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Competency-Based Development of Climate Education Courses in Ukraine: The ClimEd Project

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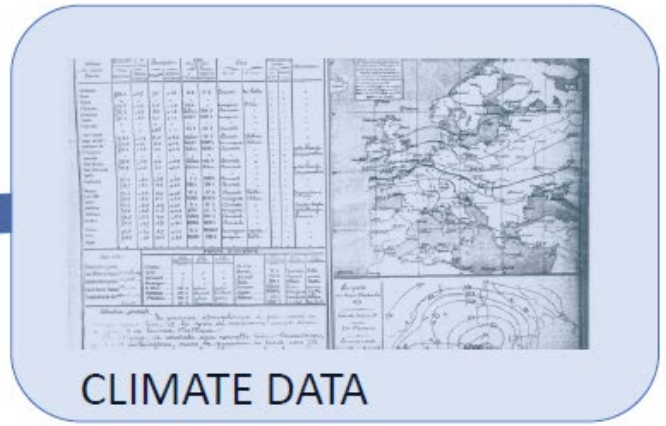
What are climate services?

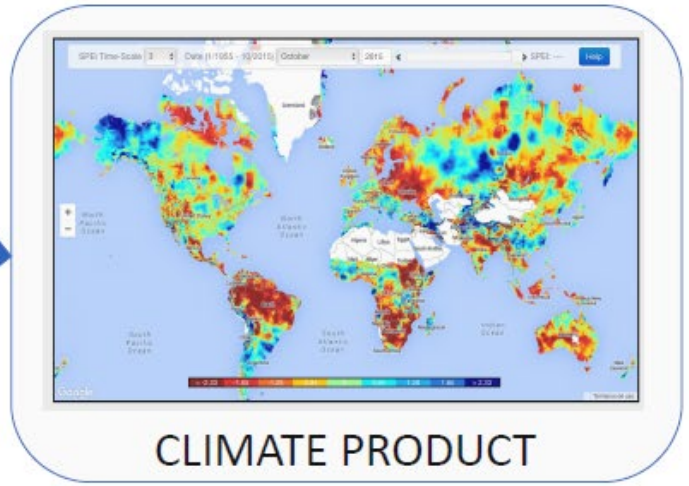
Climate services involve the provision and use of climate data, information, and knowledge to support decision-making. Effective climate services require proper interaction between the service provider and the recipient, as well as efficient access mechanisms that ensure timely action.

- **Should a vaccination programme in my region be planned based on the seasonal rainfall forecast?**
- Should drought-resistant seed varieties be sown next season according to precipitation and temperature forecasts?
- **How much wind and solar energy can we expect in different areas in the coming months, seasons, and years for developing new renewable-energy power plants?**
- Is our city's infrastructure resilient to changes in the frequency and intensity of extreme rainfall?
- **How might sea-level rise affect coastal communities and infrastructure in the coming decades, and what investments are needed for adaptation?**
- How can greenhouse gas monitoring help measure greenhouse gas fluxes into and out of the atmosphere and support countries' efforts to meet the mitigation targets of the Paris Agreement?




WMO





BECOMES A SERVICE

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- Ensure the availability of high-quality climate data
- Derive climate products from climate data using modern methods (the distant past, the recent past, the near future, and the distant future)
- Engage with end users to understand their needs, tailor climate products to those needs, and communicate them effectively.
- Evaluate the quality of the process and ensure that the climate services provided are reliable, timely, and user-oriented.

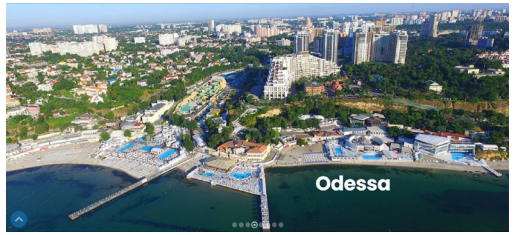
WMO

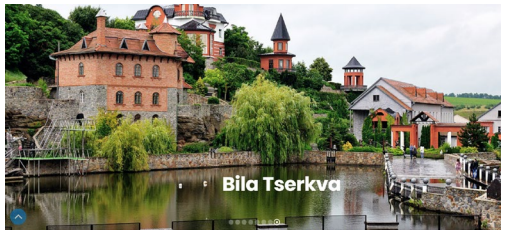
What is needed to provide climate services?

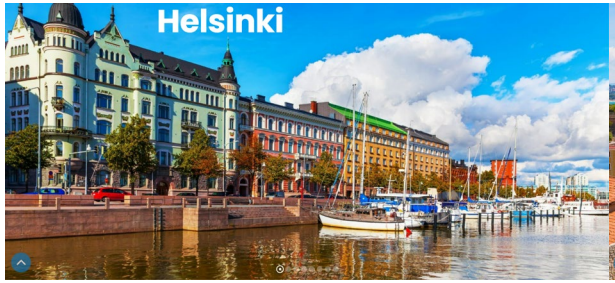
Bridging the gap between climate services providers and users

- **Engage end-users directly in designing climate services** to ensure outputs match their real decision-making needs and sector-specific contexts.
- **Translate complex climate data** into clear, timely, understandable messages using simple language and diverse communication channels (workshops, interviews, digital tools).
- **Provide customized products** – raw data, statistics, maps, plots – based on user needs, and ensure easy access through intuitive interfaces and portals.
- **Communicate uncertainties** openly, incorporate local and indigenous knowledge, and work with trusted community actors to build social capital and credibility.
- **Convert forecasts into practical implications** (e.g., crop impacts, water availability) and contextualize information to support local decision-making and risk management.

https://www.climateurope.eu/wp-content/uploads/2018/03/Climateurope_D4.2_FINAL.pdf





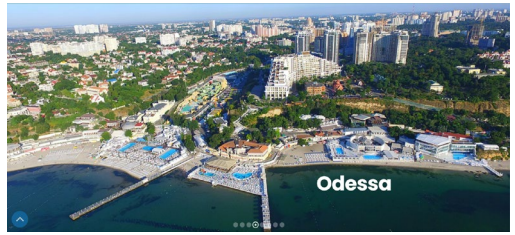


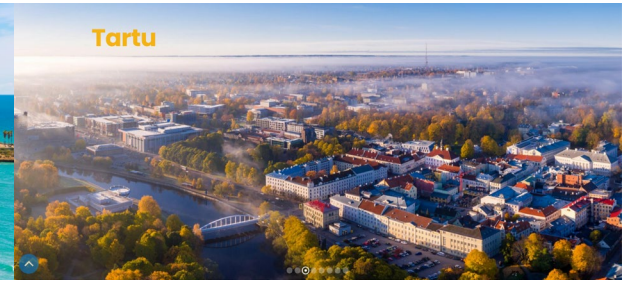
'Multilevel Local, Nation- and Regionwide Education and Training in Climate Services, Climate Change Adaptation and Mitigation – ClimEd', 619285-EPP-1-2020-1-FI-EPPKA2-CBHE-JP, 15.11.2020 – 14.05.2026

Project goals and objectives

Wider objective of the project is development of competency-based curricula for continuous comprehensive training of specialists in the field of climate services (CS) in Ukraine, as well as the initiation and development of additional education in climate change (CC) for decision-makers, experts in climate-dependent economic sectors (CDES) and the general public.

WMO





Objective 1

Development of competency-based concepts on professional education in the field of climate services and additional education for experts in climate-dependent economic sectors

Objective 2

Development of teaching and methodological materials, elaboration of distance and blended learning courses in order to form methodological support for the continuous and comprehensive training of specialists in the field of climate services

Objective 3

Development of blended learning courses in the field of climate change and adaptation to it for decision-makers, as well as massive open online courses in the same area for experts in climate-dependent economic sectors

Objective 4

Development of massive open online courses in the field of climate change and adaptation to it for the broad masses of the population

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ClimEd Partnership

WMO

‘Multilevel Local, Nation- and Regionwide Education and Training in Climate Services, Climate Change Adaptation and Mitigation – ClimEd’,

619285-EPP-1-2020-1-FI-EPPKA2-CBHE-JP,

15.11.2020 – 14.05.2026

Stages of the ClimEd Project

Preparation

analysis, planning, target groups

Development of Materials

courses, practical tasks, instructions

Training and Learning

seminars, workshops, online + in-person

Piloting

course testing, feedback collection

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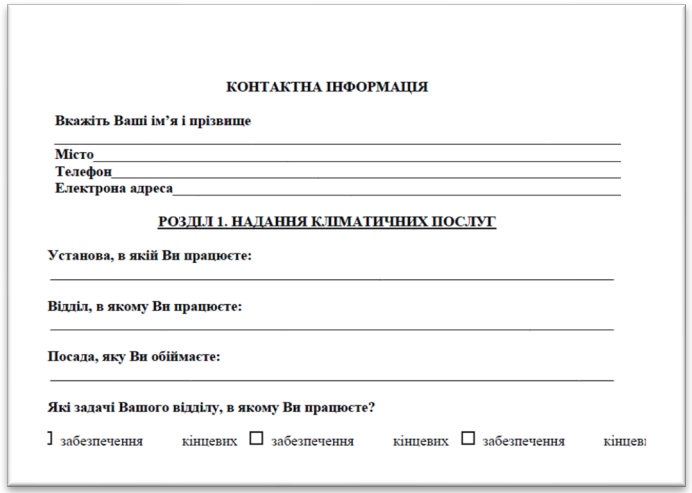
Identification of Educational Needs. Representatives of the Hydrometeorological Service

WMO297 questionnaire responses were received from representatives of various sectors:

19 regions

- 21 Hydrometeorological Centres and Institutions
  - 48 responses



КОНТАКТНА ІНФОРМАЦІЯ

Вкажіть Ваші ім'я і прізвище

Місто
Телефон
Електрона адреса

РОЗДІЛ 1. НАДАННЯ КЛІМАТИЧНИХ ПОСЛУГ

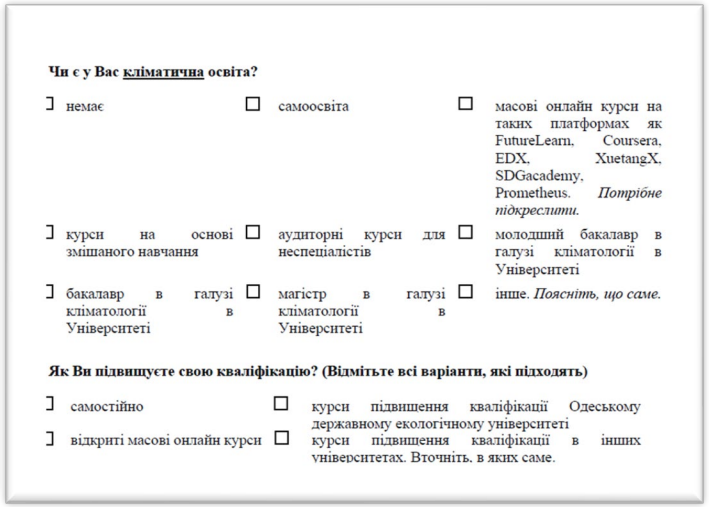
Установа, в якій Ви працюєте:

Відділ, в якому Ви працюєте:

Посада, яку Ви обіймаєте:

Які задачі Вашого відділу, в якому Ви працюєте?

☐ забезпечення кінцевих ☐ забезпечення кінцевих ☐ забезпечення кінцеві



Чи є у Вас кліматична освіта?

☐ немає ☐ самоосвіта ☐ масові онлайн курси на таких платформах як FutureLearn, Coursera, EDX, XuetangX, SDGacademy, Prometheus. *Потрібне підкреслити.*

☐ курси на основі змішаного навчання ☐ аудиторні курси для неспеціалістів ☐ молодший бакалавр в галузі кліматології в Університеті

☐ бакалавр в галузі кліматології в Університеті ☐ магістр в галузі кліматології в Університеті ☐ інше. *Поясніть, що саме.*

Як Ви підвищуєте свою кваліфікацію? (Відмітьте всі варіанти, які підходять)

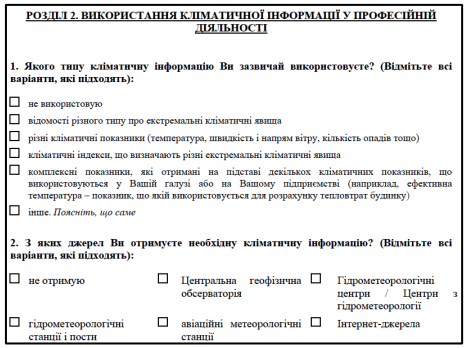
☐ самостійно ☐ курси підвищення кваліфікації Одеському державному екологічному університеті

☐ відкриті масові онлайн курси ☐ курси підвищення кваліфікації в інших університетах. Вточніть. в яких саме.

Identification of Educational Needs. Representatives of the Climate-Dependent Economic Sectors

WMO 297 questionnaire responses were received from representatives of various sectors.

- **Environmental Protection** • 37 responses
- **Health Care** • 50 responses
- Construction and Architecture • 46 responses
- Water Management • 53 responses
- Energy • 25 responses
- **Agriculture** • 84 responses
- Urban Economy • 24 responses



РОЗДІЛ 2. ВИКОРИСТАННЯ КЛІМАТИЧНОЇ ІНФОРМАЦІЇ У ПРОФЕСІЙНІЙ ДІЯЛЬНОСТІ

1. Якого типу кліматичну інформацію Ви зазвичай використовуєте? (Відмітьте всі варіанти, які підходять):

- ☐ не використовую
- ☐ відомості різного типу про екстремальні кліматичні явища
- ☐ різні кліматичні показники (температура, швидкість і напрям вітру, кількість опадів тощо)
- ☐ кліматичні індекси, що визначають різні екстремальні кліматичні явища
- ☐ комплексні показники, які отримані на підставі декількох кліматичних показників, що використовуються у Вашій галузі або на Вашому підприємстві (наприклад, ефективна температура – показник, що який використовується для розрахунку тепловтрат будинку)
- ☐ інше. *Поясніть, що саме*

2. З яких джерел Ви отримуєте необхідну кліматичну інформацію? (Відмітьте всі варіанти, які підходять):

- ☐ не отримую
- ☐ Центральна геофізична обсерваторія
- ☐ Гідрометеорологічні центри / Центри з гідрометеорології
- ☐ гідрометеорологічні станції і пости
- ☐ авіаційні метеорологічні станції
- ☐ Інтернет-джерела

Key Needs for Climate-Services Providers

Critical gaps in knowledge and technical skills

Specialists report difficulties in:
Determining climate risks (50%)
Interpreting uncertainties (37%)
Interpreting model-based climate projections (25%)
Quality control of climate information (25%)
Communicating with end users

➤ **Need:** Competence development in:
Climate risk assessment
Quality assurance of climate data
Interpreting climate projections (seasonal to long-term)
Communicating climate information and uncertainty

Awareness and use of modern tools

48% are not ready to use climate model outputs.
43% are unfamiliar with any major online climate information systems.
Only **13%** know about Copernicus C3S.

➤ **Need:** Training on:
Climate models and scenarios
Climate data portals (WMO, C3S, NOAA, IPCC, EUMETNET etc.)
Modern data analysis tools, GIS, data visualization

Limited access to climate databases

73% rely only on local/internal data.
40% report lack or inaccessibility of adequate climate information.

➤ **Need:**
Access to national and international climate datasets
A unified digital data platform for HMS
Training in metadata, data quality, and multi-source data integration

Absence of formal procedures for climate services

Only **17%** report that procedures for climate service delivery are fully developed.
66% say that only some procedures exist.
17% say procedures are absent.

➤ **Need:**
Development of standard operating procedures (SOPs)
A national framework for climate service provision (aligned with GFCS)
Clear internal workflows, quality management, and accountability mechanisms

Need for updated climate normals and new climate indices

65% demand updated normals given climate change.
Need to introduce new indices for new hazards, diseases, and sector-specific requirements.

Weak communication with users

44% struggle to understand user needs for new types of forecasts.
71% of units receive complaints; users highlight:
poor forecast skill
lack of climate risk information
lack of uncertainty information
poor visualization

➤ **Need:**
Strengthening communication skills
Co-production processes with users
Sector-specific training (agriculture, energy, transport, construction, health, water)

Limited forecasting time horizons

58% provide forecasts up to 1 month only.
29% do not provide forecasts at all.
No use of seasonal or multi-year projections despite sectoral needs.

➤ **Need:**
Seasonal and long-term prediction products
Integration of global and regional climate models

Limited understanding of sector needs

Only 27% have knowledge of economic sectors they serve.
Climate services are mostly requested by agriculture (75%), less by health (17%), tourism (4%), waste (4%).

➤ **Need:**
Development of sectoral climate service modules
Joint trainings with sectoral ministries and businesses
Improving relevance and customization of products

Lack of tools for processing, visualizing, and communicating climate data

Users complain about poor visualization and lack of risk information.
No demand for interactive GIS products — because they are not provided.

➤ **Need:**
GIS, mapping, dashboards, and interactive products
Clear graphical communication standards

Lack of risk-based climate services

Only 18% provide information on climate risks.
No uncertainty assessment is provided at all.

➤ **Need:**
Training and tools for probabilistic forecasting
Climate risk assessment frameworks
Sector-specific risk indicators and thresholds
Impact-based forecast products

General Key Needs for Climate-Dependent Sectors

Critical gaps in knowledge and technical skills

Across climate-dependent sectors, specialists consistently report difficulties in:

- **Determining climate risks** and assessing sector-specific vulnerabilities (lack of methodologies, insufficient training)
- **Interpreting uncertainties** in forecasts and projections (probabilities, confidence levels, extreme-event likelihoods)
- **Interpreting model-based climate projections** (short-term, seasonal, long-term)
  (inability to apply scenarios to planning or operations)
- **Quality control and validation of climate information** (limited capacity to evaluate reliability of data sources)
- **Understanding sector-specific climate indicators** (health indices, agroclimatic indices, hydrological indicators, heat stress metrics, municipal hazard metrics)
- **Integrating climate information into operational decisions** (planning, infrastructure, emergency response, resource allocation)
- **Communicating with end users and stakeholders** (explaining impacts, uncertainties, and actionable steps)

➤ **Need: Competence development in:**

1. **Climate risk assessment**
   - Identifying hazards, exposures, and vulnerabilities
   - Assessing sector-specific climate impacts
   - Using risk matrices, scenarios, and thresholds
   - Designing adaptation measures
2. **Quality assurance of climate data**
   - Evaluating data relevance, representativeness, and reliability
   - Understanding data limitations and uncertainties
   - Standardizing data handling across institutions
3. **Interpreting climate projections (seasonal to long-term)**
   - Understanding global and regional climate models
   - Applying projections to planning, design, and operations
   - Downscaling and interpreting scenarios for local use
   - Using probabilistic and impact-based forecasts
4. **Communicating climate information and uncertainty**
   - Translating scientific data into actionable insights
   - Presenting climate information in simple, user-relevant formats
   - Communicating uncertainty clearly and responsibly
   - Co-producing information with stakeholders

LEARNING OUTCOMES

Assessment of the impact of climate change, variability and extremes on different areas/spheres (society, environment, economy, etc.) at different scales, taking into account the full range of links between the climate system components and transdisciplinary interactions with society

1. Explain the workflow of climate dataset creation and management, including the successive application of data rescue, quality control, homogenization and integration into a climate database management system
2. Describe the geographical characteristics and historical events influencing the climate observing network, including political events and changes in observing policies and instrumentation.
3. Demonstrate proficiency in using various software tools essential for climate data management, including office suites, statistical packages, GIS, and specific quality control and homogenization packages
4. Design a database of climate data and metadata using a climate data management system, including raw, quality controlled and homogenized records;
5. Create, document, and analyze specific purpose climate datasets, including metadata and explanations of their suitable uses and associated uncertainties.
6. Retrieve climate and sectorial data from original sources inside and outside of the organization, organize, store, and document it
7. Characterize the normal climate of the study area and describe its variability and recent changes, applying descriptive statistical methods and significance analysis
8. Analyze and explain the climate of the study area and its spatial and temporal changes by applying knowledge of climate classifications, inferential and multivariate statistics, and geostatistical techniques, including data interpolation methods.
9. Effectively create synthesis reports that convert climate products into accessible climate services for users by utilizing and adapting various software tools for climate data analysis and climate product generation
10. Create sub-seasonal, seasonal and longer-scale forecasts for different geographical regions including measure of uncertainty tailored to specific user needs
11. Perform forecast verification on model outputs using WMO standard verification techniques
12. Apply different types of climate scenarios, including incremental, analogue, and global climate models, using appropriate boundary conditions, radiative forcing, and model parameterization.

Creation, development and improvement of concepts/ideas and strategies for climate change mitigation and adaptation independently or in cooperation with representatives of climate-sensitive economic sectors, public authorities, private enterprises, etc. to achieve the sustainable development goals

1. Critically analyse the complex interactions among the atmosphere, land, biology, and oceans, including the feedback mechanisms within the Earth system, while considering the impacts of human activities on the Earth's environment.
2. Identify the major global megatrends and their implications for current and future environmental, social, and economic changes, with a particular emphasis on how these trends affect the sustainability of climate-dependent sectors
3. Critically analyse the historical evolution and contemporary frameworks of sustainability, evaluating the political and socio-economic factors influencing on sustainability policies
4. Evaluate the role and impact of the Sustainable Development Goals, with a particular focus on SDG 13 - Climate Action, in facilitating sustainability transitions into various economic sectors and at various governmental levels
5. Evaluate future scenarios for the Earth system under different development pathways by utilizing climate models and future climate projections to advance sustainability agendas aligned with the UN Sustainable Development Goals
6. Evaluate the current climate policy framework in Ukraine, including national legislation, international commitments, and institutional arrangements
7. Detect and propose the best climate policy options for a selected area or economic sector based on an economic cost-benefit analysis, considering long-term socioeconomic and climate change uncertainties
8. Apply program evaluation approaches to assess the effectiveness of service delivery and stakeholder engagement.
9. Update climate services by conducting a comprehensive analysis of stakeholder needs and characteristics, including operations, limitations, time frames, expectations, terminology, climate impact considerations, and adherence to World Meteorological Organization (WMO) standards.
10. Make use of appropriate channels of communication, including management of social media and liaison with media agents
11. Formulate climatological information in a language which is both scientifically sound and adapted to the chain of foreseen users, integrating the communication of uncertainties and risks in the delivery of climate information;
12. Propose innovative strategies to advance sustainability agendas by integrating practices aligned with the UN Sustainable Development Goals into various economic sectors and at various governmental levels

LEARNING OUTCOMES

Identify and analyze the climate change causes and critical points of the Earth as a single system to quantify the contribution of climate change and human activity to the socio-economic system

- Describe the fundamental concepts of atmospheric processes, weather systems, and climate, including the nature and causes of climate variability and climate change.
- Comprehend the key processes driving climate dynamics, such as radiative forcing, greenhouse gas concentrations, ocean currents, atmospheric circulation, and feedback mechanisms.
- Describe the teleconnection between sea-surface temperature patterns and seasonal variation in rainfall and other hydro-climatic variables for the region of interest.
- Differentiate between natural climate variability and anthropogenic influences, and analyze the causes and impacts of variations and long-term changes in the climate system.
- Understand how changes in one component of the climate system can lead to cascading effects and feedback loops, appreciating the complexity of Earth's climate dynamics.

Obtain climate information to meet the needs of the end user, using all available services and climate databases (IRI/LDEO Climate data Library, Copernicus Climate Data Store, IS-ENES Climate4Impact, etc.)

- Collect information on additional sources of climate data and metadata and use it to prepare and run data-rescue campaigns.
- Discuss the strengths and weaknesses of the observational network and data availability for climate studies.
- Apply quality control and homogenization techniques and evaluate the quality and homogeneity of a climate data network after gathering documentary, statistical, and graphical evidence.
- Design a database of climate data and metadata using a climate data management system, including raw, quality-controlled, and homogenized records.
- Create and document climate datasets for specific purposes, including metadata and an explanation of their possible uses and associated uncertainties.

Create and interpret various climate products for different geographic regions and time periods, using all available state-of-the-art tools and techniques to provide quality information tailored to the user's needs, including an explanation of their possible uses and associated

- Tailor climate data and information to meet the specific needs of diverse end users, such as policymakers, researchers, and industry professionals, ensuring the relevance and usability of the information provided.
- Make use of climate data, climate indices, other climate-related information and sectorial data to derive climate product
- Define the impact of climate on strategic sectors, especially GFCS key sectors: agriculture and food security, disaster risk reduction, energy, health and water
- Operate climate models output to create sub-seasonal, seasonal and long-term climate forecasts for different climate scenarios, assessing their quality and uncertainty

Assess the vulnerability, resistance and adaptability of the economy sector or economy as a whole to climate risks, in the context of current and future climate and environmental changes in Ukraine

- Explain the key concepts of impact, risk, vulnerability, adaptation capacity, and uncertainty related to climate variability and climate change.
- Recognize regional variations in climate change impacts and vulnerabilities and the potential impacts of climate change on different sectors (e.g., agriculture, water resources, health, and infrastructure) and assess the adaptation needs of different communities, particularly vulnerable and marginalized groups.
- Choose and apply suitable analytical tools and methodologies for conducting climate vulnerability and risk assessments, ensuring accuracy and reliability of results.
- Prioritize vulnerabilities and risks based on severity, likelihood, and potential impact on vulnerable communities, ecosystems, and economic sectors.
- Provide a detailed analysis of short-term and long-term social and economic consequences of climate change.
- Use appropriate economic models to evaluate damages and identify adaptation needs based on these economic assessments.

Ensure constant and effective communication to end users/stakeholders to identify and select the best solutions for the economy and society as a whole

- Select, among the available climate products, those suitable to explain the impact of climate over the sectors of economic activity, social, and geopolitical key issues, while integrating uncertainties and risks in the delivery of climate information.
- Enhance the ability to present climate data and findings in a clear and effective manner, using visualizations, reports, and presentations that are accessible to both technical and non-technical audiences.
- Assess how gender-related factors contribute to vulnerabilities among different individuals and groups, including the impact of socio-cultural norms, economic disparities, and access to resources on their ability to respond to climate risks
- Create synthesis reports, including textual, graphical, and cartographic information, to convert climate products into climate services and communicate them to users.

Evaluate and design climate action plans and resilience strategies, including the analysis of successful case studies, the creation of adaptation strategies, and the integration of climate justice principles to ensure equitable and effective outcomes.

- Critically evaluate the effectiveness of various climate action plans and strategies, including those outlined in the Paris Agreement, assessing their potential impact on global and national scales.
- Analyze and synthesize case studies of successful climate resilience initiatives from various global contexts, identifying key factors that contributed to their success and applying these insights to develop effective resilience strategies for different regions.
- Design and propose effective adaptation strategies tailored to specific climate risks, integrating principles of resilience and sustainability to enhance the adaptive capacity of affected communities.
- Design and propose adaptation strategies that address the unique needs of vulnerable gender-specific groups, ensuring inclusive and equitable approaches to resilience-building and resource allocation
- Design and propose low-emission solutions across different sectors, including energy, agriculture, and business, incorporating innovative technologies and policies to achieve substantial reductions in greenhouse gas emissions.
- Analyze the implications of climate justice in the design and implementation of adaptation strategies, ensuring equitable and inclusive outcomes.

The Curricula Development in the Field of Climate Services was developed.

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Odessa National Medical University, Ukraine

Lviv Polytechnic National University, Ukraine

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CURRICULA DEVELOPMENT

IN THE FIELD OF CLIMATE SERVICE

Version 2.0

October 27, 2024

Work Package 01 – Work Package 03

ClimEd

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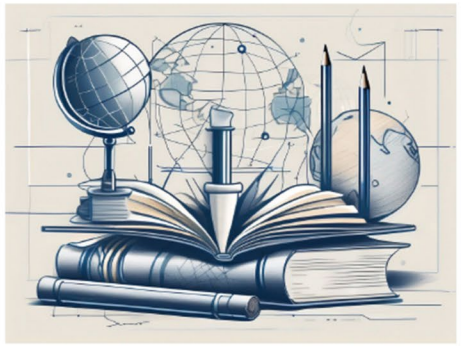
This document is the 2nd version (27th October 2024) of the "CURRICULA DEVELOPMENT IN THE FIELD OF CLIMATE SERVICE". The document has been written by the CLimEd teams of University of Helsinki, Finland, Universitat Rovira i Virgili, Tarragona, Spain, Estonian Life Science University, Estonia, Odesa Mechnikov National University, Ukraine, Bila Tserkva National Agrarian University, Ukraine, Odessa National Medical University, Ukraine, Lviv Polytechnic National University,Ukraine, Kyiv National University of Construction and Architecture, Ukraine, O.M. Beketov National University of Urban Economy in Kharkiv, Ukraine



This document is the 2nd version of a living document / interactive document, which will be expanded in a cumulatively manner by the ClimEd teams.

Contents

ClimEd

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2. UNDERSTANDING LEARNING SOLUTIONS AND DELIVERY MODES

2.1 What do we mean by Learning Solutions?

Professionals acquire skills through various avenues, including:

- Taking courses in classrooms and online
- Accessing information independently
- Collaborating with experienced colleagues
- Receiving guidance from coaches or mentors
- Engaging in work processes to innovate
- Enhancing job outcomes through practice

These diverse methods collectively define "Learning Solutions," encompassing formal, semi-formal, and informal approaches. "Delivery Modes" describe the logistical settings and environments where learning occurs, such as online platforms, classrooms, or on-the-job mentoring.

Formal learning
- Courses, teachers, assessment

Semi-formal
- Coaching and mentoring

Face-to-face
- Classrooms, labs, field trips

Online
- Many web-based options

Key strategies include Discussion, Inquiry, Experiential Learning, Case-based Learning, Project-based Learning, Guided Practice and Feedback, and Lectures and Readings. Each strategy serves a unique purpose, encouraging educators to reflect on their effectiveness in various contexts. By integrating these strategies thoughtfully, educators can optimize learning experiences and promote deeper engagement among students.

3.1 DISCUSSION STRATEGIES

Discussion Strategies are pivotal in promoting active learning. They involve structuring learning around questions or issues, encouraging students to engage deeply through dialogue. Discussions can be teacher-centered, where instructors guide the conversation towards specific learning goals, or learner-centered, allowing students to lead based on their interests. This approach fosters critical thinking and problem-solving skills, essential for mastering disciplinary knowledge.

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EXAMPLE OF LEARNING STRATEGIES MATRIX

Table 3.3 Learning strategies matrix. Suggested learning strategies for achieving the given learning outcomes in PhD courses[1]

Learning Outcomes/ Strategies	Discussion	Project-Based	Case-Based	Inquiry-Based	Flipped Classroom	Lectures	Reading	AI-Based Learning	Other Strategies
Competency 1									
LO1 (DM)	+	+			+	+	+	+	*Simulation*
LO2 (DM)	+		+		+	+	+		
LO3 (DM)		+		+		+	+	+	*Hands-on Practice*
LO4 (DM)		+		+				+	*Collaborative Work*
LO5 (DM)		+		+				+	*Data Analysis Tasks*
LO6 (DCP)	+	+		+		+	+	+	
LO7 (DCP)		+		+			+	+	*Statistical Analysis*
LO8 (DCP)		+		+			+	+	
LO9 (DCP)	+		+		+	+		+	*Report Writing*
LO10 (FM)		+		+		+	+	+	*Forecast Modelling*
LO11 (FM)	+		+		+	+	+		*Model Verification*
LO12 (FM)	+	+				+	+	+	*Climate Scenarios*
Competency 2									
LO1 (UN SDG)	+		+			+	+	+	
LO2 (UN SDG)	+		+			+	+		
LO3 (UN SDG)	+		+			+	+		
LO4 (UN SDG)	+			+		+	+		
LO5 (UN SDG)	+			+		+	+	+	
LO6 (CPU)	+		+			+	+		
LO7 (CPU)	+	+				+	+		*Economic Analysis*
LO8 (MCSU)	+			+		+	+	+	*Stakeholder Analysis*
LO9 (MCSU)	+		+			+	+	+	*Survey Design*
LO10 (BCSCS)	+					+	+		*Media Management*
LO11 (BCSCS)	+					+	+	+	*Communication Skills*
LO12 (UN SDG)	+			+		+	+	+	*Strategy Development*

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EXAMPLE OF ASSESSMENT MATRIX

Learning Outcomes/ Assessment Techniques	Quizzes	Oral Exams	Written Exams	Essays	Projects	Case Studies	Thinking Exams	Take-Home Exams	Role-Play Essays	Portfolios	Self-Assessment	Presentations
Competency 1												
LO1 (DM)	+		+		+							
LO2 (DM)	+		+			+						
LO3 (DM)			+		+							
LO4 (DM)			+	+								
LO5 (DM)				+	+							
LO6 (DCP)	+					+						
LO7 (DCP)	+					+						
LO8 (DCP)					+							
LO9 (DCP)						+						
LO10 (FM)					+							
LO11 (FM)												
LO12 (FM)				+								
Competency 2												
LO1 (UN SDG)	+						+					
LO2 (UN SDG)	+			+								
LO3 (UN SDG)						+						
LO4 (UN SDG)						+						
LO5 (UN SDG)				+								

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EXAMPLE OF DESCRIPTION OF A PROGRAMME

PhD Programme in Climate Service

	Subject (Course)	Abbrev.	ECTS credits and number of educational modules
1	Dataset Management	DM	5
2	Deriving Climate Products	DCP	4
3	Forecasting Models	FM	3
4	UN Sustainable Development Goals and Goal 13	UN SDG	6
5	Climate Policy in Ukraine	CPU	2
6	Management of Climate Service in Ukraine	MCSU	2
7	Building Communication Skills in Climate Service	BCSCS	2
TOTAL			**24**

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EXAMPLE OF DESCRIPTION OF COURSES

Subject: Deriving Climate Products (4 ECTS, C2) Abbrev. DCP		
Key Words	Basic Climate Indices (eg: extremes); Sectorial Climate Indices; Statistical Analysis (descriptive and exploratory); Report (write + graphics)	
Performance Criteria	**Learning Outcomes**	**ECTS**
Identify and retrieve climate data from different sources to generate climate products	**The module 1: Data Retrieval and Management for Deriving Climate Products** Retrieve climate and sectorial data from original sources inside and outside of the organization, organize, store, and document it	1,0
Accurately compute basic climate products, including normals, averages, anomalies, and sector-specific climate indices tailored to specific analytical needs.	**The module 2: Descriptive Statistical Methods for Climate Analysis** Characterize the normal climate of the study area and describe its variability and recent changes, applying descriptive statistical methods and significance analysis	1,0
Apply statistical and geostatistical analysis to monitor the spatial distribution and temporal evolution of climate	**The module 3: Advanced Climate Analysis Techniques** Analyze the climate of the study area and its spatial and temporal changes by applying knowledge of climate classifications, inferential and multivariate statistics, and geostatistical techniques, including data interpolation methods.	1,0
Create value-added products, such as graphics, maps and reports to explain climate characteristics and evolution, according to the needs of specific sectors such as health, agriculture, water, energy and disaster management	**The module 4: Climate data analysis and product generation** Effectively create synthesis reports that convert climate products into accessible climate services for users by utilizing and adapting various software tools for climate data analysis and climate product generation	1,0

Subject: Forecasting Models (3 ECTS, C3) Abbrev. FM		
KeyWords	Forecasts, Projections (seasonal and long term), Scenarios, Statistical Analysis (descriptive + exploratory), Report (Report (write + graphics), Uncertainty in Climate Models and Climate Projections	
Performance Criteria	**Learning Outcomes**	**ECTS**
Create sub-seasonal, seasonal and longer scale forecast products	**The module 1: Creating Climate Forecasts** Create sub-seasonal, seasonal and longer-scale forecasts for different geographical regions including measure of uncertainty tailored to specific user needs	1,0
Evaluate the performance of climate models output and quantify the associated uncertainties	**The module 2: Performing Forecast Verification** Perform forecast verification on model outputs using WMO standard verification techniques	1,0
Create future climate projections using climate models over selected domain for different scenarios and parametrization	**The module 3: Applying Climate Scenarios** Formulate and apply different types of climate scenarios, including incremental, analogue, and global climate models, using appropriate boundary conditions, radiative forcing, and model parameterization	1,0

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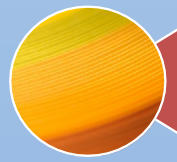
Subject Building Communication Skills for Climate Service (2 ECTS, C5) Abbrev. BCSCS		
Key words:	Media liaison, Tailored messaging, Audience-specific language, Effective communication	
Performance Criteria	**Learning Outcomes**	**ECTS**
Establish effective communication channels with users of climate services and build outreach capacities, such as Regional Climate Outlook Forums etc;	**The module 1: Effective Communication Strategies for Climate Services** Make use of appropriate channels of communication, including management of social media and liaison with media agents	1,0
	The module 2: Tailoring Climate Information for Diverse Stakeholders Formulate climatological information in a language which is both scientifically sound and adapted to the chain of foreseen users, integrating the communication of uncertainties and risks in the delivery of climate information;	1,0

EDUCATION AND TRAINING IN CLIMATE SERVICES

PhD: Climate Services

Master's Programme: Climate Services

Master's Programme: Climate Change and Adaptation



Professional Development Programmes for Climate Services Providers

Professional Development Programmes for Climate Services End-Users

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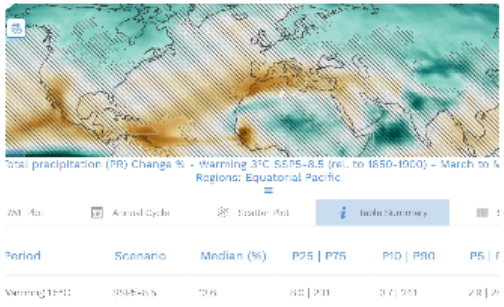
Керування базами кліматичних даних

Yelyzaveta Halych (+2)

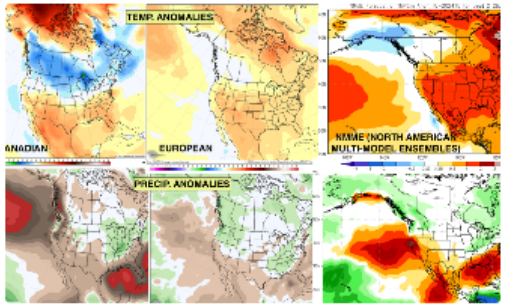
0 19 Sep 2025



Отримання кліматичної продукції

Halyna Borovska (+2)

0 24 Sep 2025



Прогностичні моделі

Halyna Borovska (+2)

0 19 Sep 2025

Цілі сталого розвитку ООН і ціль 13 (загальна частина)

Inna Khomenko (+3)

14 26 Aug 2025

Цілі сталого розвитку ООН і ціль 13 у водному господарстві

Maryna Goptsiy (+2)

Цілі сталого розвитку ООН і ціль 13 у будівництві

Yuliia Bereznytska (+5)

14 13 Oct 2025

Цілі сталого розвитку ООН та Ціль 13 в енергетиці

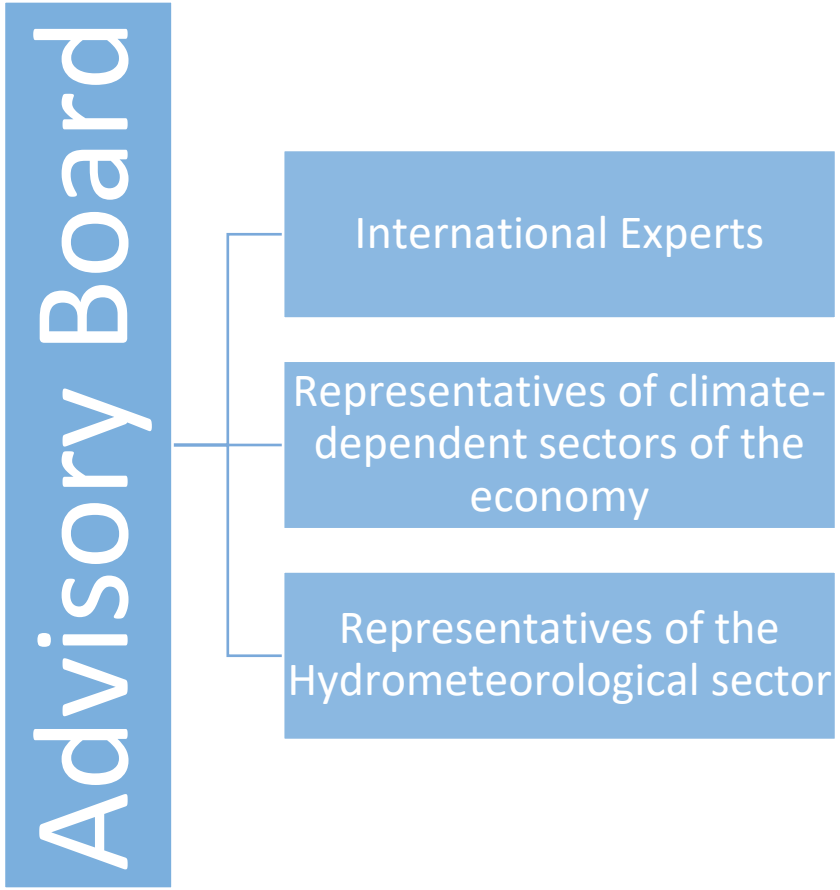
Oksana Liuta (+6)

0 28 Aug 2025

Цілі сталого розвитку ООН і ціль 13 у міському господарстві

Dmytro Diadin (+5)

QUALITY CONTROL AND ASSURANCE IN THE PROJECT



A multi-level quality control system has been established to continuously ensure the effectiveness of the climate education system.

To guarantee that the developed climate education system meets the current needs of the national labor market and adheres to international standards, advisory boards will be formed with the participation of stakeholders at the local, national, and international levels. These boards will be responsible for carrying out monitoring and regulatory functions..

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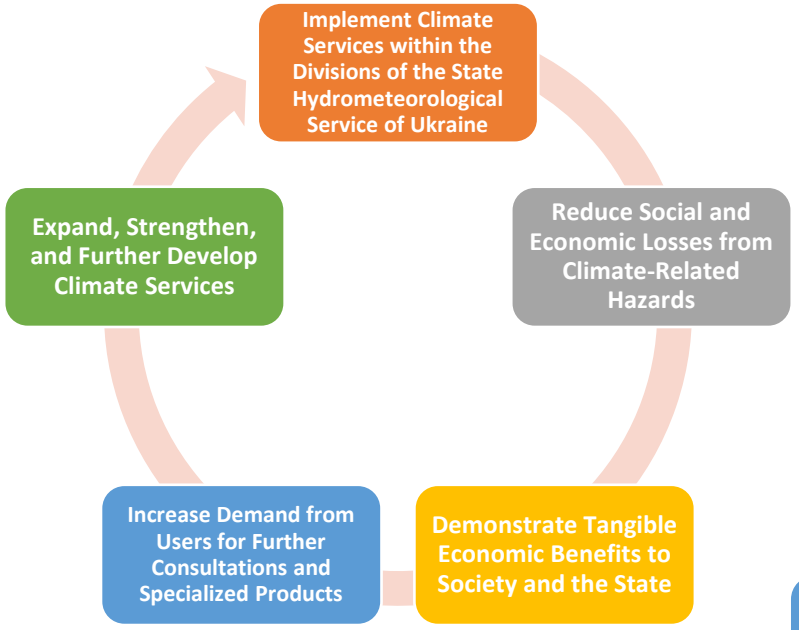
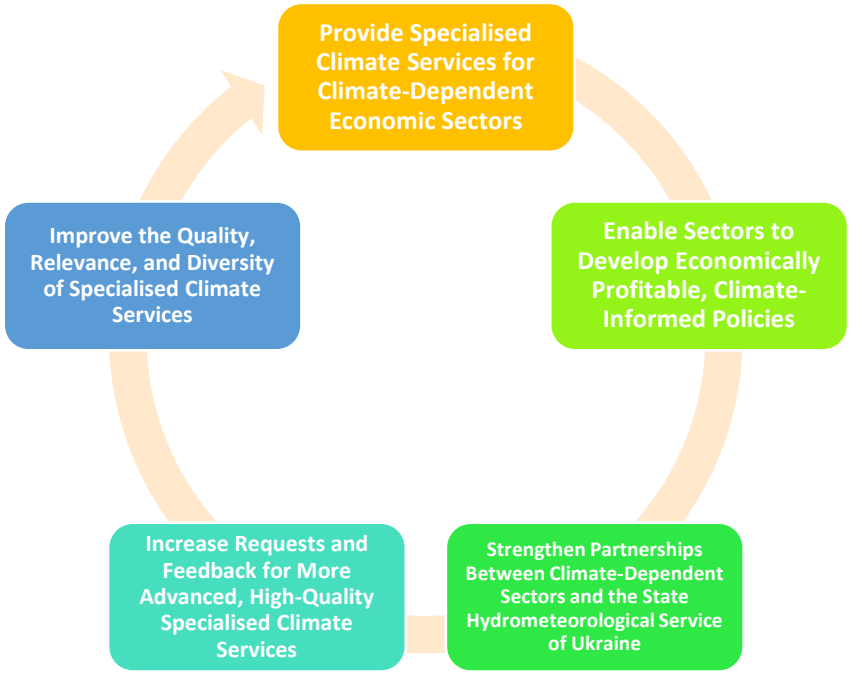
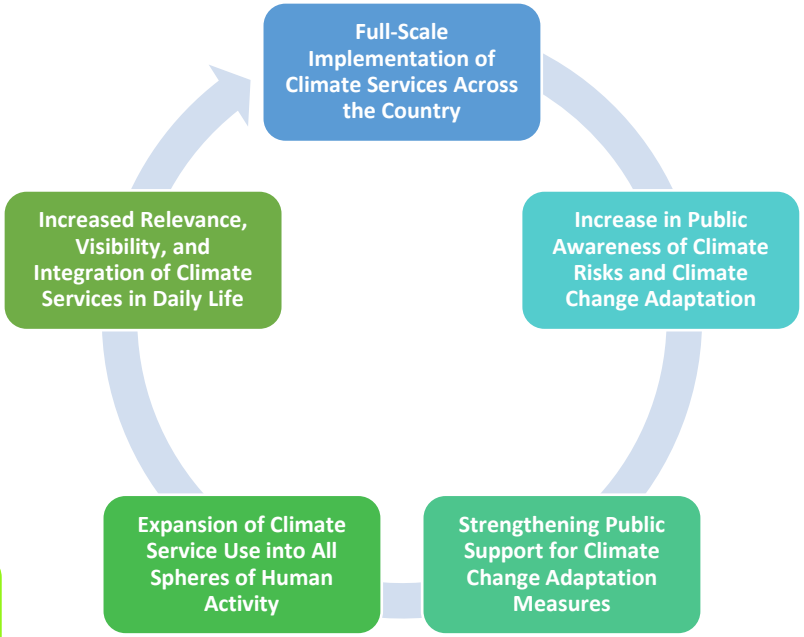
EXTERNAL VIRTUOUS CIRCLES







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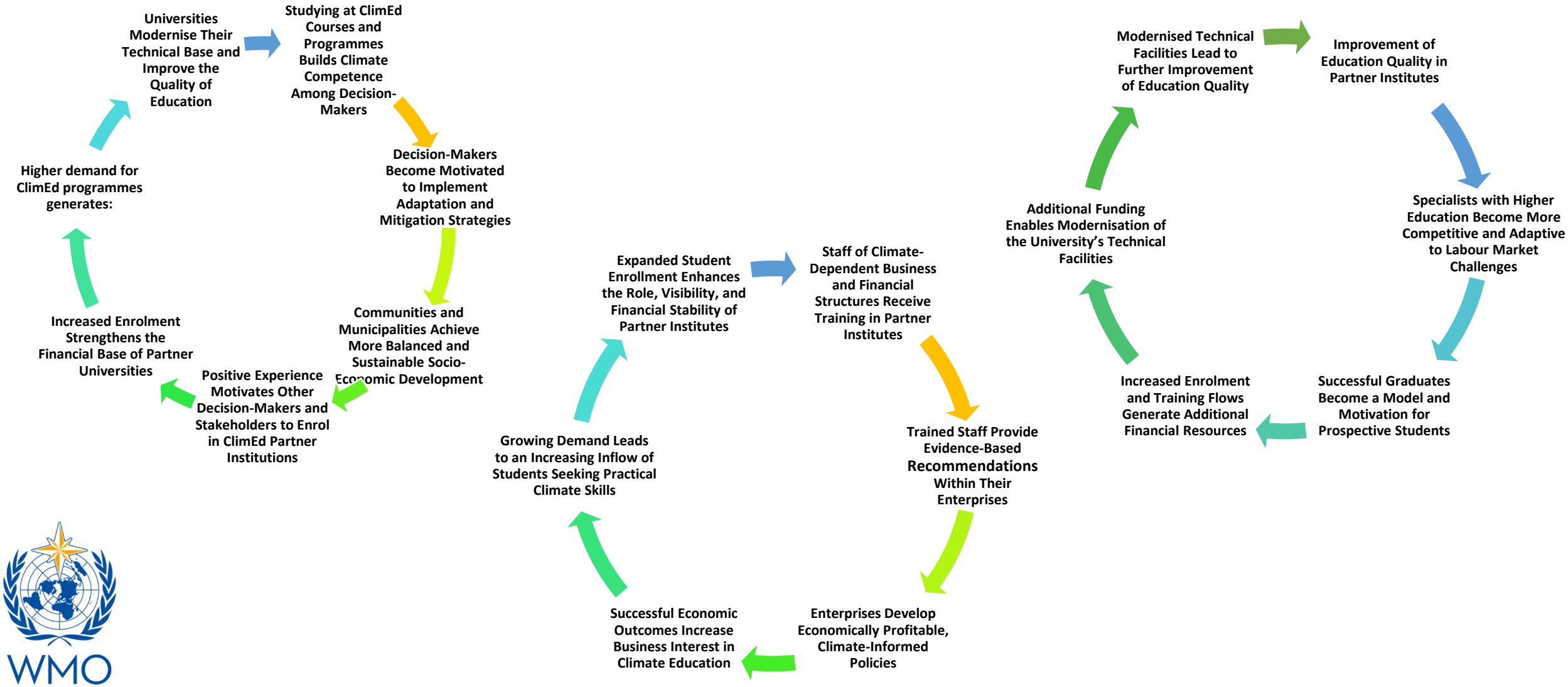
INTERNAL VIRTUOUS CIRCLES



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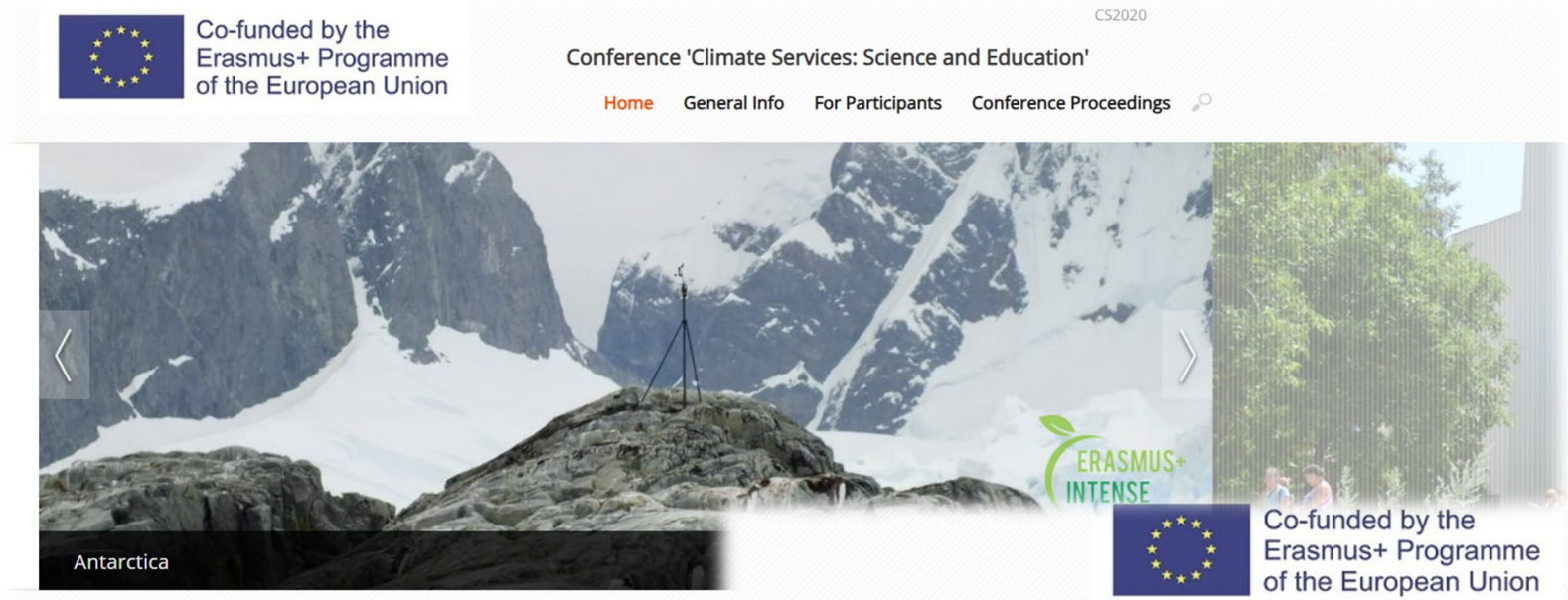

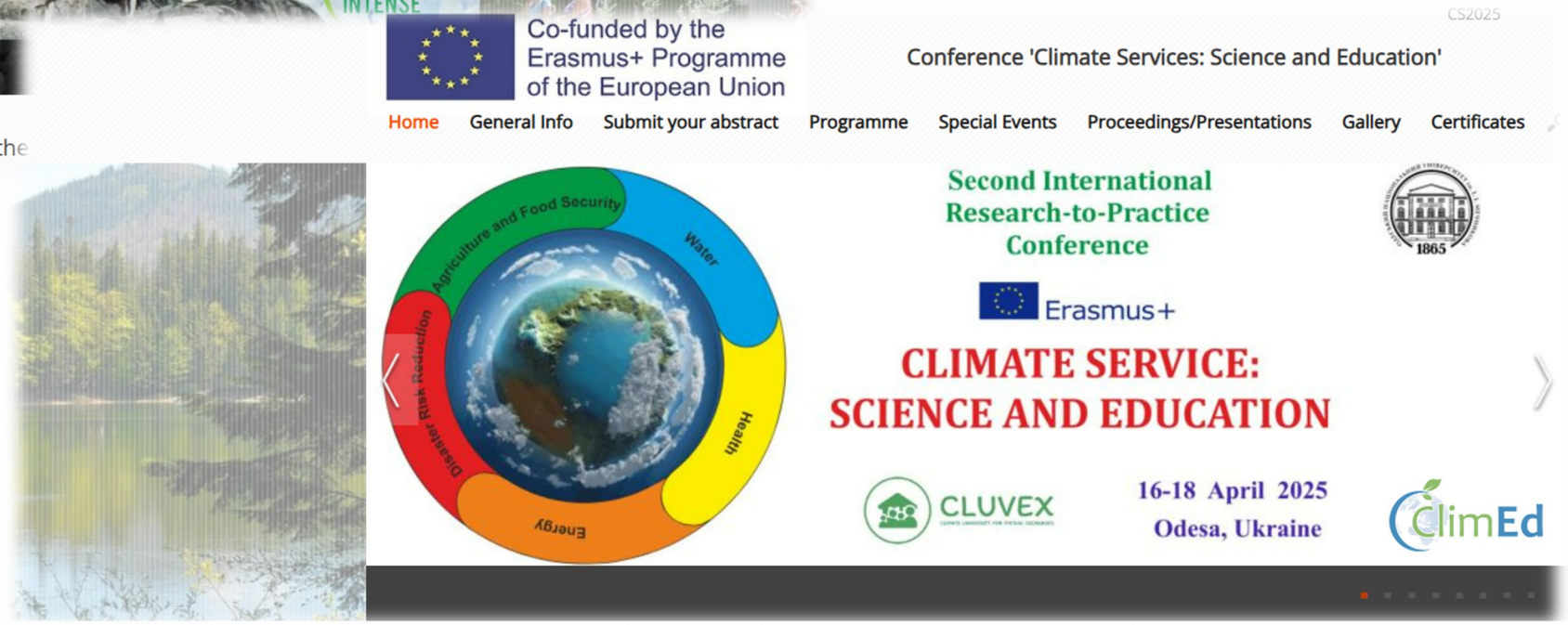

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SEVEN TRAININGS

- **Competence-Based Approach to Curriculum Development for Climate Education**
- Adaptation of the Competency Framework for Climate Services to conditions of Ukraine
- Developing learning courses in climate services considering needs of different users
- Applying different technologies of blended/on-line learning in education
- Digital tools and datasets for climate change education
- Mastering technologies of massive open on-line courses development for general public
- Developing skills to use climatic information and services for various climate-dependent branches of economy

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THANK YOU FOR YOUR ATTENTION

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Joint CALMet-XVI and CONECT-3 24-28 November 2025