepreneurs resulted in instability and eventually the interruption of LQC scheme.

¹ The local Leader Programmes (Leader II and Leader+) were the EU initiatives that promoted a bottom up approach.

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Procedure

A discussion method is applied in which students try to explore, understand and assess the factors that can boost rural tourism development ensuring at the same time adherence to sustainable values. The exercise begins by posing the two introductory questions and asking students to express

their broad and general view on the topic. Afterwards, the teacher introduces the case and relevant literature to help students to clarify the facts and the role of actors involved as well as to identify different perspectives and needs.

Additional questions that are addressed to the students are:

- Why did LQC fail?
- Why was the innovation (LQC and sustainable tourism) not adopted by the local population/local entrepreneurs?
- Which is the role of women in rural tourism?
- How is gender included/not included in local development planning and how can women be empowered?

Through the study of the written materials and discussion students put their own questions, defend their views and acknowledge opposing ones, formulate their positions and revise them while receiving feedback and critiques from the others. Finally, they are able to propose a draft sustainable tourism plan.

Final product: Draft sustainable tourism plan.

Learning outcomes assessment:

Comparison of initial and final views on (sustainable) rural tourism development; quality of draft sustainable tourism plan; communication skills.

Further application:

The battlefield of development – the case of Santorini

The island of Santorini is located in the southern Aegean Sea, in the island complex of Cyclades, approximately 128 nautical miles south-east from Piraeus (Athens' port). Santorini is the remnant of a volcanic cone, whose central part was blown up by the Minoan eruption that took place in 1613 BC, resulting in the creation of the world famous caldera of Santorini.

The volcanic soil of Santorini favours the cultivation of grapevines, which are adapted to the hot and dry conditions prevailing in the island. Historically, winemaking on the island is placed at the end of the 5th millennium BC. There are twenty-five indigenous grape varieties to the island that are totally resistant to phylloxera insect; thus Santorini is one of the few places in Europe with its original un-grafted vines. Vines are self-propagated through layering in a disorderly manner in space and pruned with two distinctive traditional methods adapted to the climatic conditions of the island (i.e. hot and dry summers, strong winds), resulting in a unique agricultural landscape.

Although at the beginning of the 20th century, vineyards covered 3,500 ha, accounting for 84% of cultivated land, over the years more than half of the vineyards' area has declined, amounting to just 1,492 ha in 1997. Based on the 2013 available data, the total area covered by vineyards is 1,300 ha.

Agriculture was the main economic activity for the population of the island until the 1970s, when tourism emerged as the dominant economic sector. Tourism development competed for agricultural

land and labour. The increasing tourism activity required new constructions creating an urban continuum on the large part of the island which, degraded the agricultural landscape. Furthermore, farmers preferred to get engaged in tourism businesses and related activities that provide higher, easier and more stable income.

Since 1970 Santorini's wines were assigned the Appellation of Origin label, protecting the reputation of Santorini quality wines. Later on when Greece joined the European Union they were nominated as 'VQPRD' (Vin de Qualité Produit dans une Région Déterminée).

However, before 1980, most of the wine was sold in bulk to the neighbouring islands as well as to the mainland. The first attempt towards quality wine production in Santorini was initiated by one of the largest wine-making companies, located in Northern Greece, in a joint effort with local bulk wine producers and the co-operative. Thereby the construction of a modern winery and an information center (1989) along with an independent facility created by the local co-op (1992), whose membership counted 2,500 vine cultivators, were the key factors that stimulated the development of a niche market for Santorini wines.

In addition to tourism expansion, another pressure on landscape comes from the development of the global market for quality wines that commands a shift towards the homogenization of the taste and the creation of "international wines". In this respect vine growers aiming to enter this new market should restructure their vineyards in terms of grape variety cultivated, propagation methods and pruning techniques thus influencing/changing the island's landscape.

Two measures of the EU's rural development policy applied on the island of Santorini provide financial incentives (subsidies) to vine growers in order to maintain the traditional pruning system of vineyards and the continued cultivation of the traditional vines respectively.

Currently in Santorini the actors involved in the wine sector are divided into two groups who conceive the notion of quality differently. The first group seeks quality through the entrance of Santorini's wines into the global market; thus, in order to be more competitive changes are needed at the expense of tradition and landscape. The second group acknowledges that the fame of Santorini's wines stems from the traditional vine varieties along with its unique 'terroir'; thus they support and protect the traditional pruning and planting methods preserving simultaneously the agricultural landscape.

Question to address:

- What are the environmental, socio-economic and cultural effects of tourism development on a local community?

Data source

Vlahos, G., Karanikolas, P. & Koutsouris A. (2016) Farming system transformation as transition to sustainability: a Greek quality wines case study, 12th European IFSA Symposium [International Farming Systems Association] on "Social and technological transformation of farming systems: Diverging and converging pathways", Proceedings available at: <http://www.harper-adams.ac.uk/events/ifsa-conference/papers/1/1.1.08%20Vlahos.pdf>.

Case 5:

Organic farming and public support in the EU – the Greek case

Authors:

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Alex Koutsouris Agricultural University of Athens (Greece)

Keywords: agricultural policy, organic farming incentives, public goods provision, interest groups (stakeholders)

Relation to Sustainable Development Goals (SDGs):



Strategy: Role playing, debate

Time required for classwork (in minutes): 270.

Students' preparation for the class (in minutes): 90.

Aims:

Appropriately handling situations that are ethically ambivalent, complex or conflictive; showing comprehension and consideration towards the requirements, interests and positions of others; reconciling contrasting stances in seeking satisfactory alternatives.

Learning outcomes:

After completing this case, students are able to:

- Evaluate the environmental, economic and social aspects of organic farming as an approach towards sustainability in agriculture/rural space.
- Analyse and criticise the rationale of organic farming support.
- Work collaboratively with others and develop decision making skills.
- Improve communication skills and critical thinking abilities.

Case

The International Federation of Organic Agriculture Movements (IFOAM) defines organic agriculture as a production system that sustains the health of soils, ecosystems and people. It relies on biodiversity, ecological processes and cycles adapted to local conditions, rather than the use of inputs that may have adverse effects. Consequently, organic agriculture as a holistic approach of sustainable farming is according to IFOAM, meeting society’s demand for environmentally-friendly farming practices and higher quality food products. Moreover, it encourages the provision of public goods contributing to environmental protection and animal welfare. The environmental claims of organic agriculture include improved soil health, reduced risk of soil erosion, water quality, enhanced biodiversity and climate change mitigation.

According to data of the Hellenic Ministry of Rural Development and Food, the total agricultural area under organic farming in Greece has increased during the period 2009-2015 with an average annual growth rate of 11.8%. Between 2009 and 2011 organic farming decreased by about 35%, followed by a sudden increase in 2012, when it reached its peak (462,618 ha), and seems to be stable from 2013 to 2015. The significant decrease in organically farmed area during the period 2009-2011 coincides with the beginning of economic crisis in Greece, while the sharp increase in 2012 can be attributed to the launch of the organic farming measure of the Greek Rural Development Programme 2007-2013. Figure 1 presents the evolution of total organic farmland in Greece.

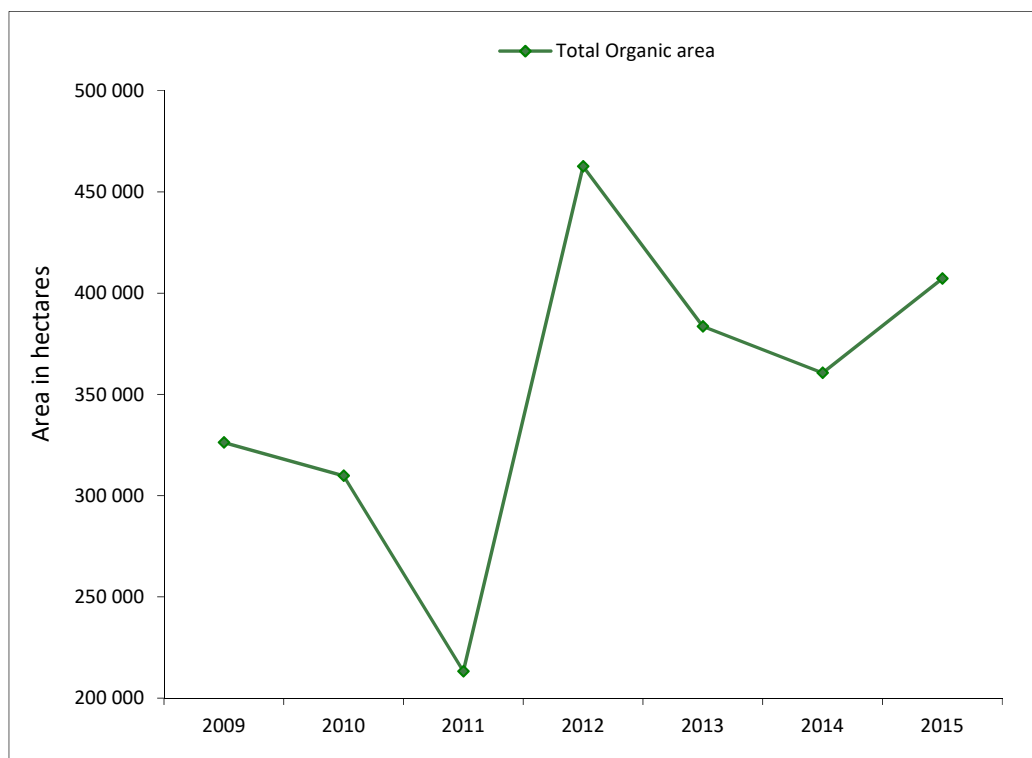


Figure 1. Evolution of organic agricultural area in Greece 2009-2015

Source: <http://www.minagric.gr>, elaborated by the research team.

Organic farming in Greece consists of arable land crops (such as cereals, fodder plants, fiber plants, oilseeds, vegetables, pulses, medicinal-aromatic plants and herbs), permanent crops (such as fruit trees, nuts, citrus, vines and olive trees), as well as pastures and grassland.

In terms of extent (excluding the pastures), arable land is the most extensive area farmed organically between 2009 and 2015, with cereals and fodder plants being the most important crops. When considering permanent crops, olive trees and vines seem to be of particular important (Figure 2).

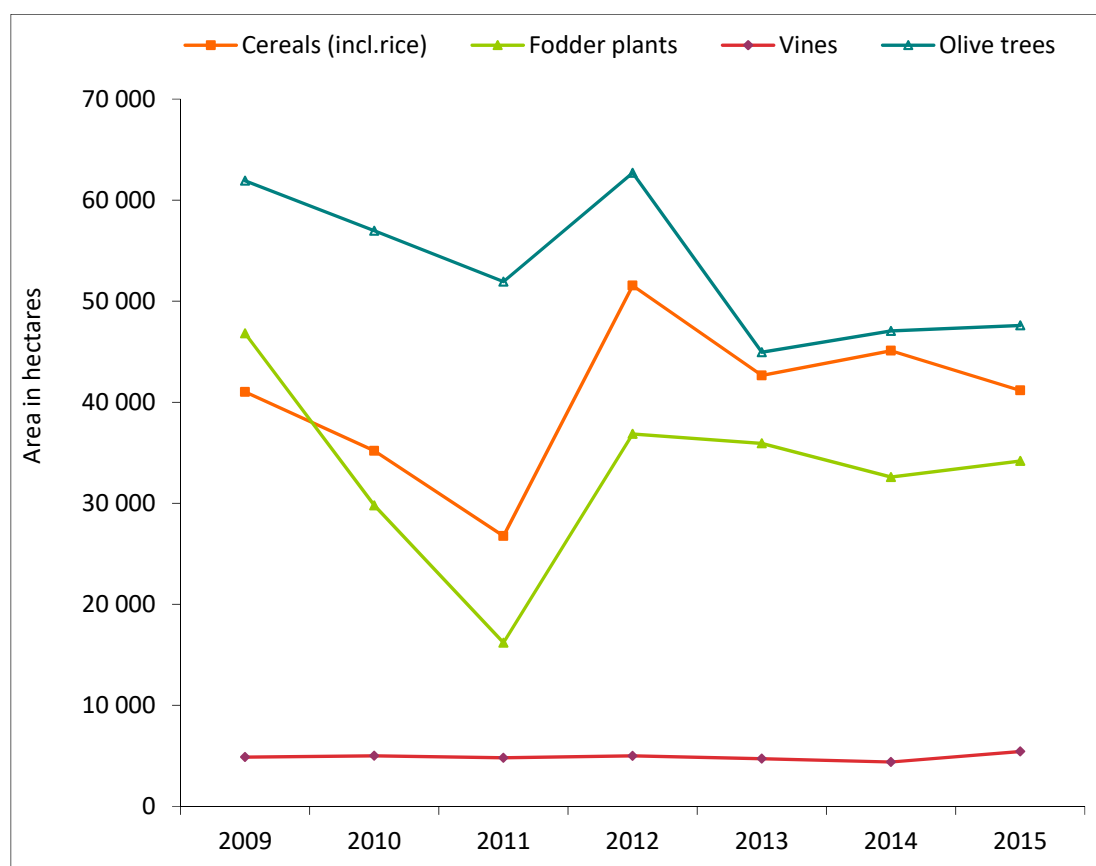


Figure 2. Organic agricultural area under major crops in Greece 2009-2015

Source: <http://www.minagric.gr>, elaborated by the research team.

The organic livestock production in Greece seems to follow the same trend. According to the data available, the total number of animals organically reared has slightly increased between 2009 and 2015, with an average annual rate of 5%, while the most important animal species seem to be sheep and goats. The evolution of organic livestock production in Greece is depicted in Figure 3.

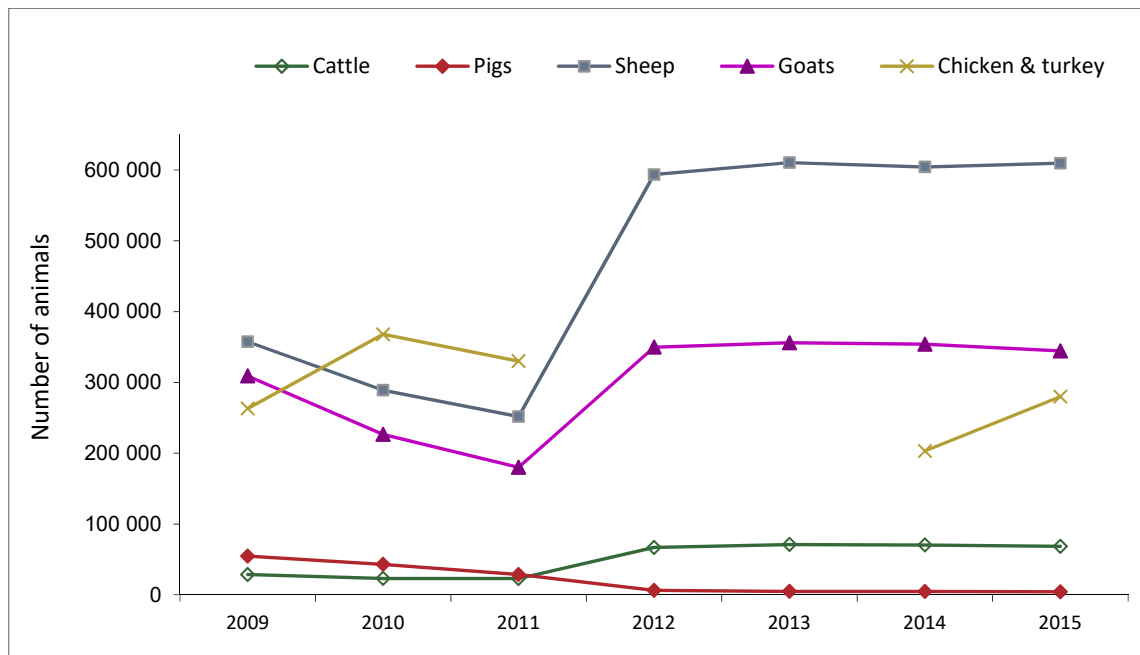


Figure 3. The evolution of organic livestock production in Greece 2009-2015

Source: <http://www.minagric.gr>, elaborated by the research team.

Organic farming is currently supported under both pillars of the Common Agricultural Policy. Organic farmers receive an additional 5% of the 1st pillar payments, while under the Rural Development Programmes provide incentive payments to farmers who voluntarily adopt organic farming systems. Support is given to compensate for income forgone and increased costs due to compliance with stringent farming practices required for organic farming. Out of the €4.7 billion of the Greek Rural Development Programme for the current programming period (2014-2020), €600 million are allocated to organic farming, thus accounting for 12.74% of the total public funds.

In addition to that, at the Greek market, the organic products are sold at prices higher than conventional products by a range of 20% to 50%. Price premium paid to organic products is often legitimised on the grounds of them being differentiated goods. Different products command different prices. The rationale for such a differentiation is usually based on food quality and consumer health and safety claims.

Food quality can be judged on objective (e.g. energy content, proteins, vitamins) or subjective (it tastes nice to me) grounds. Although nothing can be said on the subjective argument of food quality, there are many research papers (and meta-analyses) that do not support nutritional differences between organically and conventionally produced goods.

As far as food safety is concerned, conventional food products bear the risk of having chemical residues (pesticides) above the allowable safety limits i.e. Maximum Residual Limits (MRLs). However, if producers followed good agricultural practices and comply with safety regulations, MRLs are not exceeded. Hence there is no risk element. On the other hand, organically produced goods by

default have negligible risk of chemical residues, but increased probability of other risk elements (mycotoxins) cannot be excluded¹.

Questions to address:

- 1) Do you agree with the EU policy to provide financial support to organic farming?
- 2) What are the reasons for which subsidies are provided to organic farmers?
- 3) On which grounds are price premiums to organic products justified?

Data sources

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¹ Further information can be found in the selected references (below).

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Procedure

A role playing debate will be applied. There are four interest groups/ stakeholders addressing environmental, social, economic and ethical concerns:

1. Farmers
2. Consumers
3. Policy makers
4. Taxpayers

Each group should explain their positions, formulate arguments and justify their decisions concerning the questions listed above.

Moreover groups should consider the following issues:

- Farmers: What motivates farmers to adopt or reject organic farming?
- Consumers: Why do consumers purchase or refuse to purchase organic products?
- Policy makers: Should policy design, e.g. organic farming subsidies, be based on income foregone or rather on the delivery of positive externalities from this farming system?
- Taxpayers: Should taxpayers bear the cost of organic support?

If there is enough time to allow for both lecturing on organic farming and role playing (appr. 6 hours; 45 min/hour), the flow of activities of the exercise is as follows:

- In the first stage, students are presented with a comprehensive lecture on organic farming in order for students to acquire the basic information on organic farming principles, certification, labeling and financial support. Afterwards, students are divided into groups and background information and support material are distributed and further sources indicated.
- In the second stage, students do their own research, group meetings and preparation (depending on the time available, e.g. within two weeks' interval).
- In the last stage, students participate in a role playing exercise: group presentation in the class, discussions among and within groups, concluding statements/positions and joint decision making (based on their mutual agreement).

If there is sufficient time, next steps can be also followed:

Step 1: Each group presents its view on the three specific questions given; only clarification questions are allowed by the rest of the groups.

Step 2: Each group discusses additional questions to be addressed to the other three groups (farmers formulate questions to consumers and/or taxpayers and/or policy makers/ consumers to farmers and/or taxpayers and/or policy makers, etc.).

Step 3: The questions are addressed to each specific group. The facilitator should be ready to add questions in case any of the groups is short of questions

Step 4: Each group discusses the questions received and agrees on the answers.

Step 5: Each group responds to the questions addressed to the group.

Step 6: Following a general question is addressed to all: "Did you change any of your views after the discussion?"

Furthermore, depending on the size of the class and the time available, before steps 1 and 6, a human continuum activity may also be used. For example, at the 1st step before the groups' presentations, the teacher (facilitator) may ask students to stand along a continuum according to how much they agree or disagree with a statement "organic farming should be subsidized". Likewise, at the 6th step, the teacher may ask students to stand along a continuum depending on whether they have changed their initial position.

Final product: Group work presentations and discussion output.

Learning outcome assessment: Quality of group presentation and discussion.

Further application:

Water management and EU policies – the case of Larissa, Central Greece

Larissa is one of the four regional departments (NUTS3) of Thessaly. It is mostly a plain area, where agriculture has been traditionally the main economic activity. The previous 'coupled' Common Agricultural Policy (CAP), commodity support schemes led farmers to shift towards highly intensive cropping patterns, in which cotton predominated, thus causing significant pollution in surface and ground water.

One of the first Agri-environmental Measures implemented in Greece in 1995 (under Reg EEC 2078/92) aimed at combating water pollution caused by nitrates originating from agricultural sources. The Nitrate Reduction Scheme was initially targeted at Thessaly, a Nitrate Vulnerable Zone (NVZ) designated under the Nitrates Directive (EEC/91/676), and then expanded to other NVZ areas. The scheme was designed to provide incentives to farmers in order to introduce or maintain nitrate-reducing farming practices concerning irrigated arable crops in areas with high concentrations of nitrates in their groundwater or in NVZs under Directive EEC/91/676. The stated objectives of the Nitrate Pollution Reduction Scheme were: protection of water resources from exhaustion, restoration of the quality of ground water and improvement in soil fertility. Therefore the specific action aimed to reduce water use and the application of fertilizers as well as to create ecological compensation areas.

On the other hand, cross compliance is a key instrument for integrating major environmental concerns into the first pillar of the CAP and consists of compulsory environmental requirements and obligations that farmers should abide by in order to receive CAP subsidies. In particular, farmers being in a NVZ area should comply with obligations defined in their Local NVZ Action Plan as well as with other specific cross compliance legislative measures.

Question to address:

- 1) Comparison of the environmental, economic and social effects related to the implementation of a regulatory policy measure (cross compliance) and an incentive provision project (agri-environmental measure).

Case 6:

Remodelling an ancient farm

Authors:

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Keywords: ecosystem services, cultural heritage, rural tourism

Relation to Sustainable Development Goals (SDGs):



Strategy: role-play, group work, discussion

Time required for classwork: 120 minutes.

Time for students preparation to the classwork: 30 minutes.

Aims: Development of knowledge and competences related to the remodelling of open spaces in a sustainable and traditional perspective, taken in account the tradition and culture heritage of the population of the area.

Learning outcomes:

- To develop interest and motivation in the development of sustainable projects.
- To discuss the values of the three pillars in an example of a Sustainable Development project.
- To demonstrate the relevance of each pillar of Sustainable Development in the process of reaching a decision for the reconstruction of an old farm.
- To evoke knowledge related to ecosystem services.
- To improve communication skills through presentation activities or debates.

Competences:

- Anticipatory;
- System-thinking;
- Normative;
- Interpersonal;
- Strategic.

Questions to address:

- What pillar of Sustainable Development should be more relevant to the sustainable development of this farm and the Manor House?
- Which decision would be more profitable and would sustain the farm for the upcoming generations?
- Which arguments can be used to stand up your decision?
- Which values do you think are more important to be preserved (cultural, historical, environmental, social, economic...)?
- Is there a sustainable decision to remodel the House and the farm?

Case description:

Paço de Calheiros is a Manor House located in the North of Portugal, close to the medieval town of Ponte de Lima. It is classified as a Monument of National Interest and its surroundings are classified as Historic Gardens by the Association of Historic Gardens of Portugal.

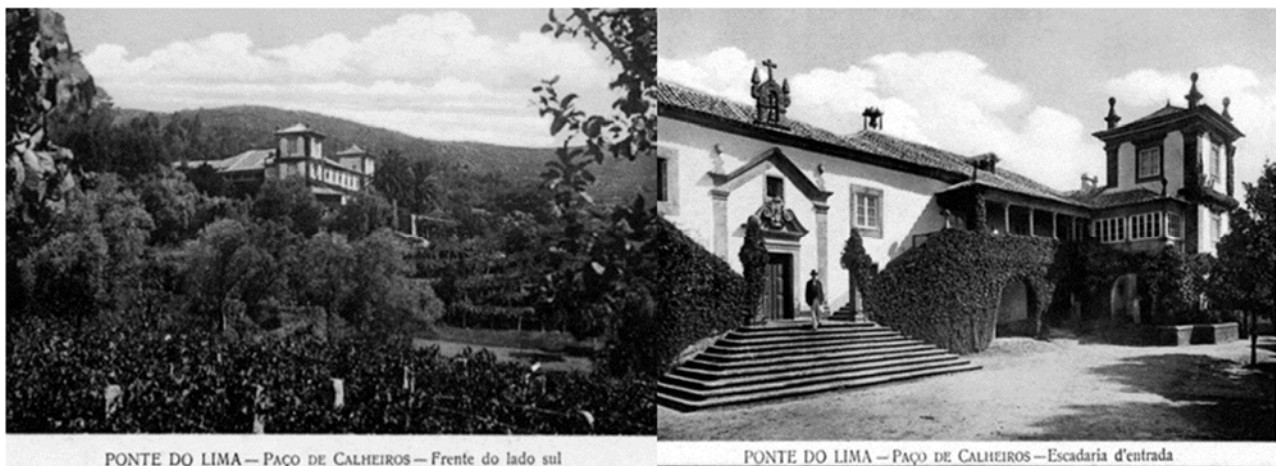


Figure 1. Farm and Manor House of Paço de Calheiros, Ponte de Lima, Portugal (1905-1930)

It is a 13-hectare property, placed on a hill in a white wine production region. Several elements are identified in the property such as: chestnut grove, old mill, the vineyards and archaeological findings and old stables. Water runs in several fountains and tanks in the property. A vegetable garden is situated near the house for self-consumption.

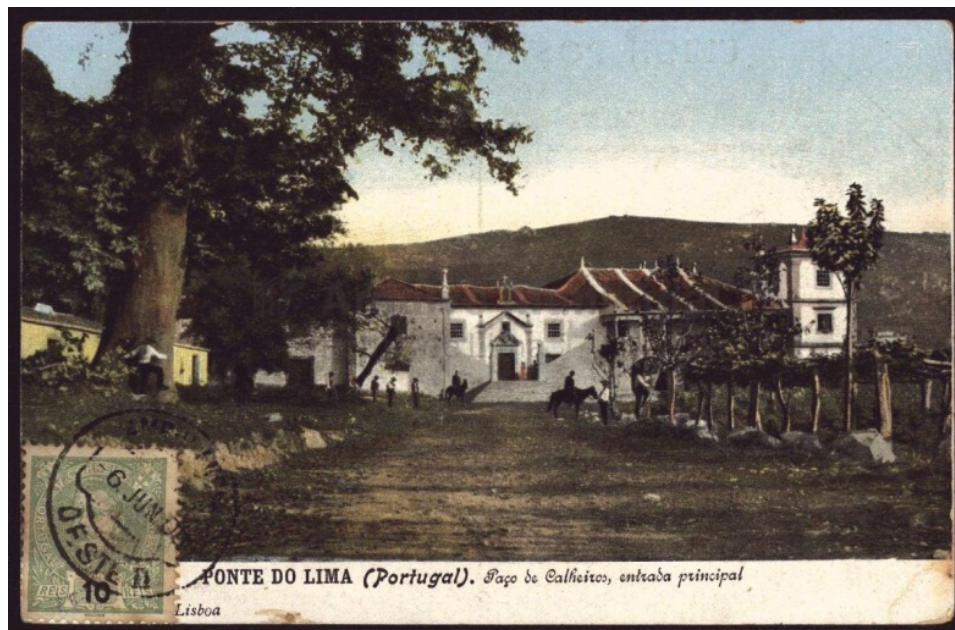


Figure 2. Postcard of the Main Entrance of Paço de Calheiros, Ponte de Lima, Portugal (1905-1930).

Built in the 17th century by the Calheiro's family, a recognized family since the beginning of our nation, the Manor House has 9 bedrooms and a wine cellar. The family was faithful to all Kings of Portugal and made an effort to preserve the originality and culture of the region. Paço de Calheiros is an 18th century manor house, built of granite and wood.

Currently the Farm is owned by the Count of Calheiros, Francisco de Calheiros e Menezes, who is looking for a sustainable way to run the house and promote its development in a region full of tradition and with a strong commitment to promoting tourism.

Data source

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Procedure

A role play will be performed after work development in small groups (each team is a group) for 15 minutes (much of the work has to be done before the class). The role play will promote a discussion so that every group can present arguments to support their decision. It is expected that the mediator (a member from the team 5) facilitates the discussion allowing each team to present arguments to support their own points of view. In the end, the team that has the role of the stakeholder (the team 5) will present a PowerPoint with the final sustainable taken decision.

Roles of each team:

Each team has to find arguments to stand up its decision and it is possible to use some resources, like a PowerPoint (with a maximum of 3 slides) to synthesize and present its opinions during the discussion.

Team 1 – these four members belong to EER (Eco-centric Environmental Relationships) an ecologic association that devotes their lives to support the idea that Humans must have an eco-centric relationship with the environment. They define themselves as a political and ethical movement that seeks to improve and protect the quality of the natural environment.

Team 2 – these four members are not associated to any group. They represent the movement of citizens interested in defending the inclusion of immigrants in the country. They have informal activities which focus their concern in social or political issues. They carry out, resist or undo a social change.

Team 3 – they are four members of the Town Hall of Ponte de Lima interested in preserving the cultural and historical aspect of the region. The touristic development and the conservation of the cultural heritage is the most important mission to be accomplished.

Team 4 – the four members are economists with a background in Agriculture Sciences and are interested in finding a place to produce good wine to sell to foreign countries in order to make the best profit possible without compromising the sustainable development of the region.

Team 5 – the four members (stakeholders) belong to Calheiros' family and want to find the best sustainable decision to remodel the farm and the manor house so as to be able to preserve its' identity to future generations.

Further application:

The Terramonte mines are located in Castelo de Paiva municipality, about 20Km SE of Porto, Portugal. The mine is crossed by the Ribeira da Castanheira which flows into the Douro River, upstream of the Crestuma-Lever dam. Lead (Pb), zinc (Zn) and silver (Ag) were extracted from the

mine, at one time, one of the most important mines in Europe. Recently, Terramonte was mined by Minas de Terramonte, SA (MITEL), between 1966 and 1973, when the mine was abandoned with no recovery plan until the year of 2007. Mine waste was accumulated in three heaps, two upstream the mining facilities and one downstream, in the valley of the Ribeira da Castanheira. This one supported by two walls but in the 80's decade one of them collapsed and the materials started being transported along the Ribeira da Castanheira to the Douro River (Figure 3).



Figure 3. Heap after the collapse.

Photo: Alexandra Lima

In 2007, the Mining Development Company, SA (EDM), started rehabilitation works of the mining area, but the efforts did not prevent the waste carried by the waters from the heap, which still remain on the banks of Ribeira da Castanheira without any intervention. The high levels of the metals in the water and the land are harmful for the surrounding ecosystems, damaging its flora and fauna. These metals are responsible for nervous system disorders and cancers in humans.

Question to address:

Think that you have the power to decide about the recuperation of the area and indicate the best way to rehabilitate it in a Sustainable Development perspective. Please, consider three perspectives:

1. Promote tourism for the citizens in the area.
2. Recovery the local from an environmental perspective, sealing the heaps and replant the place with species.
3. Continue the mine exploitation with suitable plans to minimize the risks. Justify your final decision supporting it with three valid arguments.

Case 7:

Transformation of a local production company into a sustainable business

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Keywords:

gender gap, sustainability, innovation, sustainable management

Relation to Sustainable Development Goals (SDGs):



Strategy: presentation, discussion over a draft strategic plan based on a SWOT analysis

Time required for classwork (in minutes): 90.

Students preparation to the class (in minutes): 120.

Aims:

- to illustrate challenges that a medium-sized company faces while aiming to grow with respect to sustainable development (SD) goals (for example, company development, internationalization, sustainability in the company's operations, and partnership with local communities);
- to find suggestions of possible solutions to challenges associated with work of a medium sized company in the SD context;
- to apply basic leadership strategies;
- to catalyze the synthesis of new knowledge of the relationship between the economic, social, and environmental aspects of a local production company;
- to determine the priorities;
- develop critical and innovative thinking skills.

Learning outcomes:

After completing this case, students are able to:

- better evaluate the strengths, weaknesses, opportunities, and threats of a firm using SD goals and concepts;
- craft a strategic plan to grow a company while creating societal and environmental benefits;
- appreciate, consider, and leverage the capacities of an individual belonging to a demographic minority.

Case description

An example of medium-sized company located in the Central Europe aiming to grow in a sustainable way.

A company that has become the case was founded in 1990 during the wave of economic transformation after the collapse of the Soviet-imposed socialist system, initially as a factory producing metal products but also as an intermediary in the trade of food products. In the mid-1990s, the company eliminated its food-related operations and focused on manufacturing grinding balls used in ore-enrichment plants in raw material mines and the power industry. In 1997, the company gained the status of a protected workplace¹, as over half of its employees have disabilities.



Picture 1. Company property

Currently, the company employs 70 people; and is located in the Eastern Poland, the so-called eastern wall, or poorer and less developed part of the country. The majority of the employees work in

¹ Protected workplace is an enterprise that employs people with disabilities. In order to get the status a company's team needs to consist of the minimum 50% of people with disabilities. The main purpose of such a company is to gain profits (as any other regular company) as well as the professional activation of people with disabilities who would not manage to compete on regular job market. A company that holds the status receives subsidy and some tax/loan ease but also needs to face strict requirements.

the production and transportation departments. Seven employees work in an office and two persons, including the owner, work in a newly opened office in the capital city.



Picture 2. Company property

The company's headquarters are divided into two locations seven kilometers apart. The first site is the location of an office building, material storage area, finished product warehouse, car base, and transportation and welding departments where the first stage of production begins. The whole property is located in a former greenhouse area that was adapted for the needs of production. The second site is located at local power plant and it includes three forging lines.

Production processes are partially automated. The first step is purchasing the material (scrap rail) and its selection at the first site. Railhead size determines diameters of grinding balls that can be further forged. A rail consists of 3 parts: railhead, rail-neck, and the footer. The last two parts are usually separated from the railhead as one T-shaped part during the first stage of the process.

Workers cut the rail themselves or set up gas cutting machines that automatically cut the rail. Only the railhead is transported to the forge and the rest of the rail is stored and then sold as scrap (T-shaped bottom part of a rail is not being used in our forging process).



Picture 3. Company property

The forge lines' location and arrangement enables the creation of the final product in a single sequence. The railhead is pre-heated; cut into pieces that are later heated up to the temperature of forging, and forged into balls in presses in closed matrices. A second press cuts off the flash left at the junction of moulds when a ball is cast. Balls are hardened and cooled in a water tank, and, finally, the ready product is packed and delivered to clients.



Picture 4. Company property

The primary motivation in setting-up this process was to make it simple and to keep costs reasonable. For example, at its heart is recycling scrap material. The entire process plan includes an energy saving strategy based on heating the material one time but in two stages (pre-heating and then heating-up) instead of heating it twice, as it is done elsewhere.

The company was the forerunner of this production method. Over time, other companies in Poland have started to use this approach as well. Until now, the company has been operating mainly in the domestic market, although, for a few years, a growing percentage of its revenue has also come from exports.

At present, the company has a new owner whose challenge is the fact that she has never worked in the metal product business before. The present owner aims to introduce a new strategy for the company's development, which takes into account the UN sustainable development goals.

Inheritance of the company and decision to actively lead it by a new owner has led to the unprecedented situation where a woman steps into an area traditionally reserved in Poland almost only for men. There are very few businesses operating in the region, whose owners are women. There are only 5 women working in the company that employs over 70 persons. Among the majority group is the person directly managing the company, a man with technical education.

Another challenge is the fact that most of the employees, especially the senior ones, work at the company for decades (some even almost 30 years). The new owner entered the world with grounded order and established roles' division in the enterprise that has been operating at its own mode for years. Some employees perceive the new owner through the prism of their memories, in which they remember her as a little girl or a teenager who was accompanying her father at the company. Any proposal of change and development is considered to be an unnecessary destruction. It is important to emphasize that the new owner encouraged employees to comment on the development plans and to participate in the decision-making process. This however, resulted with resistance and distrust. Ideas for hiring consultants who could introduce innovations in the organization of work, even in the administrative area, were welcomed with mistrust.

The team responds with outright aversion to any change plans. Business advisors are perceived to be superfluous and unfamiliar with the specifics of this type of enterprise. On the one hand, the old team has no ideas for work improvement and company development, which is the owner's most important agenda now, on the other the team is reluctant to cooperate with external advisors who could assist them through the process.



Picture 5. Company property

The product

The company manufactures forged steel balls (grinders) of a diameter in the range \emptyset 60 to \emptyset 100 and hardness in the range 56-62 HRC (and diameters we could produce due to machines we have in the plant: \emptyset 30 to \emptyset 120). As a basic material for the production, we use the scrap head of the ST90PA railway rail instead of a newly produced material (steel rods from smelters).

Each transport receives its standardized forging attestation confirming the quality parameters of our product. The certificate is prepared in accordance with the standard for grinders' production # PN-H-94057. The annual production capacity is approximately 9000 tons.

Balls are used in processing and power plants that use ball mills in their processes. These brief videos illustrate how our products are used in mining operations:

- <https://www.youtube.com/watch?v=VAiCiFD-Rjg>
- <https://www.youtube.com/watch?v=62-yS0uXBb0>

Company Business Concept – look at the website: www.codogni.com

Main goals to achieve by 2020

- to internationalize the company by increasing exports of our product;
- to further develop our production line, possibly qualify for subsidies, and build a fourth forging line;
- to become more innovative and create new products that might be produced from the portion of the scrap rail that we cannot currently use to produce balls. This presently unusable portion of the rail constitutes 60% of the material that we buy, and it must be sold again as scrap. We

hope to work with academics and designers to find a way to use this material to diversify the company's offerings.

- to achieve the business goals described above while also meeting goals related to sustainable development goals. In other words, to be even better connected with local communities (local authorities, local business, education and local community services), to improve conditions of work for our employees, and to further reduce environmental harms and possibly become environmentally restorative.

Company's current situation

- very good financial performance; the company has savings to support new investments, the company has no debt, and it is enjoying a period of stability;
- long term business partner relationships with clients and suppliers and very good knowledge of the market;
- employees that have been working with the company for many years (some for as many as 28 years, and for some it is the first and only job they have ever held). The team have been working in their own rhythm with no interruptions, changes, nor challenges for years. The team is not likely to be receptive to radical changes, formulating strategy, or carrying out an audit; it is likely that all of these steps will be perceived as indicative of a lack of trust in them on the part of the new owner. The team is reluctant to think about introducing innovations and expanding to produce a more diverse set of products in the plant;
- lack of expertise on the local market;
- the entire company relies on the expertise of one person, the Director of Manufacturing Processes & Engineering, who is managing the entire team starting from the production line, to management of the production line team, to transportation, welding, and finishing, to authorizing all financial transactions of the company.
- the new owner is an academic who decided to take over her family business 6 months ago and faces the challenge of managing an enterprise operating in the sector traditionally dominated by men

The new owner started her work with the team with a meeting and presentation at the headquarters in May 2017. The presentation included a Mission and Strategy draft and explanation, a presentation of the new proposed goals and work schedule of the new office in Warsaw, and mention of a EU funding application. At the end of the session we completed a SWOT analysis with the team. The result of the SWOT analysis is included below.

SWOT

based on the first attempt to engage the company's management and administration into creating the strategic plan for development

Strengths

Weaknesses

Internal origin

Human capital:
employees working for 10 - 28 years
experts in the field
knowledge of the market
knowledge of the competitors
expertise in engineering (the director)
liability
modesty
paying attention to good relations with contractors
family like relations among the team
good results of TAX authority control at the company

Services:
timely delivery
high quality of the product
focus on good relations with contractors
long term business partnerships
good reputation in the market
diverse clients

Technology:
unique setting of production lines in the forge
low production cost

Money:
stable financial situation
savings available

Localization:
far from clients
bad quality roads
hard to reach the headquarters
no site plan; scrappy area of the 1st site
headquarters is not representative

Product:
only 1 product
small range of ball diameters; we do not produce all diameters that we could

Supplies:
not diversified source of supplies

Management:
new owner has no experience in the business

Opportunities

Threats

external origin

Polish rails - constant modernization
EU funds
Numerous unexplored markets

Low profitability of the business
High risk of money transfer holdup
Uncertain currency rate (risk in case postponed payments)
New technologies development in the mining industry

The company is working on expansion in Sweden (Scandinavia), Republic of Macedonia, Spain (and potentially Portugal) and possibly one project in Germany in 2020.

Questions to address:

- 1) How can the company become more sustainable? What does sustainable development mean for this particular enterprise? What benefits would it bring to the organization? (sharing knowledge with new employees, saving energy – production and company organization, being more eco friendly, being a part of a local community).
- 2) How can employees grow with the company, how can they be engaged into work of setting the company's new goals, and how can expertise be shared within the team so that the company is less dependent on one person? How could employees be helped to understand that the new company strategy is aimed at development and improvements and creating benefits for all stakeholders, and is not an assumption of lack of trust from the new owner?
- 3) How can the new owner overcome barriers she faces in company management and which are connected with grounded position of the previous management system, perception of women role in production company, and outright aversion of the team towards any change?
- 4) Which direction of development should the company take? Which arguments can be used to support your decision, and what critiques might you expect, and from what sources?
- 5) How can the new owner expand and promote the potential for further sustainable development of the company? How can the company, by embodying best practices, encourage sustainable development in the region and among customers in a situation when some may not really care about it, in contexts where groups are used to certain assumptions and means of operating that may not be conducive to sustainable development?
- 6) What barriers in the implementation of the recommended strategy can you identify, and how would you overcome them?

Data source

Poland, Competitiveness Report 2016, The Role of Economic Policy and Institutions (2016) (ed.) Weresa M.A. Warsaw: World Economic Research Institute, SGH Warsaw School of Economics. http://kolegia.sgh.waw.pl/pl/KGS/struktura/IGS-KGS/publikacje/Documents/Raport_POLAND2016.pdf

How raw material mines operate:

- <https://www.youtube.com/watch?v=VAiCiFD-Rjg>
- <https://www.youtube.com/watch?v=62-yS0uXBb0>

Balkan Mining Summary Overview: http://energylawgroup.eu/itrfile/_1_/ec3ac8b45225bf4d309aaf08733b1894/Balkan%20Mining%20Summary%20Overview%20.pdf

Procedure

First part

Students read materials provided in the case and do more research on-line to familiarize themselves with the context of the case (e.g., the region, management, leadership in production companies, gender gap, stereotypes, sustainable business).

Second part

Each group is given a task (questions above) – group work on strategy for the company. Altogether start a group discussion on the questions above.

Third part

Use Sustainable Development Concepts.

Instructions: discuss how are the following concepts manifested in the case, and how each could be applied in planning the company's new strategy and tactics. Use these terms and concepts when answering the questions on the next page.

The following links lead to content on the UN Sustainable Development Goals (SDGs):

- <http://www.un.org/sustainabledevelopment/blog/2017/05/worlds-most-powerful-job-creators-small-enterprises-vital-to-achieving-global-goals-un-official/>
- https://www.sdgfund.org/sites/default/files/business-and-un/SDGF_BFP_HKCSRI_Business_and_SDGs-Web_Version.pdf
- <https://www.ihrb.org/pdf/state-of-play/Business-and-the-SDGs.pdf>
- <https://www.forbes.com/sites/bobeccles/2015/10/20/un-sustainable-development-goals-good-for-business/#f0414c32b50c>

Sustainability: do you accept the Brundtland Report's definition that it means to meet the needs of today while allowing for meeting tomorrow's needs? Do you think a different definition is more useful?

Sustainability (or Triple Bottom Line) Reporting: is the process of collecting data on environmental, economic, and societal impact data potentially useful? Is it also potentially useful to meet with stakeholders to decide what impacts are most important? Finally, do you see value in (and how would you go about) publishing the outcomes of stakeholder meetings and data about your environmental, economic, and societal impact, plus your company's governance?

Zero Net Impact: there are companies that have made progress toward the goal of achieving net zero environmental harms, such as Interface and Unilever. Is it conceivable that setting such an ambitious goal and visibly making process towards achieving it could create tangible business benefits in terms of finding and eliminating waste and attracting new clients, investment, and employees? Could it lead to higher profits and new opportunities?

Backcasting: organizations can fail when they act exclusively on current or historical information, rather than setting a goal and working backward to determine next steps. Tesla’s strategy for bringing electric vehicles to the mass market is a good illustration.

Fortune at the Bottom of the Pyramid: as illustrated by the example of micro-credit in the developing world, it can be profitable to provide a product or service to the poorest in society – commercial opportunities, counterintuitively, may exist in examining the needs of those with the least in terms of resources.

Cradle to cradle: a re-engineering of product lifecycles into infinitely reusable or biodegradable goods and processes (a material or product that is recycled into a new product at the end of its life, so that ultimately there is no waste).

Final product: A draft of a sustainable development strategic plan for the company.

Gender equality: gender equality is a broad concept that refers to a situation in which both women and men are granted equal opportunities to develop their personal abilities and to make choices without being constrained by gender roles and stereotypes. It does not mean that women and men have to become the same, but that their behaviour and aspirations are equally valued and that their rights, responsibilities and opportunities do not depend on their gender.” (Sustainable development from a gender perspective. A glossary. http://www.wecf.eu/download/2013/May/glossray_sus_dev.pdf)

Final product: A draft of a sustainable development strategic plan for the company

Here is a suggested outline of a sustainable development strategic plan:

- I. Provide a comprehensive list of stakeholders of the company (all those affected by the firm, e.g. employees, neighbors, etc.)
- II. List all side effects (both positive and negative externalities) – these can be divided into:
 - a. Direct (e.g. providing employment to the challenged individuals – a positive direct externality)
 - b. Indirect (e.g. pollution from employees commuting to work – a negative indirect externality)
- III. A plan for engaging all stakeholders to learn about stakeholders and externalities and ideas for improvement:
 - a. Stakeholders’ greatest concerns and pain points
 - b. Suggestions for how to eliminate problems and increase positive effects
 - c. Ideas for “metrics of success” – what can be measured and reported to show improvements over time

- d. A life cycle assessment, including what happens to products after their use:
 - i. For example, where does the material in the used balls go after customers are done with them?
 - ii. Identification of where spent or scrap material or waste heat could somehow be used or sold to other firms
- IV. Based on all of the above, a plan with specific steps that the company could take, including:
 - a. An overall vision statement with an ambitious goal (ideally that inspires and is developed with employees and other stakeholders – such that it is authentically supported by others): e.g. is the idea of being “the first manufacturing firm in the region to be net zero environmental impact” interesting to employees? Are they proud, and would like to further build on the company’s reputation, such that they can say that they helped build “the leading firm in Poland in providing meaningful employment to the disadvantaged, and in the arena of industrial materials repurposing”?
 - b. Specific identification of how steps to enhance positive side effects and reduce harms would somehow boost revenue or morale, etc., or reduce waste?
 - c. Which of these changes to core business process make sense, even from just a conventional business decision making perspective?
 - d. Which changes involve:
 - i. no investment of money
 - ii. the most immediate results? The goal of this step is critical: to get buy-in from those who doubt that sustainability-related changes make sense for the organization. A classic step is “just turning off the lights.” To paraphrase a founder and CEO who explained how to prioritize changes: “the greenest kilowatt is the one you never use.”
 - e. Prioritize changes based partially on how immediately you will be able to show results (and explain: are there restricting factors or obstacles that you can foresee that would change your prioritization). As best as you are able, set:
 - i. specific deadlines for action, and specific steps to be taken
 - ii. measurable outcomes – metrics of success
 - iii. when these effects will be measured, and when and how they will be reported (publicly? Or just to interested stakeholders?)
 - iv. when and how management will consult with stakeholders on “lessons learned” and next steps.

Learning outcomes assessment: group presentation and application

Case 8:

Castromil gold mines' geoethics dilemmas

Authors:

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Keywords: geoethics, mine exploration, mine exploitation, natural resources

Relation to Sustainable Development Goals (SDGs):



Strategy: group work, inquiry, discussion

Time required for classwork: 120 minutes.

Time for students preparation to the classwork: 30 minutes.

Aims: Create awareness of geoethics dilemmas in mining and the urgent need for a sustainable ore mining.

Learning outcomes:

- To identify the social, environmental and economic implications of mining activities;
- To evaluate the consequences of human action on ecosystems and public health based on a holistic understanding of nature;
- To construct charts and graphics to help predicting different real life scenarios;
- To analyse problems and their causes through an overall, medium- and long-term approach;
- To develop collaborative work;
- To improve communication skills through presentation activities or debates.

Competences:

- Anticipatory;
- System-thinking;
- Interpersonal;
- Strategic.

Questions to address:

- Describe some economic impacts (positive and negative) of mining activities.
- Describe some impacts or risks that mining activities have on public health and health associated economic impacts.
- Based on data from the table below, what is the expected impact, in Castromil, of the arsenic and lead contamination on public health? And on the ecosystems? Elaborate a line graph using data from the table (use minimum, maximum and mean values in ppm).

Table 2. Summary statistics (mean, standard deviation, range and quartiles) of major, minor and trace elements in soils of Castromil (Ferreira da Silva *et. al.*, 2004a, p. 17)

Variables	Mean	SD	Min.	Q1	Median	Q3	Max.
Ag (ppm)	0.9	2.3	0.05	0.2	0.3	0.8	22.0
Al (%)	2.38	1.29	0.30	1.3	2.56	3.04	7.02
As (ppm)	820	1269	31	140	273	958	6909
Au (ppm)	1		1	1	1		6
Ba (ppm)	82	34	13	58	81	101	209
Bi (ppm)	4.8	7.4	0	1.7	2.7	4.6	57
Ca (%)	0.09	0.1	0.01	0.01	0.06	0.14	0.41
Co (ppm)	4	3	1	0.6	5.0	6.0	15
Cr (ppm)	17	6	5	13	17	20	47
Cu (ppm)	59	39	8	32	50	76	206
Fe (%)	2.72	0.83	0.7	2.3	2.7	3.1	6.17
Ga (ppm)	8	4	1	4	8	10	14
K (%)	0.2	0.13	0.02	0.07	0.22	0.29	0.5
La (ppm)	30	9	12	24	30	34	57
Mg (%)	0.20	0.14	0.01	0.05	0.22	0.30	0.55
Mn (ppm)	230	184	1	33	210	377	612
Mo (ppm)	7.1	14.6	0.2	1.2	2.7	6.7	126.9
Na (%)	0.005	0.003	0.001	0.003	0.005	0.007	0.013
Ni (ppm)	9	5	1	6	8	12	31
P (%)	0.09	0.05	0.01	0.06	0.09	0.11	0.24
Pb (ppm)	403	776	5	88	173	394	6295
S (%)	0.05	0.03	0.01	0.03	0.04	0.06	0.28
Sb (ppm)	2.9	3.9	0	0.8	2.0	3.0	25
Sc (ppm)	3	0.94	1	2.1	2.6	3.30	7
Sr (ppm)	17	7	3	11	16	21	36
Th (ppm)	11	5	4	8	10	13	26
Ti (%)	0.04	0.03	0.01	0.007	0.035	0.056	0.12
U (ppm)	19	23	3	11	15	20	238
V (ppm)	73	66	15	33	48	84	323
Zn (ppm)	86	45	9	50	95	118	172

- Is it possible to exploit gold deposits in a sustainable way?

Case description:

Portugal was one of the privileged sites for the Mining of the Romans. It is now known that the Romans preferentially exploited copper, gold, and iron. The Romans were true masters of the mining arts, taking advantage of methods and techniques previously used by other people, but giving them remarkable innovations. The Castromil mines, located in the northern Portugal, in Porto district, stands out as an example of a roman mining site. This site is especially important due to its gold ore deposits.

The Romans used underground exploration or open pit mining. In Castromil Roman galleries were left as a mark of this ancient activity.



Figure 1. Castromil mining site with “Roman galleries”

Photo: Alexandra Lima

These mines were abandoned after Roman activities until 1941, when the company “Minas do Ouro do Douro” began exploration at the site. The work stopped in 1946, it seems, due to lack of funding. In 1964, however, a Canadian company – Noranda of Canada – also began prospecting work, which ended in 1966, due to falling gold prices. Many years later, around 1994, Connary Minerals industries, whose Portuguese branch was based in Castromil, carried out a very deep exploration study in the area (about 82 km²), which included the Castromil mining site. From this study it was possible to conclude that the exploitation of the gold deposit was economically viable. This company submitted a proposal for the exploitation of the ore deposit to the Portuguese State, which was refused by the Ministry of the Environment in 2000, for environmental reasons.

Mining impacts

It is undeniable that the mining industry of geological resources has a leading position in technological progress. However, it is also undisputable that negative factors can arise from this extraction, especially at an environmental level. So, the strategies implemented in the pre and post extraction to ensure the sustainable use of resources and environmental remediation of the site are crucial in the conservation of geodiversity. The exploitation of mineral deposits leads to several

environmental problems. A contamination of surface and groundwater, a change in morphology and landscape, air and noise pollution and soil impoverishment and contamination are to be noted. In addition, mining may have consequences for public health and cultural heritage. Environmental impact and feasibility studies of a mining project in the Castromil mines were carried out by Connary Minerals. In these studies, the conditions of the areas prior to mine opening were analysed and the positive and negative impacts associated with a possible exploitation of the deposit were reviewed (see Table 1).

Positive impacts	Negative Impacts
- Reduction of soil pollution	- Modification of topography
- Creation of jobs	- Creation of a waste landfill on site
- Improvement of access infrastructures	- Visual impact
- Landscape recovery of a degraded forest area	- Possibility of residual contamination
- Reduction of the presence of contaminated water	
- Increase in the value of land	
- Decrease in gold imports in the country	
- Making use of a natural resource	

Table 1. Mining impacts listed in Connary Minerals report

As a reaction to this environmental impact study, the population of Castromil produced a document ("Expositions and complaints of the population of Castromil" – March 30, 1998) which presented the reasons that led to the opposition to the project of exploration of the proposed gold mine by Connary Minerals. This document described some of the population's criticisms of the positive impacts listed in the environmental study. There were also many gaps in the treatment of currently contaminated soil. As far as employment is concerned, the increase in the number of jobs offered by Connary Minerals would be made at the expense of the occupation of agricultural land, which would reduce the professional activity of the local population engaged in agriculture. The reduction of water contamination (surface and groundwater) proposed by Connary Minerals also seemed a bit contradictory, because the opening of galleries and the construction of heaps seems to alter the surface water flow and the underground flow. In addition, the chemical contamination of surface water and aquifers by the discharge of effluents and oils and hydrocarbons used in the maintenance of the machines does not contribute to the reduction of water contamination.

The problem of arsenic and lead contamination

Although Connery Minerals had defended their position that the negative impacts of the exploitation would be minimal, there is in fact some degradation existing in the landscape caused by old mining works like spoil heaps, wells and galleries, mostly without any type of fence or protection. There is also a problem of chemical contamination of some groundwater from natural sources but the most important problem are the soils of the Castromil site. These soils have

concentrations of arsenic and lead much higher than the permissible maximum value established for the quality of a soil. The existence of this contamination is a direct consequence of soil mineralization by arsenic and lead from the old Roman mining works existing at the site.

The present days

Finally, we should refer the latest experience researches from Porto University had with Company Medgold Resources in Castromil Mines, which wanted to explore gold in the mine. This company decided to implement open meetings with local people twice a year, in order to inform them about the research developments and new works on the exploitation project. Awareness meetings started in 2015 in Castromil, but soon changed to Limarinho (Boticas, Northern Portugal), a site where the Company had undertaken test drilling work during 2016.

A research project conducted by Porto University intended to collect data from a random sample of local population to better understand their position. On the one hand, the exploitation works could be endangered, since the survey would revive previous environmental issues. On the other hand, the existence of a vivarium in the area was, in itself, an obstacle to the collection of data, since the exploration works could jeopardize the survival of a family's business. Furthermore, and in spite of the efforts of disseminating information, the population was still insufficiently informed which did not guarantee the attainment of informed and sufficiently impartial answers. Lastly, since the inquiry could lead to a disruption in the works of geological sampling (and its continuation), Company Medgold Resources withdrew its offer of assistance to carry out the survey. Considering that this would be the least painful decision for both the population (not yet fully informed) and for the Company (which had financially invested on an activity that had positive social and economic implications), the collection of data was not done.

This situation highlights an ethical problem that should be debated: is it preferable to collect data so as to better inform the population, or rather to mitigate financial problems that the application of a survey might bring about during an exploitation phase?

Data source:

- MedGold Resources Corp. <http://www.medgoldresources.com/s/lagares.asp>.
- Castromil Mines: Virtual Visit. <http://www.fc.up.pt/pessoas/allima/Castromil/flash.swf>.
- <http://link.springer.com/article/10.1023/B:EGAH.0000020893.37543.9d>.
- <http://www.sciencedirect.com/science/article/pii/S0883292703002257>.
- Green Facts: Arsenic. <http://www.greenfacts.org/en/arsenic/>.
- International Programme on Chemical Safety: Arsenic and Arsenic Compounds. <http://www.inchem.org/documents/ehc/ehc/ehc224.htm#1.8>.
- National Centre for Biotechnology Information (NCBI): Environmental Source of Arsenic Exposure. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4186553/>.

- National Centre for Biotechnology Information (NCBI): Heavy Metals Toxicity and the Environment. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4144270/>.
- Sustainable Development of Mining Mineral Resources. <http://www.sciencedirect.com/science/article/pii/S2300396015300446>.
- How can mining become more environmentally sustainable? <http://www.miningfacts.org/Environment/How-can-mining-become-more-environmentally-sustainable/>.
- International Association for Promoting Geoethics. <http://www.geoethics.org/>.
- Ferreira da Silva, E., Pinto, L., Patinha, C., & Fonseca, E. (2004a) Site-specific characterization of Castromil Brownfield area related to gold mining activities. *Environmental Geochemistry and Health*, 26, pp. 13-25.
- Ferreira da Silva, E., Zhang, C., Pinto, L., Patinha, C., & Reisa, P. (2004b). Hazard assessment on arsenic and lead in soils of Castromil gold mining area, Portugal. *Applied Geochemistry*, 19, pp. 887-898.
- Rosia Montana Gold Corporation (2015) <https://www.rmgc.ro/>.

Procedure

In groups of 3-4 students develop and produce a line graphic containing the major and minor trace elements in soils of Castromil area (see Ferreira da Silva *et al.*, 2004a), showing the mining impact on soils and water contamination of residential and agricultural site. After that, they have to compare the As and Pb values of Ferreira da Silva *et al.* (2004a) with the ones from Appendix 2 of the Guideline for use at contaminated sites in Ontario, Ministry of Environment and Energy, 1996 (access through link <https://archive.org/details/guidelineforusea00ontauoft>) and conclude on the conditions of soil and water at Castromil's residential and agricultural sites. (Note that ppm is numerically equivalent to $\mu\text{g/g}$). The discussion raised by the elaboration and analyses of graphics will allow students to be acquaintance of the information and competences required to answer to the questions addresses.

Further application:

Roşia Montană is a community of Alba County in the Apuseni Mountains of western Transylvania, Romania. The rich mineral resources of the area have been exploited since Roman times, the earliest people to set up a permanent settlement for the slaves and colonists working in mines, establishing the first big gold and silver mines in the area. They were the first to set up the initial extraction galleries, using very sophisticated and efficient mining techniques for that period.

Today, only parts of the Roman galleries are still preserved, because the additional exploitations held during the nineteenth and twentieth centuries were done by extending and widening the existing Roman galleries. Most of them vanished in 1970 when a quarry was set up in the Cetate area that destroyed an entire system of ancient roman galleries, without conducting any research, inventorying and in situ conservation (Rosia Montana Gold Corporation, 2015).

Throughout the years, the area developed significantly because of mining activities. "The gold fever" attracted people from various parts of Europe. Thus, communities of Romanians, Hungarians,

Germans, Slovaks and Jews settled in Roşia, for whom churches and schools were built (Rosia Montana Gold Corporation, 2015). At that time, almost the entire population was involved in mining activities, even women and elder children.

Underground operations at Rosia Montana ceased in 1985, but open pit mining continued until 2006 (when Romania joined the EU), leaving an obvious effect on the mountain landscape (figure 2). In 1999, the concession license for exploiting the gold and silver ore from the Roşia Montană area, Alba County was transferred to Gabriel Resources (latter renamed Rosia Montana Gold Corporation – RMGC).



Figure 2. Rosia Montana mining site

Photo: Alexandra Lima

In 2000, RMGC paid USD 20 million for a pre-feasibility study which estimated 8 million ounces of gold. The company wanted to invest USD 250 million (raised from different entities like banks, mutual funds or even through stock market) and promised to create 25,000 jobs within three years.

The power of people

The Rosia Montana project of Gabriel Resources/RMGC would have become Europe's largest open-pit gold mine operation. But it faced a widespread opposition. In this open cast mine thirty times more sodium cyanide would be used to treat the extracted gold than the entire quantity that is currently being used in Europe. Over the 17 years, 240,000 tons would be deployed in the industrial operation, i.e. the equivalent of 600,000,000,000 lethal doses for an adult (Salvati Rosia Montana, n.d.).

The court challenges by Alburnus Maior, a local community group, made the Romanian government cease the approval process for the project in 2007, forcing Gabriel Resources to reconsider its mining plans and hold back its activities. Community groups have successfully halted the mine ever since. In 2013 the Romanian Parliament rejected the mining projects once again. From 2002 to 2006, RMGC drafted some feasibility studies, including studies concerning the initial conditions for the Environmental Impact Assessment (EIA). But in October 2008, a Romanian court ruling agreed with a Ministry of the Environment decision to suspend the Environmental Impact

Assessment and the permitting process for the Rosia Montana project. Later in that month, Hungary's Prime Minister Gyurcsany Ferenc declared that Hungary is continuously opposed to the Rosia Montana mine proposal.

In 2010, the Ministry of Environment reconsiders the evaluation procedure of the Environmental Impact Assessment Study on Rosia Montana Project.

In September 2013, thousands of people went to the streets of Romania, protesting the government's decision to approve the development of Rosia Montana project. In response to the protest, the government has decided to establish a commission to review legislation and make a final decision on this subject. The project was rejected after being debated and voted on in the Chamber of Deputies (Rosia Montana Gold Corporation, 2015).

The present day

After the rejection of the project in 2013, Gabriel Resources didn't give up and filed an official letter to the President and Prime Minister of Romania calling for amicable resolution of the permitting dispute.

However, in 2016, the village of Rosia Montana was considered a UNESCO World Heritage site, in a radius of two kilometres where the mining activities are prohibited.

The mining company has not yet admitted defeat and is still trying to have a license to exploit the area.

Questions to address:

- Refer some impacts or risks that the cyanide of mining activities has on public health.
- Debate the “power of people” mentioned in this example.

Case 9:

Territorial ecological limits to the lignite surface mining in North Bohemia

Authors:

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Keywords:

lignite surface (open cast) mining, territorial ecological limits, Schwartz's theory of universal values, North Bohemia

Relation to Sustainable Development Goals (SDGs):



Strategy: discussion, text analysis and follow-up discussion

Time required for classwork (in minutes): 90.

Students' preparation to the class (in minutes): No preparation to the class needed.

Aims: To develop students' normative and interpersonal competences.

Learning outcomes:

After completing this case, students are able to:

- identify actors, analyse their case-relevant positions and attitudes, identify their underlying values according to Schwartz's theory of universal values, and apply the same procedure to other issues;
- identify and formulate their own case-relevant positions, attitudes, and values;
- identify and discuss the environmental, social, and economic aspects of the case of territorial mining limits in the Czech Republic.

Questions to address:

- 1) Who are the actors involved in the case of mining limits and what are their positions?
- 2) What are the underlying values behind actors' positions?
- 3) What are the environmental, social, and economic aspects of the case of territorial mining limits in the Czech Republic?

Case description

Biophysical characteristics

Coal has been one of the most important energy resources in the Czech Republic since the industrial revolution. It has been a fuel for the Czech economy in which heavy industry played an important role – through the 1920s and also after the Second World War.

There are two main areas in the Czech Republic where coal is extracted. In the Northwest, in the foothills of the Ore Mountains, there are reserves of lignite. In the Northeast, in Silesia, steam coal is extracted. Each kind of coal has a specific character which requires a specific method of extraction and a specific use. While (since the 1950s) lignite has been extracted in open pits and used mainly for heating (because it has a lower density of carbon), steam coal is extracted in deep mines and used also in metallurgy etc.



Figure 1. The Landscape of North Bohemia.

The North Bohemian Basin (in the foothills of the Ore Mountains) consists of 1420 km² large area. In the whole area there are 9.3 billion tonnes of coal, out of which 742.5 million are coal reserves potentially exploitable in the mines that are currently operating. Coal mining could therefore continue until 2045, and if the territorial and ecological limits – the government restriction on coal extraction protecting the existing settlements – are allowed to be broken, then coal mining could continue until the end of the 21st century (Pešek & Sivek 2012).

Historical development

Coal has been extracted in the area of the present Czech Republic since the 15th century. It became especially important in the 20th century as industrialisation had changed the requirements regarding the fuel that was needed and as it increased the extent of the extraction.

For example, the extraction of lignite gradually grew from 1937 up to the peak of 100 million tonnes of extracted coal in 1984. The reason for this growth was the new mechanisation available and the method of open-cast mining. Since 1984, the extraction of lignite has been declining, down to 38.5 million tonnes in 2014. The peak of the production was tied to the structure of the industry (Bejdová, Jaroš & Ruml 2013). During the period of the former Czechoslovak Socialist Republic, the metallurgical and energy industries were controlled and directed by the state. The production was characterized by a high level of energy inputs, low efficiency, and huge environmental pollution. Surface mining of lignite destroyed 300 square kilometres of northern Bohemia and 78 towns and villages. The people were forced to relocate from the affected places to enable the mining operations. Libkovice was the last demolished village in 1991, even though no coal has been mined at this place since then.

The socioeconomic transition that occurred after the fall of the socialist regime in 1989 has changed the coal industry. In 1991 the government established the so-called territorial ecological limits for mining, which were meant to protect the settlements in those areas and to improve the devastated environment. These limits have restricted exploration, mining and other lignite mining-related activities beyond certain spatial limits. The limits were enforced in four different mining localities: the Czechoslovak Army mine (ČSA), J. Šverma, Vršany and Bílina. These limits protect the village Horní Jiřetín that is located within the area of the ČSA mine. Since the establishment of the limits, there have been many fierce political debates about their enforcement. The limits have been under pressure from the side of the mining companies, labour unions and politicians. In 2005, the inhabitants of Horní Jiřetín – a village endangered by mining extension – organized a local referendum and the result was clear – the vast majority (96%) of voters (with a huge 75 % attendance) were against the breaking of the limits. Another referendum, organized by the local NGO Kořeny, took place in Litvínov in 2006. Even though the vast majority of voters were against the plans for the extension of mining activities, the participation was not high enough to make the results legally binding (Černík, 2015).

Another milestone after 1989 was the great transformation of the property relations of the mining companies. The state-owned mines and mining companies were privatised under unclear legal conditions. The privatisation of the mining company MUS (Most Coal Company) followed the typical path of many other industrial companies after the economic transition. The financial assets were sold much cheaper as the new owners let the company go bankrupt, which allowed them to gain the given company with an enormous value almost for free. The result was the creation of new financial elites and the loss of state power in mining companies. The process of privatization was characterized by illegal actions and litigation. At the same time, the private companies changed their names, their subsidiaries split off, and other changes took place, which makes it hard to get orientated in the ownership structure. There are now several mining companies operating in the region. Firstly it is the national company ČEZ which mines in the Tušimice and Bílina coalmines and which burns the coal in the Počerady power plant. Then there is the company Severní energetická (SevEn) which operates at the ČSA mine.

The most recent political and public discussion about the enforcement of the territorial mining limits took place in 2015. The Minister of Industry and Trade proposed to break the limits at the Bílina and ČSA mines. The following four options were discussed:

- 1) Upholding the existing limits;
- 2) Breaking the limits at the Bílina mine and upholding them at the ČSA mine;
- 3) Breaking the limits at the Bílina mine and breaking them only partially at the ČSA mine so that only part of the village of Horní Jiřetín would need to be demolished;
- 4) Complete breaking of the limits at both localities.

The debate about the decision lasted for 10 months and involved all the actors, including political parties, labour unions of workers, environmental NGOs and the local inhabitants. At a special plenary session in Ústí nad Labem the government eventually decided to break the limits at the Bílina mine and uphold them at the ČSA mine so that the village of Horní Jiřetín would not have to be demolished. The final decision was motivated by the needs of the Czech heating energy industry, by considerations regarding the energy security of the country, and by efforts to maintain a certain number of jobs. The decision made an additional 100-120 million tonnes of lignite from the Bílina locality available for mining, with the conditions that the lignite be used primarily in the Czech heating industry and that cast mines remain at least 500 metres distant from the village. The Ministry of Industry and Trade is required to annually evaluate the fulfilment of the goals and measures of the State Energy Plan until the year 2020, and it is also required to present to the government an analysis of the needs to mine more lignite (Slámová, 2015).

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Procedure

The group size and the number of the actors to be analysed will be determined according to the size of the class.

1. Introductory activity (10 min).

Students will be shown 2 photographs. One with the demonstrators supporting the upholding of the limits and the other with the demonstrators supporting the repeal of the limits.

- Students will be asked to write down the attitudes and feelings that the photographs invoke in them (5 min.).
- Students will discuss their attitudes and feelings in groups (5 min.).

Figure 1.



“Us or the coal?”

“Do not economize on the health of people from North Bohemia.”

“We want decent politicians not agents of the coal lobby.”

Figure 2.



“No more miner fired due to the limits”

“Miners for the cheap heat”

“Eco-terrorism does not heat us”

2. Introduction to the case (15 min.)

The lecturer will briefly present the history of the case and describe the actors involved (see below). Another option is to provide students with the materials in advance, so they can familiarize with the case before the lecture.

Actors involved in the conflict

- **Coal mining companies**
 - **Severní energetická** This company is owned by Czech billionaires – Dienstl and Tykač. The company is located in Most, and it is an important employer in the region. The company runs the ČSA mine. Its profit was 23 billion CZK in 2015.
 - **ČEZ** This national energy company is involved in mining through its sister company called Severočeské doly. This company runs the Bílina mine. ČEZ is one of the most powerful companies in the Czech Republic; its profit was 210 billion CZK in 2015.
- **Labour unions** The miners’ unions mainly aim to save the miners’ jobs, and thus they support the continuation of the mining operations when the repeal of the limits is being considered. The unions are active organisations in the negotiations as well as in the public sphere, for example during demonstrations.
- **Local inhabitants** There are several groups of local inhabitants, each with its own interest, which are promoting their stances within the conflict. On the one hand, there are the employees and former employees of the mining companies, and people who work for the sub-contractors of the mining companies. On the other hand, there are the residents who want to protect their homes and communities.
- **Political parties and politicians**

We have selected several political parties and politicians involved in the recent debate that are among the most active according to the analysis of the media coverage (Kubala 2017).

- **The Greens** – The party is active in the conflict on both the national and local levels. Their stance on coal mining is definite disapproval. On the local level, especially in the town of Horní Jiřetín, this stance has brought the party the support of most of the inhabitants, which was demonstrated during the municipal elections. The mayor of the town is a member of the Green party. On the national level, the Green party consistently

stands against the extension of coal mining beyond the ecological limits while supporting the expansion of renewable sources of energy. However, the Green party does not have political representation in the national Parliament, and only some of its members were elected as senators.

- **Social Democratic Party (ČSSD)** – Generally the party is in favour of the extension of mining operations. Their argument in favour of more mining is mostly energy security and employment in the region. The current Minister of Industry and Trade for the Social Democratic Party – Jan Mládek – was pushing the breaking of the ecological limits even further in the national energy conception. Also at the regional and local levels, the party members support the continuation of mining operations because they consider the coal mining companies to be important employers in the region.
- **Communist Party of Bohemia and Moravia (KSČM)** – The Communist Party has historically supported coal mining, even though at the local level the position of the party towards coal mining is not uniform or predictable. There have been occasions when Communist party members voted against the repeal of ecological limits in order to protect the village or town against destruction, for example in the town of Litvínov, where the coalition agreed on keeping the ecological limits. On the other hand, at the regional level, the regional governor from the Communist party strongly supports further extension of mining.
- **ANO** – This party is an ambiguous actor in the conflict. The mayor of the city Litvínov – Kamila Bláhová – has promised keeping the ecological limits and cooperating with Horní Jiřetín. On the national Government level, this political party also defends the limits mildly, mostly because of the financial costs of relying on coal. However, their position on the topic can change easily for populist reasons – if the majority of voters are in favour of one option, ANO will probably not go against their opinion.
- **President of the Czech Republic – Miloš Zeman.** Miloš Zeman has been very active in the debate about the territorial ecological limits, supporting the complete repeal of the current limits. He has expressed the view that employment in the region should be prioritized over the fate of the village Horní Jiřetín.
- **Minister of Industry and Trade – Jan Mládek.** The Ministry of Industry and Trade is the key government body for energy policy in the Czech Republic, and it was the current Minister, Jan Mládek from the Social Democratic Party, who opened the debate in 2015 by announcing that he will submit a proposal to the Government to repeal the limits at the Bílina and ČSA mines. Afterwards he became the leading voice of this agenda, and he framed the discussion as a dispute over whether the Czech Republic needs the lignite located beyond the limits at the Bílina and ČSA mines in terms of the security of the heat and electricity supply.

- **Minister of the Environment – Richard Brabec.** The question about the future of the territorial ecological limits belongs also to the agenda of the Ministry of the Environment, so the current minister, Richard Brabec from the ANO party, took part in the debate. Actually, the proposed adjustment of the limits at the Bílina mine and the upholding of limits at the ČSA mine that was accepted by the Government was formulated by the Minister of the Environment.
- NGO's
 - **Greenpeace.** This international environmental organisation is an active supporter of the affected communities in the region, on the national as well as the international levels. Greenpeace has conducted various analyses that show some of the possible development scenarios of the Czech energy supply without further mining and use of coal (e.g. Energy (r)evolution, 2012). In addition, Greenpeace has organized civic events in the coal mining regions and in other cities too. They have also directly entered a mining pit and stopped an excavator, and are involved in lawsuits against the mining companies.
 - **Hnutí DUHA.** This environmental organization started its activities during the direct action campaign against the destruction of the village Libkovice – the last village that was destroyed due to coal mining in northern Bohemia. Since that time Hnutí DUHA has supported the local resistance against coal mining, especially in the town of Horní Jiřetín. They provided help with the dissemination of relevant information in the media and also with management skills.
 - **Kořeny.** This is a local NGO from Litvínov, a city potentially affected by the extended open cast mine if the limits are repealed completely. The NGO's main goal is to protect the city and the people's houses against the extension of the mining activities. The NGO is politically independent, which means that they do not support any political party during the campaigns and vice versa. They are also involved in the legal/administrative processes (e.g. EIA) concerning the mining operations.
 - **Limity jsme my.** This is an anti-coal civic group in the Czech Republic. In 2015 they collected signatures for "a promise of civil disobedience" in which people asserted that they would block the mining extension with a direct action if necessary. Around 3,000 people signed this statement. The group has organized several public events in support of the ecological limits on coal mining in 14 cities in the Czech Republic. More than 1,000 people gathered in these cities to commemorate the villages destroyed due the extension of open-cast mining in the past.

3. First exercise – matching the quotes with the actors (20 min.)

- a. Each student will receive a set of anonymous quotes (see below) about the case with the task to match the quotes with the actors described in the presentation. A list of the actors will be displayed during the activity (10 min).

- b. Students will discuss their matched pairs in the groups and agree on one common solution for the whole group. The correct pairs will be presented by the lecturer (10 min).

Quotes from the actors

- **Coal mining companies**

- **Severní energetická.** ~~The Chair of the Supervisory Board of Severní Energetická, Jan Dienstl~~, said in April that revoking the limits on lignite mining at the ČSA mine in the Most area would make it possible to prolong profitable mining there by 150 years. According to ~~Dienstl~~, the mine would provide employment for up to three thousand people, and another five thousand jobs would be provided in the companies linked to the mining. If the limits are not revoked, the mining will stop in 2022.

Source: http://ekonomika.idnes.cz/hornicke-odbory-zadaji-o-prolomeni-limitu-tezby-na-mostecku-plb-/ekonomika.aspx?c=A131127_131218_ekonomika_spi

- **ČEZ.** “As far as Bílina is concerned, I can’t imagine at all that we wouldn’t mine out also the coal that today is beyond the line set by the territorial ecological limits,” ~~the General Manager of ČEZ, Daniel Beneš~~. His argumentation was based on the assertion that the mining in the area is not a problem for anyone there: “We have bought the land, we have the support of all the villages and towns in the area, and we have signed agreements of cooperation with them.”

Source: http://ceskapozice.lidovky.cz/vlada-posvetila-rozsireni-tezby-zatim-jen-na-lomu-bilina-peu/tema.aspx?c=A151022_123711_pozice-tema_lube

- **Labour unions.** “In any case, it should be this Government, this Government is not political, it should decide systematically about what this country needs. And lignite is something that this country definitely needs,” ~~Sábel (the Chair of the Mining Union)~~.

Source: http://ekonomika.idnes.cz/hornicke-odbory-zadaji-o-prolomeni-limitu-tezby-na-mostecku-plb-/ekonomika.aspx?c=A131127_131218_ekonomika_spi

- **Local inhabitants**

- ~~Oldřej Hogen, Horní Jiřetín~~. “My family has lived in Horní Jiřetín since back in the 19th century. We are never going to sell our home, and most of my neighbours see it the same way. The Prague guys have no business destroying our town, especially not for coal that is not needed.”
- ~~Hana Čermáková, Horní Jiřetín~~. “I have already had to move three times due to coal. First I lived in Most, then Janov u Litvínova, and then Dolní Jiřetín. The old town of Most and Dolní Jiřetín gave up their space to the mine, Janov was demolished and in its place they built apartment complexes for the people from the other villages affected by the removal. Now they wanted to force me away for the fourth time. I worry about what will happen to us, and memories of the previous displacements often come back to me. Recently I have had several strokes and I walk on French crutches. But I am definitely not going to give up fighting for our home.”

Source: http://www.greenpeace.org/czech/cz/Kampan/klima_a_energetika/zit-nebo-tezit/Horni-Jiretin-zije/

- **Political parties and politicians**

- **The Greens.** “People keep making the argument that the resolution regarding the limits has been fulfilled and that it no longer makes any sense. The limits were set as firm boundaries beyond which strip mining is not to encroach, but they were also an extremely important tool for the growth of the villages and towns. If it were not for the limits, no permits would have been issued for new construction in the protected deposit areas and on mining land. All those villages and towns, altogether 24 of them, would have stagnated, would not have been able to build and renovate their infrastructure. If the limits are revoked, these villages and towns will stop land and spatial planning, land development. And the effects of that are only negative for that region.” ~~Vladimír Buřt (mayor of Horní Jiřetín).~~

Source: <http://www.zeleni.cz/vladimir-burt-limity-byly-stanoveny-neprekrocitelna-hranice/>

- **Minister of Industry and Trade – Jan Mládek (ČSSD party).** “The decision regarding the repeal of the limits is primarily a political decision, two fundamental points are unemployment and securing a coal supply for heat power stations.” According to ~~Mládek~~, the limits are, in a certain sense, redundant: “It is true to say that in 1991 the limits were approved because there was no environmental impact assessment, EIA. It looks like revoking the limits means mining coal.”

Source: <http://www.ceskatelevize.cz/ct24/ekonomika/1496234-mladek-limity-castecne-prolomeny-byt-mely-otazkou-je-zda-i-na-lo-mu-csa>

- **President of the Czech Republic – Miloš Zeman.** “I have listened to the views expressed by the owners of the mining companies as well as by the Union members. And, of course, I have familiarized myself with the stance of the leaders of the Ústecký Region. The biggest problem of the Ústecký Region is the above-average unemployment rate, which is the highest there from all the other Regions in the Czech Republic. It is necessary to tackle this unemployment rate and to adopt certain measures even if they are regarded by some as unpopular.” . . . “I believe that I have received sufficient information about the quality of the coal that is deposited today under the village of Horní Jiřetín and others.”

Source: http://zpravy.idnes.cz/zeman-podporil-prolomeni-limitu-tezby-hnedeho-uhli-fhn-/domaci.aspx?c=A131024_133207_domaci_kop

- **Minister of the Environment of the Czech Republic – Richard Brabec (ANO party).** But should not ~~the Minister of the Environment~~ vote against the breaking of the mining limits even just out of principle? “Theoretically, you are right. But I knew that it would have gone through even without my vote. And I was leaning toward the view that in such situation, voting against would have been self-serving, to put it mildly. Even though I would have been able to wash my hands over it and say I voted against it. But I didn’t want that. Moreover, the suggested resolution that was approved was mine, and it would have seemed strange not to vote for it.”

Source: http://usti.idnes.cz/ministr-zivotniho-prostredi-richard-brabec-o-prolomeni-limitu-na-dole-bilina-181-/usti-zpravy.aspx?c=A151014_2198488_usti-zpravy_alh

- **NGO's**

- **Greenpeace.** “According to scientists, if all the negative consequences during the whole mining period were included in, the resulting damage would reach an unbelievable 900 billion. The Ministry of Industry takes into consideration only a fraction of this amount, but even that is more than enough: according to the numbers that the Ministry has come up with, the state as well as the tax payers would lose substantially. In contrast, Mr. Tykač and Dienstl would profit royally. It would be hard to find a better example of privatizing the benefits and socializing the costs. Political representatives from the Social Democratic Party, ANO, and the People's party would be very hard pressed to explain to their voters a similarly »advantageous« decision.” —[Jan Rovenský](#).

Source: <http://www.zelenykruh.cz/bily-slider-na-hp/tezba-uhli-za-limity-se-nevyplati-vplyva-to-z-nove-studie-ministerstva-prumyslu-a-obchodu>

- **Hnutí DUHA.** “The territorial ecological limits were established in 1991. They were set in such a way so that the supplies would continue for some time (a quarter of a century) and the energy sector would have time to gradually adjust. The heating power stations have known for eighteen years what amount of fuel they can count on. They have been adjusting their plans and investments accordingly for a long time now. It would be hard to imagine that the owners would keep a general manager in charge of their company if the manager had known that the supplies would run out, had been waiting stoically for two decades, and then at the last minute had started to talk about not having anything to burn. [Hnutí DUHA](#) has outlined a way how to free the Czech heating industry from its fatal dependence on fossil fuels in the Program for Energy Independence. The proposal combines investing in insulating houses, solar panels and biomass heat stations, and it presents new standards for developers as well as for temporarily supplying heat power station with the coal from the existing mine at Bílina or Vršany”.

Source: <http://www.chytraenergie.info/index.php/chytra-energie-novinky/dopravafosilni-zdroje/151-cena-tepla-s-limity-nesouvisi>

- **Limity jsme my.** “For a whole quarter of a century, the limits have served their purpose. Thanks to the courage and determination of the inhabitants of Horní Jiřetín or Litvínov as well as the support from people across the country, the limits have resisted (with the unfortunate exception of the Bílina mine) repeated attempts to break them. However, the situation has changed over time. The continuing mining and burning of coal no longer endangers only the homes and the health of the people in northern Bohemia. Given their destructive effects, the mining and burning of coal are one of the immediate causes of climate change. That is why we want to mark this anniversary by adding something new: The mining limits themselves are no longer enough”.

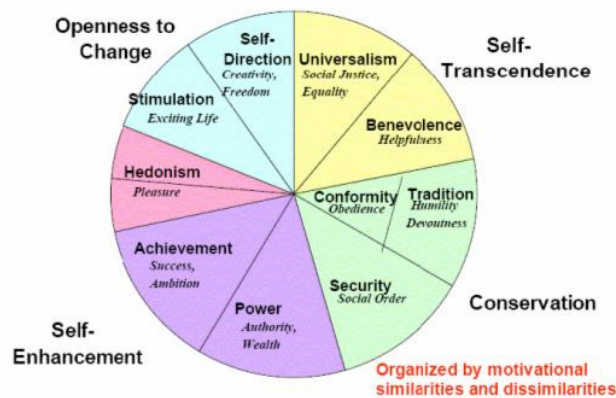
Source: <http://limityjsmemy.cz/prohlaseni-k-25-vyroci-limitu-limity-tezby-samy-uz-nestaci-chceme-konec-doby-uhelne/>

4. Second exercise – the values of the actors (30 min.)

The groups will be provided with the scheme from Schwartz's theory of values and with definitions of each value (see below).

- Each group will draw a quote from one of the actors from the previous exercise. Afterwards they will analyse the quote and match it with the values from the scheme (10 min).
- Each group will present only the values that they have selected for their quote, without revealing the quote (5 min.).
- The groups will move around the class in order to identify other groups with similar or close values to the ones they are representing. Clusters of the groups will present their common values and reveal their actors' identities (15 min.).

Schwartz's theory of basic human values



Openness to change

STIMULATION: Excitement, novelty, and challenge in life

SELF-DIRECTION: Independent thought and action – choosing, creating, exploring

Self-enhancement

POWER: Social status and prestige, control or dominance over people and resources

ACHIEVEMENT: Personal success through demonstrating competence according to social standards

HEDONISM: Pleasure or sensuous gratification for oneself

Conservation

TRADITION: Respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provide

CONFORMITY: Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms

SECURITY: Safety, harmony, and stability of society, of relationships, and of self

Self-transcendence

UNIVERSALISM: Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature

BENEVOLENCE: Preservation and enhancement of the welfare of people with whom one is in frequent personal contact

5. Reflection (15 min).

The discussion will be facilitated by the lecturer.

- a. Students will reflect upon the analysis of the values of the actors involved in the case.
- b. Students will reflect on the whole case about territorial mining limits in the Czech Republic and discuss the environmental, social, and economic aspects of this case.

Case 10:

**Smog – high concentration of air pollutants in a large city.
Warsaw example**

Authors:

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Keywords: air pollution, smog, health effects, air quality management

Relation to Sustainable Development Goals (SDGs):



Strategy: Text analysis, presentation, project team work, possible to use flipped-classroom method

Time required for classwork (in minutes): 90.

Students preparation to the class (in minutes): 120.

Aim: To illustrate the problem of air pollution, increase the awareness of its effects (including health) and develop the strategic/management skills.

Learning outcomes (micro-perspective, students' achievements):

After completing this case, students are able to:

- Discuss problem of air quality in large cities;
- Describe the influence of the most important sources of air pollutants emission on the air quality;
- Indicate the health effects of air pollutants and poor air quality as a social problem;
- Analyze decision making processes regarding the air quality management and its improvement.

Case description

Poland is a 38 million inhabitants country located in the Central Europe. Its energy system is based mainly on coal burning that caused many air quality problems, especially in the 1970s and 1980s. After the economic transformation many industrial installations collapsed and the remaining ones together with power plants and CHP plants have been thoroughly modernized and the emission of the air pollutants decreased significantly. At present, however, emissions from individual households using solid fuels as well as the transportation sector, are still a problem causing air pollutants emission.

Air quality in Poland is now a serious problem that has to be considered in several dimensions: medical and social as well as reputational, legal and administrative. Due to some of the highest concentrations of particulate matter pollution (PM₁₀ and PM_{2.5}), and the highest concentrations of polycyclic aromatic hydrocarbons (PAHs) among all European Union countries, Poland is a polluted country (see also: (<https://www.euractiv.com/section/climate-environment/opinion/smog-plague-d-poland-tries-to-escape-tag-as-europes-china/> viewed: 08/15/2017). According to 2016 EEA report “Air quality in Europe” concentrations above the PM₁₀ and PM_{2,5} annual limit value were observed mostly in Bulgaria and Poland (<https://www.eea.europa.eu/publications/air-quality-in-europe-2016>: page 27-31).

Bad air quality in Poland is extremely important social problem and obvious challenge for the government. On one hand, the high emissions of air pollutants from households and transportation are partly due to the low people awareness – people simply use the cheapest, and simultaneously the worst-quality fuel and cars with low environmental standards. Burning low-calorie coal and wood and often also municipal waste, the burn of which in home furnaces causes significant emissions of very harmful substances are common practices. The widespread use of relatively old private cars (characterized by higher emissions comparing to modern cars), large traffic generating numerous traffic congestions and low level of active transportation systems (e.g. cycling) is partially responsible for the low air quality in cities.

On the other hand, the problem of poor air quality affects the whole society, causing that each year about 45-50 thousand of Poles die prematurely because of high exposure to air pollution, especially fine particulate matter. The pollutions also promote respiratory system diseases, cardiovascular system diseases, but also cerebrovascular diseases (i.e stroke). Air pollutants are responsible for the exacerbations of bronchial asthma and chronic obstructive pulmonary disease. They are a serious problem for children and the elderly as well as people suffering from the abovementioned diseases.

The estimation of mortality proportion from lung cancer and cardiopulmonary diseases that can be attributed to exposure to concentrations of PM_{2,5} in ambient air in selected Polish cities indicated that the fraction of mortality due to the health outcomes of interest attributable to exposure to

PM_{2.5} is directly proportional to its concentration in the ambient air in individual cities¹. It varies significantly between cities reaching the highest values in southern Poland (Cracow and Katowice) and the lowest in north-eastern Poland (Białystok) as well as along the Baltic coast (Gdańsk and Szczecin).

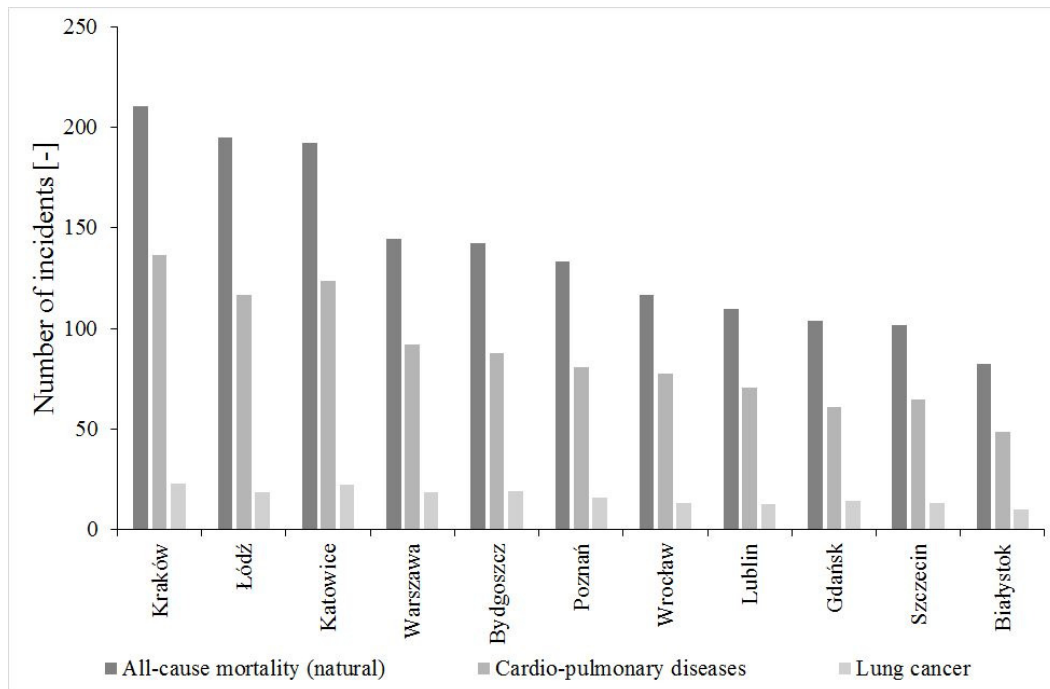


Figure 1. The average all natural causes, lung cancer and cardio-pulmonary mortality per 100,000 inhabitants attributable to ambient PM_{2.5} in Polish cities in the period 2006-2011

Source: Badyda, Grellier, Dąbrowiecki 2016.

The most common causes of death attributable to exposure to PM_{2.5}, particularly in the case of lung cancer and cardiopulmonary diseases concern cities characterized by the highest concentrations of this pollutant (Cracow and Katowice). Comparable rates were recorded in Łódź, where the concentration of PM_{2.5} are noticeably lower. Other factors that increase mortality such as age (the risk factor most associated with mortality from cancer and cardiovascular disease) clearly play a role in increasing the number of attributable cases.

Moreover, in Łódź, which used to be industrial city may reveal the effects of exposure to high concentrations of air pollutants that occurred in the city during intense activity of light industry (this is due to the lack of taking into account the latency period). Visibly lower rates concern Warsaw, however this city was still on the fourth place of Polish cities with highest mortalities attributable to ambient PM_{2.5} and moreover it has the largest population.

¹ Research conducted by Artur Badyda from the Warsaw University of Technology, James Grellier from the Centre for Research in Environmental Epidemiology from Barcelona and Piotr Dąbrowiecki from the Military Institute of Medicine in Warsaw.

The highly elevated pollution levels in Polish cities are also a legal and administrative problem. The widespread use of coal in household and the social poverty causes that air quality management in Poland is particularly difficult. There is lack of appropriate legislation that would effectively eliminate the possibility of low-quality fuels trading, as well as the burning them in the obsolete installations. There are also no regulations that would allow to forbidding urban traffic vehicles that do not meet the restrictive emission standards. There are over 28 million of vehicles registered in Poland; 21 million of them are passenger cars, out of 1.15 million vehicles which are registered in Warsaw only 30 % have 5 years or less, the whole 55% are at least 10 years old and over 25% older than 20 years. About 30% of passenger cars (both in Poland and in Warsaw) are vehicles powered by Diesel engines, which are responsible for emission of substances which have proven carcinogenic influence on humans.

Introduction of activities aimed at improving air quality, requires huge financial investment including subsidies for the purchase of modern heating equipment, improvement of fuel quality and the introduction of incentives for those who decide to buy low-emission vehicle. There is also a need to decrease the intensity of individual transport (i.e. use of personal cars), especially in central districts of Warsaw and decrease the number of vehicles passing every working day the borders of the city. Popularity of public transport in Warsaw is rather high in comparison to many European and other Polish cities. According to the latest Warsaw Traffic Measurement in 2015, the percentage of journeys made using public transport reached the level of 46.8%, while individual cars were used in 31.7% cases. There is also quite high share of pedestrian's journeys (17.9%). The share of using bikes is not very high (only 3.1%), but was actually the highest in the whole history of traffic measurements in Warsaw. To compare these results with Cracow it is worth to note that public transport is used in this town in 36.3% of journeys, individual cars in 33.7%, pedestrian's travels in 28.4% and bikes are used in 1.2% of journeys² Unfortunately, the usage of public transport indicated in Warsaw in 2015 was the lowest since such measurements have been conducted (in years 1980, 1993, 1998 and 2005), and the share of using individual cars is the highest. There is a great need of educational campaign but Warsaw municipality treats this as an additional action, which is not a priority.

The Warsaw Municipality

The city's current actions aimed at reducing air pollution concentrations include the following activities and plans that are considered:

1. Regarding the limitation of individual traffic in the city center:
 - a. The introduction of a ban and traffic restrictions for heavy goods vehicles in the central city area (in force since 2006, as amended in 2010);
 - b. It is currently impossible (national regulation) to introduce restrictions on the movement of individual vehicles not meeting the most restrictive emission standards;

² <http://transport.um.warszawa.pl/wbr2015>.

- c. Further investment is needed in the development of public transport - the city is currently investing in the expansion of the 2nd metro line; public transport is being rejuvenated for both buses and trams. Within the procedure for purchasing new buses, low carbon vehicles are being bought, including the development of rolling stock of electric buses (the first batch of 10 vehicles has been running for several months, the tender for the delivery of the next batch has been resolved and in the near future a further tendering procedure for buses is planned. electrical);
 - d. The City Office has introduced a narrowing of some streets in the center of Warsaw in order to reduce traffic congestion, and further plans to narrow other streets to discourage car usage in everyday job commuting.
 - e. To increase the use of public transport by young people and their parents, the municipality has introduced free periodic tickets for school-children
 - f. A similar goal is to introduce a reduction of ticket prices in the city center in June 2017 to encourage commuters from Warsaw to make more use of public transport (currently around 700,000 vehicles are flown to Warsaw daily), mostly from suburbs (this is also partly a political decision connected with local government elections);
 - g. The development of P + R (park&ride) parking lots (as well as bike&ride: B + R) is also used to limit the movement of individual vehicles in the central parts of Warsaw (especially for cars commuting from the suburbs). However, these are costly investments, which require large areas of land, and so far car parks are able to meet about 1% of the needs in relation to the number of vehicles exceeding the daily limits of Warsaw.
2. Other actions aimed at limiting car traffic are:
- a. Carpooling plans (which should theoretically be implemented soon). In this system, fleet of short-term rental vehicles is available as needed (some of the world-wide solutions are fully automated from the user's perspective - the location of the closest car is identified by a smartphone, which also serves to rent and start the vehicle. Some of the systems are based on electric vehicles; the system planned for implementation in Warsaw is supposed to be such a system). This makes it possible for people who do not have cars to rent a car, for example, for a few dozen minutes, or a few hours if needed (e.g. larger purchases);
 - b. The city also encourages (or is planning to encourage) the use of car-sharing solutions. This is a solution, which is to give free seats to a commuter, e.g. to work or school in the same direction (however unclear are legal interpretations of whether such lending is not an accident for a person using a landing gear, it should be taxable);
 - c. The emergence and dynamic development of the public bicycle rental? system (popularity is higher than expected) and the expansion of bicycle transport infrastructure. Some implementations are criticized as not really thought through, such as bicycle paths that unexpectedly end up being made from the wrong road surface, a tree grows in the center

of the path, or the path partially goes up the stairs. However, such situations are becoming less frequent. There is still a lack of developed bicycle parking lots which appearance could contribute more to the popularity of bicycles (there are also car parks created by individual employers);

3. Activities related to the reduction of emissions from communal-living sources
 - a. Boiler replacement allowances in individual households for low-emission appliances (in particular gas boilers);
 - b. Plans to increase the amount of areas with air quality monitoring (urban measurement system);
 - c. Organizing a system of air quality control by the municipality police (special measuring devices are used for random interventions during heating seasons) and household inspections in order to prevent illegal waste burn;
4. PR and educational activities:
 - a. Educational materials for residents;
 - b. Training for directors (managers, heads) and teachers from kindergartens and schools in Warsaw on air quality issues and methods of protecting children from excessive exposure to air pollution.

Inhabitants of Warsaw

The main problem is that still there is low awareness of the problem of high concentrations of air pollutants in the city, although media are nowadays more increasingly cover the topic (especially after smog from the beginning of 2017, when the concentration of pollutants unprecedented in at least 10 years).

- Lack of education and information: the residents do not know that some (most?) of them themselves contribute to poor air quality (using more and more fuel from road transport or burning solid fuels in home furnaces).
- Residents do not want to give up using cars as it is the main mean of transport, mainly because they are reluctant to give up comfortable transport in the city, sometimes due to the limited availability of public transportation modes (only near distant areas of the outlying districts). This is also evidenced by the low popularity of the “Day without a car”, but also the introduction of free public transport during periods of particularly high concentrations of air pollution. It is particularly noteworthy that some people who are already using public transport on a daily basis do not look at such shares so that they are already contributing to the improvement of air quality by means of collective transport but indicating that they also belong to them. Get free rides, and as the communication is free, they still have to pay (in advance they have already paid for the ticket).
- Residents (like NGOs) would welcome the introduction of completely free public transport in Warsaw, although it is difficult to assess the extent to which such an action could have motivated people to use the cars to change the means of transport to public transport. The cost of

introducing such activities is relatively high (although the introduction of free communication eliminates the need to print tickets, maintain their distribution points, control systems, or metro gates).

- Reducing the use of individual transport by residents could also be used by employers who would promote the use of bicycles by their employees (by creating adequate infrastructure) or by public transport (e.g. raising ticket costs) while limiting the number of parking spaces available at workplaces, especially in the central part of the city.
- A certain reduction in the use of not only cars, but the reduction in the number of journeys, especially in peak periods, could be used to introduce flexible working hours (also in public administration) or to increase the popularity of work at home.

NGOs

Expectations of non-governmental organizations are largely identical to the expectations of the inhabitants, because there are in particular local NGOs with inhabitants of Warsaw as members. However, awareness of the problem of low air quality among NGO members is obviously much higher than among the average citizen. They fight altogether to make plans (what plans?) come true and claim that the actions (and the action plan) is too slow for the dangerous situation that is nowadays in Warsaw.

1. First of all, according to non-governmental organizations, the actions of officials aimed at reducing the problem are insufficient and should be significantly intensified. Their expectations boil down to the following postulates:
 - a. The city should already introduce restrictions on individual traffic in the city center, as well as some streets should be narrowed, which today encourage the intensive use of individual transport;
 - b. Public transport should be for free;
 - c. Officials should use public transport instead of business cars to work;
 - d. City center buildings should have fewer parking spaces to discourage the possession of cars, especially those living in the downtown area;
 - e. A similar postulate concerns office buildings where a large number of parking spaces encourage commuting to work by car;
 - f. In general, there should be few parking spaces in the city center;
 - g. Parking fees should increase (nowadays, in many cities, the upper limit of the permissible rate is in force, although the legislative path is now a bill that is three times higher; It is, however, unpopular decisions, which will take self-governments will delay);
 - h. Center parking fees should be higher than in other parts of the city (there has been no legislation in this area to do so, but the abovementioned bill provides for such a solution);

- i. Boiler replacement fees should be higher; there should also be a subsidy for the use of low-carbon fuels, especially among the poorer parts of society, which cannot afford to use e.g. relatively expensive natural gas.
2. Some NGOs provide educational training for residents or teachers.
3. The actions of Warsaw Smog NGO are diversified and some of them are maintained by the actions of national and international Polish NGO that complaint to EU about the toxic smog:
4. "Poland has Europe's highest air-borne concentrations of the carcinogen benzopyrene -- norms are exceeded four-fold -- breaching both Polish and EU laws," Piotr Cykowski, an activist with the Action Democracy NGO told AFP at the European Commission branch office in Warsaw.
5. "This is why we're filing a formal complaint to the European Commission which could formally sanction Poland for inaction in fighting lethal smog," he added.
6. "We were expecting the introduction of a ban on the sale of the lowest quality coal for domestic heating purposes. However, new draft regulations change nothing" said ClientEarth Poland lawyer Agnieszka Warso-Buchanan, noting that the government admits that "a ban would harm the coal industry" (http://www.terraily.com/reports/Polish_activists_complain_to_EU_about_toxic_smog_999.html viewed 1.06.2017).

Experts from Warsaw University of Technology

The project "Development and implementation of the Warsaw Air Index and information and analytical system of air quality" is being implemented in recent months (together with Warsaw municipality). This system is intended to increase the level of informing the inhabitants of air quality (in the next stages the network of urban air quality measurement points will be developed, which will allow access to current air quality information in many places in Warsaw – currently the measurements are conducted in 7 stations).

The Warsaw Air Quality Index will, in turn, be a synthetic measure of air quality without the need to analyze the concentration of pollutants and their value to the permissible concentrations. WIP recommendations will also be related to proposed actions (e.g. recommendation to use public transport) or refrain from other activities (e.g. intensive outdoor sports), and separate recommendations will be directed to particularly vulnerable social groups. The risk of untreated health events (children suffering from bronchial asthma, the elderly, people with respiratory diseases, people with cardiovascular disease).

Experts strongly recommend to carry out some educational activities and well prepared communication on the topic.

Previous activities are poorly communicated – residents are either unaware of the existence of these activities or do not read them in the context of traffic congestion and thus reduce the concentration of air pollution in the city. Even if the main purpose of these activities is not to limit traffic, they can achieve this effect and this should be communicated appropriately. It is also necessary to significantly increase the intensity of public awareness that the air pollution in Warsaw is largely due

to the actions of the inhabitants of the city and the suburbs (city's commuters): intensive use of individual transport (though in Warsaw's public transport travels show that almost 47% of journeys take place by public transport, compared to 2005 or 1998, the share of mass transit traffic has fallen from 54% and 51% respectively, while cars increased from 24% and 28% respectively) throughout the year and use from autumn to spring from solid fuel (coal, wood), especially in peripheral districts and many towns around Warsaw.

Questions to address (1-6):

- How to make changes within the city to improve the air?
- How to improve the better understanding of air quality in the city among different stakeholders including general public? What can be done by: Warsaw authorities, Warsaw citizens, NGO?
- How to make Warsaw a sustainable city?
- Are there any data on gender perspective towards air pollution? (who is mainly fighting with smog?)
- Is gender included/not included in the decision-making process concerning smog?

Data source

<http://energydesk.greenpeace.org/2015/06/25/polands-smog-crisis-europes-most-polluted-country-in-trouble-with-the-eu-but-wont-cut-coal-emissions/>

<https://www.ft.com/content/6712dd66-c91d-11e6-8f29-9445cac8966f>

<https://qz.com/882158/with-air-pollution-skyrocketing-warsaw-is-severely-hit-by-polands-smog-problem/>

https://www.nytimes.com/2017/01/14/world/europe/warsaw-air-pollution-smog.html?_r=0

How 6 cities are attempting to deal with dangerous air pollution: <http://www.cbc.ca/news/world/smog-air-pollution-cities-1.3383313> (6.06.2017, posted: Dec 29, 2015)

Procedure

Teachers can use these materials and organize a round table discussion with stakeholders involved in the development of the sustainable city (with better air quality). This material can be also a background information to use the flipped-classroom method:

1. In-class work: Opening the issue. Introduce the main question of the case e.g.: "What can ordinary people do to make city less air polluted? Let students to discuss their ideas in pairs and then to present their ideas.
2. Flipped classroom (assignment): Ask students to go through presentation about air pollution in Warsaw provided on the Internet (and in the materials above). Ask them to a) identify 5 the most effective actions for reducing air pollution in Warsaw and b) organize them in xy chart in such a way that x represents the level of effectiveness of an action and y represents its cost. Then c) try to identify the best suitable action for supporting by community-based project.

3. In-class work: Ask students for presenting their suggestions for the based suitable action. Encourage critical reflection. Then select 1-4 actions with the highest students' support and ask students to make smaller teams to plan an action-relevant community-based project.
4. Provide students with a template for planning the action-relevant community-based project (action plan). Emphase an importance to plan their action as realistically as possible, as it could be conducted by ordinary people, like them. Give them enough time to prepare their plans (it may be accomplished as another home assignment).
5. Let students present their action plans. Encourage critical reflection.
6. If possible, encourage students to choose one their action plans and conduct it on their own.

Community Action Plan Template

Please consider the following template as you develop your Plan. When you are creating the plan, keep in mind that the project needs to be both sustainable and achievable. **Focused and realistic action steps are preferred.**

Step 1:

PROBLEM IDENTIFICATION and PRIORITIZING:

- What are the problems (scope, burden, context)?
- What data sets have been analyzed and what does the data suggest?

Step 2:

STRATEGIES, OPTIONS and TRADEOFFS :

- What approaches and actions are most suitable to deal with problems?
- What is the community's shared vision around the project?
- What/who are the priorities?

Step 3:

PLANNING FOR IMPLEMENTATION:

- Briefly describe the planning to date as part of an initial action step.
- Who does what, when and how, and how to get it going? Use the table:

Action step(s)	Person(s) responsible	Date to be completed	Resources required	Barriers or resistance	Collaborators
What will happen?	Who will do what?	Timing of each action step	What is needed and what's available?	Risks and a plan to overcome barriers	Who else should know about this action?

Step 4:

MONITORING:

- How is it working and what can we learn?
- What are the prospective opportunities, as well as constraints, associated with the project?

- Both in terms of process and outcomes, how will strategies be measured?
- How will results be shared with the community?

References

Badyda A., Grellier J.& Dąbrowiecki P. (2016) Ambient PM_{2.5} Exposure and Mortality Due to Lung Cancer and Cardiopulmonary Diseases in Polish Cities. *Advances in Experimental Medicine and Biology*, 944, pp. 1-9. DOI 10.1007/5584_2016_55

Case 11:

Local referendum about relocation of the railway station

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Keywords:

railway station, local referendum, public participation, decision-making

Relation to Sustainable Development Goals (SDGs):



Strategy: the lesson is based mainly on the experiential education approach. Learning is assumed to arise as a result of participating in a role-playing game and follow-up debriefing

Time required for classwork: 120 minutes.

Students preparation to the class: no need for preparation

Aims: Ultimate goal of this case is to develop students' strategic thinking competence. While receiving brief information about the plan to relocate railway station, students should be able to argue during group debriefing about the role of local referendum in urban sustainable development.

Learning outcomes:

After completing this case, students are able to:

- analyze the process of local referenda, identify its pros and cons, and compare it with other methods of decision-making processes;
- identify the social, economic, and environmental aspects of the issue based on the plan to relocate the main train station in Brno (Czech Republic) from the city center to southern, rather industrial, part of the city.

Case description

Brno is the second biggest city of the Czech Republic (approx. 380,000 inhabitants). It is the city where the Highest Court and other important Czech institutions are situated. It is the home to 14 universities with approx. 83,000 students, many theatres, and historical places. Brno is one of the core urban centers of the Czech Republic. It is also easy to reach from Prague (2.5 hrs) or Vienna (1 hr) by train or bus.

Nowadays, Brno main railway station is situated in the city center (see Image 1). However, this situation is a matter of on-going discussions.



Image 1. Comparison of the current location of the railway station and the proposed relocation

In the middle of the yellow circle we can see the current location of the train station. The circle depicts 15 minutes walking distance from the center of the circle. The white circle depicts the 15 minutes walking distance from the proposed relocation of the railway station. The white lines depicts proposed development of the area.

The city has been developing rapidly since the socio-economic transition in 1989. The growing number of new inhabitants as well as the growing number of companies and businesses in the city calls for a (new) city development plan. Reconstructing the railway station in order to improve the connection not only to regional settlements but also to other European countries has become an important priority.

With the transformation of the former state-planned economy to the market economy, an opportunity for development companies as well as for real estate retailers occurred. Thus the development of the city is a process of negotiation among various stakeholders, due to the differing views on how the city should develop.

The first local referendum was organized in 2004. The result was a clear disapproval of the proposed relocation, as 86% of voters agreed that the local government should take all steps to modernize the main railway station within its current location. However, the quorum (50% of authorized voters) was not reached, because the attendance rate was 25 %.

According to the modified local referendum act, the quorum (an attendance threshold for valid result of the referenda) dropped to 35% voters only. In the local referendum, only the permanent residents of the city may vote. However, the importance of the issue surpasses the city itself as the railway station is used widely by commuters, who cannot participate in the referendum.

In discussions on the issue, various arguments are used. The effort to move the railway station to another location is usually supported by the following arguments:

- it will enable further development of railway transport (current station is viewed as insufficient);
- it will merge personal and material transport in one place;
- the city center can be enlarged by building the railway station near the bus station;
- the relocation will support the economic development of the city, its competitiveness and a modern and new railway station is a necessary condition for such development;
- it will create conditions for the still missing high-speed rail connection between Prague, Brno, and Vienna;
- it will be faster to build a new train station than to reconstruct the current one.

The critics of the relocation plan tend to provide the following arguments:

- since the current station is situated in the city center, commuters and tourists may reach the city by public transport (and do not have to use their private cars);
- current location is convenient both for tourists and commuters,
- it is not necessary to construct a completely new building and infrastructure as a modern train station for high-speed rail connection can be constructed at the current location and it will cost less;
- people are used to the current main train station and may be largely opposed to the relocation;
- building a new train station on greenfield land might impact on the present fauna and flora as well as groundwater sources of water.

The solution to the dilemma of “to move or not to move” main station will seriously affect lives of citizens of Brno.

Questions to answer:

- What are the pros and cons of local referenda?
- What are the specific challenges in this method of seeking for a problem solution?
- For what kind of projects is a local referendum an appropriate instrument to address sustainable development in urban areas?
- Are environmental, social and economic aspects of the proposed project addressed by various actors equally?

Data source

Brno opens central station design contest. <https://www.architectsjournal.co.uk/competitions/brno-opens-central-station-design-contest/8689620.article>

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Procedure

1. Human continuum: ask the group to express their opinion about the issue by choosing a place in a class. Participants could form a line where each end represent the opposite view on the statement: “A local referendum is an instrument allowing to find the best solution for sustainable development of a city.” Ask participants to explain their opinion.
2. Participants sit in the circle with their eyes closed and receive their business cards. They are welcomed into their new roles – stakeholders of the current issue of relocating the main train station in Brno.
3. Participants receive the information that a public hearing about the planned relocation of the railway station starts in the town hall in 10 minutes. They are supposed to find other participants with the same opinion as theirs (i.e. their role) and discuss the arguments. The groups for and against the relocation should prepare a list of the strongest arguments for persuading members of the other groups to change their mind for the upcoming referendum. The not-decided group should prepare their questions about the project.
4. The facilitator opens a public hearing and the plan for relocation is introduced (it can be introduced by the proponent and opponent of the relocation, who get more familiar with the case before the lecture).
5. Facilitator opens the floor for discussion and the participants are invited to express their arguments and questions. Stakeholders present the arguments according to their roles. Time planned for a discussion is 10 min.

6. Announce the referendum in 10 minutes after the discussion ends. Show the referendum questions. The participants who may vote receive two small balls of different colors and a non-transparent bowl is placed below the screened questions of the referenda.
7. After ten minutes, when it is possible to discuss the issue privately and think through the decision, the secret voting starts. Only those participants, who have received cards with explicit instruction "YOU MAY VOTE" are allowed to vote.
8. The facilitator organizes the "secret vote" – i.e. nobody can see anyone else voting. The municipality must act according to the result of the referendum.
9. Let the participants discuss the result of the referendum in groups and to evaluate the consequences for the future development of Brno from the perspective of their roles.

Assessment

Let the participants reflect the result and think about its consequences for the future of Brno. During the debriefing session participants leave their role and are encouraged to express their personal thoughts (in smaller groups of 4–5 participants):

- a. What are the pros and cons of local referenda?
- b. What are the specific challenges in this method of seeking for a problem solution?
- c. For what kind of projects is a local referendum an appropriate instrument?
- d. Are environmental, social and economic aspects of the proposed project addressed by various actors adequately?

Application: The case could be used in the various themes and courses, such as conflict management, environmental conflicts, urban studies, communication.

Additional materials for the case:

1. Questions for referendum
2. Arguments for and against the relocation
3. Roles description

Questions for referenda

- 1) Do you agree that the city should do its best to reconstruct the railway station in its current location?
- 2) Do you agree that the city council should launch an open competition for a project of the railway station renovation immediately?

Main arguments for relocation

- to enlarge the city center and to build the railway station nearby to the bus station
- to support the economic development of the city and its competitiveness and the modern and new railway station is a necessary condition for such a development

- to prepare a condition for a still missing high-speed rail connection between Prague, Brno, and Vienna
- to bundle together personal and cargo railway traffic

Main arguments against relocation

- is situated in the city centre, commuters and tourists may easily reach the city and use public transport
- people are used to the location
- it is not necessary to build a completely new building and infrastructure
- it would cost less
- the relocated station could lead to higher use of car transport

Participants' roles

Mr. Vorisek

You have been living in the city center for more than 50 years. You like the way it is and do not support any changes in the city center. Furthermore, you do not trust the huge and expansive projects managed by rich companies with no links to the place and supervised by corrupt politicians. YOU MAY VOTE.

Ms. Chlebickova

You own a small company near the contemporary location of the train station. Because of this, the relocation would seriously hamper your business. You are aware that many people are in the same situation. Moreover, you want to prevent public money from being wasted. YOU MAY VOTE.

Mr. Modry, Spolek Brno

You are the member of a NGO supporting the relocation. You believe the decision-making should remain in the hands of experts, as the public have no expertise for qualified decisions. You also believe your city deserves a new and better situated train station. YOU MAY VOTE.

Ms. Moturkova

You are a big fan of high-speed trains and often criticize they are still not operated in the Czech Republic. You believe that the relocation of the main station could open a way for turning your dreams into reality. The current main station does not support speed trains, because of the residential infrastructure nearby and old technological railway solutions. YOU MAY VOTE.

Ing. Vlcek

You are a public transport expert. You believe it is possible to reconstruct the current main station to open it for high-speed trains.

Ing. Masinkova

You are a public transport expert. You believe that although it is possible to reconstruct the current main station to open it for high-speed trains, it would be more expensive because of the residential infrastructure nearby and the old technological railway solutions.

Dr. Travnicek, member of the Green Party

You believe that decision-making should be as transparent as possible and so the public should be involved. YOU MAY VOTE.

Dr. Kolejkova, representative of the Czech Ministry of Transportation

You represent a crucial investor of the planned project. However, your ministry still has not taken any position on the issue. Generally, you are interested in saving public money but also in obtaining public support for your party.

Ing. Vyhybka, representative of the Czech Railway Infrastructure Administration

Your company is an investor and owner of the infrastructure (i.e. the main station). You seek a consensus with the other municipal and national institutions. Your institution is highly interested in launching the high-speed rail network.

Mr. Kralicek, representative of the Czech Government

You are interested in the process of referendum as such, as you want to evaluate how the contemporary version of the local referendum law works.

Mgr. Hantecka, representative of the Brno municipality

You are personally opposed to the relocation plan. However, your task is to evaluate the arguments of both sides and respect the will of the majority of Brno citizens. YOU MAY VOTE.

Ing. Nadrazska, representative of the Brno New Station Development Company

Your company is responsible for the current building of the railway station and renting its place. Its another responsibility is the reconstruction of the building. However the company also owns some of the real estates in the area of the proposed relocation of the railway station. YOU MAY VOTE.

Mr. Spilberg, representative of the European Commission

While the investment should be supported from European funds, your task is to make sure that the process is transparent and follows democratic norms common in the EU. YOU DON'T VOTE

Ms. Balounova

You are an owner of real estate in the area where the station would be relocated. The project would open the area to new development, therefore the prices of the real estates would significantly increase. YOU MAY VOTE.

Doc. Litalek

You work for the university located in the city center. As you live in a distant city, you appreciate the current location of the station, less than 20 minutes of walk from your university. You believe the current location of the station is one of the best advantages of Brno. YOU DON'T VOTE

Ms. Bila

You have been living in Brno for more than 20 years. You like the city but you are not decided regarding this issue. You are open to arguments you will hear at the public hearing. YOU MAY VOTE.

Mr. Bily

You have been living in Brno for more than 40 years. You like the city but you are not decided regarding this issue. You are open to arguments you will hear at the public hearing. YOU MAY VOTE.

Ms. Hornicek

You study in Brno and you plan staying here after graduation. You are not sure what the best thing for the city is. YOU MAY VOTE.

Mr. Vana

As the member of an ethnical minority in Brno, you do not trust much government or rich companies. However, you still have no opinion about the issue. YOU MAY VOTE.

Ms. Kudryatseva

As an original immigrant who has recently achieved Czech citizenship you are still not clear what to support. However, you do want to express your interest in the future of your new home. YOU MAY VOTE.

Ms. Kudrnova

You are a successful manager of an international insurance company. You need to travel to Prague, Vienna and Bratislava quite often. You would appreciate a better train connection to those cities so that you do not need to drive car. The faster the connection, the better for you, regardless of the price of the ticket. YOU MAY VOTE

Case 12:

Urban greenery – how to include urban green areas in cities that are in desperate need of housing?

Authors:

Marcus Hedblom Swedish University of Agricultural Sciences SLU (Sweden)

Luís Calafate University of Porto (Portugal)

Keywords: ecosystem services, urban sprawl, biodiversity; densification, green infrastructure, urban green health

Relation to Sustainable Development Goals (SDGs):



Strategy: text analyses, role playing, debate, reasoning, discussion

Time required for preparation (in minutes): 120.

Time required for role play (in minutes): 45.

Time for discussion (in minutes): 45.

Aims: To illustrate the problems in urban planning where there are two requirements that are difficult to combine, the one urging for more greenery and at the same time meeting the need for more housing and road infrastructures. To develop students systems thinking, interpersonal and strategic competencies.

Learning outcomes:

After completing this case students are able to:

- Discuss dilemmas linked to social, environmental and economic implications of urban planning of green areas;
- Understand why nature is important for human well-being and health and education;
- Understand the importance of conserving biodiversity in cities;

- Understand the complexity of combining both urban green areas of high quality and residential housing;
- Understand the landscape view of urban planning, if you affect one place it has consequences for other places. The landscape view is important for ecology as well as recreation;
- Understand how decision making is made in city planning such as strategic plans, the reasoning of different actors such as planners, politics, science and local people.

Outputs:

Text analyses and information about urban planning and urban greenery. Provide a role play as a debate between two groups which then is followed by discussion.

Case description

Urban greenery – how to include urban green areas in cities that are in desperate need of housing?

Overview of urbanization and greening

There is an increasing global urbanization trend. Within the coming 30 years more infrastructure will be built than previous in history. This increasing urbanization leads to two major effects on the global landscape. First it densifies cities, meaning that cities get more roads, houses and general infrastructure within existing boundaries. Mainly at the costs of existing urban green areas such as abandoned areas, parks, urban forests but also in residential areas where additional houses are built in existing gardens. Densification is used in many parts of the world to avoid urban sprawl.

Urban sprawl is described as the expansion of human populations away from central urban areas into low-density, monofunctional and usually car-dependent communities. Urban sprawl in the US has e.g. reduced the number of forest by 2.1 million hectares (1 ha = 100x100m) and 1.5 million ha agricultural areas during 10 years. So, one strategy is to condensate cities so that the landscape surrounding cities are not exploited by vast residential car depense settlements. Thus, dense cities are also argued to be sustainable cities since people can easily walk, bicycle and use public transport in them. New York is seen as a good example of this and seen a “walkable city” which allows people to use public transport such a subway and walk.

The question is then why do we need to have urban green or nature in cities when there are so much of it elsewhere? Somewhat provocatively the best for nature and reducing of urban sprawl would be extremely dense cities including only extremely high skyscrapers. Hong Kong is one example where the average person lives on 17th floor in a high rise building and the metropolitan area of Tokyo is another example that with 36 million people with very little green.

These cities or the fictional future cities ones with only high rise buildings will for sure leave a lot of greenery and nature outside cities but also create dense cities. However, the densification trend has started to be questioned. Humans need urban green areas in order to provide numerous ecosystem services, for example when green plants lower temperature in cities and reduce urban heat effects. Urban heat effects are when the city “keep” heats in the infrastructure creating extreme

heats in cities. Urban green areas absorb carbon dioxide and mitigate extreme rainfall by allowing the water to runoff in the greenery rather than along paved roads.

The landscape perspective is important. Share or spare are two questions linked to the present urbanization trends. Is it best to have really dense cities as Hong Kong and spare larger urban green areas within the city? Or is it better to share, to have many small urban green areas in a dispersed city as in many US cities? It is argued that to spare larger urban green areas is better since a larger area can provide many more possible ecosystem services. Further, it seems as dense cities have a larger effect on their surrounding landscape, meaning that people are pushing development into the peri-urban areas when they do not have green spaces in the city.

An example would be that increasing number of mountain bikers and joggers in the peri-urban landscapes when cities are densified. People seem to need a certain amount of greenery to function and if it is not in the city, they have to go to the surroundings.

One of the most pronounced ecosystem services in cities may be the cultural ecosystem services linked to aesthetical values, education, recreation and human health. In Japan stressed people spend weekends in forest to reduce their stress by taking “forest baths” or Shinrin-yoku in Japanese. It is however shown that the most people conduct their everyday recreation in the vicinity of their homes and to send people out on weekend tours for stress relief, as in Japan may not be sustainable.

Elderly people and children need urban green space reachable within short distance to be able to use them. Some studies show that this distance should be no further than 300 meters from home. Further, research also shows that it is not any “urban greenery” that reduce stress and increase health but it is linked to different types of green Spots. Forests that allows light and paths have stronger stress reduction potential than urban parks. There is even evidence that biodiversity *per se* increases human well-being. If one can see and hear more birds signing one will have a more positive attitude towards the urban area.

The reason behind why humans feel more well in urban greenery is not known. One hypothesis (the biophilia theory) is that humans for very long time have lived close to nature and thus feel linked to it. Biodiversity ranges from genetic diversity within species to diversity of habitats (e.g. deciduous forest, coniferous forest, park, residential areas) to global diversity of biomes (e.g. rainforest, boreal forests, savannahs etc). Interestingly humans have settled in areas with extreme biodiversity, so called biodiversity hotspots, where the flora and fauna is unique.

Rio de Janeiro in Brazil is surrounded by the unique Atlantic forest, Cape Town in South Africa has unique fynbos flora (natural shrubland or heathland vegetation) that only exists there and type ecosystems that occur around the Mediterranean sea, California, Chile and parts of Australia have a unique and highly diverse flora. All these regions are densely settled and a study made by Aronson *et al.* (2015; in Royal Society of proceeding B) showed that the urban flora and bird fauna is still diverse in a global perspective.

Uppsala and the need of housing

In Sweden as in many other regions globally there is a movement from rural areas to larger cities. In China this is truly extreme where new cities including millions of people are created. In Sweden it is not as extreme as in China but nevertheless in the city of Uppsala where 150.000 people live there is a trend of densification. Over the last few years 3000 new apartments are built within the existing borders of Uppsala every year. The municipality as whole (200.000 people) is expecting to increase with 135.000 people to year 2050 and most of them in within the existing city borders. The increase is a combination of people moving from rural areas, students from the two universities decide to stay in Uppsala, immigrants and people from Stockholm moving to Uppsala due to the high prices in Stockholm.

The problems Uppsala is facing is that all parties agreed in the long term strategic master plan (until 2030) to keep all urban ecosystem services in the city and keep the biodiversity since it is important for the human health and making Uppsala attractive and at the same time built thousands of houses within the existing borders. This building can only be done building on the already existing green areas which contradicts the strategic master plan to keep ecosystem services. Presently, the need for housing is more important than keeping urban green space but will this create a future sustainable city?

The Eriksberg forest

One particular forest in Uppsala named Eriksbergsskogen “the forest of Erik” is under pressure from two sides, one side urge for the need of getting more houses to everyone moving to Uppsala and the other side is saying that too much is built and people need greenery around them. This creates numerous arguments between politicians, local people living nearby, planners, ecologist etc. that all have their own opinion of what is best. The Eriksberg forest is located on the western part of the river Fyris in Uppsala. On this side of the river the city has approximately 13% natural remnants of forests left (on the eastern sides it is 1%).

The average city in Sweden has 20% cover of natural remnants, so Uppsala is lower than average and also lower than many cities in China that lately try to get at least 20% forest in their outer rings. Sweden is however still unique in a global perspective having numerous existing natural remnants in the city compared to cities such a Barcelona with extremely dense cities and little green space.

The master plan of Uppsala which is a strategic document showing how Uppsala should be planned for the coming 20 years states that the urban green areas are important. The small and large urban green areas are equally important in the document. Uppsala and many other cities strive to have greenery in a distance of no more than 300 meters from home. Yet, the removal of another urban forest in Uppsala illustrates the problem (figure 1). In the document that described the removal of the forest the municipality state that they “departs from the masterplan... and a deterioration of availability for the nearest residents to green areas with reduced play for the youngest (figure 1).



Figure 1. Illustrates the removal of a smaller urban woodland in the city of Uppsala.

Photo: Marcus Hedblom.

A number of ecologists were sent out to the forest to do inventories. They found numerous red-listed species on the trees. Red-listed species means that the species are threatened and declining and that Uppsala and Sweden has a responsibility to save these species. However, the species are not protected by law but by international conventions such as the CBD (Convention of Biodiversity). The ecologists also pinpointed that the forest is part of an urban green corridor that animals use to get between the nature reserves “Stadsskogen” and “Hågadalen nåsten” (see figure 7). Most species linked to the forest which is unique in the landscape since it has many pine trees older than 180 years. No trees at this age are found outside the city since 97% of the forest in Sweden is production forest and thus harvested before the age of 80 years.

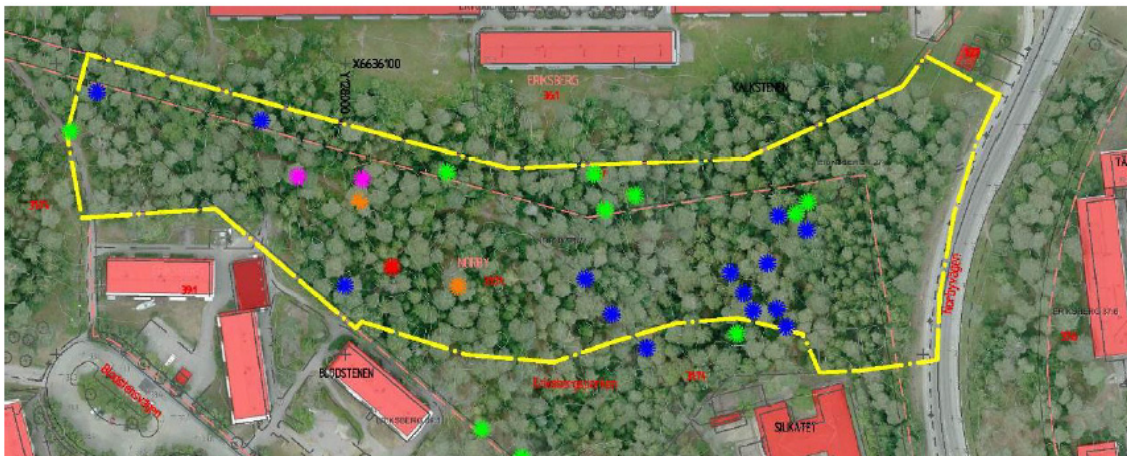


Figure 2. The different colored dots illustrate different red listed species. Two mushrooms growing on the trees that are nearly threatened and one beetle. Further, one mushroom and one beetle that are threatened was found. Inventory made by Upplandsstiftelsen, Baggforsk och Conec.

Illustration: Karavan, White arkitekter and Sweco Architects. Ortofoto: Uppsala Municipality.

Cultural values: Further, the famous Carl von Linné used to take his students on a walk in this area during the 1700 century (figure 3). According to historical documents he and his students did not walk exactly in Eriksberg Forest which enables some to argue, that there is no conflict with the housing plan. Further, there is a pacifier tree in the forest as well. A pacifier tree is a place where

parents together with children make a ceremony saying farewell to the use of the pacifier and hangs it on a tree creating a tree with hundreds or thousands of pacifiers.

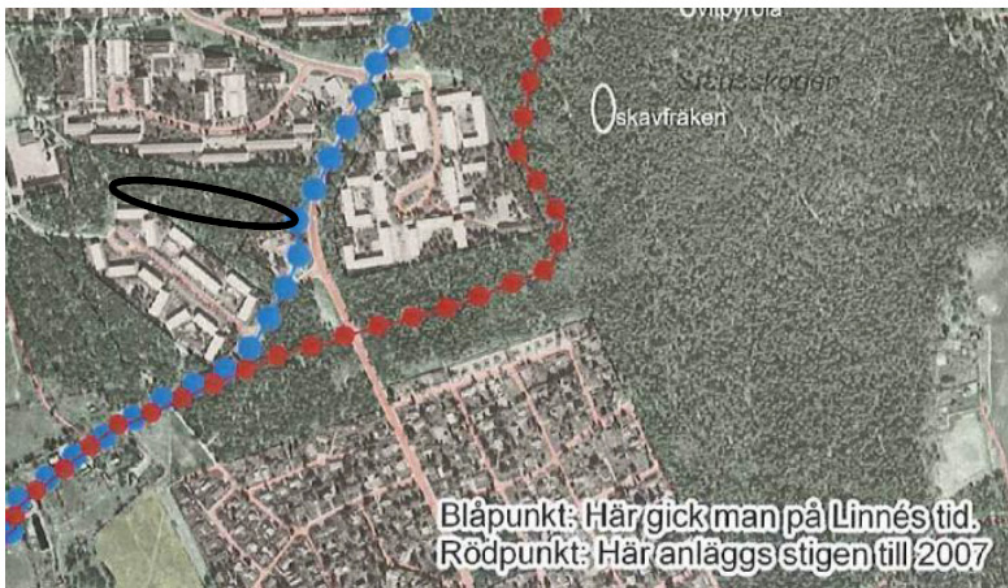


Figure 3. The black area is Eriksberg. The blue area is where Linné actually went walking and red area is where a “new Linné path is made in 2007” since the blue area is along a road these days.

Photo: Uppsala Municipality

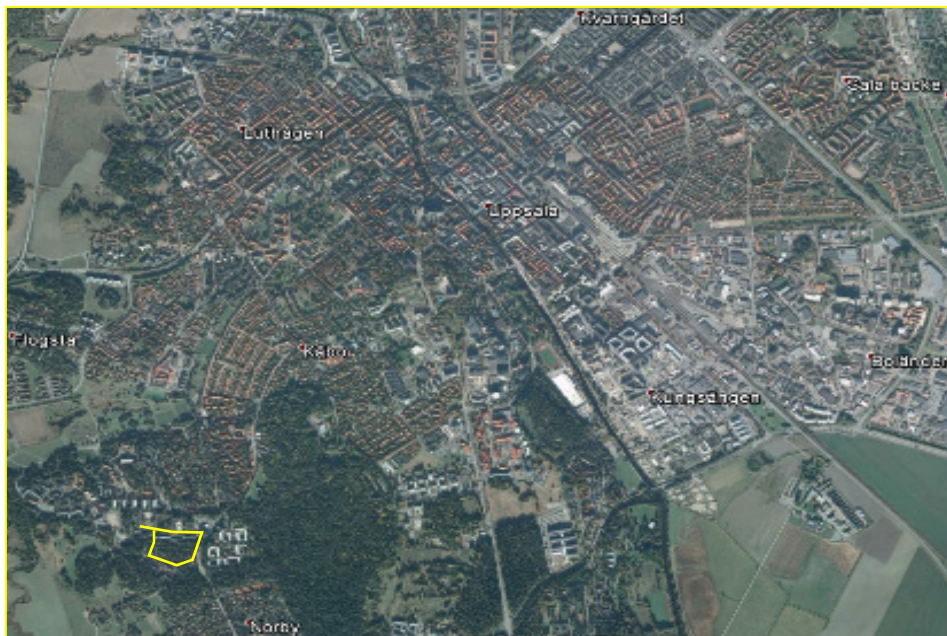


Figure 4. Photo of the location of the forest in Uppsala (in yellow). The Eriksberg forest is very close to a city forest which is a nature reserve and protected by law from exploration (seen as dark green to the right). To the left of the Eriksberg forest there is agricultural areas and also a nature reserve mainly for recreation.

Photo: Google earth illustrated by Marcus Hedblom.



Figure 5. Photos from inside the Eriksberg forest as well the adjacent gardens (right bottom).

Photo: Marcus Hedblom.

The forest is used by numerous of people. This is illustrated by the numerous paths that are in the forest (figure 5). Actually, the municipality put some effort and made a wooden bridge through the forest (figure 5) to help people passing the forest to work or for recreation.

1200 people living nearby the forest signed documents and protested against the builders (see figure 6). They use their forest on daily basis for recreation. The WHO (World health Organization) recently published a report concerning the importance of greenery and health. Green areas reduce self-evaluated stress and also actual stress, reduce obesity and type -2 diabetes, increase social inclusion, general well-being and health.

Further, in the south western parts of the forest there is a kindergarten where the children has a door in the fence that leaps right out to the forest and where the teachers and children go for strolls. There is increasing scientific evidence of the importance of greenery for children. Children increase the motoric skills, they get bigger self-esteem and they also concentrate better in school (increased cognitive skills).



Figure 6. Local people want to keep their forest. The picture is from the local newspaper where 1200 people signed a protest list.

Photo: Uppsala Nya Tidning.

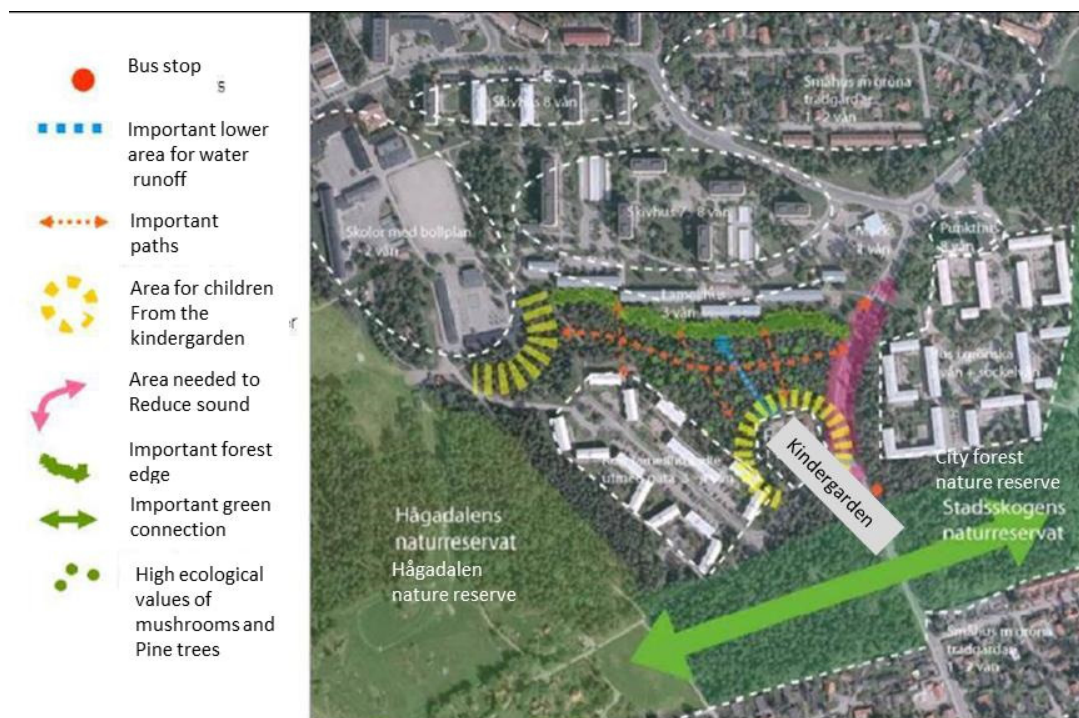


Figure 7. Overview of the area Eriksberg forest and its values. For ecological values also see figure 2.

Illustration: Sweco Architects.

Role play

The idea is that students get an overview of the problem described above including the need of housing but also the importance of urban greenery for human health in urban planning. The students will get a role in a role play representing one of many stakeholders that have an interest in the Eriksberg forest. The students can look into the references suggested in the end linked to urban

planning, urban greening and densification and try to get as much information as possible for their position to enable arguing for their cause. The students can further use internet or scientific knowledge to find further arguments for the dense sustainable city and the opposite for the sustainable green city. The “scene” or “stage” is that all the stakeholders meet on a so called dialogue meeting in a room where the municipality invited parties to discuss the future of Eriksberg forest.

It has lately becoming practice (in Uppsala) that the municipality is inviting public to meetings to discuss future exploration of Uppsala. So far this dialogue is halting in the way that so many people have come to the meetings that it is more information to citizens rather than a dialogue. There is no time or space for 200 people to ask one planner. The Eriksberg case is based on a real case where officers at the municipality met together with building companies and landscape architectures and ecologists to discuss what to do with the Eriksberg forest. This meeting was conducted in 2010 and was supposed to lead to building of houses the very same year. However, since there was no dialogue and many different values were found no buildings were made and still in year 2017 no houses are built. To make the case more interesting than often is the case in reality we have added politicians and also local people to part of the meeting.

The people or stakeholders involved in this case are invited by the municipality. This is also important to acknowledge for the students, why are these people invited to the meeting and are any people left out from the meeting? The municipality really strives to get as many people invited as possible but it is difficult to invite everyone for a dialogue and this only focal people were invited.

The houses that are to be built will be sold on the market and not be for rent. This means that that it will attract people with stronger economy. It is known that houses in close vicinity to urban green space have higher property values than the ones further away. One example that is commonly known is the Central Park in New York where the properties are extremely costly.

Procedure and the different persons in the role play

Each part could be represented by one person or many persons. Also, some of the suggested roles could be merged or left out, e.g. the politician could be merged to one, the public could be merged to one etc.

The procedure is that each actor(s) should provide all their arguments for why they think the Eriksberg forest should be protected or left, mainly state their arguments for the rest of the group. Each stakeholder is given 5-10 minutes to present. After each stakeholder presented their opinion the whole group needs to sit down to make a solution that all stakeholders can agree to. In reality a compromise is often made. One suggestion is to draw a map of the areas and discuss how it best can be solved. Use figure 7 as a background.

The politician (1) – green party – opposition

The politician (1) is in opposition with politician (2) meaning that she/he is not elected and try to get elected next time in Uppsala. The politician for the green party understand the needs for housing

and people and have said that he/she will increase the number of houses but also said that it is a tricky questions since she/he also, as a representing for the green party also argues that it is very important to keep the urban green, “at least the most important areas”. She also argues that the present houses are built for really rich and not for students.

The politician (2) – social democrats

The politician is director of the housing and building department in Uppsala and was elected mainly because she/he said that they will deliver houses. And they also fulfilled this so far with about 3000 apartments built every year. Especially for students that really lack housing and other young people that are in need of moving from their parents to their first flat. She/he finds this much more important that houses are built than green areas saved, “there are so many green areas in Uppsala already”.

Students that protest against the lack of cheap houses for rent in central Uppsala.

Some of the students have spent their first year in caravans at a camp site and other lives in cellars. They want a reasonably affordable flat where they can live and study. They do not want to commute to the city or need to by a car for travelling there. They would like to have a walkable city or at least a city where you can bike (see picture on Uppsala train station).



Figure 8. Illustration of the high number of bicycles at the Uppsala railway station. The picture is from one of the smaller biking parking places. Now, the municipality is discussing how to make a 2-3 floor parking house for bikes due to the lack of space.

The director of a building company

The director argues that she/he has been giving an agreement to build in this forest and plan to build really dense and high. At least 5 houses would be built of 8 floors with parking lots and also one bigger hose along the road with 5-6 floors but more departments. She/he understand that “ecological” values have been found and “that some people do not like the idea” but she/she sees no problem in this. There is nothing according to the laws that forbids building the whole place and not keep any green.

The public 1 – People from the neighborhood want the forest for recreational usage

Some people have used this area for morning walking's. Especially elderly in the neighborhood says that this forest is just enough for them to stroll in the morning. To go to the much larger city forest crossing a big road and also passing through these new building would be too long distance for them. Some also say that 8 story buildings that now are suggested will reduce their view and shadowing their backyards.

The public 2 – A teacher from the kindergarten is concerned where they will go with their children

Previously they could just open the gate to reach the forest where the children are familiar with huts they build. She also argued that the children can follow the yearly seasons in the forest and also that it is shadowing the children on hot summer days. If the forest is removed they have to cross a major road and walk into nature reserve where they are not allowed to build huts and have to walk a rather long way to find a nice spot to play. This will reduce their everyday visits to a forest.

The ecologist from Uppsala municipality claims that this forest is unique

It is not unique in the city since Uppsala have some other places with old pine trees but it is truly unique in this part of Sweden seen in a landscape perspective. Nowhere else are so many old pine trees found in a forest as here in Uppsala. Some trees are older than 180 years. How many houses older than 180 year would be torn down he/she asks? She/he also found a high number of species that are threatened in Sweden and that the municipality should take extra care of saving. It is not possible to compensate this place with another due to the old trees. They have also seen bird species and bats that only thrive in older forests indicating further ecological values. It is not possible to save single trees with red-listed species because if all other trees are removed the microclimate would change and reduce the values on single trees.

The city planner from Uppsala municipality

He/she have to follow the directives from the politicians to provide land for companies to build on in order to fulfill that they need houses. Thus, she/he has said that the building company can build on this place. She/he reasons that there are so many trees and actually two nature reserves just nearby this forest so there is no need to save this specific forest by any means. To provide yet another green area in Uppsala would only put a dead hand on the development of the city.

The landscape architect

She/he has been employed by the building company to design the environment between the houses. The landscape architecture is employed by the building company and has to listen to what they want but also need to listen to what the municipality demand on design as for availability of other people in the areas and children from the kindergarten. She/he suggests that it would be a possibility to save some single pine trees, specifically those trees that have red-listed species on them. Further, one compromise that would increase the costs for the company but leave more green space would

be to place the planned parking lots under the houses instead of using vast areas of the existing forest.

Road and water infrastructure planners

Two people from the municipality that actually are working as consultants for the municipality since they lately become municipal “companies” having their own economy. She/he representing the road planning says that there may be an increasing traffic load on the road nearby since the road already today is having a lot of traffic. But she/he sees no problem other than it would affect all the other people commuting with car to the city center or to Stockholm in the early mornings. She/he working with waters and traffic comments that the place is rather rocky so in order to place parking lots underground and water pipelines to there will be needed a lot of blasting’s (blowing and crossing the existing rocks). This can be very noisy under long time and potentially making it difficult to save trees since it will change the water flows under the forest.

Questions:

1. What are the main concerns for each stakeholder? What are their situations, worries, needs and expectations?
2. Are there any stakeholders that are not mentioned in the text and that could be important for the case, e.g. other local authorities, ecologists, ministry of environment, real estate agencies etc.?
3. Are there other interests that the stakeholders can claim outside this case study e.g. how do the stakeholders opinions apply the the larger scale of the whole city?
4. Can each stakeholder present three different solutions linked to economic, social and environmental aspects (use a table)?
5. Could all stakeholders agree on the optimal spatial strategic plan (based on the table in 4)?

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Urban green infrastructure and EEA. Download a pdf from EEA homepage. In this pdf there are further links to urban green infrastructure and glossary itself.

If you will look at further documents from this the Eriksberg in specific you can look at different documents in Swedish at this page:

<http://bygg.uppsala.se/samhallsbyggnad-utveckling/detaljplanering/avslutade-samrad-eller-granskning-2014/norby-3174/>

Case 13:

Sustainable food consumption – mitigating food waste

Author:

Magdalena Kraszewska Collegium Civitas (Poland)

Keywords: food waste, sustainable food consumption

Relation to Sustainable Development Goals (SDGs):



Strategy: data analysis, text analysis, group work

Time required for classwork (in minutes): 90 (120 in extended version).

Students preparation to the class (in minutes): none.

Aims:

After participating in this case students should gain a thorough understanding of complex connections between demographics, food loss and waste, food production, agriculture, environment, and well-being of societies

Learning outcomes:

After completing this case, students are able to:

- list possible dilemmas consumers encounter in their pursuit to reduce food waste;
- describe how the individual consumption choices influence three pillars of sustainability;
- indicate several solutions to food waste problem on the individual level;
- reflect on their personal consumption choices and make a commitment to change a particular consumption behaviour.

Case description

Food products come at a high price. Agriculture sector contributes vastly to the environmental pollution being responsible for 40% of world methane emission. It also consumes natural resources to a great extent, for instance being responsible for 70% of water consumption in the world (FAO 2011). This means that agricultural production has a high cost in terms of natural resources and burden for the environment. Consequently food products, in particular animal products, have a very high environmental impact.

Yet, according to Food and Agriculture Organization (2016) one third of global food production for human consumption is lost or wasted, which is an equivalent of 1.3 billion tons of edible food. Food waste that is food that was lost at different stages of food supply chain, destroyed in transport or thrown away by consumers. In the literature often a distinction is made between “food loss” which represents loss in production and food processing and actual “food waste” generated in distribution and consumption stage (Stancu, Haugaard & Lahteenmaki 2016). World food loss is responsible for 8% of greenhouse gas emissions. Moreover, nearly 30% of the world’s agricultural land is occupied to produce food that will never be consumed. Growing and producing this food also consumes approx. 20% of fresh water used in the world yearly.

In the developing countries the losses occur mainly in harvest and processing level, which can be seen as kind of inefficiency of the agri-food sector, whereas in highly developed countries the losses occur at the retailers and consumer level, which represent food not bought on time from the shops or discarded in the household. There are apparent differences in contribution to overall food waste by different regions of the world. In the developed regions such as Europe and North America approx. 100 kg of food is being wasted per capita yearly. In such regions as South-East Asia and sub-Saharan Africa food waste level is few times lower, in range of 5-10 kg per capita yearly.

Food loss represents not only cost in terms of natural resources and environmental impact, but also real financial cost for the economies. Food waste in U.S. equals to 1.3% of the country GDP, which is more than 200 billion USD (FAO 2016).

Food waste has a social and ethical aspect as well. More than 800 million people in the world suffer from hunger every year. Food that is lost and wasted could feed four times as much. High food wastage pattern in highly developed countries follows certain consumption patterns typical for developed markets. In such markets food is being purchased for multitude of reasons apart from satisfying hunger and being nutritious. It is often being bought for comfort, excitement, pleasure or even to show social status (Vitterso & Tangeland 2015). Consumers, having already fulfilled their purchase motives (other than actual consumption), seem to care less for actually eating the food that they bought. Williams *et al.* (2012) list several reasons for food wastage with preparing more food than needed and not preparing food on time as the most important ones.

The above data shows a great potential for changing food related behaviour of consumers from developed countries. Encouraging food related sustainable behaviour might have a major impact in overcoming environmental crisis.

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Food loss and waste facts. <http://www.fao.org/resources/infographics/infographics-details/en/c/317265/>.

Understanding hunger and malnutrition:

<http://www.fao.org/assets/infographics/FAO-Infographic-Nutrition-en.pdf>.

The world is thirsty because it is hungry. <http://www.fao.org/assets/infographics/FAO-Infographic-water-thirsty-en.pdf>.

Understanding water scarcity

<http://www.fao.org/assets/infographics/FAO-Infographic-water-scarcity-en.pdf>.

<http://www.fao.org/resources/infographics/infographics-details/en/c/218940/>.

<http://www.fao.org/assets/infographics/FAO-Infographic-water-food-production-en.pdf>.

<http://www.fao.org/resources/infographics/infographics-details/en/c/218877/>.

Procedure

Opening – 10 min (+30 minutes in the extended version)

In the opening part the class is provided with some facts that help to establish background to the issue of food waste – such as use of resources for agricultural production, demographic data of the world population, technological developments that allow for the increase in food production, and finally, the data about share of production that is being wasted. With this opening a ground for further work is laid, and the extent of the subject is also demarcated.

This may be executed in two manners depending on time availability: in the first, shorter version, the list of facts is provided by the teacher and briefly discussed with students. In the second option students study handouts from FAO (see Data Source section) and key facts are elicited together.

Studying the handouts can be done before the class as a homework or during the class. If the latter is chosen, the additional 30 minutes should be added up to the total time of the class.

Materials to be used:

- Facts to sketch the context of food waste.
- FAO handouts (optional).

Food waste mitigation solutions – 20 min

From this moment, class is divided into groups and further work is performed in groups.

- First, participants discuss in groups how the problem of a food waste could be reduced through everyday consumer choices. With this exercise, participants explore and summarise experience and knowledge that exists within the group.
- Then the entire class is presented with the list of possible consumer actions that mitigate the problem (prepared by the teacher) and groups reflect on that list based on their previous discussion.

The items from the list that were discussed in groups are acknowledged and those that were not discussed are briefly referred to by the teacher. Additional input from each group (which was not on the list) is added to the list. After this exercise, each group has similar knowledge on possible actions that can be taken to mitigate the food waste by consumers.

Materials to be used:

- List of sustainable consumer actions that mitigate the food waste solution.

Challenges of sustainable food consumption – 20 min

The third activity aims to investigate the motives and consequences of (un)sustainable consumer choices. The groups are given description of one of two kinds of consumer: Alexander who is a sustainability oriented person; and Anna who is a consumption oriented person. Consumer profiles are employed because discussing behaviour of others is easier for people and seem to increase the openness and frankness of the expressed opinions. Each group reads the profile and chooses a particular example of consumer behaviour that mitigates a problem of food waste on individual level. A group debates the costs and benefits of this action for Anna or Alexander. This way participants learn what may be the challenges for sustainable consumer choices

Materials to be used:

- Profile of sustainability oriented consumer – Alexander.
- Profile of consumption oriented consumer – Anna.
- Table of costs and benefits of sustainable behaviour for consumer.

Implications of consumer actions against food waste – 10 min

In this part, the implications of the particular behaviour analysed in part 3 for environment, society and economy are reviewed. Via this exercise, students realise how individual actions of consumers with respect to food affect the global problem of food waste.

Materials to be used:

- Table of costs and benefits of sustainable behaviour for three pillars of sustainability.

Results presentation – 15 min

Groups present their tables to the entire class. As groups were working with different solutions to food waste problem, the outcomes vary. Based on the results students try to identify the costs and benefits of sustainable choices for individual consumers, environment, society and economy.

Materials to be used: none.

Participants individual resolution – 10 min

In the final part, students are encouraged to select one of the food related sustainable consumer actions which they would like to apply in their lives for the next two weeks. They are also invited to share the explanation why this action, and if it is going to be difficult for them.

Materials to be used:

- Facts to sketch the context of food waste

The natural resources are scarce and seem to come to an end.

- With the increasing world population, by 2050 we are going to need three more planets to feed the population
- Due to the technological development we are capable of producing more food than ever.
- Despite this, there are major regions of the world where people suffer from malnutrition and hunger.
- Yet, 30% of the total food production is being wasted – thrown away in the production, distribution and consumption process.
- This indicate the urgent need for changes in the way we use our land and manage the food we produce.
- A major part of this enormous waste is a waste of food done by consumers after the food purchase. 25% of the food bought by consumers is thrown away

List of sustainable consumer choices that mitigate the food waste solution

1. BUY ONLY WHAT YOU NEED
 - a. Plan ahead
 - b. Make a shopping list
 - c. Be realistic about how much you need
 - d. Don't overbuy foods on sale
2. EAT WHAT YOU BUY
 - a. Use what spoils first
 - b. Don't prepare too much
 - c. Eat leftovers
 - d. Ask for a doggie bag
3. DON'T TOSS IT BEFORE IT SPOILS
 - a. Understand food expiration dates
 - b. Know the shelf-life limits
 - c. Use preservation techniques: freezing, canning, pickling or drying
4. KEEP FOOD FRESH

Learn how to store foods to keep them fresh as long as possible
5. PURCHASE SEASONAL PRODUCTS
 - a. Learn about the harvest season of different fruit and vegetables
 - b. Check the origin of fruits and vegetables
6. REDUCE MEAT CONSUMPTION
 - a. Check how much water is being used to produce animal products. Compare with plant products.
 - b. Decide to resign from meat one day a week. Which day would it be?

Consumer profile – Alexander

Read the profile of a consumer. Try to imagine this person. In group discussion try to define such characteristics as age, profession, family status, and interests. Try to identify values, norms, and lifestyles of this person.

This is Alexander. Alexander is very much concerned about the environment. He hates to waste resources. Before he buys anything, he first thinks whether he really needs to buy it. Maybe he can replace it with something that he already has? Or maybe someone among friends or family has it and would be willing to lend? When deciding for some major investments (such as treadmill for running at home, Alexander is an enthusiastic runner), he searches for used equipment. He likes the idea of giving a second life to products that have been already produced as he is aware that substantial natural resources have been already spent in the production process (water, electricity). He also likes to

spend less. Alexander purchases a piece of clothing when the ones he has are being worn out. He likes good quality clothes as he plans to use them for a long time. Alexander is a passionate cook. He rarely eats out-of-home as he finds it expensive and unsustainable. He usually prepares meals at home, often making bigger quantities than necessary to eat them later. This way he thinks he spares his own time and also energy used for cooking. The extra amount of food he simply freezes it. Alexander likes to eat meat but he is also concerned about animal welfare and the quality of meat he consumes. Struggling with himself for some time he came to a solution that he purchases meat from a local family farm. He prefers to pay twice as much for meat and eat the half of the quantity than to consume more poor quality meat from industry farming.

Alexander likes to invite friends over. He usually serves them some delicious meal that he has tried before and he knows people will like it. Sometimes he is a spontaneous cook – he looks at the ingredients he has at home and together with friends they come up with an idea for a meal. It is a lot of fun.

Consumer profile – Anna

Read the profile of a consumer. Try to imagine this person. In group discussion try to define such characteristics as age, profession, family status, and interests. Try to identify values, norms, and lifestyles of this person.

This is Anna. Anna is all about buying. She loves to add new items to a design of her home. She regularly remodels the interior. She loves purchasing new clothing items. She rarely wears anything longer than a year. Every season she changes her outfits. Anna doesn't like to be intimidated by possessions of others, thus she takes care to always look great, have a good watch, phone and pretty jewellery. If it is about food she tries to follow the trends. She likes fancy meals. She is an exquisite cook. When shopping for a one of her parties she often throws, she goes to one of the high quality grocery stores. She always buys the nicest fruits and vegetables – a look is as important as a taste. She likes to have plenty of food in the fridge. She would hate to miss some important ingredient or when being inquired by a guest – say she doesn't have something. She likes to offer to her guest plenty of choices, thus she prepares several courses. After the party there is a lot of food left but as it was on a table for a few hours it may not be stored anymore. Anna throws this away. On a daily basis Anna eats out of home. She is working too hard to cook herself during the week. She orders what is available in a diner or a restaurant and she picks from the course what she likes, leaving the rest.

Table of costs and benefits of sustainable behaviour for consumer

In a group, from the list of sustainable consumer choices that mitigate the food waste problem, select one item (for instance: one day a week I do not consume meat). Discuss this particular behaviour.

- What does it entail?
- How do you think, would it be easy / difficult for Anna / Alexander to accept this solution?

Think of possible costs and benefits of the chosen sustainable choice.

Fill in the table.

Selected consumer choice:	
Benefits of this sustainable choice for a consumer	Cost of this sustainable choice for a consumer

Table of costs and benefits of sustainable behaviour for three pillars of sustainability

Discuss the possible benefits and costs of this particular consumer choice according to the three pillars of sustainability – important for the consumers, for the environment and for the society.

	Environment	Society	Economy
Costs			
Benefits			

Assessment

Students active participation, team work in groups, presentation skills, acquiring, selection and evaluation of facts could be used.

Application

This case may be used to show how daily choices of individuals affect environment, in particular level of natural resources, but also economy and society.

It may also be used within the subject of climate change mitigation, waste reduction, environmental protection.

It can also be a great help while discussing possible resolutions to live in more sustainable manner.

PART III

WISE PARTNERS' EXPERIENCES

Chapter 6

The Agricultural University of Athens experience with the role-playing exercise

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Alexandros Koutsouris

Agricultural University of Athens (Greece)

In November 2016, the case of organic farming was suggested as a topic for discussion debate to the 7th semester students of the Department of Agricultural Economics and Rural Development in the Agricultural University of Athens. The exercise took place as a joint project of the compulsory courses *Natural Resource & Environmental Economics* and *Rural Environment Protection Policies*.

Students were informed about the role-playing exercise two weeks prior to its implementation. A concise introduction to organic farming peculiarities was presented to the students, while the audience was split into four different interest groups and background material was provided to those groups. In turn, the groups were asked to prepare arguments for or against the issue at stake and present them before the class. Students were also advised to work as a group, researching and discussing the case from their assigned perspective.

A two day debate took place, on the 8th and on the 10th of November 2016, in which 75 students participated (21 as consumers, 16 as producers, 21 as policy makers and 17 as taxpayers). The whole procedure was recorded and lasted approximately 6 hours (45 minutes each).

“Semi-structured session”

During the first day, representatives of producers and consumers presented their arguments and positions on the subject. Presentations were interspersed with comments, oppositions and clarification questions posed by the other three groups as well as the teacher, who clearly expressed his opinion on the case. It was a process which encouraged direct communication with questions and immediate responses, during which all groups spontaneously discussed and shared their points of view. The teacher’s role was active, challenging students, as well as providing scientific knowledge and guidance when needed.

“Structured session”

The prevailing procedure during the second day was different compared to the one followed the first day. The groups of policy makers and taxpayers had 15 minutes to present their perspectives and explain their position on two particular questions put forward at the end of the first day. After the presentations, groups responded to questions posed by students as individuals and not as a member of their group. Subsequently, each group had 15 minutes to prepare questions that they would like to ask the groups of policy makers and taxpayers. At this stage, the teacher also put his questions to the aforementioned groups. After a 10 minute break for group discussion, both teams replied to the questions, along with a summary of their stance. Finally, the teacher, attempting to reach a consensus, asked the four groups whether their initial position has been shifted during those meetings, and precisely whether a conceptual or practical convergence has been achieved. It should be stressed that the teacher’s role was neutral and he acted as a moderator, facilitating the discussion and keeping the time limits.

Remarks and conclusions:

- Given the size of the class, groups consisted of a large number of students. Although teachers encouraged the active participation of all members, many students were silent and were not engaged in the public discussion. Thus smaller groups of five or six students seem to be more effective, since all members would have the opportunity to speak and express their views, even the quieter /shy ones.
- Concerning the two different approaches used, students were more active and had a more passionate interaction with quick reactions, when no clear rules of the debate were given. On the other hand, a structured and guided procedure enabled students to prepare persuasive responses and improve time management skills. Thus both approaches are complementary and may benefit students’ competencies.
- In general, students seem to lack team spirit and conflict resolution skills. In the case of taxpayers group, students presented three different positions on the topic, since they couldn’t come to an agreement as a whole team. Moreover, at the end of the exercise, none of the groups was willing to reach a compromise. There is a need for improvement in students’ skills to work collaboratively, negotiate and finally accomplish a shared solution. Learning activities, such as role playing and debate may promote these social skills.
- Students’ feedback on role playing exercise was mixed. The majority of the class seemed to enjoy the procedure and felt that it was a useful learning experience. For instance, it was the first time for some students to speak in front of a large audience and defend their opinions. However, other individuals felt that it was a waste of time, since the exercise didn’t result in a solid knowledge transfer. It is a rather natural stance from people accustomed to be offered the “correct solution”, when they participate in an exercise aiming at broadening their perspectives and enhance their skills to discuss, analyse and think critically of a complex issue involving multiple aspects.

Chapter 7

Organic farming testing in Greece, Poland and Sweden

Alexandra Smyrniotopoulou, Alexandros Koutsouris

Agricultural University of Athens (Greece)

Jan Činčera Masaryk University, Brno (Czech Republic)

In the framework of WISE, pilots were run in Spring 2017 in three of the project countries on the topic “Organic farming & public support in the EU” to assess the changes of students’ attitudes towards the topic after having participated in a role playing debate as well as students’ satisfaction regarding the teaching strategy.

A total of 44 university students from the Department of Agricultural Economics & Rural Development of the Agricultural University of Athens in Greece, the Institute of Sociology of the Collegium Civitas in Poland and the School for Forest Management of the Swedish University of Agricultural Sciences in Sweden were involved in the pilots during which questionnaires have been administered before and after the case implementation.

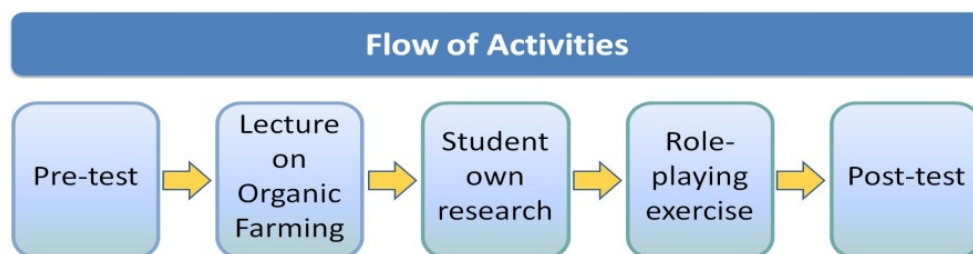


Figure 1. Pilot’s flow of activities

The steps of the organic farming pilots were as follows (see figure 1): firstly, a comprehensive lecture on the topic was addressed to the students in order to provide basic information on principles and financial support. Then, students were split into four interest groups (farmers, consumers, policy makers, taxpayers; see figure 2; Lesson Plan: *Organic Farming and Public Support in the EU – The Greek Case*); support material and further sources were provided to students. Finally, a role playing debate took place in the class comprising groups’ presentations and discussions among and within groups in seeking mutual agreement.

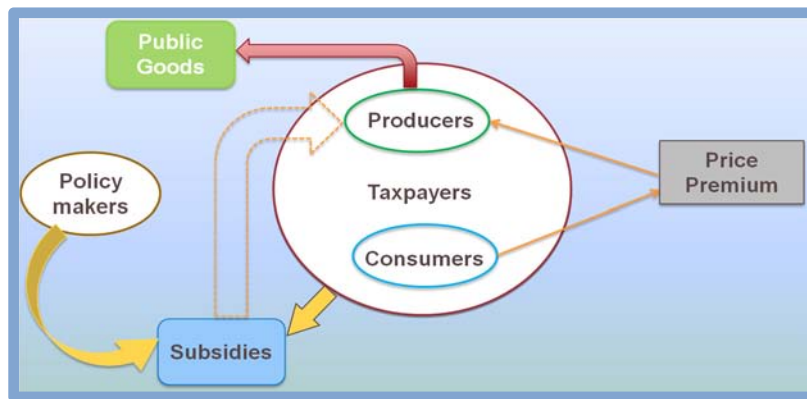


Figure 2. Stakeholders involved in Organic Farming public support in the EU

Results

Data analysis show that, after the pilot, students:

- a) exhibit more favourable beliefs and attitudes towards organic food and farming (figure 3 & table 1); and
- b) are satisfied from the exercise as compared to conventional instruction (table 2).

- Organic food is healthier than non-organic food.
- Overall, organic food tastes better than non-organic food.
- Organic food contains greater nutritional value than non-organic food.
- Organic producers offer an important service to society, since they protect the environment.
- Whenever I buy organic, I support environmental protection.
- The state/EU should support organic farming in my country.
- It would be good to have more organic farms in our country.

Figure 3. Beliefs and attitudes towards organic farming & food

	N	Mean pre-test	SD	Mean post-test	SD	Z	p
All	44	3.58	0.53	3.84	0.50	3.22	0.001
Women	27	3.49	0.50	3.88	0.45	3.44	<0.001
Men	17	3.73	0.56	3.77	0.58	0.34	0.72
GR	25	3.52	0.45	3.80	0.29	2.93	0.003
PL	9	3.87	0.60	4.36	0.52	2.52	0.01
SW	10	3.49	0.59	3.46	0.56	0.40	0.68

Table 1. Tests on beliefs and attitudes scale.

The scale has good reliability (Cronbach $\alpha=0.76$).

Significant differences (in red) are evident for all the respondents; women; and, Greek and Polish students. Therefore, it can be argued that the pilot has positively influenced students' attitudes towards organic farming and food.

	Mean GR	SD GR	Mean SW	SD SW	Mean PL	SD PL	H(2, N=44)	p
I have learnt a lot about organic farming through this exercise.	3.96	0.53	3.10	1.28	3.55	1.74		
The exercise was boring.	2.12	0.66	1.80	0.63	1.44	1.01	8.74	0.01
Cooperation with my mates was excellent during the exercise.	3.12	0.97	4.40	1.26	4.77	0.44	21.44	<0.0001
I didn't have always the opportunity to express my point of view within my group.	2.60	0.91	1.30	0.48	2.44	1.42	13.33	0.001
I have influenced the way we worked during the exercise.	3.44	0.82	4.20	0.91	3.66	0.70	6.34	0.04
The topic of organic farming was interesting for me.	4.16	0.47	3.60	1.26	4.66	0.50	7.05	0.02
Differences were clearly stated in the group.	3.56	0.71	2.70	1.05	4.22	0.66	12.26	0.002
All different opinions were satisfactorily explored within the group.	3.44	0.91	4.40	0.51	4.55	0.52	16.20	0.0003
I felt being manipulated by the teacher to accept his/her opinions about organic farming.	2.20	0.95	1.20	0.42	1.22	0.44	14.17	0.0008
The exercise was a waste of time.	1.72	0.61	1.80	0.91	1.22	0.44		
This way of carrying out the 'lesson' motivates me to do my best.	3.80	0.64	3.90	0.99	4.44	0.52		
This way of carrying out the 'lesson' does not differ from usual instruction.	2.12	0.52	2.50	1.08	2.55	1.50		
I had the chance to see different perspectives on the topic which had never crossed my mind before the exercise.	3.88	0.60	2.90	1.10	4.44	0.72	14.10	0.0009
The exercise helped me to develop new competence in dealing with sustainability issues.	3.64	0.81	2.90	1.10	4.44	0.72	12.41	0.002

Table 2. Students' satisfaction tests

Significant differences (Kruskal-Wallis test) are evident for most of the items (in bold)¹. Therefore, students enjoyed the pilot and indicate their preference for such learning settings as compared to conventional instruction. Additionally, when students work in groups they gain new insights from their peers, develop their interpersonal competences (including cooperation, communication, or decision-making) and have the opportunity to address issues of their own choice. In turn, learning may occur as a result of the students' action and reflection.

Conclusion

Given that new knowledge per se does not motivate students towards pro-environmental and responsible behaviour and does not develop students' competences, the WISE project proposes the case-based methodology to address Sustainability and Sustainable Development issues in higher

¹ However, concerning the low respondents' numbers, one should be very careful about any conclusion.

education. This approach is shown, according to our pilots in the framework of the WISE project, to be quite effective mainly in changing students' attitudes towards organic farming & food and public support as well as students' satisfaction along with some positive impact on the students' interpersonal competence.

Chapter 8

The experience of the University of Porto with Cases of Education for Sustainable Development

Clara Vasconcelos University of Porto (Portugal)

In the first semester of the school year 2017/2018, two cases were developed within the WISE project in the course of Education for Sustainability. This curricular unit integrates the syllabus of the Master Degree in Teaching of Biology and Geology, which prepares teachers to teach in middle and secondary schools in Portugal. Only nine students were enrolled. The cases were solved in groups of two, and one group consisted of three elements. Given that the number of participants in this data collection was very small, we opted for a qualitative evaluation based on the reflection established with the participants, and the observation of the students' progress during the resolution.

The selected cases were the case of *Castromil gold mines' geoethics dilemmas (Portugal)* and the case of *Territorial ecological limits to the lignite surface mining in North Bohemia (Czech Republic)*.

These were the choices since both cases implied a reflection on the values and attitudes in geoethics, a thematic explored in the curricular unit. Geoethics consists of research and reflection on the values that underpin appropriate behaviours and practices, wherever human activities interact with the Earth system. Geoethics deals with the ethical, social and cultural implications of geoscience education, research and practice, and with the social role and responsibility of geoscientists in conducting their activities (IAPG, <http://www.geoethics.org/>).

Regarding the case of *Castromil gold mines' geoethics dilemmas*, although it involved mining in Portugal, students did not show familiarity and domain of the subject. The exploration of documents and the inquiry activity helped students to develop competences for system thinking and collaborative work, thus creating awareness of geoethics dilemmas in mining and of the urgent need for sustainable mining in Europe. The students also discussed social and economic issues involved in mining, in particular those related with the contamination of water and soil (with elements harmful to public health) and the possibility of creation of jobs linked to mining.

Notwithstanding the debate that ensued, students were inclined to favour the arguments of the population, that preferred to prevent mining and gave priority to the safeguard of the environmental and human issues of the region.

Sometimes students verbalized statements unfavourable to mining companies, such as “they increase employment, but they also prevent family farming which provides for many families”. On the other hand, the need to exploit natural resources for social progress and an increase in the quality of life was also addressed.

In relation to the case of *Territorial ecological limits to the lignite surface mining in North Bohemia*, since it was a novelty (especially because it is in a different country), students understood it as a general case, that could very well affect, also, the Portuguese. The inclusion of the Schwartz's theory of basic human values was innovative and led to a reflection on the social, human, cultural and ethical aspects that stand beyond the inevitable economic and environmental issues. Students considered the activity to be time-consuming and ambiguous, but still important and capable of highlighting aspects often camouflaged by financial and political interests.

The first activity, which consisted on the identification/quotes of the actors involved in the process, was rather difficult, especially due to the lack of knowledge regarding the actors involved and also because of some lack of objectivity in some statements, which is typical in political speeches, news or even in rallies.

In conclusion, both cases addressed the three pillars of sustainable development, building up from situations associated with mining. A change of attitudes and values regarding sustainable development was promoted in an interdisciplinary way and by resorting to crosscutting themes.

Chapter 9

The experience with testing the cases at the Masaryk University

Jan Činčera, Tomáš Chabada Masaryk University, Brno (Czech Republic)

Tropical forest: an analysis of social and economic reasons of environmental degradation

The case was tested with a mixed group of university and secondary school students in March 2017. The university students were asked to fill a short pre- and post-test focused on the analysis of the development of their conceptual understanding of the issue of deforestation and its systemic complexity.

On the basis of this evaluation, we may assume the case developed students' systemic competence, particularly in:

1. awareness of the issue stakeholders and understanding the role they play ("Many groups with different preferences, background...", "also local timber industry play its role");
2. awareness of underlying social and ecological mechanisms of deforestation ("burning (...) and degradation of soil (...)", "the reason is not only desire for new plantations of palm trees but also planting soya beans (...)", "government plans to build new infrastructure for establishing security of local citizens (...)", "timber companies must have gained and been compatible in global market").

Students also expressed other personal benefits connected with the case, ("I am aware of more stakeholders than I could imagine before (...) It is good to look at the issue from the point of view of groups we may not agree with", "Thinking about my role as a consumer, linking with everyday life. Is it possible to develop a relationship on the basis of imagining the forest?")

Generally, students appreciated the case made the case-specific, showed main structure elements, and explained the role of its stakeholders. They also reflected the case was a strong and durable experience.

They also suggested a few changes in the case description, that were largely reflected in its final improvement.



Figure 1. Testing the Forest case in Kapraluv mlyn

Photo: Tereza Modrakova, Masaryk University.

Territorial ecological limits to the lignite surface mining in North Bohemia

We have tested the case *Territorial ecological limits to the lignite surface mining in North Bohemia* during the bachelor course about environmental conflicts in Czech Republic in order to receive the feedback and improve the structure of the case. Since only 5 students attended the lecture, students did not form the groups, but participated on the exercises individually.

After short introductory activity and brief description of the actors involved in the conflict students were asked to match the quotes with the actors. Although students worked individually, they were actually quite successful in this exercise. We suppose it is because Czech students are familiar with the actors involved in the case, such as politicians and NGOs.

For the second exercise we had chosen only the most significant actors of the case. We participated in this activity along with students to increase the number of actors involved. Students were surprised that even actors who are in contradiction could rely on similar values. Students reflected the structure of the case and gave us valuable recommendations how to improve it.

We have adjusted the description of the actors according to their feedback and also the instructions, which they did not find clear enough.

PART IV

Integrating education for sustainable development at the program level

Chapter 10: Lessons learned from a workshop series at Swedish University of Agricultural Sciences

Peter Aspengren Swedish University of Agricultural Sciences – SLU (Sweden)

The Swedish University of Agricultural Science (SLU) is a university with a focus of life sciences with three main campuses, in Alnarp, Umeå and Uppsala. “SLU has a unique profile in Sweden, with responsibilities that are important to society. We create and integrate knowledge about production, the environment, and animal and human health and quality of life, combining scientific excellence with competence in application-oriented issues. SLU's sectoral role, which initially only concerned the agricultural industries, has in recent years broadened and developed. SLU works continuously to develop conditions for innovative, excellent research and research based education. The focus is on areas of strategic importance to SLU's mission statement and funding agreement targets for education, with the goal that SLU be internationally renowned and provide society with relevant knowledge. During the period 2017–2020, SLU intends to focus on four university-wide research domains: Bio-based materials, Sustainable and secure food supply, Economics and The significance of experiencing nature and of companion animals on human health and well-being” (SLU strategy 2017-2022, <https://www.slu.se/globalassets/mw/org-styr/styr-dok/vision-strategi/slus-strategi-2017-2020-160616-en.pdf>).

Education at SLU

SLU offers several courses that are unique in Sweden, for example, in agriculture, forestry, landscape architecture and veterinary medicine. A large percentage of our students study a degree programme leading to a professional qualification. SLU also offers a number of Master's programmes in our strong areas of research.

The interpretation of the mission statement of SLU “SLU develops the **understanding and sustainable use and management of biological natural resources**. This is achieved by research, education and environmental monitoring and assessment, in collaboration with the surrounding community” (<https://internt.slu.se/en/organisation--styrning/mission-vision-and-values/>) has developed to an expanded definition of sustainability. In this new definition the core values of ecological or environmental sustainability have been accompanied by social and economic sustainability. The goals

for sustainability and sustainable development that are stated in the United Nations Sustainable Development Goals (<https://sustainabledevelopment.un.org/?menu=1300>) can be seen as guidelines for SLU's work directly or indirectly.



Image 1. SLUs payoff (or slogan)

The Educational Development Unit

The Educational Development Unit (EPU) at SLU is a strategic resource and knowledgeable support source within educational services and IT education at SLU. The unit is responsible for providing higher education competency courses and offer beginner and more specialized courses that build upon the knowledge provided in the beginner course. Additionally, EPU provides educational evaluators to serve on docent lecture committees.

In collaboration with departments, institutions, and teaching staff, EPU supports university-level education development at SLU. EPU provides different forms of support to educators such as:

- Teacher training courses
- Seminars
- Workshops
- Educational consulting

A workshop series concerning Education for Sustainable Development for program coordinators and course leaders was planned and is performed by EPU.

Environmental Certification

In July 2016 SLU all university activities was environmentally certified according to the international standard 14001 for an environmental management system (<https://www.iso.org/standard/31807.html>). During the process the decision was made to not only work with the environmental certification considering buildings, transportation, printers and paper but also try to make sure that or education, courses and programmes were carried out with environmental issues considered. Just like the widening of the notion of environment and natural resources in SLU's mission statement the idea was to make sure that the progression of awareness of sustainable development in the programs were supported by teaching for sustainability in the courses.

By a decision by the vice-chancellor an environmental goal that all the program study directors and 75% of the course coordinators should have taken a course in Education for Sustainable Development (ESD) before the end of 2017. The motivation in the decision was “In SLUs education today there are many courses and programs related to sustainable development. The purpose of this decision is to ensure that all programs raises the question about sustainable development in a systematic way and doing so take the full width of the concept including social, economic and environmental aspects into account”.

It was also decided that the mandatory course evaluations after all courses should contain a question concerning sustainable development. The task to revise the exiting evaluation questions have been given by the Board of Education to the student union (SLUSS) with the support of the Educational development unit.

The workshops

The Educational Development Unit was given the responsibility to design and facilitate the workshops. In November 2015 and in February 2016 the program study directors (co-ordinators) (PSR) undertook the course during a two day meeting. Between January 2016 and November 2017 the course co-ordinators has been offered 30 workshops in Swedish and 11 workshops in English. In October 2017 approx. 35% of the course coordinators have undertaken the workshop.

The learning outcomes for the PSR and the course-coordinators are similar, the main difference is that the PSRs focus on the progression of sustainable development content, methods and skills on a program level while the course co-ordinators are responsible for the learning outcomes, methods and skills in their own course.

Intended Learning Outcomes

After completion of the workshop the participants are expected to be able to:

- Define sustainable development in an educational context;
- Define Education for Sustainable Development (ESD);
- Examine, define and develop existing and possible elements of sustainable development in their own course;
- Discuss and assess methods to implement ESD in their own course;
- Suggest possible pedagogical methods that strengthens ESD.

The course-coordinators are given an assignment before they come to the one-day workshop. In the assignment they are asked to read the UNESCO definition of Education for Sustainable Development (ESD) one of many definitions. They are also asked to read: Rockström, J. *et al.* 2009: *A Safe Operating Space for Humanity*, Steffen *et al.* 2015: *Planetary Boundaries: Guiding human development on a changing planet* and Raworth, K. 2012: *A Safe and Just Space for Humanity* to get perspectives of the global reality we are living within. The course leaders also examine their courses to find existing and possible elements of sustainable development topics, dilemmas and real world contexts on a local and global scale. They also look for which generic competencies that their course is suitable

to promote as a part of a program, almost all courses are parts of programs. The last assignment is to map the learning activities (methods, strategies) they are using in their course.

During the workshop the definitions and experiences of sustainable development and education for sustainable development are discussed with the papers mentioned above as a vivid context. All participants present their findings to the rest of the group.

It is important that the workshop is seen as taking the experience of the participants very seriously to avoid the feeling that what is taught is a dictation going top down.

The workshop has led to a widened use, with the help of examples from other course leaders, of methods suitable for Education for Sustainable Development, like different approaches to case studies.

The discussions about generic competencies in courses and programmes has led to work to secure the progression in courses and programs not only concerning the knowledge and skills learning outcomes but also considering the progression of generic competencies. When the existing programmes are revised and new programs are planned this is an important task.

Lessons learned

The starting point at SLU where mainly Natural Science courses and programs are taught is a very strong link to environmental education and the environmental aspects of sustainable development. Consequently that aspect of sustainability is taken for granted and the topics and learning activities presented at the workshops are almost always of high quality. The mission of the workshop is to add the aspects of social and economic sustainability. We have learned that the terms sustainable development and sustainability can be used in most teaching contexts with differences in how and how much.

The quantity of subject matter as an obstacle to change ways of teaching because of lack of time is often discussed as well as if we can and should focus on activities with students that aim toward, generic competences – do we really need this or is it happening in the normal process of going through a program?

It is important to state that sustainability as a complex problem do not appear in all courses and programmes to the same extent. Also that the progression of sustainability knowledge and the generic skills connected to sustainability are found on program level.

The discussions during the workshops also challenge the idea of keeping within strict subject borders in contrast to involving the students in interdisciplinary projects that involve other subjects or even other courses. The strict organization of our courses and our division in faculties and departments are obstacles.

The recommendations that the workshops communicate with the participants as goal for the changes of their courses are the following:

- Values and ethical issues should take more space in our courses and programs;
- More complex problems (including all three perspectives from sustainability);
- More interdisciplinary activities and work with themes involving people with different expertise (students and teachers);

- More activating education strongly linked to real problems and dilemmas.

The degree to which this is possible and desirable differs between courses and programs but all education at SLU should contain elements of the widened sustainability concept and should use material, methods and student involvement based on the ideas of Education for Sustainable Development.

Some important practical tips in the shape of questions is discussed and serves as a guideline to how and at what speed changes can be made:

Too what degree / How much?

When changes are made it is important to consider if we change the whole programs or if we start by changing some teaching modules.

Add and remove?

When new methods and perspectives that enhance ESD are introduced it is important to take the need to focus on new perspectives into consideration. In that process it may be necessary to exclude methods and subject matter that traditionally has been in the courses and programs. This is often a painful process that may lead to questioning of the quality of the education. In ideal cases the knowledge and skills needed can be provided by the use of new methods. In some cases the discussion about what really is the focus of the course or program will lead to changes in the programs and to new programs that will replace old ones.

Tradition and expectations?

What are the students' expectations of university education and what do the teachers see as their role? How do we handle the transition from mainly declarative knowledge to a higher degree of procedural knowledge? In the process new roles of both the teacher and the student emerges.

The power, possibilities and resources of the program study directors and teachers.

The institution of higher education, from the senior leadership downwards need to give staff support, resources and infrastructure that enable them to make changes.

What? How? How do we involve the students?

These three questions that can be used to define goals and plan education. They are equally important. "What do we teach?" is a question about content. "How we teach?" is a question about methods. "How do we involve our students?" is a question about teacher/student roles, methods of teaching and planning.

Work in progress

The examples that the participants give about modules and topics in the workshops consists of a number of case oriented methods. Based on the ideas of Case methodology and Problem Based Learning and using the environmental, social and economic perspectives of sustainability the teachers plan and execute modules, projects and assignments linked to dilemmas of local, national and global significance. The cases in this handbook will be possible to use in many of the courses and also inspire teachers to adapt them to their course and also to produce their own.

On program, bachelor and master, level revision is taking place where work is being done to ensure the progression of subject knowledge and generic skills through the program. The “red thread” in the course is developed and enhanced. If you want the students to have the systems thinking competency when leaving the program you have to make sure that the competency is defined, trained, used and assessed.

Beside the normal revision work around the planning of programs there are projects on bachelor and masters level where the progression of generic competencies is reviewed. Two new masters programs are being planned with the support of the Educational Development Unit.

The challenge for SLU is to make sure that the individual teacher is aware of the position of the module or lecture that is taught in the course and that the course is a part of the program.

The way forward

The process has just started at SLU and the success of the work is strongly depending on support from leaders on all levels. The university need to find a way to create incentives for teachers and coordinators to invest time and effort in improve teaching skills and create efficient methods to plan and improve programs and courses so that sustainable development is clearly visible in the education we offer.

In doing so we need to continue exploring Education for Sustainable Development and define how SLU courses and programs differ from courses at other universities. We need to keep the discussion of what we teach, how we teach and how we include our students active in an iterative process.

In doing so the involvement of and cooperation with the students is crucial. The students need activating and relevant education that give knowledge, skills and values needed to be professionals, researchers, decision makers and citizens building a sustainable future. They also need to be given the chance to take more active part of the planning processes on university, program and course level.

Glossary

Agricultural development

The process that creates the conditions for the fulfillment of agricultural potential. Those conditions include the accumulation of knowledge and availability of technology as well as the allocation of inputs and output.

Reference

OECD Development Centre Working Paper No. 248. <http://www.oecd.org/dev/36309029.pdf>.

Biological diversity (biodiversity)

This means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Reference

Convention on Biological Diversity (1992) Convention on Biological Diversity. Montreal: Secretariat of the Convention on Biological Diversity

Case-based methodology

Case based teaching methodology is a discrete approach to interactive group- based learning with the added advantage to evoke interest in students by placing them in a dilemma taken from a real-life example and motivates them for self-directed learning. A diversity of strategies can be used to develop this methodology that implies solving new problems based on the solutions of similar past problems.

References

Bhardwaj, P., Bhardwaj, N. Mahdi, F. Srivastava J.P. & Gupta, U. (2015) Integrated teaching program using case-based learning. *International Journal of Applied and Basic Medical Research* 5 (4), pp. 24-28

Harrington, H. & Garrison, J. (1992) Cases as shared inquiry: a dialogical model of teacher preparation. *American Educational Research Journal*, 29 (4), pp. 715-735.

Conservation

An action of conserving something and in environmental sciences usually means conservation of biodiversity. There has been gradual change from biological focus in conservation to an interdisciplinary one. One of the recent proposed definitions describes it as “(human) actions that are intended to establish, improve or maintain good relations with nature’.

Reference

Sandbrook, C. (2015) What is conservation? *Oryx*, 49, pp. 565-566.

Conservation conflict

Situations that occur when two or more parties with strongly held opinions clash over conservation objectives and when one party is perceived to assert its interests at the expense of another.

Reference

Redpath S.M. *et al.* (2013) Understanding and managing conservation conflicts. *Trends in Ecology and Evolution*, 28, pp. 100-109.

Crossdisciplinarity

The abolishment of the artificial divisions between, on the one hand, the environment and, on the other hand, economy and society in favour of the co-operation (in whatever form) of several disciplines. Within such a framework, education and research cross traditional disciplinary boundaries, i.e. they become “cross-disciplinary”. Typically, collaboration that spans disciplines is classified across the continuum: multidisciplinary, interdisciplinarity, and transdisciplinarity.

References

Jeffrey, P. (2003). Smoothing the waters: observations on the process of cross-disciplinary research collaboration. *Social Studies of Science*, 33 (4), pp. 539-562.

Lawrence, R.J. & Després, C. (2004). Futures of transdisciplinarity. *Futures*, 36 (4), pp. 397-405.

Moore, J. (2005). Barriers and pathways to creating sustainability education programs: Policy, rhetoric and reality. *Environmental Education Research*, 11 (5), pp. 537-555.

Cultural heritage

It's the legacy, tangible or intangible, that has its own values for the society, whether they are scientific, historic, artistic, or others, and should be cared and preserved (Falser, 2015). It is constituted by tangible cultural heritage, like monuments, sculpture, paintings, manuscripts, etc. (UNESCO, 1972)., and intangible cultural heritage, such as rituals, oral traditions and expressions, performing arts, among others (UNESCO, 2003).

References

Falser, M. (2015) Cultural Heritage as Civilizing Mission: Methodological Considerations. In: Falser M. (ed.), *Cultural Heritage as Civilizing Mission – From Decay to Recovery* (pp. 1-32). Switzerland: Springer.

UNESCO (1972) Convention Concerning the Protection of the World Cultural and Natural Heritage. 17th General Conference of the United Nations Educational, Scientific and Cultural Organization. Paris.

UNESCO (2003). Convention for the Safeguarding of the Intangible Cultural Heritage. 32nd General Conference of the United Nations Educational, Scientific and Cultural Organization. Paris.

Dead wood

Parts of a tree or branch which are dead. Many different types of dead wood occurs in forests (e.g. standing, downed, coarse and fine, hard and soft etc.). Dead wood is considered as very important structural component of forest ecosystems and biodiversity indicator since it supports many different specialised, often threatened species.

Reference

Jonsson B.G., Kruys N. & Ranius T. (2005) Ecology of species living on dead wood – Lessons for dead wood management. *Silva Fennica*, 39, pp. 289-309.

Ecosystem services

Direct or indirect benefits that people get from ecosystems. Can be divided in four categories:

1. Provisioning services – products directly obtained from ecosystems, such as food, water, biochemicals, natural medicines, among others;
2. Regulating services – the regulation of ecosystem processes brings benefits related to air and water quality, climate, diseases and natural hazards, for example;
3. Cultural services – nonmaterial benefits such as recreation, ecotourism, aesthetic values, etc.;
4. Supporting services – these are the basis of the remaining services, some examples are nutrient cycling, soil formation and photosynthesis. They are not used directly by people.

Reference

Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-Being: Synthesis*. Washington: Island Press.

Forest landscape restoration

The long-term process of regaining ecological functionality and enhancing human well-being across deforested or degraded forest landscapes. It is about “forests” because it involves increasing the number and/ or health of trees in an area. It is about “landscapes” because it involves entire watersheds, jurisdictions, or even countries in which many land uses interact. It is about “restoration” because it involves bringing back the biological productivity of an area in order to achieve any number of benefits for people and the planet. It is “long-term” because it requires a multi-year vision of the ecological functions and benefits to human well-being that restoration will produce although tangible deliverables such as jobs, income and carbon sequestration begin to flow right away.

Reference

IUCN and WRI (2014). *A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level*. Working Paper (Road-test edition). Gland: IUCN.

Geoethics

“Geoethics consists of research and reflection on the values which underpin appropriate behaviors and practices, wherever human activities interact with the Earth system. Geoethics deals with the ethical, social and cultural implications of geoscience education, research and practice, and with the social role and responsibility of geoscientists in conducting their activities”.

Reference

International Association for Promoting Geoethics (IAPG) (2017) *International Association for Promoting Geoethics – Homepage*. <http://www.geoethics.org/>.

Green Infrastructure

The “ingredients” for solving urban and climatic challenges by building with nature. The main components of this approach include stormwater management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, as well as the more anthropocentric functions such as increased quality of life through recreation and providing shade and shelter in and around towns and cities.

References

Nielsen, A.B., Hedblom, M., Stahl Olafsson, A. & Wiström, B. (2017) Spatial configurations of urban forest in Denmark and Sweden – patterns for green infrastructure planning. *Urban Ecosystems*, 2. DOI: 10.1007/s11252-016-0600-y’.

Urban green health – a review of evidence (2016) http://www.euro.who.int/__data/assets/pdf_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf?ua=1.

Innovation

An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations.

Reference

Organization of Economic Cooperation and Development & Eurostat (2005) *Oslo manual: Guidelines for collecting and interpreting innovation data*, 3rd edition, Paris: OECD.

Inquiry

It’s a student-centered approach where the main objective is the development of scientific knowledge and the understanding of the scientific method. It mirrors the activities of the scientist allowing students to understand how the new knowledge is constructed and to develop scientific reasoning.

Reference

Flick, L. & Lederman, N. (2006). Introduction. In: Flick L. & Lederman N. (eds.), *Scientific Inquiry and Nature of Science* (pp. ix-xviii). Netherlands: Springer.

Interdisciplinarity

Means moving to joint problem formulation and hypothesis development, analysis and interpretation of data, and application; it provides for a 'mixing' of disciplines, looks for systemic outcomes and can lead to new questions and methodologies.

References

Jeffrey, P. (2003). Smoothing the waters: observations on the process of cross-disciplinary research collaboration. *Social Studies of Science*, 33 (4), pp. 539-562.

Lawrence, R.J. & Després, C. (2004). Futures of transdisciplinarity. *Futures*, 36 (4), pp. 397-405.

Moore, J. (2005). Barriers and pathways to creating sustainability education programs: Policy, rhetoric and reality. *Environmental Education Research*, 11 (5), pp. 537-555.

Lignite surface mining

It's a type of mining in which soil and rock overlying the lignite (brown coal) are removed. It usually affects large areas of land and the necessity of having to relocate whole local communities (Friese, Hupfer, Schultze 1998). It also results in several environmental problems, such as the mass transfer of billions of tons of soil and devastation of nature (Badera, Kocoń 2014).

References

- Badera, J. & Kocoń, P. (2014) Local community opinions regarding the socio-environmental aspects of lignite surface mining: experiences from central Poland. *Energy Policy*, 66: pp. 507-516.
- Friese, K., Hupfer, M. & Schultze, M. (1998) Chemical characteristics of water and sediment in acid mining lakes of the Lusatian lignite district. p. 25-45. In: *Acidic Mining Lakes*. Berlin Heidelberg: Springer.

Local referenda

Binding local referenda are not only instruments of decisionmaking but also modern methods of protective democracy at the local level (oriented towards the survival and future of a municipality, and local identity). The local application of the referendum constitutes a rational deepening of local democracy.

Reference

- Buček, J., & Smith, B. (2000) New approaches to local democracy: Direct democracy, participation and the 'third sector'. *Environment and Planning C: Government and Policy*, 18 (1), pp. 3-16.

Mining exploration

The search for metallic and nonmetallic ores or coal through direct and indirect techniques. The main objective is the definition of the extent and value of ore as well as the assessment of the viability for exploration, including economic feasibility. In mining proper the first step is to access the ore and then extraction and recovery of the mineral of interest.

Reference

- Hartman, H.L. (1992). Elements of Mining. In: Hartman, H.L. (ed.), *SME Mining Engineering Handbook* (2nd Ed.) (pp. 24-38). Colorado: Society for Mining, Metallurgy and Exploration Inc.

Multidisciplinarity

Entails the bringing together of independent disciplines to bear on a common problem; each discipline works in a self-contained manner.

References

- Jeffrey, P. (2003). Smoothing the waters: observations on the process of cross-disciplinary research collaboration. *Social Studies of Science*, 33 (4), pp. 539-562.
- Lawrence, R.J. & Després, C. (2004). Futures of transdisciplinarity. *Futures*, 36 (4), pp. 397-405.
- Moore, J. (2005). Barriers and pathways to creating sustainability education programs: Policy, rhetoric and reality. *Environmental Education Research*, 11 (5), pp. 537-555.

Natural resources

Resources that occur naturally, without or largely without human intervention, and that can be used for the benefit of the humankind (Young, 1982). Some examples are minerals, water, coal, among others.

Reference

Young, O. R. (1982). *Resource regimes: Natural resources and social institutions*. California: University of California Press.

Public goods

Public goods are those goods that have two distinctive aspects:

1. non-excludability (no one can be excluded from consuming the public good or benefiting from it)
2. non-rivalry (the consumption of the public good by one person does not reduce the quantity available to other persons).

Reference

Batina, R.G. & Ihori, T. (2005). *Public Goods Theories and Evidence*. Berlin: Springer.

Rural tourism

Tourist activities in rural places and rural settings. It is a multi-faceted concept that can include a wide range of activities, such as farm-based holidays, ecotourism, ethnic tourism, sport and health tourism, among others.

Reference

Lane, B. (1994) What is rural tourism? *Journal of Sustainable Tourism*, 2 (1-2), pp. 7-21.

Schwartz's theory of universal values

A systematic theory of the content and organization of the value systems of individuals. This theory identifies what may be a comprehensive set of 10 different types of values recognized across cultures. It also specifies the conflicts and congruities among these values that give rise to a coherent circular structure of relations among them.

References

Schwartz, Sh.H. et al. (2001) Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology*, 32 (5), pp. 519-542.

Schwartz, Sh.H. (1992) Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology*, 25, pp. 1-65.

Simulation games

Educational activities based on simulation of a real-world issue. Students usually play a role allowing them to see the issue from perspective that is different from their own. Simulation games contain aspects of case studies (i.e., they are based on real issues), simulation (i.e. the reality is simulated to allow students being immersed into the scenario), and games (i.e., there are "gaming mechanisms", like goals and rules). There are more typologies of simulation games but usually we differ-

entiate between tactical-decision-making games, where players solve a complex problem and experience the consequences of their decisions, and social system games, based mainly on interaction among players in the environment simulating a social system.

References

- Ellington, H., Gordon, M. & Folie, J. (1998). *Using Games & Simulations in the Classroom*. London: Kogan Page.
Gredler, M. (1994). *Designing and Evaluating Games and Simulations. A Process Approach*. London: Kogan Page.

Social Exclusion

Multidimensional and reflects a combination of inter-related factors that may be manifest at a community level (geographic or social community). It could be defined through 3 main characteristics: (1) is relative to the norms and expectations of society at a particular point in time, (2) is caused by an act of some individual, group or institution (agency of a person that excludes themselves by choice or is excluded by the decisions of other people, organisations or institutions), (3) is not a result simply of current circumstances (e.g., unemployment), but also requires that the person's future prospects are limited Atkinson (1998: 13-14).

References

- Atkinson, A. (1998) *Social exclusion, poverty and unemployment*. In: Atkinson A. & Hills J. (eds.) *Exclusion employment and opportunity* (CASE Paper No. 4). London: Centre for the Analysis of Social Exclusion, London School of Economics.
Atkinson, A.B., Marlier, E. & Nolan, B. (2004) Indicators and Targets for Social Inclusion in the European Union, *Journal of Common Market Studies*, 42 (1), pp. 47-75. DOI: 10.1111/j.0021-9886.2004.00476.x.
Hayes, A., Gray, M. & Edwards, B. (2008) *Social inclusion: origins, concepts and key themes*. Canberra: Commonwealth of Australia. <http://pandora.nla.gov.au/pan/142909/20130920-1300/www.socialinclusion.gov.au/sites/default/files/publications/pdf/si-origins-concepts-themes.pdf>.

Social Inclusion

The process of improving the terms for individuals and groups to take part in society by improving the ability, opportunity, and dignity of those disadvantaged on the basis of their identity to take part in society. Social inclusion (or social integration) – as a twinned concept with social exclusion – is one of the Sustainable Development Goals (SDGs), which means an effort to help countries promote inclusive growth.

Reference

- World Bank. <https://www.worldbank.org/en/topic/socialdevelopment/brief/social-inclusion>.

Stakeholders

Stakeholders are by definition people or organisations that have a “stake” in a matter, by being either involved in or influenced by it. In the rural development policy context, this covers all the groups concerned with policy delivery from the policy-makers to (the potential) project beneficiaries on the ground.

Reference

- European Network for Rural Development (2015). Improving Stakeholders Involvement. *EU Rural Review*, 19.

Sustainable Consumption and Production (SCP)

As defined by the Oslo Symposium in 1994, sustainable consumption and production (SCP) is about “The use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations”.

“It’s a consumer-driven, holistic concept that refers to the integrated implementation of sustainable patterns of food consumption and production, respecting the carrying capacities of natural ecosystems. It requires consideration of all the aspects and phases in the life of a product, from production to consumption, and includes such issues as sustainable lifestyles, sustainable diets, food losses and food waste management and recycling, voluntary sustainability standards, and environmentally friendly behaviours and methods that minimize adverse impacts on the environment and do not jeopardize the needs of present and future generations.”

Reference

Sustainable Food Systems Program, FAO – UNEP. http://www.fao.org/fileadmin/templates/ags/docs/SFCP/English_SustainableFoodSystems.pdf.

Sustainable Development

Development that provides economic, social and environmental benefits in the long term having regard to the needs of living and future generations. Defined by the World Commission on Environment and Development in 1987 as: development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Reference

Dasgupta, P. (2007) The idea of sustainable development. *Sustainability Science*, 2 (1), pp. 5-11. doi:10.1007/s11625-007-0024-y.

Sustainable development knowledge platform: <https://sustainabledevelopment.un.org/>.

Brundtland Commission (1987) *Report of the World Commission on Environment and Development*. New York: United Nations.

Sustainable forest management (SFM) also

Sustainable Forestry

“The stewardship and use of forest lands in a way and at a rate that maintains their productivity, biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil now and in the future relevant ecological, economic and social functions at local, national and global levels and that does not cause damage to other ecosystems”.

Reference

https://ec.europa.eu/growth/sectors/raw-materials/industries/forest-based/sustainable-forest-management_en.

Sustainable use

This means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Reference

Convention on Biological Diversity (1992) 1 Article 2. <https://www.cbd.int/doc/legal/cbd-en.pdf>.

Territorial ecological limits

The established boundaries for individual mines, may not be transgressed by open-pit mines and overburden disposal operations. These limits were gradually adopted by the government of the Czech Republic, which applied to individual areas of sub-bituminous coal basins. The aim of assignment of these limits was emphasizing the landscape and environment protection and enabling long-time planning in localities above the coal seams.

Reference

Sivek, M. *et al.* (2012) Factors influencing the selection of the past and future strategies for electricity generation in the Czech Republic. *Energy Policy*, 48, pp. 650-656.

Transdisciplinarity

Denotes the development of an overarching paradigm that encompasses a number of disciplines and (latterly) stakeholder groups; it implies different roles of stakeholders and brings together divergent worldviews (including the transgression of disciplinary boundaries) thus creating new boundaries for exploration and understanding.

References

Jeffrey, P. (2003). Smoothing the waters: observations on the process of cross-disciplinary research collaboration. *Social Studies of Science*, 33 (4), pp. 539-562.

Lawrence, R.J. & Després, C. (2004). Futures of transdisciplinarity. *Futures*, 36 (4), pp. 397-405.

Moore, J. (2005). Barriers and pathways to creating sustainability education programs: Policy, rhetoric and reality. *Environmental Education Research*, 11 (5), pp. 537-555.

Urban Densification

Densification is a term used by planners, designers, developers and theorists to describe the increasing density of people living in urban areas. There are number of methods by which urban density can be measured but here we focus on:

- 1) Residential density: Number of dwelling units in a given area and
- 2) Population density: Number of people in a given area.

Reference

Berghauer Pont, M.Y. & Haupt, P. (2010) *Spacematrix: Space, Density and Urban Form*. Rotterdam: NAI Publishers

Urban sprawl

Urban sprawl describes the expansion of human populations away from central urban areas into low-density, monofunctional and usually car-dependent communities, in a process called suburbanization. In addition to describing a particular form of urbanization, the term also relates to the social and environmental consequences associated with this development. In Continental Europe the term "peri-urbanisation" is often used to denote similar dynamics and phenomena.

Reference

James, P., Holden, M., Lewin, M., Neilson, L., Oakley, C., Truter, A. & Wilmoth, D. (2013) Managing Metropolises by Negotiating Mega-Urban Growth. In: Mieg H., Töpfer K. (eds.) *Institutional and Social Innovation for Sustainable Urban Development*. Abingdon: Routledge.

Urbanization (urbanisation)

The term refers to the population shift from rural to urban areas, "the gradual increase in the proportion of people living in urban areas", and the ways in which each society adapts to the change. In the environmental perspective it creates a number of different challenges and some opportunities. Trends in urbanization are integrally linked to sustainable development. With good planning and governance, the increasing concentration of people in urban settlements can facilitate economic and social development, while also offering opportunities to mitigate the adverse impact of consumption and production on the environment. However, rapid and unplanned urban growth threatens sustainable development when the necessary infrastructure is not developed or when policies are not implemented to protect the environment and ensure that the benefits of city life are equitably shared.

Reference

United Nations, Department of Economic and Social Affairs, Population Division (2015) *World Urbanization Prospects: The 2014 Revision, ST/ESA/SER.A/366*. <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf>.

ABSTRACTS OF LESSON PLANS

1. Tropical forest: an analysis of social and economic reasons of environmental degradation

Jan Činčera Masaryk University (Czech Republic)

Keywords: *tropical forests, deforestation, nature protection*

Abstract

This case allow students to experience and analyse the systemic interconnectedness among various groups affected by the process of deforestation in tropical areas. Participants are supposed to play a role, reflect their experience, and compare the gaming scenario with reality in the follow-up investigation.

2. Dead wood in Białowieża Forest – unravelling complexity of biodiversity conservation

Grzegorz Mikusiński Swedish University of Agricultural Sciences SLU (Sweden)

Xymena Bukowska Collegium Civitas (Poland)

Keywords: *conservation conflict, sustainable forestry, environmental attitudes, Poland*

Abstract

This case pertains to the conservation strategy for the renowned Białowieża Forest (BF) in eastern Poland. There are two main visions for the forest. The first is based on the assumption that forest biodiversity may be maintained without human intervention with ecological processes as the key factors. The second is based on the assumption that the maintenance of forest biodiversity in regions highly affected by humans needs active silvicultural management. The advocates of both visions proclaim the same goal: to save the Białowieża forest for future generation. The conflict around the conservation of forest biodiversity in BF has been recently focused around the outbreak of the spruce bark beetle – an insect that kills the spruce and creates a lot of dead wood. Many different stakeholders are involved in the conflict around BF and this exercise (Case) aims to increase the awareness of complexity of biodiversity conservation among participating students.

3. Urban greenery – how to include urban green areas in cities that are in desperate need of housing?

Marcus Hedblom Swedish University of Agricultural Sciences SLU (Sweden)

Luís Calafate University of Porto (Portugal)

Keywords: *ecosystem services, urban sprawl, biodiversity; densification, green infrastructure, urban green health*

Abstract

In this case students face the difficulties of preserving urban green-space in a representative city that also needs to build infrastructure. This problem is exemplified with a real case concerning an urban forest in the city of Uppsala in Sweden. Some stakeholders argue about the need of more houses for people to live and the other stakeholders argues about the need for green areas for health, for well-being, cultural values, children, biodiversity and general sustainability. The overall problem is that municipalities want to have urban green-space for the health for their residents at the same time as there is need to build more houses. This leads to planning dilemma about how to avoid the global trend where cities are densified (condensed) and urban green areas are constantly reduced. The students can be involved in a role play representing different actors in the conflict or provide a group work with discussions.

4. Sustainable development in the Shinyanga Region, Tanzania

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Key words: *agricultural development, forest landscape restoration, local knowledge, participation, soil conservation, trypanosomiasis*

Abstract

The Shinyanga case is based on a long term study of agricultural development and its consequences in Tanzania. The history of social and environmental change in the Shinyanga region illustrates how development can lead to poverty if the ecological capacity of the land is exceeded, and how this situation can be reversed if local knowledge and rules for land use are applied to manage forest and grazing land as commons. The case provides deep insights into gender inequity and the potential for elite capture and privatization of land. The challenge for residents of Shinyanga (and students who follow the lessons plans based on this case) is to develop a set of rules that ensure an equitable distribution of benefits to all Shinyanga residents and maintain the ecological potential of the land to support human wellbeing.

5. Rural tourism development: the case of Plastiras Lake, Karditsa, Central Greece

Alex Koutsouris, Alexandra Smyrniotopoulou, George Vlahos, Athanasios Kampas Agricultural University of Athens (Greece)

Keywords: *rural tourism, innovation, sustainable rural development, (local) conventions*

Abstract

In this case, students investigate the on-going discussion about sustainable tourism development in Greece. Students reflect on their knowledge and experience, and compare them with the case at hand in the follow-up investigation. The views of the main stakeholders are reviewed so as to allow students to develop a vision for sustainable tourism and, therefore, a relevant draft development plan.

6. Organic farming and public support in the EU – The Greek Case

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Keywords: *agricultural policy, organic farming incentives, public goods provision, interest groups (stakeholders)*

Abstract

The case introduces an on-going discussion in the EU about the subsidisation of organic farming. It simulates the process of stakeholders' dialogue as the means of public participation on decision-making. Students are expected to discuss the pros and cons of this policy instrument from the perspective of different stakeholders.

7. Remodelling an ancient farm in Portugal

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Keywords: *ecosystem services, cultural heritage, rural tourism*

Abstract

Focusing on a sustainable remodelling of an ancient farm to increase tourism and preserving its cultural identity, the students are engaged in a role playing that intends to develop knowledge and competences giving special attention to cultural heritage. Five teams take on different roles, thus different needs and interests have to be performed according to role descriptions given to each team. Students must play their roles within the team and find arguments to support their decisions and points of view. Promoting collaborative work and discussion, this case seeks to integrated and balance the three dimensions of sustainable development: the economic, social and environmental. Specific development goals and targets are raised as well as relevant competences for empowering students to take future sustainable actions.

8. Transformation of a local production company into a sustainable business

Paulina Codogni, Katarzyna Iwińska, Katarzyna Błaszczyk Collegium Civitas (Poland)

Adam Sulkowski Babson College (USA)

Keywords: *gender gap, sustainability, innovation, sustainable management*

Abstract

In the case students are presented an example of a local production company operating in the southern-eastern Poland. Founded in 1990 during the wave of economic transformation the enterprise is being challenged by the inevitable changes, the need to develop and start investments in order to keep its current position. The problem is presented from the perspective of the new female leader functioning in a traditionally male dominated business and trying to respect SD goals as the company and the employees grow. Students will be involved into discussion about the management challenges and work over a strategic development plan for the company. They will use SD concepts provided in the case while proposing new tactics.

9. Castromil gold mines' geoethics dilemmas

Clara Vasconcelos, Joana Faria, Isilda Rodrigues, Luís Calafate, Cristina Calheiros University of Porto (Portugal)

Keywords: *geoethics, mine exploration, mine exploitation, natural resources*

Abstract

Mining has been, and may still be, one of the most important activities in society. As mining process interferes with geosphere and many other Earth's subsystems, several ethical questions emerge that are taken into consideration. The case present students the real scenario of Castromil gold mines, obliging them to reflect about the advantages and disadvantages of the mining exploitation. Due to the geoethics dilemmas that emerge, a sustainable way to ore mining ends up as the major possibility to engage citizens in a responsible action. Through inquiry strategies, students must work in groups and discuss possible economic and public health impacts and risks and sustainable ways to exploit raw materials. At the end students must reflect on a sustainable economic growth that stimulates the economy while not harming the environment.

10. Territorial ecological limits to the lignite surface mining in North Bohemia

Mikuláš Černík, Tomáš Chabada, Jan Činčera, Veronika Chvátalová Masaryk University (Czech Republic)

Keywords: *lignite surface (open cast) mining, territorial ecological limits, Schwartz's theory of universal values, North Bohemia*

Abstract

The case presents on-going discussion about breaking the territorial ecological limits to the mining of brown coal in North Bohemia region of the Czech Republic. Territorial ecological limits established in 1991 have restricted exploration, mining and other mining-related activities beyond certain spatial limits in order to protect the settlements and to improve the devastated environment. In 2015 public debate about the preservation of the limits took place. History of the case and the position of relevant actors will be presented to students. Students will analyse the authentic quotations of the main actors engaged in this case and investigate their underlying values, based on Schwartz' theory of universal values. Students will reflect upon the values of the actors and discuss the environmental, social, and economic aspects of the whole case.

11. Smog – high concentration of air pollutants in a large city. Warsaw example

Artur Badyda Warsaw University of Technology (Poland), Katarzyna Iwińska Collegium Civitas (Poland)

Keywords: *air pollution, smog, health effects, air quality management*

Abstract

In this case students investigate the problem of air pollution in the capital city of Poland (Warsaw). It is one of the extreme examples of polluted cities in Europe. Students are given data to understand links between health effects and

exposure to pollutants. The problem of air pollution (and smog) is also presented from the perspectives of several stakeholders and decision makers that deal with the issue. Through the strategic analysis of decision making processes regarding air quality, students can develop community action plan projects for future change.

12. Local referendum about relocation of the railway station

Tomáš Chabada, Mikuláš Černík, Jan Činčera, Veronika Chvátalová Masaryk University (Czech Republic)

Keywords: *railway station, local referendum, public participation, decision-making*

Abstract

In Brno, the second largest city in the Czech republic, a plan to relocate main railway station from its current position in the city centre has been debated. Realisation of the plan would have a significant impact on the urban development of the city, as well as on public expenditures and connection of the city to the network of high speed trains. Local initiative has gathered signatures in order to call out a local referendum about the plan. The lesson takes this particular event as an example to discuss the instrument of local referendum in sustainable urban development. We use a role-play game to enable students to discuss positive and negative aspects of the instrument from point of view of various actors involved in the proces.

13. Sustainable food consumption – mitigating food waste

Magdalena Kraszewska Collegium Civitas (Poland)

Keywords: *food waste, sustainable food consumption*

Abstract

The leading theme of this case study is food waste and its impact on three pillars of sustainability. The ultimate aim of the class is identification of the challenges consumers encounter in their attempt to reduce food waste. During the session, participants will learn what food waste is and its impact on economy, society and environment, both in global and local perspective. Next, they will come up with the solutions that may mitigate the problem. They will assess benefits and costs of specific actions against food waste, from the individual perspective with a special focus on the challenges of changing their behaviour. Implications of the consumer choices for three pillars of sustainability will also be discussed. Finally, participants will be encouraged to take actions against a food waste in their personal lives.

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