Erasmus+

KA220-HED - Cooperation partnerships in higher education

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Project acronym: **DEMo4PPL**
Project full title: **Digital Education Modules 4 Participatory Planning**

OPT-T1: PUBLIC PARTICIPATION AND LAND USE PLANNING

1. Short description

In recent decades, land use planning and governance have evolved into an increasingly sectoral and multi-level process. This shift is directly linked to the broader European integration initiative, which has established a framework for multilevel governance. European policies, in particular, have experienced a dual transformation marked by both centralization and decentralization. Authority has often been transferred upward to the EU's supranational level while also being devolved downward to regional and local levels, thereby granting these entities greater influence over citizens' daily lives (Todella et al., 2024).
This dynamic requires robust public participation and heightened citizen awareness, particularly in addressing systemic challenges such as the energy transition which represents a comprehensive restructuring of the entire energy supply system (including electricity, heating, and transportation) across multiple dimensions. Its success depends heavily on local engagement, as cities and communities are where the effects of the transition are most directly experienced, and where decisions regarding its implementation are made. Municipalities and local stakeholders play a pivotal role in this process by initiating, promoting, and executing transition projects or supporting local actors within a decentralized framework referred to as Local Energy Transition (LET).
In this context, this module builds upon the Erasmus+ project LOTUS (Locally Organised Transition of Urban Sustainable Spaces), which offers higher education tools designed to inspire students, city planners, architects, and administrative professionals across Europe. These tools aim to guide communities towards greener futures while enabling the transfer of successful practices across borders and national contexts.
In particular, this module builds upon one of the key tools developed under the LOTUS project as the Serious Game "urbEN", a board game that fosters students' innovative and creative capacities in addressing LET. By simulating the evaluation of diverse interests and integrating them into a holistic perspective, "UrbEN" serves as an effective educational tool to prepare students for the complexities of sustainable urban development.

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Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

2. Keywords

Local Energy Transition, Serious Game, Educational Game, ERASMUS+ LOTUS project, Public Participation, Decision Processes.

3. Main part (this part may include text, figures, diagrams, tables etc.)

3.1. The Erasmus+ project LOTUS (Locally Organised Transition of Urban Sustainable Spaces)

The Erasmus+ project *Locally Organised Transition of Urban Sustainable Spaces* (LOTUS) seeks to empower individuals (particularly students in disciplines related to energy transition) with the skills and competencies needed to drive transformative changes in urban energy systems, Local Energy Transition (LET) and planning processes (Figure 1).

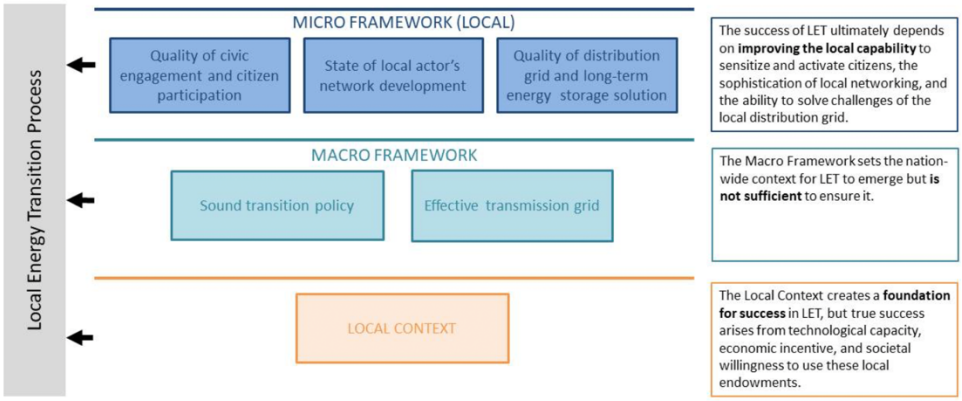


Figure 1: Determinants of LET (Source: Drewello, 2022[a])

LOTUS provides educators in higher education with innovative tools to foster a more integrated and interdisciplinary approach to teaching. By introducing an interactive curriculum, the project equips Europe's future city planners, architects, and administrative professionals to lead communities toward a greener future and to transfer successful concepts across national and cultural contexts.
To achieve this, the project employs cutting-edge teaching methodologies that combine theoretical knowledge with practical skill development. This approach prepares students to become proactive professionals in urban planning and energy transition, ensuring a tangible impact on education and urban development across Europe. The transnational nature of the initiative facilitates the sharing of successful strategies and expertise related to urban energy transition across borders (Drewello, 2022[b]).
The LOTUS projects' specific objectives are (Lami and Todella, 2022):

- Collate and Refine Knowledge;
- Develop an Educational Program;
- Promote Knowledge Dissemination.

Accordingly, the primary target groups addressed by the LOTUS project are:students in engineering and applied sciences; students in humanities disciplines; researchers and lecturers; universities and higher education institutions; practicing professionals.

Given the relevance of the topic and the interdisciplinary nature of the LOTUS project, it was essential to develop and use interactive and adaptable pedagogical tools to provide high quality innovative training in different areas.

In order to enable students to acquire the necessary skills to handle complex negotiation situations in the implementation phase of energy transition projects, the project consists of the implementation of 4 components organised in an interconnected manner:

i) a Catalogue of Real Case Studies (CoRC) that collects case studies and real experiences carefully analysed from a territorial and political point of view;
ii) a serious game on Urban Energy Management (urbEN) which is the central tool of this module. UrbEN is described in details in section 3.2;
iii) a Curriculum on Urban Transition Energy (CUTE) adaptable to different academic disciplines and pedagogical frameworks to be applied to different fields of study dealing with urban planning or energy;
iv) a textbook on urban energy transition in Europe aimed at framing the key issues and providing a structured teaching process.

All the materials (CUTE, CoRC, urbEN and textbook) are publicly and freely accessible (available at this link: https://zenodo.org/communities/lotus/).

3.2. URBEN

UrbEN is an educational serious game simulation tool (Ouariachi et al., 2018; Lami et al., 2023) in the form of a role-playing game whose objective is to define the energy autonomy of a hypothetical territory considering short to medium term planning (5/20 years).
The game is designed in the framework of a general reflection on the actions to be pursued with aims of mitigating climate change, guaranteeing energy security, promoting regional socioeconomic development and stimulate participation.
Even if climate change and LET issues are not all about energy, urbEN is focused on energy only and on interactions between public/private actors implementing renewable energy projects in a local territory, even in relations with other aspects such as social. In this sense, urbEN ignores environmental topics (i.e. carbon sinks, biodiversity, waste management, circular economy) since, according to the literature, an educational game should focus on one axis at a time, otherwise it would be too complicated to play with.
The energy autonomy is pursued in the game through the implementation of a series of actions related to new services, projects and buildings aimed at pursuing energy sobriety (by reducing consumptions) and renewable energy production (by producing energy from clean sources).
Those actions fall into broad categories of energy production (intermittent and continuous), energy consumption saving and energy storage. However, it is fundamental to underline that the game is focused on a local cooperative energy autonomy dealing with a territory whose goal is to be autonomous but not completely isolated and there is a matter of connection to the global network. Nevertheless, the energy issue cannot be disconnected from economic and social life. That's why, besides the directly energy related actions and actors, urbEN includes economic actions such as manufacturing, farming, retail, housing, public services and infrastructure as well as actors not directly dealing with energy design as promoters, farmers and producers.

3.2.1. Roles and game components

The game provides for 3 types of roles and 8 game components.
The roles concern: i) the players divided into 7 specific roles such as the local authority, an NGO representing civil society, two energy operators (local and national), an entrepreneur, a property developer and a farmer; ii) one or more game masters understood as facilitators of the role-playing game whose task is to check that the dynamics are running smoothly, moderate any conflicts, keep to the established timetables and summaries the results achieved; iii) the data manager whose task is to manage the computer application and keep track of 'controls and regulations'.
UrbEN is composed by 8 main components: timeframes, board, chance cards, actors, actions, implementation form, implementation sheet and a computer application.

The timeframes provided in the game are two: (i) the **term of office (5 years)** to be considered for policies, decisions, and assessment. In the game it is possible to play from 1 to 4 terms of office depending on the time available; ii) the **year** to be considered for energy production and investment profitability (the 1-year specific action is then calculated over all the years of the term, so 5 years).

The entire game is played on a board representing a fictious territory composed both of urban and rural areas in line with the reality of an energy transition involving energy sobriety, related particularly to urban dwellers, and renewable energy production suitable for rural areas (e.g. wind turbines, mechanization, solar farms, hydroelectric and pumped storage power plants). Accordingly, the spatial layout is fundamental, considering the possible alternative between compact urbanization and urban sprawl, as it affects energy consumption and types of projects (Figure 2).
Therefore, the board represents a very simplified local situation based on a spatial layout giving a general view on a varied local configuration as well as making the game user-friendly. It is based on abstract symbols and no notion of scale or real distances are provided. In the layout there are possible alternatives between compact urbanization and urban sprawl, as it impacts energy consumption and types of projects (e.g., public transport).
A small city occupies the center-left of the board including built-up areas and urban wasteland. Two villages are located at a distance from the core center and may be extended during the gameplay. The remaining space is rural. Part of it belongs to a Farmer whose house is depicted in the board and it is fundamental to implement specific actions.
The layout indicates the altitude, increasing from East to West, up to the hill crest in column N, which allows for projects taking advantage of a steep relief such as wind turbines or pump storage power stations.

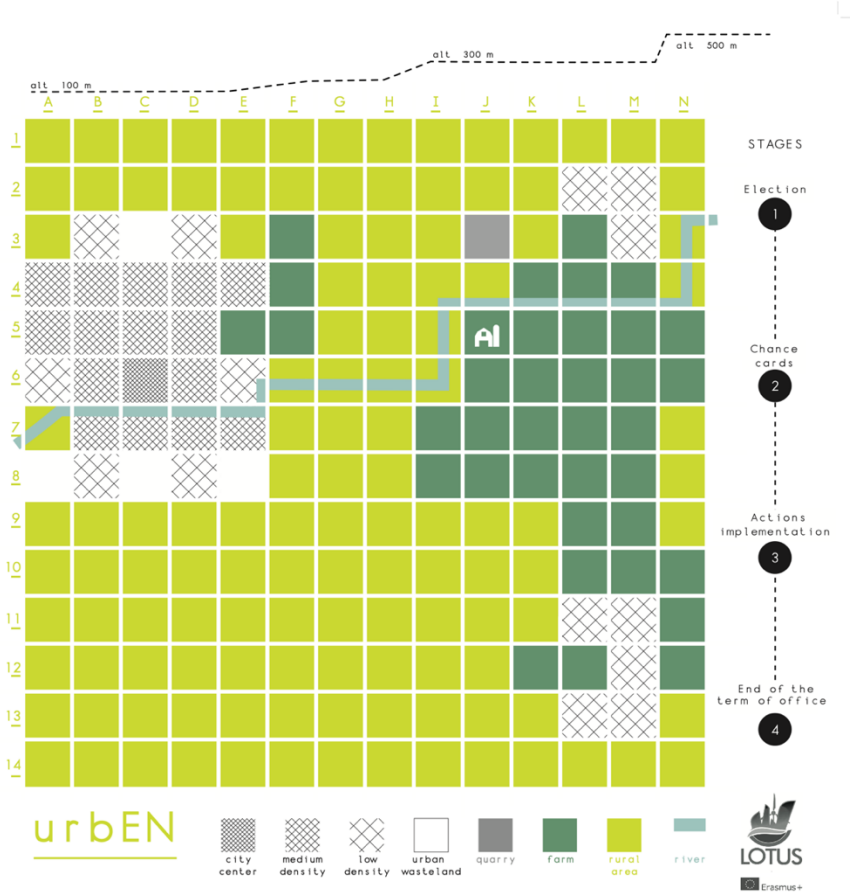


Figure 2: The Gameboard (Source: Lami and Todella, 2022)

The roles provided in urbEN are 7 and are described below.

The Local Authority (LA): is the most demanding role since the LA has the final say with respect to any proposed planning action as well as the planning of initial strategic objectives. Purpose: set the strategies and be reelected at the end of each term of office. Resources: possibility to raise or lower the local tax rate (but with direct effect on voters' approval rate); planning authorizations, subsidies from the Government and banking.

Non-Governmental Organization (NGO): it plays a key role in the game as it is in charge of the energy planning policy qualitative assessment. Purpose: as a green local action group, this organization regroups environmentally conscious inhabitants. Resources: they represent up to 5 points (positively or negatively) of public opinion (voters' approval), to sue project owners so that actions (and investments) are postponed for at least one term of office, to raise money to help fund virtuous projects by economic actors.

Local Energy Operator (LOC-EN): is a public limited company (governed by private law) which depends on the Local Authority which has set it up as their "strong arm" to implement their energy policy towards autonomy. Purpose: to produce energy (heat and electricity) and sell it to end-users or to the National energy network company. Resources: local connections (in particular with the LA whose chairman is part to the executive board), flexibility.

National Energy Operator (NAT-EN): is independent of the LOC-EN having big financial means and autonomy but has also big structure costs and operating expenses. Purpose: to produce and distribute electricity and gas. Resources: financial power, storage capacities through long distance transfer of electricity.

Private Company (PC): is an entrepreneur investing in manufacturing, retail, and services (with possible public service concession). Purpose: to implement any kind of business and maximize their profit. Resources: financial power, job creation

A property developer (DEV): invests in ordinary or green dwellings (positive energy buildings). Purpose: to build housing for all social categories. Resources: Connections with the Local authority and the Farmer as land bankers
A farmer (FARM): gives inputs for energy production from biomass. This role is crucial since it is the sole actor owning plots that can sell in order to let other actors pursue actions. Purpose: agriculture. Resources: land ownership.

LA, NGO and LOC-EN invest in the production and storage of renewable energy but also in energy sobriety.
The other actors (NAT-EN, FARM, PC, DEV) are private, so their purpose is to earn money so energy saving and renewable energy production are just means to this end.

The game starts with the so-called "chance cards" drowned by the data manager. The chance cards are of 2 different types:
4 cards contain plots that can be bought by the actors through an auction. Each plot has an auction base, and every actor can participate by bidding a minimum of 50k (Figure 3);

Figure 3: examples of chance cards containing plots (Source: Lami and Todella, 2022)

4 cards contain the government's subsidies. Those allow the actors to benefit from government's subsidies for different purposes. Such chance cards are kept by the Local Authority or the data manager and used at their discretion as and when the opportunity occurs. Such subsidies must be used during the current term of office. Otherwise, the Local Authority must put back the card into the pile at the end of the term (Figure 4).

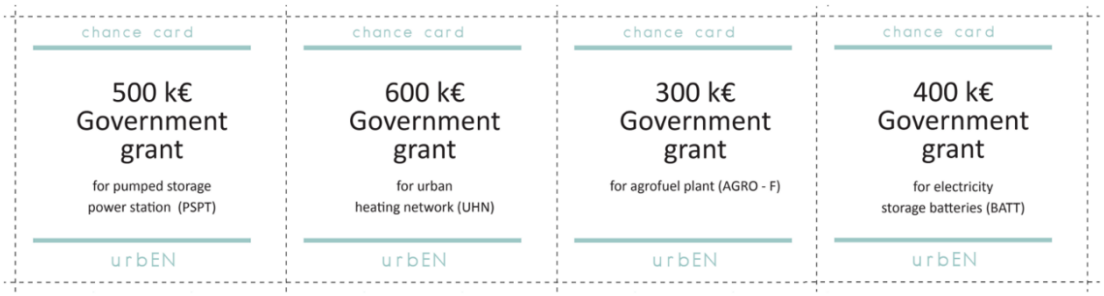


Figure 4: example of chance cards containing subsidies (Source: Lami and Todella, 2022)

After this first step, the game can begin.
Each actor can implement a different set of actions depending on their know-how and expertise comprising activity, dwellings, continuous and intermittent energy consumption, energy savings and energy storage. A pictogram is associated to each action. Every time an action with spatial significance (needing a plot) is implemented, the respective pictogram must be placed in the board (Figure 5).

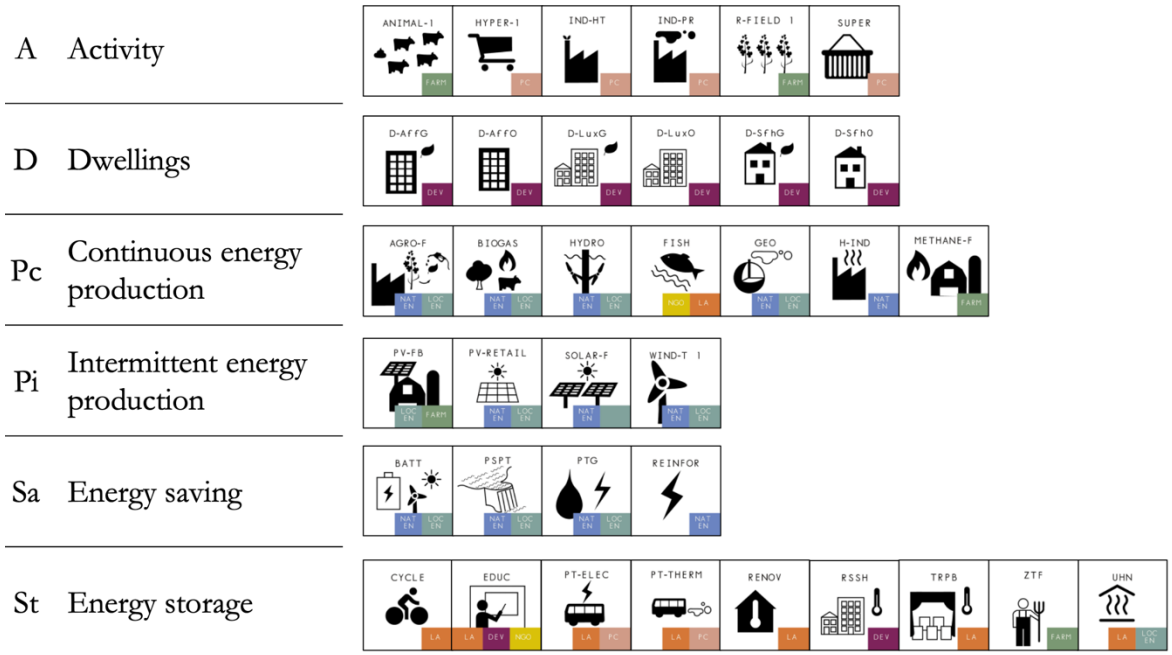
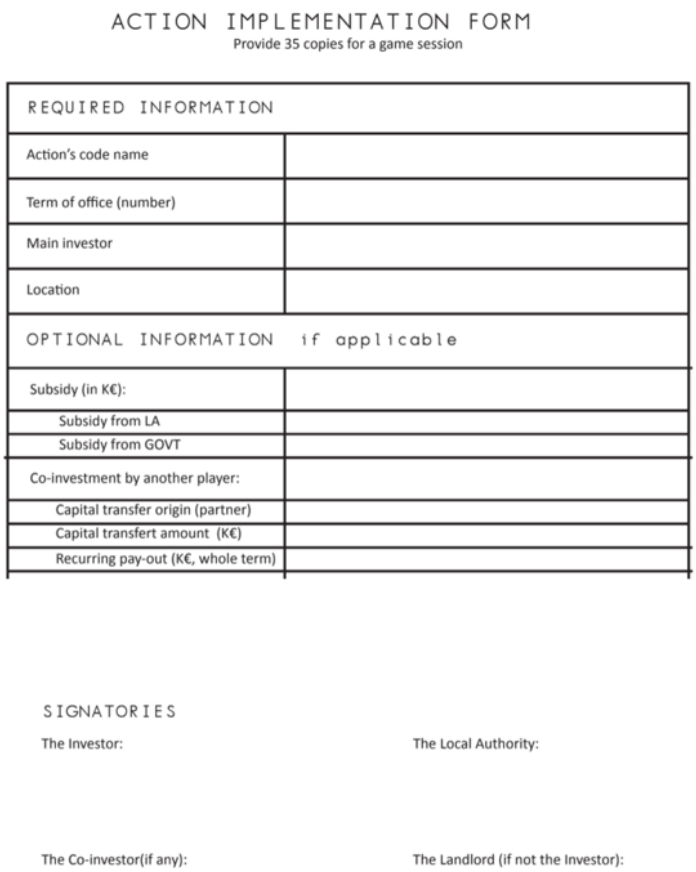


Figure 5: Actions pictograms (Source: Lami and Todella, 2022)

Due to the nature of both actors and actions, “urbEN” is designed to provide the maximum interactions possible between players. Each player is able to interact with any other according to different types of interaction:
Need for a prerequisite action (i.e. in terms of investment) which is not in the remit of the player;
Need for co-investment if the player having the knowhow and expertise hasn’t got enough money for the investment;
Need for a plot of land since most actions have a physical imprint and take place on urban or rural land. Land tenure can be acquired directly following an auction or bought back from another player as the Farmer or the Local Authority acting as a land banker;
Need for approval from the NGO which has the ability of delay any project by taking legal action towards its proponent or, on the contrary, may co-invest or convince other actors to co-invest in a project;
Need for approval from the LA (mandatory) thus opening the door to negotiations. All actors depend on the LA for prerequisite infrastructure, land availability, authorizations, and also in some cases, as facilitator towards other actors.
In particular, every project needs for a formal authorization from the LA in order to be implemented represented by the “Action implementation form”. This is a document that needs to be signed by all the involved actors and shown to the LA who must sign it in turn to allow the implementation of an action (Figure 6).



ACTION IMPLEMENTATION FORM

Provide 35 copies for a game session

REQUIRED INFORMATION	
Action's code name	
Term of office (number)	
Main investor	
Location	
OPTIONAL INFORMATION if applicable	
Subsidy (in K€):	
Subsidy from LA	
Subsidy from GOVT	
Co-investment by another player:	
Capital transfer origin (partner)	
Capital transfert amount (K€)	
Recurring pay-out (K€, whole term)	

SIGNATORIES

The Investor: The Local Authority:

The Co-investor(if any): The Landlord (if not the Investor):

Figure 6: Action implementation form (Source: Lami and Todella, 2022)

Finally, each actor is provided also with a "projects implementation sheet" containing a summary of all possible actions, how can implement them, how much they cost, what prerequisites they require, the continuous/intermitted energy produced, the storage capacity and the jobs created.
The whole game is managed by a computer application controlled by a "data manager".
The computer application is constituted by a series of Excel sheets allowing to:

- set LA goals on which to build game strategies;
- keep a trace in terms of land acquisition and actions implementation;
- calculate for each actor how much money has been spent and how much money remains in the coffers;
- verify the presence of actions necessary for the implementation of other actions; (prerequisites) and understand which actor must implement these prerequisites;
- to calculate real-time results for each term of office according to renewable energy, storage capacity, overall jobs created, investment returns and money spent by the actors;
- to calculate the final approval rate of the LA to understand if it can be re-elected or not
- to check the real-time situation during the term of office and prevent mistakes.

Whenever an actor wants to implement an action, be it buying land or building a project, he must then warn the data manager and communicate the transaction, after obtaining the approval of the LA.

4. Classroom discussion topics / case studies

Understanding the mechanisms of networking within communities is essential for enhancing the management and effectiveness of the Local Energy Transition (LET) process. Effective collaboration among local stakeholders plays a pivotal role in the successful implementation of LET projects. Additionally, participatory governance models have a particularly positive impact on addressing local challenges. They foster higher levels of acceptance and provide stronger incentives for stakeholders to actively engage and commit to the process (Lami et al., 2022).
In order to play the game better, it is possible to understand the real dynamics from real case studies and an analysis grid that highlights which dimensions of such cases are important to highlight.
Within the LOTUS project, in fact, a flexible analysis grid has been developed, which can be applied to any case study of potential interest in order to highlight the characteristics and types of energy production, how energy is saved, the origin of the funding, the legal framework, the actors involved and the dynamics of the relationships. it is also possible to highlight the specific characteristics of the territories covered by the case studies, the social dynamics and the economic effects of the interventions (Figure 8).

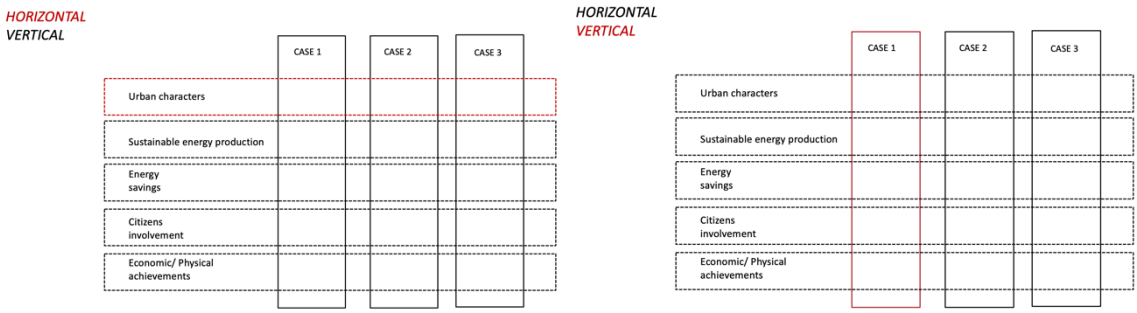


Figure 8: Analysis grid (Source: Lami and Todella, 2022)

The analysis grid thus makes it possible to look at the case studies from different angles and to identify their dimensions and the relationships between these dimensions.
The grid thus allows for a double level of analysis and interpretation of the data: on the one hand, a horizontal reading that allows to look for ‘explicit connections’ between the selected cases, to ensure a certain degree of generalization and to push towards further investigations based on the connections between the different cases; on the other hand, it allows for a vertical reading, thus opening up opportunities for in-depth analysis in relation to each specific case, allowing for a deeper understanding of the relationships between the different dimensions of the analysis grid considered.
Within the LOTUS project, 50 case studies were identified of which 10 were analyzed by means of the analysis grid (Rotondo et al., 2020, 2022).
The selection of cases is based on existing databases that were defined and constructed within the framework of European research projects aimed at supporting practitioners and local authorities in the transition.
The selected cases, defined as ‘anticipatory experiences’, are at the forefront of energy planning policies and practices at the local level, as they present some key features for the transition towards a low-carbon or zero-carbon society, through important elements of innovation in relation to governance models, the tools adopted and the ways of involving different public and private actors. These cases refer to the energy requalification of buildings, the realisation of new constructions, the integration of clean energy in terms of production within an urban development project and the reduction of energy consumption in the mobility system.
The 10 cases analysed are distributed over 10 different European countries and are experiences on different territorial scales: districts, villages, cities, islands and towns. They affect a timeframe that ranges between 1994 and 2025 covering short-term period (up to 5 years), medium-term period (from 10 to 15 years) or longer period (more than 15 years) as

they are part of long-term development visions. This evidence contributes reinforcing the idea that the implementation of energy-saving and clean energy production measure is generally expected to take place in the medium-long term.

5. Assignments

The module can be implemented with different student targets including bachelor students, master students, Ph.D. students and professionals.
The urbEN module is applicable with the participation of at least 7 students, one for each actor/role in the game.
However, it is advisable for each role to be played by a heterogeneous group of students to allow for greater fluidity of play and the emergence of more meaningful participation and interaction. The optimal number of students is therefore between 14 and 21, but the module can also be applied to larger classes.
The module is structured as a “learning by playing” approach alternating theoretical lectures, game sessions and collective discussion and it doesn’t require any previous prerequisite.
The game is preceded by a series of theoretical lessons aimed at creating a common knowledge base among all participants. Since no specific previous expertise is required, it is important to instruct students in terms of local energy production, energy autonomy, decision processes and to illustrate the dynamics of urbEN (approx. 4 hours)
The time required for the game sessions and collective discussions considering 3 terms of office is approximately 6 hours. However, it is possible to limit the application to 1/2 terms of office in cases of time constraints.
The students are then divided into working groups, one for each actor provided in urbEN.
The Local Authority sets the targets for the term and explains its strategy, according to the proposed renewable energy goal.
The ‘chance cards’ are then drawn, allowing the first term of office to begin.
The students are then called upon to act by impersonating the role of the actor assigned to them, proposing actions that fall within their know-how, interacting with the other students/actors in order to achieve their goals. If needed, each student/actor can consult the data manager to understand his progress situation.
At the end of the first term of office, the data manager and the game masters comment on the situation using the computer application. In this discussion phase, each actor can then evaluate the percentage of renewable energy, the number of jobs created, the financial situation. Finally, the group impersonating the NGO can take the floor and comment on the performance of the actors and the LA in terms of public opinion.
If the LA achieves its goals, it is re-elected and the second and third terms of office are carried out. If not, a new group of students must be voted in to act as LA.
The game proceeds through three types of controls: technical controls by the computer application, political controls by the LA (under pressure from civil society represented by the ‘NGO’ player) and legal controls by the game master.
The technical controls operated by the computer application concern the budget available to each actor, the implementation of prerequisite actions, storage capacity in order to implement specific actions and land ownership.
Political controls by the local authority take the form of the granting of authorizations for actions. These political controls mainly refer to the appropriateness and location of the project. In this sense, the LA must be careful not to grant authorization for the implementation of actions that are harmful to the health of citizens near built-up areas.
Legal controls, managed by the game master, concern game dynamics and interactions between participants. In the event of legal action by one or more players, the game master acts as judge of last resort.
At the end of the game, it is then verified whether or not the territory has achieved energy autonomy.

Each group of students is asked to compile and deliver a report counting between 4.000 and 5.000 words, within one month since the conclusion of the module.

The report should include the progression of the game, how they interacted with other actors, strengths and weaknesses of the approach proposed. The students are assessed based on clarity of presentation, correctness of content, critical capacity, attendance to the lectures, ability to interact with classmates and teachers and the capacity to present and argue the choices made within the working group.

6. Summary of Learning (up to 5 Q&As for better comprehension)

The expected learning outcomes of the module are many:

- Understand the energy strategies of local actors: NGOs, local authorities, energy operators, manufacturers, large-scale distribution companies, farmers, house builders;
- Understand the interactions between the elements of the local system: renewable energy production, energy saving, energy storage, economic activities, housing and public services, in order to propose a local energy autonomy planning strategy;
- Understand the reasons for climate change and the importance of the energy transition in active and passive terms (reducing air pollution, improving social equity, reducing dependence on other countries) by having an overview of the spectrum of activities that can be activated to achieve local sustainability goals;
- Understand the different roles and strategies of actors involved in an energy transition process by internalizing their perspectives as stakeholders in urban planning;
- Apply energy transition mechanisms at the local level;
- Design a strategy for the implementation of sustainable urban planning in a specific urban environment by understanding the financial and socio-economic consequences of activities;
- Understand the mechanisms of energy transition and autonomy to identify common patterns and singularities of specific urban environments.

7. Quiz (least 15 questions including: Multiple choice questions with 4 choices for each question, True/False questions, matching questions etc.)

Q1 - Why doesn't the investment take into account the plot purchase?
A1 - Contrary to some technical equipment whose lifetime is limited, land is timeless. Indeed, it will still be there when the piece of equipment is no longer in use and has to be dismantled (after being financially amortized). In "urbEN", land is not considered as a productive investment. Plots become an operating expense when rented.

Q2 - Why are LA's operating expenses so high compared to their financial capacity?
A2 - It's on purpose for 3 reasons: the LA has to rely on other actors to implement its strategy towards energy autonomy; the LA should seize the Government grants opportunities when they come; the LA can always increase the tax rate, but at the cost of a loss of popularity.

Q3 - The purpose of the LOC-EN is to produce energy (heat and electricity) and sell it to end-users or to the National energy network company. True or false?
A3 – True

Q4 – The purpose of the NGO is to produce and distribute electricity and gas. True or false?
A4 – False

Q5 – The resources of the DEV are related to the connections with the LA and the Farmer as land bankers. True or false?

A5 - True

Q6 - The PC has the possibility to delay projects, through legal actions, and to influence the approval rate of the Local Authority at the end of the term. True or false?
A6 - False

Q7 - In order to implement an action: 1) it is always necessary to implement a prerequisite first; 2) the LA authorization is mandatory; 3) it is necessary to own multiple plots; 4) it is necessary to be the Farmer
A7 - 2

Q8 - The actions related to energy savings are connected to: 1) Electricity storage batteries and reinforcement of electricity network; 2) electricity storage batteries and methanization at farm; 3) supermarket and green affordable housing; 4) reinforcement of electricity network and biogas
A8 - 1

Q9 - The action implementation form must be signed by: 1) investor, LA, landlord (if any), co-investor (if any); 2) investor, LA, game master; 3) investor, LA, game master, NGO; 4) landlord, NGO, Farmer
A9 - 1

Q10 - Some actions can be only implemented if there is a cooperation among actors. True or false?
A10 - True

Q11 - The horizontal reading of the analysis grid allows to: 1) understand the relationships among different dimensions 2) look at specific connections between the selected case; 3) to underline the expertise of the farmer; 4) opening up opportunities for in-depth analysis of each case study
A11 - 2

Q12 - The vertical reading of the analysis grid allows to: 1) understand the relationships among different actors; 2) look at specific connections between the selected case; 3) to underline the expertise of the farmer; 4) opening up opportunities for in-depth analysis of each case study
A12 - 4

Q13 - The energy autonomy is pursued in the game through the implementation of a series of actions related to new services, projects and buildings aimed at pursuing energy sobriety (by reducing consumptions) and renewable energy production (by producing energy from clean sources). True or false?
A13 - True

Q14 - A Serious Game is defined as: 1) a game devoted to make players understand the basics of a topic in a short time frame (rapidity) and in a playful way (playability); 2) a complex game focusing on multiple thematic; 3) a game focused on a huge number of conveyed messages; 4) a game based on social perspectives.
A14 - 1

Q15 - The Local Energy Transition is defined as the transition from decentralized fossil fuels and nuclear energy generation to renewable energy generation and consumption on a European level. True or false?
A15 - False

8. Bibliography (References to sources of information used in the content of the respective lecture. Between 5 and 10 references (ca 1/2 page). Follow APA style (https://libguides.murdoch.edu.au/APA).

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All the materials (CUTE, CoRC, urbEN and textbook) are publicly and freely accessible (available at this link: https://zenodo.org/communities/lotus/).

9. Glossary (Most important terms (ca 10), specific for the topic of the respective lecture. Two or three lines per term (ca 1/2 page).

LOCAL ENERGY TRANSITION: Local Energy Transition is defined as the transition from centralized fossil and nuclear energy generation to renewable energy generation and

consumption on a local level. This local transition process is characterized by a high degree of private ownership and control, as well as collective benefits. It is driven by small-scale energy projects with local participation and local energy initiatives.

SERIOUS GAME: a game based on a scientific model while not being a scientific model per se. The objective of a Serious Game is to make players understand the basics of a topic in a short time frame (rapidity) and in a playful way (playability). To this end, the Serious Game should be as simple as possible and focus on a single thematic axis and a very limited number of messages to be conveyed to the players.

CoRC: a Catalogue of Real Case Studies (CoRC) that collects case studies and real experiences carefully analysed from a territorial and political point of view. The catalogue provides good practices, administrative processes and participatory dynamics based on local experiences of urban energy and climate planning across Europe to verify and facilitate the transferability of lessons learned into the present and future.

urbEN: a serious game on Urban Energy Management (urbEN) which is the central tool of this module. UrbEN is a board role-play game aimed at enhancing students' innovative and creative skills on the topic of energy transition in urban planning, architecture, public administration and environmental management. In the game, students and teachers are actively involved in designing a hypothetical territory with a view to implementing new energy concepts in a dynamic context.

CUTE: a Curriculum on Urban Transition Energy adaptable to different academic disciplines and pedagogical frameworks to be applied to different fields of study dealing with urban planning or energy. This program is designed to complement courses offered by universities on the topic of energy transition, being interdisciplinary in nature and constructed in a modular manner;

CHANCE CARD: a card, in any of various games, with instructions to be followed by a player, usually affording them some chance opportunity (or inflicting upon them some chance misfortune). In the case of urbEN, the “chance cards” are drowned by the data manager at the beginning of the game. Some cards contain plots that can be bought by the actors through an auction, some cards contain the governments’ subsidies, allowing the actors to benefit from it for different purposes.

TERM OF OFFICE: or electoral mandate, it refers to the length of time a person holds elected office. In urbEN, the term of office to be considered for policies, decisions, and assessment is 5 years. In the game it is possible to play from 1 to 4 terms of office depending on the time available.

ACTION IMPLEMENTATION FORM: a document that needs to be signed by all the involved actors and shown to the LA that must sign it in turn in order to allow the implementation of an action. Indeed, the document represents a formal authorization from the LA in order to be implemented. The need for approval from the LA (mandatory) thus opens the door to negotiations.

ENERGY AUTONOMY: defined as complete autonomy from the public grid through the adoption of systems capable of ensuring one's own energy needs. Energy autonomy is pursued in the game through the implementation of a series of actions, which fall into the broad categories of energy production (intermittent and continuous), consumption savings,

and energy storage. However, the game is about local cooperative energy autonomy, not completely isolated abut partially connected to the global grid.

ENERGY PRODUCTION (INTERMITTENT AND CONTINUOUS): renewable sources are distinguished between intermittent and continuous, with some being in fact programmable (e.g., methanization, agrofuel, hydrokinetic turbines, geothermic, waste heat), while others operate at different times and seasons (e.g., solar panels, wind turbines), though increasingly predictable.