



MONTENEGRO
MINISTRY OF SCIENCE

NEW MATERIALS AND SUSTAINABLE TECHNOLOGIES

Results of Entrepreneurial Discovery Process

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NEW MATERIALS AND SUSTAINABLE TECHNOLOGIES



VISION

Montenegro with a modernized and sustainable industry that enables greater competitiveness in the international market by stimulating the use of modern materials and technologies based on domestic knowledge, innovations, raw materials and circular economy principles.

SECTORAL GOALS

- Increasing the competitiveness of the sector by introducing sustainable and new technologies and products based on innovations and principles of the circular economy with the efficient use of natural resources, waste and secondary raw materials.
- Increasing recycling and utilization of industrial waste.
- Increasing the production and use of eco construction materials.
- Continuous improvement of the business environment by applying stimulating measures for sustainable production.

Increasing recycling and utilization of industrial waste

Increasing the production and use of eco construction materials
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2022 SECTORAL GOALS

- Increase in the share of metal industry and construction in GDP by 2%.
- Reduction in import of construction materials by 5%.
- Initiation of two pilot projects for the recycling and utilization of industrial waste in the production of construction eco materials.

FOCAL AREAS AND TECHNOLOGIES

Identified focal areas and technologies that have great potential:

- Processing and use of eco construction materials based on wood and stone.
- Production of new ecologically acceptable construction materials (geopolymer cement, etc.).
- Sustainable technologies in the production of metals and alloys.



- Possibilities of using industrial and construction waste (fly ash, red sludge, slag, metal dust, wood waste, etc.).
- Expanding production chains in the metal and construction industry by involving small and medium-sized enterprises with manufacturing capacities.

EMPIRICAL FOUNDATIONS AND COMPETITIVE ADVANTAGE OF MONTENEGRO

Montenegro has committed to provide for compliance of development needs with the principles and criteria of environmental and spatial protection in the growth and development of industrial and construction capacities. The share of industrial production in the formation of GDP is currently around 10%, while the share of the manufacturing industry is about 4% of the domestic product. The industry sector is, inter alia, dominated by the production of base metals (steel and aluminium), extraction of ore and stone, as well as wood processing. The share of industry in the total export is 91.5%. In the past period, Montenegro has preserved the foundation to continue the production of base metals and metal products, so metal sector products (aluminium, iron, steel) are the most represented products in the export structure, accounting for about 30% of total industry export. Metal products are widely used in construction, which is a significant development opportunity, as the construction sector recorded the highest growth (8.8%) in relation to all industrial sectors, with construction materials representing a large part of Montenegrin total commodity imports (~ 20%). The expansion of the construction sector is the result of intensification of investments, primarily in infrastructure and tourism.

The industry sector generates large quantities of waste resulting from production in industrial systems such as UNIPROM – Aluminium Plant Podgorica, Tosçelik (Steelworks) Nikšić, Thermal Power Plant Pljevlja, and in small and medium-sized enterprises. The largest potential and usable value in the industrial waste structure lies with fly ash, red sludge, slag, metal dust and wood waste. By applying appropriate technologies, some types of industrial waste can be converted into ecological construction materials, which represents a new development opportunity on the principles of circular economy. Since the metal industry mainly accounts for the production of base metals, we need to focus on products with added value, achieved by a higher degree of final processing, modernizing existing capacities and developing new processing capacities in the SME sector. All waste recycling processes that can provide a competitive product, especially in the construction materials sector, should become a priority. Fulfilment of this priority must be accompanied by training of quality staff and improvement of research infrastructure. The existing waste, which has been generated in the territory of Montenegro for decades, creates an opportunity for good connection with specialized waste recycling companies in Europe and beyond. Examples include red sludge and fly ash for which a certain interest has already been expressed by foreign companies in terms of joint investments and the development of technological knowledge for further utilization.

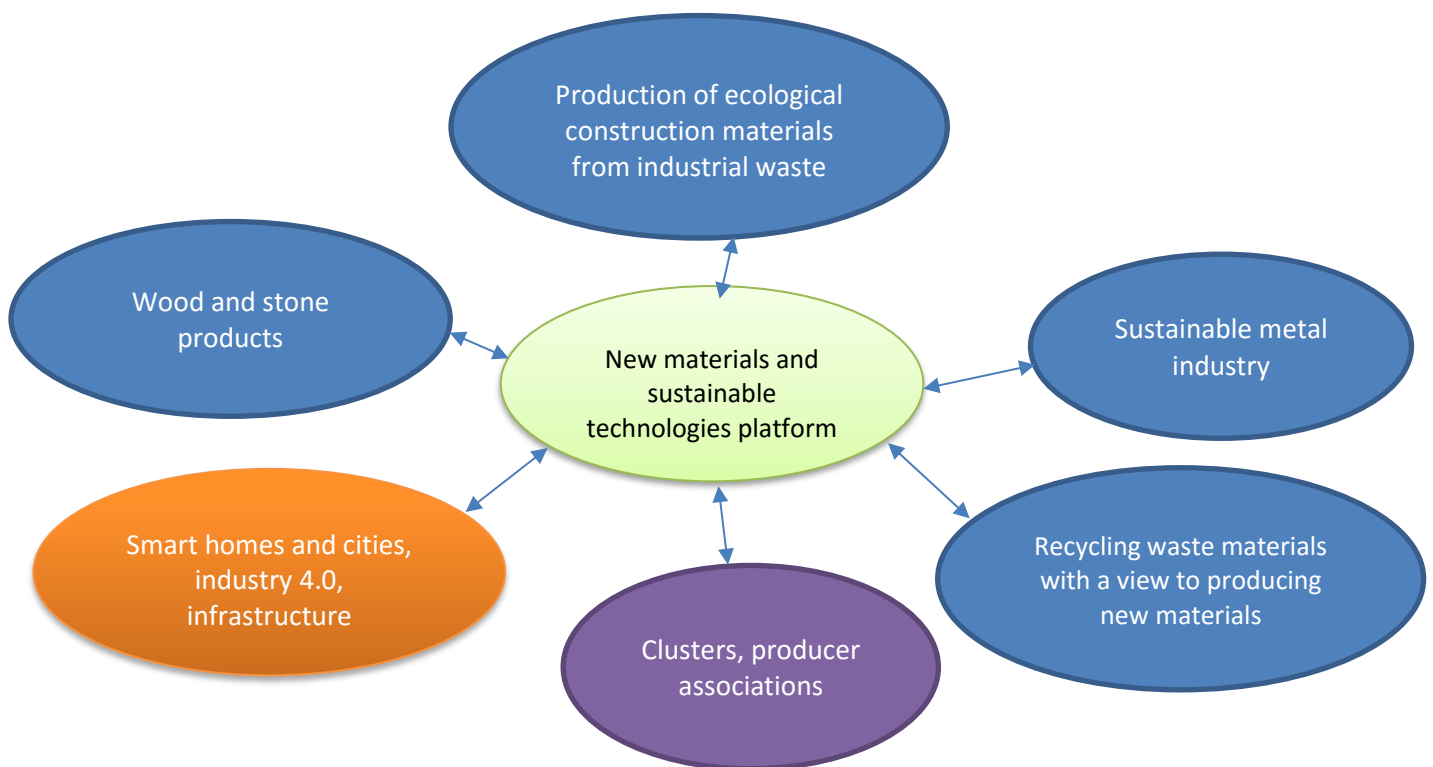
SYNERGISTIC EFFECTS IN RELATION TO OTHER PRIORITY SECTORS

	Synergy with other priority sectors
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Sustainable and health tourism	<ul style="list-style-type: none"> • Construction of new and revitalization of existing tourist and health facilities • Construction of new and revitalization of existing roads • New walking and cycling trails
Renewable energy sources	<ul style="list-style-type: none"> • Construction of hydropower plants • Construction of solar and wind power plants • Biomass as an energy source
Sustainable agriculture and food value chain	<ul style="list-style-type: none"> • Facilities for needs of the manufacturing industry • Production and processing of wood • Utilization of industrial waste (red sludge) for agricultural purposes • Recycling and reusing agricultural waste
ICT	<ul style="list-style-type: none"> • Efficient management of production facilities • 3D printing • Smart homes and smart cities • VR technology for the presentation of construction projects • Industry 4.0

PROPOSED NEW MATERIALS AND SUSTAINABLE TECHNOLOGIES PLATFORM



The Ministry of Science, Ministry of Economy, Ministry of Sustainable Development and Tourism, Ministry of Agriculture and Rural Development and other relevant public institutions, with the support of representatives of the business sector and professional associations (Chamber of Economy of Montenegro, Montenegrin Employers Federation, MBA, Engineering Chambers) and



the enterprises themselves, scientific and educational institutions, as well as civil society organizations, through the formation of clusters, are crucial for the creation and implementation of a strategy that enables the achievement of the set development goals and application of circular economy model through the production of new materials, while using sustainable technologies. In addition to designing and implementing the strategy and the action plan, clusters enable the integration of available resources, organizing and implementing projects and playing a significant role in attracting investments in this sector.

SWOT ANALYSIS

STRENGTHS

- Wealth of natural resources.
- Quality highly educated – qualified labour force.
- Quality higher education system.
- A favourable investment climate.
- A favourable geographical position, proximity to the European market.
- Good sea transport connection and the importance of the Port of Bar.
- Stabilization and Association Agreement with the EU and the CEFTA Agreement.

WEAKNESSES

- High share of primary and products in exports.
- Insufficient connectivity between the industrial sector and scientific research institutions.
- Insufficient investment in research and development.
- Mismatch of supply and demand on the labour market.
- Insufficient connectivity between industrial and other economic sectors.
- Low rate of opening of new enterprises, small number of innovative SMEs.
- High import dependency.
- Insufficiently developed road and rail transport infrastructure.
- Poor offer of special financial instruments and risk capital.
- Fragmented production in some sectors.
- Low share of domestic raw materials / products used in projects in Montenegro.
- Absence of the law on private-public partnership.
- Waste from metal and other industries is being stored instead of being recycled.
- Insufficient labour force trained in crafts / educated in secondary vocational schools for work in these industries.
- Weak administrative capacities for absorption of available EU pre-accession funds.
- Administrative barriers to investments and business development.
- Insufficient investment in staff education and training.

OPPORTUNITIES

- Possibility of using industrial and construction waste (fly ash, red sludge, slag, metal dust, wood waste, etc.) for the production of new materials.
- Adaptation and reuse of abandoned buildings.
- Developing products and services with higher added value.
- Introducing cleaner production.



- Increasing the connectivity between business and the research sector for creating, sharing and applying innovations.
- Establishing public-private partnerships.
- Development of the financial market and the possibility of access to capital.
- Strengthening competitiveness by introducing and applying EU standards.
- Greater FDI inflows.
- Linking key actors in clusters.
- Favourable investment wave and the possibility of including enterprises in large infrastructure projects.
- Integration into the EU and the use of pre-accession instruments for industrial development (Horizon 2020, IPA).

THREATS

- Technological obsolescence of production processes, low productivity rate and weak competitiveness.
- Strong foreign competition present in the local market.
- Outflow of quality labour force.
- Lack of capital for sector development.

SECTOR SUPPORT POLICIES

- Modernization of the sector, mitigation of administrative burden.
- Tax incentives for producers.
- Providing package of support measures, especially for large development projects involving the engagement of SMEs.
- Legislative changes and mitigating bureaucracy in issuing concessions for exploitation of natural resources.
- Harmonizing regulations between institutions for easier application or use of waste as a new material.
- Capacity building in the industrial sector for access to national and international funds.
- Creating a central waste database and improving the databases of products and services in the construction industry and the metal industry.
- Strengthening institutional capacities, investments in additional research equipment, especially opening new reference and accredited laboratories.
- Support to reference scientific research centres with a view to creating a critical mass of qualified, educated staff needed in the area of new materials and sustainable technologies.
- Scholarships for young people for education.
- Lifelong learning for employees in enterprises.



EDP ACTORS

ENTERPRISES

Uniprom-KAP, Tosčelik, Daido Metal, Termochem Metalac, Čelebić, Normal Company, Vektra Jakić, Bemax, Štrabag, Zeta gradnja, ICM NK, Cijevna komerc, ZIP Danilovgrad, Šišković, Mermer Danilovgrad, Fidiija, Mirai, SNV Enterier NK, FEAL Crna Gora, Građevinski nadzor i laboratorija, Progres&Co, MG Group, Mondal Industrija.

BUSINESS AND PROFESSIONAL ASSOCIATIONS

Chamber of Economy of Montenegro, Montenegrin Employers Federation, MBA, Chamber of Engineering of Montenegro.

STATE INSTITUTIONS

Ministry of Economy, Ministry of Science, Ministry of Sustainable Development and Tourism, IDF, Ministry of Education, Ministry of Agriculture and Rural Development, Investment and Development Fund.

SCIENTIFIC AND EDUCATIONAL INSTITUTIONS

University of Montenegro – Faculty of Civil Engineering, Faculty of Metallurgy, Faculty of Architecture, Faculty of Mechanical Engineering.

University of Donja Gorica (UDG) – Faculty of Polytechnics.

CIVIL SECTOR

Academy of Engineering Sciences.



INDICATORS

Indicator	2018	2022
Industry share in GDP	<i>10.2% (2016)</i>	<i>11%</i>
Manufacturing industry share in GDP	<i>3.8 (2016)</i>	<i>4.5%</i>
Industry share in total exports	<i>91.5% (2017)</i>	<i>93%</i>
Manufacturing industry share in total exports	<i>70.2% (2017)</i>	<i>72%</i>
Construction industry share in GDP	<i>5.6% (2016)</i>	<i>8%</i>
Industry sector share in total employment	<i>11.5% (2017)</i>	<i>13%</i>
Construction sector share in total employment	<i>5.9% (2017)</i>	<i>8%</i>
Base metal production employment share in relation to total industry	<i>4.5%</i>	<i>5.5%</i>
Metal products production employment share in relation to total industry	<i>5.7% (2017)</i>	<i>7%</i>
Base metal production share in manufacturing industry	<i>19.3% (2017)</i>	<i>21%</i>
Metal products production share in manufacturing industry	<i>2.4% (2017)</i>	<i>3%</i>
Processed waste share in the total industrial waste	<i>2.5%</i>	<i>4%</i>