



*Research and Technology
Infrastructures: Policy, practice and
recent developments in Europe –
emerging ‘opportunities’ for the
Western Balkans"*

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Over-view of the session



Part I: Policy, practice and recent developments in Europe

- RI and TI
 - Useful definitions and illustrative examples
 - Purpose and focus
 - Strategy and policy
- Open Access:
 - Rational and Benefits
 - Scope and functioning

Part II: Regional ‘Opportunities’

- RI and TI – design of a regional ‘Twin Transition network ‘.
- Input from Siniša Marčić (RCC)
- Damir Medved SyntAgent
- NEWS: Supporting action.

‘WHAT ARE ‘RESEARCH INFRASTRUCTURES (RI) AND TECHNOLOGY INFRASTRUCTURES (TI)?’



POLICY ANSWERS



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Research Infrastructure (RI)



- **Facilities** that provide resources and services for research communities to conduct research and foster innovation.
- Can be used beyond research e.g. for education or public services.
- May be 'single-sited', 'distributed', or 'virtual'.
- Any other research and innovation infrastructure of a '**unique**' nature which is **open** to external users

ESS: European Spallation Source Lund SE 'Single Sited'



Extreme Light Infrastructure: ELI 'Distributed'



World's first international laser research infrastructure

- 'pursuing unique science and research applications for international users'.

Distributed

- 3 specialized and complementary facilities
 - Czech Republic
 - Hungary
 - Romania.

First ESFRI project to be fully implemented in the newer EU Member States.

- pioneered a novel funding model
 - combined EU structural funds (ERDF) + ERIC (European Research Infrastructure Consortium) contributions for operation.
-
- Potential for others to join? (**Centre for Advanced Laser Techniques (CALT) in HR** - an associated project and a technology supplier/collaborator.)

ELIXIR: European Research Infrastructure for life science data Virtual and Distributed RI



A 'Hub and Spoke model'

The **Hub**, located at the Wellcome Genome Campus UK
- responsible for the overall strategy and coordination of the infrastructure.

National Nodes - centers of excellence in bioinformatics within member countries across Europe, run the actual services and resources:

- databases,
- software tools,
- training materials,
- cloud storage and
- supercomputers.



Social Science Virtual and Distributed RI



- SHARE: Survey of Health, Ageing and Retirement in Europe
- Purpose: to study the effects of health, social, economic and environmental policies over the life-course of European citizens and beyond
- a multidisciplinary and cross-national panel **database** of micro data on health, socio-economic status and social and family networks of about 140,000 individuals aged 50 or older (around 380,000 interviews).
- Covers **28 European countries and Israel**.
[linked to 'sister studies' in the UK (ELSA) and US (HRS)]
- <https://share-eric.eu/>

RIs: main take-aways



- RI focus on early TRL and ‘research’ but ‘foster innovation’
- RI can be:
 - Physical/ Virtual
 - Single sited or distributed
 - May offer some opportunities for others to ‘join’
- To be a RI the facility must be ‘**OPEN**’

From equipment and facilities to RI



Internal use



'Open' ?

- **Accessible**
- **Findable**
- **Diverse Users**

'Technology Infrastructure'

Definition and main characteristics

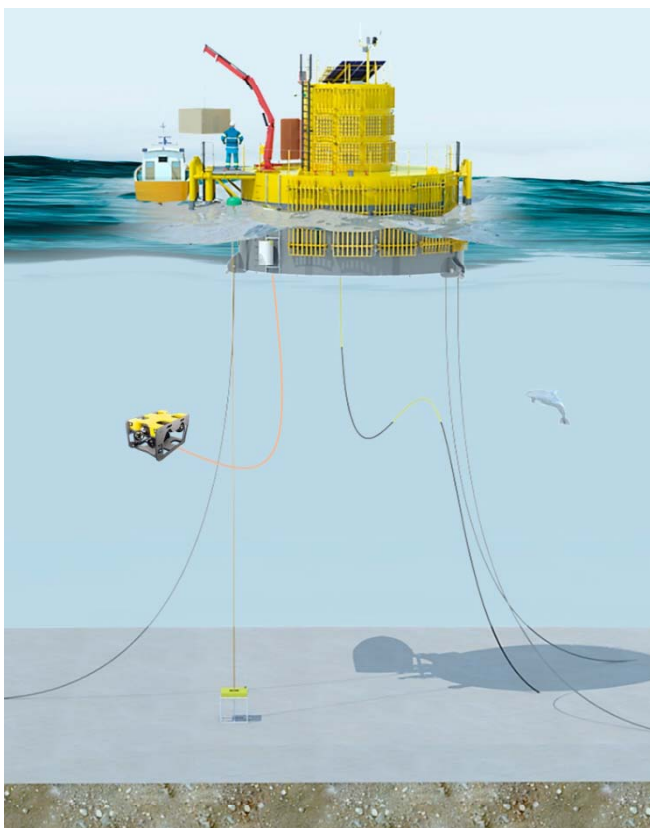


- 'Important tools for industry to lower the costs and risks arising during technology development'
 - testing
 - prototyping
 - validation
 - Up-scaling phases.
- Higher TRLs, more focused on innovation, more focus on enterprises (including start-ups)
- Formally recognised in 2025 – Strategy
- Earlier mentions in 2019
- (By definition 'Open' as aimed at enterprise and industry)

European TI examples



Tecnalia's Harsh Lab (Spain)



IT4Innovations supercomputing centre (Czech Republic)



European TI examples



**Facility 4.0 ProM Facility,
(Mechatronic prototyping Italy)**



**Renewable energy (Białystok,
Poland)**



RECENT CHANGES TO THE RI/TI POLICY ENVIRONMENT



Main strategic documents



- Updated 'European Charter for Access to Research Infrastructures' (2024).
- European Strategy on Research and Technology Infrastructures (15.09.2025)
- 'Towards a European Policy for Technology Infrastructures Building Bridges to Competitiveness' (02.2025)
- EU Startup and Scale-up Strategy (05.2025)

Summary of Key Enhancements in the Revised European Charter for Access to Research Infrastructures (2024 vs. 2015/2016)



Theme	Original Charter (2015/2016)	Revised Charter (2024)
Core Purpose	Non-regulatory principles for access	Updated principles reflecting modern RI landscape and research policies
Open Science	Encouraged	Explicit integration of FAIR principles
Research Security	Not explicitly addressed	Added as a key element along with strategic autonomy
User Focus	Broad users	Stronger focus on diverse users including SMEs/industry
Resilience	Implicit	Explicitly addresses resilience to crises
Operational Guidance	Traditional access modalities	Updated to reflect hybrid practices and modern infrastructure roles

Other notable points/ implications



European Strategy on Research and Technology Infrastructures

- treats **research infrastructures (RIs)** and **technology infrastructures (TIs)** as a **continuum** from scientific discovery to technology validation and up-scaling (*implies linkages/ networks...*)
- Explicit actions to simplify and **expand access for researchers, startups, scaleups and industry**, promoting use of facilities from early research through commercialization (*implies targeted funding...*)

EU Startup and Scaleup Strategy

- Infrastructure as **Core Startup Support** - Access to infrastructures, networks and services is highlighted as essential to growth (*implies linkages between RI/TI and startup programmes and services..*)

Towards a European Policy for Technology Infrastructures

- formalises a **definition of TIs and their role** in the innovation ecosystem
- Future TI policy will likely include **clearer roles, funding lines, and access mechanisms** tailored to innovation and industrial users



PART 2: ‘REGIONAL OPPORTUNITIES’ AKA: ‘DESIGN YOUR OWN TECHNOLOGY INFRASTRUCTURE NETWORK’

The raw 'enterprise' potential: Start-ups and Scale-ups



Western Balkans Innovation Ecosystem

Deep-Tech & Green-Tech Projects and Programmes Summary (2025)



78

Total Deep-Tech Projects



162

Total Green-Tech Projects



54

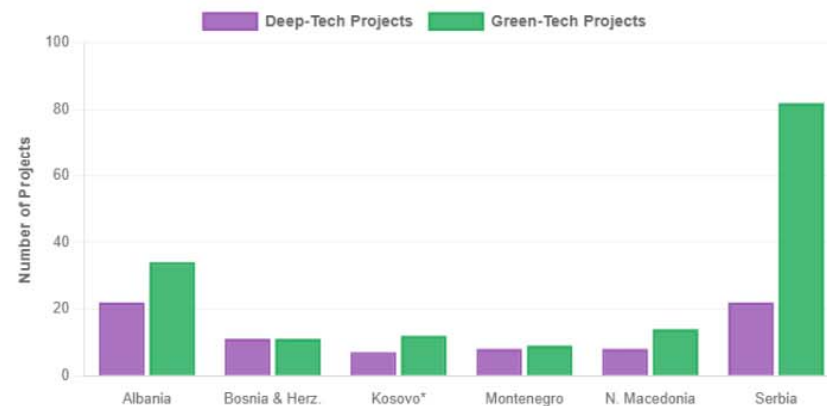
Deep-Tech Programmes



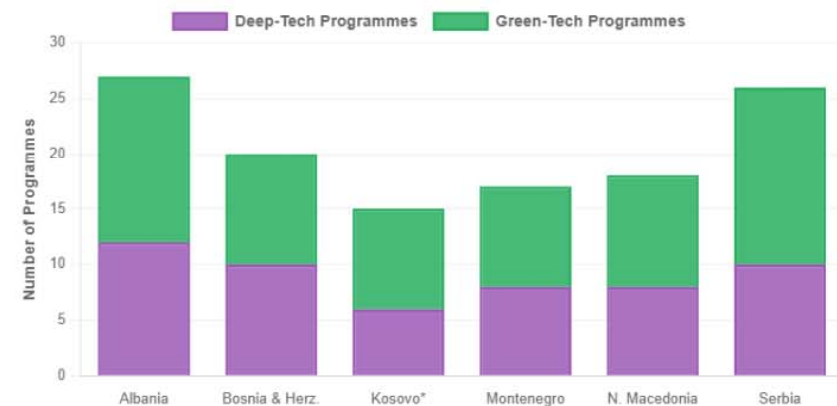
69

Green-Tech Programmes

Projects by Country (Clustered)



Programmes by Country (Stacked)



Sub-sectors



Deep-tech

- advanced materials
- advanced AVML platforms
- quantum computing
- next-gen robotics, blockchain
- Biotechnology
- IoT enabled
- manufacturing, microelectronics & semiconductors
- biotechnology



Green-tech manufacturing

- renewable energy generation & storage systems
- sustainable transport tech
- circular economy
- sustainable/energy-efficient building materials & construction systems
- recycling solutions
- eco-friendly packaging

Regional Support: Hubs and programmes



Regional support for Deep-Tech

EIT WBIF EDIF EDIHs ABCD Project

Regional support for Green Manufacturing

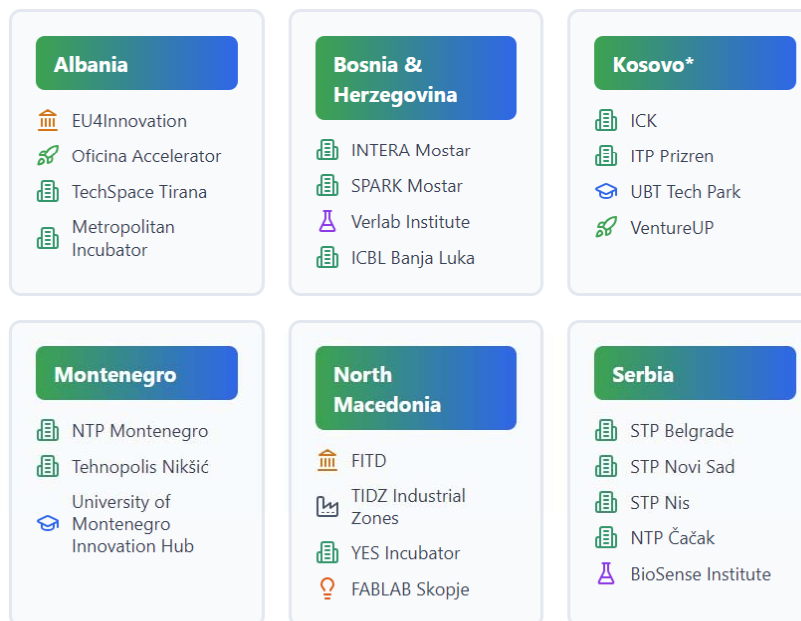
EBRD SME Go Green WBIF EIT UNDP GIZ

Main ecosystem players in the Western Balkans



Main players supporting deep-tech through funding, incubation, specialised infrastructure and KIS in the Western Balkans (mapping 2025)

Main ecosystem players in the Western Balkans



Main players supporting green manufacturing through funding, incubation, specialised infrastructure and KIS in the Western Balkans (mapping 2025)

Ranked Research Performing Organisations (RPOs) for Green Manufacturing in the Western Balkans

Ranking based on: (a) peer-reviewed manufacturing research, (b) circular-economy / green-transition engagement, (c) applied pilot capacity (e.g. BioSense). Compiled with AI deep research mode, 2025.

Serbia

Top Tier – strongest ecosystem

University of Novi Sad — BioSense Institute & Faculty of Technical Sciences (FTN)

University of Belgrade — Faculties of Mechanical Engineering & Electrical Engineering (ETF)

Indicators:

- BioSense: peer-reviewed research on sensors, precision agriculture and sustainable bio-processes; direct relevance to green, resource-efficient manufacturing and process monitoring.
- Strong EU collaboration track record (e.g. ANTARES / BioSense) showing both research quality and technology-transfer capacity.
- University of Belgrade: long history of peer-reviewed work in materials, manufacturing processes, energy efficiency and control/automation.
- Nationally leading research footprint for green process optimisation and industrial partnerships.

Bosnia & Herzegovina

High-potential Green Manufacturing RPOs

University of Sarajevo — Faculties of Mechanical & Electrical Engineering

University of Banja Luka

Indicators:

- Active in circular economy, materials and process research.
- Peer-reviewed outputs and national white papers highlight CE and sustainable production efforts.
- Mechanical/manufacturing labs enable low-carbon production pilots.
- Engineering research in process engineering, materials and telecommunications supports industrial monitoring and optimisation for greener manufacturing.

North Macedonia

Ss. Cyril & Methodius University (UKIM)

**Faculty of Technology & Metallurgy
Faculty of Electrical Engineering and Information Technologies (FEEIT)**

Indicators:

- Strong research in materials, manufacturing and automation.
- Peer-reviewed work in sustainable materials and manufacturing processes.
- Visible engagement in circular-economy and green-transition topics at regional level.

Albania

Polytechnic University of Tirana (UPT)

Polytechnic University of Tirana (UPT)

Indicators:

- Leading national engineering research capacity for manufacturing decarbonisation and automation.
- Peer-reviewed outputs in manufacturing engineering, automation and IT systems for industrial control.
- Core competencies for green manufacturing transitions.

Kosovo*

Growing Green Manufacturing RPOs

University for Business & Technology (UBT)

University of Prishtina

Indicators:

- Growing outputs in applied engineering, automation and digital solutions that support green manufacturing.
- Most visible sources of indexed engineering and applied-CS publications in Kosovo*.
- Work in data-driven manufacturing, cybersecurity for industry and applied automation positions them as partners for green-manufacturing digitalisation.


Montenegro

University of Montenegro (UoM)

University of Montenegro (UoM)

Indicators:

- Engineering faculties active in energy efficiency, control systems and applied manufacturing research.
- Research in power and energy systems, control and embedded systems, and applied engineering relevant for energy-efficient manufacturing and process control.
- Regional reports highlight UoM among national research leaders.

 These RPOs are priority partners for green-manufacturing pilots and technology transfer in the WB region.



The ecosystem support: Funding



National Schemes & International/Regional Instruments by Economy (2025)					
Deep-Tech Green-Tech General Innovation Major = Higher budget/more calls					
AL Albania	BA Bosnia & Herzegovina	XK Kosovo*	ME Montenegro	MK North Macedonia	RS Serbia
NATIONAL FUNDING SCHEMES Startup Fund Albania deep-tech EU4Innovation deep-tech Albanian Investment Fund green-tech AIDA SME Support general	NATIONAL FUNDING SCHEMES INTERA Tech Park deep-tech IC Banja Luka deep-tech UNDP Green Fund green-tech FBH Development Bank general	NATIONAL FUNDING SCHEMES ICK Innovation Fund deep-tech MCC Energy Storage green-tech KIESA Grants general	NATIONAL FUNDING SCHEMES Innovation Fund ME deep-tech Tehnopolis deep-tech Energy Efficiency Fund green-tech Investment & Dev Fund general	NATIONAL FUNDING SCHEMES INNOVA (ex-FITD) deep-tech Science Fund MK deep-tech Climate Fund green-tech APPRM SME Support general	NATIONAL FUNDING SCHEMES Innovation Fund Serbia deep-tech Science Fund RS deep-tech AI Institute Grants deep-tech Green Innovation Fund green-tech Development Fund RS general
INTERNATIONAL & REGIONAL Horizon Europe Major IPA III EBRD EIB WBIF UNDP GIZ USAID	INTERNATIONAL & REGIONAL IPA III EBRD EIB WBIF UNDP GIZ Swedish Sida Swiss SDC	INTERNATIONAL & REGIONAL IPA III USAID EBRD WBIF UNDP GIZ Swedish Sida UK Aid	INTERNATIONAL & REGIONAL Horizon Europe Major IPA III EBRD EIB WBIF UNDP GIZ	INTERNATIONAL & REGIONAL Horizon Europe Major IPA III EBRD EIB WBIF UNDP GIZ USAID	INTERNATIONAL & REGIONAL Horizon Europe Major IPA III EIB EBRD WBIF UNDP GIZ KfW

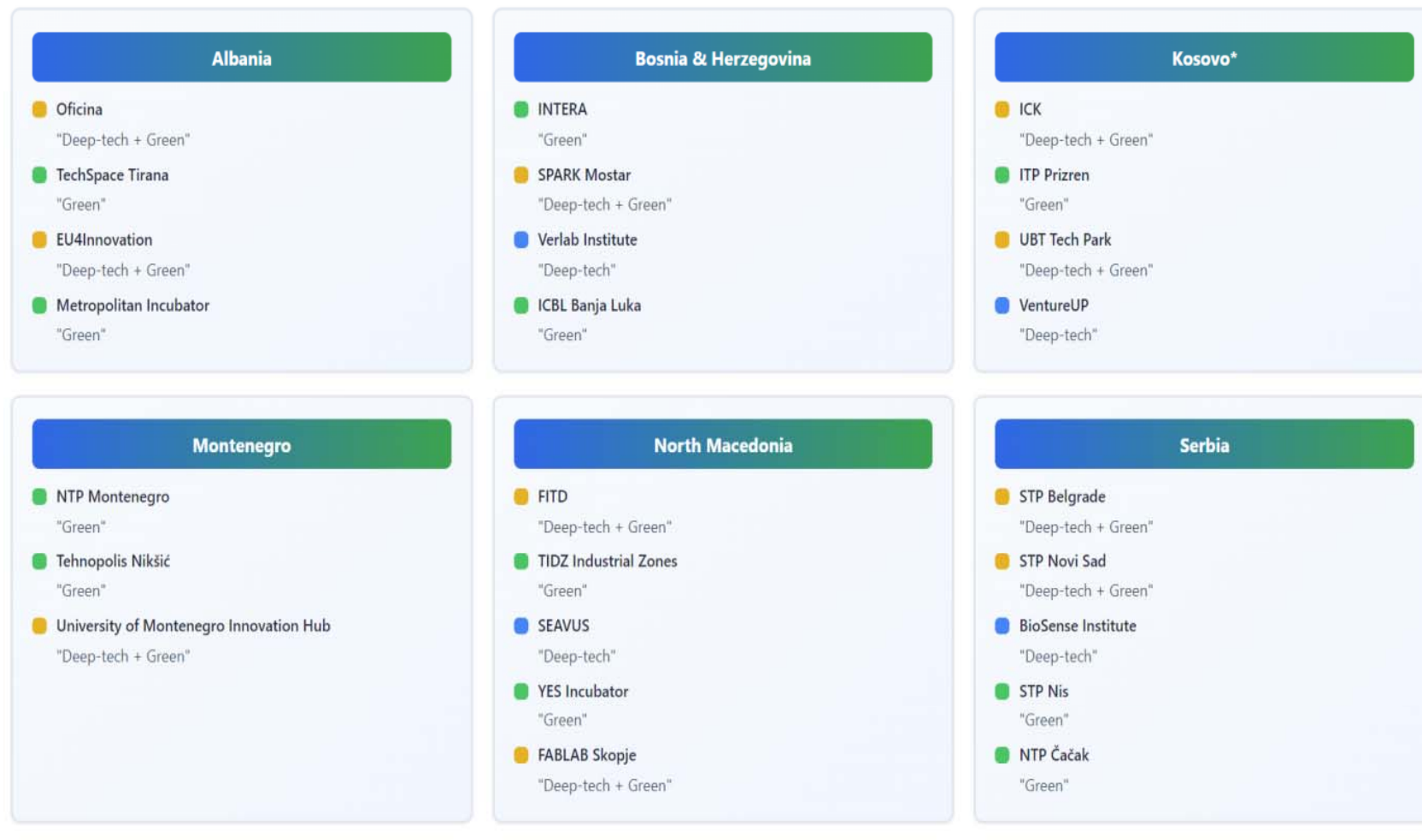


THE POTENTIAL FOR 'TWIN TRANSITION'!

Overlaps and Synergies between Deep-Tech and Green Manufacturing Ecosystems in the Western Balkans



Multi-sector support from innovation hubs – hubs hosting both deep-tech and green-tech start-ups



Green = Green Manufacturing Hubs Blue = Deep-Tech Hubs Yellow = Mixed / Cross-sector Innovation Hubs

PRO strengths mapped by sub-sector



Economy	Organisation	1. Advanced materials	1. Advanced AV/ML platforms	1. Quantum computing	1. Next-gen robotics	1. Blockchain	1. Biotechnology	1. IoT-enabled manufacturing	1. Microelectronics & semiconductors	1. Renewable energy generation & storage	1. Sustainable transport tech	1. Circular economy	energy-efficient	1. Recycling solutions / sustainable	1. Eco-friendly packaging
Serbia	Univ. of Belgrade (ETF, Mech.)	■	■	□	■	■	■	■	■	■	■	■	■	■	□
Serbia	Univ. of Novi Sad (+ BioSense)	■	■	□	■	□	■	■	■	■	□	■	□	■	□
Bosnia & Herzegovina	Univ. of Sarajevo (Eng)	■	■	□	■	■	■	■	□	■	□	■	■	■	□
Bosnia & Herzegovina	Univ. of Banja Luka (Eng)	■	■	□	■	■	■	■	□	■	□	■	□	■	□
North Macedonia	UKIM (FEEIT / Tech & Metallurgy)	■	■	□	■	■	■	■	□	■	□	■	■	■	□
Montenegro	Univ. of Montenegro	■	■	□	■	■	■	■	□	■	□	■	■	■	□
Albania	Polytechnic Univ. of Tirana (UPT)	■	■	□	■	■	■	■	□	■	□	■	■	■	□
Albania	Univ. of Tirana	■	■	□	■	■	■	■	□	□	□	■	■	■	□
Kosovo*	University of Prishtina	■	■	□	■	■	■	■	□	■	□	■	■	■	□
Kosovo*	UBT (University for Business & Technology)	■	■	□	■	■	■	■	□	■	□	■	■	■	□



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‘Twin transition’ synergies – sub-sector overlap



Deep-Tech and Green Manufacturing Synergies

	Renewable Energy Hardware & Smart Grids	Circular Economy & Waste Valorisation	Sustainable Construction & Materials	Energy-Efficient Industrial Automation	Eco-Product Design & Packaging	Sustainable Transport Tech
AI & Data	Smart forecasting Grid optimization Predictive maintenance	Waste stream analytics		Process optimization Energy efficiency ML models		Route optimization Fleet management
IoT & Sensors	Real-time monitoring Smart meters Grid sensors	Sorting sensors Quality control	Building sensors Climate control	Real-time energy monitoring Industrial IoT		Vehicle sensors Emissions tracking
Robotics & Embedded Systems		Automated sorting Disassembly robots Material recovery	Modular construction robots	Industrial automation Cobots Precision control		Assembly automation EV production
Advanced Materials	Battery materials Solar efficiency	Recycled materials Upcycling tech	Bio-composites Insulation materials Low-carbon cement		Biopolymers Recycled composites Biodegradable packaging	Lightweight materials Efficiency gains
Biotech & Bio-processes	Biofuels Bio-hydrogen	Bio-based recycling Biogas production Enzyme catalysis	Mycelium materials Bio-insulation		Bio-plastics Organic packaging Compostable products	
Digital Platforms & Blockchain	Energy trading P2P platforms	Material tracking CBAM compliance Supply chain transparency	Building passports Material traceability		Product lifecycle tracking	Mobility platforms Carbon tracking

Synergy Strength Legend



Strong Synergy – High priority areas for joint deep-tech and green manufacturing initiatives

Medium Synergy – Emerging opportunities with moderate integration potential

Light Synergy – Limited current overlap, potential for future development

Priority synergy spaces for RCC and WB6 policymakers to support industrial competitiveness and green transition

Matrix identifies technology convergence opportunities for sustainable industrial development in the Western Balkans



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The Cross sector **regional** potential



Cross-sectoral value-chain opportunities

1. AI & Data-Driven Optimization × Industrial Energy Efficiency
2. Advanced Materials × Circular Economy & Eco-Packaging
3. Robotics & Automation × Waste Management and Recycling
4. Sensors & Microelectronics × Renewable Energy Systems
5. Digital Platforms × Circular Business Models

Example high -impact “white spaces” for innovation

1. Pilot lines for production-line efficiency and smart energy management.
2. Production of eco-packaging for regional food and cosmetics industries.
3. Waste collection, sorting and recycling processes.
4. Smart renewable energy systems: affordable microgrid controllers or battery management units.
5. Tools for circular economy needs.

Cross-Sectoral Opportunity RI/TI Spaces



Pilots and scale-ups need to be supported by RPO/ RI and Hubs/TI






- **Smart, energy-efficient manufacturing (Industry 4.0)** — AI/IoT + automation pilots to reduce energy intensity in metal, textile and food plants (**INTERA, STP Belgrade, STP Niš, BioSense, VERLAB**).
- **Advanced & sustainable materials** — R&D + prototyping for biopolymers, recycled composites and eco-packaging (**UKIM, BioSense, INNOVA, TechSpace, Tehnopolis**).
- **Renewables hardware & systems + smart grids** — modular solar/wind + storage assembly and AI-enabled optimisation (**ICK/UBT, NTP Montenegro, STP Belgrade, University of Montenegro**).
- **Circular economy & waste-to-product technologies** — robotics for sorting, waste valorisation pilots and market platforms (**INTERA, VERLAB, TechSpace, INNOVA**).
- **Sustainable product / packaging design & local assembly** — prototyping and small-scale manufacturing of compostable packaging and eco-products (**TechSpace, Tehnopolis, FABLAB/INNOVA partners**).

GM: Best Ecosystem Matches by Sector/ Sub-sector



Deep-Green Opportunity Spaces – Key Ecosystem Hubs in the Western Balkans

Listing compiled with AI deep research mode (2025)

 A. Sustainable Materials & Advanced Materials	 B. Circular Economy & Waste Valorisation	 C. Renewable-Energy Hardware / Manufacturing	 D. Industrial Automation & Energy-Efficient Production	 E. Sustainable Packaging & Eco-Product Design
<p><i>Hubs focused on new materials, composites and advanced fabrication.</i></p>	<p><i>Innovation for reuse, recycling and waste-to-resource models.</i></p>	<p><i>Hardware and system solutions for the energy transition.</i></p>	<p><i>Industry 4.0, robotics and energy-optimised processes.</i></p>	<p><i>Eco-products, packaging and design-driven circularity.</i></p>
<p>INTERA Technology Park Bosnia & Herzegovina Additive manufacturing, CNC, composites.</p>	<p>YES Incubator North Macedonia Active circular economy programmes.</p>	<p>STP Belgrade Serbia Cleantech entrepreneurship.</p>	<p>INTERA Technology Park Bosnia & Herzegovina Robotics, automation, Industry 4.0.</p>	<p>Tehnopolis Montenegro Packaging R&D (food/agri-tech focus).</p>
<p>Tehnopolis Montenegro Materials testing, agri-materials, food packaging.</p>	<p>SPARK Bosnia & Herzegovina Digital circular solutions, waste-tech.</p>	<p>UBT Tech Park Kosovo* Renewable energy R&D support.</p>	<p>STP Novi Sad Serbia IoT for smart manufacturing.</p>	<p>TechSpace Tirana Albania Prototyping eco-friendly consumer goods.</p>
<p>STP Niš Serbia Microelectronics and material-integrated systems.</p>	<p>TechSpace Tirana Albania Circular product design.</p>	<p>NTP Montenegro Montenegro Clean energy system design.</p>	<p>Tehnopolis Montenegro Process optimisation.</p>	<p>INTERA Bosnia & Herzegovina 3D printing & design labs.</p>
<p>FABLAB Skopje North Macedonia Materials prototyping.</p>	<p>UNDP Accelerator Labs all WB economies Waste-to-resource challenge support.</p>	<p>FITD North Macedonia Funds renewable hardware prototypes.</p>	<p>ICK Kosovo* Digital manufacturing tools.</p>	<p>YES Incubator North Macedonia Circular-product entrepreneurship.</p>



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‘Opportunity’



**JOIN FORCES, INVEST IN
‘TWIN-TRANSITION’ TI
AND REALISE POTENTIAL!**

Making RI and TI 'Open'



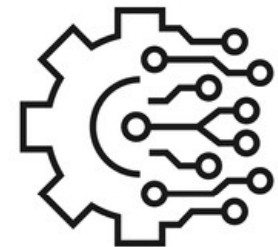
Papers/ Publications: FAIR

- Findable
- Accessible
- Interoperable
- Reusable



Infrastructure?

- (Legally) Accessible
 - Workable OA Policy for diverse users
- Affordable
 - Existence of funding support
- Findable
 - Well promoted
- Supported
 - TI Hub Services





- **MAKING REGIONAL RI AND TI 'OPEN':
VISIBILITY AND ACCESS**
- **SINIŠA MARČIĆ RCC**
- **DAMIR MEDVED SYNTAGENT**

Support on the 'Horizon'

WINGS: Widening Innovation through Networking, Growth and Skills



WP3

- Identification and adoption of a set of **core KT services**.
- Linked to **RI and TI**.
- **Support for adoption** by established service champions.
- Led by **KTU** (Lithuanian Valleys).
- RCC is a full PP in WINGS.



Discussion, comments, questions



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