

**we accelerate Ukraine's critical
infrastructure recovery**

**bridgeUkraine.org is a non-profit alliance of
more than 47 practitioners, consultants,
academics, institutions, and international
bodies that are tasked to accelerate Ukraine's
critical infrastructure recovery**

www.bridgeUkraine.org



NEWSLETTER

YEAR 2

Published: 29 March 2024

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bridgeUkraine

for a Sustainable and Resilient Future

Dear Reader,

It is a pleasure to send you our second newsletter on behalf of the bridgeUkraine Alliance. Many of our aims have been delivered during the past year, and several achievements in support of Ukraine's reconstruction and capacity building have been accomplished. We had very positive feedback and bridgeUkraine currently counts more than 47 members from all over the world with significant contribution of Ukrainians and strong participation of women. bridgeUkraine continues its collaboration based on the Memorandum of Understanding (MoU) with the Derzhdor NDI SE of the Ukrainian State Road Research Institute of the Ministry of Restoration of Ukraine.

bridgeUkraine has raised a total of £1.67m (\$2.11m) to support Ukrainian academics and consultants to develop frameworks for the efficient reconstruction of Ukraine's critical infrastructure. Of this funding, 96% is directly allocated to Ukrainians. Of this funding, [£1.05m is to support four Ukrainian academics](#), who work on the reconstruction prioritisation of Ukraine's critical infrastructure using resilience and sustainability metrics, digital data and technologies and leveraging AI where possible. bridgeUkraine also secured a large grant to deliver a 3-year capacity building programme. This programme will educate and provide certifications to thousands of Ukrainian engineers on Eurocodes and other international design guidelines, to facilitate peacebuilding for a more beautiful, sustainable and resilient Ukraine, where people are included and feel safe.

We initiated a very rewarding [Twinning](#) between the Ivan Franko National University of Lviv and the University of Birmingham on conflict resilience and organised a 1-day workshop that took place in Warsaw that was attended by more than 30 academics, consultants, politicians and policy makers of Ukraine. With targeted seminars, CPD and capacity building meetings we have educated >900 Ukrainian scientists and engineers.

bridgeUkraine published an open access paper titled '[Conflict-resilience framework for critical infrastructure peacebuilding](#)' in the journal of Sustainable Cities & Societies and an UNDP CDRI report on '[Financing for disaster and climate resilient infrastructure for a net-zero economic transition with a case study on Ukraine's infrastructure](#)', which has been presented in the G20 summit.

Please share your thoughts with us and fill in this [form](#) to join the Alliance!

Sincerely,

The bridgeUkraine Alliance

We accelerate peacebuilding prioritisation and optimisation for critical infrastructure to support Ukraine's people and economy:

- Establish a Community of Practice based on an **alliance** of engineers, academics, economists and governmental bodies to build capacities and train Ukrainians for rebuilding infrastructures. [Read more >>](#)
- Develop and apply **resilience** frameworks using open digital data and crowdsourcing for **optimal infrastructure reconstruction** to incentivise the green transition in Ukraine for optimal resource allocation in infrastructure recovery. [Read more >>](#)
- Capacity-building programme “Empower Ukraine” to **educate Ukrainian engineers** on Eurocode-based infrastructure design and construction through comprehensive Continuing Professional Development sessions. [Read more >>](#)



bridgeUkraine contributes to UN SDSs and Targets



Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

NAME: Target 16.6

DESCRIPTION: Develop effective, accountable and transparent institutions at all levels



End poverty in all its forms everywhere

NAME: Target 1.5

DESCRIPTION: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters



End hunger, achieve food security and improved nutrition and promote sustainable agriculture

NAME: Target 2.b

DESCRIPTION: Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round



Take urgent action to combat climate change and its impacts

NAME: Target 13.1

DESCRIPTION: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries



Make cities and human settlements inclusive, safe, resilient and sustainable

NAME: Target 11.5

DESCRIPTION: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations



Make cities and human settlements inclusive, safe, resilient and sustainable

NAME: Target 11.6

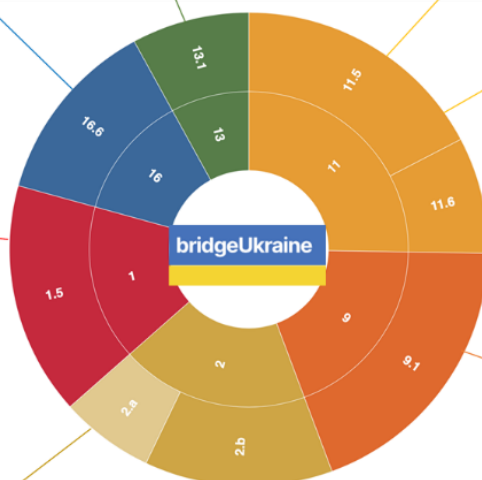
DESCRIPTION: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

NAME: Target 9.1

DESCRIPTION: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all



SUSTAINABLE DEVELOPMENT GOALS



Researchers at Risk Fellowships

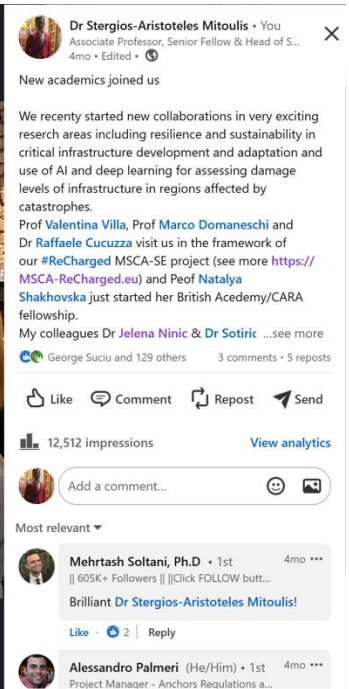
**Total Funding:
£1.67m**

Four fellowships were supported by the British Academy/CARA for top Ukrainian academics of Lviv Polytechnic University:

- **AI4SURE** - AI-empowered data-mining techniques for SUsustainable and climate-REsilient peacebuilding
- **bridgeAdapt** - Sustainable adaptation measures for deteriorated bridges to climate-induced damage
- **WINDTUNE** - Turbulence on surface pressures on residential buildings situated in industrial zones
- **ReconAI** - Data-driven infrastructure resilience assessment toward climate adaptation and conflict-resilience

BridgeUkraine Capacity Building Programme

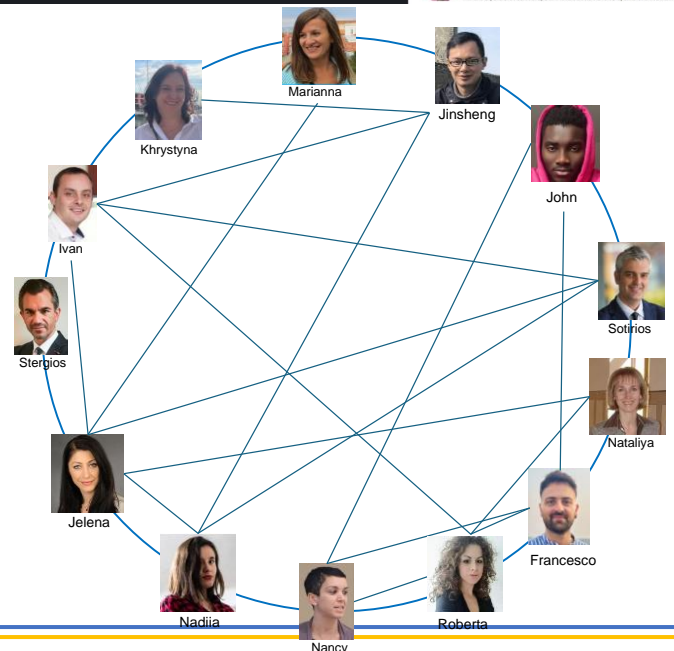
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Ukrainian academics joined UK Universities



Integration of Ukrainian researchers in the research group: metaInfrastructure.org

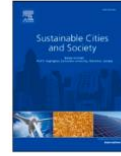




Contents lists available at ScienceDirect

Sustainable Cities and Society

journal homepage: www.elsevier.com/locate/scs

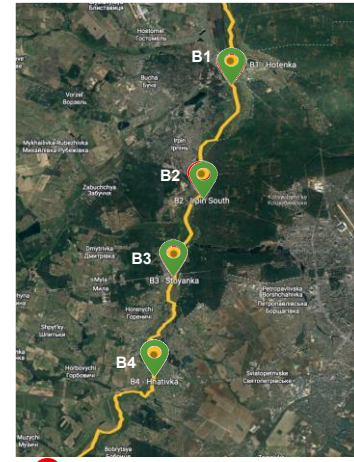
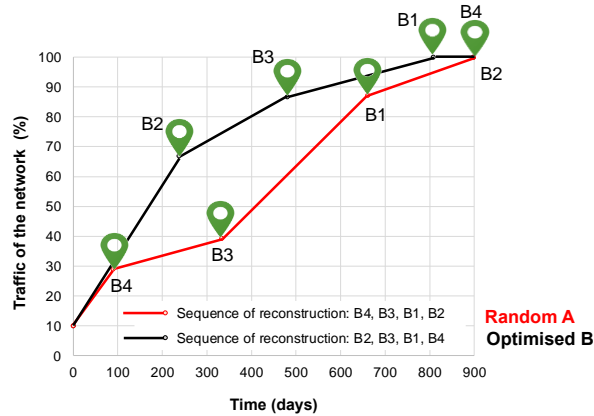


Published papers

Conflict-resilience framework for critical infrastructure peacebuilding

Stergios-Aristoteles Mitoulis^{a,b,c,*}, Sotirios Argyroudis^{b,c,d,*}, Mathaios Panteli^{b,e}, Clemente Fuggini^{b,f}, Sotirios Valkaniotis^{b,g}, William Hynes^h, Igor Linkov^{i,j}

- ^a Department of Civil Engineering, School of Engineering, University of Birmingham, UK
- ^b bridgeUkraine (www.bridgeUkraine.org), London, UK
- ^c InfrastructuresResilience (www.infrastructuresResilience.com), London, UK
- ^d Department of Civil and Environmental Engineering, Brunel University London, UK
- ^e Department of Electrical and Computer Engineering, University of Cyprus, Cyprus
- ^f Infrastructures Business Unit, Rina Consulting S.P.A., Italy
- ^g Department of Civil Engineering, Democritus University of Thrace, Greece
- ^h OECD (Organisation for Economic Co-operation and Development), France
- ⁱ US Army Engineer Research and Development Center, USA
- ^j University of Florida, Gainesville, USA



- damaged / closed bridge
- reconstructed / open bridge

- 15-20% better traffic performance for the same investment (\$) if reconstruction strategy B is adopted instead of A
- for limited investment (\$) this framework can save 30% of cost and increase 30-35% the network traffic performance
- prioritisation reduces the cost due to traffic detours by 60%

doi.org/10.1016/j.scs.2023.104405

Computer Science > Computer Vision and Pattern Recognition

[Submitted on 31 Jan 2024 (v1), last revised 1 Feb 2024 (this version, v2)]

Tiered approach for rapid damage characterisation of infrastructure enabled by remote sensing and deep learning technologies

Nadiia Kopiika, Andreas Karavias, Pavlos Krassakis, Zehao Ye, Jelena Ninic, Nataliya Shakhovska, Nikolaos Koukoulas, Sotirios Argyroudis, Stergios-Aristoteles Mitoulis

Critical infrastructure such as bridges are systematically targeted during wars and conflicts. This is because critical infrastructure is vital for enabling connectivity and transportation of people and goods, and hence, underpinning the national and international defence planning and economic growth. Mass destruction of bridges, along with minimal or no accessibility to these assets during natural and anthropogenic disasters, prevents us from delivering rapid recovery. As a result, systemic resilience is drastically reduced. A solution to this challenge is to use technology for stand-off observations. Yet, no method exists to characterise damage at different scales, i.e. regional, asset, and structural (component), and more so there is little or no systematic correlation between assessments at scale. We propose an integrated three-level tiered approach to fill this capability gap, and we demonstrate the methods for damage characterisation enabled by fit-for-purpose digital technologies. Next, this method is applied and validated to a case study in Ukraine that includes 17 bridges. From macro to micro, we deploy technology at scale, from Sentinel-1 SAR images, crowdsourced information, and high-resolution images to deep learning for damaged infrastructure. For the first time, the interferometric coherence difference and semantic segmentation of images were deployed to improve the reliability of damage characterisations from regional to infrastructure component level, when enhanced assessment accuracy is required. This integrated method improves the speed of decision-making, and thus, enhances resilience. Keywords: critical infrastructure, damage characterisation, targeted attacks, restoration

Comments: Main text (34 pages, 18 figures); Supplementary materials (13 pages)
 Subjects: **Computer Vision and Pattern Recognition (cs.CV)**; Image and Video Processing (eess.IV)
 Cite as: [arXiv:2401.17759 \[cs.CV\]](https://arxiv.org/abs/2401.17759)
 (or [arXiv:2401.17759v2 \[cs.CV\]](https://arxiv.org/abs/2401.17759v2) for this version)
<https://doi.org/10.48550/arXiv.2401.17759>

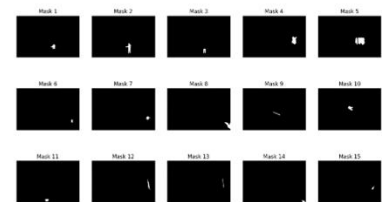
Images



SAM



Masks



<https://arxiv.org/abs/2401.17759>



ZEBAI: Innovative methodologies for the design of Zero-Emission and cost-effective Buildings enhanced by Artificial Intelligence
Budget: €5m

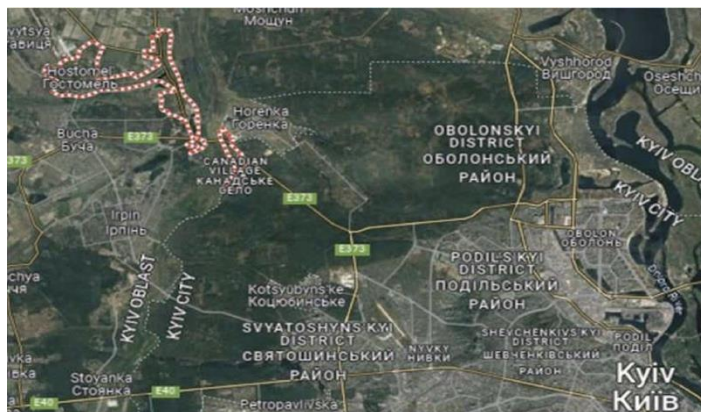
<https://cordis.europa.eu/project/id/101138678>

Reconstructing Hostomel, Ukraine using the ZEBAI methodology.

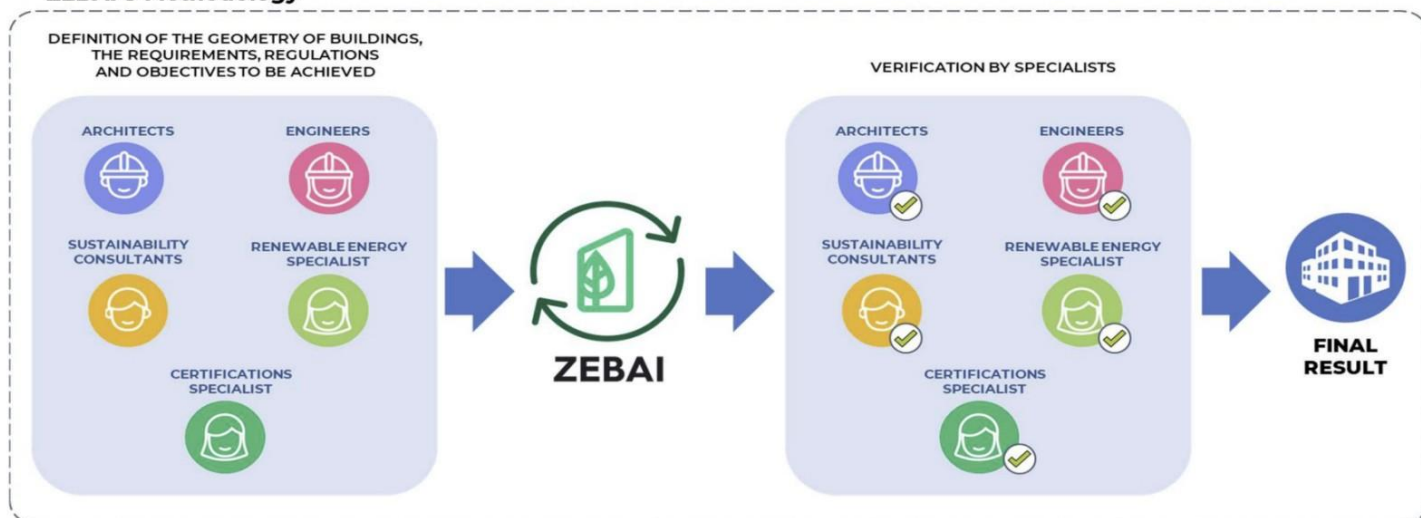
This demonstrator comprises residential buildings in Hostomel, with a total building area of approximately 3300 m². The primary objectives of this demonstrator are to reconstruct the building using construction waste generated during the war, thus adhering to the principles of the circular economy, and achieving a zero-emission solution.

Location and description.

The project is located in Hostomel, a city in northwest of the capital city of Kyiv. The town is mainly known for Hostomel Airport. This airport and the biggest cargo airplane in the world, was destroyed by Russians in a battle which lasted from 25th February to 31st of March 2022.



ZEBAI'S Methodology

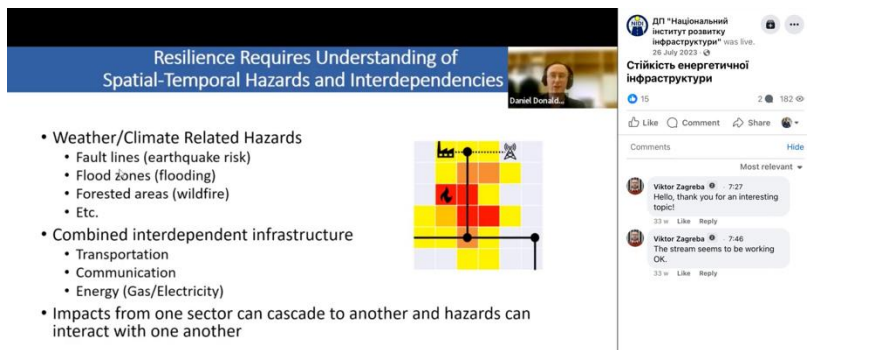


Our goals during the project are to complete the reconstruction project of the war damaged town of Hostomel and create modern urban neighbourhoods using the principles of the circular economy, environmentally, economically, and innovatively. The war has resulted in over 800 million tons of construction waste in Ukraine including concrete, brick, and other debris.

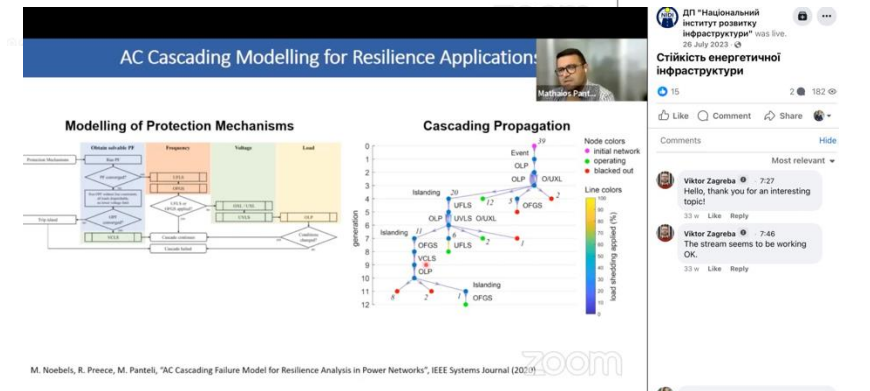
Achievements in Capacity Building



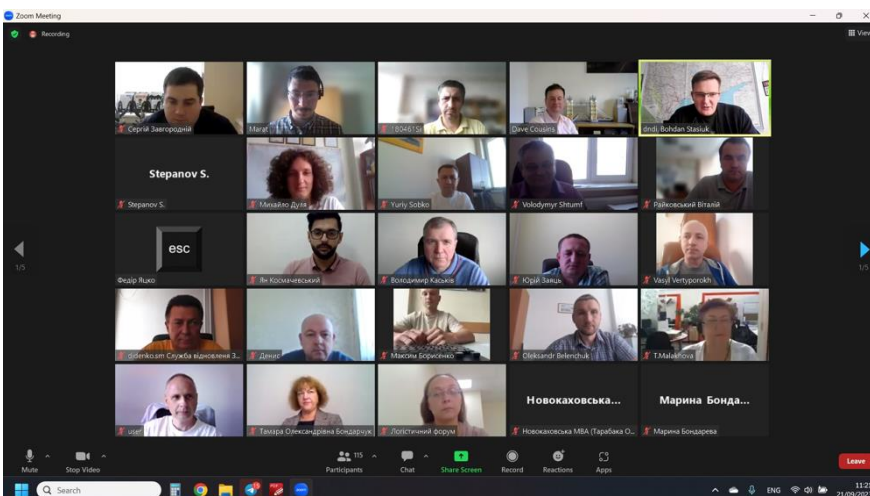
25 September 2023
the following seminar was delivered on 21.09.2023 to more than 130 Ukrainian engineers “**An overview of structural health monitoring and load testing for asset management of bridges and civil infrastructure**”. Available [here](#). Speaker: Dave Cousins



26 July 2023
a seminar was delivered on 26.08.2023 to more than 55 Ukrainian Engineers, titled “**Energy Infrastructure Resilience**”, Available [here](#). Speakers: Dr Mathaios Panteli, Dr Daniel Donaldson



28 March 2023
a seminar was delivered on “**Eurocode 7 – Geotechnical design for foundations**”. Speaker: Prof Sebastiano Foti



Organised with Stanislav Gvozdkov, Deputy Director of Eurointegration Processes – M.P. Shulgin State Road Research Institute State Enterprise – Derzhdor NDI SE for the Ukrainian State Road Research Institute.

University of Birmingham and bridgeUkraine.org formalised its collaboration with the Department of Economic and Social Geography of the Ivan Franko National University of Lviv. This is part of the University of Birmingham-Ivan Franko National University of Lviv **TwinForHope scheme** – The UK universities standing with their counterparts to support Ukraine.

A **workshop** is organised between the parties on 21 July 2023 in Warsaw, Poland. (title: *Cross-border resilience of critical transport infrastructure in Ukraine and impact on the economy and society*).



Welcome!

TwinForHope
Twinning for Identity, Sovereignty and Resilience

Workshop 5: Cross-border resilience of critical transport infrastructure in Ukraine

UNIVERSITY OF BIRMINGHAM  Stergios-Aristoteles Mitoulis
Civil Engineering, School of Engineering
University of Birmingham



bridgeUkraine.org



TwinForHope
The University of Birmingham standing with their counterparts to support Ukraine's Ivan Franko National University of Lviv



Workshop 5: Cross-border resilience of critical transport infrastructure in Ukraine and impact on the economy and society

held on 28 June 2023, Warsaw, Poland and online

Workshop report

March 2024

UNIVERSITY OF BIRMINGHAM   

<https://zenodo.org/records/11204580>

Contribution in Ukraine's recovery events

15 April 2023

bridgeUkraine.org was invited by the Royal Society to attend the “**Ukraine's Recovery: Rebuilding with Research**” conference. The Royal Society and the Universities Policy Engagement Network (UPEN), together with the Fund of the President of Ukraine for Education, Science and Sports and the Embassy of Ukraine, are delivering this conference to support Ukraine's reconstruction and recovery.



23 June 2023

bridgeUkraine participated in the international **Ukraine Recovery Conference (URC 2023)** in London on 21-22 June 2023, which aimed at mobilising international support for Ukraine's economic and social stabilisation and recovery

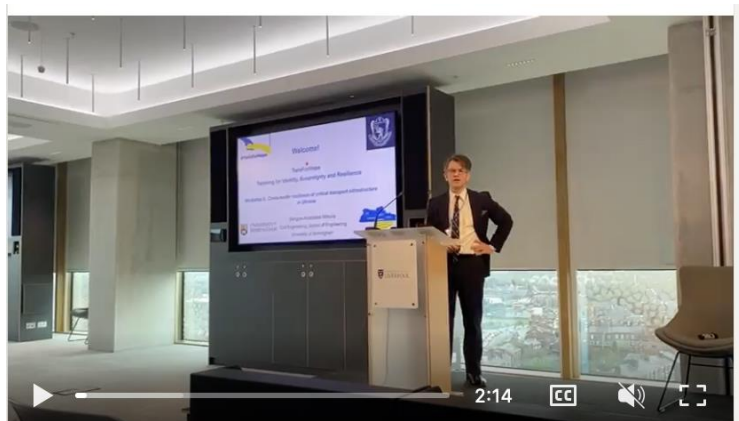
26-27 March 2024

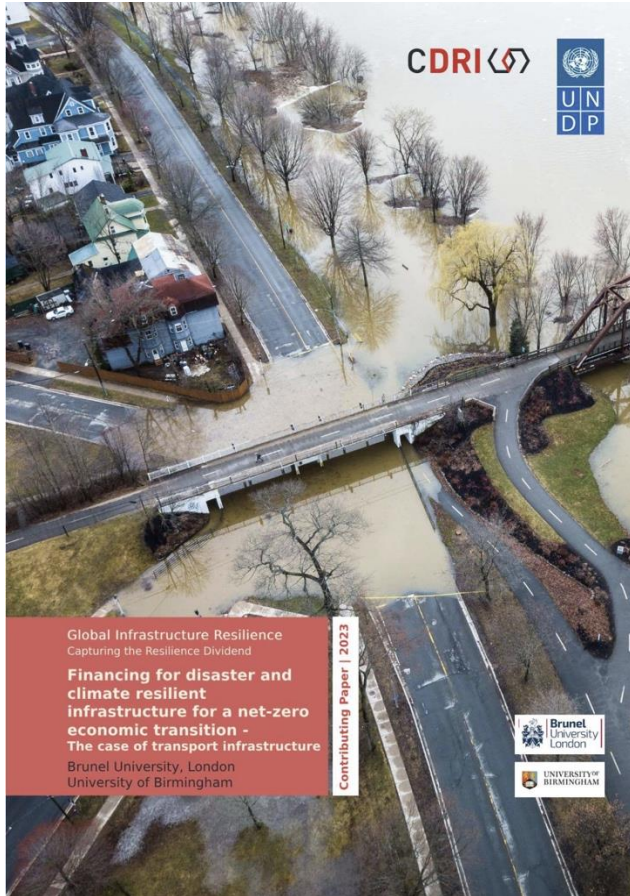
we presented bridgeUkraine and its achievements, including the twinning of the University of Birmingham with Ivan Franko National University of Lviv, at the UK-Ukraine Research Twinning Showcase & Networking Event, organised by the University of Liverpool

<https://www.linkedin.com/feed/update/urn:li:activity:7178717113967067136/>



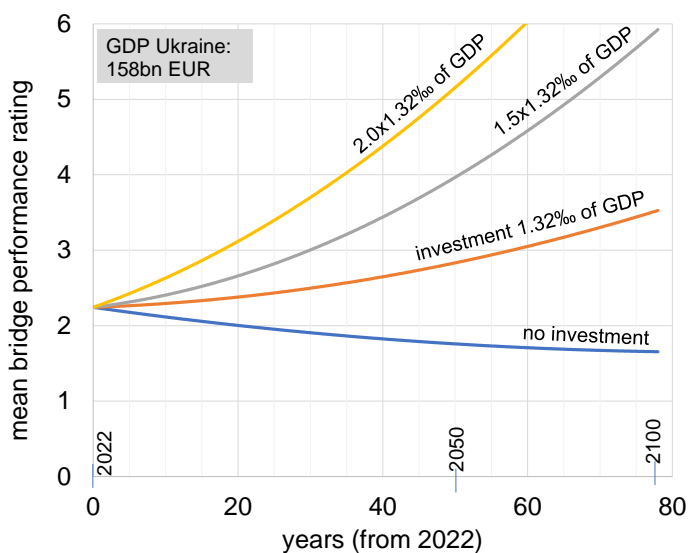
UK-Ukraine Research Twinning Showcase and Networking, 26-27 March 2024



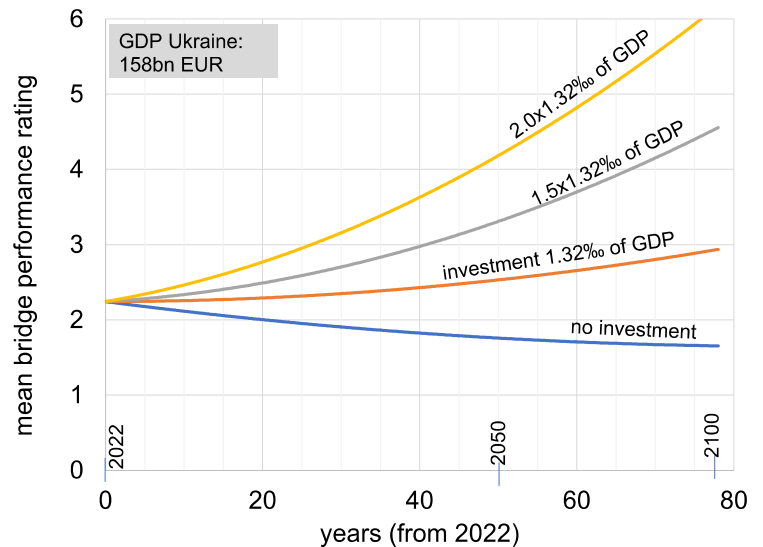


United Nations
 Development Programme (UNDP)
 Coalition for Disaster Resilient
 Infrastructure (CDRI)
 Biennial Report on Global
 Infrastructure Resilience -CDRI
 Biennial Report on Global
 Infrastructure Resilience

Title of bridge Ukraine contribution:
 Financing for disaster and climate
 resilient infrastructure for a net zero
 economic transition. Case study for
 Ukraine's transport infrastructure
 Presented at G20 summit 2023, India



Adaptation with conventional materials and methods of reconstruction



Adaptation with sustainable strategies

<https://cdri.world/upload/biennial/CH4.6-IR.pdf>



Measurable Planned Impact (3 Years: 2023-2026)

Action	KPIs	Quantifiable targets / magnitude	Size of target group
Science (SC)			
Publications-high-quality open access knowledge	Peer-reviewed open access publications, Citations, Citation index	> 25 publications, > 1000 citations after 5 years, > 3500 downloads and reads	> 1000 peers and researchers
Skills to strengthen human capital in Research and Innovation	Careers, number of upskilled staff	> 70 MSc, >20 researchers, > 5 administration staff	> 200 candidates
Share and foster knowledge and open science	Shared outputs, new collaborations	1 open web-GIS based platform, 1 Massive Open Online Course (MOOC), 1 website, > 35 new collaborations, workshops	> 30 academic and non-academic organisations
Economy/technology (EC)			
Supported employment	Number/quality of jobs	> 50 new jobs	> 3 SMEs, 10 Research Institute
Private and public investment	Amount of investment	> €10m funding/leverage investment towards 3% GDP target	5 case studies in Ukraine with critical infrastructure
Contribution to policy	Number of white papers and consultation documents	> 3 consultation/policy papers	>8 committees/review bodies, >10 Working Groups
Increase the efficiency of donors' investments toward peacebuilding	Efficiency	> 40-70% increase of efficiency, improve >30% of ROI	> 10 infrastructure operators, >5 regions, >1,000 assets
New products and services	Number of products Number of new services	1 web-GIS based open platform, 1 novel holistic reconstruction framework	> 5 software companies > 30 academic institutions, consultancies and SMEs
Society (SO)			
Outputs aimed at addressing specific policy priorities and SDGs Improving decision-making	Frameworks Software and tools Case studies SDGs	3 holistic reconstruction frameworks, > 10 metrics for data-driven condition assessment, 1 platform, > 3 case studies, > 10 SDG targets	> 5,000,000 citizens > 12,000,000 indirectly influenced end-users
Co-creation engagement of citizens to strengthen the uptake of innovation in society	Number of engagements with citizens and end-users	5 participatory decisions in workshops (WS), > 50,000 engagements in social media (e.g. reactions, comments, reads) > 1,000 engagements in open discussion group (e.g. comments, interactions)	> 30 decision makers per Workshop > 100 pupils and students > 5,000 citizens
CO2 emissions and whole-life carbon footprint	% reduction in CO2 emissions	> 50% reduction	> 10 municipalities
Mortality due to human induced and natural disasters	Number of casualties, affected population	> 50% less casualties / citizens affected depending on hazard and infrastructure	> 50,000 citizens depending on the case study areas

bridgeUkraine for a Sustainable and Resilient Future

Published report:

Open database of damaged bridges in Ukraine is available. [Find it here >>](#)

A database of damaged bridges in Ukraine and preliminary reconstruction cost assessment

Joseph Lambden, MSc Project and Infrastructure Engineering
Sotirios Argyroudis, Reader in Infrastructure Engineering

This report is part of an MSc Dissertation conducted at the Department of Civil and Environmental Engineering, Brunel University London

November 2023

Appendix
Photos of damaged bridges included in this database. Each photo is tagged with the bridge ID.

 ID001_1	 ID001_2
 ID001_3	 ID002_1
 ID002_2	 ID002_3
 ID003_1	 ID003_2

Empower Ukraine: Capacity Building for Critical Infrastructure Restoration



What	When	Description	Details
1. Tailored Seminars & CPD Activities	April 2024 – March 2027	Bilingual seminars and CPD activities in collaboration with Ukraine's Ministry of Restoration and Ministry of Education and Science; delivered alongside Ukrainian speakers from national universities. Our commitment to customisation means we will tailor these offerings to meet the unique needs and objectives of the learners.	10 x 3-hour CPDs per year for 3 years = total 90 hours of CPD We will organise, record and store CPDs for future use and wider dissemination.
2. Bilingual Massive Open Online Course (MOOC)	June 2024 – Jan 2027	Deliver a bilingual Massive Open Online Course [MOOC] on the design of critical infrastructure of Ukraine. This accessible platform will serve as a permanent, invaluable resource promoting knowledge transfer and dissemination.	MOOC with Microcredentials available for relevant learners. - Over 120 lecture hours - Talking head videos, cutaway footage, podcasts, trailers ^[8] .
3. Microcredentials (Integrated with MOOC) ^[7]		Integrated within the MOOC will be Microcredentials (short courses of learning), delivered in person and online. This combined programme is unique in its inclusion of online short-courses, which are typically delivered only in-person. We are providing these online as well as in-person to accommodate current Ukraine Government restrictions which prevent male Ukrainian engineers travelling outside Ukraine. It is critical to success as it is the only alternative learning provision for this group. The Microcredentials will be available for in-person study to anyone permitted to travel outside Ukraine (e.g. female engineers). UoB lecturers responsible for these short courses will also be able to provide support for the contents of the MOOC. <i>Birmingham's Microcredentials offering can be found here</i> Contents of the MOOC are based on the Memorandum of Understanding with the Ministry of Restoration which identifies the areas that are urgently needed i.e., restoration of bridges, roads, hospitals, schools, Eurocode design, Eurocode use approval, contracts and infrastructure management and tenders.	Programme equivalent to: - 4 modules on restoration of infrastructure - 40 weeks of attendance - 40 credits - 400 learning hours [8]Attendance and engagement with Microcredentials will be monitored throughout the project and beyond.

Outcome:

- Young researchers and engineers to learn design and construction skills through a well-structured program to fix facilities and essential infrastructure for repairs and improvements.
- Participants are mentored by academics and gain expertise, skills and accreditations, as well as access to further training, work placement and apprenticeship opportunities.

bridgeUkraine

recruitment of Ukrainians



☆ ↑ View More Jobs

Project Manager - School of Engineering - 104453 - Grade 7

United Kingdom

JOB DESCRIPTION

Position Details

School of Engineering

Location: University of Birmingham, Edgbaston, Birmingham UK

Full time starting salary is normally in the range £34,980 to £44,263 with potential progression once in post to £46,974

Grade: 7

Full Time, Fixed Term contract up to August 2027

Closing date: 6th October 2024

UK and international travel may be required for this role

☆ ↑ View More Jobs

Teaching Fellow in Infrastructure, Civil, Structural, Environmental Engineering or Architecture - College of Engineering and Physical Sciences - 104452 - Grade 7

United Kingdom

JOB DESCRIPTION

Position Details

College of Engineering and Physical Sciences

Location: University of Birmingham, Edgbaston, Birmingham UK

Full time starting salary is normally in the range £34,980 to £44,263 with potential progression once in post to £46,974

Grade: 7

Full Time, Fixed Term contract up to July 2027

Capacity Building: Supporting young Ukrainian engineers

Beneficiaries ¹	KPI (Description/numerical target)	Programme elements accessible: (1) CPD/Seminars* (2) MOOC** (3) Microcredentials***	Short-term benefits and outcomes (during the project delivery timeframe)	Long-term impacts - by 2030 (3 years after the completion of the project in April 2027)
Design engineers (office-based, as opposed to on-site contractors)	Number of professional engineers upskilled to progress their careers >5,000 Design engineers attending over 30 CPDs [9] >1,000 Ukrainian engineers trained on infrastructure restoration	1 & 2	<ul style="list-style-type: none"> • Can use Eurocodes for >4 different categories of critical assets (hospitals, schools, roads/bridges, energy stations) • Obtain Global Perspectives in multidisciplinary and holistic designs for the built environment 	<ul style="list-style-type: none"> • Each Engineer has designed at least one critical asset to Eurocodes
Professional engineers in policy-making roles	>10 policymakers	1 & 2	<ul style="list-style-type: none"> • >4 white papers on Euro-integration • >5 Ukrainian National design standards aligned to Eurocodes 	<ul style="list-style-type: none"> • Ukrainian National Design Standards fully comply to Eurocodes in at least four categories (buildings, roads/bridges, energy stations) • Regulatory Compliance
University lecturers and students	>30 lecturers >10,000 students	1,2 & 3	<ul style="list-style-type: none"> • 60 lectures created in Ukrainian • 30 modules, 10 syllabus and 5 curricula updates in Engineering MSc and undergraduate degrees to include Eurocodes • >10 MSc programmes that cover the basics on Eurocodes 	<ul style="list-style-type: none"> • All 5 Polytechnic Universities in Ukraine incorporate Eurocodes in their curricula • All UG and MSc degrees aligned to Eurocodes • >10,000 students have learned about Eurocodes and are equipped to join the profession • >200 Ukrainian lecturers are teaching Eurocode
MSc Students	Appointable engineers after graduation Professional Recognition (chartership)	1,2 & 3	<ul style="list-style-type: none"> • >200 graduate engineers help with the reconstruction. • >800 get well-paid, 	<ul style="list-style-type: none"> • >1,000 houses, hospitals, bridges, roads built with an estimated benefit to Ukraine's economy of at



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for a Sustainable and Resilient Future

we accelerate Ukraine's critical infrastructure recovery

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