

Mapping **DEEP-TECH AND GREEN-TECH** **MANUFACTURING POTENTIAL** in the Western Balkans Six



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Title:

Mapping Deep-Tech and Green-Tech Manufacturing Potential in the Western Balkans Six

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Note on structuring of information and data

In this report, economy-level comparisons have been made alphabetically, e.g. starting with Albania and ending with Serbia.



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* This designation is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

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Acronyms

AI	Artificial Intelligence
AITA	Association for IT Albania
AVLM	Acquire Volatile Memory for Linux
BAT	Best Available Techniques
CBAM	Carbon Border Adjustment Mechanism
CRM	Common Regional Market
EBRD	European Bank for Reconstruction and Development
EDIF	Enterprise Development and Innovation Facility
EDIH	European Digital Innovation Hubs
EE	Electrical Engineering
EIB	European Investment Bank
EIT	European Institute of Innovation and Technology
EIS	European Innovation Scoreboard
ENIF	Enterprise Innovation Fund
ETS	Emissions Trading System
EV	Electric Vehicle
FITD	Fund for Innovation and Technology Development
FSC	Forest Stewardship Council
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICBL	Innovation Centre Banja Luka
IF	Innovation Fund
ICK	Innovation Centre of Kosovo*
IFS	Innovation Fund of Serbia

IoT	Internet of Things
IPA	Instrument for Pre-Accession Assistance
ITP	Innovation and Training Park (Prizen)
KAP	Kombinat Aluminijuma Podgorica
KIS	Knowledge Intensive Services
MCC	Millennium Challenge Corporation
NDC	Domestic Determined Contribution
NECP	Energy and Climate Plan
PROs	Public Research Organisations
RCC	Regional Cooperation Council
S3	Smart Specialisation Strategies
SCV	Small-Cap Value
STEM	Science, Technology, Engineering and Mathematics
STP	Science Technology Park
TIDZ	Free Economic Zones (EN)
UBT	University for Business and Technology
UN	United Nations
UNDP	United Nations Development Programme
WB	Western Balkans
WB6	Western Balkan Six
WBIF	Western Balkans Innovation Framework



Executive summary

The WB6 are moving gradually toward innovation-led development, but progress remains uneven. Across the region, low R&D investment, limited researcher density, fragmented commercialisation pathways, and persistent brain drain constrain scale-up. At the same time, momentum is building through expanding ICT sectors, improved digital infrastructure, stronger participation in EU programmes, and the emergence of domestic innovation funds.

The regional picture is best described as **high potential with selective excellence**. Serbia is the strongest deep-tech ecosystem, North Macedonia shows notable strength in AI, automation, and SME innovation support, and Bosnia and Herzegovina hosts promising robotics, med-tech, and industrial automation capabilities. Albania, Montenegro, and Kosovo* have smaller ecosystems but show growing entrepreneurship, ICT-driven innovation, and green transition potential.

Key Findings

Deep-tech ecosystem: The WB6 has credible assets in advanced materials, AI, IoT, robotics, biotech, and next-generation manufacturing. Strong STEM faculties, science and technology parks, and innovation centres provide a foundation for growth, but the region still lacks advanced labs, venture capital, semiconductor and biotech production capacity, and scale-up finance.

Green-tech ecosystem: Green manufacturing is being driven by the EU Green Agenda, Energy Community obligations, CBAM exposure, industrial modernisation needs, and rising renewable deployment. Emerging sub-sectors include renewable energy equipment, circular economy solutions, sustainable materials, and energy-efficient industrial automation. Progress is accelerating, but transition readiness differs sharply across economies.

Financing landscape: Public financing instruments exist in all WB6 economies, but depth and quality vary. Serbia has the most developed funding mix, while North Macedonia offers a strong innovation-fund model. Elsewhere, donor-backed support remains central, though local funds are emerging. Green transition finance is expanding through WBIF, EBRD, EIB, and new EU Growth Plan instruments, yet frontier technologies still face a major funding gap.

Strategic Opportunity Areas

The most promising opportunities sit at the convergence of **digital innovation and green transformation**. Industry 4.0 tools—including AI, IoT, sensors, and robotics—can enhance energy efficiency, productivity, predictive maintenance, and resource circularity. At the same time, capabilities in advanced materials, biotechnology, and engineering can support cleaner production methods and the development of sustainable products. Key opportunity areas include:

- Smart and energy-efficient manufacturing enabled by AI, automation, and IoT-based monitoring
- Sustainable materials, including recycled composites and bio-based alternatives

- Green-tech equipment and renewable energy components
- Circular economy applications and waste-to-value solutions
- Eco-design, sustainable packaging, and low-impact product development

Priority Recommendations

To unlock regional competitiveness, the report highlights five priorities. First, strengthen policy and regulatory frameworks that support start-ups, commercialisation, circular economy activity, and alignment with EU standards. Second, improve access to finance by coordinating public and private capital, expanding innovation funds, and using guarantees and co-financing to crowd in investment. Third, reinforce innovation hubs, EDIHs, science parks, and cross-regional networks as delivery platforms for shared infrastructure and pilots. Fourth, focus resources on high-potential sub-sectors where deep-tech and green goals align, including industrial automation, renewable systems, sustainable materials, and agri-tech. Fifth, invest in human capital and stronger academia-industry linkages through modern STEM education, applied research, technology transfer offices, innovation vouchers, and talent retention mechanisms.

Proposed Pilot Action

The report proposes a regional pilot linking **12 hubs and research organisations** through two networks: operational hubs for incubation and prototyping, and a research-and-funding backbone for knowledge transfer and project development. Together, these actors could run joint pilots in energy-efficient manufacturing, advanced materials, smart renewable systems, circular economy technologies, and eco-design, coordinated through a light RCC-led structure with shared work plans and performance indicators.

Conclusion

The WB6 have meaningful untapped potential in deep-tech and green-tech manufacturing, supported by engineering talent, emerging innovation hubs, and growing policy attention. However, the region will only convert that potential into competitiveness if it closes funding and infrastructure gaps, improves commercialisation, and accelerates the integration of digital and green transitions. With targeted investment, stronger regional coordination, and closer alignment with EU priorities, the WB6 can build a more innovative, sustainable, and resilient manufacturing base.



1. Western Balkans Six Innovation Ecosystem Overview

1.1 Overview of RDI performance and activity

The WB6 are gradually transitioning towards innovation-driven economies. As laid out by a recent OECD report¹, the region boasts a fast-growing ICT sector and a young, skilled talent pool, but still faces persistent challenges including limited funding, fragmented markets, and ongoing brain drain. Gross domestic expenditure on R&D remains very low (ranging from ~0.2% of GDP in Kosovo* to ~0.9% in Serbia) compared to EU-27 averages reported in the European Innovation Scoreboard, where all WB6 remain in the “Emerging Innovators” groups, severely constraining innovation capacity. This under-investment translates to a low density of researchers (Serbia’s ~2,218 researchers per million inhabitants versus an EU average of ~4,450; Bosnia and Herzegovina has only ~447 per million). All WB6 are accordingly still classified as “Emerging Innovators” on the European Innovation Scoreboard (EIS), performing well below EU innovation performance averages. Fragmentation of research institutions (many small, underfunded universities and institutes) hinders critical mass and commercialisation of research.² Nonetheless, recent years have seen notable improvements – a growing community of tech start-ups, better ICT infrastructure, and the launch of new innovation policies – signaling an increasing institutional maturity. Each WB6 government has adopted or is drafting smart specialisation strategies (S3) to focus R&D on priority fields (commonly ICT, agri-food energy efficiency/green technologies, mechanical engineering, etc.). New public innovation agencies and funding instruments have been established, (e.g. Montenegro’s Innovation Fund, Serbia’s Innovation Fund and Science Fund and North Macedonia’s INOVA³), although their scale and impact vary by economy.

In summary, the WB6 innovation ecosystem is emergent but uneven – marked by pockets of excellence and industrial heritage on the one hand, and structural gaps in investment and capacity on the other. Key strengths such as a dynamic ICT workforce are offset by weak academia-industry linkages and talent outflows, underscoring the need for sustained reforms and support to reach full potential.

¹ WB Competitiveness Outlook 2024: Regional Profile, OECD, 2024. Available online at: <https://www.balkaninnovation.com/docs/53/western-balkans-competitiveness-outlook-2024-regional-profile> Last accessed 4.12.2025

² <https://www.balkaninnovation.com/news/187/effective-policy-reforms-for-research-and-innovation-in-the-western-balkans>

³ North Macedonia’s Agency for Innovation Activity, Scientific and Technological Development and Entrepreneurship (INOVA) was formed in August 2025 by merging the FITD (Fund for Innovation and Technology Development) with the Agency for Entrepreneurship Support (APPRM).

1.2 Funding Landscape for Green- and Deep-Tech Ecosystems

A robust support funding ecosystem for innovation and green transition is gradually taking shape across the WB, combining **local funds** with regional and international instruments. Some WB6 have established one or more public funding agencies to drive R&D, innovation, and scientific projects – though their capacities differ.

→ Albania

Albania's innovation funding ecosystem is in a nascent stage but evolving. In 2022, a first **Start-up Fund** was operationalized, under the Minister of State for Entrepreneurship, distributing grants and incubation support to dozens of start-ups (initially ~\$1.6 million total). Additionally, Investment Development Agency (AIDA) runs competitive calls to co-finance innovative SME projects, and the **Agency for Scientific Research and Innovation (NASRI)** provides small research grants to public R&D institutions (although budgets are limited).

For larger-scale innovation, Albania has increasingly turned to **Horizon Europe**: associated since late 2021, its entities are now eligible for the full spectrum of Horizon funding. Already, Albania's universities have joined consortiums in areas like agri-tech and ICT under Horizon Europe, bringing in funds and know-how.

IPA funds also directly support innovation and green growth – for example, the recent IPA funded project **EU for Innovation** (with GIZ and Swedish support) injected €7.5 million to build up start-up ecosystem, establishing innovation hubs in Tirana and training start-up coaches.

In terms of green financing, Albania benefits from its candidacy to access EU blending facilities: the **WBIF** has co-financed major solar power projects and energy efficiency in public buildings, and now a new **Energy Support Package** of €165 million (grant) from the EU was given in 2022 to help citizens and SMEs cope with the energy crisis while incentivising clean energy use.

Through EBRD and EIB intermediated credit lines (like the Green Economy Financing Facility), banks offer loans for sustainable energy investments – many manufacturers have used these to buy modern efficient equipment or install PV panels. Microfinance and NGO programmes also channel climate-related funds: for instance, the **EU4Innovation** programme had a component specifically for **Agri-tech and Circular Economy start-ups**, awarding grants up to €50k.

While Albania does not yet have a dedicated Green Fund, it has instituted some **fiscal incentives**: renewable energy machinery and EVs have reduced import taxes, and there are plans to introduce green public procurement which could favour companies with eco-certifications. Additionally, under the WB Investment Framework's Guarantee arm, it is set to benefit from risk-sharing that could unlock private investments in sectors like eco-tourism and sustainable agri-processing.

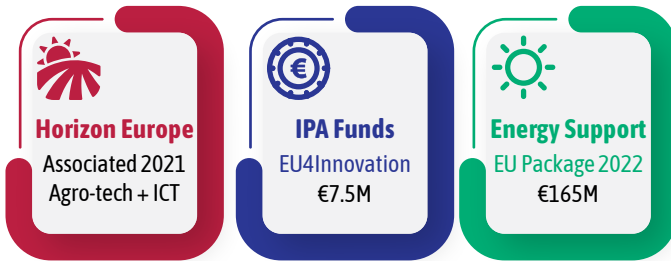
In summary, innovators and manufacturers can draw on a mix of nascent domestic funding (start-up grants, innovation challenges), increased access to EU R&I programmes, and substantial international financial support particularly oriented towards energy and sustainability.



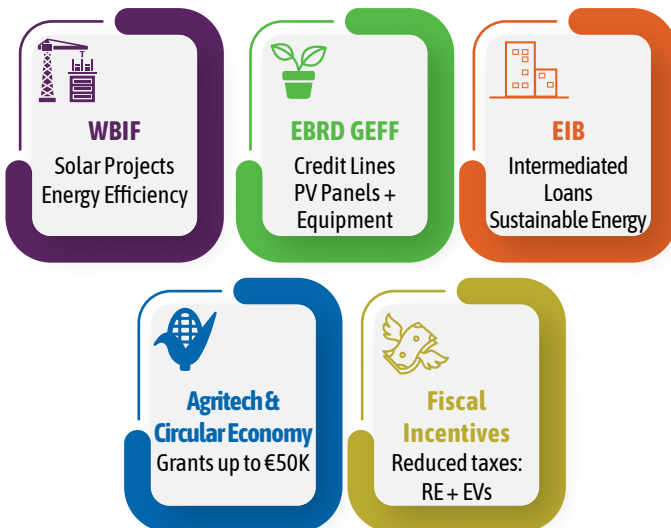
Domestic Funding



EU & International Programs



Green Financing Instruments

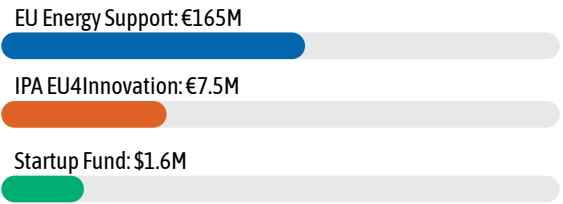


Ecosystem Summary
Mix of nascent domestic funding + strong EU/international support for green & innovation

Funding Flow Overview

Ecosystem Stage
NASCENT → EVOLVING

Major Funding Volumes



Priority Sectors

- Renewable Energy (Solar PV)
- Energy Efficiency (Buildings, Equipment)
- ICT & Digital Innovation
- Agritech & Circular Economy
- Sustainable Tourism

Priority Sectors



Strengths

- Horizon Europe access since 2021
- Strong EU/IPA support for green transition

Gaps

- No dedicated Green Fund yet
- Limited domestic budgets

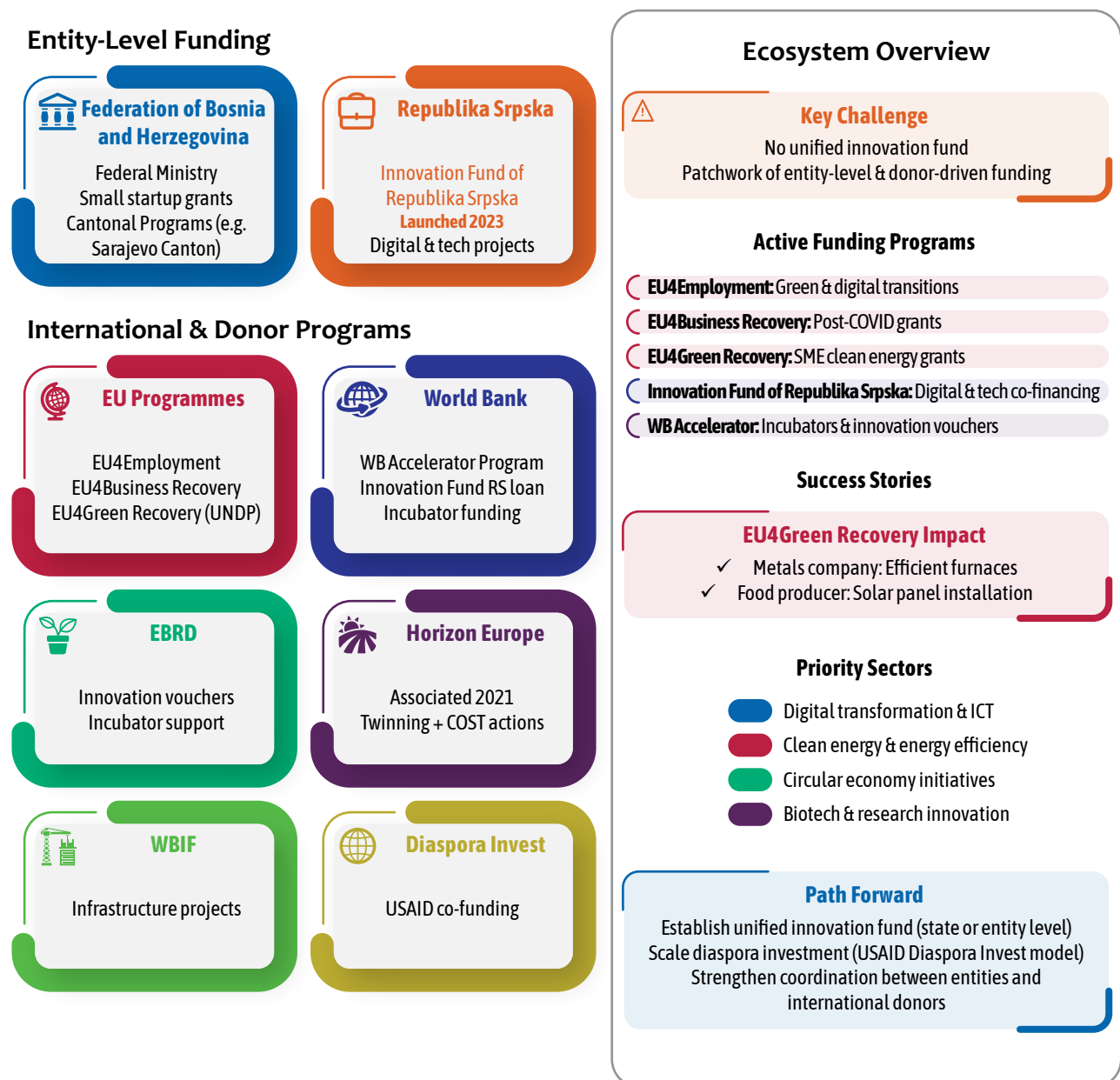
→ Bosnia and Herzegovina

Lacking a single innovation fund, Bosnia and Herzegovina relies on a patchwork of entity-level and donor-driven funding streams. In the Federation of Bosnia and Herzegovina, the **Federal Ministry of Development** has small grant schemes for start-ups and some cantonal governments (e.g. Sarajevo Canton) offer innovation calls, but budgets are modest. Republika Srpska recently operationalised an Innovation Fund, which launched calls in 2023 to co-finance **digital and tech projects** (initial capital largely provided via a World Bank loan). For **Green-tech**, Bosnia and Herzegovina taps into UNDP and EU programmes extensively – examples include EU4Employment - Harnessing the Green and Digital Transitions (providing equipment and grants to a number of biotech and IT start-ups) and EU4Business – Recovery which in

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2021–22 gave grants to companies for **green recovery** and digitalisation post-COVID. International financial institutions also play a role: the World Bank’s WB Accelerator programme and the EBRD have funded incubators and provided innovation vouchers. Research institutions get support via Horizon Europe (Bosnia and Herzegovina became associated in late 2021, although participation is still ramping up). Notably, universities and SMEs have benefited from **Horizon Europe’s Twinning and COST actions**, improving their networks.

For **environment/green funding**, Bosnia and Herzegovina accesses the **WBIF** for infrastructure (e.g. for wastewater plants, renewable energy projects) – indirectly aiding green manufacturing by improving infrastructure. A highlight is the **EU4Green Recovery** project (implemented by UNDP) which specifically provided grants to SMEs for clean energy and circular economy investments, e.g. helping a metals company buy efficient furnaces and a food producer install solar panels. Going forward, establishing a more unified innovation fund at economy or entity level, and leveraging diaspora investment (through initiatives like previously USAID’s Diaspora Invest which funded diaspora-led start-ups), will be key to scaling Bosnia and Herzegovina’s deep-tech and green-tech financing.





→ Kosovo*

Despite not being an EU member or official candidate, Kosovo* benefits from various funding instruments thanks to donor support and regional initiatives. The government has a modest **Innovation and Entrepreneurship Fund**, launched recently with German GIZ assistance, which has provided small grants to start-ups (for instance, awarding equipment to maker-spaces and seed funding to tech SMEs via the ICK).

EMERGING · Donor-Supported Patchwork

Innovation & Entrepreneurship Fund
GIZ-supported · ICK grants

International Donor Support

EU Office
R&I grants
Renewable · ICT

GIZ (DE)
Export Promotion
Manufacturing upgrades

USAID
Support diminished
AGRO program

Green Transition Finance

MCC Compact
Infrastructure
Energy workforce

WB Clean Energy Transition
Solar panels
Energy efficiency

Regional Guarantee
Berlin Process
SME lending

Future Development

- Sovereign Innovation Fund (exploring IMF SDRs)
- Diaspora-backed VC initiatives growing
- Joining regional financial instruments

Ecosystem Analysis

Ecosystem Stage:
EMERGING

Key Challenges

- ⤵ Access to finance – top barrier for entrepreneurs
- ⤵ Donor-dependent patchwork structure
- ⤵ Limited domestic funding capacity

Strengths & Opportunities

- Horizon Europe associated (2021)
- Regional VC pitching success
- Growing diaspora investment interest
- Berlin Process guarantee access

Success Story

Success Story
CROSSBOW Project participation
Smart grid integration · Renewable energy

Funding Sources Mix

- Domestic: 15%
- EU/International Donors: 50%
- Green Finance: 25%
- Private VC: 10%

Priority Actions

- Scale Domestic Fund
- Attract Diaspora VC
- Join Regional Tools
- Leverage Horizon EU

Much of the innovation financing comes through **international donors**: the EU Office funds an ongoing scheme for Research and Innovation that distributed grants to pilot projects in renewable energy and ICT; GIZ's **Creating Employment through Export Promotion** programme also supported some manufacturing process upgrades for export-oriented firms. Previously, **USAID** and other bilateral donors run challenge funds (e.g. USAID's **AGRO programme** had grants for agri-tech innovations). However, USAID support has diminished significantly under the current US administration.

Universities and NGOs have access to **Horizon Europe** as well – the economy was invited and became associated in 2021 alongside other WB partners, opening opportunities for collaborative R&D funding (Kosovo* had already seen some Horizon 2020 participation, although limited). One success was participation in the EU's **CROSSBOW project** on smart grids, which helped grid operator work on integrating renewable.

For the green transition, Kosovo* leverages funds like the **MCC Compact** (which, in addition to large infrastructure, includes support for workforce development in energy). There is also the **WB Clean Energy Transition initiative** by the EU that allocated grants for solar panels in public buildings and energy efficiency, freeing up public resources that can indirectly support green-tech adoption by enterprises. Private investment is slowly growing: a few local venture capital initiatives (often diaspora-backed) have started, and start-ups have been competitive in regional pitching events to win equity or grant investments. However, access to finance remains a top barrier cited by entrepreneurs. To address this, the government is exploring a **Sovereign Innovation Fund** possibly seeded by IMF Special Drawing Rights, and it is keen to join regional financial instruments. Under the Berlin Process, Kosovo* should benefit from the new **Regional Guarantee Facility** which aims to spur SME lending including for innovation and green projects. All these pieces, while smaller in scale, form a patchwork of funding that innovators and manufacturers can tap into for advancing deep-tech and green solutions.

→ Montenegro

A smaller innovation ecosystem means that Montenegro's funding instruments are just emerging. The government set up the **Innovation Fund** as mandated by its Law on Innovation; this fund, with initial EU IPA support, has run pilot calls, e.g. in 2021 it co-financed a handful of innovative SME projects, including some in renewable energy and ICT.

It also established a **Science and Technology Park (STP) in Podgorica**, which not only incubates start-ups but also manages certain grant programmes with international partners. For instance, STP Podgorica implemented an **EU-funded accelerator** programme providing seed funding and training to start-ups from the WB as part of the EU's STAR Venture programme.

Montenegro's research institutions rely heavily on **Horizon Europe** and bilateral funds; It is fully associated to Horizon Europe and has seen success especially in mobility programmes (Marie Curie and COST) which build research capacity.

Climate and green projects often get backing via the **WBIF** – e.g. grants for solar and wind project preparation – and through the EBRD's **Green Economy Financing Facility** which local banks on-lend to companies for green investments.

Also, being an EU candidate, Montenegro uses **IPA funds** for environmental projects: notably the large IPA funded project for **Flue-gas Desulphurisation at Pljevlja coal plant** (to cut pollution) and for upgrading water/waste infrastructure; this has knock-on benefits for industry compliance.



A unique funding aspect is utilisation of regional programmes like the **WB Investment Guarantee** (under the EU’s Economic and Investment Plan) that can de-risk investments in sectors including renewables manufacturing. While domestic private capital for venture investment is scarce, some start-ups have attracted equity from regional angel networks and funds.

Tech accelerator programmes from abroad occasionally include Montenegro (for example, EU’s Challenge Fund and Balkathon competitions have awarded cleantech ideas from Montenegro).

Domestic Innovation Instruments

Innovation Fund Montenegro
Est. 2020 · IPA Support
SME co-financing

STP Podgorica
EU STAR Venture 2022
Incubation · Grants

Key Milestones

- 2020: Innovation Fund created
- 2021: First pilot calls launched
- 2022: STAR Venture program
- Horizon Europe associated

EU & International Programs

Horizon Europe
Fully Associated
Marie Curie · COST

IPA Funds
Pre-accession support
Pljevlja desulfurization
Water/waste infrastructure

Challenge Funds
EU Challenge Fund
Cleantech awards

Regional Programs
Angel networks
Cross-regional VC

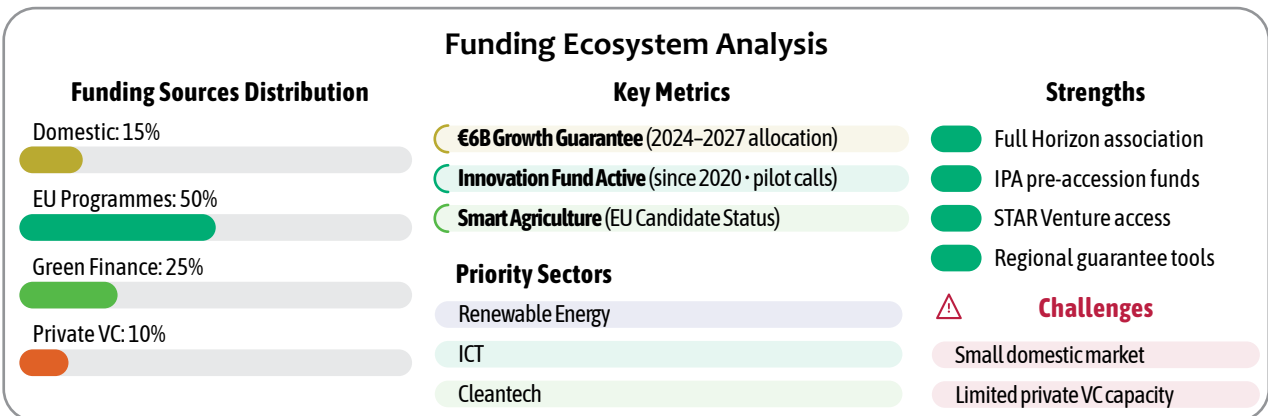
Green & Climate Finance

WBIF
Solar project prep
Wind development

EBRD GEFF
Local bank lending
Green investments

WB Investment Guarantee
De-risk renewables
Manufacturing support

WB Growth Guarantee
€6B (2024–2027)



Going forward, it aims to increase funding absorption through the new **WB Growth Guarantee** – a €6 billion EU mechanism (2024–2027) that will reward reform progress with investments, potentially channelling more funds into innovation and green infrastructure.

→ North Macedonia

Anchored by INNOVA (and its predecessor the Fund for Innovation and Technology Development, FITD), North Macedonia has built a strong public support mechanism for innovation. FITD, launched in 2014 with World Bank and EU support, invested in hundreds of start-up projects through matching grants, seed co-investments, and tech commercialisation grants. It was instrumental in catalysing sectors like ICT, agri-tech, and manufacturing process innovation. In 2025, FITD transitioned into INNOVA to expand its scope, but the core mission remains: providing funding and mentorship to innovative businesses.

The economy also encourages university-industry R&D via occasional Ministry of Education research calls and a **Technology Transfer Office** initiative.

Horizon Europe association (effective since 2021) opened additional funding: researchers and firms now participate in EU projects (the economy was part of winning consortia in smart energy and nanotech under Horizon 2020). At least one **Horizon Europe Teaming project** has been awarded to establish a Centre of Excellence in smart agriculture (with BioSense Serbia), bringing EU funds to local labs.

On the green side, North Macedonia is adept at mobilising climate finance: it secured **Green Climate Fund** support for an e-mobility project and uses **WBIF grants** to prepare renewable energy investments. The local Development Bank offers a **Green Finance Line** (supported by KfW) that gives low-interest loans for energy efficiency and renewables in SMEs. Additionally, donor projects such as the **previous USAID's Clean Energy Investment Project** help businesses conduct energy audits and access financing for green upgrades.

It also benefits from regional venture capital – It is within the investment scope of funds like Small-Cap Value (SCV) and **ENIF** under the WB EDIF platform. Furthermore, **UNDP's Climate Promise** and local EU-funded schemes provide technical assistance for policy, indirectly improving the environment for green innovation.

In summary, funding landscape is characterised by an active innovation fund for general innovation, solid engagement with Horizon Europe, and blended finance facilities targeting the green transition.



★ **STRONG PERFORMER**

INOVA
(formerly FITD, est. 2014)

Matching grants Tech
Seed co-investment commercialization

EU & Research Programs

Horizon Europe
Associate 2021

University-Industry R&D
Ministry of Education
TTO Initiative

★ **Centre of Excellence**
Horizon Learning
Smart Agriculture
(with BioSense)

Green & Climate Finance

Green Climate Fund
E-mobility projects

WBIF
Renewable energy grants

Green Finance Line
Dev Bank + KfW
Low-interest loans

USAID Clean Energy
Energy audits
Green financing

Regional VC Access
ENIF · Small-Cap Value · EDIF
Platform

UNDP Climate Promise
Policy & technical assistance

Ecosystem Strength

Performance

Innovation Support

Green Finance

EU Integration

Key Achievements

- Hundreds of startups funded
- Horizon SoE awarded
- Green Climate Fund secured
- Regional VC access

Focus Sectors

- ICT & Digital
- Agri-tech
- Smart Energy
- Manufacturing Innovation

Funding Sources

- Domestic (INOVA)
- EU Programs
- Green Finance

→ **Serbia**

Serbia has the most developed innovation funding system in the WB6. The **Innovation Fund** ⁴ (IFS) provides competitive grants to tech start-ups and SMEs (e.g. matching grants up to €300k) and has become the backbone of start-up scene, largely supported by EU and World Bank financing. Meanwhile, the government’s **Science Fund** runs dedicated programmes for research, including a recent Collaborative R&D Program – Green Economy which funded joint projects between academia and industry on topics such as


⁴ See inovacionifond.rs

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 ↵ ↴ **POTENTIAL IN THE WESTERN BALKANS SIX**


nano-materials for water purification and hydrogen production. These programmes channel public and donor money into both deep-tech and green-tech innovation. Serbia also benefits from targeted support for digital innovation: it hosts a European Digital Innovation Hub (EDIH) focusing on AI (led by STP Niš), connecting local companies to EU expertise.

 **REGIONAL LEADER · Most Comprehensive**

Domestic Backbone Institutions

 **Innovation Fund (IFS)**
 Backbone of startup ecosystem · EU & World Bank supported
 Matching grants up to €300K

- Tech startups support
- SME innovation grants
- Competitive process

 **Science Fund**
 Dedicated research programs
 Collaborative R&D Program
 Green Economy Focus

- Nano-materials research
- Hydrogen production
- Water purification tech
- Academia-industry joint projects


 **European Digital Innovation Hub (EDIH)**
 AI Focus · Led by STP Niš · Connecting companies to EU expertise
 Artificial Intelligence · Machine Learning · Digital Transformation

EU Research & Innovation Excellence

 **Horizon Europe**

Associated 2021

€170M in H2020 grants

 **EU Support Infrastructure**

Network of EU Programme Offices


EUREKA COST Actions

Enhanced access to EU funding mechanisms

Green & Climate Finance Instruments

 **Green Climate Fund**

Readiness projects
 Climate adaptation

 **WB GEFF (EBRD)**

Credit lines via banks
 Energy-efficient tech

 **Climate Fund**

Planned - Climate Law
 Sustainable innovation


 **Development Fund**

Local financing
 Business support

Venture Capital & Innovation Incentives

 **Regional Venture Capital Activity**

South Central Ventures Deep-tech investments

 **Most Comprehensive Incentives in WB6**

Tax Credits

Innovation Voucher Schemes up to €X



Beyond local schemes, entities are very active in **Horizon Europe** (Serbia associated to the programme in 2021, and during Horizon 2020 it received €170 million in EU R&D grants). Access to EU funds is enhanced by network of offices for EU programmes and its success in initiatives like **EUREKA** and **COST**. For Green-tech specifically, it taps into climate funds (e.g. Green Climate Fund readiness projects) and instruments like the **WB Green Energy Financing Facility** (WB GEFF, run by EBRD) which provides credit lines through banks for energy-efficient technologies in businesses. Local development banks and programmes, such as the **Development Fund** and upcoming Climate Fund (planned under the Climate Law), will further augment financing for sustainable innovation. Importantly, Serbia is home to regional VC activity too – the EU-backed **South Central Ventures** fund and others have invested in **deep-tech start-ups** (e.g. in IoT, agri-tech). As noted by international observers, innovation incentives (such as tax credits, innovation vouchers, voucher schemes) are among the most comprehensive in WB.

2.1. Analysis of Deep-Tech innovation ecosystems and technological capabilities

This section of the report describes the relevant ecosystems for Deep-Tech at the level of each WB6 and then at regional level.

For the purposes of the assignment, deep-tech has been defined to include:

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

2.1.1 Introduction to the Deep-tech sector in the WB

Digital Maturity and R&D Focus: The digital maturity of the WB6 still lags behind EU levels in advanced technologies, even as basic connectivity and IT adoption improve. A 2024 regional digital index⁵ found gains in broadband coverage and IT education, and persistent gaps in advanced digital skills, AI adoption, 5G deployment, and e-governance compared to EU benchmarks.

Research and innovation activity in the WB is concentrated in applied sciences – particularly ICT, electronics, and mechanical engineering – reflecting both current capabilities and the legacy hardware heritage of former Yugoslav industry. Serbia, for example, has leveraged its electronics and engineering tradition (e.g. the historic Electronics Industry in Niš) to build competencies in microelectronics, robotics, and software development. The region is increasingly active in fields like AI and automation R&D, albeit at a smaller scale than EU peers. Notably, **Serbia** was the first in South East Europe to establish **the Institute for Artificial Intelligence Research and Development**⁶ (established 2021) and one of the first to adopt a dedicated AI Strategy, signaling regional ambition in AI and robotics. Several WB6 (Serbia, North Macedonia, Montenegro) identified **ICT and digital tech as S3 priorities**, aligning their R&D agendas with global tech trends.

Overall, deep-tech innovation in the WB6 is driven by strong public research faculties in electrical engineering and computer science – e.g. **Serbia's University of Belgrade Electrical Engineering and CS departments** lead in **AI, signal processing, and robotics publications** – alongside a growing cohort of private tech companies and start-ups focusing on **software, IoT, and niche hardware solutions**.

⁵ See Regional Cooperation Council (RCC), “WB Digital Economy and Society Index 2024 Report,” 11 Aug 2025. Available: <https://www.rcc.int/pubs/211/western-balkans-digital-economy-and-society-index-2024-report>

⁶ See <https://ivi.ac.rs/en/>



Innovation Hubs – Science Parks and Clusters: Over the past decade, the region has developed a network of STPs, innovation centres and ICT industry clusters to nurture deep-tech ventures. **Serbia** spearheaded this trend: **STP Belgrade**, opened in 2015 with international support, has incubated over 240 tech companies and helped make Belgrade a leading innovation hub in the Balkans⁷. Building on this success, Serbia’s government and partners established three more STPs– in Novi Sad, Niš (focused on electronics/ Industry 4.0), and Čačak – by refurbishing R&D infrastructure with EU and EIB investment. These parks provide labs (e.g. 3D prototyping, laser, and electronics labs), co-working space, mentorship and seed accelerators (e.g. Belgrade’s Raising Starts pre-seed programme), and have engaged thousands of young engineers in start-up projects. The Belgrade STP model has also been replicated regionally: its team advised the launch of the **Innovation Centre Banja Luka (ICBL) in Bosnia and Herzegovina** and the **STP Montenegro in Podgorica** which is notable for its support for local **robotics and automation start-ups**.

Today each WB6 has at least one notable tech hub or park: for example, **INTERA Technology Park in Mostar** offers fabrication labs and business incubation; **Innovation Centre (ICK)** in Pristina hosts digital start-ups and an AI training programme; a multi-functional STP in Skopje (approved by the government in 2025) is being established, complementing private initiatives such as **Seavus Accelerator in Skopje**. Several dynamic ICT clusters also operate, linking tech SMEs and academia – e.g. the Vojvodina ICT Cluster (Novi Sad) and Niš’s Cluster of Advanced Technologies in Serbia, IT clusters in Republika Srpska, the ICT Cluster in Kragujevac, etc. These networks play a key role in knowledge exchange and joint projects.

2.1.2 Regional Position vs. the EU

In broad terms, the WB6 deep-tech ecosystem is nascent but growing, with strengths in software engineering and pockets of hardware talent, yet limited in overall scale. Compared to the EU, the region’s digital economy is smaller and firms are less digitally advanced on average. Few local companies engage in frontier deep-tech (such as semiconductor fabrication or quantum computing), partly due to limited capital and skills. However, the WB6 have become strong contributors in certain niches – for instance, **Serbia’s and North Macedonia’s** engineers are frequently contracted for **automotive software, IoT devices, and AI solutions** as part of EU value chains. WB researchers increasingly participate in EU R&D collaborations (e.g. Horizon Europe projects in **smart sensors, ICT**, etc.), closing some gaps in know-how. The region’s hardware heritage from past industrial capacities (e.g. electronics institutes, mechanical factories) provides a foundation to build modern deep-tech manufacturing. For example, local expertise in electronics in Niš, and North Macedonia’s electrical engineering (EE) industry is being redirected to areas like **embedded systems and renewable energy gadgets**. Still, challenges remain in keeping pace with the EU’s digital transition – the WB6 need to improve advanced STEM (Science, Technology, Engineering and Mathematics) training, invest more in R&D (public and private), and encourage tech entrepreneurship to avoid falling behind in the AI/robotics revolution.

2.1.3 Overview of the WB regional Deep-Tech ecosystem

Introduction

Deep-tech innovation is emerging as a high-potential domain in the WB6, driven by a growing cohort of science-based start-ups and increased investment from the EU and other sources. Despite challenges like limited risk capital and brain drain, several hotspots are positioning themselves as regional deep-

⁷ European Investment Bank (EIB), “Belgrade technology park nurtures Serbian startups,” EIB Stories, Nov 2025. Available: <https://www.eib.org/en/stories/science-technology-park-belgrade-innovation-serbia>

tech leaders by leveraging strong academic institutions, longstanding engineering traditions, and collaborations with global tech firms. For example, Serbia has cultivated notable deep-tech centres – the **BioSense Institute in Novi Sad** (a European-awarded hub for AI, sensor and agri-tech R&D) and **science parks in Belgrade and Niš** – building on a legacy of electronics and software talent. Elsewhere in the region, Kosovo's ICK nurtures cybersecurity and hardware start-ups, **Bosnia and Herzegovina's VERLAB Institute** focuses on med-tech/AI solutions, while North Macedonia's Fund for Innovation (formerly FITD, now restructured and renamed as INOVA to broaden its mandate and instruments) funds advanced ICT and biotech ventures. These growing deep-tech nodes are supported by international programmes like Horizon Europe and Digital Europe, aligning with EU priorities for strategic autonomy in advanced tech.

The sub-sector potential is diverse. WB6 teams are exploring **advanced materials** (e.g. biodegradable plastics and nanomaterials) and **AI/ML platforms for industry and agriculture**. Niche initiatives in **micro-electronics & semiconductors** (building on Serbia's electronics industry) and **nascent efforts in quantum computing and blockchain** also appear, often through university labs or diaspora-led start-ups. For instance, governments are beginning to back flagship deep-tech ventures – Albania's government invested €8.8M in an AI start-up founded by ex-OpenAI CTO Mira Murati, signalling public commitment to frontier tech. Regional market size is still modest in absolute terms, but growth is accelerating: significant investment has been mobilised for innovation and SME support in the WB, such as more than €850 million in EIB investments across sustainable development and private sector financing in the region. With digital transformation as a regional priority, deep-tech is set to be a key engine of innovation – provided that supportive infrastructure, talent retention, and financing mechanisms continue to improve.

The export potential of WB6 deep-tech is notable: start-ups often adopt a global-first mindset due to small local markets, resulting in cutting-edge solutions (**AI for precision agriculture, biomedical devices, Industry 4.0 software**) that can scale beyond the region.

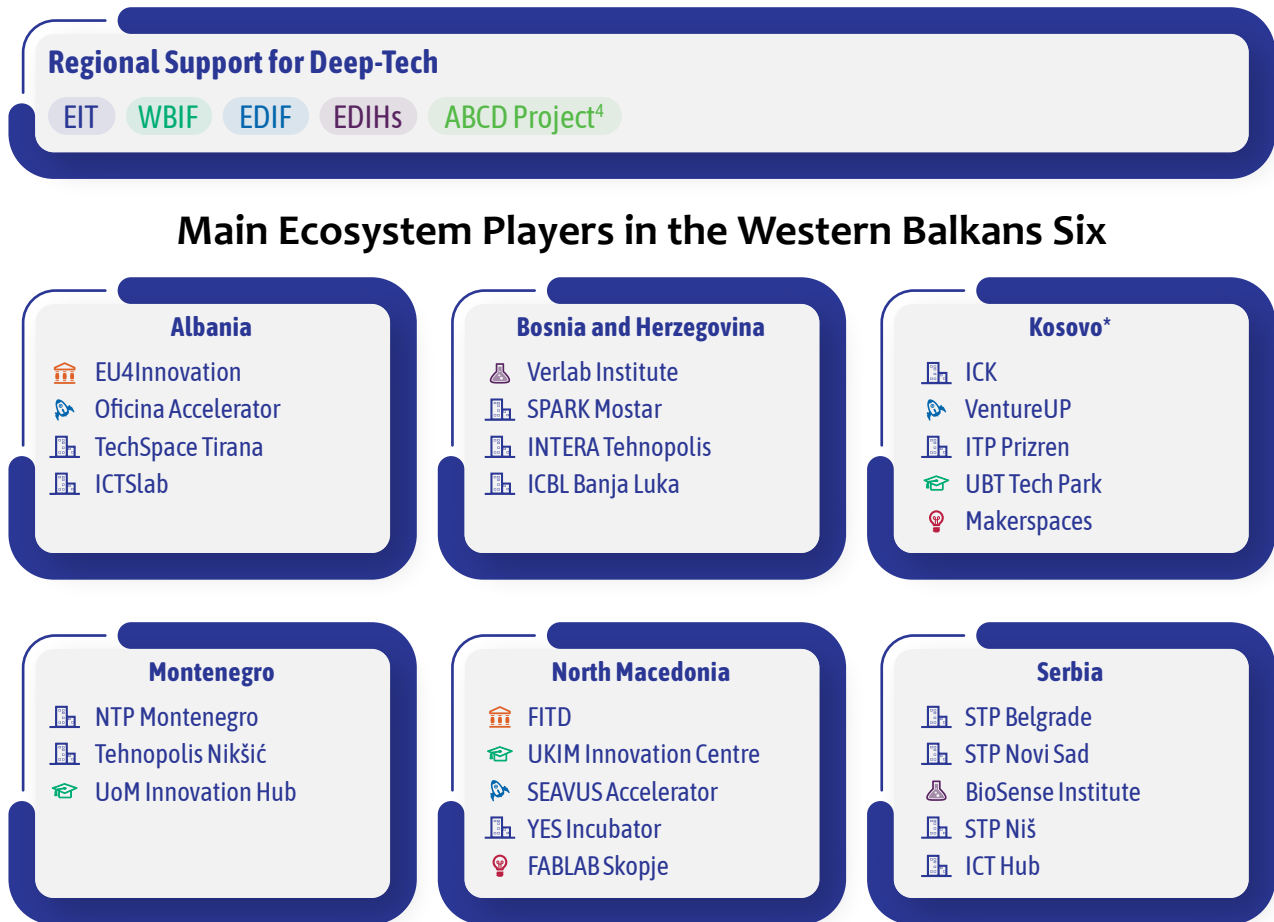
In summary, the WB's deep-tech ecosystem is gathering momentum, underpinned by strong technical universities and a growing network of incubators, innovation funds and digital hubs. Continued investment in R&D, commercialisation support, and international partnerships will be crucial to translate this raw potential into sustainable economic impact.

2.1.4 Main players: Ecosystem nodes

Figure 1 shows the Deep-Tech Ecosystem in the WB and in particular the main players who support the ecosystem through funding, incubation and acceleration, specialised infrastructure and KIS.



Figure 1: Regional support for Deep-Tech



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

2.1.5 Ranked List of the Strongest Deep-Tech Support Organisations

The following list has been weighted by research infrastructure, start-up track record, talent concentration, and international integration.

Tier 1 — Regional Leaders

- BioSense Institute (Serbia) — Sensors, AI, robotics, agri-deep-tech
- Science Technology Park Belgrade (Serbia) — AI, biotech, hardware
- Science Technology Park Novi Sad (Serbia) — Embedded systems, robotics
- VERLAB Research Institute (Bosnia and Herzegovina) — Med-tech, AI, hardware
- ICK (Kosovo*) — AI, cybersecurity, hardware

Tier 2 — Strong WB6 Players

- STP Montenegro (Podgorica) — Robotics, automation, engineering
- SEAVUS Accelerator (North Macedonia) — Software + hardware deep-tech
- FITD (North Macedonia) — Major funder + incubator for deep-tech

⁸ <https://abcd-project-deeptech.org/>

↶ ↷ MAPPING DEEP-TECH AND GREEN-TECH MANUFACTURING ↵ ↘ POTENTIAL IN THE WESTERN BALKANS SIX

- INTERA Technology Park (Mostar) — Robotics, fabrication, prototyping
- Oficina Accelerator (Albania) — Growing role in hardware/AI start-ups

Tier 3 — Emerging Deep-tech Nodes

- Tehnopolis (Nikšić) — Prototyping, engineering
- VentureUP (Kosovo*) — University-based hardware/AI incubation
- TechSpace Tirana / ICTSlab (Albania) — Makerspace + deep-tech links
- ICBL Banja Luka (Bosnia and Herzegovina) — Engineering + industrial tech
- FABLAB Skopje (North Macedonia) — Prototyping, robotics support

1.3.6 Best Deep-Tech Ecosystem Matches by Sector

A. Artificial Intelligence (AI)

- BioSense Institute (Serbia) — AI for sensing, agriculture, automation
- STP Belgrade (Serbia) — Strong AI start-ups and research partnerships
- ICK (Kosovo*) — AI training, applied AI start-ups
- VERLAB Institute (Bosnia and Herzegovina) — AI in medical and industrial applications
- Seavus Accelerator (North Macedonia) — Deep AI + software engineering

B. Robotics & Embedded Systems

- STP Novi Sad (Serbia) — Robotics, embedded systems, automation
- INTERA Tech Park (Bosnia and Herzegovina) — Robotics labs, automation training
- STP Montenegro — Robotics and industrial automation
- VentureUP (Kosovo*) — IoT, robotics student/start-up pipeline
- FABLAB Skopje — Prototyping for robotics hardware

C. Biotech / Life Sciences

- STP Belgrade + University of Belgrade Faculties — Bioengineering
- BioSense Institute — Grey-zone bio-tech (biosensing, bio-AI)
- VERLAB Institute (Bosnia and Herzegovina) — Biomedical engineering & medical robotics
- STP Montenegro — Engineering-led biotech collaborations
- SEAVUS Accelerator — Emerging biotech software-hybrid start-ups

D. Advanced Manufacturing / Industry 4.0

- INTERA Technology Park (Mostar) — CNC, robotics, Industry 4.0
- Tehnopolis (Nikšić) — Prototyping, additive manufacturing
- STP Niš (Serbia) — Microelectronics + industrial systems
- STP Montenegro — Smart manufacturing and automation
- ICTS Lab (Albania) — Hardware, fabrication

1.3.7 Top Deep-Tech Public Research Organisations (PROs)

Based on publication volume, citations, journal quality, and deep-tech relevance the following universities and research faculties in the WB show most potential to contribute to the deep-tech industrial sector.



Top Tier (strongest deep-tech research ecosystems):

1. University of Belgrade Regional Deep-Tech Leader

Key faculties:

- Faculty of Electrical Engineering (ETF)
- School of Electrical Engineering & Computer Science (EE/CS)
- Faculty of Mathematics
- Faculty of Physics

Why it leads:

- Largest number of Scopus-indexed deep-tech publications in the WB
- Strong outputs in AI, signal processing, robotics, telecommunications, theoretical CS, and ML
- Multiple labs participate in Horizon Europe and ERC-affiliated collaborations

2. University of Novi Sad / BioSense

Key unit: BioSense Institute

Strengths:

- Publications in sensors, IoT, embedded systems, AI for agriculture, and advanced materials
- Hosts a major EU-recognised Centre of Excellence (ANTARES) with substantial peer-reviewed scientific output.

3. Ss. Cyril & Methodius University, FEEIT & FCSE (North Macedonia)

Key faculties:

- Faculty of Electrical Engineering and Information Technologies (FEEIT)
- Faculty of Computer Science and Engineering (FCSE)

Strengths:

- One of the strongest AI/ML and Computer Engineering publication centres in the region
- High peer-reviewed output in signal processing, power electronics, embedded systems, cybersecurity, and applied ML

Mid-High Tier:

4. University of Sarajevo

Key faculties:

- Faculty of Electrical Engineering
- Faculty of Natural Sciences and Mathematics

Strengths:

- Peer-reviewed publications in electronics, computer engineering, software systems, information security, applied mathematics
- Emerging groups in robotics and industrial automation

5. University of Montenegro

Key faculties:

- Faculty of Electrical Engineering

↶ ↷ MAPPING DEEP-TECH AND GREEN-TECH MANUFACTURING ↷ ↶ POTENTIAL IN THE WESTERN BALKANS SIX

- Faculty of Natural Sciences & Mathematics

Strengths:

- Leading publication contributor in computer science, energy systems, automation and signal processing
- Consistent Scopus-indexed work in AI methods, communication systems and applied robotics

Emerging Tier:

6. Polytechnic University of Tirana

Key faculties:

- Faculty of Information Technology
- Faculty of Electrical Engineering

Strengths:

- Most peer-reviewed engineering publications
- Research in automation, electronics, software systems, and communications

7. University for Business and Technology in Pristina

Strengths:

- Most visible research contributor in AI, cybersecurity, data science, and computer engineering (based on Scopus-indexed conferences and journals)

8. University of Pristina

Key faculties:

- Faculty of Electrical and Computer Engineering

Strengths:

- Publications in computer engineering, telecommunications, embedded systems, and applied ML

9. University of Banja Luka

Key faculties:

- Faculty of Electrical Engineering

Strengths:

- Visible publication record in control engineering, telecommunications, and applied electronics

These rankings reflect **actual, measurable scientific output** rather than innovation policy or funded centres.

1.3.8 Deep-tech sector: contextual highlights by individual WB6

The deep-tech landscape varies across the WB6, with Serbia taking a lead in many indicators while smaller economies nurture niche capabilities.



Albania

Albania's innovation ecosystem has historically been weighted towards software and IT services, but there is growing interest in deep-tech domains. Tirana, the capital, hosts an increasing number of co-working spaces, innovation hubs (e.g. the Oficina accelerator), and labs focusing on ICT and entrepreneurship. The Polytechnic University of Tirana (particularly its IT and engineering faculties) is the centre of technical R&D, contributing research in computer science, electronics, and materials – though research output remains modest.

A few start-ups and initiatives are venturing into hardware: for instance, projects in drone technology for agriculture, solar panel system integration, and biotech apps have appeared in recent years.

Since 2022, government has supported its start-up ecosystem through a series of government-backed grant schemes and support platforms rather than a single economy-level Start-up Fund. In parallel, Albania is establishing Durana Tech Park — the first dedicated technology and science park — located in Xhafzotaj near Durrës, focusing on innovation in ICT, software, robotics and data-driven sectors, and aimed at fostering product innovation and manufacturing.

Albania's IT industry association (AITA) and various donor programmes (EU and GIZ-funded incubators) support SMEs in adopting advanced tech like automation in manufacturing and GIS in agriculture.

Overall, while heavy deep-tech manufacturing is limited (its economy leans more on services, textiles, and resource extraction), the economy sees opportunity in niches like geospatial tech, cybersecurity, and renewable energy tech assembly, building on its skilled youth (many educated abroad).

The deep-tech future for Albania will depend on improving research capacity and attracting investment – recent positive signs include the establishment of a few research centres and increased participation in EU R&I projects.

Innovation & RDI

WB6 R&D Spending
0.2–0.9% of GDP
vs ~2.4% OECD average

R&D Intensity
0.2% of GDP

Researchers
Serbia: 2,218
Bosnia and Herzegovina: 447

EIS Category
Emerging

Domestic Instruments

\$1.6M
Startup Fund
(since 2022)

€7.5M
EU Innovation
IPA Project

Bosnia and Herzegovina

An emerging player with pockets of deep-tech activity despite a relatively small tech sector. Bosnia and Herzegovina's strengths stem from its engineering talent and legacy industrial institutes. The VERLAB Institute in Sarajevo is notable for applied R&D in biomedical engineering, AI for quality control, and certification technology – it has been recognised as a regional leader in med-tech and hardware validation. The economy hosts several tech parks/centres: INTERA TP in Mostar supports robotics and prototyping start-ups; Innovation Centre Banja Luka (ICBL) incubates IT companies and product developers in Republika Srpska. Several private IT clusters and academies (e.g. BIT Alliance, Networks Sarajevo) nurture software development skills, feeding a growing outsourcing sector.

Bosnia and Herzegovina's deep-tech ecosystem is hindered by fragmentation (split governance) and limited funding, but individual success stories (e.g. start-ups in decentralised identity, robotics, and VR) are gaining attention. Notably, local universities (Sarajevo, Banja Luka) have introduced programmes in AI and automation. With donor support, Bosnia and Herzegovina is establishing labs for Industry 4.0 (e.g. a new Smart Factory hub in Tuzla) aiming to translate its traditional metal/mechanical engineering know-how into modern industrial tech solutions.

Kosovo*

An agile, youth-driven tech ecosystem characterises deep-tech potential in Kosovo*. With a median age under 30, it has a vibrant IT start-up community centred in Pristina. The ICK has been instrumental as a start-up incubator and training hub, producing companies in ICT services, software, and some hardware (e.g. 3D printing applications). Additionally, the University of Pristina's faculties of electrical engineering and computer science collaborate with diaspora experts to advance research in AI, signal processing, and renewable energy tech while students and young researchers are supported by VentureUP – the university incubator/accelerator. First Innovation and Training Park (ITP) in Prizren – repurposed from a former military base – offers space for tech entrepreneurship and light manufacturing pilots, emphasizing ICT and creative industries.

While deep-tech manufacturing is minimal (due to lack of large high-tech industries), there are promising initiatives in ICT for energy (such as software for virtual power plants and grid management developed by local firms) and in digital fabrication (makerspaces exploring drone assembly, robotics kits for education, etc.).

Innovation & RDI

WB6 R&D Spending
0.2–0.9% of GDP
 vs ~2.4% OECD average

R&D Intensity
0.2% of GDP

Researchers
Bosnia and Herzegovina: ~447
 EU: ~4,450

EIS Category
Emerging

Governance

Fragmented RDI governance
 (jurisdiction-wide)
 but emerging innovation
 infrastructure
 (e.g. innovation centres and
 tech parks).

Innovation & RDI

R&D Intensity
0.2% of GDP
 Lower end of WB6
 vs ~2.4% OECD

Young Workforce
 Young workforce and dynamic
 ICT startup community

Low formal R&D
 Fragmented infrastructure

EIS Category
Emerging Innovator

High Potential
 Through diaspora links and
 rapid adoption of digital tools.



A key strength is diaspora, which often brings know-how and capital for tech ventures. The main challenges are limited R&D funding and a still-developing legal framework for innovation. Yet, the economy's proactive start-up scene – exemplified by events like KosICT tech festival – and the youngest workforce in Europe give it an advantage in quickly adopting and developing new tech solutions.

Montenegro

One of the smallest WB6, Montenegro has a nascent deep-tech scene, but with high aspirations. A notable established local initiative is Tehnopolis in Nikšić – a technology and innovation centre with labs for prototyping, 3D printing, and agri-tech, serving as a launchpad for product start-ups. The newer and larger Science and Technology Park in Podgorica, launched with support from STP Belgrade team, is building significant capacity in robotics, smart systems, and engineering design. Universities (e.g. the University of Montenegro's engineering faculties) contribute research in areas like renewable energy systems, automation, and applied ICT, albeit at a small scale.

The economy's deep-tech development benefits from its high internet penetration and the government's push to digitalisation as part of the EU accession process. However, limitations include a very small talent pool and scarce private investment. Some creative niches are emerging – e.g. start-ups in marine tech (leveraging its coastline) and fintech solutions for tourism.

Through regional cooperation projects and EU programmes, Montenegro is seeking to compensate for scale by integrating its start-ups into cross-region innovation networks (for instance, EDIH programmes where STP Niš leads a regional AI hub involving Montenegro). As EU membership prospects grow, it aims to position itself as a test-bed for innovative tech (drones, green energy gadgets, etc.) in a sandbox regulatory environment.

North Macedonia

A small but dynamic ICT ecosystem, increasingly oriented towards product innovation. Skopje's tech community is energised by accelerators like Seavus Accelerator and makerspaces (e.g. FABLAB Skopje) that encourage hardware start-ups. The strong technical universities – notably the Faculty of Electrical Engineering and IT (FEEIT) and the Faculty of Computer Science (FCSE) in Skopje – produce skilled graduates and research in power electronics, embedded systems, and AI, making North Macedonia one of the region's leaders in per-capita scientific output in ICT. Several deep-tech start-ups have emerged: examples include companies working on AI-based medical diagnostics, drone technology, and cleantech IoT devices.

Innovation & RDI

Small Economy

Small economy with nascent RDI system, but growing innovation support (Innovation Fund; participation in EU programmes).

R&D Intensity
0.45% of GDP
WB6 range
vs -2.4% OECD

EIS Category
Emerging Innovator

Strategic Focus
**Digitalisation
&
EU Accession**

Innovation & RDI

R&D Intensity
0.2–0.9% of GDP
WB6 range
vs -2.4% OECD

Strong ICT Base

FEIT and FCSE in Skopje produce high per-capita scientific output in ICT fields.

Innovation Funding
FITD/INNOVA
Fund for Innovation and Technology Development, recently reorganised.

EIS Category
Emerging Innovator

The government’s original Fund for Innovation and Technology Development (FITD), recently replaced by INNOVA (see above), co-financed many technology-based projects, fostering collaboration between industry and academia.

Hardware heritage (e.g. electronics factories from Yugoslav times) has largely transformed into foreign-run manufacturing plants, but now there is a push for local innovation – e.g. the economy repurposed an old coal mine site (Oslomej) into a solar technology park and is exploring battery assembly investments. The modern Science-Tech Park planned for Skopje should further anchor the deep-tech ecosystem.

While the market is small, start-ups often target EU markets and collaborate regionally to scale their deep-tech solutions.

Serbia

The clear regional front-runner in deep-tech, hosting the largest number of tech professionals and start-ups. ICT sector is the economy’s top export industry (over \$3.9 billion in 2023)⁹. Belgrade and Novi Sad form thriving tech hubs, home to R&D centres of major multinationals (Microsoft, NCR, etc.) and robust start-up scenes in AI, gaming, and enterprise software. Serbia has an AI Institute (the first in South East Europe) and a Centre for the Fourth Industrial Revolution (C4IR) focusing on AI and biotech, reflecting strong government commitment to digital innovation. Multiple science parks (Belgrade, Niš, Novi Sad, Čačak) and research institutes (e.g. BioSense Institute for agri-tech, Mihajlo Pupin Institute for electronics) drive R&D in sensors, robotics, and applied AI. It also retains a manufacturing base in electronics and machinery, enabling integration of hardware and software (e.g. local production of nanosatellites and MedTech devices by start-ups).

Overall, Serbia leads in regionally authored scientific publications and patents in ICT fields and is pioneering initiatives (economy-level AI strategy, innovation tax incentives) to further boost deep-tech growth.

Innovation & RDI

0.9
R&D % of GDP
HIGHEST IN WB6

Researchers
2,218 / Million

ICT Exports
\$3.9 Billion

Innovation Ecosystem

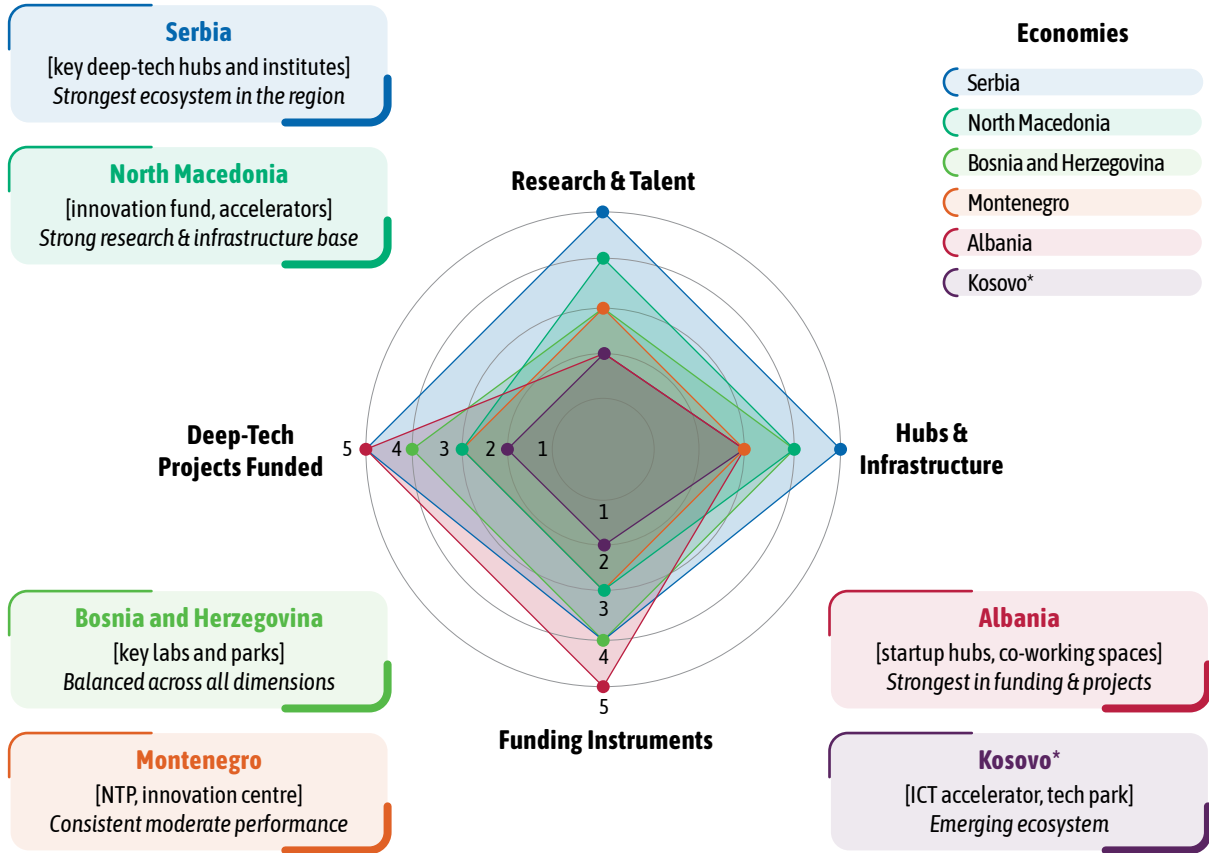
- Innovation Fund
- Science Fund
- 4+ Tech Parks
- AI Institute
- CAIR Serbia

EIS Category
Emerging Innovator

⁹ See U.S. Department of Commerce – International Trade Administration, “Serbia – Digital Economy (Commercial Guide),” updated 20 Sep 2024. Available: <https://www.trade.gov/country-commercial-guides/serbia-digital-economy>



Deep-Tech Ecosystem Strengths by Economy



2.2. Analysis of Green-Tech Manufacturing innovation ecosystems and technological capabilities

This section of the report describes the relevant ecosystems for Green-Tech Manufacturing at the level of each WB6 and the region.

For the purposes of the assignment, Green Manufacturing has been defined to include:

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

2.2.1 Introduction to the GM sector in the WB

Industrial Base and Green Transition Pressures

Manufacturing remains a significant pillar of WB6, with a mix of traditional industries and emerging sub-sectors. The WB6 industrial base is diversified across metals, machinery, automotive components, food and beverages, textiles/apparel, wood processing, and chemicals.

In recent years, industrial output has been expanding especially in **Serbia** (automotive assembly and parts, machinery equipment), **North Macedonia** (electrical components, textiles), and **Bosnia and Herzegovina** (metal fabrication and processing)¹⁰. These sectors are often integrated into European supply chains – for example, factories from Serbia and North Macedonia produce wire harnesses, car seats, and electronic parts for EU automakers, while Bosnia and Herzegovina exports steel and aluminium products. However, this manufacturing prowess comes with a legacy of high carbon intensity and pollution. Much of the region's energy for industry is generated from coal/lignite, and heavy industries (steelworks, cement, aluminium smelters) operated with dated technology, resulting in significant emissions and energy inefficiency.

As the EU tightens environmental standards, the WB6 face mounting green transition pressures. Notably, the EU's new **CBAM** – phasing in from 2026 – will impose carbon costs on certain exports including steel, aluminium, fertilisers, electricity. This is expected to affect Bosnia and Herzegovina, Serbia, North Macedonia, and Montenegro,¹¹ whose exports in CBAM-covered goods amount to an estimated 4–6% of their GDP. Those four economies still rely heavily on coal-fired power (with carbon intensity ~1.0–1.1 ton CO₂/MWh, far above the EU grid average), and major export sectors include electricity, aluminium, iron & steel – all of which will become less competitive unless production is decarbonised. In contrast,

¹⁰ <https://montenegrobusiness.eu/industrial-supply-chains-how-montenegro-links-western-balkans-industrial-clusters/>

¹¹ Berlin Process, “Challenges and Opportunities of the EU (CBAM for the Western Balkans),” Factsheet, 1 Oct 2024. Available: https://www.berlinprocess.de/uploads/documents/factsheet-challenges-and-opportunities-of-the-eu-carbon-border-adjustment-mechanism-cbam_1729075153.pdf



Albania (almost entirely hydropower for electricity) and **Kosovo*** (minimal EU exports) are less directly exposed to **CBAM** in short-term¹², but they too must align with EU's climate goals to attract investment and market access. Beyond CBAM, the broader European Green Deal agenda exerts pressure on the WB6 to green their industries and energy systems. In 2020, all six endorsed the Sofia Declaration, committing to an EU-aligned Green Agenda for the WB as a regional growth strategy to tackle climate change and environmental challenges. This entails reaching climate neutrality by 2050, cutting pollution, and shifting to sustainable production models.

Sustainability Initiatives and Circular Economy

Across the region there is a nascent but growing movement towards greener manufacturing practices, often backed by international support. The Green Agenda's Action Plan (2021–2030) covers five pillars – including decarbonisation & energy efficiency, circular economy, pollution reduction, biodiversity, and sustainable food systems – which frame individual WB6 efforts. In practice, this has led to various initiatives: factories are being retrofitted for energy efficiency (with EU/EBRD credit lines supporting new equipment and insulation), investments in renewable energy are ramping up (solar and wind farms, biomass boilers) to provide cleaner power to industry, and waste valorisation projects are underway to convert industrial waste into inputs. For example, **Serbia** and **North Macedonia** have begun pilot projects in biomass and biogas utilisation, turning agricultural and municipal waste into energy.

Recycling and materials recovery are also on policy agendas – several economies are introducing laws to promote recycling of packaging and industrial scrap, and donors have funded circular economy pilot projects (such as reusing construction waste in **Albania**¹³ and circular business trainings region-wide¹⁴). Eco-innovation hubs and green technology start-ups are slowly appearing: e.g. a start-up from Serbia developed an urban algae bioreactor (“Liquid3”) to absorb CO₂ and clean city air, firms from **Bosnia and Herzegovina** are looking into solar panel recycling, and a **Croatian-Albanian** venture is testing plastic waste-to-fuel technology (although Croatia is outside WB6, its firms often partner with WB6 on green solutions).

Despite these positive examples, **circular economy adoption in the WB is still at an early stage**. Most businesses have yet to embrace resource efficiency – recycling rates are low and waste management systems underdeveloped. A recent regional survey¹⁵ highlighted that only about 30% of WB6 businesses perceive climate change as a significant issue for their operations and over one-third have not taken any steps to reduce their environmental impact or engage in circular practices. The barriers cited include cost concerns and lack of know-how or incentives. This underscores the importance of stronger policy measures (e.g. eco-design standards, green procurement rules) and support programmes to accelerate the transition.

2.2.2 Green Transition Readiness

Each WB6 has formulated strategies or laws to guide the green transition, though implementation varies. All six are in the Energy Community and thus are preparing their **Energy and Climate Plans (NECPs)**

¹² https://www.berlinprocess.de/uploads/documents/factsheet-challenges-and-opportunities-of-the-eu-carbon-border-adjustment-mechanism-cbam_1729075153.pdf

¹³ Reconomy Programme, “From Waste to Wealth: The rise of the circular economy in the WB,” knowledge-hub article. Available: <https://www.reconomyprogram.com/knowledge-hub/from-waste-to-wealth-the-rise-of-the-circular-economy-in-the-western-balkans/>

¹⁴ WB Circular Economy Hub, “Circular Economy Awards 2025 – the WB's first regional winners announced,” 2025. Available: <https://wbcirculareconomy.com/circular-economy-awards-2025-the-western-balkans-first-regional-winners-announced/>

¹⁵ Regional Cooperation Council (RCC), “Bregu: Circular economy strategies can reduce greenhouse gas emissions... unlock trillion dollars worth economic opportunity,” news release, 8 Feb 2024.

for 2030, setting targets for renewable energy share, emission cuts, and efficiency. Renewable energy potential in the region is considerable – especially in hydropower (already heavily utilised by Albania, Montenegro, Bosnia and Herzegovina, and Serbia), but also solar and wind (North Macedonia, Serbia, and Albania have high solar irradiance; coastal areas of Albania and Montenegro and mountain ridges in Bosnia and Herzegovina and Serbia have good wind speeds). Governments have begun auctions for solar/wind projects (e.g. Albania awarded 240 MW of solar PV in 2022, North Macedonia is developing 30 MW of solar on a depleted coal mine, Serbia held its first renewables tender in 2023). These steps will gradually green the electricity that powers factories.

Another pressure is the need to **modernise polluting industries**: for instance, old coal power plants (like ‘Kosovo* A’ and Pljevlja in Montenegro) and steel mills (Zenica in Bosnia and Herzegovina, Smederevo in Serbia) face either upgrades with emissions control or closure in coming years. The EU’s financial instruments (e.g. WBIF) and climate funds are channelling resources to help in this industrial decarbonisation – supporting projects such as district heating conversions from coal to biomass, installation of energy management systems in factories, and introduction of best available techniques (BAT) in sectors like cement and chemicals.

On the policy side, some WB6 are exploring **carbon pricing mechanisms** (Montenegro, for example, considered a carbon tax on power generation to mirror the EU ETS pricing). Meanwhile, **environmental regulations** are gradually being tightened to EU standards, e.g. new laws on industrial emissions, integrated pollution prevention, and extended producer responsibility for waste are in draft or early implementation across the WB6. The circular economy concept is gaining institutional backing: the RCC launched a **WB Stakeholder Platform for Green and Circular Economy** in 2024 to align efforts and share best practices regionally. This platform is meant to coordinate government, industry, and donor actions to unlock green investments and harmonise standards in the WB.

Overall, while the region’s green manufacturing transition is only starting – and significant obstacles exist (financial constraints, low awareness, and regulatory gaps) – the trajectory is set by the EU accession imperative. The coming decade will likely see accelerated adoption of clean technologies, driven by both push (EU market and regulatory pressure) and pull factors (opportunities for sustainable growth, such as the trillions in economic value that circular economy approaches can unlock globally).

2.2.3 Overview of the WB regional Green-Tech Manufacturing ecosystem

Introduction

Green-tech manufacturing – the development of environmentally sustainable technologies and products – is gaining momentum across the WB, as governments align with EU Green Deal targets and commit to decarbonisation. All WB6 are in an early phase of green transition, but increasing investments are flowing into renewable energy equipment, circular economy projects, and eco-innovation. For instance, the region has abundant renewable resources (solar, wind, hydro) and has begun to localise parts of the value chain: **Albania** opened the Balkans’ largest **solar plant** (Karavasta, 140 MW), and **Kosovo***’s HelioKos start-up is assembling **solar panel components** domestically. In **Bosnia and Herzegovina and North Macedonia**, entrepreneurs are piloting **wind turbine micro-factories and energy storage systems** (e.g. GreenSpark in **Bosnia and Herzegovina** developing small-scale wind tech). Meanwhile, circular economy initiatives are on the rise – from **Montenegro**’s award-winning **3D recycled plastics furniture venture** (3D Soba) to **Albania**’s first **Circular Economy Park** integrating recycling, reuse and education in one hub. These examples illustrate a broader trend: **traditional manufacturing sectors (materials, textiles, food processing) are slowly integrating greener processes, often with donor support and policy incentives.**

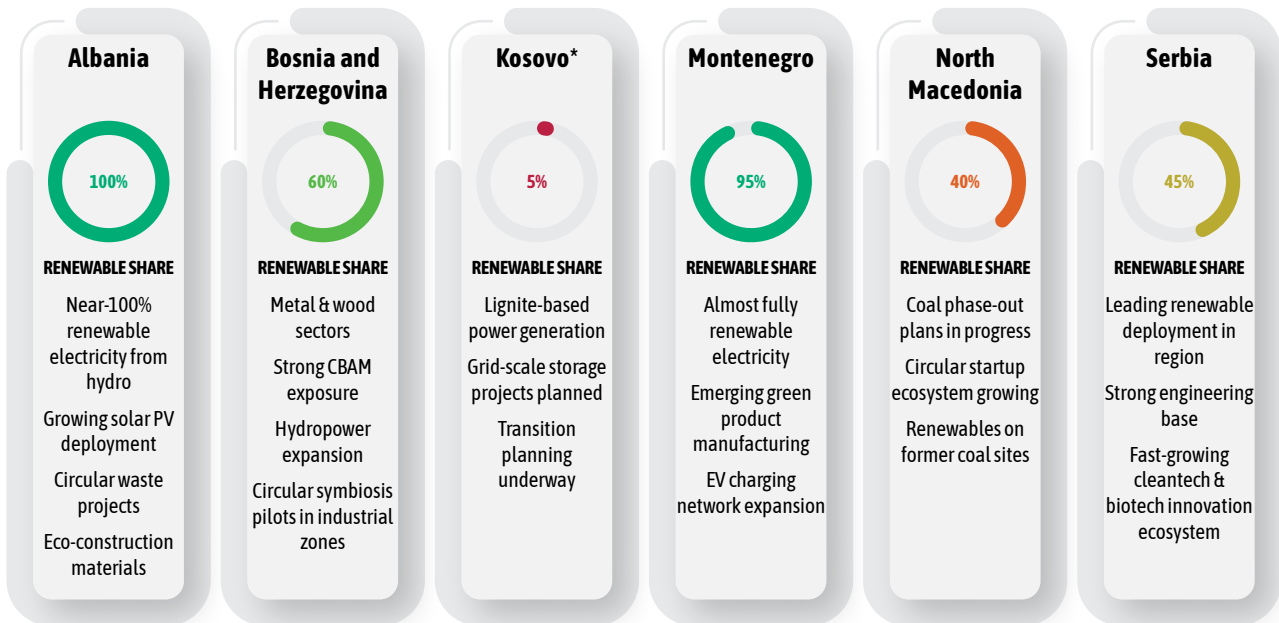


The market size for green technologies in WB6 is expanding as climate funding increases. The WBIF has steered €1.8 billion into clean energy and efficiency projects in the region, and prospective renewable energy capacity (solar, wind) is now measured in tens of GW – signalling future demand for local green-tech solutions. Industries such as sustainable building materials, waste management, and eco-packaging are likely to expand. **North Macedonia and Serbia** host emerging **sustainable packaging start-ups** (e.g. PakGreener and BioPack Balkans producing compostable packaging), while **advanced material research** (Serbia’s BioReForm, an R&D effort in biopolymers) is targeting **biodegradable inputs for regional manufacturers**.

Each WB6 has identified *circular economy and clean energy* as strategic priorities, embedding them in their strategies in line with the Green Agenda for the WB. However, gaps remain in infrastructure and regulation – e.g. patchy waste collection systems and reliance on coal power – which constrain green manufacturing growth. To overcome this, cross-region projects, EU funds, and public–private partnerships are catalysing progress. Notably, regional cooperation platforms (such as the WB Green Deal and Circular Economy Stakeholders Platform) engage multiple jurisdictions in knowledge-sharing and pilot initiatives. Overall, the WB’s green manufacturing ecosystem shows promising early signs, bolstered by natural resource endowments and a strong imperative to modernise aging industries. With continued investment and policy support, the region can become a niche player in green-tech, from renewable energy components to innovative circular products – marrying its industrial heritage with a sustainable future.

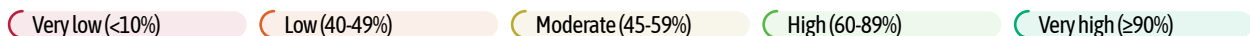
Green-Tech Manufacturing Readiness in the Western Balkans Six

Renewable electricity share as indicator of green-tech production capacity



Arc length is mathematically proportional to each percentage

$$100\% = \text{full circle } (360^\circ) \cdot 60\% = 216^\circ \cdot 45\% = 162^\circ \cdot 40\% = 144^\circ \cdot 5\% = 18^\circ$$



Drivers: EU Green Deal for Western Balkans - Energy Community rules - CBAM exposure

2.2.4 Main players: Ecosystem nodes

Figure 2 shows the Green Manufacturing Ecosystem in the WB and in particular the main players who support the ecosystem through funding, incubation and acceleration, specialized infrastructure and KIS.

Figure 2 Regional support for Green Manufacturing



Main players supporting green manufacturing through funding, incubation, specialised infrastructure and KIS in the WB6 (mapping 2025)

2.2.5 Ranked List of the Strongest Green Manufacturing Support Hubs

The following graph has been weighted by manufacturing capabilities, prototyping infrastructure, circular-economy focus, energy-efficiency projects, and start-up traction.



Ranked Green Manufacturing Support Hubs in the WB6

Ranking weighted by manufacturing capabilities, prototyping infrastructure, circular-economy focus, energy-efficiency projects, and start-up traction (AI-assisted assessment, 2025)

Tier 1 - Regional Leaders

<p>INTERA Technology Park Mostar, Bosnia and Herzegovina CNC labs, Industry 4.0, automation, advanced manufacturing</p>	<p>Tehnopolis Nikšić, Montenegro Food & materials labs, prototyping, sustainability innovation</p>	<p>STP Niš Serbia Microelectronics and industrial engineering for greener production</p>	<p>NTP Montenegro Podgorica, Montenegro Robotics, engineering, manufacturing optimisation</p>	<p>STP Belgrade Serbia Clean-tech, circular solutions, industrial AI</p>
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Tier 2 - Strong Domestic Actors

<p>STP Novi Sad Serbia Agri-manufacturing tech, IoT for efficiency</p>	<p>ICK Kosovo* Hosts green innovation programs, product design</p>	<p>TechSpace Tirana Albania Green product fabrication</p>	<p>ICBL Banja Luka Bosnia and Herzegovina Industrial tech, waste-to-resource solutions</p>
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Tier 3 - Emerging Hubs

<p>YES Incubator North Macedonia Circular economy start-ups</p>	<p>UBT Tech Park Kosovo* Energy and materials engineering</p>	<p>Oficina Accelerator Albania Eco-business support</p>	<p>VentureUP Kosovo* Early-stage engineering ideas</p>	<p>FABLAB Skopje North Macedonia Sustainable prototyping</p>
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2.2.6 Best Ecosystem Matches by Sector

Deep-Green Opportunity Spaces – Key Ecosystem Hubs in the WB6

Listing compiled with AI deep research mode (2025)

 A. Sustainable Materials & Advanced Materials <i>Hubs focused on new materials, composites and advanced fabrication</i>	 B. Circular Economy & Waste Valorisation <i>Innovation for reuse, recycling and waste-to-resource models</i>	 C. Renewable Energy Hardware / Manufacturing <i>Hardware and system solutions for the energy transition</i>	 D. Industrial Automation & Energy-Efficient Production <i>Industry 4.0, robotics and energy-optimized processes</i>	 E. Sustainable Packaging & Eco-Product Design <i>Eco-products, packaging and design-driven circularity</i>
INTERA Technology Park <i>Bosnia and Herzegovina</i> Additive manufacturing, CNC, composites	YES Incubator <i>North Macedonia</i> Active circular economy programmes	STP Belgrade <i>Serbia</i> Cleantech entrepreneurship	INTERA Technology Park <i>Bosnia and Herzegovina</i> Robotics, automation, Industry 4.0	Tehnopolis <i>Montenegro</i> Packaging R&D (food/agri-tech focus)
Tehnopolis <i>Montenegro</i> Materials testing, agri-materials, food packaging	SPARK <i>Bosnia and Herzegovina</i> Digital circular solutions, waste-tech	UBT Tech Park <i>Kosovo*</i> Renewable energy R&D support	STP Novi Sad <i>Serbia</i> IoT for smart manufacturing	TechSpace Tirana <i>Albania</i> Prototyping eco-friendly consumer goods
STP Niš <i>Serbia</i> Microelectronics and material-integrated systems	TechSpace Tirana <i>Albania</i> Circular product design	NTP Montenegro <i>Montenegro</i> Clean energy system design	Tehnopolis <i>Montenegro</i> Process optimisation	INTERA <i>Bosnia and Herzegovina</i> 3D printing & design labs
FABLAB Skopje <i>North Macedonia</i> Materials prototyping	UNDP Accelerator Labs <i>all WB6</i> Waste-to-resource challenge support	FITD <i>North Macedonia</i> Funds renewable hardware prototypes	ICK <i>Kosovo*</i> Digital manufacturing tools	YES Incubator <i>North Macedonia</i> Circular-product entrepreneurship



2.2.7 Ranked list of Public Research Organisations (PROs)

Joint Research Centre (JRC) and regional policy reports suggest that WB region's green transition priorities are based on the following institutional anchors as leverage points:

- (a) **peer-reviewed academic activity in manufacturing-relevant areas** (materials / sensors / process engineering / automation / digital manufacturing),
- (b) **visible engagement in circular-economy or green transition themes** in regional reviews, and
- (c) **institutional centres** that translate research into applied pilots (e.g. BioSense).

The following universities and research faculties in the WB show most potential to contribute to the Green Manufacturing sector based on these anchors.

Ranked Research Performing Organisations (RPOs) for Green Manufacturing in the WB6

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.
- Domestically leading research footprint for green process optimisation and industrial partnerships.



Bosnia and 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 economy-level 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 domestic 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 domestic research leaders.



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



2.2.8 Green Industry contextual highlights by WB6

As outlined below, each WB6 exhibits distinct green industry initiatives and challenges, shaped by its industrial structure and resource endowment.

Albania

Albania stands out in the region for its almost entirely renewable electricity generation, thanks to large hydropower plants that supply ~100% of domestic production in a wet year. This gives Albania’s manufacturing a low-carbon electricity input, an advantage as the EU market values clean energy. Key industries in Albania include food and agro-processing, textiles/footwear (often for European fashion brands), building materials (cement), and oil extraction/refining. The cement and oil sectors are among the biggest emitters and are under pressure to reduce CO₂ (for instance, Albania’s cement exports could face **CBAM** fees in the future).

The economy is making strides to broaden its renewable mix – it awarded major solar PV projects (Karavasta 140 MW and Spitalla 100 MW) and is launching its first wind auction for ~150 MW, aiming to ensure reliability beyond hydropower.

For green manufacturing, one area of focus is energy efficiency: a new law on energy efficiency mandates large industries to conduct energy audits and many businesses (cold storage, breweries, cement factories) have begun upgrading to efficient technologies often using EU IPA grants or EBRD loans. Another area is waste and recycling – Albania has had serious issues with waste (e.g. open dumpsites), but recent projects are establishing recycling centres and promoting sorting of industrial waste. Tirana now has companies recycling paper, plastic, and used tires into secondary materials, some with Italian partnership.

In circular economy terms, Albania has room to leverage its agricultural sector waste (e.g. olive pits, fruit waste) for bioenergy and materials – some small businesses already produce biomass briquettes from agri-waste.

The government, with UNDP, is piloting eco-industrial parks concept in one of its industrial zones, encouraging companies to share resources (like a common wastewater treatment plant and solar installation for park tenants). Additionally, Albania’s small appliance assembly and textile factories are being encouraged to adopt *Eco-Label* and other certifications to improve their EU market access by proving environmental compliance. Policy-wise, it updated its Law on Environmental Protection to integrate circular economy principles, and is developing its circular economy strategy. It is also part of the regional EU4Green initiatives, receiving support for reforestation, sustainable agriculture, and solar water pumping for farms, which indirectly benefits manufacturing by improving resource sustainability. With EU candidacy status, Albania is accelerating alignment with the EU environmental acquis – recently

Green-Tech Manufacturing

- Industrial base integrated into European automotive and electronics supply chains (wire harnesses, components, etc.), driving demand for greener processes.
- Green-manufacturing opportunities in renewable energy hardware, energy-efficient components, sustainable textiles and eco-materials.
- CBAM-covered exports for Montenegro, Bosnia and Herzegovina, North Macedonia, Serbia around 4-6% of GDP).

Supply Chain

European Automotive & Electronics

CBAM Exposure

~4-6% of GDP
carbon-intensive exports

Green-Tech Support & Funding

Support Organisations

4

Funding Projects (2025)

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it banned some single-use plastics and is designing a deposit-return system for bottles (which will spur recycling industry for plastics and glass).

In the coming years, green manufacturing growth may particularly centre on renewable energy technology (there is interest to assemble solar panels and floating PV equipment locally, given the big projects) and sustainable construction materials (leveraging its mining sector to produce greener cement alternatives and recycled aggregates). Its abundant renewable power and clear strategic commitment to the Green Agenda can make it a showcase for how a developing economy can decouple growth from emissions.

Bosnia and Herzegovina

Bosnia and Herzegovina’s industrial sector is significant (accounting for ~20% of GDP) and heavily oriented towards metal industries and energy, which presents both major challenges and opportunities in the green transition. The economy is endowed with abundant hydropower (about 40% of its electricity is hydro-generated) and also still operates several coal plants (Tuzla, Kakanj, Ugljevik) which are large polluters targeted for gradual phase-out. Its steel and aluminium producers (e.g. ArcelorMittal Zenica steelworks, Mostar’s aluminum plant) are among the biggest exporters and will need to cut emissions or face **CBAM** costs, as they send a bulk of their output to the EU. Recognising this, both entities have started drafting climate policies – Federation of Bosnia and Herzegovina approved a Climate Change Adaptation and Low-Emission Development Strategy, and Republika Srpska passed an updated Law on Renewable Energy. Still, Bosnia and Herzegovina has lagged on a unified climate law or carbon pricing at the economy level. Progress is largely driven by external support: the EU’s EU4Energy and EU4Green Deal programmes are investing in energy efficiency upgrades for SMEs, sustainable forestry, and waste management improvements. For instance, dozens of public buildings and some factories have been refitted with efficient heating under these programmes.

In manufacturing, circular practices are slowly emerging – there are companies now making insulation materials from recycled textiles, and a notable initiative is the Symbiosis project in Tuzla aiming to use industrial symbiosis to reuse waste heat and materials between factories. Hydropower and now wind are growth areas (Bosnia and Herzegovina opened its first wind farms recently, e.g. Podveležje 1 – 48 MW, with more under construction) which will supply greener electricity to industry. Additionally, wood/furniture sector, a major exporter, is adopting sustainable sourcing and certification (Forest Stewardship Council - FSC) to maintain EU market access.

Environmental governance remains a hurdle – entity fragmentation and limited enforcement mean issues like air pollution and waste are persistent. However, local green activism and EU integration pressure are prompting change.

Green-Tech Manufacturing

CBAM Pressure
4-6% of GDP
exports affected

- Podveležje 1 wind (48 MW)
- Recycled textile insulation
- Symbiosis Tuzla project
- FSC-certified wood exports
- CO2 cut 1/3 by 2030
- Coal phase-out needed

Green-Tech Support

Support Organisations
3

Funding Projects
11



By 2030, Bosnia and Herzegovina aims to cut CO₂ emissions by one-third; achieving this will depend on re-tiring coal plants on schedule, scaling up renewables, and attracting investment in cleaner technologies for its metal industry (e.g. electric arc furnaces for steel, which are less carbon-intensive).

Kosovo*

Kosovo*'s industrial base is relatively limited and dominated by mining (lignite, metals) and small-scale manufacturing (food processing, plastics, wood). The energy sector is the biggest green challenge – over 95% of electricity comes from two antiquated lignite coal plants (Kosovo* A and B) which are among Europe's highest-emitting power stations per capita. This cheap, domestically mined energy has historically powered industries (like the Ferronikeli nickel smelter and Trepča mining complex), but at huge environmental cost (severe air pollution and CO₂ emissions).

The priority for green transition is thus energy sector reform: with no domestic gas and limited hydro, the focus is on solar, wind, and potentially imported energy. International support is crucial here – the U.S. Millennium Challenge Corporation (MCC) has provided a \$202 million grant for an Energy Storage Project, which will deploy large-scale battery systems enabling Kosovo* to integrate more renewable power. Several solar farms (totaling ~20 MW so far) and the economy's first wind farms (e.g. Kitka wind park 32 MW) have been commissioned, with more in the pipeline through private investment.

For manufacturing, it is at an early stage of adopting green practices. There are donor-led projects for clean production in SMEs – e.g. the EBRD's SME credit lines have helped a few food processors and metal workshops invest in efficient machinery and insulation. Waste management and recycling are underdeveloped, but a notable new facility is the Integrated Waste Management Centre being built near Pristina to modernise waste processing (with some recycling capacity).

With regard to the circular economy, one bright spot is in the scrap metal recycling trade – Kosovo* collects and exports considerable scrap (a by-product of past industrial activity), and some domestic firms have started to re-melt scrap steel and aluminium for reuse, effectively building a recycling industry from the ground up.

The government is also using fiscal policies to encourage green investment: customs duties on renewable energy equipment have been removed, and a feed-in tariff (now auctions) spurred interest in small hydro and biogas (there are a couple of pilot biogas plants at farms). Environmental awareness is growing among the young population, putting pressure for change – witnessing the rise of solar panels on commercial buildings in Pristina and initiatives like tree-planting by businesses.

While It lacks a comprehensive climate law, it is developing a Climate Strategy with EU assistance. Being outside the UN system complicates accessing some climate funds, but Kosovo* aligns with many EU directives via the Energy Community.

Green-Tech Manufacturing

- Industrial base still limited and dominated by mining and small-scale manufacturing, but energy sector is critical.
- Over 95% of electricity still generated by two lignite power plants (Kosovo* A and B) - among Europe's highest per-capita emitters.
- Major support: MCC grant of \$202 million for an Energy Storage Project, enabling more renewables.
- Renewables to date: solar farms totalling approximately 20 MW and first wind farm Kitka (32 MW), with more planned.
- Emerging recycling & circularity: scrap-metal recycling trade, and Integrated Waste Management Centre near Pristina.

Green-Tech Support & Funding - Kosovo*

Support Organisations

6

Funding Projects (2025)

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The green transition will likely be driven bottom-up by necessity (e.g. addressing chronic air pollution) and by trying to seize opportunities like exporting services to regional neighbours (tech outsourcing could expand to energy management software, etc.). In sum, Kosovo’s path to green manufacturing is just beginning – heavy reliance on coal and imports makes it challenging, but also means even modest steps (like integrating batteries and renewables) can yield significant relative improvements.

Montenegro

Montenegro markets itself as an “eco-state” (a principle in its Constitution) and has made environmental sustainability a core element of its development strategy, especially as it advances in EU accession negotiations. Its manufacturing sector is relatively small but not insignificant – key industries include aluminium processing (the Kombinat Aluminijuma Podgorica, KAP, historically a big emitter), steel/ironworks, and a range of light manufacturing (food, beverages, plastics).

Montenegro has already seen a major shift in its emissions profile after the partial closure of KAP and upsizing of renewables in its energy mix. The economy’s electricity is now predominantly from renewables: large hydropower plants (Perućica and Piva) supply the majority, and a 72 MW wind farm (Krnovo) plus a 46 MW wind farm (Možura) are operational. Plans are underway for a huge solar project at Briska Gora (expected ~250 MW). With nearly 100% low-carbon electricity in sight, Montenegro’s manufacturers could gain a green edge – for instance, an Italian steel company has invested in Montenegro’s Nikšić steel mill with the idea to run it on green electricity and export green steel to the EU.

Montenegro has introduced climate legislation (an updated Law on Air Protection and Greenhouse Gases) and is considering an internal carbon pricing mechanism to prepare for the EU CBAM, particularly since it exports some electricity to the EU. Another notable initiative is in marine and sustainable tourism manufacturing: leveraging its coast, Montenegro is encouraging production of solar-powered boats and installation of domestic solar water heaters (often locally assembled). The government, supported by UNDP, also provides grants for small-scale circular economy projects – for example, in 2022 it funded pilot projects for recycling used cooking oil into bio-diesel and making building materials from recycled plastic.

The Innovation Fund has a Challenge Programme that recently awarded funding to several cleantech start-ups, including one developing smart EV charging stations and another making biodegradable food packaging.

Furthermore, it is unique in exploring regional green integration – it envisions itself as a hub connecting WB green power to the EU via undersea cable to Italy and offering regional services such as EU-standard testing labs for green products. By positioning the port in Bar and free zones for handling and certifying green goods, Montenegro seeks to integrate its small manufacturing sector into broader regional supply chains as a green logistics and finishing hub.

Green-Tech Manufacturing

- Energy mix already more renewable-heavy than some neighbours (notably hydropower), but still exposed to EU green transition and CBAM (CBAM-covered exports for Montenegro, Bosnia and Herzegovina, North Macedonia, Serbia around 4-6% of GDP).
- Opportunities in green energy tech, eco-tourism solutions, marine tech and sustainable construction materials.
- Green-manufacturing pilots can be hosted via NTP Montenegro and Tehnopolis (e.g. recycling, eco-packaging, energy-efficient devices).

Renewable Energy
Strong Hydropower Base

CBAM Exposure
4-6% of GDP

Green-Tech Support & Funding

Support Organisations

4

Funding Projects (2025)

9



As an upper-middle-income economy, financing is less accessible than for larger neighbours, but Montenegro is tapping into the WBIF and other EU instruments for its green agenda (including funding for sustainable transport and energy storage).

North Macedonia

North Macedonia has positioned itself as one of the more proactive WB6 on climate action. It was among the first in the region to commit to phasing out coal (planning to close its two remaining lignite power plants by 2027–2030) and to adopt an enhanced NDC targeting 51% emission reduction by 2030 (relative to baseline).

Its manufacturing base includes automotive components (wire harnesses, batteries), ferronickel production, textiles, and food processing. To green these, North Macedonia is implementing a mix of policy and projects. A comprehensive Law on Climate Action is in parliamentary procedure, expected to set a carbon price and integrate climate considerations across sectors.

On the ground, renewable energy is expanding rapidly – old coal mine sites like Oslomej are being transformed into large solar photovoltaic parks (the first 10 MW solar plant is already operating, with additional 20+ MW in progress), and the economy’s first wind farm (Bogdanci 36 MW) has been running since 2014 with expansion planned. These renewables will reduce reliance on coal and cut industrial power emissions.

It’s Free Economic Zones (TIDZ), which host many foreign manufacturing investors, are now promoting green standards: new investors are required or encouraged to use renewable power and implement waste management plans. Some factories in the zones are installing rooftop solar and switching to natural gas or electric processes. In terms of circular economy, Skopje has a notable initiative on solid waste management (with EU and EBRD support, a regional waste utility and recycling system is being set up). Additionally, the government launched a Green Industry Support mechanism via EBRD to provide soft loans for companies investing in cleaner production and pollution control equipment. An example success story is a dairy company which, with government support, invested in a biogas digester to turn farm waste into energy, reducing both emissions and costs.

North Macedonia is also one of the first WB6 to explore energy communities and small-scale renewable – allowing factories to install solar panels and even trade excess power. With these measures, the economy is steadily moving towards its goal of 50% renewable electricity by 2030.

Challenges remain in financing large upgrades (such as the transition of its heavy industry in metallurgy), but funds from the UN-backed Green Climate Fund and other donors are being sought. Overall, North Macedonia’s green manufacturing outlook is cautiously optimistic, backed by strong political will and strategic planning to align with the EU Green Deal.

Green-Tech Manufacturing

- Industrial base integrated into European automotive and electronics supply chains (wire harnesses, components, etc.), driving demand for greener processes.
- Green-manufacturing opportunities in renewable energy hardware, energy-efficient components, sustainable textiles and eco-materials.
- Exposure to EU CBAM due to exports of carbon-intensive goods (~4-6% of GDP for CBAM-covered sectors in North Macedonia, Serbia, Bosnia and Herzegovina, Montenegro).

Supply Chain
European Automotive & Electronics

CBAM Exposure
~4-6% of GDP
carbon-intensive exports

Green-Tech Support & Funding

Support Organisations

4

Funding Projects (2025)

14

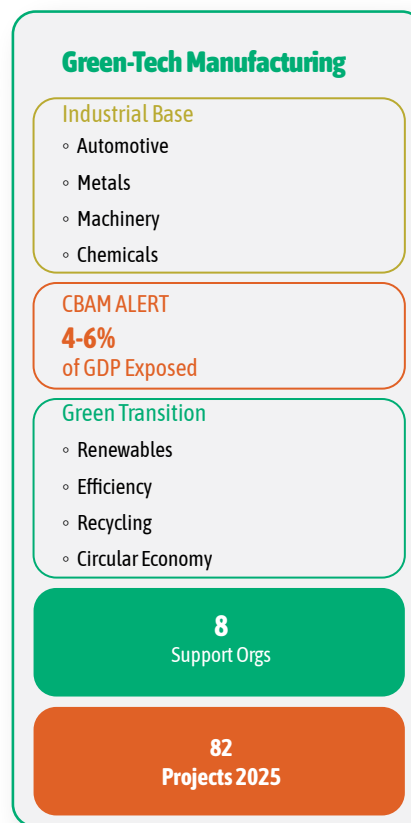
Serbia

As the largest WB6, Serbia faces a dual challenge in greening its substantial industrial and energy sectors. On one hand, Serbia relies on large coal power plants (over 65% of electricity comes from lignite) and hosts carbon-intensive industries like the Smederevo steel mill and Kostolac cement, all needing modernisation. On the other hand, it has significant renewable resources and a proactive stance towards green innovation. Serbia has the highest hydropower capacity in the region (e.g. Đerdap/Iron Gate on the Danube) and is now expanding into solar and wind (the economy has connected its first large wind farms of ~500 MW in recent years).

Under the Green Agenda, Serbia (with EU and bilateral donors) launched the EU for Green Agenda i project, a multi-million euro initiative to support policy alignment and co-finance innovative pilot projects for decarbonisation and circular economy. Dozens of pilots – from municipal composting systems to electric vehicle (EV) charging infrastructure – are being funded through challenge grants. The government adopted a Climate Law (2021) and is developing an Emissions Trading System, signalling commitment to reduce GHG emissions by 33% by 2030 (vs. 1990).

Green manufacturing activity is picking up: Serbia’s automotive sector is starting EV component production (e.g. a new e-mobility industrial park in Kragujevac), agribusiness firms are investing in biogas plants, and there is growing interest in recycling industries (such as a new recycling facility for electronic waste opened near Novi Sad).

The Innovation Fund and Science Fund have also earmarked grants for green technologies (renewable energy devices, waste-to-product innovations), harnessing Serbia’s strong engineering R&D base. Going forward, it’s integration into EU markets (and exposure to CBAM) makes greening not just environmentally essential but economically critical – a fact recognised in its latest industrial strategy which emphasizes energy efficiency and “clean production” as key to competitiveness.





3. Deep-Tech and Green-Tech Manufacturing – sector comparison

3.1 Regional Outlook and Integration Potential

The analysis above reveals cross-cutting trends that span both deep-tech and green manufacturing across the WB. Chief among these is the twin transition – digital and green – which is increasingly pursued in an interconnected manner. In practice, this means that **technology innovation (AI, IoT, digitalisation) is being marshalled to drive sustainability (energy efficiency, smart grids, cleaner production), creating synergies between deep-tech and green-tech domains**. For example, start-ups in the region are applying AI and sensor technology to optimise renewable energy and reduce industrial waste, while manufacturing firms are adopting Industry 4.0 automation to improve resource efficiency.

All WB6 are aligning with EU standards and initiatives, which provides a unifying direction: the 2024 WB Agenda for Innovation, Research, Education, Culture, Youth and Sport¹⁶ offers a comprehensive framework fostering scientific excellence and aiming to prevent brain drain, while recent initiatives such as the €6 billion WB Growth Plan (2023) promise significant funding for those who advance reforms. **Regionally, there is a strong recognition that collaboration is key to overcoming small size and fragmentation**. This is evident in the emergence of regional innovation networks (e.g. the Rectors' Forum of Southeast Europe and the WB 6 Chamber Investment Forum) and joint endeavours under the RCC's Common Regional Market framework – which envisage a seamless regional market for goods, services, capital, and labour, thereby benefiting innovative companies with scale and easier mobility of experts.

A positive integration dynamic is underway both within the region and with the EU. All WB6 are now associated to major EU programmes (Horizon Europe, Erasmus+, Digital Europe, etc.), allowing ideas and talent to flow more freely and embed the WB in Europe's innovation ecosystem. This is expected to gradually reduce the innovation gap with advanced EU member states, as local researchers gain experience and partnerships, and as start-ups get exposure to EU markets and investors. Regionally, initiatives like the WB Venture Capital Fund (planned under WB EDIF) and the pooling of research infrastructure (via the RCC's Open Research Area) aim to create a shared innovation space. **Cross-region projects – from joint smart specialisation strategies to regional green corridors – demonstrate that the WB6 can achieve more by leveraging complementary strengths** (for instance, one economy's robust IT sector can pair with a neighbour's manufacturing capacity to produce high-value green-tech products).

Crucially, the integration of the WB into European supply chains and value networks stands to deepen. Near-shoring trends are already bringing more manufacturing and R&D investment into the region, given its geographic proximity and cost advantages. If the WB6 can continue improving their innovation climate and meet green standards, they are well placed to attract EU companies seeking to diversify supply chains (especially in sectors like automotive electronics, battery assembly, agri-tech equipment, etc.). **Establishing robust venture capital markets and stronger science-business-government linkages will significantly boost the start-up ecosystem and help integrate the regional market globally**. There are promising signs: new venture funds are coming, governments are jointly committing to innovation agendas, and youth entrepreneurship is flourishing – all signalling that the WB is at a tipping point.

¹⁶ Available online at https://research-and-innovation.ec.europa.eu/system/files/2021-10/ec_rtd_western-balkans-agenda-overview.pdf

In the coming years, one can expect more cross-region clustering (e.g. a regional automotive cluster spanning Serbia-North Macedonia-Montenegro, or a green energy tech cluster linking Albania’s hydro know-how with Kosovo*’s young coders and Bosnia and Herzegovina’s metal fabricators). Such integration would create a virtuous cycle, increasing the region’s collective bargaining power and ability to participate in large EU projects (for instance, building parts of a supply chain for hydrogen technologies or electric vehicles in which different WB6 specialise in different components).

In conclusion, the **WB’s deep-tech and green manufacturing ecosystems**, while still developing, **exhibit a clear momentum supported by policy focus and international partnerships**. The region’s innovation trajectory is one of convergence with Europe: by embracing digital transformation and the green transition together, the WB6 can accelerate socio-economic growth and improve resilience. Cross-cutting trends – like start-ups addressing climate issues, industries adopting digital solutions, and governments creating enabling environments – are shared across the region, suggesting that cooperation will be a powerful driver of success. The potential for regional integration is enormous: a more integrated WB market (fuelled by the CRM initiative and eventual EU accession) could unleash economies of scale and attract larger investments than any single economy could alone. **Collectively, the WB6 can develop complementary niches** (one a software powerhouse, another a green energy hub, etc.) **and form a competitive bloc that slots into European and global value chains**. This vision is increasingly within reach as reforms begin to deliver results over the coming decade. With sustained commitment to innovation and sustainability, the WB region is set to move from the periphery to an integrated part of Europe’s innovation landscape, harnessing its untapped potential for the benefit of its economies and citizens.

Deep-Tech vs Green Manufacturing Ecosystems



3.2 Overlaps and synergies between Deep-Tech and Green Manufacturing Ecosystems – regional level

Multi-sector support from innovation hubs

One striking finding of this mapping is the significant overlap between deep-tech and green-tech ecosystem players in the WB. This is illustrated by the tables below, the first of which shows the distribution of visible deep-tech and green-tech manufacturing companies across the main innovation support hubs. The colour code of ■ Green = Green Manufacturing Hubs ■ Blue = Deep-Tech Hubs and ■ Yellow = Mixed / Cross-sector Innovation Hubs indicate that a significant number of the major hubs are hosting start-ups from both sectors.

Table 1: WB Innovation Ecosystem – Hubs Hosting Deep-Tech and Green-Tech & Start-Ups

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



The full mapping indicates that across 37 identified innovation support organisations, approximately 8 were hosting deep-tech companies, 9 were hosting green manufacturing companies, while 20 (over half) had start-ups from both domains under the roof with associate technologies. For example, the Ofici-

MAPPING DEEP-TECH AND GREEN-TECH MANUFACTURING POTENTIAL IN THE WESTERN BALKANS SIX



Deep-Tech vs Green Manufacturing Ecosystems

	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, Emission tracking
Robotics & Embedded Systems		Automated sorting Disassembly robots Material recovery	Modular construction Cobots	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

Matrix identifies technology convergence opportunities for sustainable industrial development in the WB6



na Accelerator in Tirana has supported AI/software start-ups and green ventures alike. In Bosnia and Herzegovina, INTERA Technology Park Mostar and ICBL Banja Luka host both IT/engineering projects and manufacturing process innovations. Kosovo* likewise has at least 3 of its 6 hubs supporting companies from both sectors. The Innovation Centre (ICK) is incubating digital start-ups (cybersecurity, AI) and clean-tech ideas (solar, recycling) under one roof, while university-based incubators like University for Business and Technology Tech Park and VentureUP foster student ventures in robotics, IoT and green innovation. Montenegro shows a similar pattern with 4 of out of 5 hubs hosting start-ups from both sectors while STP in Podgorica is hosting IoT/automation projects and green energy pilots in the same campus. In North Macedonia at least 2 of 6 government-backed hubs have both sectors under the roof. Finally, STP Belgrade and STP Novi Sad in Serbia host start-ups in AI/robotics as well as clean-tech and sustainable manufacturing.

This overlap matters because hubs that host both sectors naturally become focal points for cross-sector innovation programmes. When an incubator or tech park understands both advanced technology *and* sustainability needs, it can more easily catalyse interdisciplinary projects – for example, AI for energy efficiency, robotics for recycling, or bio-materials for eco-packaging.

The prevalence of hubs hosting both sectors in the WB6 means there is already a network of innovation actors capable of driving collaborative deep-green initiatives. Policymakers and donors can leverage these dual hubs as anchors for regional programmes (e.g. an AI-for-Green pilot network linking multiple economies). In short, the WB6 innovation ecosystem is not siloed – deep-tech and green-tech communities significantly intersect, providing a fertile ground for hybrid tech solutions to emerge.

Sector and sub-sector support specialisation

While this co-location of deep- and green-tech can simply indicate that hubs are sector agnostic and start-ups have located purely on the basis of geographical proximity to the technology source/ founders, there are also some signs that hubs and initiatives are starting to develop sector-specific support. For example, in **Albania**, the **EU4Innovation** project now offers sector specific support services for green-tech while **the TechSpace/ICT Slab makerspace** caters to all electronics prototyping. **INTERA Technology Park (Bosnia and Herzegovina)** has a robotics lab while **ICK (Kosovo*)** runs hackathons on both blockchain and renewable energy. In Montenegro, **Tehnopolis in Nikšić** offers a hardware prototyping lab that has been used for both industrial robotics and sustainable agriculture innovations while **FABLAB Skopje in North Macedonia** provides prototyping facilities for electronics as well as eco-oriented product design. In **Serbia**, **the BioSense Institute**, and **the Belgrade & Novi Sad science parks** each have support programmes ranging from agri-tech sensors to eco-innovations while STP Niš hosts electronics start-ups alongside a Climate-KIC supported climate entrepreneurship programme. In short, deep- and green-tech sector specific services are also becoming visible.

These individual and cross-sector (and sub-sector) strengths linked to particular hubs are visible in the Deep-Tech vs. Green Manufacturing ecosystems shown in Table 2 below while Table 3 shows how different hubs are now starting to support the sub-sectors.

Table 2: Side-by-Side Comparison: Deep-Tech vs. Green Manufacturing Ecosystems

Deep-Tech Ecosystem (AI, Robotics, Sensors, Advanced Computing)	Green Manufacturing Ecosystem (Circular Economy, Energy Efficiency, Materials, Industrial Optimisation)
Strongest WB6: Serbia, Kosovo*, North Macedonia	Strongest WB6: Bosnia and Herzegovina, Montenegro, Serbia
<p>Strengths:</p> <ul style="list-style-type: none"> ▶ AI & sensor research (BioSense, Belgrade STP) ▶ Robotics & embedded systems (Novi Sad, INTERA, Montenegro STPs) ▶ University R&D pipelines (UKIM, Pristina, Belgrade) ▶ EIT Deep-Tech Talent / ABCD network presence 	<p>Strengths:</p> <ul style="list-style-type: none"> ▶ Fabrication labs + CNC (INTERA, Tehnopolis, STP Niš) ▶ Circular economy programmes (YES, SPARK) ▶ Food, agri & materials labs (Tehnopolis, UBT) ▶ Strong donor programmes: SME Go Green, UNDP, GIZ
<p>Weaknesses:</p> <ul style="list-style-type: none"> ▶ Limited hardware mass-production infrastructure ▶ Funding gaps at early TRL (3–5) 	<p>Weaknesses:</p> <ul style="list-style-type: none"> ▶ Few specialised green manufacturing accelerators ▶ Weak cross-region industrial supply chains
<p style="text-align: center;">Overlap Zones (Deep + Green)</p> <p>STP Belgrade, STP Novi Sad, STP Montenegro, ICK, TechSpace Tirana</p> <p>Best suited for: industrial AI, sensor-driven optimisation, robotics for sustainability, durable materials testing</p>	



Table 3: Matrix of Strongest Organisations by WB6 + sub-sector

BB6	Organisation	Materials	Circular Economy	Renewables	Automation	Packaging
Albania	TechSpace Tirana	✓	✓	○	○	✓
	Oficina	-	✓	-	○	○
Bosnia and Herzegovina	INTERA	✓	✓	○	✓	✓
	SPARK	○	✓	○	○	○
	VERLAB	○	-	-	✓	-
Kosovo*	ICK	○	✓	○	○	○
	ITP Prizren	✓	✓	○	✓	○
	University for Business and Technology Tech Park	✓	○	✓	✓	-
Montenegro	STP Montenegro	✓	○	✓	✓	○
	Tehnopolis	✓	✓	○	✓	✓
North Macedonia	FITD	✓	✓	✓	✓	○
	YES Incubator	○	✓	○	○	✓
	FABLAB Skopje	✓	○	-	○	✓
Serbia	STP Belgrade	✓	○	✓	✓	○
	STP Niš	○	○	○	✓	○
	STP Novi Sad	○	○	○	✓	○
	BioSense	○	○	✓	✓	-

Legend: ✓ Strong capability | ○ Moderate capability

Strongest Research Organisations by WB6 + Sector

As shown in the Table below, universities and research institutes also have the potential to bridge the two main domains. Action is already visible: for example, the University of Novi Sad's institutes span microelectronics and bio-economy, and University for Business and Technology in Kosovo* has faculties in engineering and an Energy Efficiency Centre under one umbrella. This analysis is taken deeper, e.g. by sub-subsector in the section that follows.

Table 4: Strongest Research Organisations by WB6 + Sector
 Note: High (H), Medium (M), Low (L)

WB6	Research Organisation	Deep-Tech Potential (H-High, M-Medium, L-Low)	Green Manufacturing Potential (H-High, M-Medium, L-Low)	Notes (Why They Rank Strongly)
Serbia	University of Belgrade (Electrical & Mechanical Engineering)	H	H	Largest engineering research output in WB; strong AI/robotics, materials, energy-efficient systems.
Serbia	University of Novi Sad + BioSense Institute	H	H	Strong sensors/IoT publications; BioSense CoE relevance to sustainable/agri-bio manufacturing.
Bosnia and Herzegovina	University of Sarajevo (Eng. Faculties)	M	M	Stronger local research base; process engineering, automation, CE-related work.
Bosnia and Herzegovina	University of Banja Luka	M	L-M	Applied electronics, control, telecoms with manufacturing relevance.
Kosovo*	University of Pristina	M	L-M	Applied engineering & embedded systems; emerging green manufacturing research.
Kosovo*	University for Business & Technology	M	L-M	Applied AI, IoT, cybersecurity for industrial digitalisation.
North Macedonia	Ss. Cyril & Methodius University (UKIM) – FEEIT & Tech/ Metallurgy	M-H	M-H	Strong materials / manufacturing / automation research.
Montenegro	University of Montenegro	L-M	L-M	WB6 leader; strengths in energy systems, control, embedded systems.
Albania	Polytechnic University of Tirana (UPT)	M	M	Leading engineering faculty; automation, materials & manufacturing focus.
Albania	University of Tirana	L-M	L	Theoretical CS & mathematics; limited direct manufacturing research.



PRO strengths mapped by sub-sector

The Table below maps the research strengths of the main PROs in the region in eight deep-tech and six green manufacturing sub-sectors. The mapping is based on research capability and peer-review publication presence. The interpretation is **strict**, e.g. institutions have only been represented as strong in a sub-sector if they have **direct, explicit peer-review output or laboratory capacity** in that exact domain. This means that **most of the region scores Low/None** in quantum computing, semiconductors, next-gen robotics, and biotech. (An alternative less strict interpretation would broaden the identification to include areas *related* to these sub-sectors, e.g. Serbia has no quantum computing centres, but it has quantum physics groups which would qualify as low/medium presence.)

The Table shows that the strongest PROs in the region also have the potential to support multiple deep-tech and green manufacturing sub-sectors. This is a significant result. However, in order for this potential to be fully realised there needs to be a high level of fusion and exchange between the innovation support organisations, the start-ups and enterprises and the researcher providers. Initially, this may occur naturally, e.g. a spin-out from a research institute or faculty may take up space on a geographically adjacent STP or innovation hub and knowledge will flow between the three entities. However, to fully realise the potential it will be necessary for knowledge to be visible, accessible and to flow across the entire region. This implies the need for **strong sub-sector specific knowledge networks, tethered by open science providers and knowledgeable and proactive intermediates.**

Table 5: PRO strengths mapped by sub-sector

WB6	Organisation	DT 1. Advanced materials	DT 2. Advanced AV/ML platforms	DT 3. Quantum computing	DT 4. Next-gen robotics	DT 5. Blockchain	DT 6. Biotechnology	DT 7. IoT-enabled manufacturing	DT 8. Microelectronics & semiconductors	GM 1. Renewable energy generation & storage	GM 2. Sustainable transport tech	GM 3. Circular economy	GM 4. Sustainable / energy-efficient building materials	GM 5. Recycling solutions	GM 6. Eco-friendly packaging
Serbia	Univ. of Belgrade (ETF, Mech.)	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Serbia	Univ. of Novi Sad (+ BioSense)	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Bosnia and Herzegovina	Univ. of Sarajevo (Eng)	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Bosnia and 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 Pristina	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Kosovo*	University for Business & Technology	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Rows = leading research organisation by WB6 (selected strongest research anchor).

Legend (strict interpretation)

- = High (clear, repeated peer-review evidence + lab/capability in that exact sub-sector)
- = Medium (some peer-review outputs or small lab capability directly in that sub-sector)
- = Low (occasional/indirect peer-review links, capability is emerging or highly partial)
- = None (no clear peer-review evidence / no lab capacity found for that exact sub-sector)



3.3 Overlaps between Deep-Tech and Green Manufacturing Ecosystems – economy-level capabilities

The economy-level snapshots below indicate that overlaps and cross-sector potential exist between relevant ecosystems at economy-level. However, a tailored approach is needed to bolster deep-tech and green-tech capabilities in each WB6.

Albania *Emerging ecosystem*

Albania's deep-tech scene is in early stages but growing. Key **deep-tech hubs** include the **Oficina Accelerator** and **TechSpace Tirana (ICT Lab)**, which nurture ICT start-ups and have introduced maker-spaces for hardware prototyping. The **Polytechnic University of Tirana** (and its research centres) is a crucial PRO, producing engineering talent and conducting applied research (e.g. in materials and ICT).

On the **green manufacturing** side, its strengths lie in **renewable energy** (significant hydro and solar projects) and nascent circular economy initiatives. The government's commitment to solar is exemplified by the Karavasta solar park and investments in energy start-ups (like the AI-driven **Machine Thinking Lab** in energy analytics). Private sector green innovation is modest but growing – e.g. **Recycling Albania launched the economy's first Circular Economy Park** integrating recycling and education.

Cross-sector activity is starting to appear: multi-purpose initiatives such as **EU4Innovation** (an EU-funded project) support both digital and clean-tech entrepreneurship, and the **Metropolitan Incubator Tirana** works with university students on tech solutions including green applications.

Albania also has a few **champion firms** exploring sustainability (for instance, food processors adopting solar dryers, or textile companies investing in eco-certifications), often in partnership with donors. To strengthen capabilities, it could leverage its young talent pool and diaspora – focusing on basic tech infrastructure, green skills training, and linking its growing start-up community with traditional industries.

Bosnia and Herzegovina *Industrial base with nascent innovation*

Bosnia and Herzegovina has a strong legacy in **industrial manufacturing** (metalworking, wood, automotive components), which provides a base for green-tech adoption, although formal deep-tech start-up activity has been limited so far. Key **deep-tech hubs** include the **Innovation Centre Banja Luka (ICBL)** and **INTERA Technology Park Mostar**, which offer incubation and engineering labs. The **VERLAB Institute in Sarajevo** is a notable PRO specialising in metrology and med-tech, showing the economy's potential in advanced hardware/QA technologies. Major universities (e.g. **University of Sarajevo**, **University of Banja Luka**) have technical faculties and research groups, but stronger linkages to industry are needed. In **green manufacturing**, its strengths are tied to its natural resources – it has sizable **hydropower and is scaling up wind energy**, and industries like **wood furniture and agribusiness** are exploring cleaner production. A few start-ups and SMEs are active in **circular economy** (e.g. **Maguba/Magbago** converting textile waste, and small biogas projects). **Cross-sector hubs** like INTERA and ICBL are important as they run projects in both ICT and, for instance, energy efficiency in manufacturing. Notably, **INTERA Mostar's robotics and fabrication labs have been used to support local companies in prototyping efficient machines**, while also hosting climate innovation challenges. **Industry associations**, such as chambers of commerce and the Metalworkers Union, have begun partnering with innovation bodies (with RCC support) to introduce technology upgrades for greener production. Bosnia and Herzegovina's priorities to boost capabilities include **modernising R&D facilities**, improving access to funding (currently many start-ups rely on inter-

national donor grants), and fostering spin-offs from its industrial firms – which can become deep-tech or green-tech ventures with the right support.

Kosovo* – Dynamic start-up scene, expanding into green

Kosovo*'s innovation ecosystem is small but vibrant, especially in ICT. Its leading **deep-tech hubs** are the **ICK**, which has incubated start-ups in AI, fintech, and hardware, and **VentureUP**, the University of Pristina's incubator fostering student-led tech projects. Universities (University of Pristina, and private University for Business and Technology (UBT)) are key PROs producing IT engineers and increasingly engaging in applied research – e.g. University for Business and Technology launched a research centre for energy and sustainability.

Green manufacturing capabilities in Kosovo* are at an early stage: the renewable energy sector is just beginning (small solar and wind installations), and there is a growing interest in **waste management solutions** given its environmental challenges.

A positive sign is **cross-sector start-ups** like **HelioKos**, assembling solar components locally, and **CycleMine**, merging digital tech with recycling. These have been nurtured by the same innovation ecosystem that produces pure-software start-ups, indicating natural crossover. **Agnostic and sector-focus hubs** are present – **ICK runs programmes on clean energy entrepreneurship** while the government's Innovation and Training Park (ITP Prizren) hosts both IT companies and an agricultural innovation initiative.

The ecosystem benefits from strong **diaspora ties** (many founders with international experience) and significant donor support (e.g. GIZ, former USAID projects in digital and energy).

To strengthen its capabilities, ongoing efforts should focus on **improving research infrastructure** (labs for energy, materials testing), incentivising **public-private partnerships** (the new Science and Innovation Ministry can link tech universities with industry), and expanding successful models like ICK to support more green-tech manufacturing start-ups alongside digital ones.

Montenegro – Cross-sector leader on a small scale

Montenegro, though the smallest market, has made deliberate strides in both deep-tech and green-tech, often **combining them within the same institutions**. Key **deep-tech hubs** include **Science and Technology Park (STP Podgorica)** and **Innovation Center Tehnopolis (Nikšić)**, both of which focus on supporting start-ups in ICT, electronics, and robotics. Notably, **Tehnopolis has prototyping labs and bio-labs** that have been used for everything from drone development to agri-tech experiments. The **University of Montenegro** (particularly its faculties of Electrical Engineering and Mechanical Engineering) is the top PRO, contributing to research in energy, materials, and automation. Montenegro's **green manufacturing capabilities** are relatively advanced: the economy has a **strong renewable energy push**, aiming for solar and wind investments (e.g. Krnovo wind farm, Briska Gora solar in pipeline). It also has unique green niches – for instance, a **marine bioresource industry** and companies like **Hemosan**, a shipyard firm recognised for closed-loop industrial processes preventing pollution. **Dual/cross-sector hubs** and instruments are effectively the norm: **STP Podgorica, Tehnopolis, and the Innovation Fund** all simultaneously house or fund deep-tech (e.g. a robotics start-up) and green-tech projects (e.g. an agri-food innovation). For example, STP Podgorica might host a **3D printing start-up next to a solar energy start-up** in its premises. This integrated approach makes Montenegro a microcosm of the deep-green ecosystem.



To further strengthen capabilities, it is focusing on **EDIHs** for digital manufacturing, improving tech transfer from its main public university (recently opened University of Montenegro Innovation Hub), and continuing to leverage international programmes (it is an eager participant in EIT Climate and Digital initiatives). Ensuring its small pool of experts are networked regionally (so Montenegro's hubs can collaborate with institutes in Serbia or Croatia) will be key to overcoming scale limitations.

North Macedonia – Strong support mechanisms, now targeting green-tech

North Macedonia has developed a robust support framework for innovation. **INNOVA** (the successor to FITD) is a flagship agency that provides grants and incubation, heavily backing **ICT, agri-tech, and advanced manufacturing start-ups**.

Complementing this, **Seavus Accelerator in Skopje** and **YES Incubator** support entrepreneurship (Seavus focusing on software/deep-tech, YES on youth start-ups).

The economy's PRO backbone are the **Ss. Cyril and Methodius University – UKIM**, especially the **Faculty of Electrical Engineering & IT (FEEIT)**, and its **Academy of Sciences and Arts (MASA)**. Between them, these organisations conduct research from electronics to climate science. **Deep-tech capabilities** here centre on **software development, electronics, and lately AI** (North Macedonia has an emerging AI community and was early to adopt an umbrella AI Strategy). On the **green-tech manufacturing** side, the economy retains significant **automotive supply chain** activity (wire harnesses, components) that could pivot to e-mobility, and it has been growing its **renewables (solar)** capacity quickly.

Circular economy efforts are evident: Skopje has start-ups working on **plastic recycling, sustainable materials** (e.g. an **EcoMaterial Lab** on composites) and the government piloted a **Circular Economy Academy** for businesses.

Innovation hubs that support both sectors include the **FABLAB Skopje**, which serves hardware innovators and eco-designers alike, and the **TIDZ Technology Park** – an industrial zone management that is bringing in high-tech manufacturers (like electronic car parts companies) with green standards. To boost capabilities further, North Macedonia is investing in **EDIHs and EU programmes** to gain know-how (it joined the EU's Digital Europe Programme) and emphasizing **skills development** in advanced tech and green skills through its education system.

The economy's challenge is to translate its strong policy support into more home-grown tech products – something that cross-sector focus (like funding AI-for-energy projects) can help achieve.

Serbia – Regional heavyweight with diverse strengths

Serbia possesses the largest and most diversified innovation ecosystem in the WB6. It leads in **deep-tech hubs**, boasting multiple science parks (**STP Belgrade, Novi Sad, Niš**) and institutes (**BioSense, Vinča** in nuclear sciences, etc.) that drive R&D. **Top PROs** include the **University of Belgrade** (especially its School of Electrical Engineering and institutes such as the Mihajlo Pupin Institute) and the **University of Novi Sad** – collectively, R&D institutions produce a significant share of the region's scientific output and have pockets of world-class research (e.g. Novi Sad in agri-tech, Belgrade in AI and bioengineering). The **Innovation Fund** provides funding to both tech and green start-ups, showing a broad mandate. Its **green manufacturing capabilities** are rooted in its sizable industrial sector: it has automobile assembly (Stelantis in Kragujevac, now pivoting to EVs), machinery, chemicals, and agriculture/food processing – all areas where greener processes are being slowly introduced. There are standout examples of corporate

innovation: e.g. **NIS (Oil Industry)** investing in biofuel and hydrogen research, **Metalac** (home appliance manufacturer) adopting circular production practices, etc. Serbia also hosts numerous **clean-tech start-ups** (many highlighted in Annex 1), such as those in solar optimisation, smart grids, recycling tech, and sustainable materials. **Dual/cross-sector hubs** are abundant – **BioSense Institute** is inherently a deep-tech centre (ICT, sensors) serving a green mission (precision agriculture), and the major science parks house a mix of IT firms and green-tech pilots. For instance, **STP Belgrade has biotech labs and clean-tech start-ups alongside software companies**, and **STP Niš, though focused on electronics, collaborates with Climate-KIC on green innovation programmes**. It's strategy to strengthen capabilities includes heavy investment in the **science-tech park network (expanding facilities in secondary cities like Čačak)**, incentives to attract R&D investments (e.g. tax breaks for R&D centres of international firms), and active participation in EU research projects (Horizon Europe). A continued emphasis on linking its **strong IT sector with manufacturing** (through Industry 4.0 centres, digital innovation hubs) will further boost cross-sector innovation. Regionally, Serbia often acts as an **anchor** – its institutions (universities, institutes) frequently partner with neighbours, and its successful start-ups (like those acquired by global companies) showcase what is possible in the WB6.

3.4 Cross-Sectoral Opportunity Spaces in the WB6 Ecosystem

Building on the overlaps identified, several cross-sectoral value-chain opportunities stand out where deep-tech capabilities intersect with green manufacturing needs. These represent high-impact 'white spaces' for innovation across the WB6, potentially accelerating both tech competitiveness and sustainability. Key opportunity areas include:

→ AI & Data-Driven Optimisation × Industrial Energy Efficiency

There is considerable scope to apply artificial intelligence, machine learning and IoT solutions to traditional industries for energy savings and process optimisation. The region's AI/analytics talent (e.g. Serbia's strong AI research at institutes and start-ups, Bosnia and Herzegovina's AutoOpt and North Macedonia's OptiLine start-ups) can develop AI-driven tools for production-line efficiency, and could pilot solutions with local factories in metal processing or food production. Deep-tech hubs with IoT expertise (such as ICBL Banja Luka's Industry 4.0 lab in Bosnia and Herzegovina) together with green-oriented industrial parks can collaborate on cross-WB pilot lines for smart energy management – using sensors and real-time data to cut electricity and heat usage in plants. This not only reduces carbon footprint but also boosts competitiveness through cost savings.

→ Advanced Materials × Circular Economy & Eco-Packaging

Marrying advanced material science R&D with circular economy initiatives can create regionally competitive niches in sustainable materials and packaging. The WB hosts materials research groups (e.g. Serbia's BioReForm focusing on biodegradable materials R&D and EcoMaterial Lab in North Macedonia working on recycled composites) alongside a rising cohort of eco-packaging start-ups. For instance, Montenegro's Green Pack and Albania's BioPack Balkans are prototyping sustainable packaging solutions (bioplastic and plant-fibre packaging). By linking these efforts – advanced bio-based materials from labs feeding into circular packaging and recycling ventures – the region could develop new value chains in compostable packaging, bio-based building materials, or recycled textile fibres. A concrete opportunity is the production of eco-packaging for regional food and cosmetics industries, utilising local agri-waste or recycled inputs, which both reduces import dependence and addresses waste management goals.



→ Robotics & Automation × Waste Management and Recycling

The WB's growing know-how in robotics, automation and embedded systems can be applied to enhance waste collection, sorting and recycling processes – an area currently fraught with inefficiencies. Local deep-tech talent in robotics (for example, Serbia's Robotin start-up for manufacturing automation) and mechatronics programmes at science parks could collaborate with municipalities and recycling companies to develop smart waste-sorting robots, automated recycling lines, and other process efficiencies. Likewise, STP Montenegro's robotics and industrial automation programmes and INTERA Mostar's prototyping labs in Bosnia and Herzegovina can partner with circular economy innovators (e.g. Serbia's Replastify, which turns plastic waste into new materials) to scale up technology-driven recycling. This cross-sector convergence (automation + circular economy) would help address the region's waste challenges by reducing the cost of recycling operations, improving material recovery rates, and enabling profitable waste-to-product manufacturing. It taps into two strengths – engineering know-how and the urgent need for greener waste management – creating solutions like robotics-assisted e-waste recycling or AI-driven waste collection routing.

→ Sensors & Microelectronics × Renewable Energy Systems

Given the WBs' push into renewables (solar, wind, hydro) and its pockets of excellence in microelectronics, IoT and sensor technologies, there is an opportunity in smart renewable energy systems. The region could develop niche products and services such as IoT-enabled solar PV optimisers, smart inverters, grid monitoring sensors, and energy storage management systems. For example, BioSense Institute Serbia (a leader in sensors and electronics) and the electronics cluster in Niš can contribute design and prototyping expertise for energy IoT devices. These deep-tech capabilities can pair with local renewable initiatives – e.g. Kosovo*'s HelioKos assembling solar components and Bosnia and Herzegovina's GreenSpark working on wind turbine tech – to integrate advanced sensors for performance monitoring, predictive maintenance and grid integration. A concrete cross-region project could be developing affordable microgrid controllers or battery management units tailored for WB renewable farms and remote communities. With dozens of solar and wind projects slated in WB6 (over 20 GW of prospective projects region-wide), homegrown deep-tech in this area can add significant value (enabling more efficient, stable renewable energy systems) and spawn exportable green-tech products.

→ Digital Platforms × Circular Business Models

The rise of digital platforms and marketplaces in the WB6 can be harnessed to accelerate circular economy models – connecting suppliers of waste or by-products with users, facilitating product-life extension services, etc. Start-ups focusing on digital solutions for circularity, such as North Macedonia's Cirkula platform for trading secondary materials or Kosovo*'s CycleMine which combines an online marketplace with physical recycling innovation, are already emerging. Pairing these with more traditional manufacturers (in sectors like textiles, plastics and electronics assembly) creates opportunity for circular business model innovation. For example, a regional digital marketplace could allow a furniture factory in Serbia to source recycled plastic from Albania, or a product-as-a-service platform could enable tool-sharing across construction firms. By leveraging the WB growing ICT sector and start-up scene – which has produced successful platforms in fintech and mobility – similar digital tools can be built for circular economy needs (waste exchange portals, repair service networks, sharing platforms). The cross-sector benefit is two-fold: start-ups gain new markets in the green space, while traditional industries gain tech-enabled pathways to become more circular (reducing waste and costs). Development agencies (e.g. EIT Climate-KIC) are already supporting such cross-overs, seeing digital circular solutions as a way to leapfrog infrastructure gaps.

Each of these opportunity areas leverages complementary strengths across the WB6 – by connecting the dots between deep-tech hubs (AI, robotics, materials, ICT) and green economy actors (energy projects, recycling initiatives, manufacturers seeking sustainability). Realising these cross-sector value chains will require targeted support (policy incentives, pilot funding, regional matchmaking events), but the building blocks are in place. Tapping these synergies can position the WB as a testbed for innovative Deep-Green solutions (such as AI-optimised clean energy or high-tech recycling) that not only serve local development goals but could be scaled to broader markets as well.

3.5 Pipeline of Investable Cross-Sector Start-ups

The WB already boasts a pipeline of innovative start-ups that bridge deep-tech and green-tech, demonstrating the investable potential of this cross-sector nexus. These particular ventures below blend advanced technological capabilities with sustainable manufacturing or environmental outcomes:

→ SolarAI (Serbia)

An early-stage company that develops *AI-enhanced solar optimisation hardware*. This start-up leverages deep-tech (computer vision, satellite data and IoT sensors) to automatically assess rooftops and optimise solar panel installations in real-time. By combining AI and power electronics, SolarAI's solution boosts renewable energy yields – a clear case of deep-tech enabling green-tech outcomes (more efficient solar power generation). It exemplifies how Serbia's software and hardware talent can be applied to clean energy challenges.

→ EnerBrik (Montenegro)

An innovator producing *modular micro-renewable energy units*. Essentially energy bricks, these small-scale solar/wind hybrid units can be stacked to power homes or remote sensors. EnerBrik draws on Montenegro's engineering and electronics capabilities (deep-tech) to create a green product that addresses energy access and resilience. Its modular design and IoT connectivity reflect deep-tech engineering, while its impact is in sustainable energy provision – connecting advanced manufacturing to green transition needs.

→ Replastify (Serbia)

A start-up focused on *turning plastic waste into new materials/products*. Replastify uses advanced material science and chemical engineering (deep-tech) to recycle difficult plastic waste into durable eco-products (like planks, blocks for construction). In doing so, it tackles a green manufacturing challenge – waste valorisation and circular use of materials. The company's R&D-driven approach (testing novel additives, processes) illustrates deep-tech innovation in service of the circular economy. Investors see potential in such technology that can scale waste-to-product conversion, both regionally and globally.

→ CycleMine (Kosovo*)

An example of a *digital-meets-physical circular economy venture*. It operates an online platform (leveraging software and data analytics) to connect recyclable material sources with recyclers, and also develops in-house tech for material recovery. By fusing a tech start-up model (marketplace platform) with on-ground green-tech (recycling processes), CycleMine shows a novel cross-sector business model. It taps



into Kosovo*'s growing IT sector to solve an environmental problem, a formula that is attracting interest from ecosystem investors focused on impact tech.

These cases – along with others like **HelioKos (Kosovo*)** assembling solar components, **GreenLoop (Albania)** upcycling organic waste, or **Robotin (Serbia)** building factory automation for efficiency – form a growing pipeline of investable Deep-Green start-ups across the WB. What makes them particularly compelling is how they connect cutting-edge technologies with tangible sustainability outcomes. Each of these start-ups relies on a deep-tech component: *AI algorithms, robotics, new materials, IoT or automation*. And each targets a green manufacturing or cleantech outcome: *decarbonising energy, reducing waste, improving resource efficiency, or greening a supply chain*. This convergence increases their scalability and impact. For example, SolarAI's AI hardware could plug into thousands of solar installations, not just locally but in any emerging market aiming to boost solar uptake. Replastify's material innovation addresses a global plastics problem with potentially exportable products (e.g. recycled plastic lumber). Investors – including regional innovation funds and international VCs – are starting to take note of this class of start-ups. They represent the future success stories of the WB6 innovation ecosystem, proving that the region's talent can produce solutions that are both high-tech and green. **Supporting this pipeline (through accelerators, public grants, and cross-region pitching events) will be critical to drive the next generation of sustainable deep-tech champions in the WB.**

↖ ↗ MAPPING DEEP-TECH AND GREEN-TECH MANUFACTURING
↙ ↘ POTENTIAL IN THE WESTERN BALKANS SIX

Deep-Tech and Green Manufacturing Synergies

	Renewable Energy Hardware & Grids	Circular Economy & Waste Valorisation	Sustainable Construction	Energy-Efficient Automation	Eco-Product Design	Sustainable Transport
AI & Data	⚡ Smart forecasting Grid optimization Predictive maintenance	Waste analytics Optimization models		🎯 Process optimization Energy efficiency ML Predictive control		Route optimization Fleet management
IoT & Sensors	📡 Real-time monitoring Smart meters Grid sensors	Sorting sensors Quality control	Building sensors Climate monitoring	🔗 Real-time energy monitoring Industrial IoT		Vehicle sensors Emissions tracking
Robotics & Embedded Systems		🏗️ Automated sorting Disassembly robots Material recovery	Modular construction robots	💡 Industrial automation Collaborative robots 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 transparency	Building passports Material traceability		Product lifecycle tracking	Mobility platforms Carbon tracking

Complete Synergy Legend – Priority Areas for RCC and WB6 Policymakers

Color-Coded Synergy Strength:

- Yellow (AI/Automation) – High-priority tech convergence
- Blue (IoT/Digital) – Smart monitoring & platforms
- Orange (Robotics) – Automation & physical systems
- Brown (Materials) – Advanced materials & composites
- Green (Biotech) – Bio-based solutions & processes

General Synergy Levels:

- ⚡ Energy systems & smart grids
- 🎯 Automation & process control
- 📡 IoT sensors & monitoring
- 🏗️ Robotics & physical automation
- 🌱 Bio-based & organic solutions

General Synergy Levels:

- Medium Green – Emerging opportunities
- Light Green – Future potential areas

Priority Actions:

Colored cells = immediate policy focus
Icons mark highest impact interventions



4. Summary and conclusions

WB6 are gradually building a twin deep-tech and green-tech innovation ecosystem, leveraging their growing ICT sectors and engineering talent while striving to overcome persistent gaps in funding and R&D capacity. The region's deep-tech landscape, although nascent, is energised by a surge of science-driven start-ups and increased EU investment. Notable innovation hotspots – often linked to strong universities and an industrial legacy – are emerging as leaders in fields like advanced robotics, AI, and biotechnology. At the same time, a green manufacturing movement is taking root as governments align with the EU's climate objectives and the Green Agenda for the WB. Investment is flowing into renewable energy equipment production, waste-to-energy plants, sustainable agriculture tech and other clean industries. This synergy offers the WB a pathway to modernise manufacturing, attract investment, and bolster Europe's technological and environmental resilience. Overall, the mapping shows a **maturing innovation ecosystem** with *considerable potential* – but also **structural challenges** like *fragmented markets, talent outflow, and low R&D spending* that still need to be addressed.

Key intersections and synergies between deep-tech and green-tech have been identified across the region. In particular, *digital technologies are being applied to accelerate sustainable manufacturing solutions*. For example, AI-driven platforms like North Macedonia's EarthCare.ai are providing hyper-local climate intelligence to help optimise energy infrastructure and logistics under extreme weather conditions – marrying data science with renewable energy management. Likewise, advanced robotics in recycling is on the rise: Serbia's CircuBot project is developing an AI- and robotics-based modular system for automated waste detection and sorting, with cloud analytics to enable smarter recycling and circular economy practices. Such cases illustrate how **deep-tech innovation** (e.g. artificial intelligence, computer vision and IoT sensors) **can directly enhance green outcomes** in **energy efficiency, waste management, and resource reuse**. Additionally, digital platforms in the circular economy are emerging, from online marketplaces for recycled materials to blockchain-based traceability for sustainable supply chains. These overlaps not only multiply the impact of innovation (by solving environmental challenges with high-tech tools) but also foster new business models in the region (for instance, cleantech start-ups that are by nature both digital and green). *The WB's small markets make a compelling case for cross-sector and cross-region collaboration* – as innovators realise that combining expertise can open access to regional value chains and EU markets.

Collaborative ecosystems and emerging partnerships are reinforcing these synergies. Across WB6, a **network of incubators, accelerators, science parks and digital innovation hubs is expanding to support start-ups in both domains**. Some of these institutions are deliberately adopting a dual focus: for example, new EU-supported Digital Innovation Hubs (EDIHs) in each economy will serve as one-stop-shops assisting companies with both digital transformation and green transition needs. Likewise, innovation funds and research centres are increasingly running programmes that encourage teams to tackle climate and industrial problems with advanced tech solutions (e.g. hackathons, challenge funds). Regional cooperation platforms are also taking shape. The RCC's Green and Circular Economy Stakeholders Platform is one recent initiative to spur regional knowledge exchange and align funding for green innovation. Cross-region pilot opportunities are also gaining traction: for instance, three region's cities – Elbasan (Albania), Podgorica (Montenegro), and Sarajevo (Bosnia and Herzegovina) – have committed to become climate-neutral and smart cities by 2030, effectively acting as regional test-beds for clean-tech and smart infrastructure that other cities can emulate. Such initiatives indicate a growing recognition that pooling resources and expertise across regions can accelerate the development of deep-tech and

green-tech solutions at scale. Early signs of joint ventures are visible, such as partnerships where an AI start-up in one WB6 collaborates with a renewable energy company in another to develop smart grid technology.

These collaborative efforts are knitting together a more cohesive regional innovation ecosystem. However, other **critical nodes in the WB innovation ecosystem, e.g. STPs, technology parks and innovation centres, are still at the level of being more sector agnostic than truly deep-tech/ green-tech focused.** With a few exceptions, e.g. where specialised equipment is co-located, their hosting of start-ups from the two sectors seems to be more due to proximity than the result of a systematic recruitment approach combined with provision of sector specific support packages. **The clear trend for green-tech manufacturing to incorporate deep-tech solutions offers opportunities for nodes to build sector specific and cross-sector support programmes and to work with the strongest R&D teams, both the seed and spinoffs and support emerging start-ups.**

Looking ahead, the WB's innovation ecosystem is set for further consolidation and growth. If current momentum is sustained – and critical gaps are proactively closed – the WB6 can position itself as an emerging powerhouse of deep-tech-driven sustainable green manufacturing. The findings suggest that the region's abundant renewable resources, untapped tech talent, and increasing integration with EU programmes form a strong foundation for growth. The next few years will be crucial: by doubling down on reforms and investments, the WB could dramatically increase its pipeline of high-tech, eco-innovative start-ups and meet the CRM 2025–2028 target of a five-fold increase in ready deep-tech start-ups and embed itself into European value chains.

In summary, deep-tech and green manufacturing in the WB6 are no longer separate silos but converging into a vibrant, synergistic landscape. The region has already demonstrated creative ways to bridge its traditional industries with frontier technologies and sustainability goals. With enhanced support, coordination and vision, the WB is in a position to transform these early successes into an engine of innovation-driven growth and sustainable industrial transformation for the decade ahead.



5. Strategic recommendations

To capitalise on these findings, a coordinated strategy is needed. Below are actionable recommendations for the RCC aimed at strengthening deep-tech and green manufacturing innovation over the coming years.

Policy oriented recommendations

1. Promote enabling Policy Frameworks

Promote the adoption of supportive regulations and policies that foster innovation and sustainable industry, and drive regional transformation. This includes securing the CRM Action Plan targets – for and in particular the quintupling of the number of deep-tech start-ups ready for EU-wide acceleration and enabling one-stop-shop innovation services through local Digital Innovation Hubs.

The region's governments should be urged to further streamline business regulations for start-ups (easy company registration, sandbox regimes for new tech), strengthen intellectual property rights, and introduce green standards that reward eco-innovation. Notably, addressing regulatory gaps in the circular economy is critical: over a quarter of WB businesses cite the lack of clear frameworks and incentives as a barrier to adopting circular practices. By updating public procurement rules (to favour green-tech adoption) and aligning environmental regulations with EU norms, policymakers can create a stable demand and support environment for both deep-tech and green solutions.

2. Encourage Funding and Finance Mechanisms

The region's governments and main regional institutions have a clear role in helping to increase access to capital for innovation through a mix of public and private funding instruments by encouraging the main stakeholders to seek synergies and leverage initiatives and encourage and coordinate crowding in and co-investment.

The existing innovation funds in the WB6 and WBIF initiatives should be scaled up and better coordinated regionally. For example, the new EIB Innovation and Green Transformation Facility (€187 million) combining loans and EU grants for WB businesses is a positive step to bridge the financing gap. WB6 governments should complement this with local co-financing programmes (e.g. matching grants, seed funds) and by crowding in private investors.

The RCC can play a role in encouraging policymakers to incentivise banks and venture funds to support deep-tech and green-tech start-ups via credit guarantees or tax breaks (building on models like the WB EDIF). Additionally, establishing a regional venture fund or a WB6 innovation guarantee under RCC/WBIF could help pool resources to back high-potential projects across the region. Every stage of the innovation pipeline requires attention: from R&D grants for prototyping to scale-up capital for growth-stage companies. Given that affordable financing is a major hurdle for firms seeking to upgrade technology or improve environmental performance, these measures will ensure that promising start-ups and manufacturing SMEs can obtain the funding needed to commercialise and expand their innovations.

Action oriented recommendations

Five recommendations for practical actions are outlined below. They are followed by a design for a Pilot Twin Transition hub cluster and KT network approach that combines the main aspects of the practical recommendations.

The 15 suggested organisations are illustrative examples derived from this report's analysis. They are included only to show feasibility and should not be interpreted as endorsements or final selections.

1. Support Deep-Tech and Green Manufacturing focused Innovation Hubs and Networks

There is a clear need for innovation hubs that can offer knowledge intensive services for one or both of the deep-tech and green-tech manufacturing sectors, serve as convergence points for stakeholders, and ensure these hubs are connected to the regionally knowledge base.

Each WB6 is on track to host a European Digital Innovation Hub by 2025, focusing on digital and green transitions; governments should fully empower these hubs (via funding, policy support, and talent placement) to act as local innovation engines.

Beyond the EDIHs, the creation of ***innovation clusters and associated knowledge networks*** is recommended – for example, a CleanTech Cluster in one WB6 could specialise in renewable energy and cleantech start-ups, while a Deep-Tech Manufacturing Hub in another focuses on advanced robotics and AI for industry, and they collaborate through a regional network involving leading PROs, hubs able to offer specific KIS and living labs for piloting and testing. The aim is to avoid siloed efforts: ***multi-disciplinary centres (incubators, accelerators, fab labs) where software engineers, hardware developers, and green technologists can co-create solutions should be championed.***

Policymakers could facilitate this by providing grants for collaborative hub activities and by improving infrastructure (such as shared prototyping facilities, testing labs, or co-working spaces across the region). Cross-region pilot projects deserve special support as well. ***Regional bodies like RCC and the WB6 Chamber Investment Forum could initiate joint pilot programmes*** – for instance, a cross-region smart grid demonstrator linking renewable energy sites in several WB6, or a circular economy pilot where one economy's waste materials become another's industrial input.

These pilots would pool expertise and showcase the viability of new technologies, making a strong case to larger investors. Notably, EU instruments (Horizon Europe, Interreg, IPA funding) and the WB Investment Framework should be tapped into to co-finance such regional pilots and new joint innovation centres. By nurturing interconnected dual hubs and living labs across the WB, the region can achieve critical mass in innovation and present itself to the world as a unified, dynamic tech ecosystem rather than six separate markets.

2. Target High-Potential Sub-sectors for Innovation

There is a need to further identify and prioritise specific sub-sectors where deep-tech and green-tech intersect and the WB has competitive potential. ***A focused approach will concentrate resources on areas with the highest payoff.*** For example, advanced sensor systems for renewables (to improve solar panel efficiency, wind farm maintenance, smart grids, etc.) could leverage the region's engineering talent while addressing energy sustainability goals. Similarly, developing eco-friendly materials (such as bio-based composites or recycled construction materials) and cleaner production processes can strengthen



local manufacturing with a green twist – building on existing projects in polymer recycling and green construction observed in the region. Another promising area is AI and automation for manufacturing, where machine learning optimises production lines for energy and material efficiency (aligning with both Industry 4.0 and climate targets).

Governments should be encouraged to craft targeted R&D programmes, innovation challenges, or tax incentives around these niches, in line with each economy's Smart Specialisation Strategy priorities. By doing so, the WB6 can create flagship projects in each priority sub-sector – for instance, a flagship in AI-assisted clean energy management, another in sustainable agri-tech, another in advanced recycling technology – that become reference points of excellence. These would not only address local needs (e.g. reducing pollution or improving energy security) but also serve as exportable innovations, integrating the WB into global supply chains. Importantly, focusing on a few high-impact domains fosters clusters of expertise; as success stories emerge, they will attract further investment and talent in a virtuous cycle.

In summary, **a strategic concentration on key deep-green tech niches – sensors for renewables, circular materials, AI for smart factories, and more – can accelerate the WB's progress from an aspiring innovator to a competitive player in sustainable high-tech industries.**

3. Build capacity or skills and support talent retention

There is a need to prioritise human capital development to sustain the emerging Deep-Tech and Green Manufacturing innovation ecosystems. It is clear that **governments must modernise education curricula** (from secondary schools to universities) to emphasize STEM, software and data science, clean energy engineering, advanced materials science, and other relevant fields. New or expanded Master's and vocational programmes in areas like AI, robotics, renewable energy, and industrial automation, **linked to S3 priority areas**, will help to build the skilled workforce that deep-tech and green industries require. Furthermore, all WB6 should implement lifelong learning and re-skilling programmes, ensuring the existing workforce can adapt to Industry 4.0 and green transition jobs. By addressing the digital skills gap – 80% of WB6 citizens already recognise digital upskilling as essential – and improving research training (currently hampered by very low R&D investment), the region can build a strong talent pipeline that underpins its innovation ambitions.

However, equally important is **fostering entrepreneurial and interdisciplinary skills** – for instance, developing coaching and mentoring programmes that pair engineers with business mentors to turn research into start-ups. Regional cooperation on talent is vital: joint initiatives (scholarships, research exchange programmes, brain circulation schemes) can help retain and attract talent within the WB6.

In addition, with roughly 20% of the region's population living abroad and businesses struggling with skill gaps, **policy actions should include incentives for diaspora professionals to return or collaborate** (such as innovation grants for diaspora-led projects, or simplified recognition of foreign qualifications).

4. Strengthen Technology and Knowledge Transfer and Academia–Industry Linkages

Bridging the gap between research institutions and industry will accelerate commercialisation of deep-tech and green-tech innovations. WB6 governments and universities should collaborate on **creating or bolstering technology/knowledge transfer offices (T/KTOs), patent support programmes, and incentives for researchers to found spin-off companies.** Universities and public research institutes could establish joint R&D centres with industry in strategic fields (for example, a centre for advanced solar materials or a robotics lab for smart agriculture) to work on applied projects. Supporting measures might include

grant programmes that require university-industry partnership, innovation vouchers for SMEs to acquire research expertise, and simplified regulations for researchers to become entrepreneurs (so academic staff can take leave to start a company or share in equity from intellectual property).

Encouragingly, WB6 governments have already begun allocating more resources to science parks, labs, and cooperation initiatives that facilitate tech transfer. This momentum should be maintained and expanded. For instance, each WB6 could designate innovation zones around major universities where start-ups receive benefits and mentorship from faculty. Additionally, participation in EU programmes like Horizon Europe and EUREKA should be leveraged to connect WB researchers and firms with European consortia, thus injecting know-how and opening access to new markets. By forging tighter academia–industry linkages, the region will not only drive faster innovation diffusion into the manufacturing sector but also enhance the relevance of research to real-world economic needs.

The figure below summarises how the proposed strategic actions link to the regional opportunity spaces. It also introduces the possible pilot action which is outlined in more detail in the section below.

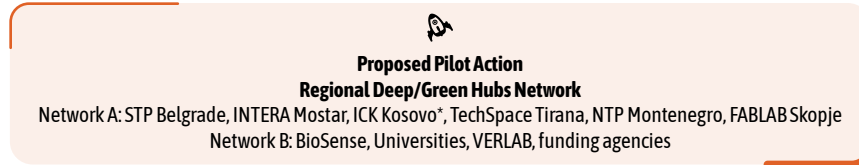
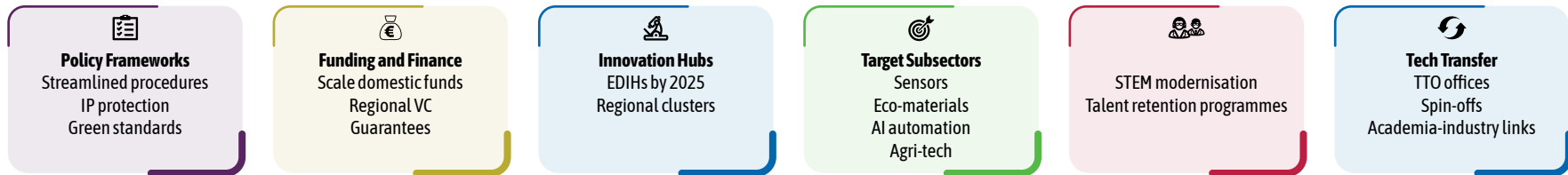
By pursuing these recommendations with urgency and sustained commitment, WB6 leaders and stakeholders can significantly strengthen the regional innovation ecosystem. The result would be a WB that not only keeps pace with European innovation trends but also contributes unique value: a region where cutting-edge deep technologies drive green growth and industrial renewal, creating jobs and prosperity on the path to EU integration. The convergence of deep-tech and green manufacturing in the WB is a timely opportunity; with the right strategic actions, this synergy can be fully harnessed to secure a dynamic, sustainable future for the region.

Regional Opportunity Spaces and Strategic Actions

Five High-Potential Cross-Sector Domains



Strategic Recommendations



Pilot Network Structure

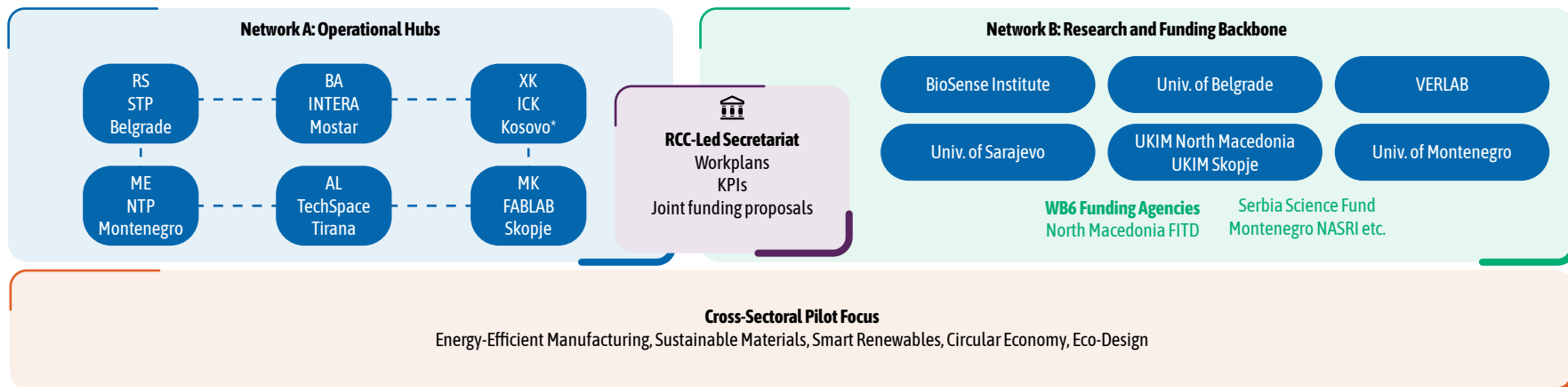


Figure 3 Regional Opportunity Spaces and Strategic Actions

Possible pilot action: Twin Transition Deep-Tech /Green Manufacturing Hubs + KT networks + Funding backbone

The suggested pilot action below was constructed based on the results of the mapping report. The design of the pilot was based on the premise that it would be feasible to identify 3 networks of 12 -15 organisations which together met the follow criteria:

- support start-ups from both deep-tech & green manufacturing-tech sectors
- include the strongest support organisations
- leverage economy strengths
- maximise STP/innovation centre & PRO coverage
- align with funding actions
- offer geographical coverage of the region
- realise the identified Cross-Sectoral Opportunity Spaces

All selections and capabilities below are drawn from the report. (Citations to the report's relevant tables/ sections are shown for each section.)

- **Network A — Twin Transition Support Hubs (operational cluster):** science & technology parks, innovation centres and prototyping hubs that will host pilots, incubation, manufacturing prototyping and SME support.
- **Network B — Research and Knowledge providers (knowledge network):** leading PROs (universities / research institutes) that provide R&D, tech transfer and standards.
- **Funding backbone — Innovation Funds:** Funding agencies that provide funding/scale support.

Network A — Twin Transition Support Hubs (operational cluster)

These hubs already host **both** deep-tech and green-tech start-ups and have prototyping / Industry-4.0 facilities (see Table 1 & Table 3: hub mappings).

1. **STP Belgrade (Serbia) — Science & Technology Park / hub**
 - Rational for inclusion: Tier-1 cross-sector park; strong in AI, biotech, cleantech and prototyping. Excellent industry links and capacity to host pilots and SME scaling across sub-sectors. (Table 1 / Table 3).
 - Roles in cluster A: regional anchor, pilot factory, industry partnerships.
2. **INTERA Technology Park (Mostar, Bosnia and Herzegovina) — Advanced manufacturing / prototyping hub**
 - Rational for inclusion: Ranked Tier-1 for green manufacturing support (CNC, Industry 4.0, robotics); hosts both deep-tech and manufacturing teams (Table 1, Table 3).
 - Roles: prototyping, circular-economy pilots, industrial automation testbeds.
3. **ICK (Kosovo*) — Incubator / innovation centre**
 - Rational for inclusion: Identified as a mixed/cross-sector hub supporting AI/cybersecurity and clean-tech pilots; strong start-up pipeline (Table 1).
 - Roles: entrepreneurship & scale-up pipeline, distributed pilot sites for renewable & di-gi-fabrication projects.
4. **STP Montenegro (Podgorica) — Economy-level tech park / prototyping & robotics hub**
 - Rational for inclusion: Ranked among regional leaders for robotics, engineering & manufacturing optimisation (Table 1 / Table 3). Montenegro's green energy context also enables local pilots.
 - Roles: robotics for recycling/automation pilots, small-scale manufacturing testing.



5. **TechSpace Tirana (Albania)** — *Makerspace / innovation hub*
 - Rational for inclusion: Visible in the report as Albania’s key cross-sector hub (hosting green product fabrication and electronics prototyping). Useful low-cost testbeds for sustainable product design and packaging (Table 1 / Table 3).
 - Roles: product prototyping, eco-packaging pilots, capacity building.
6. **FABLAB Skopje (North Macedonia)** — *Makerspace / innovation hub*
 - Rational for inclusion: Visible in the report as a mixed/cross-sector that supports hub hardware innovators and eco-designers (Table 1).
 - Roles: product prototyping/small-scale manufacturing testing.

Network B — Research, Knowledge & Funding Backbone

This set brings the PRO strengths, lab infrastructure and policy/funding levers needed to scale pilots to industrial R&D (Table 4 & Table 5).

7. **BioSense Institute / University of Novi Sad (Serbia)** — *Research centre / PRO*
 - Rational for inclusion: Top PRO in sensors, IoT, agri-bio, and cross-sector research (Table 4). Strong capacity to deliver sensor / materials / AI research relevant to green manufacturing and deep-tech.
 - Roles: R&D partner for sensor, advanced materials and bio-based product pilots; co-supervise PhD / skilled talent pipelines.
8. **University of Belgrade — Engineering faculties (Serbia)** — *PRO / technical anchor*
 - Rational for inclusion: Identified as the largest engineering research output (AI, robotics, materials, energy efficient systems) — vital for industrial decarbonisation & deep-tech (Table 4).
 - Roles: high-TRL R&D, standards/validation labs, tech transfer.
9. **VERLAB Research Institute (Bosnia and Herzegovina)** — *Applied R&D / PRO*
 - Rational for inclusion: Noted Tier-1 for med-tech, AI and hardware validation; strong applied R&D which maps into industrial automation and low-carbon process solutions (Table 9/11).
 - Roles: applied testing, certification, med-device / automation collaboration with INTERA and industry.
10. **University of Sarajevo / Faculty of Engineering (Bosnia and Herzegovina)** — *PRO*
 - Rational for inclusion: Listed among key PROs with process engineering and circular-economy research supporting green manufacturing (Table 4).
 - Roles: process optimisation, circular economy pilots, student/researcher mobilisation.
11. **Ss. Cyril & Methodius University (UKIM) — FEEIT & Faculty of Technology & Metallurgy (North Macedonia)** — *PRO*
 - Rational for inclusion: Mapped as high relevance for materials, manufacturing and automation research (Table 4 & Table 5). Hosts the INNOFEIT Innovation Centre.
 - Roles: advanced materials testing, joint research projects for sustainable materials and packaging pilots.
12. **University of Montenegro or Tehnopolis link (Montenegro)** — *PRO / applied hub*
 - Rational for inclusion: University of Montenegro is the umbrella PRO in Montenegro with strengths in energy systems and control (Table 4). Tehnopolis is close by as an operational partner in Nikšić (but listed STP above). Including University of Montenegro links the research into Montenegro’s hub network.
 - Roles: energy systems R&D, battery/renewables integration trials, workforce training.

Funding backbone

This set of actors supply the funding needed to support prototyping and scale-up actions for the opportunity spaces.

13. **Innovation Fund (Serbia)**
 - Rational for inclusion: Currently delivering targeted support to start-ups and enterprises in both Green- and Deep-tech sectors. Has accrued significant good practice and experience in successfully delivering such schemes.
 - Roles: design and delivery of targeted funding support. Sharing of good practice.
14. **Innovation Fund (Montenegro)**
 - Rational for inclusion: Currently delivering financial support to start-ups and enterprises in both Green- and Deep-tech sectors.
 - Roles: delivery of targeted funding support. Recipient and amplifier of good practice.
15. **INNOVA (North Macedonia)**
 - Rational for inclusion: Building on experience gained from the FITD in supporting start-ups and enterprises from both sectors.
 - Roles: delivery of targeted funding support. Contributor and amplifier of good practice

Cross-Sectoral Opportunity Spaces the clusters should address

Based on section 1.5.4 of the report, the combined networks are well suited to deliver pilots and scale-ups in the following **priority Cross-Sectoral Opportunity Spaces** (each linked to the hubs / PROs above):

1. **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).
2. **Advanced & sustainable materials** — R&D + prototyping for biopolymers, recycled composites and eco-packaging (UKIM, BioSense, INNOVA, TechSpace, Tehnopolis).
3. **Renewables hardware & systems + smart grids** — modular solar/wind + storage assembly and AI-enabled optimisation (ICK/UBT, STP Montenegro, STP Belgrade, University of Montenegro).
4. **Circular economy & waste-to-product technologies** — robotics for sorting, waste valorisation pilots and market platforms (INTERA, VERLAB, TechSpace, INNOVA).
5. **Sustainable product / packaging design & local assembly** — prototyping and small-scale manufacturing of compostable packaging and eco-products (TechSpace, Tehnopolis, FABLAB/INNOVA partners).

Each opportunity maps directly to hubs and PRO strengths shown in Tables 3–5 and in section 1.5 (sector comparison), so the clusters can run targeted, measurable pilot portfolios.

Recommended roles & brief operating model

- ➔ **Network A (Hubs)** runs an operational rotating **pilot pipeline**: incubator-level pilots (TRL 4–6) for technology combinations (e.g. AI + solar storage, robotics + recycling) hosted across 6 hub nodes. (Drawn from the hubs' prototyping capability mapping.)
- ➔ **Network B (PROs)** provides R&D, validation labs, curriculum & talent pipelines. Use the PROs to certify results and produce IP/licensing pathways (Table 4 & Table 5).
- ➔ **Funding backbone** coordinates joint funding calls (e.g. INNOVA/ IF Serbia/ IF Montenegro + university consortia).



- A **small secretariat** (RCC or shared, e.g. from IF Serbia/ IF Montenegro/ INNOVA) coordinates annual work plans, shared KPIs (pilots completed, start-ups scaled, CO₂ reductions demonstrated), and regional funding proposals (WBIF / EDIF / Horizon consortia).

It is important to stress again that the proposed network simply illustrates the feasibility of such an action based purely on the results of the mapping and in particular identified organisational strengths and regional opportunities. It is not intended to be an endorsement of any particular organisation. Any such realised action should be based on the results of normal competitive practice in selecting consortia for funding.

Annex 1: Short list of Investable / High Potential Start-ups by Sub-Sector

This list is indicative; based on *visibility, acceleration history, awards, and ecosystem recognition*. It was compiled in November 2025.

A. Sustainable / Advanced Materials

- **BioReForm (Serbia)** – Biodegradable materials R&D
- **Green Pack (Montenegro)** – Sustainable packaging prototypes
- **AgriPlast (Bosnia and Herzegovina)** – Agricultural bio-materials
- **EcoMaterial Lab (North Macedonia)** – Recycled composites

B. Circular Economy & Waste Valorisation

- **Cirkula (North Macedonia)** – CE marketplace + physical products
- **Replastify (Serbia)** – Waste-to-product materials
- **CycleMine (Kosovo*)** – Digital CE + physical recycling innovations
- **Green Loop (Albania)** – Food & organic waste valorisation

C. Renewable-Energy Hardware & Systems

- **SolarAI (Serbia)** – AI-enhanced solar optimisation hardware
- **EnerBrik (Montenegro)** – Modular micro-renewable units
- **HelioKos (Kosovo*)** – Solar components assembly
- **GreenSpark (Bosnia and Herzegovina)** – Small-scale wind tech

D. Industrial Automation & Resource Efficiency

- **AutoOpt (Bosnia and Herzegovina)** – Industry 4.0 optimisation tools
- **Robotin (Serbia)** – Robotics for manufacturing
- **SmartFab (Montenegro)** – Factory energy-efficiency automation
- **OptiLine (North Macedonia)** – Production-line optimisation

E. Sustainable Packaging & Eco-Product Design

- **PakGreener (North Macedonia)** – Compostable packaging
- **BioPack Balkans (Albania)** – Plant-fibre-based packaging
- **ReBox (Kosovo*)** – Circular logistics packaging
- **EcoBox Mostar (Bosnia and Herzegovina)** – Packaging from recycled materials

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