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***Cross-clustering partnership for boosting eco-innovation
by developing a joint bio-based value-added network for the Danube Region***

Framework Conditions for Cluster Development in bio-based industry
in **Romania**

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Introduction

I. Description of the region

Romania is endowed with a large variety of natural resources (forests, natural gas, fertile agricultural lands-7.5% of utilised agricultural area in EU-, brown coal and lignite, crude oil, salt, mineral, silver, gold and hydrological networks) and a great potential of renewable energy. It is worth mentioning that Romania has the largest surface of virgin forests in Europe. In 2013, one third of the farms in the EU were located in Romania (though many are subsistence households).

The intensive development of Romanian industries was based on natural resources' exploitation, without mitigating the negative consequences on the environment. After joining EU, the Romanian government approved the National Renewable Energy Action Plan and the Energy Strategy (NREAP, 2010). Those strategies take into account renewable energy sources.

According to the Romanian National Institute of Statistics the unused technical energy production potential from renewables is of around 8,000 ktonnes, which includes 47% biomass and biogas, 19% solar, 19% wind, 14% hydro and 2% geothermal energy.

In Romania, renewable energy is obtained using mostly traditional renewable resources (hydro) to the detriment of green renewable resources (Diaconu et al., 2008). Biomass energy is based on different resources: agricultural and household waste, forest wastes and energy crops. The production of biomass energy falls into two categories: biofuels (biomass is used to obtain liquid fuels that replace petroleum production needed in transport sector) and biopower (biomass is used to obtain electricity and heat). The local production of bioethanol and biodiesel began in 2007 but biofuels are produced at a low level, even if the country has a high potential of processing sunflower, corn, rape and soybean crops (Dumitru et al., 2004). Biomass represents 51.61% of the global RES potential in Romania, but a large amount of biomass is not used. There are only few incentives for using modern biomass technologies for electricity and thermal generation. The CEFA project was the first project in Romania for producing electricity from biomass (Vac et al., 2013). Other companies strive to use or implement similar technologies, but the development of this field is still low in Romania.

Romania's biomass energy potential is of approximately 7.6 tonnes of equivalent oil per year, out of which (Ministry of Agriculture, 2014):

- 7.7% biogas;
- 15.5% lumber and firewood waste;
- 6.4% wood waste;

- 63.2% agricultural waste from cereals, corn stalk, vineyard;
- 7.2% urban household waste.

The number of energetic crops is increasing more and more. Thus, according to the database of Romanian Agency for Payments and Interventions in Agriculture (APIA) in 2015 the number of energetic crops farmers increased to 442 in compare with 320 in 2014 and the total area claimed for payment in 2015 is about 5.000 ha.

The biomass usage has been mainly focused on the household firewood, with direct burning, space heating, cooking and water heating accounting for approximately 95% of the current biomass exploitation. Nevertheless, the technologies / equipment used are traditional ones and their performances are low. The industrial biomass reached only 5%. (Source: "Biofuels (biogas, biomass, biodiesel) sector in Romania", an FRD CENTER Newsletter, March 2015).

According to the latest data published by the National Institute of Statistics, the total area of the forest land in Romania was 6 544.6 thousands hectares in 2014, accounting for 27.3% of the total country area. According to the same source, the production of fire wood in Romania in 2014 was of 4.86 million m³, while in 2015, it was of 5.08 million m³, 4.5% more than in 2014. According to ASFOR, in Romania are harvested annually approx. 19 million cubic meters of timber, of which 12 million cubic meters for the industrial processes, and the difference of seven million cubic meters for heating and other uses (<http://market-entry-romania.blogspot.ro/2017/02/waste-to-energy-potential-in-romania.html>).

The production of biofuels and biogas is considered to have a high potential in Romania. In 2015, the production was 1,500 GWh for biofuels and 450 GWh for biogas (<http://market-entry-romania.blogspot.ro/2017/02/waste-to-energy-potential-in-romania.html>).

II. Bio-based industry key assets in ROMANIA

There are many Romanian sectors with a high potential for developing the bioeconomy (Pasculea, 2015); agriculture has a high potential to produce bioenergy (biofuel, biogas, biomethane), while solid garbage and vegetable residue might be used to produce green energy.

In Romania there are 800 firms and 30,216 farms growing cereals and industrial crops and with high productions of wheat, corn, sunflower and potatoes. The bio-natural products sector is quite developed based on the spontaneous flora (Fares,

Medica Group, Dacia Plant, Gerovital, Plafar etc.). The food industry is the largest manufacturing sector in Romania, with a turnover of more than 1 billion euros. For a safe, accessible and nutritionally optimized food that contributes to agrifood sector's value added, the government should stimulate the research in agricultural biotechnology even at this moment the multinationals that dominate the food market in Romania are not interested in the development new technologies. Romania could become a strong pole of innovation in the European Innovation Partnership in agriculture (PEI) based on local horticultural genetic resources and using sustainable technologies in the horticultural production chain (developing new practices, products, processes and new technologies). Given the conversion program/restructuring of viticulture and horticulture, between 2014 and 2020, more than 1.5-billion-euro investment in horticultural holdings and deposits storage could be made.

Antibiotics SA Iași produces bio-active substances and those for semisynthetic conservation. Bioequivalence studies are cheaper compared to the other European countries that make in vitro/in vivo design of generic medicines. There are 150 firms in Romania that benefit from industrial biotechnologies research results. These companies have a turnover of 300 million euro, 1500 employees and a commercial surplus of 200 million euro. Some 200 Romanian companies are active in the field of environmental biotechnology (remediation by firms of contaminated soil using sewage plants, phytoremediation, microorganisms). These firms have more than 2 000 employees and a turnover of 100 million euro.

Some of biomass plants in Romania (Source: "Biofuels (biogas, biomass, biodiesel) sector in Romania", an FRD CENTER Newsletter, March 2015):

- The biomass plant in Radauti (Suceava county) has a thermal power capacity of 83 MW, uses wood waste and is operated by Austrian Group Egger;
- Transelectrica is operated biomass plants starting on March 2015 and generates a daily cumulated power of 70 MW.

Some of biogas plants in Romania (Source: "Biofuels (biogas, biomass, biodiesel) sector in Romania", an FRD CENTER Newsletter, March 2015):

- Biogas facility in Oradea has the capacity of 1.6 MW/h and is operated by Eco Bihor (member of IND-AGRO-POL competitiveness pole) starting on 2014 and uses organic waste deposited in the landfill as fuel generating electricity and heat (<http://www.ecobihor.ro/biogaz.htm>);
- Biogas cogeneration plant in Prahova has an installed capacity of 1 MW/h and is operated by Genesis Biopartner starting on 2013 and uses 50 tons of organic material per day for electricity generation and of 1.2 MW/h for thermal energy;

- Biogas plant Moara, Vornicenii Mici, Suceava is operated by TEB Energy Business (it is an Energy Service Company - ESCA) starting on October 2014. The plant has the electricity output of 2.974 MW and the thermal output of 2.944 MW. It uses as fuel the biogas from corn silage and manure (<http://teb.com.ro/realizari/biogaz-din-culturi-energetice/>);
 - Cogeneration power plant based on biogas from organic waste is operated by Iridex (member of IND-AGRO-POL competitiveness pole) and is located in Chiajna starting on 2014 with an installed power of 2.4 MW/h. In July 2014 Iridex has received the authorization to construct the 3rd energy unit of its biogas cogeneration plant with the electrical power of 1.2 MW. Iridex targets to reach installed power of 7 MW in the next years;
 - Biogas plant in Tulcea has an installed power of 0.5 MW and is operated by EnergoBit starting on 2014. The plant generates electricity and thermal energy using the biogas resulted from the anaerobic fermentation of the organic animal and vegetal waste;
 - Biogas plant of Dutch company Colsen van den Hul has developed in 2013 for the dairy producer Covalact in Sfantu Gheorghe. The plant generates biogas from water waste for energy productions;
 - Biogas plant for the five-star hotel City Plaza in Cluj Napoca is inaugurated in December 2014;
 - Biogas plant developed in 2014 in Arduș (Satu Mare county) has an installed power of 1.5 MW;
 - Biogas plant of Avicom Vaslui has been launched in 2013. The plant generates biogas from poultry manure, sugar beet pulp and corn cobs. The plant has the capacity to produce 500 kW/h;
 - Biogas plant of Arad landfill produces energy of approximately 1.500 MW/year starting on 2013. The plant generates biogas from Arad county waste (over 70% of the Arad county waste);
 - Biogas plant of Timisoara operated by beer producer Ursus Breweries produces an auxiliary fuel for the beer production process, using biogas from its wastewater treatment plant.;
 - ECO Hornet - is specialized in advanced equipment for thermal energy manufacturing from any pelletised biomass. After 10 years of research, experimentation, testing there has been patented and implemented a performant technology to transform efficiently biomass into energy without emissions. From the first product ever marketed by ecoHORNET in 2010 until now, ecoHORNET equipment operates in 8 countries on 3 continents demonstrating its proficiency.
- Regarding waste management: (<http://market-entry-romania.blogspot.ro/2017/02/waste-to-energy-potential-in-romania.html>)
- A waste incinerator in Bucharest is forecasted to be launched by 2020, following estimated investments of some 230 million EUR. The project will be financed using EU funds. The incinerator will have

the capacity of 300,000 - 350,000 tonnes per year. Chemie-Tech DMCC from the United Arab Emirates will invest 56 million EUR in a plant that recycles the oil used in the automotive industry. The plant will be located in Oltenita, Calarasi county (Southern Romania). The plant will have the capacity to recycle 73,000 tonnes of used oil per year.

The recycling company GreenTech has completed in April 2016 a project of 2.3 million EUR to improve the recyclable waste collecting in 23 cities in Romania. The Norwegian Government has

co-financed the project with 1 million EUR. The project aims to collect some 15,200 tonnes of recyclable waste per year from retailers, companies, HoReCa players, office buildings and individuals.

III. Stage of development

At the moment, there are 27 clusters recorded in Romania in fields related to bio-based industries. Out of this, 7 of them are in the initial stage, 11 of them are in the take off stage, while the rest of 9 are in their maturity stage.

Current situation in the region

I. Key driver, Innovation landscape

The EU Directive 2009/28/CE establishes a quota of 24% of the national energy consumption out of renewable sources at the horizon of 2020.

EU member states set national targets lower or higher than 20%.

In Romania, Law 199/2000 promoted RES and the National Regulatory Authority for Energy (ANRE) was established to supervise the liberalized electricity market.

The Romanian objective is even more ambitious than the European one, i.e. 38%, as stated in the Law 220/2008 (revised and modified in 2016) which introduces a support scheme for renewable energy production in the form of green certificates. Each renewable energy producers is entitled to receive a number of green certificates according to the type of energy source and production capacity:

- For any other renewable resources (including biomass, biogas, and biodegradable waste): 3 green certificates per 1 produced MWh.

Green Certificates are to be dealt with on the Green Certificate Market which includes a centralized market of green certificates (spot transactions) and the bilateral green certificate market (forward transactions). The market is run by the National Operator for Energy and Gas Market (www.opcom.ro). Price per green certificate is set between 27 and 55 Euro/certificate.

Key driver or pioneers in the bioeconomy in Romania may be mentioned clusters as: Green Energy Romanian Innovative Biomass Cluster, Cluster Pro Wood Sf Gheorghe, Ind Agro Pol (biomass), ETREC Cluster Sacele Brasov, ELINCLUS Cluster Bucuresti, ROSENC Cluster Timisoara, Med Green Cluster Constanta, KWG Salcie Energetica Miercurea Ciuc, Biogasinno Cluster Bucharest, Klara cluster Magurele, Green Solutions Lower Danube Cluster Galati.

Barriers for the development of the bio-based industry clusters

The most important barriers: Lack of: bioeconomy mapping; specific/agregate bioeconomy statistical data (only on NACE); specific bioeconomy value chain.

The lack of suitable training is the most important barrier for the development of renewable electricity and heat technologies in Romania. Other barriers relate to the grid connection phase, such as information management, access to credit and virtual saturation (Kampman et al., 2015).

According to Romanian Association of Biomass and Biogas, there are some decisive factors which influence the biomass market in Romania. From its report in table below is presented an overview related to barriers, opportunities and needs in this field.

Demand: Solutions	Supply: Means	Framework
Subsidies	Tax on polluting activities	Specific laws
Information Campagnas	Adequate legislative policy	Financial support
Trainings courses	Information Campagnas	Collaboration
Coherent legislation	Proper technologies	Dissemination
Tax on emissions	Subsidies	
	Associations implication	
	Authorities implication	
	Producers implication	

II. Cluster development/cluster landscape

Key asset	Primary biomass sector	Food & Feed	Pulp & Paper	Bio Chemicals	Bio Polymers	Phyto-pharma	Textile & Clothing	Renewable Energy (biomass, biogas, biofuels)	Eco-Construction
Cluster organization	X	X	X				X	X	X
Enterprises	X	X	X	X	X	X	X	X	X
Policy makers	X	X	X	X	X	X	X	X	X
Knowledge institutes and Universities	X	X	X	X	X	X	X	X	X
Biomass supply	X	X					X	X	X
Competitive bio-based industry product on the market						X (Gerovital)	X (SIDERMA)	X (Green Energy Boiler)	X (ROSENC - Eco-Bordei)
Funding	X	X				X	X	X	X
Policies, programs and regulations	X	X	X			X	X	X	X

List of cluster initiatives for bio-based industry:

1. PROWOOD (primary biomass sector) - Maturity stage
2. Green Energy (renewable energies) - Maturity stage
3. IndAgro Pol (food & feed) - Maturity stage
4. ETREC (automotive) - Take off stage
5. ASTRICO NE (textile) - Maturity stage
6. ELINCLUS (automotive) - Maturity stage
7. ROSENC (Renewable energies) - Maturity stage
8. Traditions Manufacture Future (textile) - Take off stage
9. REGIOFA (primary biomass sector) - Take off stage
10. Romanian Textile Concept (textile) - Maturity stage
11. Transylvanian Furniture Cluster (primary biomass sector) - Maturity stage
12. AgrooFood Regional Cluster (food & feed) - Take off stage
13. Agro Transylvania (food & feed) - Maturity stage
14. MECHATREC (automotive) - Take off stage
15. Transylvanian Textile and Fashion (textile) - Take off stage
16. Builders Guild Iasi (eco construction) - Initial stage
17. Construct Cluster Oltenia (eco construction) - Take off stage
18. Advertise Printing Packaging (pulp & paper) - Take off stage
19. BIOGAS INNO (renewable energies) - Initial stage
20. Green Solutions Lower Danube (renewable energies) - Take off stage
21. TREC (renewable energies) - Take off stage
22. ACAROM (automotive) - Take off stage
23. START Innovation (renewable energies) - Initial stage
24. BIODANUBIUS (renewable energies) - Initial stage
25. ECOIND (renewable energies) - Initial stage
26. INOMAR (renewable energies) - Initial stage
27. Transylvanian Mechanical Engineering (automotive) - Initial stage

III. Where has a given region/country relevant strengths and opportunities

Strengths

Primary biomass, Food & Feed, Renewable Energy.

Opportunities

Phyto-pharmaceuticals, Textile & Clothing, Eco-Construction; human resource.

From the experience of Romanian Association of Biomass and Biogas (ARBIO) the most promising solid biomass sources and market segments are presented in the table below:

The most promising solid biomass sources	The most promising market segments
Wood waste	District heating
Wood chips	Public buildings, especially schools and hospitals
Pellets	Hotels industry / Tourist Resorts

Regional Bio-based industry Strategy

Criteria	Indicator	Region	
		2010	2015
Land use	Forestry land (% of total land area)	28.30%	29.81% ¹
	Agricultural & horticultural land (% of total land area)	57.81%	56.71% (*2013) ²
Biomass availability	Agricultural biomass production (tonnes equivalent oil per year)		4.8 ³
	Blue biomass production (tonnes equivalent oil per year)	-	-
	Forestry biomass production (tonnes equivalent oil per year)	-	1.663
	Waste production – biogas, urban household waste (tonnes equivalent oil per year)	-	1.14 ³
Innovation	SME birth rate (% of total firms in region)	-	10.3% (*2014) ⁴
	R&D expenditure (index (EU = 1))	0.061	0.076 ⁵
	R&D employment (% of total employment in region)	0.4361%	0.4837% (*2014) ⁶
Cluster size	Firms in total bio-based industry sectors (% of total firms in region)		0.086991
	Employment in total bio-based industry sectors (% of total employment in region)		0.7423
	Firms in primary biomass sector (% of total firms in region)		0.048069
	Employment in primary biomass sector (% of total employment in region)		0.1832
	Firms in food & feed sector (% of total firms in region)		0.00759
	Employment in food & feed sector (% of total employment in region)		0.0928
	Firms in paper & pulp sector (% of total firms in region)		0.000973
	Employment in paper & pulp sector (% of total employment in region)		0.0257
	Firms in chemicals sector (% of total firms in region)		n.a.
	Employment in chemical sector (% of total employment in region)		n.a.
	Firms in polymers sector (% of total firms in region)		n.a.
	Employment in polymers sector (% of total employment in region)		n.a.
	Firms in phyto-pharma sector (% of total firms in region)		n.a.
	Employment in phyto-pharma sector (% of total employment in region)		n.a.
	Firms in textile sector (% of total firms in region)		0.006227
	Employment in textile sector (% of total employment in region)		0.1333
	Firms in energy sector (% of total firms in region)		0.024132
	Employment in energy sector (% of total employment in region)		0.3074
Quality of workforce	Secondary & Tertiary education in bio-based industry (% of total population in region)		0.009405834

1) Eurostat – Forest area: <http://ec.europa.eu/eurostat/web/forestry/data/database> (for area)

2) Eurostat – Agricultural and horticultural land: http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_census_in_Romania#Land_use [ef_oluaareg]

3) "Biofuels (biogas, biomass, biodiesel) sector in Romania", an FRD CENTER Newsletter, March 2015

4) Business demography and high growth enterprise by NACE Rev.2 [bd_hgnace2_r3]:

5) Business enterprise R&D expenditure (BERD) by economic activity

6) Total R&D personnel and researchers by sectors of performance, as % of total labour force and total employment, and by sex [rd_p_perslf]:

More Data (in Thousand tons of oil equivalent, TOE)⁷ for Final energy consumption (from Biomass and renewable wastes) in various sectors (2010 and 2015):

- Food and Tobacco: 30 (2010); 31.3(2015)
- Wood and Wood Products: 128.8 (2010); 138 (2015)
- Fishing: 0 (2010&2015)
- Agriculture & Forestry: 6.8 (2010); 7.5 (2015)

Is there a specific regional Bio-based industry strategy? On which pillars is the strategy focused? Is there a smart specialization strategy? Is the strategy focused on Value Chains?

NOT YET in Romania, but some seeds can be found in the National Strategy for Competitiveness 2014-2020, in the analysis of Industrial Policies, in the proposal for an Energy Strategy 2016-2030, in the 2010 Master Plan for Biomass, and the biomass law proposal which is presently discussed in the Parliament.

Currently is under preparation the New Heating Law which debates to set a 50% share of the energy produced (heat) for the domestic / district heating to be obtained from bioenergy sources.

Strategy implementation

Additional Funding schemes

Bioeconomy and Energy, environment and climate change are amongst the priorities of the national smart specialization strategy for 2014-2020, as they were identified in the 2014-2020 National Strategy for Research Development and Innovation. RDI projects which address these smart priorities are financed by National RDI Plan for 2015 – 2020. Specific infrastructure research for these priorities are financed by Competitiveness Operational Programme (structural funds) for 2014 – 2020. Also in the current programming period (2014-2020), main financial support sources are to be found in the Operational Programme "Big Infrastructure" (structural funds), Priority Axis 6 with a total budget of 200 million EUR, as described subsequently:

- Specific Objective 6.1 "Increased Energy Production from biomass, biogas and geothermal sources":
- Interventions dedicated to the increase of renewable energy with a particular focus on biomass, biogas, geothermal. Eligible applicants are local and regional administrative bodies, regional development associations and enterprises specialised in energy production and selling. Eligible activities include the set up or modernisation of energy production capacities based on biomass, biogas or geothermal sources. All regions except Bucharest-Ilfov are eligible. Financing is limited to a maximum of 15 Mio EUR, while beneficiary's contribution ranges from 2% in the case of public bodies up to 20% for private entities;
- Interventions dedicated to the enlargement of energy distribution grids. Eligible applicants are energy distributors transporting renewable energy. Eligible activities include the

modernisation and enlargement of energy grids with a nominal voltage of up to 110 kV. Financing is limited to a maximum of 3 Mio EUR.

- Specific Objective 6.4 "High efficiency co-generation systems" is dedicated to a more efficient use of primary energy in highly efficient co-generation systems. Eligible applicants are industrial enterprises with a consumption of over 200 toe/year or industrial parks. Eligible activities include the set up or modernisation of high efficiency co-generation electric plants of max 8MWe. Financing is limited at 6 Mio EUR while beneficiary's contribution ranges from 20% for micro and small enterprises to 30% for medium enterprises and 40% for large enterprises. All regions are eligible with the exception of Bucharest-Ilfov.

The National Rural Development plan 2014-2020 includes funds for investments in agricultural farms that can produce and use renewable energy for own consumption or for other economic operators:

- Measure 4 "Investment in physical active" is dedicated among others to investments in installations for production of electrical and / or heat energy by using biomass. Total financial allocation for the 2014-2020 period is 2.4 billion euro;
- Measure 6 "Development of agricultural exploitations and enterprises" is dedicated to support investments for obtaining pellets, briquettes, etc. from biomass, for using in own activities. Total financial allocation for the 2014-2020 period is EUR 270.4 million;
- Sub-measure "Afforestation and creation of woodland" is dedicated to support the afforestation of agricultural and non-agricultural lands by using species which include energetic acacia and 3 species of energetic willow. Total financial

⁷) Eurostat – Supply, transformation and consumption of renewable energies [nrg_107a]: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_107a

allocation for the 2014-2020 period is approx. 124.5 million euros;

- Measure 19 "Local Development LEADER" are encouraged, among others, investments for promoting the use of heat sources based on biomass, creating and developing systems for production and distribution of biogas at the community level. Total financial allocation for the 2014-2020 period is 563.5 million euros.

As for other agricultural crops (wheat, corn, sunflower, etc.), the energetic crops are eligible for both scheme of direct payments from EU funds and scheme of national transient aid funded by national budget.

From the national budget the energetic plant growers are beneficiaries of reimbursement of amounts which represent the difference between the standard duty and the reduced duty of 21 euros / 1000 liters of diesel. Nominal amount of support for 2016 is approx. 1.8 RON/liter and the maximum annual amount of diesel for which is given state aid under the form of reimbursement is 100 liters /ha. Ministry for Regional Development and Public Administration established some measures for the financing of investment in the capacity for the production of RES-E cogeneration and high-efficiency: state aid to support investments in biomass, biogas.

Future challenges for cluster development in bio-based industry

The main role of the clusters in bio-based industry consists in:

- Organization (cluster organization reinforcement, clear membership, enrich services provided to cluster participants);
- Actors (R&D providers);
- Biomass supply;
- Competitive bio-based products;
- Funding;
- Policies and measures;
- Lessons learned
- Key recommendations

The future of renewable energies

The law draft regarding the biomass and biogas is under debate in the Parliament of Romania

Lessons learned

From the experience of Romanian Association of Biomass and Biogas (ARBIO)

Measures for the financing of investment in the capacity for the production of RES-E cogeneration and high-efficiency:

- MDRAP-state aid to support investments in biomass, biogas
- MDRAP-state aid for high-efficiency cogeneration

MDRAP = Ministry for Regional Development and Public Administration

According to Romanian Energy Regulatory Authority (ANRE), Romania has already exceeded targets for 2020 being close to the EU average for the target of 2030.

Future objectives

- To design a suitable legislative framework for promoting the ERES in power plants with small capacity (micro-capacity to satisfy local consumption) on:
- Biogas
- Biomass
- High efficiency cogeneration
- Support of the RES-E production less operated and with great potential for Romania (Biomass, biogas geothermal).

The most promising solid biomass sources	The most promising market segments
Wood waste	District heating
Wood chips	Public buildings, especially schools and hospitals
Pellets	Hotels industry / Tourist Resorts
Straw	Shopping sector

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Annex

Definitions/Glossary

Clusters: Clusters are generally described as groups of specialised enterprises, often SMEs, and other supporting actors in a particular location that cooperate closely together.

Cluster initiatives: A cluster initiative is an organised effort aiming at fostering the development of the cluster either by strengthening the potential of cluster actors or shaping relationships between them. They often have a character like a regional network. Cluster initiatives usually managed by a cluster organisations.

Cluster organisations: Cluster organisations are entities that support the strengthening of collaboration, networking and learning in innovation clusters and act as innovation support providers by providing or channelling specialised and customised business support services to stimulate innovation activities, especially in SMEs. They are usually the actors that facilitate strategic partnering across clusters. Cluster organisations are also called cluster managements.

Cluster participants: Cluster participants are representatives industry, academia or other intermediaries, which are commonly engaged in a cluster initiative. Given the case a cluster initiative has a certain legal form, like associations, cluster participants are often called cluster members.

Cluster policy: Cluster policy is an expression of political commitment, composed of a set of specific government policy interventions that aim to strengthen existing clusters and/or facilitate the emergence of new ones. Cluster policy is to be seen as a framework policy that opens the way for the bottom-up dynamics seen in clusters and cluster initiatives. This differs from the approach taken by traditional industrial policies which try (and most often fail) to create or back winners.

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