GREEN SKILLS
FOR CITIES

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Long Term Programme Curriculum & Guidelines

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Institute for Advanced Architecture of Catalonia

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1. INTRODUCTION

1.1. DEVELOPING GREEN SKILLS FOR CITIES

There is growing recognition and awareness that nature can help provide viable solutions that use and deploy the properties of natural ecosystems services in order to address urban environmental, social and economic challenges. The European Commission (EC) defines nature-based solutions (NBS) as "Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions". The EC has several objectives focusing on NBS, one of them being the advancement in "the development, uptake and upscale of innovative NBS".

Cities are showing a growing interest in the integration of NBS to address urban challenges. Currently, NBS projects for cities are mainly developed by external entities specialised with the necessary knowledge to develop such complex projects, where experts from the fields of botany, technology, design and economy are required. In order to further strengthen the integration of NBS in cities, experts working in the public sector need to be empowered and trained with a transdisciplinary knowledge. In turn, this will help to: (1) introduce NBS projects in the cities with more efficient action plans and visions targeted at achieving the Sustainable Development Goals (SDG), especially SDG 13 Climate Action; (2) integrate NBS in urban and climate action plans; (3) develop new innovative NBS projects; and (4) receive, implement and manage NBS projects developed by external entities.

Green Skills for Cities (G4C) aims to establish a transdisciplinary educational platform aimed at the development of skills in the field of NBS implementation in

cities. The project brings together teachers and learners from the fields of botany, technology, design, and economy involving them in an unique transdisciplinary learning environment aiming at the development of curricula targeted at working in the public sector and involves three educational institutions (Institute for Advanced Architecture of Catalonia, University of Genoa and Vienna University of Economics and Business) and one cities network (ALDA - European Association for Local Democracy).

G4C develops several activities, one of the main outcomes being setting up a "Long-term Programme" aimed at creating a transdisciplinary educational format embedded in each of the participating HEIs academic programmes.

This report defines the main features and characteristics of the Long-term Programme Curricula.

1.2.   INNOVATIVE ELEMENTS

Within the Long-term Programme several innovative educational strategies are implemented:

- **transdisciplinary approach to learning**
  Students come from four disciplines (Botany, Technology, Design and Business) learning about each other's disciplines, in order to be able to cooperate with professionals with different backgrounds through theoretical and practical modules.
- **pioneering collaborative international learning**
  The students are located in 3 cities (Barcelona, Genoa, Vienna) and work together on projects. Learners will start to learn to deal directly with municipalities and public bodies, understanding how they function and which are their priorities.
- **innovative learning strategies**

This will be achieved through the implementation of flip teaching, learning by doing and service learning.

2. DEFINITION OF CV CHARACTERISTICS

2.1. OBJECTIVES

The curriculum will implement:

- **Service learning**

  Enable the students to become professionals able to work in municipalities and public bodies on urban sustainability enhancement through the implementation of NBS, a growing sector in the sustainable urban development field.

- **Transdisciplinary learning**

  Allow students to learn to work in transdisciplinar groups, skills that they will be able to apply while working in municipalities and public bodies.

- **International cooperation**

  Enable students to learn to work in an international dimension preparing them for future cross border cooperation projects in which the municipalities and public bodies could be involved.

2.2. SKILLS GAP

From the surveys and interviews conducted by ALDA and the partners, several skills have been identified as missing or lacking. These include:

- Key knowledge on NBS
- Green infrastructure
- Lobbying, project development and management
- Tools and strategies for impact analysis
- Data analysis and data visualisation

- Communication with citizens
- Tools to engage citizens
- Transversal relationships between different disciplines
- Working with legislation for innovative ideas
- Cooperation and teamwork between disciplines

Through the course of this programme, these skills gaps will be addressed to help learners build a well-rounded knowledge base that could contribute to municipalities and public bodies.

2.3. SKILLS TO BE DEVELOPED

The learners have the opportunity to expand their skill sets within their discipline, but also in regards to the other disciplines. Learners will be expected to develop the following skills across all disciplines:

- To work in a transdisciplinary manner taking into account different perspectives
- Clear communication in understandable way for citizens and non-experts
- Understanding legislation municipalities and public bodies face when implementing nature-based solutions

Below are a list of skills expected to be learned, by discipline:

Botany

The students will be able to:

- develop an overview of plants as a living and effective element of the green technological project within urban ecosystems;
- evaluate aspects related to the key role of plants in urban design and planning with particular reference to city resilience, environmental sustainability and climate change;

- recognize the main species characteristic of plants and their assemblages coherent with bioclimate of urban areas;
- develop the knowledge for the best practices to evaluate which plants use in Nature-based solutions interventions, referring to the ecological characteristics and the distribution of the species in the different terrestrial ecosystems within urban areas.

Technology Dimension

The students will be able to:

- consciously and critically analyse the issues of environmental sustainability applied to the NBS;
- argue the importance of the issues of resilience, optimization and circularity, applied to the architectural design and NBS;
- critically re-elaborate and evaluate the relationships between the urban environment, architectural and building envelope design and ecological and environmental issues;
- apply the acquired knowledge to the green design in architecture;
- qualitatively assess the impact and environmental benefits of design choices related to NBS, for example the selection of a design system or materials used for the construction of such systems, also considering the performance adjustment of the building envelope.

Design Dimension

The students will be able to:

- Implement and design NBS strategies that enhance and add value to the city while addressing key urban challenges;
- Conduct site analysis and impact analysis through digital simulation tools applied to a real case study;

- communicate and visualise the data in a clear and understandable way for both citizens and stakeholders to be able to process and understand the information.

Business Dimension

The students will be able to:

- form a business case for NBS solutions within the context of mitigation/adaptation for climate change, considering the barriers and opportunities of implementation;
- be able to identify and seize opportunities that may arise for key beneficiaries, through the development of presentation skills and negotiation skills;
- Promote stakeholder engagement and participation through strategies like surveys;
- Apply their knowledge to a project-based case study, and develop project and team management skills

2.4. FUTURE EMPLOYMENT PROSPECTS

One of the main goals is to provide the learners with the information and strategies to be able to work in the public sector implementing NBS. Some examples of future employers are:

- Municipalities
- Societies controlled by municipalities (as for example waste or water controlled companies)
- Provinces
- Regional bodies
- Ministries

The Long-term Programme will increase learners employability by:

- Strengthening their competitiveness in the labour market
- Facilitating access to the labour market within the public sector
- Providing the learner with a portfolio of solutions

3. COMMON CURRICULA

3.1. METHODOLOGY

The student centered curriculum will address the topic **_Environment and the Fight Against Climate Change_** and focus on topics given by the stakeholders and participating cities. In turn, the projects developed will be reviewed by the stakeholders (municipalities and public bodies) in order to receive direct feedback on their quality and feasibility.

The methodology for G4C is developed through Flip Teaching and Learning by Doing. Flip teaching will be used for the theoretical modules, where the students will be asked to learn the material before participating in classes to address doubts. The practical module will focus on learning by doing through project-based learning, giving the students real case studies to analyse and design solutions for.

The Long Term programme methodology includes:
- **Urban challenges**
  - Water management strategies including drought and extreme rainfall
  - Extreme increases in temperatures including heat waves
- **Team building**

  To ensure social cohesion within the different groups of learners, team building strategies will be used to allow the learners to familiarise themselves with one another. Team building can be

implemented in two phases, the first within each different discipline's group of learners and the second during the practical phase.

- **Theoretical modules**

  The students are provided with resources that they will study in advance. They participate in online and presential sessions to clarify any doubts. Each discipline provides a session for cross-border learning.

- **Practical exercise**

  Transdisciplinary groups of students are assigned a project site (public square) to co-design and strategise a project together implementing knowledge from all disciplines.

- **Reviews with stakeholders**

  Stakeholders are asked to participate in providing feedback for the different groups as well as participate in the final pitching sessions as jury.

3.2. COURSE STRUCTURE

The course will be divided into two sections. Firstly, the theoretical part is taught through flip teaching methodologies. This will be then followed by a practical module where the students work together on a real case study addressing the Urban Challenges highlighted in the surveys.

Overall Calendar

Month	Description
Theoretical module	
Month 1	Flip Teaching
Month 2	Flip Teaching

Month 3	Flip Teaching Introductory Online Session to the Practical Phase
Practical module	
Month 4	Intensive Workshop with all students (Practical) *Day 1:* Team building, group selection, onsite visits, and interviews *Day 2:* Design objectives and project proposal draft *Day 3:* Creating content and preparing the proposal, pitch to TBD with involvement of municipality, colleagues, professionals.
Month 5	Students arrange virtual work sessions (minimum 2 sessions)
	Final Sprint Workshop and Final Pitch (Practical)

Theoretical Background

The students learn the material provided in the resources themselves before participating presentially or in online classes to clarify the material and address their doubts. Each discipline should provide at least 1 online opportunity where the students from other disciplines can connect to ask questions and solve doubts.

Theory Module Outputs Required:

- Student Self Assessment Questionnaires

Practical - Project-based Learning

The practical module of the programme is undertaken in the form of workshops and online sessions. Before the workshops and online session takes place as a transition from the theoretical to the practical. The first workshop takes place presentially, and another workshop online to finalise the projects and pitch them to the stakeholders. In between the workshops the students should arrange at least 2 online working sessions together.

Online Introductory Session

Date	Schedule
Day 1	- Introductory session - Online team building / get to know each other - Each discipline presents there work so far or what they will bring to the table during the practical phase

Presential Workshop

Date	Schedule
Day 1	*Morning:* - Introductory Session: Overview of the Case Study, Goals and Outputs required - Team Building Exercises *Afternoon:* - Team Building & Group Selection (2 Students from each discipline) - Onsite Visit, Interviews, Site Analysis
Day 2	*Whole Day:* - Define the design objectives and design strategies - First drafts of project proposal
Day 3	*Morning:* - Design Development - Preparation of visuals and content for the pitch *Afternoon:* - Pitch to professors, municipality, citizens the first drafts of the proposal

Online Workshop

Date	Schedule
Day 1	*Morning:* - Brief Introduction - Address any doubts etc - Learners work to finalise their proposals *Afternoon:* - Learners continue to work and trainers check in with each of the groups - Refresher- Key Points on how to pitch

Day 2	Morning:
	   ● Finalise the pitches and graphic content
	Afternoon:
	   ● Final Pitch Presentation to the Stakeholders
	   ● Virtual Celebration

<u>Practical Module Outputs Required:</u>

- Pitch

- Presentation

- Report

3.3. STUDENT SELECTION PROCESS

The student selection process will take place in two formats. First format, through an application process where learners will apply to be part of the programme by submitting a CV and motivation letter. The second format is where the course is embedded within a Masters Programme, becoming a seminar within the academic programme.

4. GUIDELINES FOR COURSE IMPLEMENTATION

4.1. COOPERATION MECHANISMS BETWEEN INSTITUTIONS

- **Theoretical Classes**

  Being a transdisciplinary programme, the theoretical classes are given online (i.e. the class of Botany will be given from Genoa, the students from Genoa will have the option to participate presentially or online, the students from Vienna and Barcelona will do it online). Trainers should, if necessary, provide additional guidelines for the trainers of other disciplines on how to use their material or highlight important points.

- **Conflict prevention and resolution**

  During the monthly consortium meetings a check-in would be arranged to address any issues that may have arisen. Should a conflict arrive that cannot be internally resolved, it should be brought to the attention of all partners and an optimal and fair solution is to be found.

4.2. COOPERATION MECHANISMS BETWEEN STUDENTS

- **Balance of groups**

  The practical part of the courses is based on project-based learning and cooperative learning: the students will be organised in transnational and transdisciplinary groups (at least 2 students of Botany, 2 of Business, 2 of Design, 2 of Technology in each group)

- **Common practical project development**

  The students work together towards a common project development, each one addressing the part of the project related to his background discipline (i.e. the students of botany will make the selection of the plants to be implemented, assess their resistance

in urban environment to pollution, their need of water, insulation, etc.).

- **Meetings and Support**

  Establishment of fixed meetings with clear next steps for each discipline. Trainers can be reached through SLACK.

- **Conflict prevention & resolution**

  A session will be integrated within the theoretical module that will address the difficulties of remote working and teamwork. This is achieved through material integrated into the flip teaching and addressed during the team building sessions.

  During the monthly consortium meetings a check-in would be arranged to address any issues that may have arisen. Should a conflict arrive that cannot be internally resolved, it should be brought to the attention of all partners and an optimal and fair solution is to be found.

4.3. RESOURCES AVAILABLE

The resources will be made available online, including the documentation of the projects developed by the students, thus allowing the replication of the programme from other institutions and the use of the materials from students not participating in the programme, but interested in learning more about the topic.

Resources will Include:
- Presentations
- Video Tutorials
- PDF's in the format of short reports
  Case Studies / State of the Art Examples
- Questionnaires for Learners Self Evaluation

Dimension	Resource Content
Botany & Technology	Botany • Ecological characteristics and distribution of the plant species in the different terrestrial environments with specific reference to urban areas; • Role of plants in urban design and planning in response to climate change and city resilience; • Characteristics (nursery material, quality) and performance (ecosystem services and disservices) of the plant component in Nature-based Solution; • Human-plant interactions: aesthetics and perception of plant components in urban areas; • Tools and strategies for the sustainable integration of plant component in the urban area; • Adoption of NbS in European cities and worldwide: best practices. Technology • Tools and strategies for the integration of greenery in architecture considering the environmental sustainability; • Role of Botany, Business, Design and Technology disciplines in implementing the NbS in the cities. "Which are the challenges of each discipline?"; • What are the Nature-based Solutions, and how will they transform the urban environments and citizens' lives: – Opportunities and barriers that cities face to implement NbS;

	– Beneficial aspects for citizens of the adoption of NbS; – Identification and composition of Nature-based solutions that match with climate urban challenges; • Technologies for NbS implementation in cities.
Design	• Best practices and case studies for nature-based solutions within the city • Site analysis including ecological connectivity • Development of suitable NBS for specific sites (site-specific design), considering climatic conditions, and main environmental challenges, including working with morphologies and innovative materials • Data driven design aiding NBS implementation • Testing performances through digital prototyping and simulations

Economic	• NBS and climate action in business context
	• Introduction to core elements of business sustainability
	   ○ Financial sustainability (impact measurement)
	• Management skills (transdisciplinary problem solving on various levels)
	• Network and exchange with project partners and practitioners
	• Case studies
	• Possible extra content:
	   ○ EU Policies: E.g. European green deal, green infrastructure strategy, bioeconomy strategy, etc.

	○ Team building
	○ Business case of NbS

Templates to be provided to the learners to make the documentation coherent.

4.4. EVALUATION PROCEDURE

4.4.1. STUDENT EVALUATION PROCEDURE

As mentioned above, there will be some general outputs across all disciplines that will be required of the individuals and their groups for the project-based study.

These are:

- Student Self Assessment Questionnaires
- A Pitch
- Presentation
- Report

In addition, each higher education institution will have certain criteria that will have to be fulfilled to meet the requirements of their academic programme. This will be clearly communicated with all the students to make them aware of the responsibilities of each discipline.

Design Dimension

- Level of participation
- Demonstration of imaginative and critical thinking skills
- Development of a project that is appropriate to the criteria defined by each start-up and that of the discipline of architecture, design and engineering
- Creation of a blog post and internal submissions

Business Dimension

- Combination of attendance and interim-reporting
- Peer-review for pitch in Genoa meeting
- Business Case
- Self-reflection on learning journey

Botany & Technology Dimension

- *Intermediate assessment*

  - The activities implemented during classes (e.g., debates) allow evaluating the ability of the students to critically elaborate and relate the topics.

  - The design exercise will allow verifying the abilities to apply the knowledge acquired and to qualitatively evaluate the impact of design choices on the environment.
    The evaluation includes also the exercises developed during the course and all the activities.

- *Final assessment*

  - The final exam includes the evaluation of the students' skills considering methodological, theoretical, and practical knowledge of the topics of the course.
    The evaluation also considers the quality of exposure and the correct use of specific terms.
    The ability of the students to critically elaborate and relate the topics, and to evaluate the impact of design choices on the environment will also be evaluated.

4.4.2. OVERALL EVALUATION PROCEDURE - QUALITY SURVEYS

For the evaluation of the overall programme, the learners, stakeholders and municipalities involved will be asked to assess the quality of the programme. This will be organised and handled by ALDA.

<u>FOR LEARNERS</u>

A survey will be prepared and disseminated to the learners of the Programmes, who will   be asked to evaluate all the aspects of the educational programme in which they have been enrolled (e.g. calendar of activities, clarity of the trainers' communication and the academic resources, adequacy of the facilities and services, etc.). The analysis of the survey will generate an array of inputs that will be useful for the revision of the educational programmes during and at the end of their implementation.

<u>QUALITY SURVEY FOR STAKEHOLDERS</u>

Two surveys are aimed at monitoring the quality of results produced by the Programmes from the stakeholders' perspective (mainly municipalities, public bodies, and NGO), both collecting their feedback on the curricula produced, and evaluating the projects produced by the learners The results of these surveys will ensure that the elaborated programmes address the needs and requirements defined in the first phase of the project and that the projects produced by the learners address the urban challenges identified.