

Teaching Curricula

Erasmus+ Project

LOTUS – Locally organized transition of urban spaces

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3.1 Introduction to the Teaching Curricula

3.1.1 Approach of the Curricula

The challenges of a changing climate increase the need to support municipalities, citizens, and companies in the process towards a zero-emission future. Local energy transition is not only the local council's duty, but includes a multitude of actors, public and private, who work in a complex set of interactions embedded within a wider regional, national and European context. Current and future policy makers on the national, regional and local levels are obliged to take action. For example in Italy, policies on energy and climate protection are made by the Ministry for Ecological Transition in the National Energy and Climate Plan (PNIEC), by the regions in the Regional Energy Plan (so far only implemented in some regions) and by municipalities in the Municipal Energy Plan (PEC), which is mandatory for municipalities above 50,000 inhabitants. In European municipalities, professional profiles with a specific focus on environmental and climate protection or on the management of public tasks in this area are emerging. One example is the "Klimaschutz-Manager" (climate protection manager) in Germany.

Therefore, it has become a central task for educators in the field of urban planning and development to include the dynamic integration of new energy concepts in their curriculum on undergraduate and graduate levels as well as on continuous professional development (CPD).

Since climate protection is a cross-cutting issue that must be considered by all municipal administrative units, all municipal decision-makers need at least basic knowledge in order to be able to cooperate with the experts in the best case and at least not to block their activities. This curriculum is an attempt to prepare the required know-how for a local energy transition, an important subarea of climate protection, in such a way that it can be imparted both as general knowledge for all administrative employees (bachelor) and as specialized knowledge for management personnel in climate protection.

The curricula were developed with the help of various interdisciplinary stakeholders of groups, who are interested in highly qualified graduates in the field of local energy transition and teaching experts of institutions of higher education, who can integrate the training content directly into their work. In addition, the different parts and lectures of the curricula were tested by all academic project partners from five different European countries. They were discussed, (re-)evaluated and improved in regards of the results of these tests. Thus, the overall goal to provide a curriculum for different levels of education and various national frameworks could be achieved.

The practice-oriented curricula on Local Energy Transition aim to be an adaptable and interdisciplinary framework to teach students of different backgrounds and disciplines, like public administration, urban planning, architecture, and energy systems engineering, to develop, implement, and execute energy transition in a local social, economic, institutional and administrative context. Due to these broad variations, there are not any prerequisites mentioned. Those have to be added, if necessary, by the lecturers, who adapt and teach the courses. These curricula for bachelor's, master's and PhD levels and CPD training offer an innovative and modular pedagogic guideline for higher education institutions all over Europe, which can be used independently or in conjunction with the other results of the project LOTUS to enhance existing curricula.

The aim of the courses is to communicate propositional knowledge, meaning teaching facts on local energy transition, as well as procedural knowledge, meaning teaching how this energy transition can work on a local level by experiencing processes through real-life case studies and a serious game.

These interactive curricula allow Europe's future city planners, architects and administrative staff to guide communities to a greener future and transfer successful concepts across borders and national contexts.

3.1.2 Explanation of the Curricula

The curricula are a guideline for a course on local energy transition. It is not possible to develop curricula that suit all European countries in regards of length and points. Therefore, the curricula are only one possible example of a course implementation and it is highly recommended to adapt the curricula to the individual framework of the university and students.

All three curricula consist of three parts: (1) the theoretical background, (2) the serious game (urbEN), and (3) the catalog of real cases. In each part, elements are developed which are essential for a basic understanding of the challenges of local energy transition in urban systems. The theoretical part is designed in a modular manner to either complement already existing courses offered by universities on a related topic or as an independent, new course in combination with the case catalog and the serious game. Each curriculum contains a suggestion of lectures, which can be implemented as a whole or chosen from to fit the universities' timeframes for courses. The suggested number of academic hours (a.h.; 1 a.h. = 45 min) show the maximum timeframe of the course for a single semester. Due to their modularity, the curricula can be adapted to the diverse scopes of courses and regulations at European universities, as well as different levels and semesters, specific needs, and pedagogical aims. Thus, they can be integrated into existing study programs or seminars by all universities and departments with a focus on urban planning or similar topics. The curricula are universal for all European countries and can be as well adapted to the national differences on legislation and regulations. By using the ECTS system, the curricula are compatible in various countries. The ECTS points might have to be adapted to the countries system and in case of a reduction of the time frame.

The integration of the serious game urbEN and the practice-oriented case study teaching leads to an enhanced knowledge and a better comprehensibility of the actors of local energy transition and the process of negotiation. Due to this process- and practice-oriented approach, theoretical framework and practical knowledge are linked in the curricula with a focus on experienced-based learning with the aim of students' competence development and learning outcomes. The urbEN game with its role-play character creates a dynamic perspective on the challenges of a zero-emission economy in an urban environment. Students and teachers will be able to test and implement new energy concepts in a dynamic framework. Due to the reenactment of the interaction of different actors of local energy transition, the students' understanding of the interdependencies of actors involved in the planning process is deepened.

The case catalog gives educators, students and practitioners a fundus of up-to-date material on local energy transition issues to use either in concordance with the curricula or to implement in new or existing courses. To achieve this, the cases in the catalog are generated in a way to complement different teaching approaches and methods. The case studies are carefully chosen and curated based on

a pedagogical framework. With these real cases from all over Europe students get to know different energy transition and best-practice projects from various countries and scales.

This open-source textbook accompanies the curricula to guide lecturers and students through the courses. The combination of theory and application testing in serious-game-playing and pedagogical case study teaching on the topic of energy transition is particularly important, because the success of sustainable local energy transition policies depends crucially on the understanding of the processes and interactions of the actors involved.

3.1.3 Educational Objectives

The content of the curricula is practice-oriented to be beneficially integrated into various fields of study and the education of urban planners, architects and municipal administrative staff as well as other potential actors involved. Depending on the academic level, students will be able to support transition management or manage the challenges of energy transition in municipalities and to analyze the specific circumstances of interactions between stakeholders and other actors. They are capable of contributing constructively to the coordination of diverging interests within the process of local energy transition. Ultimately, this pedagogical approach will promote the success of energy transition policies in municipalities, thereby making an important contribution to combating climate change through local actors. The students deepen their knowledge and reflect on sustainability on a local level. They are able to develop and compare different transformation scenarios. The playful and interactive mode of the curricula with the case studies and serious game allows a greater awareness of the strengths and weaknesses of the sustainable energy transformation scenarios developed. The students acquire skills and competencies necessary to be able to master complex negotiation situations in municipalities during the implementation phase of renewable energy transition projects. The implementation of this course increases the awareness and knowledge of students and lecturers across Europe on sustainable development in the broad field of urban planning.

To facilitate the exchange of national experiences the partners link their individual programs and students together in an alumni-network on LinkedIn (<https://www.linkedin.com/groups/12672462/>) on the topic of local energy transition.

3.2 The Curricula for Different Levels

The curricula for undergraduate and graduate levels show how a course for one semester can be designed. As mentioned before this is a maximum number of academic hours and can be modified depending on the formal and content-related requirements of the study program, department and university. Besides the lectures, the curricula also include the usage of the catalog of real case studies CoRC and the serious game urbEN.

The case studies can be used for the teaching methodology of case study teaching. The case studies are a tool to open up discussions on real-world scenarios. They include relevant information about the cases, and give multiple insights on the decisions that were made, but do not provide an analysis or a conclusion. The catalog of cases gives lecturers and students access to various real-life cases in different European cultural backgrounds and scales. The students prepare the case studies, selected by the

lecturer. This means, they read them thoroughly and answer the four to five questions in the assignments. These questions are the base of the discussions and help the lecturer to structure the session. The lecturer has the role of a moderator or facilitator, leads the session, and encourages students to take an active part in the discussion. Case study teaching aims for a dialogue with the students and encourages critical thinking. The case studies can also be used for graded assignments, if this is a requirement of the university or department.

The catalog of cases contains many other European cases which are not further developed, but give a good overview on various approaches of Local Energy Transition. Furthermore, students could develop these cases into in-depth cases, e.g., for examination or for teamwork.

The urbEN can be played either at the beginning of the course or at the end. Both alternatives have advantages. Playing the game as a start of the course, will help the students to understand the topic of local energy transition in a playful manner and can be a good way to improve group dynamics as well as introduce basic knowledge before going into detail in lectures and case studies. Students with prior knowledge on the topic of renewable energy might be more suitable for and will get a better learning outcome of an early game session. A game session at the end of the course offers the possibility for students to use all the knowledge they acquired through the course. The game sessions are likely to be more intense, as interactions are more detailed and could be closer to reality. It is, however, the decision of the lecturer which time for a game session might be best for a specific group of students. It is also possible indeed to play the urbEN at the beginning as well as at the end of the course to show differences and improvements within the interaction in the two sessions. At the end of each term the lecturer evaluates the term together with the students. This is crucial to understand the intention of each actor, the interactions and relations as well as the outcomes of a session.

Below, the curricula for bachelor's, master's and PhD levels as well as for CPD can be found.

3.2.1 Curriculum for Bachelor's level

Target group: Bachelor students in different fields related to urban/spatial planning and development, regional and municipal planning, architecture, regional management, public administration

Time frame: 1st - 4th semester

Duration: one semester

Number of students: min. 7 (to play the game) - 20

module	type of examination	workload in academic hours (a.h.; 1 a.h. = 45 min)			ECTS ¹ points
		in presence	independent learning time	sum	
1.1 Introduction to climate change on a local level	written exam on the subjects of the module (120 min)	34	86	120	4
1.2 Case teaching on local energy transition	Presentation (15 min each) and discussion (30 min); essay on self-selected and developed in-depth case study in groups of 2-3 students (10 - 15 p. each)	60	120	180	6

module 1.1: Introduction to local energy transitions	
learning objectives	<ul style="list-style-type: none"> The students know future challenges caused by climate change to urban living. The students know reasons beside climate change for promoting energy transition, e.g., reducing air pollution, improving social equity, reducing dependence from other countries, etc. The students know existing tools of transition of urban spaces towards the goal of increased sustainability (energy production, energy consumption, architecture, mobility, ...) and their impact on the environment and humans. The students have an overview of the spectrum of activities that can be used to lead towards reaching sustainability goals in municipalities. The students can define environmental, economic and social objectives for a sustainable urban planning strategy.
content of teaching	<ul style="list-style-type: none"> basic knowledge of the terminology and definitions basic knowledge of the phenomenon of climate change basic knowledge on sustainable urban planning and municipal climate resilience basic knowledge on renewable energy production and its impact basic knowledge about the objectives and strategies of main stakeholders in urban planning

¹ The European Credit Transfer and Accumulation System (ECTS) is a standard for comparing academic credits, meaning the workload of university courses, all over Europe to be able to compare the courses of European universities.

	<ul style="list-style-type: none"> • basic knowledge on policies for local energy transition, e.g., energy, infrastructure, fiscal, regulatory, innovation, social, ... • basic knowledge on civic participation and engagement in local energy transition and their mechanisms
teaching methods	<ul style="list-style-type: none"> • lectures with discussions (24 a.h. online or in presence) • independent learning time for preparing and reviewing lectures as well as self-study of documents, studying for the exam (86 a.h.) • field trip to a project site (10 a.h. in presence)
suggested lectures	<p>The lecturers will give some theoretical and methodological input and framework. A suggestion for the organization of lectures follows:</p> <ul style="list-style-type: none"> • Overview on climate change and the role of sustainable planning (2 a.h.) <ul style="list-style-type: none"> ○ What is Climate Change? ○ Impacts of climate change on urban and rural living ○ Importance of sustainable planning for adaptation on climate change • Different dimensions of energy transition for sustainable planning (5x2 a.h.) <ul style="list-style-type: none"> ○ Energy consumption ○ Energy production through renewables <ul style="list-style-type: none"> ▪ Different ways of production (wind, solar, water, biomass, hydrogen) ▪ European and country specific goals and statistics ○ Sustainable architecture ○ Mobility ○ Green infrastructure ○ Other objectives as needed • Governance and management of local energy transition (4x2 a.h.) <ul style="list-style-type: none"> ○ Stakeholders and their roles ○ Citizen participation: legal aspects top-down, bottom-up ○ Strategies ○ Funding • Sustainable development of a municipality (2x2 a.h.) <ul style="list-style-type: none"> ○ Presentation of in-depth case study/ies and/or best-practice examples • Field trip (10 a.h.= 1 day or 2x1/2 day)

module 1.2: Case teaching on local energy transition	
learning objectives	<ul style="list-style-type: none"> • The students are able to identify the needs of a municipality concerning the transition of urban spaces towards increased levels of sustainability. • The students know the different actors and can describe the different potential of actors and stakeholders in urban planning and their respective strategies concerning urban planning. • The students know different concepts of sustainable development of municipality. • The students understand the financial and socio-economic consequences of sustainability-oriented activities. • The students can analyze the interactive framework of urban planning in a specific location.
content of teaching	<ul style="list-style-type: none"> • deeper knowledge on sustainable urban planning • application-oriented knowledge on local energy transition • understanding and developing objectives and strategies of main stakeholders in urban planning • deeper knowledge on the interaction of stakeholders to implement projects and strategies for energy transition
teaching methods	<ul style="list-style-type: none"> • 10 case studies, e.g., in the form of case study teaching (analysis and discussion) (10x4 a.h. of in presence) • independent learning time for preparing and reviewing case studies as well as self-study of documents (10x8 a.h.), preparation of presentation and essay (40 a.h.) • serious game urbEN (a minimum of 8 a.h. to explain and play two terms, a maximum of 20 a.h. to go into detail and play more than two terms = 2 days)

3.2.2 Curriculum for Master's level

Target group: Master students in the fields of urban planning and development, regional and municipal planning, architecture, regional management, public administration, spatial planning

Time frame: 1st - 3rd semester

Duration: one semester

Number of students: min. 7 (to play the game) - 20

module	type of examination	workload in academic hours (a.h.; 1 a.h. = 45 min)			ECTS points
		in presence	independent learning time	sum	
1.1 The framework of local energy transition	Presentation (30 min) and discussion (30 min); term paper (25 p.)	34	86	120	4
1.2 Case studies on local energy transition	essay on self-selected and developed in-depth (25 p.)	60	120	180	6

module 1.1: The framework of local energy transition	
learning objectives	<ul style="list-style-type: none"> The students know the legal framework for energy transition in the EU and their country. The students understand the interactive framework and the actors of urban planning. The students understand the role of citizens in the transition of urban spaces. The students are able to apply mechanisms of energy transition on a municipal level.
content of teaching	<ul style="list-style-type: none"> deeper knowledge on environmental, economic and social sustainability and its implications for urban development and transformation deeper knowledge on the legal framework of energy transition deeper knowledge on policies for local energy transition, e.g., energy, infrastructure, fiscal, regulatory, innovation, social, ... deeper knowledge on different forms and dynamics of citizen participation models deeper knowledge on interdependencies between urban planning and energy critical reflection on energy-oriented urban planning
teaching methods	<ul style="list-style-type: none"> lectures with discussions + student presentations with discussions (24 a.h. online or in presence) independent learning time for preparing and reviewing lectures as well as self-study of documents, preparing term paper (86 a.h.) field trip to a project site (10 a.h. in presence)
suggested lectures	Depending on the students' background, it might be necessary to hold one to two lectures giving basic knowledge on energy transition on a local level. This includes its goals, actors and strategies to help students in interdisciplinary or non-consecutive master's programs to understand this subject better and bring

	<p>them on the same level. Ideas for lectures can be found in the Bachelor's curriculum, module 1.1..</p> <p>The lecturers will give some theoretical and methodological input and framework. The students, however, need to make a presentation as an examination, which will be assessed. They could either present one of the suggested topics below or make a presentation on a related topic. In addition, more case studies could be integrated into the module as presentations of students, or be discussed in tutorials.</p> <p>A suggestion for the organization of lectures follows:</p> <ul style="list-style-type: none"> • Brief introduction of the legal framework on renewable energy production of the EU and your country (e.g. EEG in Germany) (2 a.h.) • The role of sustainability for urban development (2 a.h.) • Possibilities of energy production in urban (u) and rural (r) areas (2 a.h.) Case studies and best practices (s. Textbook), e.g., on Bologna (u) Hamburg (u), Riga (u), Kuldiga (r), Freiamt (r), Peccioli (r) • Local energy production – chances and challenges (2 a.h.) • Local energy transition as location factor (2x4 a.h.) <ul style="list-style-type: none"> ○ Employment ○ Tourism ○ Education ○ Marketing/Image of region • Integration of citizens (2x2 a.h.) <ul style="list-style-type: none"> ○ Participation and Engagement of citizens ○ Country specific legal possibilities <ul style="list-style-type: none"> ➔ The Case studies of Freiamt and Le Mené would be useful here for discussion and reflection • Municipal properties and real estate for the protection of the climate (2 a.h.) • Planning and building as factors of energy transition (2 a.h.) • Field trip (10 a.h.= 1 day or 2x 1/2 day)
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module 1.2: Case studies on local energy transition	
learning objectives	<ul style="list-style-type: none"> • The students can compare and examine different methodologies of sustainable urban planning. • The students understand the financial and socio-economic consequences of sustainability-oriented activities. • The students can analyze the interactive framework of urban planning in a specific location. • The students are able to design a strategy for implementing sustainable urban planning in a specific urban environment. • The students understand mechanisms of energy transition and autonomy and can identify common patterns and singularities of specific urban environments. They are able to identify the most appropriate strategies for specific cases.
content of teaching	<ul style="list-style-type: none"> • deeper knowledge on sustainable urban planning • application-oriented knowledge on local energy transition • understanding and developing objectives and strategies of main stakeholders in urban planning • deeper knowledge on the interaction of stakeholders to implement projects and strategies for energy transition
teaching methods	<ul style="list-style-type: none"> • 10 case studies, e.g., in the form of case study teaching (analysis and discussion) (40 a.h. of in presence) • independent learning time for preparing and reviewing case studies as well as self-study of documents (10x8 a.h.), preparation and writing of in-depth case study (40 a.h.) • serious game urbEN (a minimum of 8 a.h. to explain and play two terms, a maximum of 20 a.h. to go into detail and play more than two terms = 2 days)

3.2.3 Curriculum for PhD's level

Target group: PhD students in the fields of urban planning and development, regional and municipal planning, architecture, regional management, public administration, spatial planning

Time frame: not given, as the students take the course, when it is offered and fits their schedule

Duration: two-day block seminar

Number of students: min. 7 (to play the game) - 20

module	type of examination	workload in academic hours (a.h.; 1 a.h. = 45 min)			ECTS points
		in presence	independent learning time	sum	
1. Practice-oriented urban energy transition	In-depth analysis of the game played: reflections on the serious game and on the roles played by each PhD student in the game; the results obtained in the game; including a detailed explanation of the logics that led to specific decisions of the role.	20	40	60	2

module 1: Practice-oriented urban energy transition	
learning objectives	<ul style="list-style-type: none"> • The PhD students understand the interactive framework and the actors of urban planning. • The PhD students understand the role of citizens in the transition of urban spaces. • The PhD students are able to integrate theory and practice. • The PhD students are able to apply mechanisms of energy transition on a municipal level. • The PhD students can apply knowledge and skills to develop a viable solution to a defined urban problem. • The PhD students will develop high critical thinking skills in making decisions characterized by a high level of uncertainty and complexity. • The PhD students will learn how to manage specific and conflicting requirements in territorial transformation.
content of teaching	<ul style="list-style-type: none"> • deeper knowledge on sustainability and its implications for urban development and transformation • deeper knowledge on the legal framework of energy transition • deeper knowledge on policies for local energy transition, e.g., energy, infrastructure, fiscal, regulatory, innovation, social, ... • deeper knowledge on interdependencies between urban planning and energy. • critical reflection on strategies for energy transition on a local level.
teaching methods	<ul style="list-style-type: none"> • lectures with discussions (10 a.h. online or in presence)

	<ul style="list-style-type: none"> • independent learning time for preparing and reviewing case studies as well as self-study of documents (2x8 a.h.), preparation of in-depth analysis of the game (24 a.h.) • serious game urbEN (10 a.h. in presence)
<p>suggested schedule</p>	<p><i>Day 1 (5 a.h.)</i></p> <ul style="list-style-type: none"> • The role of sustainability for urban development (1 a.h.) • Energy transition and governance (4 a.h.) <ul style="list-style-type: none"> ○ Introduction to energy transition ○ Legal framework of EU and country (e.g. EEG in Germany) ○ Presentation and discussion of 2 case studies, esp. the actions and strategies implemented, in preparation of the game <p><i>Day 2 (10 a.h.)</i></p> <ul style="list-style-type: none"> • Introduction to the game urbEN (3 a.h.) • Playing the game (7 a.h.) <p><i>Day 3 (5 a.h.)</i></p> <ul style="list-style-type: none"> • Reflecting on the game and each role (3 a.h.) • Looking at different scenarios (2 a.h.)

3.2.4 Curriculum for Continuing Professional Development (CPD)

Suggested title: Citizens and municipalities as energy producers: Independence through local energy production

Target group: Mayors, senior employees in municipalities, lateral entrants, interested parties

Participants: min. 7 - 20

Examination: The curriculum for CPD does not foresee an examination. The participation is sufficient to receive the certificate. If necessary, however, a 10-page case study analysis can be written by each participant.

module	requirements	workload in academic hours (a.h.; 1 a.h. = 45 min)			ECTS points
		in presence	independent learning time	sum	
1.1 Introductory seminar	none	5	-	-	-
1.2 Advanced seminar	Successfully completed introductory seminar or suitable vocational training	10	-	-	-

module 1.1: Introductory seminar	
learning objectives	<ul style="list-style-type: none"> The participants know future challenges caused by climate change to municipalities. The participants know reasons beside climate change for promoting energy transition, e.g., reducing air pollution, improving social equity, reducing dependence from other countries, etc. The participants know existing tools of transition of urban spaces towards the goal of increased sustainability (energy production, energy consumption, architecture, mobility, green infrastructure, ...) and their impact on the environment and humans. The participants have an overview of the spectrum of activities that can be used to lead towards reaching sustainability goals in municipalities. The participants know the legal framework for energy transition in the EU and their country.
content of teaching	<ul style="list-style-type: none"> basic knowledge of the terminology and definitions basic knowledge on the production of renewable energy on a local level imparting of possibilities, the municipality can use to promote renewable energies basic knowledge of the legal framework
teaching methods	<ul style="list-style-type: none"> Lecture with discussion (5 a.h. online or face-to-face)

module 1.2: Advanced seminar

learning objectives	<ul style="list-style-type: none"> • The participants know best practice examples. • The participants know the challenges of the transition process and ways to manage them. • The participants know legal forms of citizen companies. • The participants know ways to manage citizens' energy. • The participants know conflict management strategies. • The participants are able to analyze transformation strategies. • The participants are able to develop the basic features of a transformation strategy towards renewable energies for a municipality.
content of teaching	<ul style="list-style-type: none"> • application-oriented knowledge of local energy transition • deeper knowledge of possibilities for municipalities to produce renewable energy • basic knowledge of civic participation and engagement in local energy transition and their mechanisms • deeper knowledge of the legal foundations • basic knowledge of the objectives and strategies of main stakeholders in local energy transition
teaching methods	<ul style="list-style-type: none"> • Lecture with discussions (5 a.h.) • Serious Game: Simulation of the interaction of actors in municipal energy production (5 a.h.)