German Economic Team Moldova

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Leveraging Clusters for Industrial Development in Moldova

Preconditions, Potentials and Key Steps to Introduce a Cluster-Oriented Approach

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About the German Economic Team Moldova

The German Economic Team Moldova (GET Moldova) advises the Moldovan government and other Moldovan state authorities such as the National Bank on a wide range of economic policy issues. Our analytical work is presented and discussed during regular meetings with high-level decision makers. GET Moldova is financed by the German Federal Ministry of Economics and Energy. Our publications are publicly available at our website (www.get-moldova.de).

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Executive Summary

Around the globe, clusters are regarded as an important driver for innovation, enterprise development and investment attraction. Clusters are geographical concentrations of interconnected companies and institutions focusing on related value chains. They are rooted in the triple helix concept, which refers to the cooperation between actors and institutions from three spheres – the private sector, government and academia. International experience indicates that, in principle, a cluster approach could be leveraged for industrial development in Moldova. However, experience also shows that not every concentration of companies can be developed into a cluster. Certain preconditions have to be met which relate in particular to the structural characteristics of the specific (emerging) clusters as well as to the general framework conditions for cluster development in a country.

Discussions with relevant actors suggest that the majority of (emerging) clusters identified in Moldova only partly meet the necessary preconditions for a broad based cluster approach. In particular, they lack the critical mass and regional concentration as well as the necessary innovation, investment attraction and job creation potential. From today's perspective, amongst the areas identified, the information technology and automotive industry seem to offer the most promising cluster potential. Furthermore, a number of challenges in the general framework conditions need to be considered in the design of a cluster strategy. Linkages between government, business and academia and intra-governmental coordination are not yet sufficiently developed. Financial sustainability poses an additional challenge for cluster development.

Considering the findings on the cluster-specific and general preconditions and potentials, an introduction of a cluster-oriented approach with three phases seems advisable:

- **Pre-cluster phase:** focusing on (1) establishing the analytical base for policy decisions, (2) improving the environment for cluster development, (3) testing the cluster approach in selected policy areas
- **Pilot-cluster phase:** focusing on (1) testing the cluster approach by setting up regional cluster management and support structures for two pilot clusters, (2) establishing a lean coordination mechanism, (3) orienting further policy areas and instruments towards cluster development
- **Roll-out phase:** (1) launching a targeted and competition-based cluster development programme, (2) widening the scope of tasks of the coordination unit, (3) fully integrating cluster development into the policy framework.

Each time, before a new phase is entered, the interim results should be critically reflected in order to decide if the process should be continued or if alternative strategic options offer more promising opportunities (e.g. sectoral or horizontal measures).

As a first step, a workshop with the key stakeholders and a comprehensive cluster analysis should be carried out to develop a shared and grounded understanding of the (emerging) cluster-landscape and to specify the needs and opportunities for cluster development. Depending upon the results of the comprehensive analysis and consultations, the next steps outlined in the roadmap should be initiated.

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1 Introduction

In many countries, cluster-oriented policies and programmes have been successfully introduced to strengthen competitiveness and to address challenges related to structural change. Cluster development is considered as an attractive approach in this regard as it requires rather limited resources from government, yet may generate a significant impact and a high visibility.

Against this background, the government of Moldova is interested in leveraging clusters for industrial development and has adopted a "Concept for Cluster Development in the Industrial Sector", which outlines the objectives and priorities. In order to support the necessary planning processes and policy decisions with respect to the implementation of the concept, this policy paper examines the preconditions and potentials for introducing a cluster-oriented approach in Moldova. Taking into account international experience, it assesses what type of challenges and opportunities cluster-oriented policy instruments and initiatives can address in the Moldovan context and what limitations should be considered.

On this basis, the paper outlines the key implementation steps specifying in which policy areas and industries the cluster-approach can be leveraged to increase the efficiency of policies and instruments. Synergies and interdependencies between cluster development and related policy areas are taken into consideration. Furthermore, the policy paper reflects on the roles of the different players and institutions from the private sector, academia and government involved in cluster development.

The paper is structured as follows: A definition of clusters and outline of the rationale and key design features of cluster development programmes in chapter 2 form the starting point. Chapter 3 reviews the cluster potentials and relevant experience in Moldova against cluster-specific and general preconditions derived from international experience. Based upon those findings, chapter 4 contains a roadmap for introducing a cluster-oriented approach in Moldova with three phases, a pre-cluster phase, a pilot-cluster phase and a roll-out phase. Finally, the document concludes with a proposal on the way forward, outlining the work programme for a comprehensive cluster analysis.

2 Rationale of the cluster approach and key features of cluster programmes

2.1 Definition of clusters

Clusters are geographical concentrations of interconnected companies and institutions focusing on related value chains. A cluster does not simply represent a specific industry or sector, but all actors and activities relevant to the respective value chains that form the core of the cluster. Thus, the cluster approach goes beyond the linear and transaction-oriented concept of a value chain and is based on a more integrated and systemic perspective, taking into account both formal and informal interactions.

Clusters are rooted in the triple helix concept, which refers to the cooperation between actors and institutions from three spheres – the private sector, government and academia. In a cluster, the three groups are usually represented as follows:

1. **Private sector:** The private sector is commonly represented by two types of firms, the horizontally and vertically linked companies that perform the core activities of the cluster and the related network of technology and service providers covering areas such as financial services, logistics, design, marketing or legal advice. In addition, chambers of commerce and other business and industry associations often form a part of cluster initiatives.

2. **Academia:** Universities, other tertiary institutions and research institutions, education and training institutions with the relevant expertise to take part in upgrading the knowledge base of the cluster by providing specialized research, education or technology transfer services.
3. **Government:** Public sector actors of clusters include government institutions, agencies and authorities (national, regional and local level) responsible for related issues and services such as regional economic development, education, investment promotion, internationalization, science and technology, finance and economic affairs.

In addition, specialized facilities such as incubators or industrial parks are often part of the cluster infrastructure. Successful clusters are usually known as centres of expertise beyond the region. Further defining characteristics of clusters include shared interests and a willingness to cooperate between members and a variety of formal and informal relationships based on trust and intensive dialogue. Since the cluster companies are independent businesses each seeking to improve their own bottom-line, clusters are driven by the co-existence of cooperation and competition between members.

It should be made clear from the start that governments cannot create clusters from scratch. However, the public sector can play an important role in facilitating cluster initiatives and creating an enabling environment. The origins of clusters differ, but successful clusters are mostly rooted in specific assets and conditions in a region:

- Anchor companies attracting suppliers and service providers, thus establishing a localized network of interconnected companies
- R&D institutions with specific technological competencies leading to the colocation of companies through opportunities for collaboration and technology transfer
- Universities generating spin-offs sparking new value chains and supporting activities
- Natural resources or climate conditions conducive to specific activities
- Industrial tradition and specific knowledge or skills
- Specific infrastructure such as in the case of tourism or logistics clusters.

2.2 Rationale and objectives of the cluster approach

Clusters offer promising opportunities to companies, academia and the government providing a good basis for collaborative efforts. Governments worldwide regard clusters as an important driver for innovation, enterprise development and investment attraction.

Cluster initiatives can boost the regional innovation system and increase competitiveness by fostering needs-driven and application-oriented research through the establishment of formal and informal interactions between businesses and researchers. Research and development collaborations pooling the resources reduce the risks and costs involved in developing and introducing new products. With regard to the necessary skills development and the availability of highly qualified labour, the cluster approach can make a key contribution by helping to align the needs of private sector and the type of training and education provided by public institutions and academia. This may include collaborations on curricula, engagement of industry experts as lecturers or the establishment of joint training institutes.

From the company perspective, clusters offer an attractive breeding ground for competitive advantages and dynamic enterprise development. Because of their proximity, cluster players can benefit from several location-specific externalities and synergies such as reduced transaction costs, fewer delays, and easier access to information and opportunities for collaboration. Large firms can rely on specialized suppliers and focus on their core competencies, while new business opportunities are created for SMEs and start-ups or spin-offs to fill gaps or develop new applications. Inter-company knowledge sharing and

collaboration usually increases as the cluster matures and the necessary level of trust is established. At the same time, the competitive pressure from co-located companies leads to higher productivity. The development of a cluster brand and a reputation established beyond the region aids the internationalization and export development of the member companies.

With regard attracting new businesses to the region, clusters allow a convincing argumentation in line with needs and location search process of investors. Clusters provide attractive conditions for new or relocating companies, as they enable direct access to supply chains, skilled labour and a reliable and established network of potential business partners. Therefore, an internationally renowned cluster will raise awareness for the region and improve chances to get on the long list of investors searching for new locations and business opportunities. Furthermore, effective cluster support services and mechanism are perceived as an indicator of a business friendly environment.

Table 1 Cluster development objectives from the perspective of the different stakeholders

Government	Business	Academia
• Foster innovation • Raise profile, attract investment • Increase and diversify export • Promote start-ups and entrepreneurial development • Foster SME development • Develop skills base • Generate jobs and income • Foster structural transformation	• Increase productivity - Reduce costs/time to market - Draw on more specialized assets, suppliers, workers • Become more innovative, e.g. - Collaborative research - Access to information/finance - Reduce risks involved in developing new products • Improve access to customers and international markets	• Tap new potentials for funding - Commercialize research - New programmes for collaborative research - International funding • Align research and education programmes to market needs • Develop international relations and collaborations • Improve take-up of graduates, interns etc. in the job market

The cluster approach allows for the demand-driven concentration of government resources on with a high development impact that can spread beyond the cluster through spill-over and multiplier effects. This makes clustering a relevant policy tool to address development objectives and structural challenges by strategically developing and harnessing competitive advantages and fostering specialization.

The cluster approach provides a framework for aligning public sector efforts and investments towards economic development by shifting from individual or ad-hoc measures towards a holistic approach addressing the needs and opportunities represented in the whole cluster. Thus, clustering can help government institutions and agencies align already existing programmes and support measures to exploit synergies and avoid duplication. At the same time, companies get an arena to identify and communicate common problems and opportunities that often cannot be addressed alone and subsequently raise awareness and enlist the necessary support from the public sector.

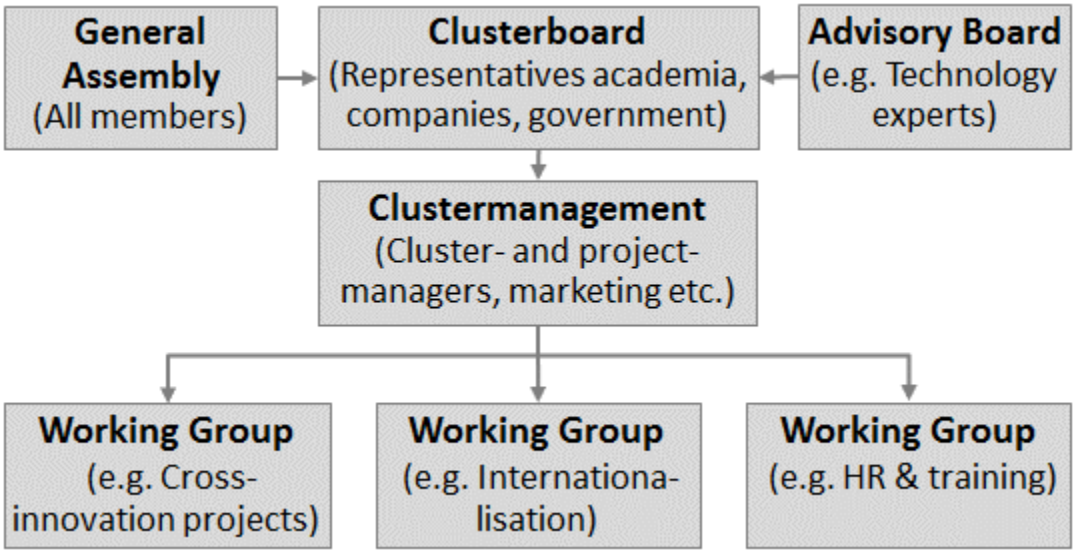
2.3 Key features of cluster programmes

Cooperation-based cluster programmes focus on facilitating the development process of (emerging) clusters, on improving the environment for cluster success and on maximising the impact of clusters. They aim at creating and exploiting benefits at the company, regional and national economy level.

Drawing from international experience, cluster strategies comprise three dimensions:

1. **Regional cluster management structures:** According to international experience, regional cluster management structures form a central element of cluster programmes. Typically, programmes provide technical and financial assistance for setting up those structures. The portfolio of services and activities of those cluster-specific organisations typically comprises areas, such as Information and cooperation platforms, business development and internationalization, skills development, innovation and start-up support and cluster marketing.

Figure 1 Typical structure of regional cluster management organisations



Regional cluster management organisations integrate the key stakeholders and competencies. As shown in figure 1, in addition to the operative cluster management, the organisational structure often contains a cluster board which consists of representative from companies, (local) government, research and educational institutions. Depending upon the strategic focus, some models also comprise advisory boards with technology experts. Working groups are considered to be an important tool not only to involve cluster members but also to stimulate cooperation.

2. **Coordination at the national / cross-cluster level:** In addition to the support for regional cluster management structures, programmes usually comprise a coordination and exchange mechanism to ensure a consistent and integrated approach, to generate synergies between the regional clusters and to involve key stakeholders at the national level. The functions include amongst others public relations for the entire cluster programme, organizing trainings for regional cluster management organisations, facilitating knowledge transfer between regional clusters, international networking, monitoring/evaluation and providing policy advice on cluster development and related policy areas**.**

3. **Aligning related policy areas and instruments:** Cluster development requires an integrated approach. To improve the environment and framework conditions for cluster development,

related policy areas and instruments need to be aligned towards the selected strategic clusters. Amongst others, the areas investment and export promotion, investment incentives, industrial infrastructure, entrepreneurial development and education/training are of relevance to maximize the impact.

It should be noted, that the definitions and descriptions above relate to mature clusters and fully-fledged cluster programmes. Obviously, clusters do not develop overnight and it takes time until the effects of cluster programmes begin to unfold. Not all features mentioned have to exist right from the beginning. However, it should be realistic in the medium-term that the scope of dimensions and instruments can be implemented in line with the potentials and characteristics of the (emerging) clusters.

3 Preconditions and potentials in Moldova

3.1 Necessary preconditions for cluster development

International experience indicates that, in principle, the cluster approach can be used to address a number of major challenges related to managing structural change in Moldova. Various countries and regions have successfully leveraged clusters to increase the efficiency of policies and instruments in areas which are also of strategic importance in Moldova, such as:

- Investment attraction and entrepreneurship development
- Export promotion and diversification
- Innovation and upgrading
- Skills development and job creation.

However, experience around the globe also shows that not every concentration of companies can be developed into a cluster. Certain preconditions have to be met which relate in particular to the structural characteristics of the specific (emerging) clusters as well as to the general framework conditions for cluster development in a country or region.

With respect to the cluster-specific preconditions, the (emerging) clusters need to have a significant innovation, internationalisation and employment creation potential. This requires a critical mass and sufficient concentration of players with related activities and interests to generate synergies and spill-over effects. A balanced mix of SMEs and large anchor companies complemented by specialised service and training providers as well as academic and research institutions provides a sound basis. Cluster support efforts aimed at industries which are geographically too widely dispersed are not likely to generate the desired impact.

Clusters vary in terms of their size and geographic boundaries. There is no clear rule in this respect. However, some lessons from international experience are widely applicable: A major success factor for cluster development relates to geographic proximity which is important for lowering transaction costs, sharing information, interacting with customers and benefitting from specialised factor markets (e.g. labour, capital, technology). Personal contacts are key in this respect. Typically, cluster members accept traveling times of up to approximately one hour – in specific cases also more. So, the core region of a cluster typically has a radius of not more than 50 km. Clusters often have a local centre or nucleus with a high concentration of players – such as a science and technology park or a special economic zone.

Table 2 Cluster-specific preconditions

Category	Preconditions
Internationalisation	• Potential to attract foreign investment - (High) visibility - Tangible benefits and convincing arguments for investors - Promising investment potentials • Potential to increase and diversify exports
Employment and skills development	• Potential to generate substantial and sustainable employment effects covering a wide spectrum of qualifications • Potential to upgrade the skills base • Potential to develop collaborations between companies and vocational training centres or universities
Innovation and upgrading	• Potential to foster innovation activities promoting … - linkages between companies and universities / research institutions - collaborative innovation activities of companies • Potential to upgrade value chains • Potential of spill-over effects in related industries
Critical mass and cooperation climate	• Critical mass and sufficient geographic concentration of players • Balanced mix regarding size and ownership • Interest in collaborative cluster development efforts

Clusters need a certain minimum membership – in quantitative and qualitative terms – to generate synergies, to offer a needs-oriented service portfolio and to create awareness beyond the region. Enough members are also important to ensure financial sustainability as – at least in the medium term – revenues from membership fees and income from cluster services should provide a major source of funding of a cluster. The size of clusters also tends to vary between industries. While in knowledge-intensive areas – such as biotech or nanotechnology – also smaller clusters can be found, as the specific expertise of the businesses and the research institutes plays a major role, clusters in manufacturing industries – such as automotive or food industry – tend to be larger. Clusters with more than 100 members are not uncommon in those areas. In principle, to become viable, a cluster initiative should to be able to attract at least 25 members.

To unlock the potential, cluster development requires shared interests and a willingness to collaborate between the players. Successful clusters are characterised by common challenges and opportunities (e.g. technology- or market related) and a variety of formal and informal relationships.

In addition to the cluster-specific factors, a number of general framework conditions for cluster development have to be fulfilled: Cluster development requires an integrated approach. It should not be pursued in isolation. Cluster development needs to be integrated into the industrial and innovation policy framework. To maximize the impact, it is important to align related policies and strategies accordingly and to ensure a coordinated intra-governmental approach. Cluster development is not the domain of a single department, agency or ministry.

Strong linkages between the government, academia and businesses represent another key success factor. Trust needs to be built between those partners which often requires a step-by-step approach starting with small projects. In this context, it is also important that all players have a sufficient understanding of the rationale and benefits as well as the suitability and limitations of the cluster approach and the underlying division of roles. Finally, although cluster development requires rather

limited resources compared to other policy areas, still there is need to ensure a base public funding in particular in the start-up phase to generate a lasting impact.

3.2 Relevant experience and cluster potential in Moldova

The outlined cluster-specific and general preconditions need to be considered in the design of a cluster strategy and corresponding support mechanisms. Hereinafter, the cluster potentials and relevant experience in Moldova will be reviewed against those preconditions derived from international good practice.

In recent years, a number of cluster-related measures have been initiated in Moldova at the strategic and operational level which should be taken into account in an assessment of the cluster potential. These include, amongst others:

- The Government has adopted a concept – "**Concept for Cluster Development in the Industrial Sector"**. Based on international experience, the concept describes the objectives of cluster development in Moldova. It also comprises a brief assessment of the general and industry-specific potentials and an outline of key measures (including legislation, training and promotional activities) required for the implementation.
- Between 2012 and 2014 the Ministry of Economy participated in the project **"ClusterPoliSEE: Smarter Cluster Policies for South East Europe"**. As part of the project, 11 different SEE countries jointly developed a learning platform that aims at improving cluster policies through cooperative learning and information exchange.
- A number of **programmes of international cooperation partners** and donors have been implemented or initiated that **address industry-specific innovation and competitiveness issues**. For instance, a new USAID programme focuses on strengthening product quality, innovation, export promotion and the institutional environment in - amongst others - the **wine, tourism, light and IT industry**. Cluster-oriented trainings for companies and public officials have been also carried out in the past.
- Targeting the **IT industry**, a combination of **target-group specific incentives** as well as industrial infrastructure projects (virtual and physical IT park) has been initiated. On the basis of a PPP project involving the Technical University, the association of the IT industry ATIC, USAID and private companies, an **IT Excellence and Innovation Centre** is under construction in Chisinau. It will provide training courses, certification programmes, accelerator programmes and co-working space. Furthermore, the private company **StarNet plans an IT park**. Key features comprise an incubator and accelerator as well as a training centre and facilities for established companies.
- In the **automotive industry**, Moldova has successfully attracted **major investment projects**. In the context of the investments by Dräxelmaier and Gebauer & Griller in the Free Economic Zone of Balti, measures have been implemented focusing on **infrastructure and skills development as well as on value chain upgrading**. Based on collaborative efforts facilitated by the zone management, needs-oriented training courses and university programmes have been developed. A "Berufsakademie" combining dual and academic education is planned in cooperation with the Technical University Illmenau and the Berufsakademie Eisenach for the sub-zone in Straseni. In addition, qualification schemes for potential suppliers of the foreign investors have been introduced.

- **In the light industry**, various programmes have been implemented aiming at **upgrading the domestic companies and strengthening collaborations with academia** (e.g. ZipHouse Center of Excellence at the Technical University of Moldova).
- The Innovation Agency **AITT supports collaborative R&D and innovation projects** between businesses and academic institutions with grants and innovation vouchers amongst others in the areas of **nanotechnology, renewable energy, agriculture and food processing**. AITT also coordinates a **network of academic incubators and science parks**. A number of so-called **scientific-technological clusters** has been set up in recent years, focusing mainly on preparing proposals for forming parks and incubators (e.g. cluster "Academia", cluster in microelectronics and nanotechnology, cluster in ecology and agriculture, cluster in nanotechnology and IT technologies, cluster of entrepreneurial innovation incubators). Most of those have five or less partners. The initiatives are mainly driven by academic and research institutions. Involvement of the private sector is rather low. Furthermore, AITT has signed a Memorandum of Understanding on co-operation in the field of the agro-industrial clusters within the Danube Region countries.

While those initiatives touch upon various aspects of cluster development, there is yet no institutionalised cluster in Moldova that covers the range of services and comprises a membership structure similar to successful clusters at the international level. Drawing from the mentioned initiatives, preliminary research and the interviews carried out, in particular the following areas can be identified that could be targeted by cluster-oriented measures in Moldova:

- **Automotive with a focus on the FEZ in Balti:** Building upon major investments in the areas of wiring components and systems, measures could aim at extending value chains (e.g. electronics, injection moulding, metal components), skills development and fostering linkages between foreign investors and domestic suppliers.
- **IT with a focus on Chisinau:** Building upon the projects mentioned above, cluster development measures could focus on developing the innovation-oriented ecosystem (e.g. strengthening linkages between businesses and academia, promoting spin-offs and start-ups, training and skills development) and upgrading the industry profile.
- **Wine with a focus on the wine region(s)**: Building upon existing structures and initiatives (e.g. National Office for Wine, National Wine Fund), cluster development measures could focus on areas such as quality management and internationalization fostering linkages to other wine clusters or centres of excellence abroad.
- **Light industry focusing on different regions reflecting the more widespread geographic distribution:** Building upon a longstanding industrial tradition and various competitiveness enhancement schemes (e.g. by USAID), cluster development measures could focus on strengthening business-academia partnerships, on upgrading business models and developing new fields of application, e.g. in the automotive industry
- **Fruit and vegetable processing focusing on Edinet Industrial Park:** Building upon the existing concentration of processing companies, cluster development efforts could focus on upgrading value chains and strengthening linkages between food processing and agriculture.

In addition, a number of (emerging) “micro-clusters” have been identified in the interviews focusing in particular on unlocking cross-innovation potentials. Mostly, those build upon collaborative R&D and innovation projects, e.g. in the fields of nanotechnology and new materials, food processing and applications of renewable energy technology in agriculture.

However, the majority of areas identified above only partly meet the necessary preconditions for a broad based cluster approach. In particular, key criteria related to the critical mass and regional

concentration as well as the innovation, investment attraction and job creation potential cannot be fulfilled posing major challenges for cluster development measures.

From today's perspective, amongst the areas identified, the IT and automotive industry seem to offer the most promising cluster potential. Both industries are export-driven and have a strong track-record with respect to investment attraction and job creation. They are characterised by strong international linkages and could meet the requirements regarding the critical mass at the regional level. First collaborative measures have been initiated in both industries. However, more in-depth research would be needed to analyse the structural characteristics and cooperation climate/interests in those industries. As the automotive industry is strongly driven by foreign investments, particular emphasis should be on assessing the potential for collaborative innovation activities and linkages between foreign companies and domestic suppliers.

Furthermore, a number of challenges at the cross-cluster level and in the general framework conditions need to be considered in the design of a cluster strategy: Linkages between government, business and academia are still rather weak. Many actors are not (fully) familiar with the cluster approach and their roles within it. As highlighted in the interviews, intra-governmental coordination is not yet sufficiently developed. For instance, as one example mentioned, there are three different legal frameworks for incubators and technology/industrial parks governed by three different ministries limiting the potential for synergies. There is also no common vision for cluster development between the stakeholders involved and the necessary legal framework is missing. Finally, as confirmed by the interviews, financial sustainability poses a major challenge for cluster development. Considering previous experience, interview partners were rather sceptical if companies would be willing and able to co-finance cluster development activities. Due to the strained public budgets in Moldova, the financing model would need to strongly rely upon international funding.

4 Roadmap for introducing a cluster-oriented approach in Moldova

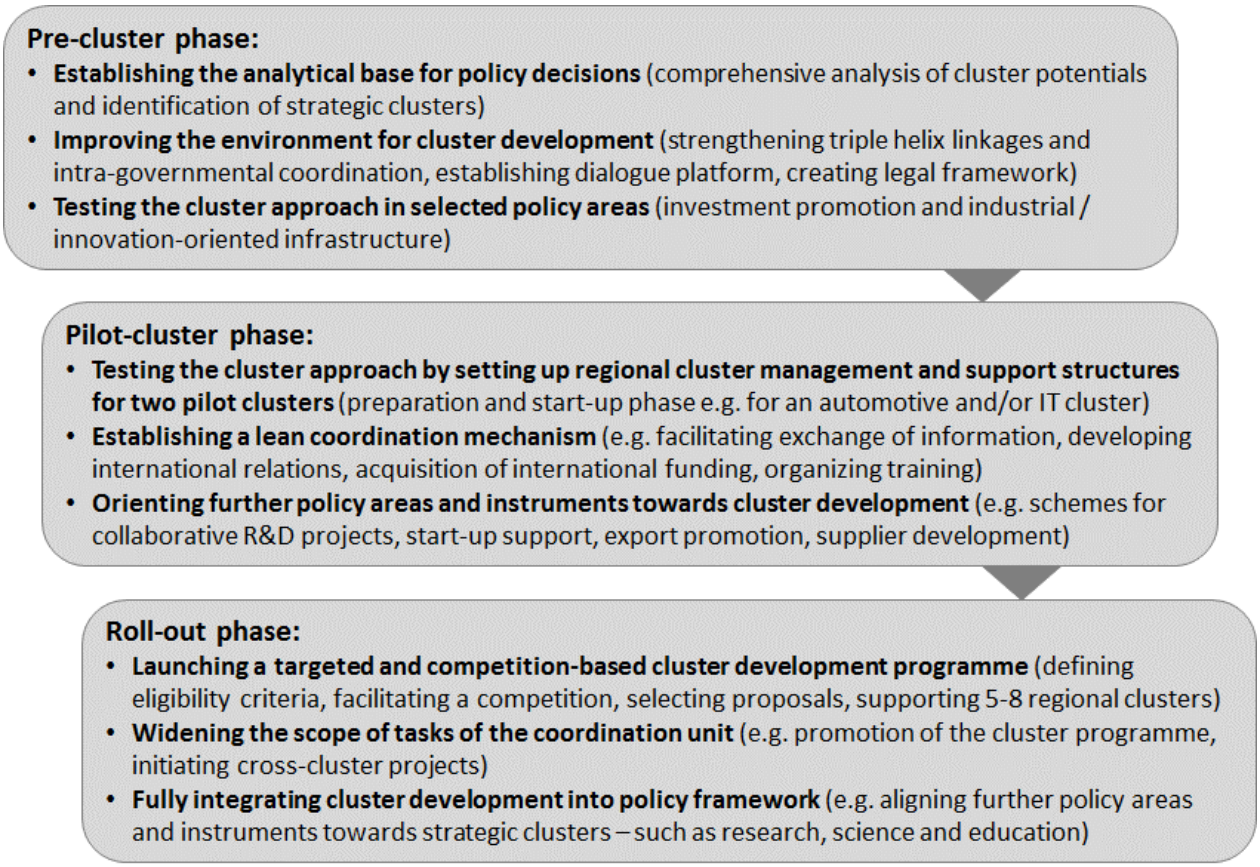
Considering the findings on the cluster-specific and general preconditions and potentials, a phased introduction of a cluster-oriented approach seems advisable. From a cost-benefit perspective, implementing a broad-based cluster initiative in Moldova straight away including setting up stand-alone regional cluster management structure on a large scale does not appear to be promising.

A number of countries has successfully utilized a phased approach, e.g. addressing the different dimensions or policy areas step-by-step. In the case of Moldova, a cluster-oriented approach should be introduced with the three phases (1) pre-cluster phase, (2) pilot-cluster phase, and (3) roll-out phase.

Each time, before a new phase is entered, the interim results should be critically reflected in order to decide if the process should be continued or if alternative strategic options offer more promising opportunities. For instance, if the regional concentration and cluster potential has not reached the necessary level yet, the focus could be shifted to a more sectoral approach aiming at increasing the critical mass with targeted investment promotion and entrepreneurship development measures. If the concentration at both the regional and sectoral level is not sufficient, more emphasis could be placed on the horizontal dimension of industrial policy. Measures could for instance aim at strengthening the innovation system without a strong sectoral or spatial focus. There are various strategic options how to balance the horizontal, vertical and spatial dimension of industrial policy.

Figure 2 below provides an overview of the key elements of the proposed phases, which will subsequently be explained in further detail.

Figure 2 Phases for introducing a cluster-oriented approach in Moldova



4.1 Pre-cluster phase

A comprehensive cluster analysis should form the starting point of this phase. The objective of the analysis is to validate, amend and specify the findings of the preliminary research on the cluster potentials and to identify further (emerging) clusters which could be promoted. Chapter 5 on the way forward elaborates the proposed methodology in closer detail.

As highlighted in the interviews, efforts to improve the environment for cluster development should form another key element of the initial phase. Main emphasis should be on fostering collaboration between the triple helix actors and on strengthening intra-governmental coordination. Programmes to stimulate and incentivize collaborative R&D and innovation projects between academia and businesses should be expanded (e.g. grants or soft loans). This could be complemented by further measures aiming at reshaping the research sector and aligning it closer to the needs of businesses (e.g. changes in the regulatory and financing framework, industrial PhD programmes etc.).

A dialogue platform should be set up ("cluster or triple helix council"), comprising high-level decision makers from the relevant ministries/agencies, local authorities as well as academia and the business community. The platform should serve – amongst others – to:

- Exchange information and experience with respect to market- and technology-specific trends
- Coordinate cluster-oriented activities of the actors
- Refine the road map for introducing a cluster-oriented approach.

At later stages, the scope of tasks could be widened. As a key initial task, a concept for the integration of the different frameworks for zones, parks and incubators should be developed aiming at generating synergies between the scientific-technological and industrial dimension. Furthermore, the necessary legal framework for cluster development should be established at this stage.

Furthermore, a process of orienting relevant policy areas and instruments towards cluster development should be initiated. Taking into account international experience, investment promotion could be used to test this approach. Many countries and regions have successfully leveraged clusters to increase the efficiency of their investment promotion efforts. Against this background, the German Economic Team Moldova currently reviews the target groups and promotion activities aimed at investments from the automotive industry. The main objective of this review is to identify target groups of investors which could contribute towards an extension of the existing value chains and a cluster-oriented development process. Depending upon the results and experience gained from the review of the automotive sector, the method could be utilized for further sectors.

In addition to investment promotion, existing policy instruments like free economic zones, industrial parks, science and technology parks and incubators could be used as a test-lab for the cluster approach. From today's perspective, in particular the Free Economic Zone of Balti (automotive) and Ungheni (light industry) and the IT park projects in Chisinau offer a promising potential in this respect. A quick scan, based on expert interviews and a review of available planning documents and statistics, could be carried out to determine which (further) projects could contribute towards a cluster-oriented approach.

4.2 Pilot-cluster phase

Depending upon the outcome of the first phase, the main focus of the pilot-cluster phase would be on setting up cluster management structures at the regional level which facilitate and support cooperation-based innovation and internationalisation processes in one or two pilot clusters. Taking into account the findings of the preliminary research carried out, it seems advisable to start the cluster development process with a limited number of pilot clusters before planning and decision-making processes with respect to the roll-out of a larger scale programme are initiated. Pilot initiatives creating tangible benefits can make an important contribution towards raising awareness and motivating stakeholders. They also help to gather first-hand experience – e.g. regarding needs, suitable services, institutional and funding mechanisms – which would be helpful for the next steps.

As already mentioned, from today's perspective, the IT and automotive industry seem to be suitable candidates to test the cluster approach considering in particular their internationalisation and growth potential as well as their regional concentration. However, the selection should be validated based upon the comprehensive cluster analysis carried out in the previous phase.

Considering international good practice, as illustrated in the example from the IT cluster in Lviv (Ukraine) below, cluster management structures should be supported in the pilot cluster(s) covering the following range of services and activities:

- **Information, matchmaking and cooperation platforms** (e.g. regular dissemination of market-/ technology-related information, networking events)
- **Business development and internationalisation** (e.g. trade fair visits, B2B matchmaking, export networks, joint approach of potential customers, participation in international projects, twinning with similar clusters abroad)
- **Development and upgrading of skills base** (e.g. tailored training programmes, job exchanges and fairs, collaborations between companies and schools / universities)

- **Start-up and innovation support** (e.g. identification of partners and funding sources for collaborative innovation / R&D projects, initiating incubators or accelerators, initiatives to strengthen science-industry linkages)
- **Cluster marketing** (raising awareness of the cluster and its members at the regional, national and international level, e.g. website, newsletter, cluster atlas).

Cluster Example: Lviv IT Cluster

The Lviv IT Cluster has been established in 2011 based on the competitiveness strategy developed for the city. The membership comprises about 35 companies employing 7,000 employees as well as local universities and government institutions which cooperate in the following areas:

- ***Promotion:*** *The Lviv IT Cluster is a partner and organiser of several events. Amongst others, it organises the Lviv IT Arena which is with more than 1,000 participants and 100 speakers one of the largest IT conferences in Ukraine. Furthermore, as part of the Lviv IT Tour, a roadshow with conferences in Kyiv, Vinnytsia, Dnipropetrovsk, Kharkiv and Odessa has been carried out. Members benefit from the promotion and loyalty programme Lviv IT Club which is supported by 200 partners and offers discounts on accommodation, traveling, flight tickets and other services.*
- ***Education:*** *Every year, the Lviv IT Cluster supports an IT Competition at schools in collaboration with Lviv City Council and Lviv Polytechnic. The project IT Expert aims at modernising the curriculum of programmes at Lviv Universities. Together with Lviv Business School, a new master programme in technology management has been developed. With respect to recruitment, cluster members benefit from a unique database of Lviv IT School graduates.*
- ***Infrastructure:*** *The cluster develops innovative housing projects, e.g. the IT House offering 72 apartments, underground parking and a roof terrace to be completed in 2017.*
- ***Business development:*** *The Lviv IT Cluster has a representative office in Poland which helps member companies to open offices in EU countries and provides visa support. A law committee comprises lawyers of cluster members. It provides assistance to companies in legal matters and develops recommendations on current legislative and regulative issues in Ukraine. Furthermore, the cluster provides market related information, e.g. research on the Lviv IT market and industry.*

The cluster is organised in the legal form of an association. The cluster management has currently eight employees and is financed by membership fees and paid services.

Under efficiency and sustainability considerations, a lean organisational model for the regional cluster management structures seems advisable. We recommend contracting an existing organisation for the cluster management unit. The selected organisation should have strong ties to business and investment attraction process. For instance, in Germany a number of regional development agencies have been appointed to take over this function. It would be a viable option in Moldova to contract an industrial park or FEZ management, an association or provider of innovation support services for the regional cluster management. In this constellation, the cluster management has direct access to the expertise of the host organisation. In any case, it should be avoided that the cluster management duplicates competences or services already offered by other stakeholders in the region. Considering international experience, we also advise against placing the regional cluster management within a ministry of government agency.

However, there are some key requirements concerning cluster management structures which have to be taken in consideration in the organisational design and in particular in the case that existing institutions are contracted: The most important requirement relates to the triple helix model which should be

reflected in the organisational design. The key stakeholders from the business community, academia and the government need to be integrated.

Those aspects need to be considered in the organisational design. Many cluster initiatives have successfully used combinations of cluster or advisory boards, cluster assemblies or working groups in their organisational structure to integrate the triple helix actors and stimulate cooperation between them. Furthermore, it needs to be ensured that the portfolio of services and activities is in line with the needs of the cluster members and the cluster development strategy. It should be avoided that the portfolio is too strongly influenced by the host organisation.

Funding could be provided for the preparation phase (approximately 6 months) as well as for the set-up phase (approximately 36 months). During the preparation phase technical assistance could be offered covering the following tasks:

- **Needs analysis / cluster diagnostics** (e.g. carrying out a survey and workshops to identify key needs and priority areas for collaboration, developing a baseline for monitoring and evaluation)
- **Vision building** (e.g. formulating with the stakeholders a shared vision for the overall cluster development path, defining strategic objectives)
- **Action planning** (e.g. translating the vision and objectives into concrete activities, defining the services and instruments of the cluster management)
- **Organisational concept** (e.g. defining the institutional set-up, division of roles and core processes, selecting the host organisation, formulating terms of reference, preparing the necessary contracts / legal framework, developing job descriptions)
- **Monitoring and evaluation concept** (e.g. identifying information needs of stakeholders, defining key performance and impact indicators, data collection methods and reporting processes).

Figure 3 Key activities, eligible costs and estimated funding needs for the support of pilot-clusters

Timeline	Preparation phase 6 months	Start-up phase 36 months	Growth phase (as needed) 24 months
Key Activities	• Needs analysis / cluster diagnostics • Vision building / action planning • Organisational / M&E concept	• Setting up cluster management • Implementation of the action plan • Delivery of services	• Refining/extending action plan and service portfolio • Continued implementation • Planning/initiating special cluster projects
Eligible Costs	• Studies and technical assistance (e.g. specialized service providers)	• Salary of a cluster manager • Office space • Costs related to activities such as information and cooperation platforms, trade fair visits, training offers	
Funding per cluster	EUR 25,000	EUR 150,000	Reduced rate (e.g EUR 75,000)

For the preparation phase, a budget of approximately EUR 25,000 per cluster would be needed to cover the external costs for studies and technical assistance.

During the start-up phase, the setting-up of the cluster management (e.g. recruitment and training) as well as the implementation of the action plan and delivery of the services should be supported. As

mentioned, the support should be based on a lean model that generates synergies with the host organisation. Therefore, funding should be provided for the salary of only one cluster manager as well as for the costs of an office and a basic set of services (e.g. information and cooperation platforms, trade fair visits, training offers). Considering those costs, the necessary funding volume for the preparation phase is estimated at approximately EUR 150,000 per cluster for the three year start-up phase.

Furthermore, since it sometimes takes more than three years until a cluster management can operate on a self-sustaining basis, it may become necessary to support the cluster at a reduced rate throughout the growth and consolidation phase of approximately an additional 24 months.

In addition to the regional cluster management structure, a lean coordination and exchange mechanism should be integrated to generate synergies between the regional clusters (e.g. facilitating exchange of information and experience, developing international relations, acquisition of international funding, organising training for cluster organisations etc.). Those tasks could be taken over by a senior official at a ministry or agency with the support and advice from the dialogue platform ("cluster or triple helix council") established during the pre-cluster stage. For external costs (e.g. organisation of trainings, participation in international events), a budget of approximately EUR 25,000 p.a. would be needed.

As a third key element of this phase, the process of orienting relevant policy areas and instruments towards cluster development should be continued. Based upon the findings from cluster analysis, strategic clusters could be defined at the national level. Projects in those strategic clusters could receive preferential treatment in funding programmes (e.g. in the form of a top-up or a reserved share of the funding volume) in particular in the following areas:

- Schemes supporting (collaborative) R&D and innovation projects
- Financial assistance for innovation-oriented start-ups
- Export promotion programmes
- Programmes supporting SMEs to reach international standards.

4.3 Roll-out phase

Depending upon the results and experience made during the pilot-cluster phase, the roll-out of a targeted cluster development programme could be initiated. A combination of a top-down and a strong bottom-up approach should be used. The Government could define – in consultation with the key stakeholders – a framework and eligibility criteria (e.g. membership size and structure, offered services, outcome targets) for a competition-based cluster programme targeting the defined strategic clusters. Interested teams from the regions (comprising the private / public sector and academia) could jointly apply for the funding.

The dialogue platform ("cluster or triple helix council") could be developed into a steering committee at the national / cross-cluster level. In addition to the selection of the clusters to be funded, the functions of the committee could include refining the cluster strategy, supervision of the coordination unit, monitoring the performance of the regional clusters and the use of public and international funding. Furthermore, the committee could play an important role with respect to a policy advice function representing an interface to the government and strategic stakeholders. At the same time, the spectrum of tasks of the coordination unit could be widened with the increased number of participating clusters. More emphasis could be placed on the promotion of the programme, on facilitating the knowledge transfer between the regional clusters and initiating and coordinating cross-cluster projects.

Based on the assumption, that the funding conditions and the volume per cluster would be similar to the previous phase and that 5 to 8 regional clusters are supported, a programme volume of between

approximately EUR 1 million and 1.5 million would be needed for a 3.5 year period covering the preparation and start-up phase. This estimate also takes into account an increase of the budget for the cluster coordination.

The programme should be based on a new allocation of roles between the private and public sector and between government levels. The role of central government should focus on:

- Acquisition of (international) funding for the programme
- Facilitating a competition based funding procedure, defining eligibility criteria for participating regional clusters
- Taking up ideas for business environment reforms identified in the process.

The actual cluster activities should be driven by the actors in the regions and in particular the private sector. The efforts should generate tangible benefits which motivate the private sector to co-finance activities. Commitment from government is of critical importance - to convince companies to buy in. However, government should take over the role of a facilitator and participant, not of the leader.

As a second element of this phase, cluster development should now become fully integrated into the policy framework. Drawing from the experience made during the different phases, further policy areas and instruments should be aligned towards the strategic clusters (e.g. science and education).

5 Way forward

Based upon the findings and conclusions from the preliminary research, a roadmap for a phased introduction of a cluster-oriented approach has been developed. As already mentioned, each time before a new phase is entered, the interim results should be critically reflected in order to decide if the process should be continued or if alternative strategic options offer more promising opportunities.

As a first step, a workshop with the key stakeholders (relevant ministries / agencies at the national level, representatives of local government, academia and the business community) should be organized to:

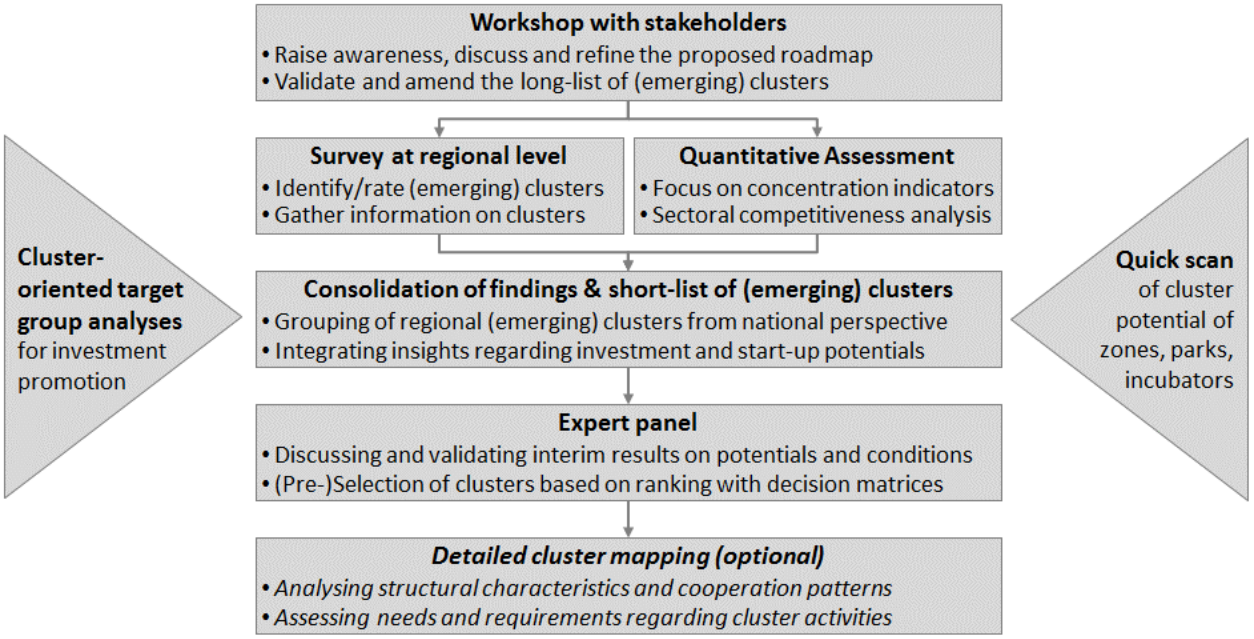
- Discuss and refine the proposed roadmap with its key phases, design features and assumptions
- Raise awareness and assess the interest to participate amongst stakeholders
- Validate and amend the long-list of (emerging) clusters which could in principle be supported

Building upon the results of the workshop, a comprehensive analysis of the cluster potential should be carried out combining quantitative and qualitative methods. While quantitative methods represent a rather top-down approach for the identification and selection of clusters, qualitative methods tend to be more bottom-up promoting stakeholder involvement.

The comprehensive analysis aims at:

- Developing a shared and grounded understanding of the (emerging) cluster-landscape with its strengths and weaknesses
- Identifying the needs and opportunities for cluster development
- Creating the analytical base for prioritizing policy efforts and justifying further policy and funding decisions.

Figure 4 Next steps – work programme for a comprehensive cluster analysis



As the starting point, telephone interviews or a written survey could be carried out amongst local/regional development officials and/or the regional branches of the chamber of commerce and industry. The purpose is to obtain an overall picture of the types and geographic concentration of (emerging) clusters in the regions and to ensure that the regions are closely involved.

Participants could be asked to identify and rate the development potential of (emerging) clusters in their regions. In addition, they could be asked to provide further information on the identified (emerging) clusters, such as anchor companies, relevant universities and research institutes as well as data on structural characteristics, such as estimates of employment and turnover. As needed, additional semi-structured interviews with regional experts could be conducted to validate and specify the findings.

The survey could by complemented by a basic quantitative assessment of the (emerging) cluster landscape at the regional and national level. The regional statistical analysis should focus on concentration indicators, in particular localisation quotients. The localisation quotient compares an industry share of total employment or turnover in a given region to the industry's total employment or turnover of the whole geographical area. Furthermore, a brief sectoral competitive analysis at the national level using common quantitative performance and trend indicators related to growth, employment, exports, R&D and investment as well as an international comparison (e.g. referring to sources such as the European Cluster Observatory) could be integrated.

The findings from the survey and the assessment of available statistics could be discussed with an expert panel which could be recruited from the first stakeholder workshop. At this stage, also the results from the already mentioned target-group analyses and quick scans carried out in the areas of investment promotion and industrial infrastructure development could be integrated into the assessment. These could provide helpful insights with respect to the investment and start-up potential of different clusters.

The identified (emerging) clusters could be grouped at the national level (e.g. subsuming regional clusters in the light industry). For a (pre-)selection of the most promising (emerging) clusters, the expert panel will rank the identified clusters on the basis of a decision matrix covering criteria, such as the innovation and upgrading potential, cooperation climate and existing linkages, balanced mix of companies or the competitive position of the business and scientific landscape.

As needed, a more detailed mapping could be carried out analysing the structural characteristics (e.g. presence of anchor companies, role of SMEs and start-ups) as well as the forms of cooperation, the institutional integration, transaction and communication relationships of the identified (emerging) clusters. The derived cluster profiles would also include the level of maturity and support needs as well as an overview of the key value chains and a summarizing SWOT analysis. However, it should be noted that in-depth cluster diagnostics would also form part of the actual support for clusters during the next phases bearing the risk of duplication of efforts. Therefore, the detailed mapping should only be carried out if needed at this stage for an informed decision on the way forward.

Depending upon the results of the comprehensive analysis and the stakeholder and expert consultations, the next steps outlined in the roadmap should be initiated (e.g. improving the environment for cluster development, testing the cluster approach in selected policy areas).

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