Energy Transition Action Day (ETA Day)

Project no 2023-1-DE03-KA220-SCH-000152753

https://www.freepik.com/free-photo/tech-people-trying-achieve-ambitious-sustainability-goals_80749436.htm#fromView=search&page=1&position=30&uuid=b6ff5ece-0795-459c-ade4-9fb09f46fcf7

Erasmus+
Enriching lives, opening minds.

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Contents

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Introduction of Erasmus+ Project

Energy Transition Action Day (ETAD) is an international educational program.

The main outputs of this program will be the creation of learning and teaching materials for students (aged 15–17+) and teachers and a digital ETAD tool for city planning to facilitate sustainable urban development.

Start of the project: September 2023.

Project duration: two years.

Key learning goals of the project

The energy transition is one of the major tasks facing society as a whole in the coming years and decades. Energy transition on a European level is needed and a chance for prosperity and security. The countries in Europe are facing very different challenges. The energy transition must be planned politically at the European and national levels but must occur locally. The transformation process in the municipalities will depend on the different conditions in each municipality. Technology and habit changes are needed for both energy transition and„ societal and individual actions. There is already an abundance of proven measures to fight the climate crisis, and these measures have manifold impacts in multiple dimensions!

To successfully implement the energy transition together, we must be all informed about the common goals as well as the local challenges and solutions. An equal dialogue between students, teachers and representatives of local authorities and municipal utilities is important to us. This is what we want to achieve with the Energy Transition Action Day!

Objectives

The project has clear objectives, centred on advancing education for sustainable development. It aims to equip teachers with an innovative educational package, enabling them to implement an Energy Transition Action Day at schools. Simultaneously, the project focuses on upskilling students, providing knowledge on climate, energy, mobility, transport and IT, and fostering an understanding of complex interrelationships. It also aims to empower students, encouraging their self-awareness and sense of responsibility as active citizens for shaping a sustainable

future through their participation in social transformation and developing the resilience needed to face contemporary challenges. The students experience themselves as active players in their future. In this way, ETA Day helps to reduce climate and future fears and strengthen students' self-efficacy and resilience.

Implementation

The project's implementation phase includes creating Energy Transition Action Day materials across five units, covering topics such as energy transition, mobility, housing and climate-friendly urban planning. These materials will be tested in secondary schools from Austria, Germany, Greece, and Romania, in collaboration with municipal decision-makers. The project also involves educating teachers and trainers to effectively execute the Energy Transition Action Day, ensuring widespread dissemination of knowledge and fostering engagement in sustainable practices.

Results

The project aims to deliver impactful outcomes, including a comprehensive educational package for the Energy Transition Action Day, featuring e-learning modules, teacher guidelines, educational videos, quizzes, presentations, discussion prompts and role-playing instructions for five interactive units:

- Power Up! – Know-how on energy transition
- Move on! – Know-how on mobility
- Feel at home! – Know-how on housing
- Just imagine – Roleplay to plan a new more climate-friendly area
- Let´s pitch! – Presentation of planning results and discussion

A Digital Energy Transition Action Day (ETAD) tool for city planning, along with a manual, is part of the envisioned results. The project also includes the creation of a user-friendly website providing free access to ETA-Day materials. Successful test runs are expected to yield trained students ready to contribute to the energy transition and training sessions. In addition, webinars aim to equip teachers and trainers with the skills needed for effective implementation of the Energy Transition Action Day. These outcomes collectively emphasize the project's commitment to promoting sustainability and active engagement in cleaner energy practices.

Vision

The four partners involved in this project are based in Germany, Austria, Romania and Greece. The German partner is the project coordinator. The materials will be made available in the languages of these partners (German, Greek, Romanian) and English. We intend to extend our reach beyond these countries to other EU Member States.

ETAD is a day of action and education that brings together students, teachers and community members to learn, discuss and implement sustainable practices. We believe that by equipping our future leaders with knowledge and skills, we can create a more sustainable and environmentally conscious world.

This long-term educational outcome is beneficial to the planet. We share the knowledge and responsibility to care for ourselves, our community and our planet! We are excited to take part in this project and to work towards a brighter and greener future for all.

The ETA-Day

The project day itself consists of three blocks of approx. 90 minutes each:

Block 1: Information transfer

Topics: Climate change and climate protection goals. Basic knowledge about the energy sector is imparted: energy generation, storage, distribution/grids and end devices. We focus on the electricity, heating and mobility sectors. The first block includes a quiz and an animated film (10 minutes). This is followed by preparation for group work.

Block 2: Group work and presentation of the results

The students are divided into groups. With the help of an innovative software tool, the students plan measures for sustainable, climate-friendly urban development and can enter concrete contributions and wishes into an interactive city map. Then, the group work results are evaluated and there is the opportunity to present and discuss them in plenary.

Block 3: Discussion with local representatives (optional)

Representatives of the municipalities and municipal utilities introduce themselves and describe the current situation, explaining their goals and measures for more climate protection and CO2 reduction. The students then discuss their previously developed climate measures with the municipal representatives.

Partners' description

Multivision – Germany

Die Multivision e.V. is a nationwide non-profit association based in Hamburg. The association aims to promote political and social education for young people. die Multivision designs, organizes and hosts educational events and project days for secondary schools in Germany and Austria on socially relevant topics such as ecology, environmental education, democracy and human rights. Each year, they conduct approximately 1000 environmental education events, reaching about 150,000 students, along with teachers and parents.

Die Multivision e.V. employs about 25 permanent staff members and works with partners, both nationally and internationally, to create content and carry out school events. These partners include NGOs, especially environmental associations, as well as foundations, cities, public utility companies and other communal service providers. At the local level, die Multivision e.V. also works with representatives from local businesses and administration, so that the projects have the widest possible publicity and reach.

Akaryon – Austria

Akaryon is a research-based Austrian SME founded in 1999. Since 2000 akaryon has been comprised of two locations, one in the rural area of Styria, and one in the Austrian capital Vienna. The company has gradually grown in terms of turnover and employment and currently employs more than 10 people. The interest in sustainability topics and the intention to increase awareness of the responsible use of resources are part of our corporate mission: We specialise in the development of complex web applications dealing with environmental and energy-related topics, thereby often fulfilling educational purposes. Apart from capitalizing our web-based/mobile environmental informatics applications as standalone solutions, we also take part in environmentally relevant educational projects regularly not only introducing our know-how but also providing our solutions to project target groups (for example learners with different educational backgrounds). We often also coordinate these projects, as well as we have experience in managing cooperative research projects.

5o Gymnasio Karditsas – Greece

The 5th Gymnasium of Karditsas (5o Gymnasio Karditsas) is an urban school, located in the centre of Greece with 25 teachers and a small student population (ages 12–15), committed to providing high-quality education. The teaching staff demonstrates genuine interest, dedication and a high level of professionalism, ensuring a safe and challenging environment for students to acquire knowledge, develop a structured personality and lay the foundations for their future personal development.

Striving for excellence in all areas, we create a pleasant and supportive learning atmosphere that motivates students. Our school is open to the community, engaging in various volunteer activities and cultural as well as informative events. Additionally, we implement environmental, health and cultural education programs. Embracing a European dimension, we have participated in numerous initiatives, including six European Erasmus+ Programs in Action (KA219, KA229, and KA220) since 2017. Alongside these, we have implemented numerous eTwinning projects, three of which have been awarded national and European quality labels.

Every year, our school implements environmental programs approved by the Ministry of Education on topics such as renewable energy sources, school gardening, sustainable management of the forest ecosystem, climate change, ecological footprint and solar energy.

As a member of the National Environmental Education Network on “Renewable energy sources and ecological footprint,” we actively contribute to shaping environmentally conscious and responsible citizens. In the year 2021, our dedication to sustainability was recognized when we were awarded the first prize in a pan-European competition on “Solar Energy.”

Colegiul „Vasile Lovinescu” – Romania

Vasile Lovinescu College Fălticeni is a large vocational high school located in the Suceava region (NE Romania).

The school will celebrate its 100th anniversary in 2024. It was originally founded as an agricultural school. The school merged with other educational institutions and added economics and mechanics to its curriculum. After 1990, other specialisations were added: construction and civil engineering, food industry, forestry and environmental protection.

Today, the school has 14 technological and theoretical fields of study.

At present, there are more than 1300 students (including evening classes, technical-vocational school and post-graduate school), 98 teachers and 36 auxiliary staff.

It is a comprehensive school that prepares students mainly for the labour market. Many students come from remote rural areas and face many challenges (geographical, economic and social barriers).

The school is currently involved in many European projects in the following areas: vocational training in the hotel industry, food processing and programming, environmental protection and sustainable living, and gamification.

How to use the guideline for teachers

We have prepared this Guideline for Teachers so you can prepare the ETA Day for your students on your own - while providing you with as much information and assistance as we can.

In this guideline, you will find background information about climate change in general and more specifically on fossil and renewable sources of energy. There is also some more in-depth information about energy use in housing and mobility, both current systems and green alternatives. This section is mainly meant to give you all the necessary information you might need in class.

We also give you best practice examples from the participating countries (i.e. Germany, Austria, Greece and Romania), that you can use as inspiration for your students on what is already being done to mitigate climate change and help with the green energy transition.

Finally, we describe the software tool and how to use it. Also, we provide you with the moderation concept including a checklist that you can use to hold an ETA Day in your school on your own.

Aside from this guideline, you can find the following helpful materials on our website: www.etad.eu. There you will find useful e-learning material to be used before the ETA Day, presentation slides and an animated video to use in class during the ETA Day and access to the software tool plus a manual on how to use it.

Background information:
1. Initial situation about climate change and energy transition

The climate crisis is a global phenomenon driven by the increasing concentration of greenhouse gases in the atmosphere. Proven since at least the 1980s, it is primarily caused by human activities such as the burning of fossil fuels, deforestation and intensive agriculture. Greenhouse gases, such as carbon dioxide, methane and nitrous oxide, store solar energy and lead to the warming of the planet, resulting in extreme weather events, rising sea levels and a variety of ecological and social challenges. The urgency of the current situation lies in the need to drastically reduce emissions to avoid the worst impacts of climate change. As stipulated in the Paris Agreement, global warming should be limited to below 2 degrees Celsius – preferably to no more than 1.5 degrees Celsius. Compared to the pre-industrial era, the average global temperature has already increased by about 1.3 degrees Celsius. The necessity for climate protection measures is even more urgent in 2024, as science suggests that humanity will not be able to stop or reverse the increasingly rapid global warming beyond 1.5 degrees Celsius due to triggered tipping points such as the melting of Arctic Sea ice and the resulting decrease in reflection of sunlight, drying or burning forest areas or the death of coral reefs etc.

People around the world are already experiencing the consequences of climate change. The most drastic and dangerous consequences affect the people of the global South: drying agricultural lands, temperatures that make human work (and life) impossible, devastating floods and extreme weather events cause countless deaths and mass emigration. The effects of the climate crisis are palpable in Europe as well. Especially old and weak people suffer (and die) from the effects of heat in midsummer, Southern Europe recently lamented the worst drought in over 400 years, and agriculture throughout Europe is suffering losses due to heat extremes, persistent rain, floods, and hail as well as events such as wildfires in Greece and Italy, receding glaciers in Austria, expanding deserts in Romania and the Ahr Valley flood disaster in Germany demonstrate the tragedy of climate change

consequences (and their costs). Let alone the increased spread of ticks, mosquitoes and other carriers of infectious diseases are also among the consequences of climate change.

Europe has therefore set itself the goal of taking a leading role in the fight against the climate crisis. The European Union has committed to becoming climate-neutral by 2050, which means that there should be zero net greenhouse gas emissions. This goal requires a comprehensive energy transition that includes the shift from fossil fuels to renewable energy sources such as wind, sun and water. The challenges involved are technical, economic and social. Sufficient capacities for the generation of renewable energies and energy storage must be developed as well as energy efficiency improved. At the same time, jobs must be created in the new sectors and the social impacts of structural change must be cushioned.

This process does not meet with societal approval across the board. In general, it can be observed that especially right-wing and right-wing populist parties in Europe are skeptical about the topic of climate change or prioritize it less in their political agenda: They position themselves as climate skeptics by questioning the (scientifically recognized) human responsibility for climate change or downplaying the urgency of climate protection measures; they often emphasize the importance of economic interests and jobs and argue that strict climate protection measures could harm the economy and reduce competitiveness. Nuclear energy is also a controversial topic from country to country, as well as within individual countries. While France and England (as countries with nuclear weapons) are pushing for further expansion of nuclear energy despite rising costs, countries like Germany focus on a decentralized energy system (many small energy producers instead of a few large facilities). In the overall European context, nuclear power still plays an enormously important role as a bridging technology towards a sustainable, decentralized, renewable energy system.

In summary, Europe has set ambitious goals and already made important decisions, even though, from a scientific point of view, an even more drastic reduction in greenhouse gas emissions would be necessary to meet the Paris climate target of a maximum of 1.5 degrees Celsius global warming compared to the pre-industrial era. The expansion of decentralized, renewable energies and the associated storage technologies poses enormous challenges for European societies, which some perceive as an opportunity for growth, independence and sustainability, while others as a threat to prosperity and stability.

2. What are fossil and renewable energy sources?

The use of fossil fuels produces carbon dioxide and other greenhouse gases (GHGs). The overconsumption of fossil fuels causes accumulation in the atmosphere and thus causes the climate crisis. Renewable energy sources produce only very few GHGs but are only available in limited amounts, so they should also be used wisely.

Fossil Fuels

Fossil fuels have been formed in the geological period ‘Carboniferous’ (approx. 300 million years ago). Dead organisms (plants and animals) have, in the natural process of anaerobic decomposition, transformed firstly into peat, captured CO2 from the atmosphere and stored it underground. After millions of years buried under heavy layers of inorganic sediments, constantly compressed and heated, the peat has transformed into coal, oil or natural gas.

Oil

Crude oil is a dark, viscose, poorly flammable liquid at ambient temperature. It contains mainly hydrocarbons (95-98%), other additives are sulphury oxygen and nitrogen compounds and traces of metals (copper, nickel, vanadium…). In the refinery more useful derivatives are processed from crude oil, such as kerosene, diesel fuel, gasoline, heating oil, paraffin wax, lubricates, asphalt and various chemicals to produce plastic.

Natural Gas

Natural gas is a highly flammable, invisible, odorless, natural gas consisting mainly of methane. It is mainly used for heating and electricity production. Methane itself is a potent greenhouse gas, burning it releases CO2 bound for millions of years.

Coal

Coal is a black or brown solid fuel, most often present in sedimentary deposits. It contains mostly carbon, but also oxygen, nitrogen and sulphur. In Europe, the use of coal drastically increased with the Industrial Revolution. It is used in thermal plants to produce electricity.

Nuclear Energy

Nuclear energy is the energy stored in atoms. The majority of electricity from nuclear power plants is produced by nuclear fission of uranium or plutonium, using up the material, thus a non-renewable source of energy. Besides the unsolved problem of the storage of radioactive waste for millennia, incidents in nuclear power plants are a large threat.

Solar

The sun's energy can be collected and used. Collecting solar energy with the use of solar panels dates to the year 1890. The energy was used to heat water. Today, different technologies are used to harness solar energy, not only to heat the water (solar thermal) but also for the transformation to electric power (photovoltaic). Solar energy is affordable and almost without a negative impact on the environment.

Wind

The wind has been used to power windmills for centuries. Windmills transform energy from wind power to be used for grinding grain or pumping water from wells. Nowadays, wind is used by wind turbines to produce electricity. The technology of collecting wind energy is environmentally friendly but has one flaw: There is not enough wind everywhere.

Water

Hydropower plants are used at the present time to produce electricity like flow power stations in a running river, reservoir power stations with dams, and tidal power plants at seashores. Technology is still evolving, for instance: Ocean thermal energy conversion (OTEC) is a process or technology for producing energy by harnessing the temperature differences (thermal gradients) between ocean surface waters and deep ocean waters.

There is another source of hot water on Earth, and it can be used as an energy source, too. Hot water is stored under the Earth's surface named geothermal energy. It is not only used for heating buildings and greenhouses but also for spas and health resorts due to its therapeutic effects.

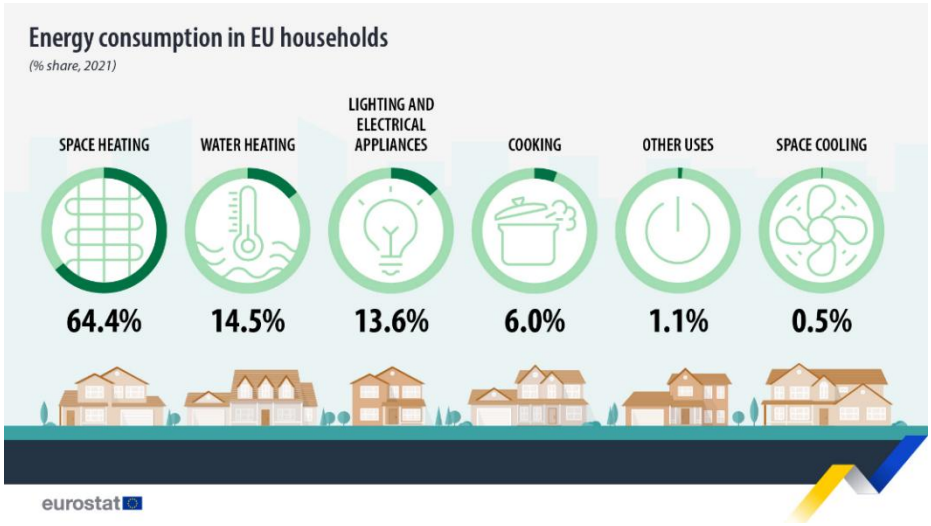
Biomass

Biomass represents all organic material from wood, household waste, forest residues, sawdust and compost residues to animal residues. It is used to produce electricity or heat. Its eco-friendliness is disputed as burning wood in stoves produces particle matter and scientific assessments on the overall CO2 neutrality of burning wood are still ongoing.

3. Information on housing: current energy use & options for change

Housing is an important factor in energy consumption in Europe, accounting for a significant portion of the continent's energy demands. Understanding existing energy consumption patterns in European households, as well as identifying possible areas for change, is essential for meeting sustainable energy targets and lowering greenhouse gas emissions.

Graph:The Current Energy Use Landscape



Source: https://ec.europa.eu/eurostat/documents/4187653/16179935/energy-consumption-households-2021.png/4426ee03-57b9-d31a-cb61-5107859e6860?t=1685705113234

In 2021, households in the European Union (EU) consumed an average of 11.0 million Terajoules of energy per year. This accounts for over a quarter of the EU's total final energy consumption, emphasizing the significant energy footprint of residential buildings.

Heating accounts for 64.4% of total energy consumption in households; the next highest energy-consuming activities are water heating (14.5%), electricity for appliances and lighting (13.6%) and cooking (6.0%). The EU's energy requirements differ depending on the climate, with warmer climates generally requiring more electricity for cooling purposes and colder climates generally having higher heating needs.

The European Household Fuel Mix

At 33.5% of total energy use, natural gas dominates the energy landscape in European households. With a usage of 24.6%, electricity comes in second, while renewable energy sources like wind and solar power are becoming more and more popular, accounting for 21.2% of household energy use.

Reliance on natural gas brings concerns over energy security and the possible effects of shifting gas prices. A more sustainable and secure energy future for European homes requires increasing the use of renewable energy sources and improving building energy efficiency.

Emissions of Greenhouse Gases

The primary energy source used in buildings is fossil fuels, which release greenhouse gases into the atmosphere. These gases trap heat, which leads to global warming and all its consequences, such as higher sea levels, more extreme weather and negative effects on the welfare and health of people.

The need for change

Reducing energy use and adopting a more sustainable and ecologically conscious way of living at home is crucial since housing has a significant impact on greenhouse gas emissions and energy consumption.

Strategies for Transitioning and Saving Energy

The ambitious targets the European Union has set for reducing greenhouse gas emissions have an immediate effect on how energy is used in European homes. By 2030, building energy efficiency will have to improve by 32.5%, according to the EU "Energy Efficiency Directive." A substantial investment in insulation, heating systems and renewable energy technology is required to achieve this ambitious goal.

Different techniques can be put into practice to decrease energy usage in European households in addition to increasing energy efficiency:

Using energy-saving lights and appliances: Energy usage can be significantly reduced by swapping out old appliances for energy-labelled A or A+ ones and converting them to LED lights.

Energy-efficient practices such as using thermostatic radiator valves for controlling heating, turning off lights and devices when not in use as well as adjusting heating and cooling settings to the proper levels may all contribute to saving considerable amounts of energy.

Using renewable energy sources: Installing heat pumps for effective heating and cooling and solar panels for electricity generation can drastically reduce dependency on fossil fuels and save energy costs.

Integrating green building techniques in newly constructed buildings: The lifespan of an energy-efficient building can be extended by designing it with sufficient insulation, ventilation, and smart building technologies.

Examples of successful initiatives

There are already several effective programs that exist that reduce energy consumption in European houses, including:

1. In Greece, the "Exikonomo 2023" program is being implemented for the energy upgrade of residential buildings, aiming to reduce the energy needs of buildings and the emissions of pollutants that contribute to the deterioration of the greenhouse effect in order to achieve a cleaner environment.
2. A German bank encourages homeowners to engage in energy-saving measures by offering low-interest loans for upgrades in energy efficiency.
3. The introduction of subsidies for solar panels and heat pumps by France aims to promote the adoption of renewable energy technologies in households.

In conclusion

Reducing energy consumption in European households presents both a challenge and an opportunity. Through the implementation of energy-efficient measures, the adoption of renewable energy sources, and the promotion of sustainable building practices, we can reduce our dependence on fossil fuels, enhance energy security and protect the environment. The European Union's ambitious climate goals, along with the growing availability of energy-efficient technologies, present a solid foundation for achieving sustainable energy consumption in European households.

4. Information on mobility: current energy use & alternative options

Where are we heading? What comes to us?

Travelling means going to school, shopping and visiting friends or acquaintances. We spend an important part of our existence travelling. We travel for many different reasons. We travel for work, to see friends or family, to discover the world or just to relax. During the recent decades, air travel has increased significantly, and flying has become cheap and commonplace, unfortunately with major impacts on our climate.

Depending on the distances, purposes and situations, we travel on foot, by bike, car, train, bus, boat or plane. But it's not just us who move from one place to another. The things in our everyday lives are also transported to us, usually from far away.

New technologies are often fascinating. This fascination can also tempt us to stop thinking since a solution is already available. For our vision, however, we can dream boldly and question everything. For example (in my optimal future): do I even want to spend a lot of time getting from A to B every day to get through my daily routine? The COVID-19 pandemic has shown us that we don't have to go down many paths at all by going virtual.

Modes of transport

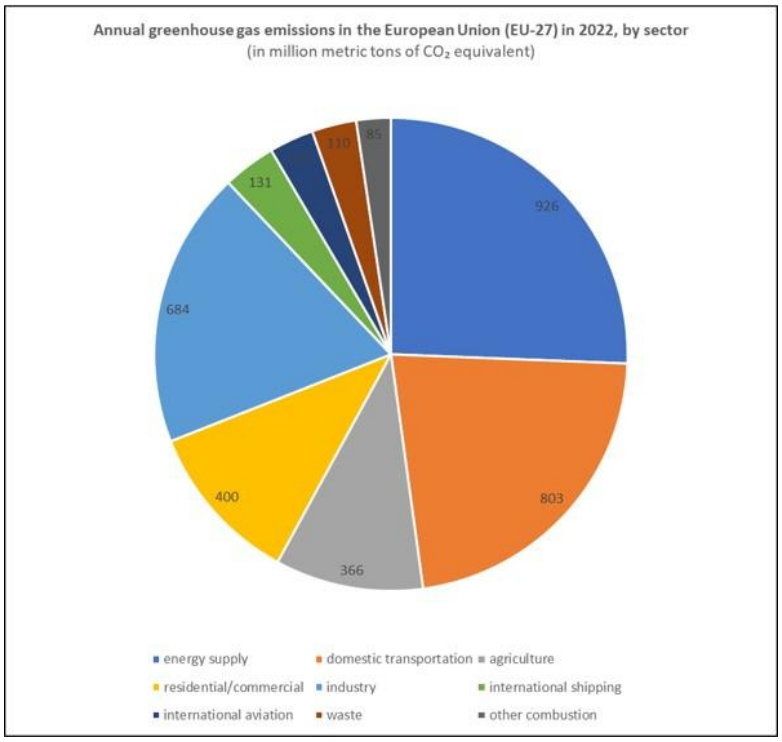
Passenger transport has a fixed schedule and routes, most of the time. More recently, taxis have been duplicated by ride-sharing, planes – by charter flights or tourist transport. Local transport is an integral part - the backbone - of a city. The long-distance forms (national or international), which have exploded in recent decades, have led to a change in our way of life. Before, many people did not leave their village or a geographical area of several tens of square kilometres. Today, families travel even with young children, to go on vacations, to go to work or to visit relatives.

The transportation of goods is vital for products to reach consumers or for manufacturers to have access to raw materials of clarity and time or components. The existence of easy transport routes influenced the appearance

and evolution of many cities and villages and the cargo routes led to wars (from the Crusades to the crises in the Suez Canal area) or the discovery of America or other territories.

Our traffic, and here we are looking at our passenger traffic as well as our freight traffic, causes greenhouse gases that further fuel the climate crisis. And our mobility behaviour also has a major impact on our land consumption and contributes to the input of pollutants.

Graph Annual greenhouse gas emissions in the European Union



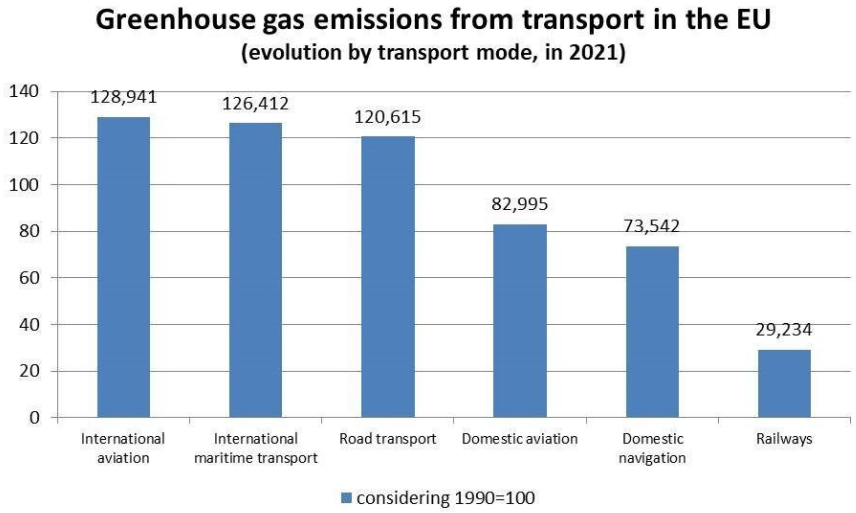
Source: STATISTA - https://www.statista.com/statistics/1171183/ghg-emissions-sector-european-union-eu/

Domestic transportation is the second most pollutant activity in the hierarchy of greenhouse gas emissions, after energy production (a good part of which goes to fuel electric vehicles – trains, trams, electric cars). So, there is room to substantially improve this situation that generates pollution and leads to a decrease in the quality of air and life, especially in big cities.

What are the most polluting means of transport?

Greenhouse gas emissions from transport evolution in the EU, by transport mode (2021, comparison with 1990 – considered as 100). But the results are influenced by the pandemic situation of 2020-2021:

Graph: Greenhouse gas emissions from transport in the EU

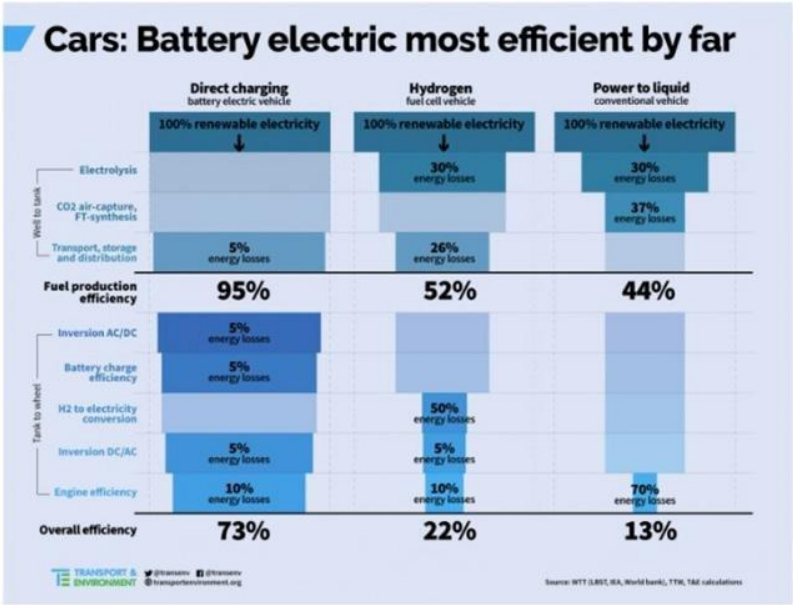


Source: https://www.eea.europa.eu/data-and-maps/daviz/greenhouse-gas-emissions-from-transport-7

Compared to 1990, foreign air travel has recorded the largest increase in GHG (greenhouse gas) emissions, followed by international maritime transport (mainly cargo). In 2021, when the effects of the pandemic were still being felt, emissions from road transport increased by only 20% compared to 1990, while emissions from rail transport were greatly reduced. So, if we want to reduce these emissions, rail transport should take over a share of air transport (especially shorter distances) and road transport.

As for the efficiency of the different types of engines, this graph, released for the first time in 2017, is suggestive. An average battery electric vehicle, fuel cell vehicle and conventional engine vehicle were compared. They used both fuel production efficiency and tank-to-wheel losses. The BEV engine has the highest fuel production efficiency and the lowest share of energy losses while operating. That makes it the best option for private use vehicles, in the context of the green vehicles revolution.

Graph: Influence of External Environmental Factors on Range Estimation of Autonomous Hybrid Vehicles – (Scientific Figure on ResearchGate)



Available from: https://www.researchgate.net/figure/Effectiveness-of-vehicles-with-different-propulsion_fig2_332101566 [accessed 12 Oct 2024]

Country-specific facts: Germany

Climate change and energy transition in Germany: brief summary

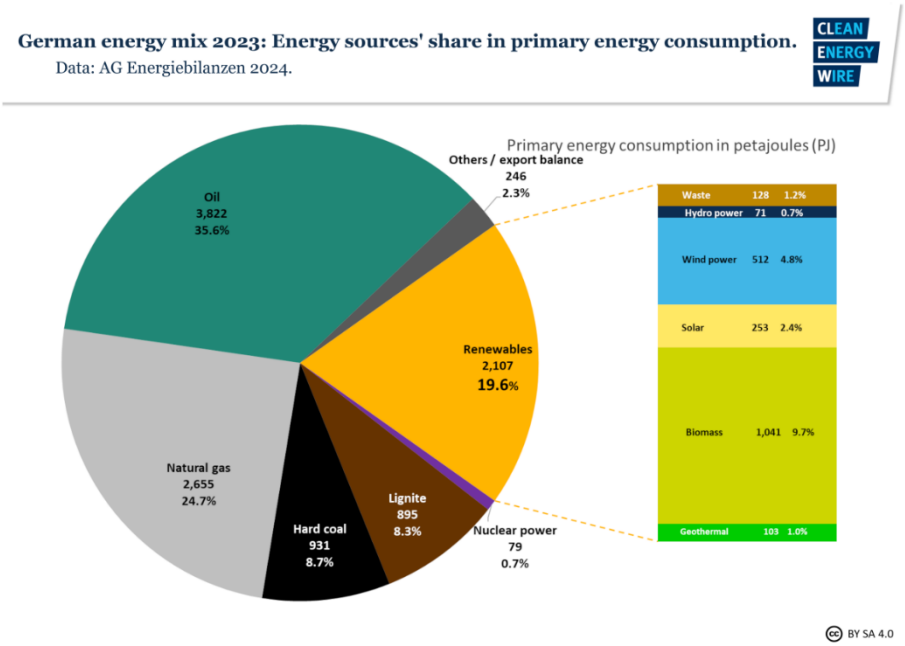
Germany plays a key role within the European Union in combating climate change and promoting the energy transition. As the largest economy in Europe and one of the largest energy consumers, Germany bears a special responsibility when it comes to reducing greenhouse gas emissions and transitioning to a sustainable energy supply.

According to the European Statistical Office Eurostat, Germany was the largest emitter of greenhouse gases in the EU in 2020, underscoring the urgency to take effective measures to reduce emissions. As part of the European Green Deal, the EU has set a goal to become climate-neutral by 2050 and Germany has committed to achieving this goal by 2045. To achieve this ambitious goal, Germany has taken several measures, particularly in the field of renewable energies.

In a European comparison, Germany is seen to play a pioneering role. According to Eurostat, about 38.5% of German electricity came from renewable sources in 2020, making Germany one of the leading countries in this area, while the EU average was about 34%. The expansion of renewable energies is a central pillar of the German energy transition. In recent years, Germany has seen a significant increase in the installation of wind turbines, both onshore and offshore, as well as photovoltaic systems. In 2021, about 42% of the electricity consumed in Germany already came from renewable sources. By 2023, Germany had already reached 56%.

The rapid increase in renewable energies in the German electricity mix in recent years is also due to the consequences of the Russian war in Ukraine. A retraction from dependence on Russian natural gas has led to the expansion of renewable energies, which in turn shows that the great advantage of green energy lies not only in lower emissions but also in national (and European) as well as private independence.

Graph – German energy mix (2023)



Despite its progress, Germany still faces challenges in reducing greenhouse gas emissions. The industry, transport sector and heating of buildings are areas where Germany continues to record high emissions. The retraction from fossil fuels is also seen as a challenge, even more so because Germany, compared to some European neighbours, is taking a special path with the simultaneous phase-out of nuclear and coal power. This requires significant investments in energy infrastructure, including improving grid capacities and storage technologies, to achieve climate goals. Another focus is on increasing energy efficiency to reduce overall energy consumption. Germany has set the goal of improving energy efficiency by 30% by 2030. This includes measures in industry, the transport sector and buildings.

Germany also plays an important role in technological innovation and the development of green technologies that can contribute to emission reduction both nationally and internationally. German research and industry are

at the forefront of developing technologies such as electromobility, hydrogen technology and energy storage solutions.

In summary, Germany's role in the European energy transition and the fight against climate change is of central importance. With its ambitious goals, economic strength and technological innovation, Germany has the potential to serve as a role model to make a significant contribution to achieving global climate goals. However, it must be acknowledged that humanity can only halt the climate crisis together, which is why global actions, international cooperation and learning from each other are the keys to a livable future.

Country-specific facts: Austria

Renewable Energy

Renewable Energy is often associated with green and clean energy and often they have cross-overs but the definition is something else. Clean Energies are those that do not release pollutants like carbon dioxide and green energy always comes from natural sources. One can talk about renewable energy if it comes from sources or processes that are refilled constantly and automatically. This includes hydroelectric power, wind energy, solar energy and geothermal energy. Renewable energy sources produce only very few GHGs, but are only available in limited amounts, therefore should be used wisely.

Energy Transition

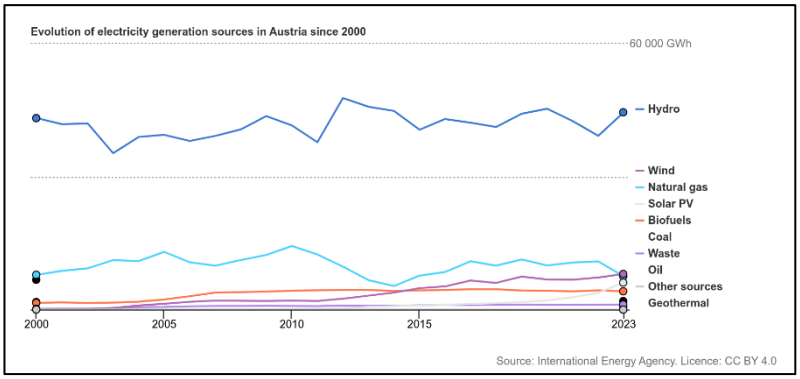
Now that we have defined renewable energy, we can talk about energy transition. The overconsumption of fossil fuels causes accumulation in the atmosphere and thus causes the climate crisis, this is why energy transition is necessary. It is the move by the global energy sector away from fossil fuels towards renewable energy. In other words, it is the transition from the use of fossil fuels to renewable energy.

This is not always easy, so it is necessary to have long-term strategies to create cleaner and sustainable options that reduce carbon emissions and strategies for decarbonisation. There is also a tool developed by the World Economic Forum, called the Energy Transition Index (ETI), which helps to assess and compare the process of different countries in transitioning their energy sources. They are rated based on two equally weighted factors: transition readiness and system performance. A country's performance in each of these dimensions is measured in percentages.

Energy Transition in Austria

Austria ranks sixth place on the list of 115 surveyed countries on the ETI, with 71% in both dimensions.

Graph: Evolution of the electricity generation sources (Austria, 1990-2023)



Source: https://www.iea.org/countries/austria/electricity

As you can see in the picture above, the main source of energy is Hydropower with around 39.000GWh, second place is natural gas with around 11.000GWh, third is wind with 7.000GWh. Other fossil fuels like oil have 668GWh and coal has 1.962GWh.

Passive Houses

Passive House is an energy-saving building standard introduced in Austria that focuses on minimum energy consumption for heating and cooling. The company, founded in 1994, requires buildings to be significantly more energy efficient than conventional construction. Key features include heat energy reduction of up to 90%, efficient use of solar energy, good ventilation and a focus on overall comfort. Austria's commitment to Passive House has resulted in the construction of more than 14,000 such buildings, making it a global leader in sustainable construction.

Sustainable housing

Austria is world-renowned for its commitment to sustainable housing, particularly the innovative Passive House concept. Proactive steps taken by Austria in 2009 further consolidated its position as an EU eco-innovation leader and improved the energy efficiency of public and private buildings. Vienna, in particular, has adopted Passive House standards across a variety of building types, reflecting the country's commitment to environmentally friendly living.

Public transport

Public transport in Austria is highly rated for its cleanliness and efficiency, making it one of the best in Europe. An extensive network of trains, trams and buses ensures easy access to various destinations. In cities with particularly well-developed public transport, such as Vienna, options include bus, tram, train and underground systems. The major railway companies ÖBB and Westbahn operate national and international routes and provide reliable, punctual connections.

In addition, buses (including regional and international lines such as FlixBus) complement the train network and provide easy connections to smaller cities. Austria's commitment to environmental sustainability is reflected in environmentally friendly transportation options, such as trams and buses in some cities. Overall, public transport in Austria is known for its convenience, affordability and commitment to environmental protection.

E-Mobility

Austria is actively promoting electric travel, which includes electric vehicles, electric scooters and shared travel services such as ShareNow. As an environmentally friendly and convenient means of transport, the use of electric scooters is increasing in the country. ShareNow is a car-sharing service that contributes to the electric vehicle sector by offering short-term rentals of electric or hybrid vehicles. The integration of shared e-scooters and electric cars is in line with Austria's commitment to sustainable urban mobility, reducing emissions and providing residents with flexible, environmentally friendly transport options. This multi-faceted approach underlines Austria's commitment to diverse e-mobility solutions to create a cleaner and more efficient transport system.

Country-specific facts: Greece

Greece's Transportation and Energy Consumption

In Greece, the energy landscape is still dominated by fossil fuels. Fortunately, both the government and society are beginning to understand the importance of switching to renewable energy sources and adopting sustainable forms of transport.

Fossil Fuels and Renewable Energy Sources

Picture: windmills in a rocky area

Source: https://www.pexels.com/el-gr/photo/7439974/

In 2021, fossil fuels accounted for a significant 82% of Greece's total primary energy supply, with natural oil (47%), gas (27%), and lignite (8%) being the primary sources. The government has set ambitious targets to increase the use of renewable energy in order to reduce dependency on these polluting fuels. In the same year, renewables contributed 18% of Greece's primary energy supply, with wind (6%), hydropower (3%) and solar (2%) leading the way. Source: https://www.iea.org/countries/greece/energy-mix

Handling Insulation Deficiencies in Buildings

Greece's increasing energy usage is partly caused by insufficient building insulation. About half of Greek buildings are not properly insulated against heat, mostly because they were built before 1980, and thermal standards were not strictly enforced in the decades that followed. This deficiency leads to significant heat loss in winter and heat gain in summer, contributing to the country's high energy consumption.

Attempts to resolve this issue are hindered even more by the absence of an Energy Performance Certificate (EPC), which is required for buildings when they are rented or sold. An EPC system would allow for the identification of inefficient buildings and the promotion of energy-saving measures.

Public Transportation

Greece's public transportation system is a vital part of the country's transport infrastructure, linking cities, towns and villages on the mainland and islands. Reducing greenhouse gas emissions, air pollution and traffic congestion all rely on it. Greece has a wide range of public transportation options, such as regional trains, trams, city buses, metros and ferries.

Picture: Athens Metro batch 3 train, at Omonia metro station.

C messier, CC BY-SA 4.0, via Wikimedia Commons

Metros operate quickly and comfortably within city centres, while city buses connect most urban areas and their suburbs. Another environmentally friendly and sustainable urban transport option is the tram. The national railway operator operates a network of regional trains linking cities and towns across the mainland, providing intercity travel options.

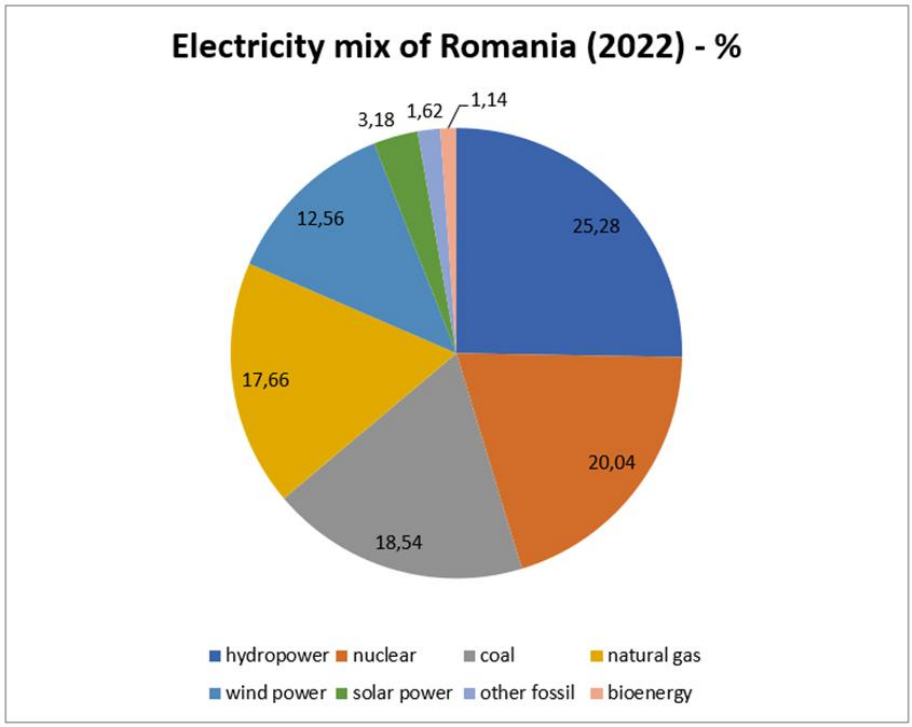
Improvements in E-Mobility

To promote sustainable transport and reduce dependence on fossil fuels, Greece is gradually implementing e-mobility. The Greek government and business sector are moving quickly to accelerate the transition to electric vehicles, with more than 7000 EVs expected to be sold by 2023.

Country-specific facts: Romania

The electricity (power) supply mix of Romania in 2022 was as follows 25.28% hydropower, 20.04% nuclear, 18.54% coal, 17.66% natural gas, 12.56% wind, 3.18% solar, 1.62% other fossil, 1.14% bioenergy.

Graph Electricity Mix Romania



https://www.statista.com/statistics/1236358/romania-distribution-of-electricity-production-by-source/

Renewable energies

On average, Romania has a higher share of renewable energy sources than many other EU countries. Less than 40% of the electricity comes from fossil fuels. However, at the same time, this leads to a dependency on imports – the fluctuation of sunshine hours, wind speed, or river flows results in a high volatility of electricity production. This is the main reason for the strong resistance against the complete decarbonization of electricity production.

Also, the nuclear power plant in Cernavoda has two functional power units and two other power units whose construction was frozen at an early stage. The Romanian government has searched for several alternatives to complete their construction, at least for one of the two units. Thus, the energy consumption was reduced. Due

to the higher prices, some industrial activities were reduced or even stopped. This led to a decrease in energy consumption which does not necessarily mean higher energy efficiency (unfortunately).

As an efficiency measure to reduce the dependency on fossil fuels, the ”Greenhouse” program for households was implemented, which assured subsidies for hot water panels on the rooftops. A similar program was also available for public utility buildings (such as schools and others). In 2024, the photovoltaic/heat pump program component (its second phase) which should provide significant subsidies for the photovoltaic panels, was blocked due to administrative procedures. these delays contribute to a lack of trust among citizens, but the situation is improving.

Housing

Modern building standards meet the requirements of energy-efficient buildings. The high price of electricity and heating is an important drive for the existing house units to search for solutions in this area. The measure aiming to finance a part of the expenses for insulation is somehow lost in administrative procedures as well (mainly due to lack of money). However, the house owners are constantly trying both to improve their living conditions by transforming the existing ones and to comply with the insulation standards. The real estate sector has had a real boom which was interrupted by the crisis periods. A lot of money has been invested in purchasing properties, either new or old ones.

Public transportation

The public transport in Romania is seriously affected by the old road infrastructure and the status of the old vehicles. During rush hours, people waste precious time waiting for the buses in the stations, or inside the crawling vehicles, because of the traffic jams. The same goes for the inter-city buses, which are the first option for short and medium-distance passenger transport. Luckily, the major cities improved their public transportation fleet with new electric vehicles and trams. The subway network (available only in Bucharest for the time being) will be enlarged soon by building the first metro line in Cluj, the second largest city in Romania.

Unfortunately, a huge number of buses are travelling on international routes, transporting passengers to/from many European countries. The passengers are people working abroad who travel to their homes several times a year. This situation is a result of the extremely bad situation of the railways, which have the slowest average speed in the entire EU region, having multiple delays.

Air transportation has experienced a boom in the past decade, due to the low-cost companies offer, both for the people working abroad and for the tourists travelling to and out of Romania (an increase in the number of incoming tourists has been reported, especially for city breaks holidays and events such as UNTOLD).

E-mobility

The electric cars are still not enough present on the Romanian roads. Their price is still too high for an average Romanian. The electricity prices are also prohibitive, and the charging network – insufficient. Many supermarkets or public places have charging stations, but many of them are not in use. Some steps forward are to be noticed after the state subsidies and vouchers to purchase a new electrical vehicle can reach even 800 euros (for a BEV). But not many citizens can cover the difference.

As for the e-scooters and bikes, they are becoming more and more popular in big cities, for deliveries, going to work ... but, here the road infrastructure is a little bit behind the changes.

Best practice examples: Germany

Agro-Photovoltaic and sustainability in schools

1. Agro-photovoltaics (APV) is an innovative method that combines agriculture and photovoltaics to increase land use efficiency. In Germany, several notable projects serve as positive examples of the successful implementation of agro-photovoltaic systems:

2. APV Pilot Plant in Heggelbach: In the municipality of Herdwangen-Schönach by Lake Constance, one of the first agro-photovoltaic systems in Germany was commissioned in 2016. On one hectare of land, both electricity and agricultural products such as wheat, potatoes, clover grass and celery are produced. The facility demonstrates that combined use of the area can increase overall productivity per hectare.
3. APV-Resola in Bayreuth: The project "Regional Energy with Solar Power from Agricultural Systems" (Resola) in Bayreuth is another example. Here, photovoltaic modules are installed over raspberry and blackcurrant bushes to provide the plants with protection from direct sunlight and hail while simultaneously generating electricity.
4. APV Facility in Donaueschingen: Since 2017, APV systems have been used on the premises of the Demeter farm Schwab. The facility combines power generation with sheep breeding, with the animals grazing under the solar modules.
5. Fraunhofer ISE Projects: The Fraunhofer Institute for Solar Energy Systems ISE has initiated and accompanied several APV projects, including the project "Agrophotovoltaics – Resource-Efficient Land Use" (APV-REL). The institute researches and demonstrates how APV can be used economically and ecologically on agricultural land. These projects show that agro-photovoltaics has the potential to decentralize energy production, improve land use efficiency and strengthen the resilience of agriculture to climate change. They serve as role models for the integration of renewable energies into agriculture and can help to further advance the energy transition in Germany. APV systems find another application in reforestation projects, ideally combining climate protection and climate adaptation.

Picture: Photovoltaic system with an output of 135 kilowatts

Source: https://www.ise.fraunhofer.de/de/presse-und-medien/news/2024/photovoltaik-als-schutz-fuer-junge-baeume.html

6. The Fraunhofer Institute for Solar Energy Systems ISE is monitoring a mobile photovoltaic system that was installed over a reforestation area in a quartz sand pit near Meßkirch as part of the "Agri-Photovoltaic Model Region for Baden-Württemberg" project. This system provides the necessary shading for the young trees and can be relocated after their growth. Emil Steidle GmbH & Co. KG, which operates the pit, uses the electricity from the system to power its machinery, with the surplus being fed into the grid. The Forest Research Institute of Baden-Württemberg is studying the development of the trees in comparison to an uncovered reference area.

Learning sustainability in schools

The Johannisberg School in Witzenhausen is an excellent example of promoting renewable energy within an educational context. Here, students from grades eight to ten have actively worked on various projects related to renewable energies. These include:

- The construction of five small wind turbines (with their own blueprints), seven water wheels, an updraft power plant, several solar ovens, and five mini solar cars
- The design of an energy terrace as a green classroom and a school garden as a learning site for renewable energies and climate protection
- Additional projects such as "Environmental protection as a meaningful companion to physics classes" – a homemade model house for energy use, an upcycling project, an energy transport project, a photo project on the Agenda 2030 with European partner schools, data access and analysis to the school's photovoltaic systems, and a weather station for teaching purposes
- Currently still in planning are the linking of various learning sites through theme paths and audio guides, the installation of energy storage systems, a project on 'energy plants', waste prevention projects, and the expansion of cooperation with other committed schools

The projects at Johannisberg School not only combine independent learning with a meaningful topic but also connect different scientific subjects (geology, physics, biology) with practical skills. Theoretical impulses were put into practice and have been scientifically monitored and optimized to this day.

While the idea for the project originated from a dedicated physics teacher, who is also the head of a Junior Engineer Academy course and the MINT representative of the school, various subject teachers were brought on board. The financing was provided by the district upon the principal's request, who also continuously informed himself about the progress of the project, expressed great appreciation and had a motivating effect on the participants. Furthermore, the janitor was involved by advising on suitable areas and making them accessible. Parents of the students also supported the project with various construction measures and by providing the necessary tools. In addition, a cooperation with the school's health team was established, and other departments are now planning follow-up projects (e.g., a political perspective on the topic in social studies classes).

Picture: Johannisberg School Junior Engineering Academy

https://www.hna.de/lokales/witzenhausen/witzenhausen-ort44473/schueler-der-johannisberg-schule-witzenhausen-konstruieren-windanlage-90148460.html

The project results are not only an exciting focal point at the school today but have also attracted regional attention and interest through various newspaper articles due to their success. Moreover, students have developed an awareness of the challenges surrounding the topic of energy transition, as well as being able to record successful experiences.

Best practice examples: Austria

Energy transition in a rural municipality

50 years of border region along the Iron Curtain (Güssing is 8km away from the Hungarian border) border), poor transport infrastructure, an economically weakest region in Austria with the lowest Austria with the lowest per capita income, few businesses, and therefore few jobs. Cheap oil neglected, poorly thinned forests, high

dependence on fossil fuels – that was the initial situation of Güssing in the 1990ies, a rural town with a population of 4000.

Today it is the first energy self-sufficient municipality in Austria with 100% renewable energy.

Key success factors:

1. **Individuals with a vision in key positions**: a newly elected mayor and a technician were the dream team to thrive the innovation.
1. **Taking chances**: Güssing got a lot of funding from the Objective 1 program of the EU in 2000-2006
2. **Build a Coherent strategy**: several municipal council resolutions were taken to secure continuity and broad support in the population
3. **Exploit Synergies**: as the municipality started to renovate public buildings and built a local heating plant, the forest owners grew more interested in forest maintenance to make money by thinning timber.

Benefits:

In 2002 the" Europäische Zentrum für Erneuerbare Energie" (EEE) – European Center for Renewable energy was founded. It is a research and development institution for renewable energy providing green high-tech jobs in a rural area. Above it inspires other municipalities to follow suit with excursions and training.

Lessons learned:

1. **Awareness raising**: Information events and citizen meetings are needed to overcome prejudices and reduce resistance against the transition. Awareness for energy saving does not automatically stem from the municipalities effort but needs repeated communication work.
2. **Step-by-step**: starting off with a small local heating plant, the advantages become visible and a large biomass power plant with 2 MW of electricity and 4,5 MW heat supplies the municipality with renewable energy

Conclusion:

The energy transition is possible for a whole municipality. It needs commitment, long-term thinking and persistence.

Please find more information at the following link: https://www.guessing.co.at/index.php/english-information

Mobility service for the "Last mile"

Go-Mobil is a door-to-door flexible transport service that operates in 36 peripheral and rural areas in Carinthia, providing residents access to groceries, doctors, post offices and bus stops; the service complements conventional public transport systems. From the publicly available information, it could be gathered that the service usually operates using micro public transport systems, while the on-demand services use cars, vans and minibuses (up to 9 persons including drivers). The service is accessible on working days (8.00-24.00), on Saturday (9.00- 24.00) and Sunday (9.00-22.00). Journeys must be pre-booked by phone. Single tickets cost 3.80 euros if this is bought in local shops, otherwise, they cost 5.20 euros.

Between 70% and 100% of costs are covered by ticket revenues and membership fees (including national train card), with the remaining cost being covered by municipalities, the state of Carinthia and the federal government financing regional public transport. It is worth noting that Go-Mobil is included in the national train timetable information platform.

Key success factors:

1. Mobility in areas of poor/nonexistent public transport.
2. Closes the gaps between the front door and the public transport station

Benefits:

- People living too far from a bus stop
- People whose 'normal bus does not drive in the evening'
- People with limited mobility
- People who need adapted transport

Lessons learned:

- Pre-booking via phone works best for people with disabilities
- Mobility for everyone must be subsidized by the municipality or state

Conclusion:

Go-Mobil, Austria Go-Mobil is a door-to-door flexible transport service that operates in 36 peripheral and rural areas in Carinthia, providing residents access to groceries, doctors, post offices and bus stops; the service complements conventional public transport systems. It offers meaningful employment (as drivers) to the inhabitants of villages while helping vulnerable population groups (especially physically impaired people) to escape social isolation.

Please find more information at the following link: www. gomobil-kaernten.at

Best practice examples: Greece

Tilos - A Model of Renewable Energy Success

Tilos, a small Greek island in the Aegean Sea, achieved a groundbreaking energy transition in 2016, becoming Greece's first self-sufficient renewable energy community. In 2016, the small Greek island of Tilos became the first in the country to power itself entirely with renewable energy. By using solar panels, wind turbines and advanced batteries, Tilos now generates 100% of its electricity from clean, sustainable sources. This achievement positions Tilos as a global leader in the move towards eco-friendly communities and serves as an inspiring example for others around the world. The story of Tilos is a testament to the possibility of achieving a sustainable and green future, even in remote and beautiful places like this Aegean gem. Tilos uses wind turbines and battery storage to generate 100% of its electricity from renewable sources, marking a remarkable global achievement.

Picture: Tilos Island

Source: https://www.flickr.com/photos/kostas-limitsios/36171490660

Key Success Factors:

1. Strong Political Leadership: Mayor Giorgos Xylas played a pivotal role in securing funding and community support.
2. Community Engagement: Residents actively participated in workshops, provided feedback and volunteered for the renewable energy installation.
3. Financial Support: Funding sources included government grants, private investment and crowdfunding.
4. Technological Innovation: Smart grid technology was employed to efficiently manage the island's energy system.

Benefits:

The transition to renewable energy on Tilos has brought about significant benefits for the island. Energy costs have been drastically reduced by an impressive 90%, providing economic relief and sustainability. Furthermore, the island has successfully eliminated carbon emissions, contributing to a cleaner and healthier environment.

Lessons Learned:

The energy transition on Tilos is a testament to what can be achieved when communities work together to address the climate crisis. The island is now a shining example of how renewable energy can be used to power a sustainable future. In more detail, the lessons learned from this project are the following:

1. Feasibility of 100% Renewable Energy: Tilos demonstrates the viability of transitioning to 100% renewable energy, even in small, remote communities.
2. Essential Community Engagement: The project's success hinged on strong community support.
3. Need for Financial Support: Diverse funding sources, including grants and crowdfunding, were crucial for project success.
4. Role of Technological Innovation: Smart grid technology played a pivotal role in overcoming challenges and managing the island's energy system.

Conclusion:

Tilos stands as a beacon of hope, showcasing the potential for clean, renewable energy to power a sustainable future. Its success offers valuable lessons for communities worldwide embarking on the path of energy transition.

Please find more information at the following link: https://eunice-group.com/projects/tilos-project/

Picture Source https://www.flickr.com/photos/kostas-limitsios/36171490660

General Hospital of Kalamata - Green Hospital Practices

The General Hospital of Kalamata has positioned itself as a pioneer in prioritizing environmental consciousness, undertaking substantial initiatives to integrate eco-friendly policies and implement energy-saving measures. These efforts signify a proactive commitment to sustainability, reflecting the hospital's dedication to reducing its ecological footprint and promoting environmentally responsible practices. By embracing a green ethos, the hospital sets an important example within the healthcare sector, illustrating how institutions can contribute positively to both public health and the well-being of our planet.

Picture – General Hospital of Kalamata

Source:https://www.nosokomeiokalamatas.gr/nosokomeio-kalamatas-to-1o-quot-prasino-quot-nosokomeio-tis-choras/

Key Success Factors:

1. Solar Thermal System Installation: The hospital's commitment to installing a solar thermal system has been pivotal in utilizing solar energy for space heating and hot water production, thereby reducing reliance on traditional energy sources.

2. Bioclimatic Infrastructure Upgrades: Undertaking bioclimatic projects and implementing energy-efficient technologies, such as waterproofing and dehumidifying ceramic paints, highlights the hospital's dedication to upgrading building infrastructure and enhancing energy efficiency.

Benefits:

1. Reduced Energy Consumption: The implementation of solar thermal systems and energy-efficient infrastructure aims to significantly decrease the hospital's overall energy consumption.
2. Cost Savings: By incorporating renewable energy sources and eco-friendly practices, the hospital anticipates substantial cost savings, contributing to its financial sustainability.
3. Environmental Protection: By actively participating in environmental protection, the hospital minimizes carbon emissions and promotes sustainable healthcare practices.

Lessons Learned:

The success of the hospital's green initiative has provided valuable lessons. Collaborative efforts among hospital management, employees and local stakeholders have underscored a collective responsibility to foster sustainable practices within the healthcare institution and the wider community.

Conclusion:

In summary, the General Hospital of Kalamata's green hospital practices exemplify a comprehensive approach to sustainability, encompassing energy efficiency, collaborative partnerships and a vision for a healthier, environmentally conscious future. The key success factors, cooperative endeavors and anticipated benefits underscore the hospital's commitment to environmental stewardship and sustainable healthcare practices.

Please find more information at the following link:
https://www.scirp.org/journal/paperinformation?paperid=97405

Best practice examples: Romania

The local competition "Participate actively. Collect selectively"

The schools of Fălticeni have been competing since 2015 in the local contest for selective waste collection "Participate actively. collect selectively", organized by the town hall. This competition for the town educational units, (having as partners the town municipal waste collection company and a private company, specialized in selective waste collection) appeared due to the participation of the municipality in the national competition "City of Recycling 2015". It became a permanent action ever since, with a calendar comprising two stages for each school year (October-December and January-June). Also, the initiative was complemented by other educational actions and awareness campaigns at local, national and international levels ("Cleanliness Week", "Eco-School", "Let's Do It", etc.).

Key success factors

The town hall counts on the support of the school institutions in the development of environmental responsibility among the young population. Students' parents, partner companies and small businesses that operate near the schools are also involved in the competition, thus empowering the local community. Local media coverage and awards, in addition to prizes, increase the impact of the action. For Romania, a country that is still in the intermediate stages of sustainability education, the impact is quite significant.

The town hall offers, from the local budget, substantial prizes for the first 9 places - starting from 40,000 RON (8,000 euros, divided between the two stages) for the first prize. Prizes are awarded according to the number of materials collected per capita (PET, paper, cardboard, aluminum, and iron). The money can be used exclusively to buy furniture, computers or other necessary equipment for schools/kindergartens. Within the educational units, the challenge goes further – the classes/study groups that collect the most have priority in spending the received money.

Apart from the contest, the schools also get involved in other activities aimed at recycling waste, such as the collection of used batteries – 4 new batteries are given for 20 handed-in used batteries, or periodic campaigns for the collection of electrical waste.

Picture: selective collection

Source: https://www.goscomfalticeni.ro/colectare-selectiva/

Positive aspects:

* Students participate in the selective collection action in an organized framework, under the guidance of teachers.

* Competition between schools/between the classes of each school or kindergarten is used to increase the amounts collected, but also to prove that it is possible to gain something from the action, apart from the ecological benefit.

* Parents are also involved and contribute to the success of their children.

* The money obtained is included in the investment budget of the school units, and the performance in the selective collection activities is an important criterion for allocating the funds available for current investments.

* Important quantities of recyclable materials are thus collected, being received in an organized manner, with minimal operating expenses.

* Decreased the pressure on the collection points in the neighbourhoods, which had become insufficient.

Lessons learned:

* A lot of work has been and is still needed to maintain a constant pace of selective collection through schools.

* The collective efforts have produced fruit after several years of trials and evaluations of the activities carried out.

* In this case, the material rewards, happily combined with the advertising of the results in the local press and social media, had a positive effect, in the end, stimulating competition among school-age pupils and providing a fair criterion for awarding important shares of the funds from the local budget, intended for schools.

The village (and school) of Ciugud - Alba

The Ciugud rural municipality, located close to Alba Iulia, can always compete with any other commune in Europe. It has 6 villages and almost 3,500 inhabitants (approx. 45% more than in 2000, when it had no jobs, no running water, no sewage, and no paved roads).

Context

Ciugud is the pioneer of the "smart village" concept in Romania and it is, starting from 2020, the classical case study, used by the Romanian government to illustrate this concept. This place attracted investors to the economic development area (built on a former communal pasture). The collected taxes and fees, along with various financing alternatives, made it possible for the local community to put in place numerous projects for public

infrastructure development, to modernize the schools and kindergartens, and, more importantly, to digitalize public services. In the field of "smart village" investments, Ciugud municipality developed a platform with digital public services for all citizens, payment machines for local taxes and fees, smart public lighting depending only on locally installed renewable sources (wind, solar), smart street video surveillance system, electric cars for the municipality and public charging stations (the highest number of electric charging stations per inhabitant in the country). The school was modernized and the first smart kindergarten in the area was opened (on the industrial platform where a lot of young people work).

Key success factors

"Ciugud Smart School" has been, since 2019, the first smart school in the Romanian rural area. It went from 100 to almost 250 students. Teachers use different educational resources for digital education, such as interactive smart boards, online platforms, educational software and chrome-books, but also augmented and virtual reality software for lab activities. The school is a smart building, controlled by apps and various software solutions, to reduce energy consumption. The lighting, ventilation, and heating are all automatically controlled (e.g. control of the amount of light falling on the student's desk and a constant temperature, regardless of the time/number of people present in the room). Many families have moved here both for the living conditions and for the educational services offered by the school which works now at full capacity. The price of the properties has increased as well.

The guarantee-return recycling system, officially implemented in Romania on December 1, 2023, started at the Ciugud school almost 3 years before. There is a "Verzulică/Greeny" robot and a virtual currency of its own with an exclusively educational role. A partnership was created with the American company ENVIPCO, an important global manufacturer of RVMs (Reverse Vending Machines). "Greeny" is a pilot test program to test the RVMs, at no cost to the school, but also an educational program, in the context of the guarantee-return system. Children receive "ciugubani/ciugu-money" for recycled products (plastic, paper, aluminum). The money is converted into real money, and used for educational projects. The project won 1st place in a national competition for recycling projects, in 2022, as the most innovative environment protection campaign.

A slogan was also born, based on a wordplay, which summarizes the value of these initiatives for Romania's experience: "Ciugud to be true" (an adaptation of "too good to be true").

Picture - ”Greeny the robot”

source: Ciugud city hall

Positive aspects:

- through a lot of work and a well-thought-out strategy, a backward rural area has turned into a center of modernity, with innovative solutions for efficient local administrative management;

- the economic momentum was reflected in the quality of people's lives and sustainable solutions;

- the place managed to stop the demographic decline and become a magnet for domestic and foreign investments.

Lessons learned:

- vision, consistency, and orientation for the citizens are needed to overcome inertia and bureaucracy;

- there are ways to improve the quality of life of the inhabitants. It depends on the strategic vision, consistency, and power of persuasion of those who apply them;

- a small community can initiate the transition to a sustainable future a lot easier because even if there may be more problems to solve, they are more specific and easier to target.

Best practice examples: Europe

The EURO standards for vehicles: a big step towards reducing traffic pollution

In Europe, a lot of regulations regarding the engine's minimal parameters have been adopted. The road transport sector represents one-fifth of the EU's greenhouse gas (GHG) emissions, and it is the main cause of air pollution in the cities. Citizens, cities and consumers want to move towards green mobility. However, transport is the only sector in the EU where emissions have continued rising in recent years. Heavy-duty vehicles (HDVs), such as trucks, city buses and long-distance buses, are responsible for more than 25% of GHG emissions from road transport in the EU and account for over 6% of total EU GHG emissions. These emissions continue to increase, especially in freight transport. This upward curve is mainly driven by growing road transport demand, which is expected to keep rising in the future.

Euro standards represent a set of regulations established by the European Union to limit the emissions of pollutants from vehicles, particularly nitrogen oxides (NOx) and particulate matter. They concern mainly auto vehicles, but also motorbikes, lorries, trucks, and off-road vehicles. The Euro 6 standard was introduced in 2014, and it applies to all vehicles produced since 2015. It was followed by Euro 6.2 in 2017 and Euro 6.3 in 2020.

In many European cities, such as Brussels, Paris, Milan, or Stuttgart, traffic restrictions or limitations have been established regarding excessively polluting cars. The measures mainly affect the owners of cars with diesel engines, but there are also obligations for those who drive cars with gasoline engines, with the pollution norm below Euro 5. In Brussels, there are areas marked "LEZ", i.e. "Low Emission Zone". For example, Diesel vehicles with a Euro 6 pollution standard can drive in the area, while a diesel vehicle with a Euro 4 pollution standard or less will not have access.

Germany is one of the strictest countries when it comes to car pollution regulations. Total restrictions target old Diesel cars, under Euro 5. This happens in cities like Stuttgart or Hamburg. Other European cities, such as Paris or Milan, also apply restrictions at certain times of the day, of the year, or at certain specific time intervals. Failure to comply with restrictions or visas required for access will result in fines. We could say that a real revolution is taking shape in the automotive industry, which must reinvent itself in less than 30 years. So, the perspective is clear, that of selling electric cars. That's why the European Union has already started the construction of an infrastructure of charging stations for electric and plug-in hybrid cars.

Euro standards benefit Europe by improving air quality, protecting public health, promoting technological innovation, and positioning the region as a leader in sustainable transportation practices. These standards reflect a commitment to environmental responsibility and contribute to a more sustainable and resilient future. At the end of 2018, the European Union announced that it wants Europe to become, in 2050, the first continent without carbon dioxide emissions. Moreover, the Commission and the European Parliament have reached an agreement regarding thermal engines: their marketing should be prohibited starting from 2035. So, from 2035, all new cars on the European car market should have zero emissions.

"EUSEW School Awards" (European Union Sustainable Energy Awards)

The "EUSEW School Awards" (European Union Sustainable Energy Awards) project is a European best-practice example of transnational school collaborations in the context of the energy transition. This project is organized by the European Commission and promotes awareness of sustainable energy practices and renewable energy among pupils across Europe.

Schools from various European countries can apply for the awards by implementing concrete measures to promote the energy transition in their everyday school life and documenting their successes. These measures can include energy-saving infrastructure, the installation of solar panels, the implementation of energy-related teaching units or energy-saving campaigns.

The award promotes exchange and cooperation between schools from different countries. The schools are in direct contact with each other to exchange ideas, experiences and resources and to learn from each other. This transnational exchange enables participating schools to approach the energy transition as a Europe-wide initiative and to benefit from the experiences of other schools and countries.

The EUSEW School Awards project thus contributes to the dissemination of best practices in the school sector and strengthens European cooperation on the energy transition.

Picture: 2023 European Sustainable Energy Week

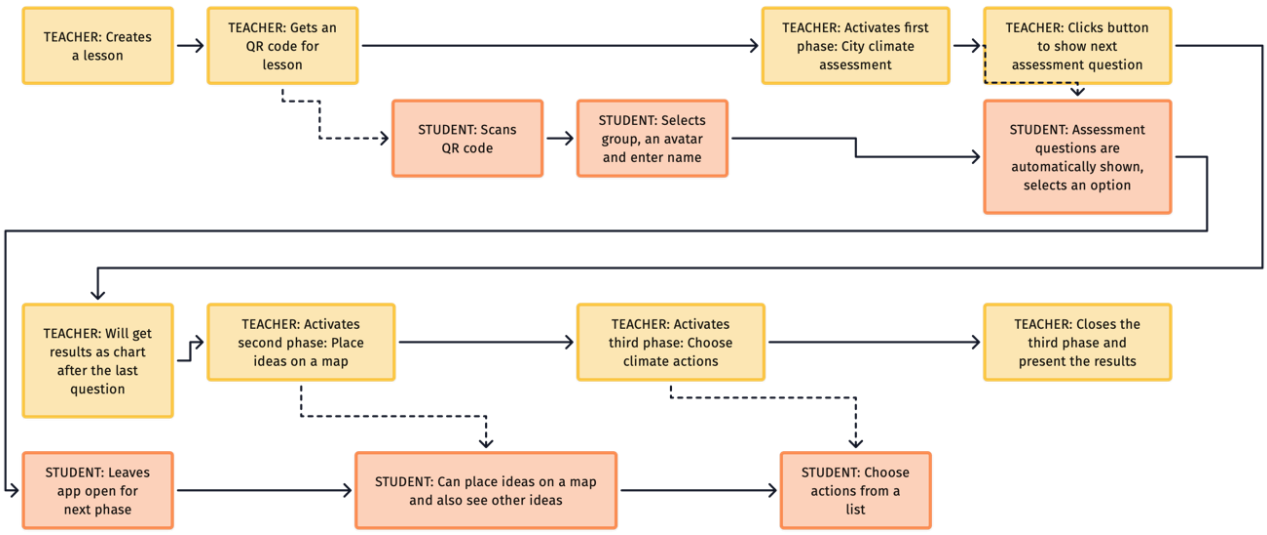
Source: **https://sustainable-energy-week.ec.europa.eu/awards_en**

How to use the software tool

Tool overview

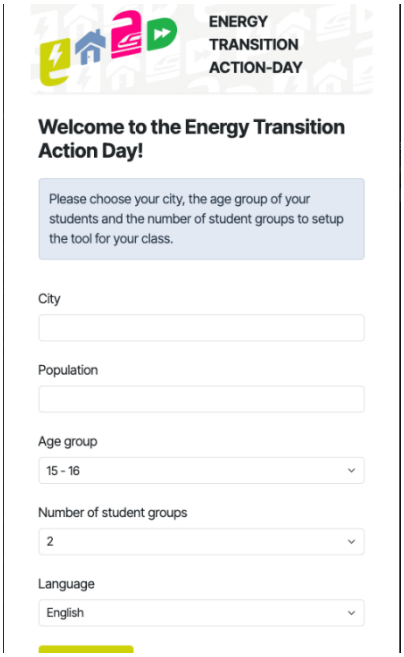
The tool has separate views for teachers and students. While the teachers are controlling the lesson and are actively starting the different phases, the students' view is updated mostly automatically.

As a short overview, the tool flow looks like this:

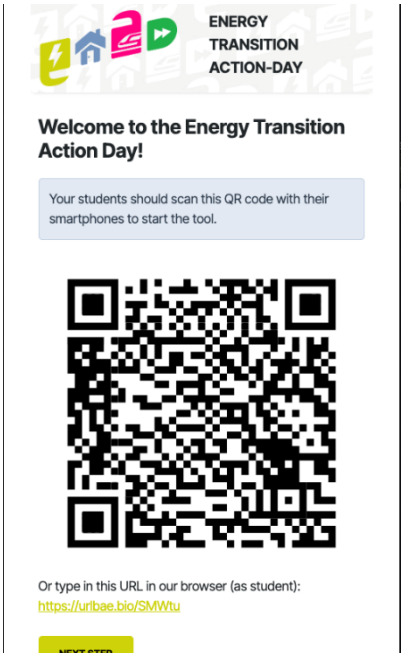


Teacher: Create a lesson

1. Open https://tool.eta-day.eu
2. Fill in the form. While entering a city name, suggested cities are listed. Select one of the shown options (by clicking on it) to ensure that later the map is located correctly.
3. If you want, you can change the population number.
4. Select how many student groups you will have while using the tool.
5. Select the preferred language.
6. When done with all options, click on *Next*.
7. Now a QR code is shown. Students should scan this QR code with their smartphone to open the tool. Alternatively, a short URL is shown below the QR code. This URL can be also used to access the created lesson room.



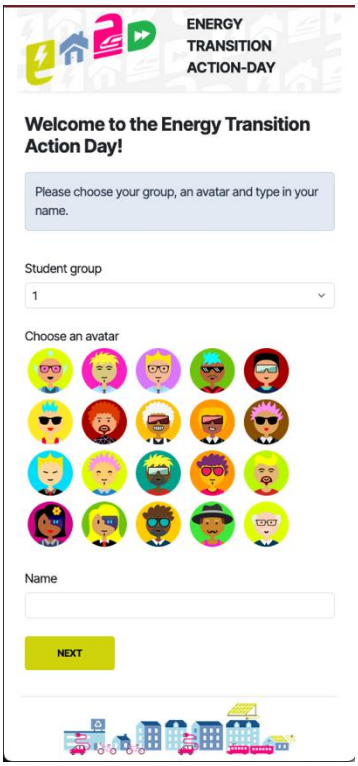
Form to create a new lesson



Generated QR Code

Students: Fill in basic information

1. Students will see a form after scanning the QR code.
2. Each student should select to which group number he/she belongs to.
3. Students can select an avatar.
4. Students can enter their names, too.
5. As soon as the form has been filled in, the students should click on the *Next* button.
6. A short message will appear informing them, that they will have to wait a little until the first phase (Climate performance assessment) is started.

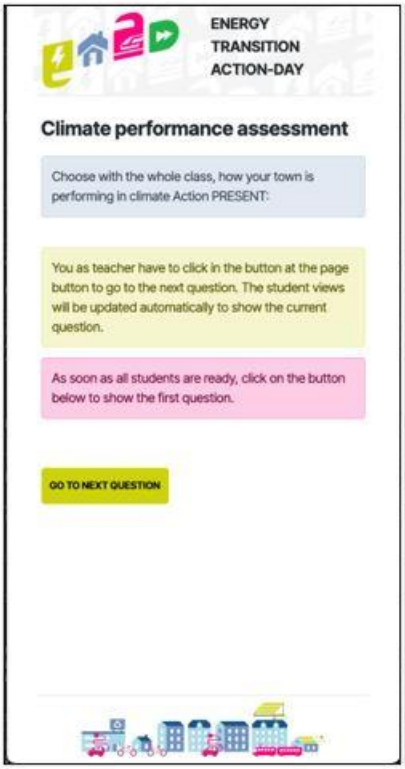


Students should fill in the form and click on Next

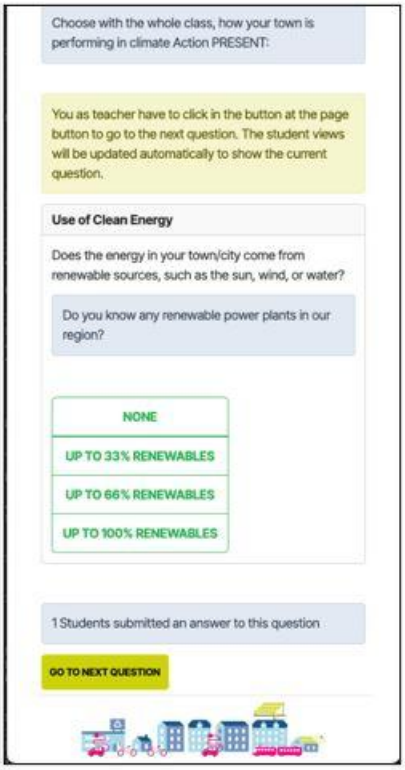
Teacher: Start and perform the climate performance assessment phase.

1. When all students are ready (fill in their name and choose a group), click on the *Next* button below the QR code.
2. The screen will be updated. Use the *Go to the next question* button to activate the first question. This question will also pop up on the students' smartphones too. Therefore, all will see the same question.
3. Now discuss within the class the aspects of that question. You as a teacher see additional information in a blue box which might help you to start a discussion.
4. Each student should click on one of the options to choose it.
5. You as a teacher, will see live how many students already have made a choice.
6. As soon as all students make a choice and the discussion is over, use the *Go to the next question* button again to go to the next topic and activate the next question on all screens.

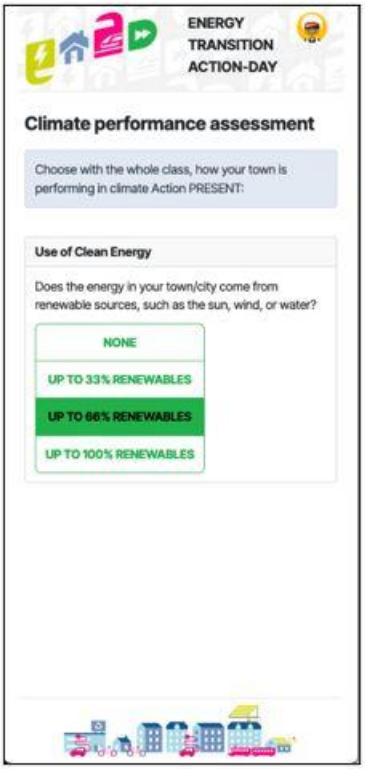
Teacher screen: Use yellow button to show first question



Teacher screen: You see current question and number of submitted answers



Student screen: See automatically current question, should click on one option to choose it



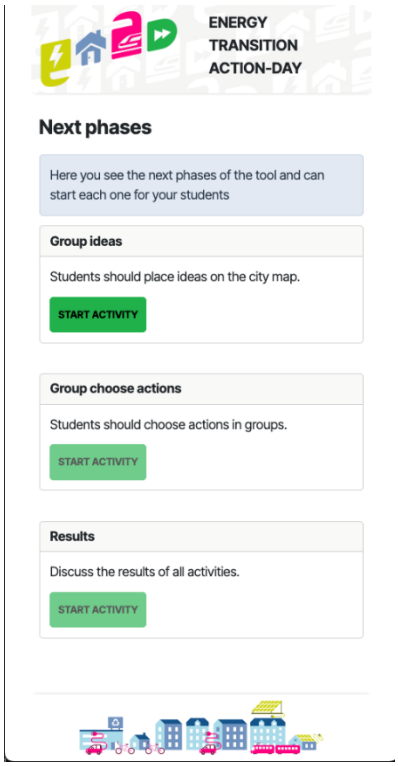
Teacher: Present climate performance assessment result

After the last assessment question, the tool will automatically render a chart with the results. This chart is only visible to you as a teacher. Students will see a message, informing that you are going to present the results in the class, but that the students should leave the app open, since it will be needed again soon.

Use the *Next* button when finished discussing the results.

Teacher: Start the next phase: Placing ideas on a map

As a teacher, you see now a screen where three boxes and buttons are visible. Only one green button is active at the same time. The first one below *Group Ideas* is now active. Click on this *Start activity* button. As soon as you click on it, the students will get to another page with a map.



Start each phase by clicking on the green buttons

Students: Placing ideas on a map

The students see on this page not directly a map, but first a button *Enable interactive map*. They have to click on this button (for legal reasons) to enable and see the map.

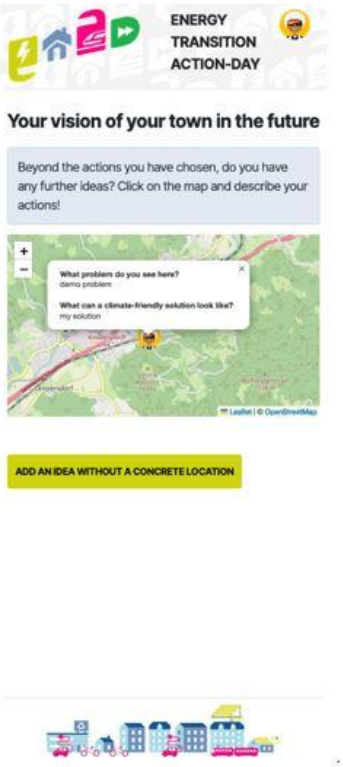
Once the map is visible, they can click anywhere on it. Clicking on the map brings up a pop-up where the student can describe the problem and possible solutions for that location.

As soon as a student has added one idea to the map, this idea will be shown on the map of all other students in the class, too. It will be shown with the chosen avatar on the map. Clicking on this avatar presents the submitted problem/solution.

Students have to click on the upper yellow button to enable/see the map

When clicking on the map, a popup with a form appears

Each idea is shown on the map with the student's avatar and a click on it shows details



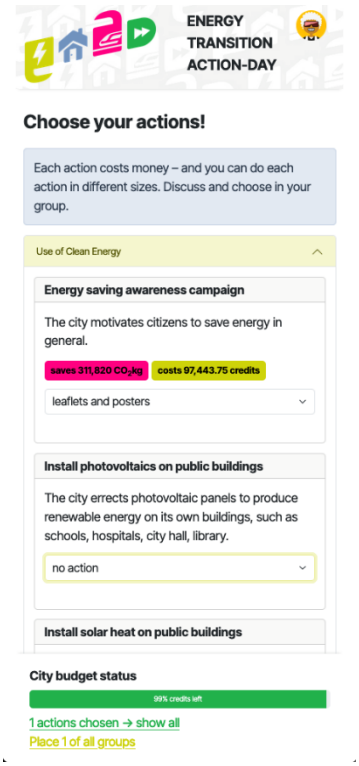
Teacher: Start the next phase: Choose climate actions

When you decide it is time to go on, use the next *Start activity* button on your screen to start the next phase.

Students: Chose climate actions

The screen now lists many possible climate actions. The actions should be discussed in the student groups, and the students should decide which one should be implemented and in which shape. Each action costs credits, depending on the selected implementation size. The students have a climate budget and should use this budget sparingly. A bar at the bottom of the screen informs how much budget is left.

At the bottom of the page, the students should describe the reason why they chose these actions.



Students have a list of possible actions
and should choose which one to implement

Teacher: Start the next phase: Discuss the results

When you decide it is time to go on, use the next *Start activity* button on your screen to start the next phase.

Now, the students can close their apps.

As a teacher, you can see the class results at this moment, as well as the results by group. Discuss them within the class.

Concept of moderation

Concept of moderation: Energy Transition Action Day

This moderation concept gives an **overview** of the **chronological order** of the ETAD project day.
It lists the **PPT slides**, **summarizes** what they depict, gives an approximate **time** attributed to each slide, and states what the moderator should **convey** at this time.

It also entails **checklists** for you to make sure all necessary steps are complete before going to the next phase of the project.

The times mentioned indicate a **general timeframe**. Feel free to adjust according to your or your students' needs.

You will find **'presenters' notes'** in the PPT presentation that are supposed to help you by providing a general script for each slide. In the presenters' mode of PPT, you will find them below each slide.

Overview: what are the overall steps of this project day?

1. school hour: Introduction, Quiz, movie
2. school hour: answering & discussing questions, preparing group work
3. school hour: group work with the ETAD online tool
4. school hour: presenting the group work (optional: collect questions for penal debate)
(5. & 6. School hour: panel debate with the guests)

Checklist: The ETAD day is about to begin. What should you have done up until this point?

You have …

- read the guidelines for teachers
- read the e-learning material (and ideally work on it with your pupils)
- gotten acquainted with the online tool (have the links ready and know what to expect)
- worked through the moderation concept including the notes (inside the guideline for teachers)
- watched the animated video (10 min)
- checked the technical options at school (PCs/ Laptops and/or smartphones are necessary and a flipchart/canvas as well)
- invited guests to the panel debate (school hours 5 & 6 of today), e.g. local policymakers, city planners, energy/climate managers or other local experts **(this last part is optional)**

Nr of **Slides**	**Time** necessary	**Content PPT** Slides	What slides & **moderation** should convey?
First 45 – 60 minutes: establish **basics** / a **foundation** to build upon			

1	1 minute	**Title** page, sponsors, logos	***Welcome*** *the students, introduce yourself and the people enabling the event*
1	1 minute	**Schedule** for the day	Present what is planned for the day (and if guests are coming: who will join the penal debate?) 1&2 school hour: introduction and quiz (+ movie) 3&4 school hours: group work & results (5&6 school hours: panel debate)
10 max	10 minutes	**Quiz** Quiz questions with A B C answers	**Check** the **knowledge** of the pupils and give some first **input** by playing a little quiz. e.g. let the students stand up, quiz with multiple choice A/B/C – A = left arm / B = right arm / C = both arms – right answer = stay standing / wrong answer = sit down
3	5-10 minutes depending on students' knowledge	Basics for understanding the **need** for energy transition i.e. greenhouse gas effect, rise of GHG emissions, **global warming** and **consequences**, European (and/or local) **climate goals**	First slide: **Greenhouse Gas effect** – who knows what it is, can anyone explain in a few sentences? Slide with atmosphere and arrows indicating energy Second slide: Now that we understand the GHG effect, **where do we stand today**? How many GHG emissions did/do we emit, how warm is it already and why is this problematic? Slide with **global warming graph** and animation of **consequences** (floodings, desertification, heatwaves, bushfires) Third slide: If we want to stop global warming, what is the European (& your national) approach to do so? Slide with European **goals on climate neutrality** (2050) and/or **local goals** *Small survey: what do you think about this goal: A) possible and we will achieve B) possible but we will not achieve C) impossible therefore we won't achieve* - Students will vote B with large majority ➔ Talk about the need for **optimism** What needs to happen? More important (bigger lever) than lifestyle, habits, consumptions is the **conditions** and **framework** given by laws, regulations and **infrastructure**, especially the energy infrastructure ➔ *That's why we are having this project*
3 – 5	5-10 minutes	**Comparison** of **energy systems** *If you worked on this point in the preparatory e-*	First slide: **fossil** system - Resources - Energy producers - Nets - Consumers

		learning with your students, you may opt to quickly repeat or skip this part	Second Slide: **renewable** system - Resources - Energy Producers - Nets - Consumers Third slide: **comparison** of energy systems - What is different? Resources are renewable (= lower costs, higher availability and range), energy is independent from resource providers, nets are decentralized (= more resilience, best fit for specific locations), consumer turns prosumer → *plus, we stop climate change* But we need **more**: Important aspects of the energy transition are among others the way we live (housing) and the way we move (mobility). So next step is a little **movie** that summarizes the changes that are needed. ➔ Movie time, then 5-minute break during which students can digest input and think about questions
Approximately 30 minutes to this point, so more or less **15 minutes** left for the **film**			
END OF THE FIRST SCHOOL HOUR **Checklist:** in this first hour your students should … - Have an **overview** of the day to come - Learned something new during the **quiz** - Understood the **basics** (greenhouse effect & comparison of energy systems) - Watched the video			
1	?	**Questions, opinions, critique?**	Check students' questions, opinions, and criticism about what is shown in the film clip. - Collect the first batch of questions (up to 5 max) and **discuss** - If no questions/opinions etc. arise, start with 'What are your thoughts on this?' ➔ Survey: who would want to live in the future shown?

			A) Yes, I could imagine such a world and would be happy to live in it B) Yes, looks nice, but I see many problems/challenges to be tackled first C) No way, I would not want to live in this world ➔ Concentrate on C) and B), discuss opinions and ideally show solutions to the challenges
1	?	Let's **discuss it**!	This slide should have links to the 'discussion slides' with the overarching **topics**: - **Overall info** (aka what should we know and understand about climate change and energy transition?) - **Energy infrastructure** (new technologies, innovation, stuff to awe) - **Housing** - **Mobility** - **Consumption/lifestyle** - **Adapting to inevitable change** ➔ Show students that development and new inventions still take place and feed **curiosity** and **optimism**
the following PPT slides should be **non-linear** → link to switch to the topic slides You can choose the topics yourself according to the students' interests/questions or issues that play an important role for your school/city/region For all the following discussions plus modular movie clips there should be approximately **35-40 minutes** time			
3-5	?	**Overall info**	In this group of slides, we find information about **general facts** around energy transition (or answers to the most popular overall questions): - *What does it **cost**, who pays for it?* Comparison in costs, fossil vs renewable (1: what does the transition cost compared to the current system? 2: what are energy costs per method?) - *What about the rare **resources**?* Map with resource deposits in Europe (and beyond?), e.g. Lithium, Cobalt, Coal, Gas, Oil, copper - *What about all the **jobs** we lose?* Statistics about jobs that could be lost due to energy transition (e.g. in fossil industry, public

			transportation, automotive industry) vs what jobs are needed for the transition (in renewable technologies but also what 'social' jobs are needed soon)
5 - 10	?	**Energy infrastructure**	What are current and potentially future **methods** of generating energy? - Wind (kites, highway turbines, Spanish vortex, house turbines, rooftop wind) - Sun (agro PV, household/balcony PV, shadow spending PV along roads) - Biogas (algae tanks, composters) - Others (new technologies like pressure roads, shoes etc)
5 – 10	9	**Housing**	How will **housing** change? - Smart homes - Integrated PV - Efficiency increase in household appliances - Urbanization, less surface sealing and shared energy - Green vs dark surfaces - Insulation - Lights - Solar heating and heat pumps
5 – 10	?	**Mobility**	How will our **mobility** change? - Electric vs hydrogen vs combustion - Public transportation vs private transportation - On-demand mobility - Car sharing & pooling - Trains - Planes - Boats/ships - Cycling & pedestrians (and changes to our mobility infrastructure + potential for more social cities)
At this point, there should be 5 – 10 minutes left to explain the group work with the online tool.			
2	5 – 10	**Group work** / working with the **online tool**	Explain to the students what they are supposed to do in the next 45 minutes of **group work**: - Show the surface and potential outcome of the online tool - Give clear instructions on what to do and what we expect
45 minutes **group working phase**			

1	45	Have fun and be creative!	Be available for **questions** and **help** students with the program if necessary.
35-40 minutes for the **presentation** of the group work			
1	35-40	How did you plan your future city?	The slide should welcome the students back to the big group Each result of the group work should be displayed on stage and the group presents - Ideas/outcome - Biggest challenges in the work If there is time left after the presentation and before the podium discussion, one can refer to the **discussion slides** and compare/add existing ideas or show other **movie clips** if they fit the ideas.
The remaining 5-10 minutes are for further **questions** (or: preparing the **panel debate)**			
If you have no panel debate, the event ends here, so you can skip to the last PPT slide. **You should have muted the 'panel debate' PPT slide or just skipped it.** **If you have a panel debate, continue with this guideline.**			
1	10	Think about your questions and/or proposals/criticism	Give students room and time to write down some **questions** they want to ask in the panel debate.
The remaining 45-90 minutes consist of the **panel debate.**			
1	10-15	Welcome to our **panel debate** with … (optionally add the guests' names and logos)	**Introduction** of and by the guests (5 minutes max per person, with individual PPTs by panel guests if wanted) Standard introductory questions: - Who are you and why are you here today? - What does an ordinary workday look like for you? - What do you think about the students' ideas (if the guest saw them before)?
/	30 – 60	**Student questions**	Open the room for **student questions** and/or allow questions by the guests to the students.

			Question catalogue prepared questions the moderator can ask… - 'What does your company/city/municipality do with regards to energy infrastructure/mobility/housing/any other topic that came up during the day?' - 'What lies ahead?' - 'What was the biggest achievement so far?' - 'What are your main challenges?' - 'How can young people help/become active/engage with you?'
/	15	**Conclusive questions a**nd farewell words	- 'What do you students need from your city/municipality? - 'What do our guests need from our students?'
1	1	**End** the event Slide with QR code to the website and 'thank you for your attention and participation'	Give each guest the time to say farewell and thanks, then thank the audience, guests, teachers, technicians, and everybody involved and end the event. Refer to the website, online tool, and all other material available for after-work Invite students for more questions/discussions upfront.
APPLAUSE and **THE END**			

For further information (project website):

https://eta-day.eu/

OR

SCAN THE QR CODE

PARTNERS' WEBSITES:

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