INTERGREEN

TRAINING MODULE 3 – Municipal Environmental Case Studies

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0 | Module introduction

In this module, participants will gain insight into the **concept** of an **environmental case study** and its significance as a potent analytical tool.

Through the examination of thoughtfully curated interdisciplinary illustrations, alongside accessible guidance and practical templates, attendees will acquire the skills necessary to **craft their own** environmental case studies.

Leveraging the green competencies acquired in preceding modules, participants will also enhance their ability to effectively **gather, analyze, and interpret data**, thereby contributing to the enhancement of their municipality's environmental efficacy.

1 | Training Units

Unit	Title	Duration
1.1	Introduction to environmental case studies	30 min
1.2	How to design a Case Study	45 min
1.3	Creating Case Studies	90 min
		2H35min

Learning objectives

- Use the acquired skills to undertake an inter-departmental (representatives of different municipal departments) case study focused on a specific local problem and propose a solution

- Analyze a series of individual case studies (from a local challenge and propose a solution) undertaken by participants and mentored by the trainers, ending in the international exchange of the solutions (a second online meeting where participants will present their case studies organized by areas of interest). It is an opportunity for participants to apply these skills in the production of a series of case studies focused on identifying a particular problem, conducting research and proposing a solution.

- Prioritize local challenges to be addressed. Under the light of the recently acquired green skills and mentoring of the trainers, do research and present solutions for these problematics. Present these local case studies in an international exchange.

Unit 1.1. – Introduction to environmental case studies

Introduction

This learning unit serves as an introduction to the concept of environmental case studies. It offers participants a robust comprehension of the concept, its appropriate methodology, and the advantages it presents. Moreover, it enhances understanding of the fundamental characteristics of environmental case studies.

Learning outcomes:

After the learning session, participants will:

- ☑ Improve their understanding of the concept of environmental case study
- ☑ Gain insight into the essential traits of an environmental case study and their practical application
- ☑ Understand why and when to use environmental case studies

1.1.1. What is an Environmental Case Study?

An environmental case study is a detailed examination and analysis of a specific environmental issue, event, or problem. These case studies are typically conducted to gain a deeper understanding of the environmental issue, its causes, impacts, and potential solutions, and present key characteristics such as:

Specific Focus: Environmental case studies concentrate on a particular environmental problem, such as deforestation, pollution, climate change, habitat destruction, or resource management. The focus is on a real-world situation or event.

Detailed Description: They provide a comprehensive and detailed description of the issue, including its background, history, and context. This should involve collecting as much data as possible, by conducting fieldwork and/or reviewing existing research and literature.

Analysis: Analyze the root causes of the environmental problem and its impacts on ecosystems, communities, and human health. Social, economic, and political context may play a big contribution to the issue.

Stakeholder Involvement: It may be very beneficial to identify stakeholders, including affected communities, government agencies, NGOs, and businesses. Understanding their perspectives and interests is essential in crafting effective solutions.

Brainstorming a solution: Environmental case studies may explore and evaluate various solutions or interventions aimed at mitigating or resolving the problem. This could include policy changes, technological innovations, conservation efforts, or community-based initiatives.

Documentation: The findings and insights from the case study are typically documented in a report or publication. This report can be used for educational purposes, policy advocacy, or further research.

Examples of environmental case studies could include analyzing the impact of a specific oil spill on marine ecosystems, examining the consequences of a policy change on deforestation rates in a particular region, or investigating the success of a community-led recycling program in reducing waste.

1.1.2. Why should we use Case Studies?

Environmental case studies are a valuable **tool** in our efforts to understand, address, and ultimately resolve complex environmental challenges. They offer tangible, real-world examples that bridge the gap between theoretical knowledge and practical application, allowing individuals, organizations, and governments to gain a comprehensive understanding of environmental issues.

By examining these cases, stakeholders can make **more informed decisions**, shape effective policies, and identify best practices that have been proven successful in similar contexts.

Additionally, case studies serve as powerful **educational** tools, engaging students and learners with relatable scenarios, promoting critical thinking and problem-solving skills.

Moreover, they raise **awareness** about environmental concerns, inspire advocacy, and encourage transparency and accountability by exposing harmful practices and their consequences.
In summary, environmental case studies contribute to the collective global effort to protect our environment, fostering innovative solutions and a deeper commitment to sustainable practices.

Unit 1.2. – How to design a Case Study

Introduction

In this unit the participants will find two real case studies from municipalities emphasizing environment and sustainability, enhancing their comprehension of the practical application of the previously discussed subjects. A general template will also be presented to be refined structurally or enhanced according to specific needs.

Learning outcomes:

After the learning session, participants will:

- ☑ Understand the practical applicability of environmental case studies in a municipal context
- ☑ Gain knowledge of the step-by-step process involved in creating a case study
- ☑ Obtain a template for creating environmental case studies tailored to their specific work-related needs

1.2.1. Examples of Environmental Case Studies in a Municipality setting

The following case studies represent real projects and actions. While going through them, the participants should carefully notice the development of the different sections and pose questions such: Is the data sufficient? It's understandable how to replicate the project? What are the strengths and weaknesses of the project? This will help them structure their own problematics later on.

Title of the case	**Wetland adaptation in Attica Region, Greece**

Characterization	
Type of action	Biodiversity and Climate Change
Geographical scope	Regional / Sub National
Location	Attica Region, Greece
Time scale	The Strategy and Action Plan were formulated during the OrientGate project: 2012-2014. The first stage of the Action Plan implementation took five years (2015-2020).
Organization in charge of the practice	The Environmental Department of Attica Regional Authority with the scientific support of the Greek Biotope Wetland Centre (EKBY)
Type of organization	Local Administration & NGO
Organization's brief description	The Environment Directorate of the Region of Attica has – as a part of its responsibility to specify the environmental policy guidelines at the regional level – focused on the conservation and protection of wetland ecosystems in view of climate change. The objective of EKBY is to promote the sustainable management of renewable natural resources in Greece and other areas of the Mediterranean basin and Europe.
Contact person	Eleni Fitoka Greek Biotope Wetland Centre (EKBY) 14th kilometre Thessaloniki Mihaniona, 57001 Thermi, Thessaloniki, Greece Tel.: (30-231) 0473432 Email: helenf@ekby.gr
Description	
Summary	The strategy and action plan for the wetland ecosystems in Attica Region (Greece) were developed in the OrientGate project by the Environmental Department of Attica Regional Authority with the scientific support of the Greek Biotope Wetland Centre (EKBY). Based on projections of future drought episodes, as well as on information from operational programmes and actions that are in progress or scheduled by various institutions and organisations, the strategy sets the vision and commitment to conservation and adaptation to climate change of the Attica's wetlands to increase its resilience and reduce biodiversity loss, while making better use of ecosystem services. The strategy is built on seven axes under which measures with specific priority actions have been determined: the

	Attica Wetland Action Plan. This strategy also includes some over-arching elements: sustainable management and restoration of wetlands; their interconnection in a “green arc”; the evaluation of the services provided; awareness raising and environmental education in biodiversity and climate change, and citizen participation. The Attica Regional Authority drafted a road map to promote the implementation of selected actions of the Plan under the new National Strategic Reference Framework 2014-2020 or under other funding sources. From September 2015, a project entitled “Improving knowledge and increasing awareness for wetland restoration in Attica Region” is already implementing priority actions”.
Goals	The implementation of the proposed action plan is expected to mitigate the impacts on Attica wetlands of the combined effects of anthropogenic interventions and climate change. Improved protection of wetlands is also expected to improve their ecosystem functions, such as: (i) protection of the coasts by reducing the effect of waves and currents; (ii) improvement of water quality by trapping sediments, nutrients and toxic substances; (iii) support to economic activities depending on wetland resources. Other positive outcomes that will derive from the implementation of the action plan include the: ● Improvement of knowledge about climate change and its influence on wetland species, habitats and ecosystem functions; ● Enhancement of environmental awareness and development of information centres.
Stakeholders	From the beginning of the OrientGate project, Attica Region, engaged a wide range of stakeholders and end users (e.g. central, regional and local services, other authorities, research agencies, environmental organisations and interested citizens) and implemented several awareness actions through media, workshops, training seminars, information meetings and interviews. Thus, the formulated wetland adaptation strategy and plan followed a participative process. At the end of 2014, a training seminar “Adaptation strategy for Attica Wetlands: The assessment of wetland vulnerability index” and an open dissemination event were held. During the seminar, around 30 participants from public services of Attica Region, NGOs, research institutes, and foreign participants (from Serbia and Romania), received hands-on training on the Wetland Vulnerability Indicator assessment methodology. During the dissemination event, around 80 participants from public services and municipalities of Attica Region, central services of the Ministry of Environment and Climate Change, NGOS, research institutes and from other

	sectors such as archaeologists, received information on Attica wetland vulnerability due to expected increase of drought and on the adaptation action plan that should be implemented in the coming years. In 2015, Attica Region carried out the Green Week 20015 satellite event “Raising support to restore the wetland of Brexiza, in the Region of Attica, Greece”, during which almost 90 visitors have come in touch with the biodiversity of Brexiza wetland and the important archaeological site of the Roman great temple of the Egyptian gods. This event opened the dialogue on Brexiza wetland restoration and biodiversity protection and on implementation of the action plan of the newly published Strategy for Attica wetland conservation and adaptation to climate change. All these events were organized by Attica Region and scientifically supported by the Greek Biotope Wetland Centre (EKBY). Participants were very much motivated and showed strong interest to increase their knowledge and capacity in order to become capable to take action towards climate change adaptation and wetland conservation.
Policy context	*Legislation and strategic, policy and programming frameworks* • The Attica Wetland Action Plan integrates measures and priority actions which are foreseen by the existing legislation and fall in existing national strategic, policy and programming frameworks, including: • The National Operational Plan for the environment (2014-2020), which covers objectives and priority actions for: the waters and the implementation of the Water Management Plans; the conservation of nature and biodiversity through better management of NATURA2000 sites; the promotion of ecosystem services and green infrastructures for climate change adaptation based on natural solutions and for the management of flood risk including actions for the creation of a hydrological database, public awareness, etc. • The national strategy and action programme on biodiversity, which highlights the need for wetland conservation and adaptation to climate change and includes priorities such as delineation, restoration, research on climate change effects on biodiversity and ecosystems, and promotion of biodiversity islands in urban environments as green infrastructures. • The national law on biodiversity and in particular the articles that cover the designation of wetlands as

	protected areas. • The Master Plan of Athens/Attica 2021, which lists Attica wetlands (including lakes, rivers, streams and their estuaries, springs, lagoons, and coastal marshes) and covers actions for their legal protection and their promotion as green infrastructures. • The River Basin Management Plan-Attica Water District (in the context of the Water Framework Directive implementation), which includes a specific measure for the restoration and promotion of Attica Wetlands. *Institutional opportunities* • The Region of Attica is a Metropolitan Region. It is the first region that has been mobilized towards a climate change adaptation strategy in regard to natural ecosystems, involving local authorities in its area, social groups, environmental organisations and research institutions for the protection of the wetlands in its jurisdiction. Municipalities of Attica Region are mobilized to take adaptation actions in the context of their local operational plans.
Social context	Enhancement of environmental awareness and development of information centres.
Environment context	Improvement of knowledge about climate change and its influence on wetland species, habitats and ecosystem functions
Starting point	
Detailed description	In Attica, more than 100 wetlands have been recorded, which include streams and estuaries, coastal marshes and lagoons, lakes and artificial wetlands. Their importance lies in their ecological and conservation values, as well as ecosystem services to human well-being. Wetland conservation and/or restoration, their use for recreation and environmental interpretation and their connection to a "green belt" in the Attica Region are strategic priorities in view of upgrading the environment and improving the quality of life of citizens of Attica Region. The goal of the OrientGate project was to produce a climate change adaptation strategy and an action plan, which: (i) involve monitoring and assessing of the environmental quality of wetland areas in Attica Region, (ii) study drought deterioration in the future and (iii) put in force the implementation of a series of measures that reduce regional

	vulnerability of wetlands to climate change.
Impact	
Beneficiaries	Residents and the general population of the Attica Region
Environmental results	Adaptation Options Implemented In This Case: • Adaptive management of natural habitats • Awareness raising campaigns for stakeholders' behavioural change • Improve the functional connectivity of ecological networks
Social results	The wetlands importance lies in their ecological and conservation values, as well as ecosystem services to human well-being. Wetland conservation and/or restoration, their use for recreation and environmental interpretation and their connection to a "green belt" in the Attica Region are strategic priorities in view of upgrading the environment and improving the quality of life of citizens of Attica Region
Economical results	Healthier and happier citizens contribute to a balanced quality of life and reduce NHS strain and cost. Also reduced mitigation costs from the negative effects of climate change.
Targeted SDGs	3, 11, 13, 14, 15, 17
EU Green Deal	BIODIVERSITY
Monitoring	The Strategy is built on seven axes under which measures along with specific priority measures have been determined in the "Attica Wetland Action Plan": • AXIS I - Improvement of knowledge for Attica wetlands and the effects of climate change: Measure I-1: Improve knowledge; Measure I-2: Ensure access to data and information and monitor the implementation of the Strategy. • AXIS II - Conservation and restoration of Attica wetland ecosystems and their services and adaptation to climate change: Measure II-1: Delineate wetlands and designate protected areas; Measure II-2: Protect, guard, conserve and restore; Measure II-3: Conserve and manage sustainably wetlands of the Natura 2000 network. • AXIS III - Sustainable use of water resources: Measure III-1: Prevent and abate industrial pollution. • AXIS IV - Land use regulations: Measure IV-1: Promote the concept of a compact and non-polluting city. • AXIS V - Information, awareness, and ecotourism: Measure V-1: Strengthen public information and awareness programs for wetlands in Attica and

	climate change adaptation; Measure V-2: Education for wetlands and climate change adaptation; Measure V-3: Highlight the wealth of wetlands in Attica, improve recreation and ecotourism opportunities. • AXIS VI - Improvement of adaptive capacity in regard to wetland conservation and management: Measure VI-1: Improve the capacity of public administration and local authorities. • AXIS VII - Integration of wetland conservation in enterprises: Measure VII-1: Promote wetland conservation and innovative best practices in entrepreneurship. From September 2015, a project entitled "Improving knowledge and increasing awareness for wetland restoration in Attica Region", is running (co-financed from the European Economic Area Financial Mechanism). Within the project priority actions under Measure I-1 and Measure II-1 are being carried including: (i) Scientific documentation of boundaries delineation of 50 Attica wetlands and development of a draft Presidential Degree for their legal designation according to Biodiversity national law; (ii) Determination of restoration actions for two highly degraded wetland areas; (iii) Measurements on the quantitative status of water in the wetland of the National Park Schinias and development of rehabilitation proposals focusing on wetland water needs; (iv) Gathering and storing of inventory data in a freely accessible web database. Up to the end of the project (February 2017) three public events were organized to demonstrate project findings and results and raise awareness on wetland protection and climate change adaptation.
Learnings	
Challenges faced or previewed	The Region of Attica is called on to combine the needs arising from human overpopulation, various human activities and often competitive land use through the proper and sustainable management and protection of the natural environment. Wetlands constitute a significant element of the natural environment, not only as ecosystems for the conservation of different species, but also as part of the water bodies of the region, as recreational areas or even as areas for the development of economic activities, which must be managed and protected by the state. Within the territory of the Region of Attica, there are still more than 100 wetlands including: streams and their estuaries, coastal marshes and lagoons, lakes and constructed wetlands. They now constitute "biodiversity islands" within a broadly degraded environment and offer the inhabitants of the Attica Region the opportunity to stay in touch with nature. Climate Change is expected to put additional pressure on these habitats as, based on future climate projections

	(emission scenarios A1B and A2 were considered by the OrientGate project), Attica's vulnerability to drought is expected to rise from low to moderate by the year 2100. Drought episodes are expected to last longer and occur more frequently than in the past. This phenomenon is expected to have a serious impact on Attica wetlands as most of them are rain-fed. Further, due to the synergy of deteriorating drought conditions and anthropogenic interventions, most of Attica's wetlands are expected to suffer moderate to high impacts. At the same time, findings show that the agencies involved in the conservation of Attica wetlands have a medium-level adaptive capacity. In particular, there is inadequate knowledge of wetland ecosystems and their services, a lack of experience in the use and interpretation of climatic parameters, a low degree of networking and exchange of experiences and good practices, medium-level operational capacity of the competent agencies and availability of funds for the implementation of adaptation measures. In parallel, however, society is gaining a high level of understanding of the role played by wetlands in the quality of life. For the purpose of conserving the wetlands of Attica, it is deemed necessary to adopt an adaptation strategy and an action plan which is expected to reduce the impacts on wetlands of the combined effects of anthropogenic interventions and climate change and improve the capacity of involved stakeholders to cope with climate change.
Lessons learned (if past example)	The factors that were decisive for a successful design of the adaptation strategy and plan include: • The coordinator of strategy and plan design was the Environment Directorate of the Region of Attica, which has – as a part of its responsibility to specify the environmental policy guidelines at the regional level – focused on the conservation and protection of wetland ecosystems in view of climate change. • The formulation of the wetland adaptation strategy and plan followed a participative process. There was early engagement and strong collaboration with various end users: central, regional and local services, other authorities, research agencies, environmental organisations and interested citizens. They were encouraged to take action through interviews, information meetings, workshops and training seminars. Experiences were exchanged; weaknesses and good/bad practices in the management and protection of Attica's wetland wealth were recorded; and the value of conserving wetlands and the need to adapt to climate change were promoted. There were no significant hindering factors during the elaboration of the adaptation strategy and plan. However, limitations will need to be overcome at the implementation

	stage of the proposed wetland adaptation action plan. These have their roots in: availability of funds, operational capacity of involved services and bodies to take the proposed adaptation measures, regulation of land uses in view of wetland protection and restoration.
Potential to transfer	Yes, it can be transferred to other regions
Future actions or plan of action	Review results and develop a further Action Plan by 2025
Resources	
Financial	
Funding	Attica Region, co-financed from the European Economic Area Financial Mechanism
Human	Environmental Department of Attica Regional Authority with the scientific support of the Greek Biotope Wetland Centre (EKBY).
Material / Logistics	
Duration of implementation phase	5 years
Additional or useful information	
Internet links	https://keep.eu/projects/5955/ http://www.biodiversity-info.gr/index.php/el
Bibliography	South East Europe Transnational Cooperation Programme "A structured network for integration of climate knowledge into policy and territorial planning" OrientGate (2012-2014). Climate-ADAPT Apr 04 2023
Others	*Bulletins, magazines, etc*
Others	
Awards, recognition, other relevant information if past example	

Title of the case	**Municipality of Lousada's Sustainable Development Strategy**
Characterization	
Type of action	*Land Management*
Geographical scope	*Local*
Location	*Lousada, Porto, Portugal*
Time scale	*2014-on going*
Organization in charge of the practice	*Municipality of Lousada - Sector of Environmental Education and Nature Conservation*
Type of organization	*Public administration*
Organization's brief description	*The municipality of Lousada is a local administrative unit in Portugal, located in the Porto district, Northern region.*
Contact person	*Manuel Nunes, manuel.nunes@cm-lousada.pt*
Description	
Summary	*The Municipal Plan for the Sustainability of Lousada was an unprecedented effort led by political will and academic knowledge. The region is today a laboratory of good practices in terms of environmental conservation and social engagement, being a national case study and the target of European awards.*
Goals	● Stop local biodiversity loss. ● Foster ecological literacy. ● Engage the community in an environmental agenda to leverage territorial development.
Stakeholders	Schools; Young people; Volunteering programs; Adults; Families; Elderly; Companies; Land owners; ONG's; Cultural groups;
Policy context	At the time, the political executive's understanding of environmental management revolved around the traditional triad of water, sanitation, and waste. There was a noticeable absence of environmental sustainability policies, gaps in infrastructure resilience to address climate change, and a lack of scientific knowledge (Biodiversity, Forest management, Water systems, Sustainable agriculture, Peri-urban landscape management).
Social context	Despite the peri-rural context, society showed little connection with natural values/sensitivity to environmental issues. There was a lack of environmental literacy and a low level of active citizenship/community involvement in solving

	environmental problems.
Environment context	The region was heavily impacted by human intervention, with many degraded areas, watercourses with waste deposits, and a prevalence of invasive species in the landscape. There were small pockets of biodiversity threatened by development.
Starting point	The work plan focused on : ● Scientific Research - Characterization and mapping of the local reality with integrated solutions for sustainable landscape management. ● Environmental Education - Long-term locally designed environmental education programs for children, youth, adults, and seniors. ● Social Involvement - Intervention projects designed with/for the local community. ● Financial Management - Permanent needs vs. shortage of funds. ● Infrastructure Actions - Territorial intervention for the recovery of degraded areas based on natural engineering.
Detailed description	Lousada's green revolution began quietly in 2014, when Manuel Nunes, Archaeologist, and professor with a great love for his land, recently elected **councilo**r for the environment in Lousada, approached the **University of Aveiro** in search of academic knowledge that would structure something unprecedented in the country - the Municipal Plan for the sustainability of Lousada. Milene Matos, PhD in Biology with a Master in Marketing and Digital Communication, led the effort, based on the five pillars of Research and Nature Conservation, Environmental Education and Scientific Literacy, Social Involvement, Infrastructural Efficiency and Internal Sustainability. She was surprised when the first survey of fauna and flora showed the existence of highly **threatened species** nuclei, something that the strong human presence in the territory, with an agricultural-industrial-rural matrix, did not allow to foresee. At the same time, efforts to raise **awareness** of the population began, with educational activities open to the public and the incorporation of books on local nature into the school reading plan. The region is today a laboratory of good practices in terms of environmental conservation, being a **national case study** and the target of European distinctions, applying projects such as: **Biolousada-** Environmental education program with the objective of involving citizens in valuing and protecting the territory's natural values, as you can only protect what is known **Lousada Ponds-** Conservation and creation of new ponds and other aquatic environments in the municipality. **Plantar Lousada-** Public reforestation actions and offer of native plants to the population

	Bioschool - scientific education activities and environmental awareness in a school context, framed in the syllabus of the various disciplines. **Lucanus-** municipal technical-scientific publication in the areas of Conservation, Management and Enhancement of Natural Resources. **Sustainable Waste -** Program that gives discounts on the waste management fee the higher your recycling fee **Sustainable Lousada Fund -** Financing grants for academic work to be implemented in Lousada **Lousada Jardins-** inventory of the species of trees and shrubs that exist in the historic gardens of stately homes in the municipality. **Green Giants -** Inventory and valuation of large trees and ecological value **Lousada River Guard -** inspection and monitoring program of the ecological state of the rivers and streams of Lousada, through the adoption of its sections by the citizens **360º Bioschool Challenge -** Return to schools the energy value saved compared to previous years **Casaninho-** Placement of artificial nest boxes to promote biodiversity and mitigate conflicts through human interaction. **100% LED -** Replacement of all LED street light bulbs **Cornelias –** Free electric-bike sharing **Municipal network of micro reserves -** Creation of mini-protected areas to ensure the connectivity of natural spaces and the mobility of fauna and flora **Municipal regulation for the management of trees and natural spaces in the municipality of Lousada-** Protection of the arboreal heritage of Lousada Although some of these projects pay for themselves for the savings they represent, for others a constant flow of external funding is needed, especially from applications to **European environmental funds**. A more cohesive village, with space for Nature and educated citizens and with a better quality of life, shows that these funds are definitely well invested.
Impact	
Beneficiaries	*General community, with highlight to students, families and elderly; Volunteers; Land owners;*
Environmental results	● *Creation of a local Protected Landscape with +1609 hectares* ● *Inventory of Fauna and Flora: 557 species of plants and invertebrates have already been discovered, of which 62 are protected and 28 are endemic to Iberia* ● *Inventory of trees with high ecological value: +7400 trees from +40 species* ● *+200 nesting boxes installed;* ● *+30km of water lines restored* ● *Additional 2500m2 of blue surface in the municipality through the creation of ponds* ● *+113,000 native plants planted* ● *+70ha of terrestrial area restored* ● *Reduction of approximately 3100 tons of CO2 per year through the improvement of public buildings and street lighting*

	● *-1600 tons of garbage in landfills in 4 years by recycling programs*
Social results	● *+9177 volunteer participations in environmental restoration work, totaling 33,892 hours* ● *Recycling rate per inhabitant (39kg/year) above the national target (32kg/year)* ● *3546 environmental education activities in 37 schools with 5134 teacher participations and 71,324 student participations* ● *Bi-weekly environmental education sessions for the general public with +4400 participations* ● *Over 35,000 custom environmental education books distributed* ● *+550 active aging activities in nature with +6500 senior participations and +2000 native plants planted* ● *+200 wild nests registered by citizen science*
Economical results	● *Savings of +300,000 euros of nature restauration labor by volunteering programs* ● *Savings up to 200,000 euros/year by improvement of water structure* ● *Savings up to 700 000 euros/year by improvement of public buildings and street lighting*
Targeted SDGs	*14 of the 17, with highlights on 13, 15, 11 and 4.*
EU Green Deal	*Environment and oceans; Finance and regional development*
Monitoring	*Each project has their own*
Learnings	
Challenges faced or previewed	Social involvement is always a challenge due to the human natural opposition to the unknown. It helps to start by engaging key sectors of the community, such as schools and established associative groups, to begin generating buzz around actions and spreading the message. Landowners and peers within the political committee are often the first to hinder disruptive ideas, not believing in the realization of plans - they only believe when they see it. It is important, therefore, to start with practical projects whose success is practically guaranteed, and/or showcase examples of best practices already validated in external contexts. Focus on credible and easily justifiable themes, avoiding (at least initially) issues that could be divisive.
Lessons learned (if past example)	● Never promote a project before it's on the ground/validated and running smoothly. ● The community wants to be involved; we just have to give them the opportunity/create the most favorable conditions for it.

	● it's crucial to choose the right people to implement actions on the ground, ensuring that besides academic knowledge, they possess excellent human relationship qualities, with empathy, charisma, and friendliness. ● When we want something new done well, we have to take charge, lead, and not leave it in the hands of middle management. ● The process of raising awareness and social involvement is faster when people feel valued and have confidence in the projects. Therefore, it's important to ensure efforts with visible short-term results when involving the initial volunteers and to receive and listen to their feedback. ● If we don't take care of our territory, the central power won't. ● It's essential to use science as the foundation in structuring actions but also as an argument for their justification, in both internal and external communication. Opinions can be dismantled, but facts cannot.
Potential to transfer	The work carried out in the environmental area in Lousada has always aimed to be pioneering to facilitate replication in other national and European regions, being perfectly transferable, as evidenced by the award mentioned at the end of this document.
Future actions or plan of action	● To have 30% of the territory protected, following European guidelines; ● Consolidate what has already been accomplished; ● Expand the network of micro-reserves across the territory; ● Create or facilitate the creation of financial incentives for civil society to preserve nature, reinforcing the economic sustainability of these actions.
Resources	
Financial	*Started at 50 thousand euros annually, and right now its at roughly 500 thousand euros annually - which is only 3% of the municipal budget of 15 million euros.*
Funding	*60% from the municipal budget (+ logistical support) + 10% from national applications and 30% from international applications*
Human	*It started with a councilor and a researcher from the University of Aveiro. Currently, there are 12 environmental conservation technicians, including biologists, forest engineers, geographers, and land management specialists, some employed directly and others as service providers.*
Material / Logistics	*Two passenger vehicles and two work vans, various field equipment such as shovels and protective gear, and support from the municipality's general stock. The team works mostly*

	on two separate public buildings (field work and environmental education focused), but has the option to manage their own schedule.
Duration of implementation phase	*Two years of fieldwork to build the state of the art and outline the plan, in execution ever since.*
Additional or useful information	
Internet links	*https://www.cm-lousada.pt/p/educacao-ambiental* *https://www.facebook.com/LousadaAmbiente*
Bibliography	*Matos M & Nunes M (2021). Estratégia Municipal para Sustentabilidade – O projeto transformador do Município de Lousada. Lucanus – Revista de Ambiente e Sociedade, Volume V, Páginas 8-43.*
Others	
2019 Transformative Action Award - https://cor.europa.eu/en/news/Pages/lousada-wins-2019-transformative-action-award-.aspx	

1.2.2. Case Study Design Step-by-Step

A case study is an in-depth look at an individual, group, organization, or society at large in the context of an environmental issue. Findings from a case study should illustrate themes and ideas that can be applied in other places, situations, and times. Case studies often involve an environmental decision, challenge, or opportunity, and many are interdisciplinary. An environmental case study can involve many environmental fields including but not limited to the fields of environmental studies, environmental sciences, environmental policy, environmental economics, environmental history, ecology, geography, spatial science, landscape geography, and other relevant disciplines.

A case study should provide the amount of technical detail necessary to tell a compelling story, and do not always need to result in the reader mastering a sophisticated methodology or analysis. They must be concise and have a clear takeaway.

1. Identify a challenge

Municipalities face numerous environmental challenges that can vary depending on their geographical location, population density, industrial activities, and governance structures. Addressing these challenges often requires collaborative efforts between different municipal departments, government agencies, businesses, community organizations, and residents to implement policies and practices that promote sustainability, and green stewardship. Below we outline some common areas where environmental challenges might arise in a municipality:

- **Cultural and natural heritage / Biodiversity**: Urbanization and habitat destruction can fragment ecosystems, leading to a loss of biodiversity and disrupting ecological balance
- **Land planning / Green design**: Poor urban planning can lead to inefficient land use, urban sprawl, loss of agricultural land, and distraction of natural habitats.
- **Mobility:** Transportation emissions can contribute to poor air quality and high noise pollution, which can have negative impacts on human health and wildlife and exacerbate climate change.
- **Energy**: High energy consumption, particularly from non-renewable sources, contributes to climate change and air pollution. Improving energy efficiency and transitioning to renewable energy sources are key challenges for municipalities.
- **Water management**: Pollution from agriculture, industry, and urban runoff can contaminate water sources, affecting both human health and aquatic ecosystems. Additionally, water scarcity due to over-extraction or climate change impacts can pose significant challenges.
- **Waste management**: Inefficient waste disposal practices can lead to overflowing landfills, pollution of soil and water bodies, and greenhouse gas emissions from decomposition.
- **Green procurement**: Environmentally responsible procurement helps municipalities reduce their environmental footprint by selecting products and services that are less resource-intensive, generate less waste, and have lower emissions of greenhouse gases and pollutants.
- **Environmental education**: helps residents, businesses, and policymakers understand the importance of environmental issues such as climate change, biodiversity loss, and pollution. It raises awareness about the impacts of human activities on the environment and fosters a sense of responsibility towards its protection.
- **Green economy and tourism**: Sustainable tourism practices promote responsible travel that minimizes negative impacts on the environment, culture, and communities while maximizing socio-economic benefits.

2. Analyse the current situation and implications

Identifying a current situation and its implications in a municipal environmental case study involves thorough research, data analysis, and understanding of the local context.

Suggested levels on the approach could include:

- **Definition of the Environmental Issue:** Start by clearly defining the environmental problem or challenge that the municipality is facing. This could be pollution, habitat degradation, climate change impacts, waste management issues, or any other relevant concern, as described above.

- **Data collection and Conducting Research:** Collect relevant data on the environmental issue from various sources such as government reports, scientific studies, environmental assessments, and local databases.

Analysis of the data to understand the current status of the environmental issue, including its extent, severity, and trends over time is an essential process. In addition, factors such as pollution levels, biodiversity loss, resource depletion, greenhouse gas emissions, public health impacts, and socio-economic consequences, should also be taken into consideration in order to gain a complete picture.

- **Assessing Local Context:** Consider the unique characteristics of the municipality, including its geography, climate, land use patterns, population density, industrial activities, and infrastructure. Identify any specific vulnerabilities or sensitivities that may exacerbate the environmental issue, such as proximity to sensitive ecosystems, population growth, economic disparities, or regulatory gaps.

- **Identifying the Community:** Identify the geographic boundaries of the community relevant to the case study. This could be a neighborhood, town, city, or even a broader region depending on the scope of the environmental issue. Describe the demographic makeup of the community, including factors such as age, income levels, ethnic diversity, and socioeconomic status. Understanding these demographics can provide insights into how different segments of the population may be impacted differently by environmental concerns.

  Considering the community's history, culture, and values, reveals factors which can influence attitudes and behaviors related to environmental issues.

- **Identifying Stakeholders:** Identify the various stakeholders involved in or affected by the environmental issue. Stakeholders can include individuals, groups, organizations, and institutions with a vested interest in the outcome.

  Any specific community organizations, groups, or leaders that play a role in environmental advocacy or decision-making processes, should also be highlighted.

  Gathering input and perspectives from diverse stakeholders enables us to gain a comprehensive understanding of the issue and its implications.

- **Identifying policy, social & environmental context and Evaluating Implications:** Assess the potential environmental, social, economic, and health implications of the current situation. This may include impacts on air and water quality, ecosystem health, natural resources, public health, property values, livelihoods, and quality of life.

  Consider the role of government agencies, regulatory bodies, and policymakers as stakeholders, particularly in the context of enforcing environmental regulations and implementing policy initiatives.

  Consider both short-term and long-term consequences of the environmental issue, as well as any interconnections or cascading effects on other systems or sectors.

  Identify any inequities in the distribution of impacts, including disproportionate burdens on marginalized communities or vulnerable populations.

- **Use of Analytical Tools to Assess Environmental Case Studies and Forecast Future Scenarios:** Risk assessment (RA) and Life Cycle Assessment (LCA) are two analytical tools used to support decision making in environmental case studies.

  Risk assessment (RA) is a very broad analytical tool that is applicable in many different contexts. In the context of environmental management, RA is often concerned with evaluating the risks posed by stressors, such as chemical pollutants or pathogens, to humans and other receptors. Risk is commonly defined as a combination of the probability and the severity (nature and magnitude) of the effects of a proposed action.

  Life Cycle Assessment (LCA) is an analytical tool for the environmental assessment of products or services and generally covers the entire life cycle, or supply chain, of a product or service.
  Environmentally relevant resource consumption and emissions throughout a life cycle are quantified with respect to a functional unit, and the related potential impacts on a number of safeguard subjects (e.g., human health, natural environment, and natural resources) are estimated.

Modeling, **scenario analysis**, or **forecasting techniques** can also be used to project how the environmental issue may evolve in the future under different conditions or policy scenarios.

These techniques are used in order to anticipate potential risks, challenges, and opportunities associated with future trends in population growth, urban development, technological advancements, regulatory changes, or climate variability.

3. Set Goals: What do we want to achieve

Setting goals in an environmental case study is crucial for providing a clear direction and framework for action towards addressing environmental challenges and achieving desired outcomes. By setting clear and achievable goals in an environmental case study, you can provide a roadmap for action and mobilize collective efforts towards positive environmental outcomes. Effective goal-setting helps focus attention, allocate resources, and measure success in addressing environmental challenges.

- **Defining Specific Objectives:** Start by clearly defining the objectives or desired outcomes of the environmental case study. These objectives should be specific, measurable, achievable, relevant, and time-bound (SMART).
  For example, objectives could include reducing air pollution levels by a certain percentage, increasing recycling rates, restoring degraded ecosystems, or improving water quality in a local river.
- **Prioritizing Environmental Issues:** Identify and prioritize the environmental issues or challenges that need to be addressed based on their significance, urgency, and potential for impact. Consider factors such as environmental risk, severity of consequences, feasibility of solutions, and alignment with broader sustainability goals.

- **Setting Quantifiable Targets:** Establish clear, quantifiable targets or benchmarks for measuring progress towards each goal. These targets should be based on scientific evidence, data analysis, and feasibility assessments. For example, targets could include reducing greenhouse gas emissions by a certain percentage, conserving a specific area of natural habitat, or achieving a certain level of renewable energy production.

- **Aligning with Policy and Regulations:** Ensure that the goals align with relevant environmental policies, regulations, and international commitments. Consider any legal requirements, standards, or guidelines that may apply to the environmental issue being addressed. Aligning goals with existing policy frameworks can help ensure regulatory compliance and support from government authorities.

4. Set Implementation Methodology

Setting an implementation methodology in an environmental case study involves developing a systematic approach to translate goals and objectives into concrete actions and strategies for addressing environmental challenges. Main areas of consideration could include:

- **Assessing Existing Resources and Capacities:** Evaluate the available resources, including financial, human, technical, and organizational capacities, needed to implement environmental initiatives. Identify strengths, weaknesses, opportunities, and threats (SWOT analysis) to inform the development of the implementation methodology.

- **Identifying Key Activities:** Break down the goals and objectives of the environmental case study into specific activities and interventions that need to be implemented. Consider the sequence, timing, and interdependencies of activities to ensure a logical and coordinated approach.

- **Developing Action Plans:** Create detailed action plans for each activity or intervention, outlining the objectives, tasks, timelines, responsible parties, and resources required. Define clear roles and responsibilities to ensure accountability and coordination among stakeholders.

- **Prioritising Strategies and Solutions:** Prioritise solutions based on their potential for impact, feasibility, cost-effectiveness, and alignment with broader environmental goals. Consider short-term, medium-term, and long-term actions to address immediate needs while laying the groundwork for sustainable solutions.

- **Using a flexible Management Approach:** Embrace an adaptive management approach that allows for flexibility and responsiveness to changing circumstances, new information, and unexpected challenges. Monitor progress, evaluate outcomes, and adjust strategies as needed based on feedback and lessons learned.

- **Utilising Multi-Sectoral Collaboration:** Foster collaboration and partnerships across multiple municipal departments, sectors and disciplines to leverage expertise, resources, and networks. Engage with government agencies, non-profit organizations, businesses, academic institutions, and community groups to promote integrated and holistic solutions to environmental challenges.

- **Ensuring Monitoring and Evaluation:** Establish robust monitoring and evaluation mechanisms to track progress, measure outcomes, and assess the effectiveness of implementation efforts. Develop indicators, metrics, and data collection methods to evaluate the success of environmental initiatives and inform adaptive management decisions.

- **Promoting Collaboration and Partnerships:** Foster collaboration and partnerships among stakeholders to achieve shared environmental goals. Engage with government agencies, non-profit organizations, businesses, academic institutions, and community groups to leverage resources, expertise, and networks. Collaborative approaches can enhance effectiveness, efficiency, and sustainability of environmental initiatives.

6. Set Key Measurement Indicators: How will we measure performance

The use of indicators

The Organisation for Economic Co-operation and Development (OECD) gives the following definition for **indicators**:

"It is a parameter or a value derived from parameters, which has a significance that extends beyond its direct value parameter which it represents".

Alternatively, an indicator may be defined as information which is part of a management process and which has significance beyond the value it represents.

The Scientific Committee on the Environment Problems (SCOPE) argues that the two main characteristics of indicators are that they quantify the information so that its significance becomes clearer, and simplify information about complex phenomena, thereby improving communication.

More specifically with regard to the Sustainable Development Indicators, Farrel and Hart (1998) give the following definition: *"It is a measure that provides useful information about a physical, social or economic system, usually in numerical form, and which can be used to describe the state of the system, to identify changes in it, or to highlight cause-and-effect relationships. Effect"*. An indicator is therefore nothing more than condensed information in such a form that it can be more easily understood.

Sustainable development indicators can help to assess the achievement of the sustainability objective, to analyse the relationship between human activities and the environment, the broad participation of citizens in decision-making and their results can feed back into the political process in order to necessary adjustments and corrections can be made. The adoption of indicators and priority issues can be more easily identified, so as to direct the data and information collection. In addition, the indicators should represent the environmental, social and economic impacts of the economic characteristics of a region and should be used to identify and

address important problems in order to ensure improvement and development areas in accordance with sustainability and natural resource reserves management criteria.

The categories of indicators included in the sustainable indicators are **environmental, social and economic indicators** and are explained in more detail below.

- **Environmental indicators:** This group of indicators has attracted the interest of researchers as the environment and its protection are of major importance and a prerequisite in the context of sustainable development. Examples of environmental indicators include air pollution levels (e.g., concentration of particulate matter), water quality indices (e.g., dissolved oxygen levels in rivers), species abundance and diversity, forest cover, renewable energy share in total energy consumption, and waste recycling rates.

- **Social Indicators:** Social indicators assess the well-being, equity, and resilience of communities and populations. They encompass indicators related to health, education, poverty, social cohesion, access to basic services, human rights, and quality of life. Examples of social indicators include life expectancy, infant mortality rate, literacy rate, access to clean drinking water and sanitation, income inequality, unemployment rate, and social capital such as level of community trust and civic engagement).

- **Economic indicators:** Economic indicators measure the economic performance and sustainability of societies. They include indicators related to economic growth, resource efficiency, income distribution, employment, innovation, and financial stability. Examples of economic indicators include gross domestic product (GDP), gross national income (GNI), unemployment rate, poverty rate, labor productivity, energy intensity and green investments as a percentage of total investments.

7. Evaluation of results: Have we achieved our goals?

Evaluating results in an environmental case study involves assessing the effectiveness, efficiency, and impacts of the actions and interventions implemented to address environmental challenges. Explain how your actions or the outcomes satisfy your learning goals for the reader. Be clear about the main point. For example, if you wanted readers to understand how your organization dealt with a major environmental change, include a few sentences that reiterate how you encountered and dealt with the environmental change.

The Evaluation criteria should align with the goals and objectives established at the outset of the Environmental Case study and their environmental, social, economic, and governance dimensions, as explained above.

- **Compare Baseline and Post-Intervention Data:** Compare baseline data collected before the implementation of interventions with post-intervention data to identify changes and trends over time. This helps determine whether the interventions have led to measurable improvements or achieved the desired outcomes in environmental performance, social well-being, and economic resilience.

- **Conduct Data Analysis:** Analyze the collected data using appropriate statistical methods, modeling techniques, and qualitative analysis approaches. Look for patterns, correlations, causality relationships, and outliers to understand the drivers of change and assess the significance of the results.

- **Assess Effectiveness:** Evaluate the effectiveness of the environmental interventions in achieving their intended goals and objectives. Assess whether the interventions have produced the desired outcomes, solved the identified environmental problems, and contributed to positive changes in environmental quality, resource management practices, and community well-being.
- **Evaluate Efficiency:** Assess the efficiency of the interventions in terms of resource allocation, cost-effectiveness, and utilization of inputs. Evaluate whether the interventions have been implemented in a timely manner, within budget, and with minimal waste or adverse side effects.

- **Measure Impacts:** Measure the broader impacts of the environmental interventions on ecosystems, human health, livelihoods, and socio-economic development. Consider both direct impacts (e.g., reductions in pollution levels, improvements in air or water quality) and indirect impacts (e.g., changes in land use patterns, shifts in community behavior).

8. Challenges and lessons learned

Discussing the challenges and opportunities of a developed case study is pivotal for enhancing continuous understanding and refinement. This reflection enables learning from encountered obstacles, identifying areas for methodological and strategic improvement, while also valuing successful approaches. Analyzing challenges also sparks innovative and creative solutions, fostering the development of critical thinking and problem-solving skills essential for addressing complex issues in environmental studies and beyond.

1.2.3. Case Study Template

****Have the editable word document of handout 1.2.3 Suggested Case-Study Template available on this section****

In this section, participants are encouraged to review a pre-existing environmental case study template and refine it according to the specific requirements they have identified in section 1.2.1, tailored to the challenges faced by their municipality.

The objective is to create a personalized environmental case study template that addresses the unique needs and issues pertinent to the participant's municipality.

Unit 1.3. – Creating Case Studies

Introduction

In this concluding session, participants should apply the acquired knowledge to craft case studies rooted in real-life challenges encountered in their professional spheres. This exercise not only validates the lessons learned in this module but also serves as a valuable tool for resolving local issues effectively.

They should analyze the entire learning process of the module and reflect on the challenges and opportunities encountered throughout it, enhancing their critical thinking and problem-solving abilities.

Learning outcomes:

After the learning session, participants will:

- ☑ Understand how to design and develop an environmental case study tailored to their local reality
- ☑ Obtain an environmental case study based on a real and current issue, which can and should subsequently be used as a tool for problem-solving, dissemination or other
- ☑ Have improved their capacity of problem-solving, critical thinking, and integrated analysis

****Have optional "submit document" and "submit question" on this section****

2 | Handouts

1.2.3 Suggested Case-Study Template

Title of the case	
Characterization	
Type of action	*Field of action (water, waste, biodiversity, resources management, education…)*

Geographical scope	*Local/Regional/National/International*
Location	*Country, Region and City*
Time scale	*Start and Ending date*
Organization in charge of the practice	
Type of organization	*Public/Private	NGO, public administration, local government, etc*
Organization's brief description	
Contact person	*Name, position and email*
Description	
Summary	
Goals	
Stakeholders	
Policy context	
Social context	
Environment context	
Starting point	
Detailed description	
Impact	
Beneficiaries	*Social group(s) of targeted beneficiaries (e.g. residents, teachers, tourists, etc)*
Environmental results	
Social results	
Economical results	
Targeted SDGs	*In numbers (more information clicking here)*
EU Green Deal	*"Chapter" of the EU Green Deal that is tackled by this module*

Monitoring	
Learnings	
Challenges faced or previewed	
Lessons learned (if past example)	
Potential to transfer	
Future actions or plan of action	
Resources	
Financial	*2 million € of total investment*
Funding	*1.8 million € - Funded by .....agency/programme.....* *0.2 million € - Self-funding*
Human	*Two full time environmental technicians and one environmental educator.*
Material / Logistics	*One 4x4 pickup truck; 5 ton of concrete, renting a 30 ton backhoe, etc*
Duration of implementation phase	*xx months/years*
Additional or useful information	
Internet links	*Website, news, etc*
Bibliography	*Books and scientific literature.* *BOOKS:* *Scott W, Murray S and Kerry B. 2018. Book title. Publisher, city.* *PAPERS:* *Ewert A, Chang Y. 2018. Levels of nature and stress response. Behavioral Sciences, 8: 49-58.*
Others	*Bulletins, magazines, etc*
Others	
Awards, recognition, other relevant information if past example	

1.3.1 System of Environmental and Sustainability Indicators for the city of Thessaloniki

	Areas – Theme Areas	Indicators
1	ECONOMY - POPULATION	1.Population - Solar Pyramid 2.Population density 3.GDP per capita - Sectoral distribution of GDP 4.Sectoral analysis Employment 5.Travel to work
2	Spatial planning- Urban planning	1.Land use 2.Urban and peri-urban greenery 3.Density Road network density 4.Abandoned - degraded land 5.Access to sewerage infrastructure 6.Construction of new infrastructure Urban development
3	Energy	1.Energy consumption 2.Sectoral energy analysis 3.Energy intensity 4.Renewable sources 5.Penetration of natural gas and biofuels 6.Efficiency of heating and cooling systems 7.Eco-efficiency of the energy sector
4	Transport	1.Travel and transport demand 2.Percentage participation of transport modes in travel and transport 3.Number of vehicles 4.Age of vehicles - Distribution Vehicle age - Distribution of vehicles by technology and fuel 5.R rate of penetration of alternative technologies in motoring 6.Average speed Average speed of urban transport 7.Average speed of urban transport 8.Evolution of road accidents 9.Eco-efficiency of the transport sector
5	Agriculture- Livestock Fisheries	1.Fertilizer use 2.Pesticide use 3.Penetration 4.Production of animal products 5.Grazing 6.Cultivated area and quantity 7.Structure of livestock units 8.Penetration of livestock farming 9.Eco-efficiency of the sector

		10.Fisheries 11.Heavy metals concentration in agricultural water fish and shellfish
6	Industry	1.Industrial and craft units 2.Units with Environmental Management System installed 3.Installations covered by the SEVESO Community Directives and IPPC 4.Number of medium and high pollution installations 5.Production of waste water from industrial plants 6.Eco-efficiency of the industrial sector
7	Tourism	1.Tourist arrivals 2.Tourist overnight stays 3.Number and occupancy of hotel accommodation 4.Sectoral analysis 5.Eco-efficiency of the sector
8	Air pollution Climate change	1.Air pollutant emissions 2.Emission decoupling air pollutant emissions decoupled from the economy 3.Average values and air pollutant limit values exceeded 4.Sectoral analysis air pollutant emissions 5.Exposure to air pollutants pollution by category of receptor 6.Indoor air quality 7.Greenhouse gas emissions 8.Sectoral analysis greenhouse gas emissions 9.Non-ionising radiation
9	Water resources-Marine environment	1.Water balance 2.Drinking water quality 3.Sectoral Sectoral analysis of water demand 4.Eutrophication 5.Flood risk 6.Marine water quality 7.Eutrophication in coastal waters 8.Production and Wastewater production and treatment
10	Solid waste	1.Production of solid urban waste 2.Composition of urban waste 3.Recycling of solid waste 4.Production of solid waste and treatment of hazardous waste
11	Flora- Fauna Diversity	1.Number of forest fires - Burned area - Reforested area 2.Risk of fire occurrence 3.Status of the fire Conservation and utilisation of terrestrial ecosystems

		4.Conservation status of wetlands 5.Acidification risk Risk of soil acidification; soil erosion 6.Endangered species; endemic species 7.Fallow land
12	Health	1.Population exposure to noise 2.Life expectancy 3.Diseases and causes of death
13	Education-Research & Technology	1.Research staff 2.Internet penetration 3.Services Internet services 4.Percentage of teleworking 5.Level Level of education of the population 6.Participation of students in programmes 7.Pupils per school class Double-shift school groups 8.Diplomas Patents

3 | References

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