

## NBS EduWORLD - Project Education Learning Unit Overview

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### Learning Unit (LU) Planning Template - High Level Overview

Name of Learning Unit (LU) Topic		Sustainable Urban Drainage Systems Case					
NBS Context (e.g. urban rural, coastal)	NBS keywords <b>complete checklist at the end of the document</b>	Other Keywords (topics other than NBS) <b>add in Other below</b>	Linked or complementary concepts to NBS (to assist curriculum integration)	Prior learner knowledge of NBS (high, moderate, low/none)	Prior instructor knowledge/ skills/ competences of NBS or equivalent	Key EU NBS resources used (for instructor preparation) include link	Type of LU - lecture, workshop, field trip/site visit
any				moderate	moderate		Lecture
Target academic subject / discipline / professional area or group	Target learners/ groups [age range of learners] if applicable	Min/ Max # of learners (if applicable)	Sector (e.g, professional, higher education, community)	Prerequisites required of learners if applicable (education)	EQF (European Qualifications Framework) level (or Irish NFQ) indicative only	Time for LU (aim is 50 minutes per learning unit)	Course delivery format (e.g. in-person, hybrid, online)
<b>General</b>	<b>Undergraduate</b>	n/a	<b>professional or higher education</b>		EQF 6 - Irish NFQ 7/8 Ordinary/H	50 minutes	Hybrid
Overall Purpose	This unit introduces Sustainable Urban Drainage Systems (SUDS) as a critical approach to stormwater management, climate adaptation, and urban sustainability. It explains how SUDS mimic natural water cycles, manage surface water runoff, and integrate green infrastructure						
LU Summary (2-3 sentences)	This unit covers the principles of Sustainable Urban Drainage Systems (SUDS), their importance in managing stormwater and promoting urban resilience to climate change. The session examines SUDS components like rain gardens, green roofs, and permeable pavements, and the role of EU policies and funding in supporting SUDS projects. Students will also explore case studies of cities successfully integrating SUDS for improved water management, biodiversity, and sustainability.						
Learning Outcome 1	Understand the principles and components of SUDS and their role in stormwater management, climate resilience, and urban sustainability.						
Learning Outcome 2	Identify key EU policies and funded projects that support the integration of SUDS in cities.						
Learning Outcome 3	Evaluate the challenges and opportunities of implementing SUDS, with a focus on community engagement, policy support, and maintenance.						
Learning Outcome 4							

## Activities and Elements of Learning

*Aim that each learning unit include at least 4 activities for an interactive learning experience*

Time (duration of activity)	Aims - linked to NBS concepts or topics)	Link to Learning Outcome	Learning Activity [PPT Slide # - if applicable]	Teacher action/activity (Learner action/activity)	Confirmation of learner's learning (assessment of learning)	Link to online NBS resources (and/or academic resources with DOI as relevant)	Offline resources and materials (e.g. post-its,)
15 minutes	Introduce SUDS and explain how they mimic natural hydrological processes to manage stormwater sustainably.	1	Introduction to SUDS and their components [Slides 3-5].	Define SUDS and explain their principles: infiltration, storage, treatment, and discharge. Introduce the key components of SUDS such as permeable pavements, rainwater harvesting, green roofs, swales, and retention ponds. Discuss the benefits of SUDS for climate adaptation, biodiversity, and urban sustainability.	In class discussion are designed to engage students; Learners respond to the questions and the teacher will determine understanding from their responses		Post-it notes for a <b>brainstorming exercise</b> on <b>NBS concepts</b> and how they might apply to local urban challenges.

15 minutes	Discuss EU policies and funded projects that support SUDS integration in urban settings	2	Case study of EU-funded projects supporting SUDS [Slides 6-10].	Present case studies of EU-funded projects like CityLoops, Green4CITIES, and LIFE UrbanGreening that integrate SUDS in urban planning and stormwater management. Explain the role of EU policies such as the European Green Deal, EU Water Framework Directive, and EU Floods Directive in promoting SUDS as a climate adaptation strategy.	Group exercise where students are tasked with analyzing one of the presented EU projects and discussing its impact on climate resilience and urban sustainability designed to engage students; Learners respond to the questions and the teacher will determine understanding from their responses		Post-it notes for a brainstorming exercise on NBS concepts and how they might apply to local urban challenges.
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15 minutes	Analyze the challenges and opportunities in implementing SUDS in urban environments	3	SWOT analysis of SUDS implementation [Slides 11-14].	Lead a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) discussion of SUDS implementation, considering factors like cost, space constraints, maintenance, and public engagement. Discuss how policy support, community engagement, and technological advances can overcome challenges and scale up SUDS. Explore examples of successful public engagement in SUDS projects.	In class discussion are designed to engage students; Learners respond to the questions and the teacher will determine understanding from their responses		Post-it notes for a brainstorming exercise on NBS concepts and how they might apply to local urban challenges.
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5 minutes	Wrap up the session and ensure that all key learning points have been understood.	1, 2, 3	Open Discussion	Open the floor for questions regarding the implementation of SUDS, EU policies, and challenges in scaling SUDS in urban areas. Provide feedback and encourage students to reflect on how SUDS can enhance urban resilience to climate change.	Teacher will ask follow-up questions based on students' responses to ensure key learning outcomes have been achieved. Give instant feedback on students' ability to connect NBS concepts with real-world applications.		NA
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NBS- Application of Curriculum, Trends and Skills

Curriculum integration (how it may connect to curriculum)						
<u>Teaching &amp; Learning Trends employed</u>  <u>Highlight all that apply</u>  <u>(Source)</u>	<b>Project-based learning:</b> e.g., students work in groups on a research project on greenhouses and the greenhouse effect, alternatives to waste management or investigate what are the views of their peers on climate change.	<b>Peer learning:</b> e.g., students work in groups, evaluate the work of their peers, or develop assessment questions to assess peers.	<b>Problem-based Learning:</b> e.g., students are introduced to a problem and challenged to find a solution together based on the information provided to them.	<b>Student-centred learning:</b> the learning scenarios are not based on classical instruction by the teacher, but they are expected to actively engage students in the lessons.		

<p>21st Century Skills</p> <p><b>Highlight all that apply</b></p> <p>(Source)*</p>	<p><b>Creativity:</b> e.g., students think of various solutions for promoting a better lifestyle in their communities or encourage greener solutions to their schools' issues.</p>	<p><b>Information/ Media literacy:</b> students explore examples of NBS, research similar solutions in other communities.</p>	<p><b>Collaboration:</b> e.g., students work in groups and engage in task division to produce outputs.</p>	<p><b>Critical thinking:</b> e.g., students learn that a debate on deforestation or climate change does not consist of two opposing camps only but involves many stakeholders with different perspectives.</p>	<p><b>Communication:</b> e.g., students present their work to the whole class and learn to put forth strong arguments based on facts.</p>
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\*Gras-Velázquez, À., Mulvik, I. B., Campodonio, A., Nada, C. & Pocze, B. (2020) *Nature-Based Solutions in education - Validation report, European Commission, August 2020* [accessed on 25/03/2024 <https://files.eun.org/NBS/NBS-pilot-validation-report-final.pdf>] p.8.

<p>GreenComp - European Sustainability Competency Framework</p> <p><b>Highlight all that apply</b></p> <p>(Source) 1- Embodying Sustainability Values and 2 - Embracing Complexity in Sustainability (see pp.13-14)</p>	<p><b>1.1 Valuing Sustainability:</b> To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values</p>	<p><b>1.2 Support Fairness:</b> To support equity and justice for current and future generations and learn from previous generations for sustainability</p>	<p><b>1.3 Promoting Nature:</b> To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems</p>	<p><b>2.1 Systems Thinking:</b> To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.</p>	<p><b>2.2 Critical Thinking:</b> To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.</p>	<p><b>2.3 Problem Solving:</b> To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems</p>
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<p>GreenComp - European Sustainability Competency Framework</p> <p><b><u>Highlight all that apply</u></b></p> <p>(Source) 3- Envisioning sustainable futures and 4 - Acting for Sustainability (see pp.13-14)</p>	<p><b>3.1 Futures Literacy:</b> To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.</p>	<p><b>3.2 Adaptability:</b> To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk. generations and learn from previous generations for sustainability</p>	<p><b>3.3 Exploratory Thinking:</b> To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.</p>	<p><b>4.1 Political Agency:</b> To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.</p>	<p><b>4.2 Collective Action:</b> To act for change in collaboration with others.</p>	<p><b>4.3 Individual Initiative:</b> To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet</p>
<p>Author and organisation to credit when using the LU</p>	<p>Centre for Social Innovation - Trinity Business School, Trinity College Dublin</p>					

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**NBS Keywords Checklist (tick here below)**

	<p>Forest Preservation</p>
	<p>Forest Restoration</p>

<p>Teacher Resources (If 'Notes' are used in the related PowerPoint presentation please indicate here)</p>	<p>Learner Resources (e.g. academic articles or links) for advanced reading or review (citation in individual cells)</p>
	<p>NBS</p>

Faivre et al (2017) NBS and the

	<i>Forest enhanced management for woodfuel harvest</i>
	<i>Forest Production</i>
	<i>Grassland Preservation</i>
	<i>Grassland Restoration</i>
	<i>Grassland grazing management</i>
	<i>Coastal Preservation</i>
	<i>Coastal Restoration</i>
	<i>Coastal maintenance of slope vegetation</i>
	<i>Maintenance of coastal, floodplain and riverine vegetation</i>
	<i>Agroforestry</i>
	<i>Reduce tillage and carbon restoration practices</i>
	<i>Agricultural intensification</i>
	<i>Urban forests and green spaces</i>
	<i>Urban green roofs</i>
x	Climate-change adaptation and mitigation
x	Sustainable cities/ sustainable communities
x	Re-naturing cities/ re-naturing communities
x	Urban regeneration
x	Coastal resilience
	Multi-functional watershed management
	Enhancing the insurance value of ecosystems
	Sustainability of the use of matter and energy
x	Sustainable development
x	Innovating with nature
x	Biodiversity
x	Nature-based enterprises
x	Nature-based entrepreneurship
x	NBS and new business and investment models
x	Citizen participation, stakeholder/community consultation
x	Disaster risk reduction
	Risk management and resilience
x	NBS policy development and implementation
	NBS research
	Green infrastructure
	Green finance / sustainable finance
x	Ecosystem services and ecosystem-based approaches




	Rural municipal/local authority/government planning	
x	Coastal municipal/local authority/government planning	
x	Urban municipal/local authority/government planning	
	Improving well-being and quality of life	
x	NBS and new business and investment models	
	NBS and CCAM (Connected, Cooperative and Automated Mobility)	
	Other 1: (Please specify)	nature-inspired innovations
	Other 2: (Please specify)	
	Other 3: (Please specify)	

Keywords Source 1: United Nations Environment Programme (2020). *The Economics of Nature-based Solutions: Current Status and Future Priorities*. United Nations Environment Programme Nairobi., p.5. (keywords above in italics)

Keywords Source 2: Faivre N, Fritz M, Freitas T, de Boissezon B, Vandewoestijne S. (2017)'Nature-Based Solutions in the EU: Innovating with nature to address social, economic and environmental challenges.' *Environ Res.* 2017 Nov;159:509-518. doi: 10.1016/j.envres.2017.08.032. Epub 2017 Sep 8. PMID: 28886502.

Keywords Source 3: European Commission (2015). *Towards an EU Research and Innovation policy agenda for Nature-Based Solutions & Re-Naturing Cities: Final Report of the Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities' Full Version*. Luxembourg: Publications Office.













