LET'S MAKE A PERFECT CLUSTER POLICY AND CLUSTER PROGRAMME

SMART RECOMMENDATIONS FOR POLICY MAKERS

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1. I NTRODUCTION AND CHALLENGES

1.1 INTRODUCTION

History proves that humanity is ready for cooperation and it has a claim on cooperation. To put it simply, the modern enterprise is a typical product of contemporary human cooperation. The relations between the enterprises and the other organisations mean a higher stage in the cooperation's hierarchy. At present, the formation of clusters – the collaboration of small and medium enterprises (SMEs), not only with each other but also with the research sector – can be seen as an opportunity to renew the economy and the society. Recognizing this potential, the further strengthening of clusters and cluster organisations has to be actively supported on regional, national and European levels.

Clusters and innovation networks – mostly the management organisations - are promising and powerful instruments in promoting research, development and innovation which in turn create growth in the fields of employment, productivity and export. Many studies around the world prove the positive impacts of cluster activities on R&D investments, innovation and R&D collaboration. The fact that the return and profit on R&D investments are increasing with this economic instrument confirm that clusters offer a favourable and dynamic business environment which significantly increases competitiveness. In this favourable ecosystem, innovative enterprises can flourish by interacting with different innovation actors and across sectoral boundaries.

Clusters are a key element and instrument of modern innovation policy activities. However, as identified by the NGPExcellence report, "Clusters are Individuals", the traditions and development levels of cluster policies and cluster organisations vary across regions and countries. In some countries cluster policies have been introduced only recently, while in other countries they have been implemented since the 1990s.

In recent years more opportunities were opened for exchange of best practices across countries, cross-border collaboration and for promoting policy convergence across regions and countries. The establishment of international cluster policy collaboration bodies, comparison exercises of cluster policies as well as benchmarking of cluster organisations and programmes has triggered a great leap forward in the development of cluster policies and cluster programmes.

The NGPExcellence report "Clusters are Individuals" published on July 11th, 2011 introduced a principle outline of key features of a perfect cluster programme with respect to the overall strategic set-up of a cluster programme (e.g. alignment with economic development and innovation policy priorities, focus on pockets of excellence and competitiveness, etc.), the target groups, the instruments such as grant funding and technical assistance and the programme implementation.

On December 14th, 2011 a group of policy makers and programme owners from Denmark, Estonia, Finland, Germany, Lithuania, Norway and Poland gathered in Copenhagen for an in-depth discussion. The main question for the workshop was whether any perfect cluster programme actually exists, and if so, what should it look like? Based on the results of this meeting, additional telephone interviews with programme owners from Iceland and Sweden and studying the "cluster-literature" a brand new bunch of ideas about this topic was outlined. These ideas were further refined during a second workshop, which was held in Berlin on February 22nd, 2012, during which cluster policy makers and programme owners from the above mentioned countries participated. On the occasion of the workshop, valuable comments were also provided by Prof. Dr. Christian Ketels of Harvard Business School and Despina Kanellou of the Centre for Research in Innovation Management (CENTRUM) at the University of Brighton. Valuable comments were also provided by Zita Zombori, former head of the Hungarian cluster programme Pólus. Thanks to the thoughts, ideas, comments, interviews, workshops and other meetings, the "Let's Make a Perfect Cluster Programme" was born.

This report moves forward in the field of the development, improvement and fine-tuning of cluster policies and cluster programmes. It reflects the common state-of-the-art thinking of a large number of policy makers and experienced European cluster programme owners.

Cluster organisations are always the result of an organic economic development; therefore, what is introduced in this report will not give comprehensive answers to all challenges that cluster policy makers and programme owners face on a daily basis. It sets up a framework for a more effective and coherent cluster policy based on the knowledge of a number of new studies and analyses as well as of the experiences of excellent cluster organisations and owners of good practice programmes on what works and what does not work.

However, each country has specific traditions of policies, different regulations, cultures and economic circumstances. The report contains what may be regarded by the best possible cluster policies, cluster programmes and cluster evaluation methods. No previous experiences can be directly applied to circumstances and not all elements of "The Perfect Cluster Policy and Cluster Programme" can be fully implemented in all countries. It is better to select the best practice elements of the other programmes examined that could suit the prevailing conditions and thus create a personalised model. However, as economic circumstances are subject to continuous change, what the actors of a model really need is the stability and the stable principles of any model.

It is our hope that this report will be of great assistance to policy makers and cluster programme owners so that they can apply innovative approaches to their respective cluster policies and stimulate new developments.

1.2 CHALLENGES AND QUESTIONS FACED BY CLUSTER POLICY MAKERS AND PROGRAMME OWNERS

Cluster policy makers and programme owners face a large number of challenges and questions while developing and implementing regional or national cluster policies and programmes, including:

1. Since clusters have to be considered to be tools and objectives, what is cluster policy aiming for?

2. What should the overall objectives of cluster policies be and how do cluster policies differ from other innovation policy instruments?

3. Should cluster organisations focus mainly on improved international competitiveness, productivity, innovation and growth or should cluster organisations also face societal challenges and find innovative solutions to major problems within our societies?

4. How can policy makers develop an infrastructure of cluster organisations which are closely connected to other innovative policy instruments? How can the best possible synergies with other research and innovation (infrastructure) instruments be found?

5. How many different cluster organisations and different types of cluster organisations shall be supported by an active cluster policy through cluster programmes? Should the focus be on immature clusters, national champions, world-class clusters, clusters in transition or a combination of these types of clusters?

6. What should the relationship between the different types of cluster organisations and networks be? Is there any optimum size of a cluster organisation and if yes, what is it?

7. Should all types of cluster organisations be supported financially or how should policy makers and programme owners focus public investments?

8. What should the financial profile for the cluster organisations look like and how can the balance between private and public funding be found?

9. How can internationalisation of cluster organisations be better promoted for the benefit of enterprises and research institutions?

10. Should there be a cluster programme for each type of cluster and network and how should the relationship be between different cluster programmes in a region?

11. Should cluster organisations and networks only receive financing for the management of the cluster or should cluster organisations also receive additional funding for R&D and innovation projects?

12. What is the relevance of cluster management excellence and how can cluster management excellence be promoted within a cluster programme?

13. Should cluster organisations also receive technical support as a supplement to financial support?

14. Which is the best way for monitoring, evaluating and measuring cluster policies, cluster programmes and cluster organisations?

15. How should the international benchmarking of cluster organisations and cluster quality labels be placed in cluster policies and cluster programmes?

The report helps to answer these questions and presents state-of-the-art thinking in these areas. The result will be new ideas, thoughts, suggestions and solutions that will outline the elements of a world-class cluster policy and of a corresponding evaluation system.

Let's make a perfect cluster policy and cluster programme!

2. POLICY RECOMMENDATIONS - FUTURE PATHS OF CLUSTER PROGRAMMES AND POLICIES

2.1 FUTURE PATHS OF CLUSTER PROGRAMMES AND POLICIES

Cluster policies and programmes have been mushrooming in European Union Member States over the last two decades. By reviewing the experiences made with these cluster policies and programme initiatives on both national and European levels, such as the NGPExcellence project or the TACTICS project, we have identified lessons learned and areas where there is room for improvement. The importance of cluster management excellence was one of the key lessons learned and, consequently, has become a key element of most cluster programmes and cluster policies in Europe. It will become even more prominent with the introduction of a Quality Label System in the context of the EU-financed European Cluster Excellence Initiative (ECEI).

Today, both representatives from programme agencies and policy makers agree upon that the development of clusters is no longer merely about establishing cluster organisations in the first place, but is also about developing excellent cluster organisations that are internationally competitive and have an impact on national economies.

The broader policy context of the future development of cluster programmes and cluster policy is set on the European level. In 2008 the European Commission called for the development of world-class clusters to maintain and further develop Europe's global competitiveness through better cluster policies, increased transnational cooperation, the promotion of cluster management excellence and the improved integration of innovative SMEs into clusters.[1]

The relevance of clusters for economic development in the European Union was further emphasised in 2010 by the European Commission's communication on future regional policy which highlighted clusters as a key element in smart specialisation strategies. In order to contribute to knowledge and innovation based economic growth, Member States are encouraged to put more emphasis on the smart specialisation of their regions by concentrating resources on a few key priorities and addressing their particular strengths rather than by spending investment thinly across areas and business sectors.[2] On the EU level, cluster development is discussed from a regional policy perspective[3], while at the same time the idea of developing world-class clusters is still pursued.

Clusters play an important role in the context of Research and Innovation Strategies for Smart Specialisation (RIS3):

"Clusters can be used at both the design and the implementation phase of smart specialization strategies. In the design phase, they can be used to identify the industrial strength and assets in a region, to contribute to set strategic priorities and to make the right political decisions. For this purpose, cluster mapping and benchmarking are valuable tools that can be used to identify regional specialisation patterns and compare economic activities, including agriculture, strength with other regions in the EU. In the implementation phase, clusters can be used as efficient platforms that can focus on and quickly contribute to the objectives of smart specialisation. In particular, by fostering cross-sectoral cooperation, clusters can contribute to implement thematic-based strategies by addressing new society challenges and creating new competitive advantages in a region."[4]

It is well-known that Horizon 2020 is a key tool in implementing the Innovation Union flagship initiative which focuses on tackling major societal challenges, maximizing the competitiveness impact of research and innovation and raising and spreading levels of excellence in the research base.[5] It will work towards ensuring broader access, including among others:

- SMEs with dedicated projects to address societal challenges and enabling technologies, and
- all regions with tailored support to policy learning, twinning, networking, complementing Structural Funds.

Horizon 2020 could contribute to Smart Specialization Strategies

- by promoting research priorities that have a strong innovation potential,
- by supporting all forms of innovation including social innovation,
- by promoting SMEs and their efforts toward market access, commercialisation of research results and IPR management,

1. European Commission, 2008: Towards world-class clusters in the European Union: Implementing the broad-based innovation strategy, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of Regions, COM(2008) 652/2 final
2. European Commission, 2010: Regional Policy contributing to smart growth in Europe 2020, Communication of the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2010) 55 final
3. E.g. Büscher, Reinhard/Schierenbeck, Carsten, 2012: Intelligente Clusterspezialisierung – Die Herausforderungen künftiger europäischer Clusterpolitik, in: Wingarten, Joe (ed.): Infrastruktur für Wissen und Wirtschaft. Cluster in Rheinland-Pfalz
4. European Commission, 2012: Guide to Research and Innovation Strategies for Smart Specialisation (RIS3), p.67
5. For further details Horizon 2020, the financial instrument implementing the Innovation Union (one of the seven flagship initiatives of the Europe 2020 strategy for a smart, sustainable and inclusive economy) please see www. http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=home

- by opening up new paths to risk finance,
- by supporting open access to research results, scientific publications and data.

Regions can play a crucial role by implementing Horizon 2020 – on the one hand they can be instrumental in organising local operations, and by preparing and implementing strategies and projects through smart specialization; on the other hand they can liaise with knowledge institutions, industry and clusters to build research and innovation capacity, while providing intelligent assistance to prospective Horizon 2020 participants.

2.2 POLICY RECOMMENDATIONS

Given the fact that cluster organisations should always have a strong regional base and that that these regions differ in terms of their economic circumstances, knowledge and innovation capacity, it is obvious that the integration of the concepts of world-class clusters and the role of cluster organisations for the smart specialization of regions calls for differentiated cluster policy and programme approaches:

1. Analysis demonstrates that cluster programmes are a highly effective instrument in enhancing the innovation capacity of SMEs and promoting research and innovatio collaboration projects, because SMEs can benefit drectly from the collaboration and knowledge of both large companies and research and education institutions within the cluster. Each and every region and/or country with a sufficient industrial or innovative potential should develop their own cluster policy supported by appropriate cluster programmes, since clusters are powerful tools in promoting innovation, RD investments, business-research collaboration and internationalization of enterprises.

2. The cluster infrastructure can be the "glue" that connects the different actors in the innovation system – universities, technology transfer units, RTO's, incubators, etc. – and ensures that research, education, business and innovation actors work in the same strategic direction. Clusters should be developed with the parallel support of a strong and unique infrastructure development that provides a region or a country with a flourishing and prospering ecosystem that meets the needs of enterprises as well as of R&D organisations.

3. The economy is always on the move. In order to keep up with new business challenges cluster governance has to be open to continuously looking for business potentials, not only between cluster participants but with other actors as well. Cluster policies and programmes should ensure and support knowledge exchange and collaboration between clusters with a view to accelerating the dissemination of new ideas, knowledge and technologies between different sectors in the economy. In addition, cluster programmes could be developed as a policy instrument for national and regional grand societal challenges, since clusters are the right arenas for regional or national partnerships where all the relevant public and private stakeholders meet, create and develop common strategies in addressing the challenges and in finding solutions.

4. It is proven and well-known that cluster development is a long-term project. In order to meet specific development conditions, cluster-support should be provided on a long-term basis of (at least) five to ten years. It means that long-term but flexible support of clusters and cluster management organisations with stable principles is required. At the same time governments should ensure that

   - the cluster management organisation has efficient and effective institutional structures and processes in place or the potential to develop them and
   - the cluster as such has a significant potential for development in order to guarantee a high "return on public investment" in terms of economic and societal impact.

5. Cluster programmes need to be designed based on the specific context under which they operate. There are immature clusters, matured clusters (which can be either national champions or world-class clusters) or clusters in transition which are at the crossroads of becoming immature again, experiencing a renaissance or developing emerging industries. It is obvious that depending on the development stage of the cluster there should be different opportunities in a programme that offer different funding schemes, instruments and approaches to develop further a cluster organisation in terms of its cluster management organisation, cluster members and the organisation itself or the framework conditions.

6. Cluster organisations are part of the economy, and are thus constantly on the move. Depending on the age, economic performance, financial sources, subsidies etc. they are at different stages of development. In order to be able to offer corresponding perfectly suited financial and technical support through a cluster programme that corresponds to the development level of the clusters and networks and to further develop their knowledge and innovation capacities, governments need to get a right picture of the cluster organisations as well as which stage they are at. From this point of view, the best way is for governments to support the establishment of a Cluster League where cluster organisations could be "qualified" depending on their industrial developmental stage.

7. The R&D and business development programmes which do not have a specific cluster focus, investment in infrastructure, implementation of regulations that support economic development through the creation of markets for new products and services as well as macroeconomic and fiscal policies for a conductive business environment, should be supported by a cluster programme. Thus, cluster organisations should be developed through an integrated cluster development strategy jointly developed and supported by relevant government departments. In order to achieve a high economic impact with the cluster organisations, the coordinated and joint efforts of a wide range of government departments are required.

8. Innovative services and standards of excellence for cluster management can support the development of excellent cluster organisations with a high impact of cluster activities. Cluster management organisations are very important keys to the development of a cluster. Thus, cluster programmes have to put greater emphasis on cluster management excellence. Quality labelling according to agreed upon standards of ECEI (European Cluster Excellence Initiative) could support cluster managers in the development of new and better cluster services and will create better financing opportunities and improved branding strategies of cluster organisations. Furthermore, excellence labelling could increase the impact of cluster programmes and could improve the methods of benchmarking, monitoring and impact assessment. Cluster policy makers should recognize the European Cluster Quality Label system in their national cluster programmes and policies.

9. The internationalisation of activities in a cluster or of the cluster organisation itself can take many forms – e.g. through bilateral cross-country inter-cluster collaboration (collaboration between cluster organisations from different countries), the creation of European meta-clusters, the acquisition of foreign members, initiating international activities and export promotion, cross-country research and innovation projects, cross-country business-research dating activities, etc. It is proven that most of the cluster organisations have an internationalisation strategy based on the needs of the cluster members, because it is essential to take part in the global exchange of knowledge for the benefit of their members, including SMEs. Therefore, cluster policies and cluster programmes should support the internationalisation of cluster organisations and cluster activities.

10. The Perfect Cluster Policy and Cluster Programme focus on the development of the cluster organisations which suits the business structure and the needs of enterprises in the region or in the country it is operating within. This programme should contain an optimal balance between financial and technical support for the cluster organisations. Policy makers and programme owners have to be in a continuous dialogue with each actor to develop the programme, ensuring synergies with other innovation policy instruments and to support the establishment and development of cluster organisations. Participating in the international exchange of knowledge about cluster policies and cluster benchmarking is a useful learning tool as well.

11. It is important to assess whether investing public money in cluster organisations has the desired impact and also to consider whether investing in cluster programmes is more beneficial than investing in other types of innovation programmes. Based on international best practices, a "perfect system for cluster evaluation, benchmarking, monitoring and impact assessments" could consist of the following three levels and would be able to characterise the evaluation needs of cluster organisations and cluster managers, programme owners and policy makers:

    a) benchmarking and performance statistics of cluster organisations,
    b) cluster programme evaluation and performance statistics of cluster actors and
    c) impact assessments and analyses of cluster policies.

12. Policy makers and cluster policy programme owners have to collaborate on the development of key performance indicators, benchmarking exercises, impact assessment tools and the evaluation of cluster policies since only the improved evaluation methods and impact assessments can improve the measurement of the outcome of cluster policies and cluster programmes. Policy makers and cluster policy programme owners should not be afraid of the results –as they increase their knowledge of the impact of cluster policy and improve the learning circle among policy makers, programme owners and the other actors of the cluster world.

3. THE PERFECT CLUSTER POLICY

3.1 WHY SHOULD GOVERNMENTS SUPPORT CLUSTERS?

Clusters represent an innovation infrastructure consisting of companies, R&D institutions and universities that specialise in a specific industry or knowledge area. The existence of such an infrastructure provides governments with an excellent opportunity to promote economic growth through the support of innovation and R&D activities.

A recent study demonstrates the benefits that companies, gain from participating in a cluster and SMEs in particular:[6]

1. Companies participating in a cluster are far more likely to become innovative than other companies. Statistical analysis shows that companies participating in clusters increase their probability of being innovative by a factor of 4.5 compared to a control group of companies with similar characteristics. Innovation leads to the creation of new products, processes and services in businesses, increasing earnings and at the same time raising the level of knowledge. They will thus make the innovative companies more competitive in the long run, benefiting productivity and growth.

2. Companies participating in a cluster are far more likely to enter into R&D collaborations than other companies. Statistical analysis demonstrates that companies participating in clusters increase their probability of entering R&D collaborations by a factor of 4 compared to a control group of companies with similar characteristics. R&D collaboration has many potential advantages, including e.g. an overall better ability to absorb and translate new knowledge and technology, faster and easier access to knowledge and technology, cost minimisation in research and innovation projects and reducing financial risks associated with long-term research investments.

Participation in a cluster can change the behaviour of a company towards being more innovative for the benefit of economic growth and job creation. Thus, government support should encourage companies to participate in clusters by offering a set of programme and policy instruments. How this could be done is explained in the following chapters.

3.2 THE DIMENSIONS OF A CLUSTER

According to Michael E. Porter "clusters are geographic concentrations of interconnected companies and institutions in a particular field"[7] that compete and collaborate at the same time. Clusters reflect specialisations of regions in activities within which companies can gain higher productivity through accessing external economies of scale or other comparative advantages.[8] The type and degree of regional specialisation and thus the potential for regional development depends on path-dependent processes influenced by regional characteristics of factors such as available resources, level of education and existing industrial structures.[9]

Collaboration in a cluster needs to be facilitated in order to tap the cluster's full potential. Even in a geographic concentration of interconnected companies and knowledge institutions, collaboration in clusters happens rather by coincidence unless it is managed by a coordinating body - a cluster management organisation. And even if there is such a coordinating body, collaboration will most likely not result in projects and flourishing companies if there are not support programmes and conducive framework conditions and, of course, if there is not a market for the cluster's products and services.

From a policy making point of view, the performance and development potentials of a cluster depend on three dimensions which have to be addressed by policy makers through corresponding policy or programme interventions (Figure): [10]

The dimension of framework conditions, which structure the business environment in which the cluster operates: In a competitive environment clusters need to develop within favourable framework conditions that support the activities of cluster participants. There are two types of framework conditions:

a. **Macroeconomic framework conditions:** Stability-oriented macroeconomic policies and fiscal consolidations are necessary macroeconomic framework conditions in order to create jobs, export growth and economic development in clusters.

6. Danish Agency for Science, Technology and Innovation, 2011: The Impacts of Cluster Policy in Denmark – An Impact Study on Behaviour and Economic Effects of Innovation Network Denmark

7. Michael E. Porter, 1998: Clusters and the New Economics of Competition, in: Harvad-Business Review, November 1998, p. 78

8. OECD, 2009: Clusters, Innovation and Entrepreneurship, p. 26

9. E.g. Sunley, Peter/Martin, Ron, 2006: Path Dependence and Regional Economic Evolution, in: Journal of Economic Geography, August 2006, 6 (4), pp. 395-437

10. Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence, Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, p. 12

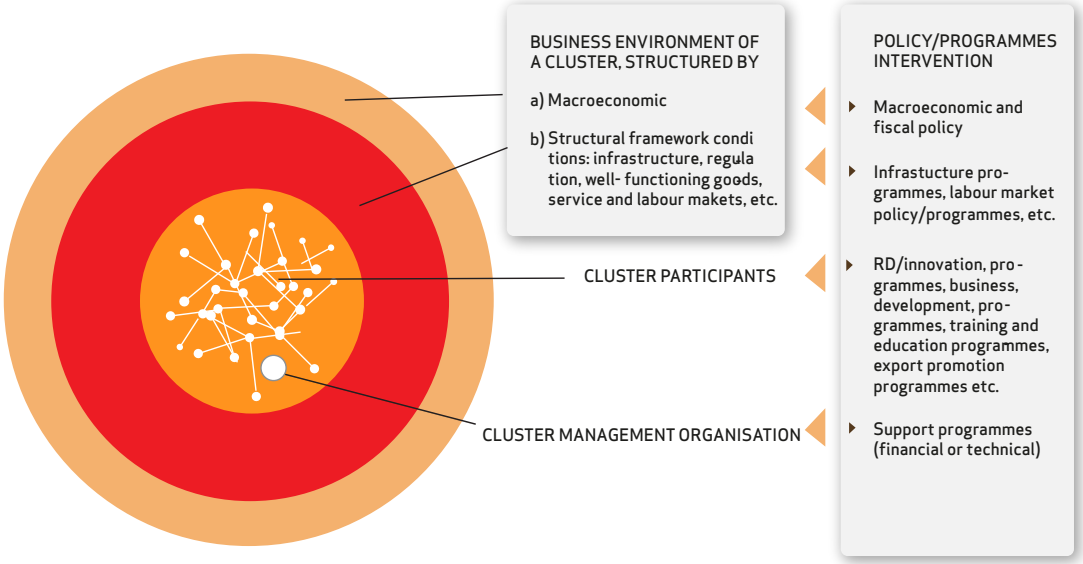
b. **Structural framework conditions, including infrastructure, well-functioning goods, services and labour markets and regulations**: Stable macroeconomic framework conditions are necessary, but not sufficient conditions for economic growth and job creation. Well-functioning markets and the free movement of capital, labour, goods, services and knowledge create dynamic markets which promote favourable growth conditions for a cluster. Well-functioning markets can be promoted through deregulation, but regulation can also create new markets, as well as investments in infrastructure, education, research and technologies. In addition, regulatory issues such as work migration, taxation and competition policy also constitute important structural policy instruments, which have an impact on the development of clusters.

While the macroeconomic framework conditions are common to all clusters in a particular country, structural framework conditions are rather cluster-specific. Clusters in the logistics industry need different structural framework conditions to flourish than biotechnology clusters or renewable energy clusters do.

The dimension of cluster participants: A critical mass of companies and other stakeholders relevant for cluster activities such as research institutions and universities is mandatory for the success of a cluster. The actual size of a critical mass depends on the potential that is represented by the cluster participants. Cluster participants must be willing to collaborate with others on joint R&D and business development projects.

The dimension of the cluster management organisation: In order to facilitate collaboration between the cluster participants, there has to be a strong coordination body - a cluster management organisation. The quality of the cluster management is critical in order to initiate and support collaboration among companies and other relevant stakeholders of the cluster.

Figure 1: Different dimensions of a cluster and corresponding policy and/or programme intervention (VDI/VDE IT 2012)



3.3 IMMATURE CLUSTERS, MATURED CLUSTERS AND CLUSTERS IN TRANSITION

Clusters are networks of interacting companies, R&D institutions, universities and other relevant stakeholders whose activities result in the generation of new knowledge which translates into new products and services as well as innovations in processes, organisations and markets. Clusters are not necessarily limited to administrative or geographical boundaries, but they have a geographical centre. The benchmarking of 143 cluster organisations in seven European countries in the context of the NGPExcellence project has shown that typically 75 to 95 per cent of the cluster participants are located within a distance of 150 kilometres from the cluster management organisation, which can be considered as the "node" of the cluster (Figure 2).[11]

Geographical proximity of cluster participants is very important as the closer these players are located to each other, the more likely there is interaction between them and the chance of mutual trust building between them is much higher. Modern ways of communication, particularly structured by the Internet, have made communication much easier, but nothing beats face-to-face interaction when it comes to the development and implementation of projects, particularly if problems need to be solved. Personal interaction matters a lot in this regard as it contributes to trust building between project partners, which is a mandatory resource for successful projects.

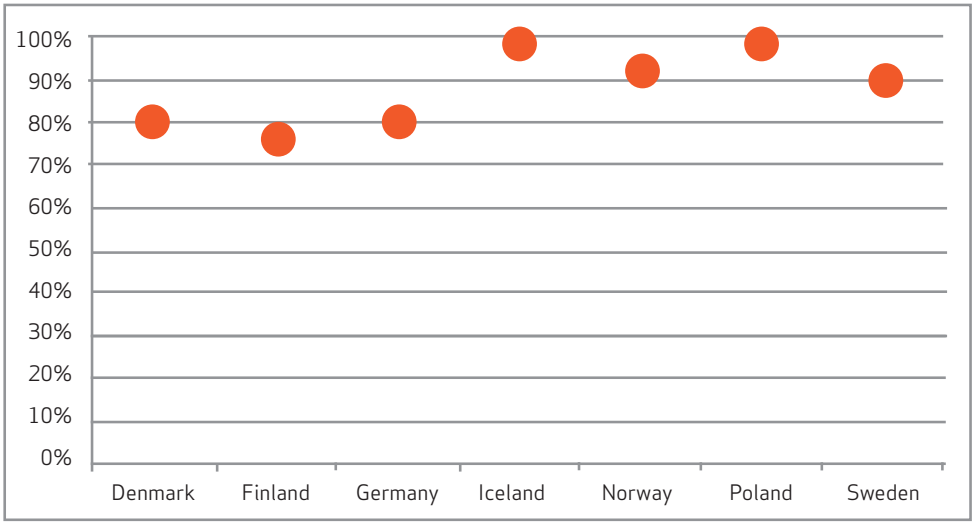
However, although geographical proximity matters a great deal, the development and dynamism of a cluster may also depend to a large extent on the clusters' ability to create linkages to the rest of the world in order to get access to global leading research centres, companies and new markets. Thus, in order to avoid "regional lock-in" effects, a cluster should always strive to achieve supra-regional collaboration on both national and international levels.

Depending on the strengths and dynamism of a cluster, one can distinguish between three principal groups of clusters (Figure 3):

1) Immature Clusters

A newly established cluster or a cluster with limited strengths can be expected to be rather less vibrant. Cluster support should therefore focus on developing or "awakening" the existing potentials, which can include "natural or geographical factor advantages, cultural factors, unique skills" and/or "an entrepreneurial person in a particular location [who] happened to start a business, which in due time led to increasing local demand, new firm formation, spin-off firms and so on, and ultimately to a cluster".[12] Such clusters can be labelled as "immature cluster".

Figure 2: Geographical concentration of clusters in different European countries: What percent of the cluster participants are located within a distance of 150 km from the cluster management organisation?



11 Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: Clusters Are Individuals. Creating Eco-nomic Growth through Cluster Policies for Cluster Management Excellence, Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, p. 21

12 Sölvell, Örjan, 2009: Clusters. Balancing Evolutionary and Constructive Forces, p. 55

2) Matured Clusters

Once a cluster has started to grow it follows a cluster-specific growth trajectory. The dynamism of a cluster is created by social capital, formal and informal networks (personal, research and corporate networks), an increasing degree of institutionalised collaboration facilitated by a cluster management organisation, but also by competition between companies. Key conditions for growth include the existence of linkages across cluster participants, the transformation of public into private science, the commercialisation of new knowledge and the mobility of people to transfer knowledge and patterns of thinking between industry and the research sector. The growth has to be supported by a policy and programme framework that creates conducive framework conditions and supports joint projects of the cluster participants.[13] Clusters that show a vibrant dynamism can be labelled as "mature clusters".

There are two sub-types of "mature clusters":

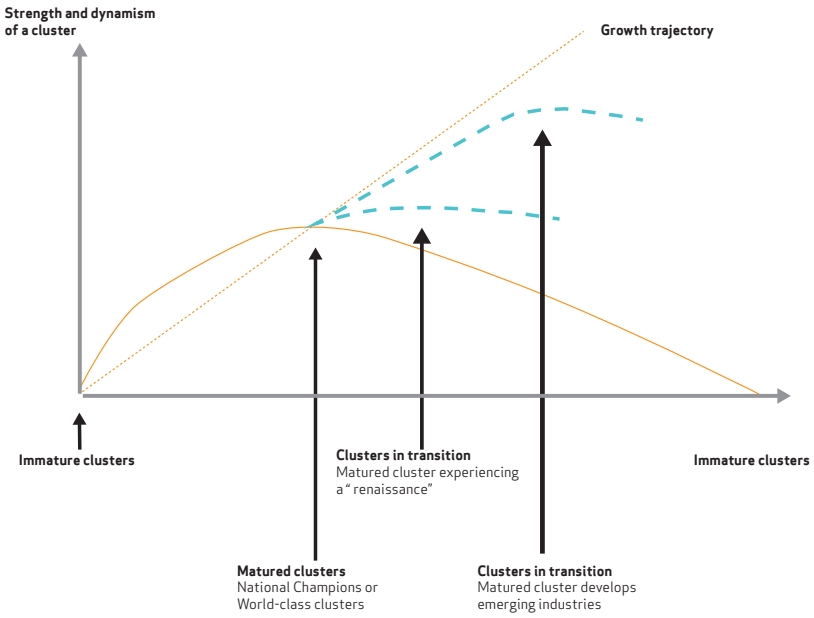
a. National Champions: National champions are strong clusters that have clear ambitions and a substantial national and international growth potential. Such clusters are characterized by a well-developed cooperation infrastructure and significant innovation capabilities as well as a high level of internationalisation.

b. World-class clusters: Very strong clusters can develop into world-class clusters that constitute innovation and business hubs that are known world-wide. World-class clusters are characterized by a vibrant innovation system based on R&D and education systems of particularly high quality, dynamic cluster participants including a critical mass of market and technology leaders, integration in global business and R&D activities, as well as supportive infrastructure and regulatory conditions.[14] As groundbreaking technologies, products and services develop particularly well in strong innovation eco-systems[15], world-class clusters appear to be the best environment in which to support the development of emerging industries.

3) Clusters in Transition

"All good stories must come to an end. […] Some clusters experience a rather short life cycle before they decline, whereas others survive for centuries".[16] Clusters act on competitive markets and will survive only if "their" regional systems of innovation are able to keep up with the competitive pressure that prevails in the world market. As this requires strength and dynamism, a cluster could also decline if "its" regional system of innovation is no longer strong enough to come up with new competitive products and services. Both cluster participants and policy makers should therefore anticipate upcoming competition in order to develop and implement measures that actively steer economic structural

Figure 3: The life cycle of a cluster [17]



13 Ibid., pp. 55-60

14 For further details on the concept of world-class clusters see Meier zu Köcker, Gerd/Svensson, Klas/Szechenyi, Nicholas: World Class Clusters – An Attempt to Formulate the Main Criteria of World Class Clusters

15 Büscher, Reinhard/Schierenbeck, Carsten, 2012: Intelligente Clusterspezialisierung – Die Herausforderungen künftiger europäischer Clusterpolitik, in: Wingarten, Joe (ed.): Infrastruktur für Wissen und Wirtschaft. Cluster in Rheinland-Pfalz, p. 40

16 Sölvell, Örjan, 2009: Clusters. Balancing Evolutionary and Constructive Forces, p. 61

17 Own description based on Sölvell, Örjan, 2009: Clusters. Balancing Evolutionary and Constructive Forces, p. 22

change. This includes stopping to "defend" industrial sectors by subsidizing industries that do not have a chance to compete successfully.

Such clusters can be labelled as clusters in transition which "have" three development options:

a. Decline and become immature again,

b. Renaissance (strong clusters that continue to service "traditional" markets, but introduce new products and services or develop new business models which give new momentum to business dynamics) or

c. Create entirely new markets through "radical" product and service innovation (very strong clusters that develop emerging industries).

d. Public support should only be provided if there is either a chance to initiate

- A "renaissance of the cluster" by assisting cluster participants through targeted policies and to develop new competitive products and service or

- The "discovery of emerging industries" which could create entirely new markets.

While a "renaissance of a cluster " is most likely to maintain the dynamism of the regional and/or national system of innovation or increase it slightly, the development of emerging industries ("discovery of future industries") can be expected to give an enormous boost to dynamism.

3.4 THE IDEA OF A NATIONAL "CLUSTER LEAGUE"

As discussed above there are different groups of clusters. Each has its specific development needs with regard to its different dimensions of cluster management organisation, cluster participants and framework conditions. Consequently, there is no "one-size-fits-all" policy or programme, but the need to develop and implement different policies or programmes that address the different groups of clusters.

The different development conditions of clusters reflect their particular knowledge and innovation capacities. The different capacities can be adequately addressed by specific cluster programmes "playing in different leagues" that are coordinated through an integrated national cluster policy[18]:

1. Immature clusters,

2. Mature clusters, which can be either

   - national champions or
   - world-class clusters, and

3. Clusters in transition[19], which can either

   - experience a renaissance or
   - provide the basis for the development of emerging industries.

Depending on their developmental stage, clusters "qualify" for one of these leagues and have to receive corresponding tailor-made support through a cluster programme to further develop their knowledge and innovation capacities.

The assessment of the developmental stage of a cluster should be based on a comprehensive set of indicators, which still needs to be developed. The concept of world-class clusters[20] and the "Cluster Management Quality Label"[21] that is currently being developed by the European Cluster Excellence Initiative may serve as a starting point for the development of such a comprehensive set of criteria. Both concepts should be integrated to measure the success of a cluster: while the concept of world-class clusters has a comprehensive view on a cluster, the "Cluster Management Quality Label" focuses on the cluster management organisation only (Figure 4).

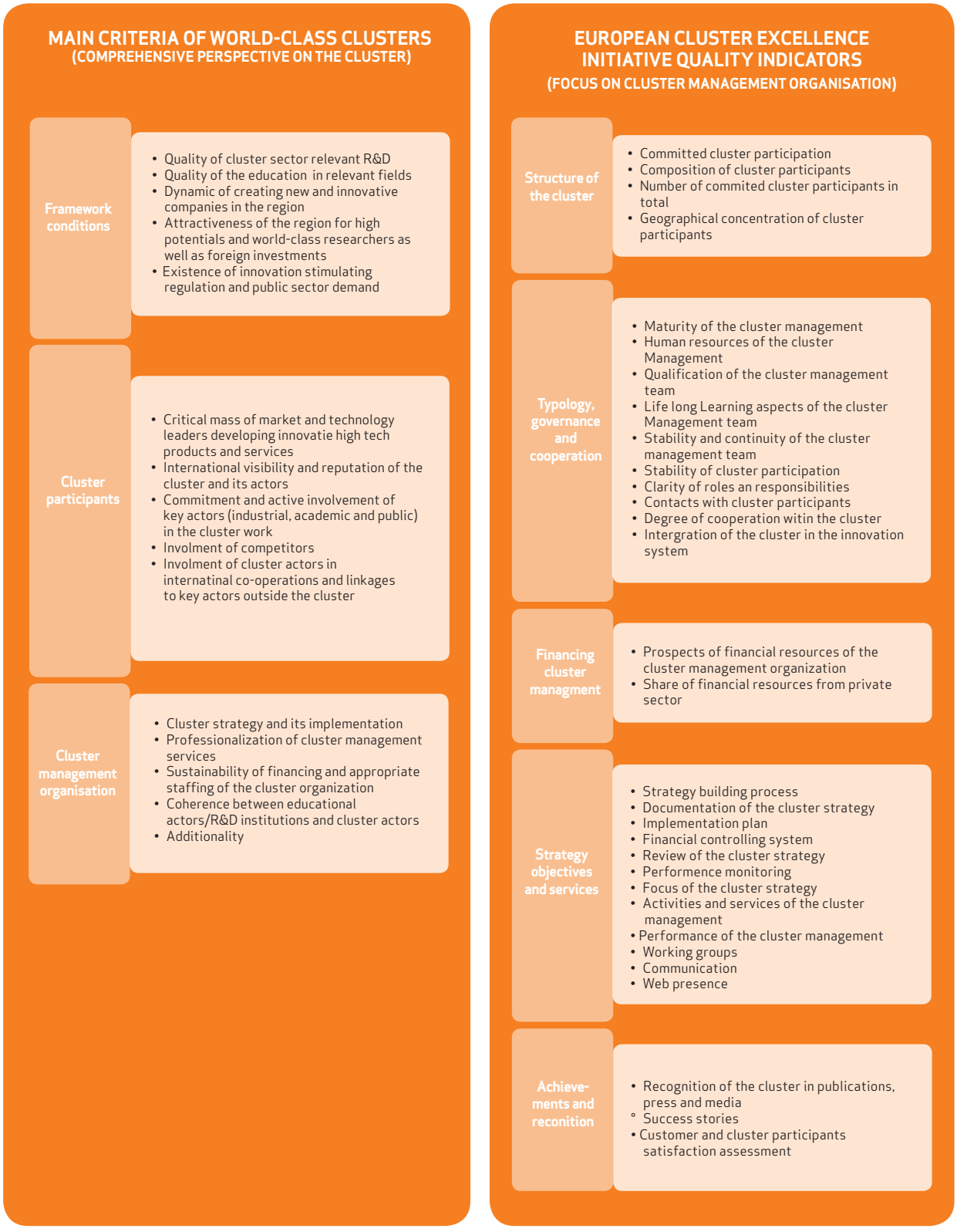
18 The integrated national cluster policy should also incorporate EU programmes and policy initiatives.

19 The option "Decline" is not further discussed in this section as public cluster support should always kick in once there is the danger of decline to support the cluster's development either towards a renaissance or the development of emerging industries. Public support should be provided only if the cluster has the potential for a renaissance or for the development of emerging industries.

20 Meier zu Köcker, Gerd/Svensson, Klas/Szechenyi, Nicholas: World Class Clusters – An Attempt to Formulate the Main Criteria of World Class Clusters

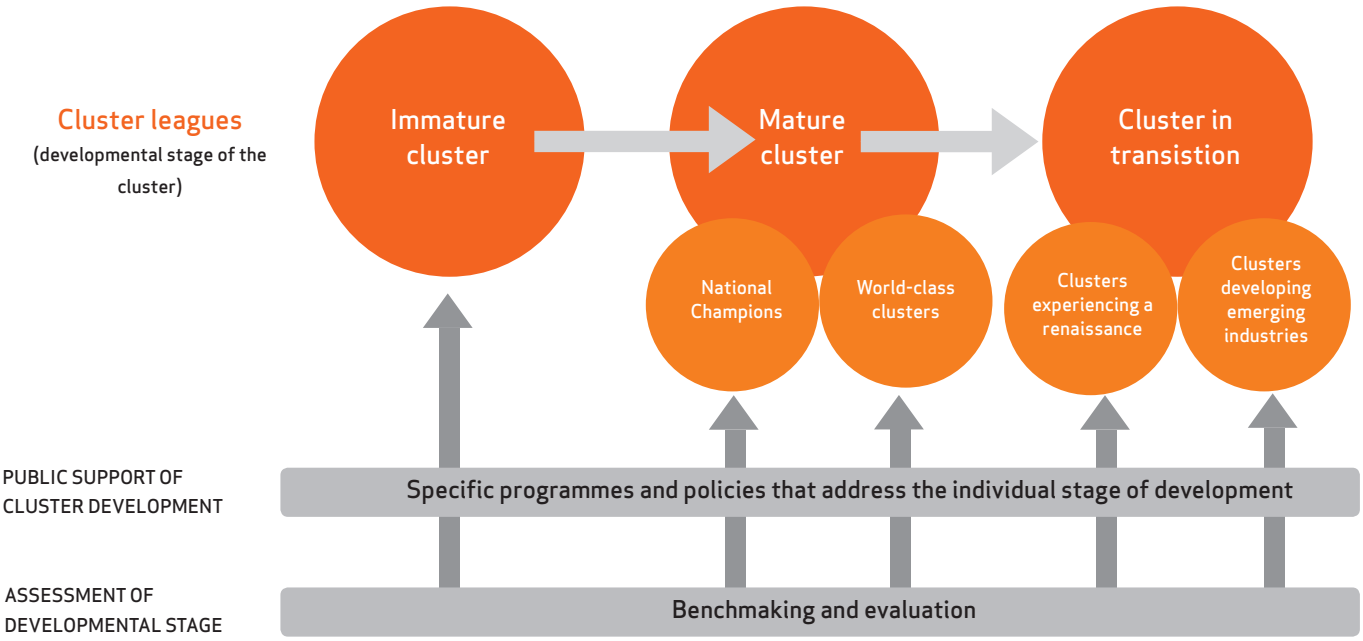
21 Hagenauer, Simone/Kergel, Helmut/Stürzebecher, Daniel, 2011: European Cluster Excellence Baseline. Minimum Requirements for Cluster Organisations, European Cluster Excellence Initiative

Figure 4: Success of a cluster: criteria/indicators for the assessment of the developmental stage of a cluster



Based on these criteria, the individual developmental stage of a cluster should be assessed on a regular basis. Benchmarking of clusters and their cluster management organisations should be the tool of choice in this regard, as it allows for effective and cost-efficient performance surveillance. It should be accompanied by a formative evaluation of the cluster policy and programme which includes the cluster organisations in a smart way. Based on the result of the developmental stage assessment the cluster should receive adequate support (Figure 5).

Figure 5: The Cluster League



In principle, the precursor of a cluster league already exists in Norway: The ARENA cluster programme, which supports the development of regional business environments, can act as a qualifying league for the NCE programme, which supports the development of clusters that are internationally visible as national cluster champions.

3.5 INTEGRATED CLUSTER DEVELOPMENT STRATEGY: CLUSTER POLICY AND CLUSTER PROGRAMMES TO DEVELOP IMMATURE CLUSTERS, MATURED CLUSTERS AND CLUSTERS IN TRANSITION

3.5.1 DIFFERENT LEVELS OF CLUSTER SUPPORT: INTEGRATED CLUSTER DEVELOPMENT STRATEGY

Clusters should be developed through an integrated cluster development strategy jointly developed and supported by relevant government departments. The integrated cluster development strategy should consist of four levels which build upon each other (Figure 6):

- **Level 1 "Integrated cluster programme":**

Such a programme should consist of two elements:

- First, financial and/or technical assistance to develop the capacity of the cluster management organisation; and
- Second, smart thematic and network programmes (focused R&D, business development and training) that address the specific development needs of cluster participants to a) develop their capacities and b) to facilitate joint projects that promote the development of the cluster.

Thus, both cluster management organisation and cluster participants are supported through one single programme: the integrated cluster programme.

Examples of the integration of a) programmes for cluster management organisation and b) thematic and network programmes for cluster participants exist already (e.g. in addition to the financial and technical support of cluster management organisations the Bavarian programme "Cluster Offensive Bayern" included a small budget line for R&D projects of cluster participants).

Ideally, there should be different integrated clusters programmes in order to address the specific support needs of immature clusters, mature clusters (cluster for national champions and world-class clusters) and clusters in transition (for clusters experiencing a renaissance and clusters developing emerging industries). By this, the "individual needs" of clusters can be accommodated.

- **Level 2 "Non-cluster specific thematic programmes for project funding and policies in the areas of R&D/innovation, technology transfer, entrepreneurial and business development, export promotion, international collaboration, education and training":**

In addition to integrated cluster programmes cluster participants and cluster management organisations should also benefit from other funding programmes and policies that do not directly target clusters, but which can provide stimulus for cluster development. This refers in particular to innovation policies and programmes such as R&D/innovation programmes, commercialisation of research/technology transfer-offices, support of research and technology organisations/technological infrastructure (e.g. VTT in Finland, Fraunhofer Society in Germany, GTS in Denmark, TNO in Netherlands etc.), research policies (e.g. universities, strategic research programmes), entrepreneurial and business development programmes, internationalisation policies (export promotion, international collaboration etc.) and education and training policies/programmes.

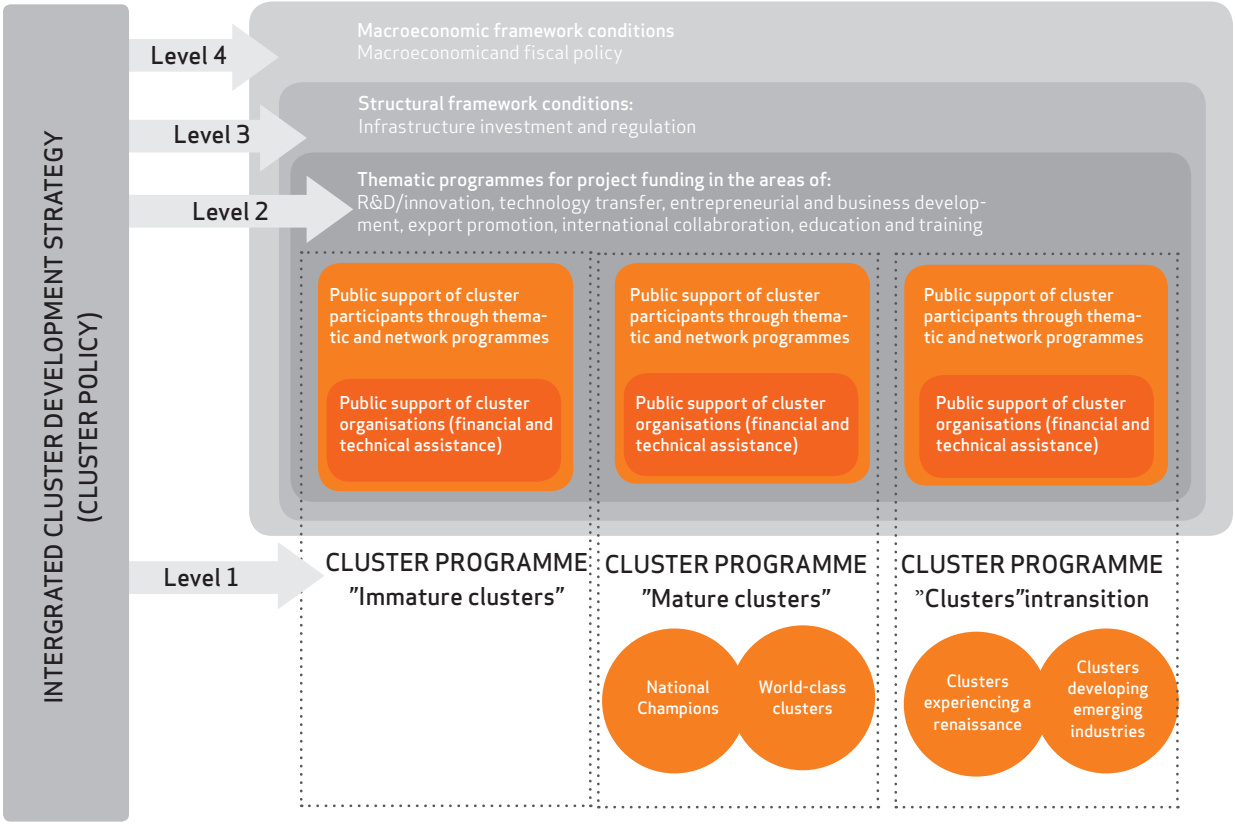
- **Level 3 "Development of structural framework conditions":**

Investment in infrastructure and regulation that creates markets is an important field of activity with regard to this level of cluster policy. Which kind of infrastructure needs to be developed and which kind of regulation is required in order to create a market for products and services is cluster-specific. Clusters in the logistics industry have different needs than biotechnology clusters or renewable energy clusters have. Policies and programmes at this level should therefore address the industry-specific needs, but also the specific support needs of immature clusters, mature clusters and clusters in transition.

- **Level 4 "Macroeconomic framework conditions":**

Macroeconomic and fiscal policies at this level are typically non-cluster-specific policies, but they are important as they create the general business environment of a country.

Figure 6: Integrated cluster development strategy: cluster programmes and cluster policy



3.5.2 POLICY COORDINATION ON THE NATIONAL LEVEL IS ESSENTIAL

The development and implementation of an integrated cluster development strategy is a complex endeavour and involves various ministries and government agencies from various policy areas including economic affairs, regional development, fiscal, research and development, education and training, transport and spatial planning.

Coordination between relevant ministries and government agencies (e.g. ministries of economic affairs, research and innovation, education, labour market) and policy levels (national, regional and, where appropriate, local level) is therefore essential to develop an integrated cluster development strategy. Coordination has to take place both with regard to the general policy level (framework conditions: macroeconomic policy, infrastructure, thematic policies and regulation) and the specific funding programme level (support of cluster through programmes).

3.5.3 INTEGRATION OF EU PROGRAMMES AND INITIATIVES

Cross-border collaboration and international activities are important drivers for economic development as they not only open access to new markets for domestic products and services, but also contribute to the exchange of knowledge and thus create an impetus for the (further) development of products and services.

The strategy should therefore also involve EU programmes and initiatives such as the Competitiveness and Innovation Framework Programme (CIP), Regions of Knowledge (as part of the EU FP7) or projects such as the European Cluster Excellence Initiative (ECEI) and similar activities.

4. KEY FEATURES OF INTEGRATED CLUSTER PROGRAMMES

This section introduces key programme features for integrated cluster programmes at Level 1 of the integrated cluster development strategy as described above. The description of key programme features shall assist owners of cluster programmes to further develop their existing programme or to set up new programmes.

By means of integrated cluster programmes it is expected to

a) establish and develop the capacity of the cluster management organisation and

b) to develop the capacities of cluster participants and to facilitate joint projects among them that promote the development of the cluster.

Both cluster management organisation and cluster participants shall be supported through one single programme.

As outlined above, ideally there should be different integrated cluster programmes in order to address the specific support needs of immature clusters, mature clusters (cluster for national champions and world-class clusters) and clusters in transition (cluster for clusters experiencing a renaissance and clusters developing emerging industries).

Each of the following tables presents for the different groups of clusters key programme features, including:

a) Basic preconditions for the programme: This section describes the minimum conditions with regard to the target group of the programme (cluster management and cluster participants) that need to be fulfilled to create results and impacts through public support.

b) Programme management approach: This section characterizes the role of the programme implementation agency and explains which instruments (funding and/or technical assistance) should be used to develop the cluster management organisation and cluster participants.

c) Objectives – operational objectives and output: This section presents the outputs and operational objectives that are to be achieved through the programme, both with regard to the cluster management organisation and cluster participants.

d) Programme duration: This section gives a recommendation for the duration of the programme.

e) Level of public investment: This section provides recommendations in terms of the overall level of financial investment of the programme implementation agency that is required to develop the cluster.

f) Project funding rate: This section provides recommendations in terms of the level of financial investment of the programme implementation agency in individual projects to support the cluster management organisation and cluster participants.

The key features give a general orientation on the focus areas of integrated cluster programmes. Depending on the country-specific policy and industry environment there might be need for adaption:

- Chapter 4.1 – Integrated cluster programme to develop immature clusters
- Chapter 4.2 – Integrated cluster programme to develop matured clusters: National Champions (4.2.1) and world-class clusters (4.2.2)
- Chapter 4.3 – Integrated cluster programme to support clusters in transition (4.3.1) and emerging industries (4.3.2).

4.1 INTEGRATED CLUSTER PROGRAMME TO DEVELOP IMMATURE CLUSTERS

CLUSTER LEAGUE: IMMATURE CLUSTER			
KEY PROGRAMME FEATURES			
Target groups		**Cluster management organisation**	**Cluster participants (companies, R&D institutions, universities and other relevant stakeholders)**
Basic preconditions for programme		• Potential cluster organisation identified • Potential cluster management team identified	• Nucleus of cluster participants • Basic industrial and R&D infrastructure • Minimum innovation capacity of key actors
Programme management approach (Role of Programme Implementation Agency)		• Programme should address broad spectrum of potential appli cants (preferably from the private sector) • Financial assistance to set up infrastructure of cluster management organisation and hire and train staff • Technical assistance to develop capacity of the cluster management organisation • Programme Implementation agency should take over proactive role and provide guidance to the cluster management team • Active monitoring of project progress by Programme Implementation Agency	• Cooperation between cluster participants should be facilitated mainly through services provided by the cluster management organisation. • Small innovation projects including several cluster participants should be financed in order to promote trust-building.
Objectives	**Operational objectives**	• Cluster management organisation is established (infrastructure and staff) • Cluster strategy is developed and approved by key actors • Key actors contribute actively to the further development of the cluster management organisations (e.g. through in-kind or financial contributions) • Key services are provided by cluster management organisation, including matchmaking events, exchange of information and experiences, working groups, training of cluster participants and joint projects. • Cluster management organisations has contact to relevant stakeholders from the regional system of innovation	• High recognition of cluster management organisation • High commitment to co-operate and to implement cluster strategy • Cooperation among cluster actors has increased • Services offered by the cluster management organisation are accepted and used by the cluster participants
	Key output to be achieved	• Cluster management organisation set up and staffed • Development of communication tools • Strategy process involving relevant key actors is initiated • Key services for the cluster participants are identified, developed and offered	• Number of cluster participants has increased • Regular contacts between the cluster participants and the cluster management organisation • Cluster participants express their needs and ask cluster management organisation for assistance
Programme duration		• Up to 5 years	
Level of public investment		• Rather limited as already a small investment in the infrastructure of the cluster management organisation and staff can make a difference	• Limited to small thematic and network programmes to support first “joint innovation projects” of the cluster participants
Funding rate		• Significant share of public funding in the total budget of cluster management organisations, but co-financing from private sources should be asked for in order to ensure commitment from the private sector	• 50% public and 50% private funding

4.2 INTEGRATED CLUSTER PROGRAMME TO DEVELOP MATURED CLUSTERS

4.2.1 NATIONAL CHAMPIONS

CLUSTER LEAGUE: MATURED CLUSTER - NATIONAL CHAMPION			
KEY PROGRAMME FEATURES			
Target groups		Cluster management organisation	Cluster participants (companies, R&D institutions, universities and other relevant stakeholders)
Basic preconditions for programme		• Established cluster management organisation exists which is operated by an experienced cluster management team • Wide spectrum of cluster management services is already offered to cluster participants • Key criteria of cluster management excellence are met • Cluster strategy is developed and implemented • First international cooperations or partnerships are established	• Critical mass of cluster participants • Critical mass of national market and technology leaders • High quality of relevant R&D and related infrastructure • High quality of education system • Potential for the development of new and innovative companies • National and international attractiveness of the cluster region • Target markets to be addressed by the cluster participants should have a significant potential for business
Programme management approach (Role of Programme Implementation Agency)		• Programme should address only cluster management organisations that have a high potential to become a national champion • Transparent and measurable selection criteria of winners (no political influence) • Funds to co-finance cluster management organisations should be provided (funding should focus on those areas which are of public interest) • Technical assistance for capacity building should be provided to the cluster management organisations if required • Measures to further develop cluster management excellence should be provided (e.g. benchmarking and training) • Programme Implementation Agency should take over a more reactive role • Monitoring approach to measure project progress should be agreed between beneficiaries and Programme Implementation Agency	• Thematic and network programmes to support innovation through the development of new products and services • High flexibility to implement new funding schemes or instruments during programme duration, if needed • Linking cluster programme to other innovation related support schemes (national and regional level) • Programme Implementation agency should actively support visibility of the cluster and its participants
Objectives	Operational objectives	• Creation of an environment conducive of innovation and creativity • Increase international visibility of the cluster management organisation • Coherence between education actors, R&D institutions and other cluster participants • High additionality of the work and services provided by the cluster management organisation • Further professionalization of the cluster management organisation and its services • Cluster strategy implemented, reviewed and continuously updated, together with the cluster participants • Implementation of new, tailor-made services • Active support to initiate cross-technology as well as internationalization of the cluster participants (if appropriate) • Long-term financing of the cluster management organisation is secured, including private financial support	• New high-tech products, processes or services with high market potential (at least on national level) • Mobilization of additional private co-investments in science, technology and innovations as well as education and training and infrastructure • Increasing numbers of market and technology leaders developing or manufacturing high tech products, components, applications / processes or providing innovative service • Increased visibility of the cluster and its participants • Long term commitments and active involvement of key actors • Cooperation among cluster participants has significantly increased • Services offered by the cluster management organisation are accepted and used
	Key output to be achieved	• Milieu for innovation and cooperation improved • Number of innovations and cooperations initiated by the cluster management organisation • Number of services implemented • Number of new services developed and implemented	• Increased number of innovation projects: a) with R&D partners and b) with international partners • Acquisition of additional science, technology and innovations funds • Improved success rate in term of commercialisation /exploitation of the innovation projects initiated • Attracting investments in the region as a result of the cluster initiative • Increased number of incremental as well as of break-through / radical innovations • Increased number of innovations with significant market share • Increased number of internationalisation projects • Increased number of new co-operations • Increased number of new training / education schemes • Increased number of competence/knowledge projects
Programme duration		• 5 to 10 years (different phases, funding for each phase depends on positive evaluation)	
Level of public investment		• Cluster management organisations should be funded for activities which are in public interest and are essential to turn cluster strategy into reality	• Significantly high investments in science, technology and innovation needed to develop critical mass
Funding rate		• Depending on the activities and the public interest therein • Public funding should serve as a rather long-term "start-up support" with a decreasing rate in the course of time	• Depending on the specific risk of science, technology and innovation projects

4.2.2 WORLD-CLASS CLUSTERS

CLUSTER LEAGUE: MATURED CLUSTER - WORLD CLASS			
KEY PROGRAMME FEATURES			
Target groups		**Cluster management organisation**	**Cluster participants (companies, R&D institutions, universities and other relevant stakeholders)**
Basic preconditions for programme		• Established cluster management organisation exists which is operated by an experienced cluster management team • Wide spectrum of cluster management services is offered to cluster participants. Cluster management organisation continuously develops new services in collaboration with cluster participants. • All criteria of cluster management excellence are met • Cluster strategy is developed and implemented • A significant number of sustainable international cooperations or partnerships is established	• Critical mass of cluster participants • Critical mass of market and technology leaders • High quality of relevant R&D and respective infrastructure • High quality of education system • Potential for the development of new and innovative companies • National and international attractiveness of the cluster region
Programme management approach (Role of Programme Implementation Agency)		• Programme should address only a small number of cluster management organisations which have a very high potential • Transparent and measurable selection criteria of winners (no political influence) • Funds to co-finance cluster management organisations (funding should focus on those areas which are in the public interest) • Technical assistance for capacity building should be provided to the cluster management organisations if required • Programme Implementation Agency should take over reactive role • Monitoring of project progress by Programme Implementation Agency • Creation of a positive milieu for innovation and creativeness • Increase international visibility of the cluster management organisation • Coherence between education actors, R&D institutions and other cluster participants • High additionality of the work and services provided by the cluster management organisation • Further professionalization of the cluster management organisation and its services • Cluster strategy implemented, reviewed and continuously updated • Implementation of new, tailor-made services • Active support to initiate internationalization of the cluster participants • Long-term financing of the cluster management organisation is secured, including private financial support	• Thematic and network programmes to support innovation through the development of new products and services • High flexibility to implement new funding schemes or instruments during programme duration, if needed • Linking cluster programme to other innovation related support schemes (national and regional level)
Objectives	**Operational objectives**	• Creation of an environment conducive of innovation and creativity • Increase international visibility of the cluster management organisation • Coherence between education actors, R&D institutions and other cluster participants • High additionality of the work and services provided by the cluster management organisation • Further professionalization of the cluster management organisation and its services • Cluster strategy implemented, reviewed and continuously updated, together with the cluster participants • Implementation of new, tailor-made services • Active support to initiate cross-technology as well as internationalization of the cluster participants (if appropriate) • Long-term financing of the cluster management organisation is secured, including private financial support	• New high-tech products, processes or services with high market potential • Increase of numbers of market and technology leaders developing or manufacturing high tech products, components, applications / processes or providing innovative service • Increase of the international visibility of the cluster and its participants • Long term commitment and active involvement of key actors • Significant co-investments by cluster participants • Services offered by the cluster management organisation accepted and used
	Key output to be achieved	• Number of services implemented • Number of new services developed and implemented • Amount of co-investments in the cluster acquired • Satisfaction of the cluster participants with the performance of the cluster management organisation Number if international co-operations initiated • Number of foreign cooperation requests • Additional private or public investments acquired • Number of promotion activities	• Increased number of innovation projects: a) with R&D partners and b) with international partners • Acquisition of additional science, technology and innovations funds • Improved success rate in term of commercialisation /exploitation of the innovation projects initiated • Attracting investments in the region as a result of the cluster initiative • Increased number of incremental as well as of breakthrough / radical innovations • Increased number of innovations with significant
Programme duration		• 5 to 10 years (different phases, funding for each phase depends on positive evaluation)	
Level of public investment		• Cluster management organisations should be funded for activities which are in public interest and are essential to turn cluster strategy into reality	• Very high to support maintenance of global competitiveness
Funding rate		• Depending on the activities and the public interest there in	• Depending on the specific risk of science, technology and innovation projects

4.3 INTEGRATED CLUSTER PROGRAMME TO SUPPORT CLUSTERS IN TRANSITION

4.3.1 RENAISSANCE OF CLUSTERS

CLUSTER LEAGUE: CLUSTERS IN TRANSITION - RENAISSANCE			
KEY PROGRAMME FEATURES			
Target groups		Cluster management organisation	Cluster participants (companies, R&D institutions, universities and other relevant stakeholders)
Basic preconditions for programme		• Established cluster management organisation is operated by an experienced cluster management team • Wide spectrum of cluster management services implemented • Cluster management organisation has ideas how to initiate renaissance	• Critical mass of cluster participants • Sufficient potential and commitment to innovate industry • Target markets to be addressed by the cluster participants
Programme management approach (Role of Programme Implementation Agency)		• Selection criteria should be very individual, since it depends from case to case • Funds to co-finance cluster management organisations should be provided (funding should focus on those areas which are of public interested) • Technical assistance for capacity building should be provided to the cluster management organisations if required • Programme Implementation Agency should take over an active role to support cluster management organisation • High flexibility of the programme management approach	• Providing funds for project only if really needed • High flexibility to implement new funding schemes or instruments during programme duration, if needed • Programme Implementation agency should actively support visibility of the cluster and its participants
Objectives	Operational objectives	• Very much case depending and should be jointly defined at the beginning of the project	• Very much case depending and should be jointly defined at the beginning of the project
	Key output to be achieved	• Very much case depending and should be based on the operational objectives	
Programme duration		• Individual programme duration	
Level of public investment		• Individually, depending on the objectives	• Individually, depending on the objectives
Funding rate		• Individually, depending on the objectives	• Individually, depending on the objectives

4.3.2 EMERGING INDUSTRIES

CLUSTER LEAGUE: CLUSTERS IN TRANSITION - RENAISSANCE			
KEY PROGRAMME FEATURES			
Target groups		**Cluster management organisation**	**Cluster participants (companies, R&D institutions, universities and other relevant stakeholders)**
Basic preconditions for programme		• Established cluster management organisation exists which is operated by an experienced cluster management team • Wide spectrum of cluster management services is offered to cluster participants. Cluster management organisation continuously develops new services in collaboration with cluster participants. • All criteria of cluster management excellence are met • Cluster strategy is developed and implemented • A significant number of sustainable international cooperations or partnerships is established	• Critical mass of cluster participants in the emerging industry sector • Critical mass of companies that can develop national / international market and technology leadership in the emerging industry sector • High quality of relevant R&D and related infrastructure relevant for the emerging industry sector • High quality of education system • High dynamic or potential for the development of new and innovative companies in the emerging industry sector • Cluster is attractive for new participants • Cluster participants are aware of technological and market trends in the emerging industry sector
Programme management approach (Role of Programme Implementation Agency)		• Programme should address only cluster management organisations that have a high potential to succeed in emerging industrial sectors • Transparent and measurable selection criteria of winners (no political influence) • Funds to co-finance cluster management organisations (funding should focus on those areas which are in the public interest) • Technical assistance for capacity building should be provided to the cluster management organisations, if required • Programme Implementation Agency should take over a more reactive role • Monitoring approach to measure project progress should be agreed between beneficiaries and Programme Implementation Agency	• Thematic and network programmes to support innovation through the development of new products and services • High flexibility to implement new funding schemes or instruments during programme duration, if needed • Linking cluster programme to other innovation related support schemes (national and regional level) • Programme Implementation Agency should actively support visibility of the cluster and its participants in new emerging industry
Objectives	**Operational objectives**	• Creation of an environment supportive of innovation and creativity • Coherence between education actors, R&D institutions and other cluster participants • High additionality of the work and services provided by the cluster management organisation • Cluster strategy how to best address new emerging industry and its specific challenges • Implementation of new, tailormade services, characteristic for emerging industry to be addressed	• New high-tech products, processes or services with high market potential for emerging industry • Mobilize additional private co-investments in science, technology and innovations • Create market and technology leaders in the emerging industrial sector • Increased visibility of the cluster and its participants • Long-term commitment and active involvement of key actors • Cooperation among cluster participants has significantly increased • Services offered by the cluster management organisation are accepted and used
	Key output to be achieved	• Number of innovations and co-operations initiated by the cluster management organisation • Number of services implemented • Number of new services developed and implemented • Satisfaction of the cluster participants with the performance of the cluster management organisation • Number of cooperations initiated • Number of external cooperation requests • Number of press releases and articles about the cluster / cluster management organisation	• Number of innovation projects • Acquisition of additional science, technology and innovations funds • High success rate in terms of commercialisation / exploitation of the innovation projects • Increased co-investments in the region as a result of the cluster initiative • Increased number of incremental as well as of breakthrough / radical innovations in emerging technological sector • Increased number of new co-operations • Increased number of new training / education schemes • Increased number of competence/knowledge projects • Increased amount of additional private or public co-investments acquired
Programme duration		• Up to 3 years	
Level of public investment		• Individually, depending on the objectives • Medium, since mainly cluster management organisations shall be funded for actions dedicated to support cluster participants to become successful actors in the new emerging industry	• Significantly high investments in science, technology and innovation needed to become successful actors in the new emerging industry
Funding rate		• Medium to high	• Depending on the specific risk of science, technology and innovation projects

4.4 IMPLEMENTATION OF CLUSTER PROGRAMMES

The nature of implementation of a cluster programme has an impact on the performance of clusters. The discussions in the context of this project confirmed the findings of the NGPExcellence project. Five key aspects should be considered when setting up a cluster programme:

1. Programme officials indicated that a programme has to be smart and simple in order to avoid administrative burdens for cluster organisations that may have an impact on the performance of their daily operations.

2. Programme requirements and processes should not only be less bureaucratic, but also flexible enough to respond quickly to changing economic and technological environments in which clusters are operating.

3. Programme implementation should be supported by a knowledge-based support infrastructure including the programme agency and specialized partners such as universities and consultants in order to assist clusters with their specific needs in an adequate manner.

4. From the very beginning the programme should be based on clear targets that can be measured through a purposeful indicator system that provides information relevant to the implementation processes.

5. The implementation of a programme should be accompanied by a formative evaluation which provides recommendations for programme adaptation on a continuous basis. Ex-post evaluation can be useful to improve the performance of a programme, if results are used both for the further development of the existing programme and the development of new programmes.

4.5 THE IMPORTANCE OF CLUSTER MANAGEMENT ORGANISATIONS

Although the success of clusters depends eventually on the potential of the cluster participants and supportive framework conditions a capable cluster management organisation can be of vital importance for the unleashing of the clusters potential for two reasons:

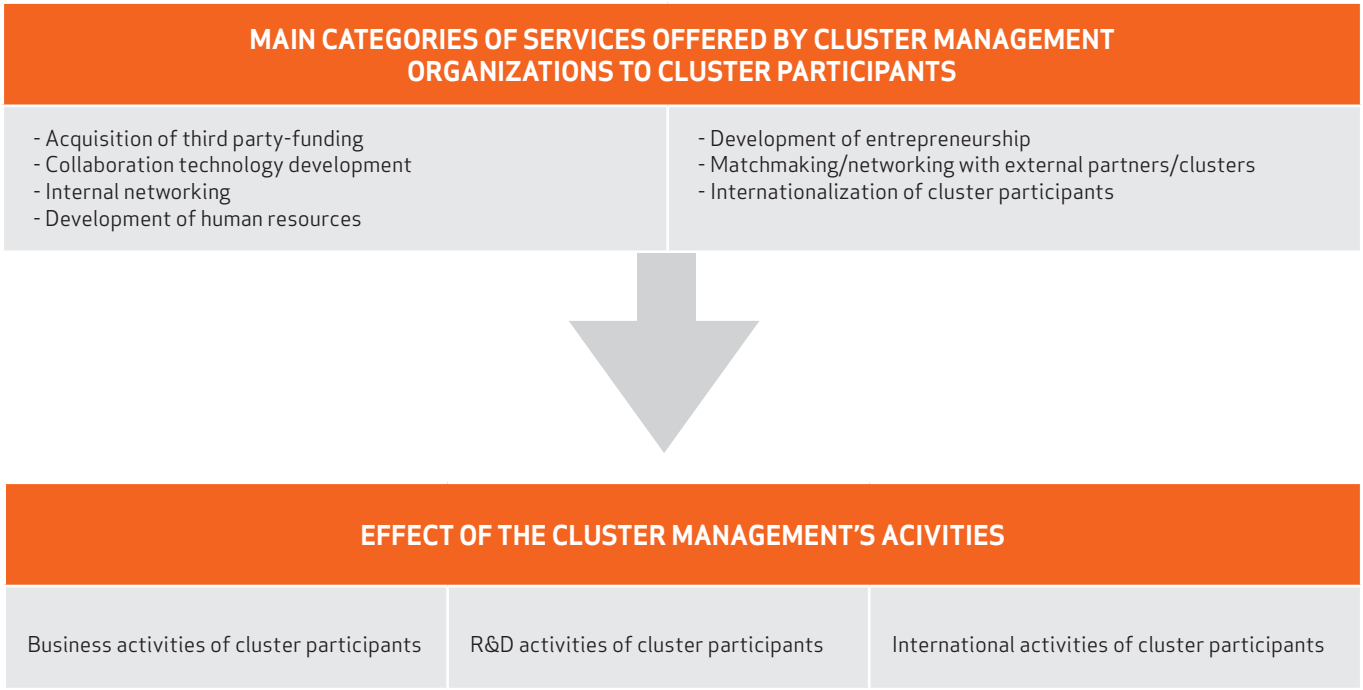
- First, Cluster management organisations can make a difference as they can facilitate collaboration between the cluster participants and other players (e.g. other clusters) for the benefit of joint projects.
- Second, being well-connected with cluster participants and policy makers they can also serve as a node both for policy makers and cluster participants in terms of communicating development needs and identifying corresponding remedial measures.

These two functions have different implications for a cluster management organisation: In order to facilitate collaboration between the cluster participants they have to offer services that actually trigger joint activities (see 4.5.1) and with regard to the "node function" they can act not only as communicator of needs, but also as implementing agencies entrusted by the government (see 4.5.2).

4.5.1 SERVICES OF THE CLUSTER MANAGEMENT ORGANISATION MATTER

Services are the key instrument of a cluster management organisation to facilitate collaboration between cluster participants and other players (e.g. other clusters) for the benefit of joint projects. By offering services and implementing corresponding activities the cluster management organisation can trigger a certain behaviour of a cluster participant by providing information or addressing other needs and thus having an effect on the cluster participant which reflects in the development of the cluster as such. There is a causal relationship between the service level of cluster management organisations and the effect of the work of cluster management organisations on business, R&D and international activities of cluster participants (Figure 7).

Figure 7: Main categories of services and the effect of the cluster management's activities

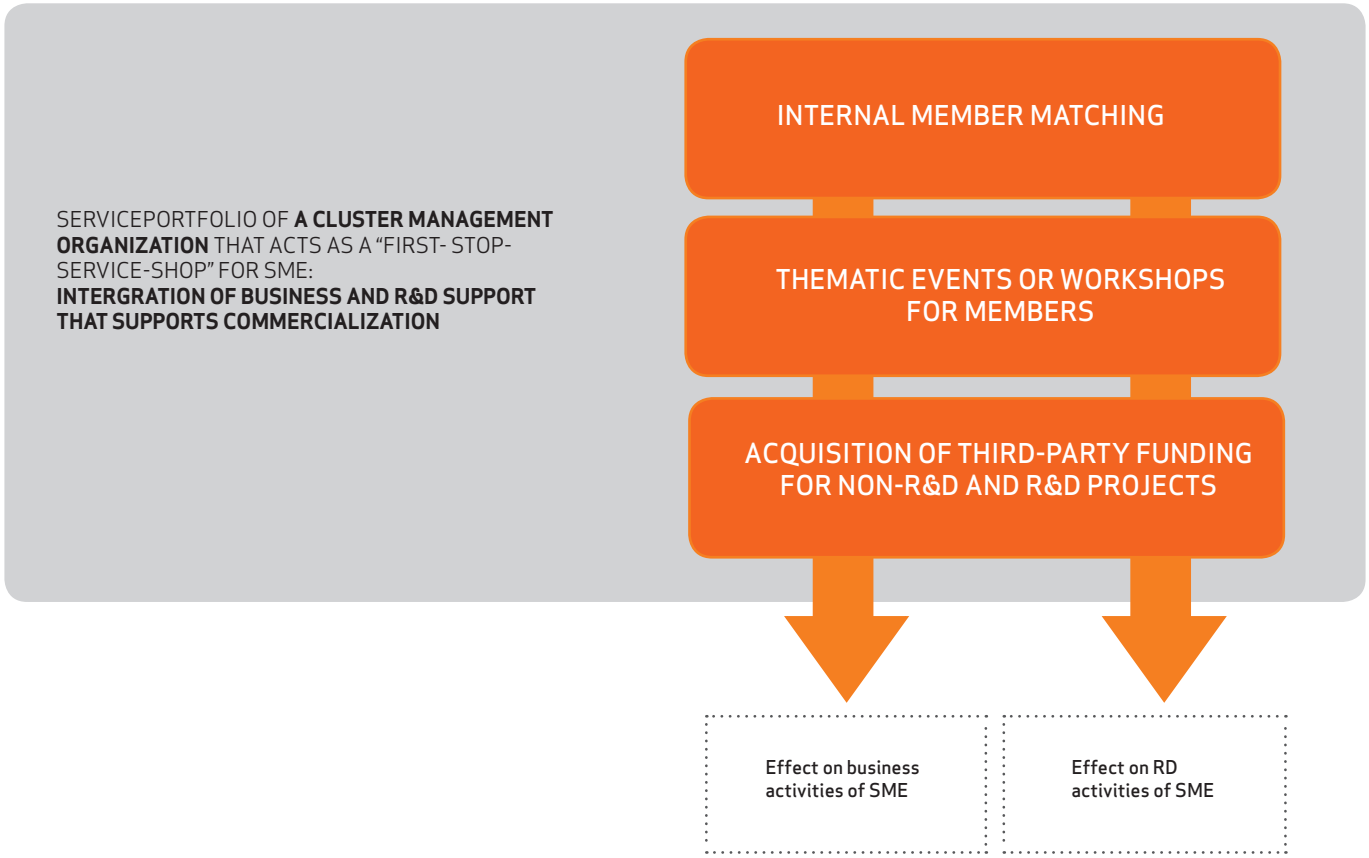


Recent research results[22] suggest that there are key impact-relevant services that should be offered by any cluster management organisation in support of activities of cluster participants. It is not about an "either/or" of services, but about the integrated offer of services to commercialise R&D results and thus to trigger innovation-based economic growth. Cluster management organisations that feature such an integration of services are typically based on a strategy that addresses the support needs of the cluster participants.

Figure 8 shows such an integrated portfolio of key impact-relevant services that has an effect on business and R&D activities of SME cluster participants by sequencing services such as internal member matching to bring cluster participants together, organizing workshops or thematic events to further discuss ideas that developed from the matchmaking and apply for funding for projects that are the outcome of workshops or thematic events.

22 Lämmer-Gamp, Thomas/Nerger, Michael, 2011: Clusters are Individuals – Service Performance of Bavarian and Danish Cluster Management Organisations, NGPExcellence project report, not published yet

Figure 8: Integrated service portfolio of a cluster management organisation to support business and R&D activities of SME



The analysis of the relationship between the intensity of individual services and the overall effect of the cluster management's activities on business and R&D activities of SME demonstrated that a high intensity of service provision does not necessarily result in a large effect of the cluster management's activities. Creating effects is therefore not only about the quantity of service provisions, but in particular about the quality of service provision in terms of the development, content and delivery of services. It is also the combination and interaction of different services that creates the effect of the cluster management's activities on the R&D and business activities of SME. This refers to the quality or excellence of the cluster management organisation in terms of a professional development and implementation of services that address the needs of the cluster participants.

Programmes that focus on the development of cluster management organisations should therefore support cluster management organisations with the development of a service portfolio. Financial support is not sufficient in this regard as developing services does not depend on available financial resources, but on a sound understanding of the needs of the cluster participants and the expertise to translate this knowledge into value-adding services. It is therefore about professionalism and education of the cluster management which can be supported through technical assistance to develop corresponding capacity. Workshops, seminars and tool boxes to train cluster management staff as well as networking between clusters to learn from best practice examples are the instruments that should be applied by programme owners to support service development.

4.5.2 NEW TASKS FOR CLUSTER MANAGEMENT ORGANISATIONS: IMPLEMENTATION OF PUBLIC FUNDING PROGRAMMES

Clusters are individuals and each individual needs different support in order to deliver to its potential. While programme owners can react to the specific development needs of individual cluster management organisations through technical assistance for capacity development[23] there are

23 For an overview see Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, pp. 51-52

two principal ways to influence the development of a cluster through specific programmes that address the cluster participants through individualised support:

a) Cluster management organisations are entrusted with the implementation of public funding programmes as they do know best what the cluster participants need. The example of Flanders' Food[24]

Flanders' Food is a Brussels based cluster management organisation which serves as an innovation platform for the Flemish food industry. In order to develop the cluster of some 300 companies, universities and research institutions the cluster management organisation is entrusted by the Flemish government to spend EUR 2 million per year for innovation projects in areas that are identified by the cluster participants without any further guidance by the government. The procedure consists of five main steps:

1. Principal topic of the call for proposals is identified in a brainstorming meeting with industry and subsequent discussion with R&D institutions and universities.

2. Identification of project opportunities, e.g. how to replace salt in specific meat products, and agreement on a call for proposals.

3. Launch of a pre-call to check whether the identified topic meets the interest of a sufficient number of cluster participants.

4. Request for full proposals from consortia consisting of cluster participants (each project consortium has to consist of at least five cluster participants, the actual average is 10 project participants). The call for proposals is open to all cluster participants.

5. Evaluation of full proposals on a competitive basis, done by an international panel of experts.

Selected projects are industry-driven and supported by Flemish R&D institutions and universities. The typical duration of projects is 2-3 years. Since 2006, twenty-nine projects have been implemented (e.g. on "Optimization of the colour stability of bovine meat" or "Impact of material, process and design on O2-permeability of packaging after thermoformation process"). According to the cluster manager, this programme contributes not only to a vibrant culture of collaboration within the cluster covering the entire value chain, but also to the identification of new growth potential and new markets. The key to the success of the programme is the thematic proximity of the cluster management organisation as the funding agency for the cluster participants as well as the opportunity to discuss the topics of the call indepth with industry stakeholders.

b) Joint–development of thematic and networking programmes by government and cluster management organisations: Taking the cluster further

In order to avoid a lock-in of cluster management and cluster actors in "habitual patterns of thought and action" and to promote further development of the cluster in terms of emerging industries, programme owners can develop cluster-specific programmes that promote innovation in new technological and service fields as well as new collaborations across sectors and clusters. The development of such programmes should take place in collaboration with the cluster management organisation and cluster participants to ensure that the programme is accepted and takes the existing potential for development into account.

There are two principal types of programmes that can be combined:

1. Thematic programmes should address thematic areas that have the potential for new technologies and services and thus for new markets. Such thematic programmes are "classic" R&D and innovation programmes, but due to their joint development with the cluster, are tailor-made to the needs of the cluster participants. In principle, the procedural set-up of the Flanders' Food program (see above) provides an example for the identification of topics.

2. Network programs to support the development of innovative networks consisting of five to ten cluster participants and, if appropriate, partners from other clusters. Such network programmes can facilitate near-to-market R&D activities and the establishment of the nuclei of emerging-industry-clusters. The German program "Zentrales Innovationsprogramm Mittelstand – Fördermodul Netzwerkprojekte (ZIM-NEMO)" provides an example for the principle set-up of such network[25].

The key difference between the entrustment of cluster management organisations with the implementation of

24 Interview with Erwin Lamot, Manager Flanders' Food, January 27th, 2012

25 For further details please see Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, pp. 70-73

funding programmes and the joint-development of programs is that latter approach gives programme owners the possibility to intervene in the development of the cluster by providing "top-down strategic guidance" in terms of thematic development objectives.

In order to obtain the maximum effect from such approaches, programme owners should collaborate with excellent cluster management organisations as only they have the necessary capacity to develop and implement funding in terms of organisation and knowledge.

4.5.3 LABELLING OF CLUSTER MANAGEMENT ORGANISATIONS: THE EUROPEAN CLUSTER EXCELLENCE INITIATIVE (ECEI)

After more than a decade of establishing cluster management organisations to develop clusters, policy makers and programme owners agree upon that cluster support is not about the mere establishment of cluster management organisations in the first place, but about developing excellent clusters that are internationally competitive and that have an impact on the national economy. The majority of pro-gramme owners who participated in the NGPExcellence project argued to focus their programmes on cluster excellence instead of "numbers of clusters". Only clusters with a high potential for development and high performance should be supported.

The European Cluster Excellence Initiative (ECEI, www.cluster-excellence.eu) promotes excellent cluster management through the design of a quality cluster management label. ECEI proposes a set of indicators developed by cluster experts from different European countries which will allow assessing the "excellence status" of a cluster management organisation. The set includes 31 indicators which provide the basis for a thorough assessment of a cluster management organisation in terms of its structure, governance, financial basis, strategy, objectives, services and achievements (Table 1).

Table 1: Indicators of the ECEI Cluster Management Excellence Label Assessment

INDICATORS OF THE ECEI CLUSTER MANAGEMENT EXCELLENCE LABEL ASSESSMENT
STRUCTURE OF THE CLUSTER
Committed Cluster Participation
Composition of the Cluster Participants
Number of Committed Cluster Participants in Total
Geographical Concentration of the Cluster Participants
TYPOLOGY, GOVERNANCE, COOPERATION
Maturity of the Cluster Management
Human Resources Available for the Cluster Management
Qualification of the Cluster Management Team
Life Long Learning Aspects for the Cluster Management Team
Stability and Continuity of Human Resources of the Cluster Management Team
Stability of Cluster Participation
Clarity of Roles – Involvement of Stakeholders in the Decision Making Processes
Direct Personal Contacts Between the Cluster Management Team and the Cluster Participants
Degree of Cooperation within the Cluster
Integration of the Cluster Organisation in the Innovation System
FINANCING CLUSTER MANAGEMENT
Prospects of the Financial Resources of the Cluster Organisation
Share of Financial Resources from Private Sources
STRATEGY, OBJECTIVES, SERVICES
Strategy Building Process
Documentation of the Cluster Strategy
Implementation Plan
Financial Controlling System
Review of the Cluster Strategy and Implementation Plan
Performance Monitoring of Cluster Management
Focus of the Cluster Strategy
Activities and Services of the Cluster Management
Performance of the Cluster Management
Working Groups
Communication of the Cluster Organisation
Cluster Organisation's Web Presence
ACHIEVEMENTS AND RECOGNITION
Recognition of the Cluster in Publications, Press, Media
Success Stories
Customer and Cluster Participants' Satisfaction Assessment

26 Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, p. 52

The assessment will be conducted by independent cluster analysis experts who have participated in a specific training. Those experts are also trained by the European Foundation for Quality Management (EFQM) to assess and validate improvement processes within cluster management organisations. Thus, the experts cannot only assess the excellence status of a cluster management organisation, but can also help to identify areas for improvement and assist cluster managers with corresponding action.

The ECEI quality label provides a sound framework for supporting excellent cluster management. The objective is to award a label to cluster management organisations that have reached a certain status of excellence, and also to provide cluster managers with recommendations on how to improve.

The ECEI quality label scheme can be utilised by policy makers and programme owners in two respects:

- First, by encouraging cluster management organisations to participate in the scheme (e.g. by providing financial support for the assessment procedure) they can assist cluster management organisations in their efforts to develop more efficient and effective institutional structures, processes and services.

- Second, as the label reflects excellence it provides guidance to policy makers and programme owners for decisions on which cluster should be supported by cluster programmes (label as a condition for funding).

4.5.4 WHEN AND HOW SHOULD CLUSTER MANAGEMENT ORGANISATIONS RECEIVE PUBLIC FINANCIAL SUPPORT THROUGH CLUSTER PROGRAMMES?

The question of whether a cluster management organisation should receive public funding is a topic that features high on the agenda of cluster policy makers and programme owners. The answer to this question depends on the context the cluster management organisation is operating in, both in terms of national/regional policy and programme traditions and the history of the cluster, e.g. whether it is established and driven by industry or by a top-down decision by a Ministry.

Thus, there is no "one-size-fits-all" answer, but a general rule of thumb can be formulated. Cluster management organisations should be financially supported with public means:

a) If the cluster management organisation is in the process of establishment and if there are no sufficient private means available to support this process. Such funding should be provided as degressive funding in order to ensure commitment of the private sector as industry eventually benefits from the existence of a cluster management organisation. The share of public funding depends on the national state aid law. Public funding is a "temporary boost to take off".

b) If the cluster management organisation is utilised by the government to offer specific services to cluster participants a) in case of market failure; some of the core activities that cluster management organisations provide for SMEs would not be carried out without public support. For example, SMEs that are not aware of the benefits that collaboration with other companies and research institutions within a cluster offers, are very unlikely willing to pay the full costs of matchmaking services offered by a cluster management organisation; or b) to implement funding on behalf of the government (see chapter 4.5.2 "New Tasks for Cluster Management Organisations: Implementation of Public Funding"). Such "government services" should be financed based on a public service contract.

c) If a) the cluster management organisation has efficient and effective institutional structures and processes in place and b) the cluster as such has a significant potential for development in order to guarantee a high "return of public investment" in terms of economic and societal impact. If it can be documented that investing public money in cluster organisations has a greater impact than investing in other types of innovation programmes then government should prioritise cluster support.

The NGPExcellence project recommends that long-term, yet flexible support of cluster management organisations is required. In order to meet the specific development conditions of cluster's support should be provided on a long-term basis of five to ten years. Furthermore, programme requirements and processes should not only be less bureaucratic, but also flexible enough to respond quickly to changing economic and technology environments in which the clusters are operating[27].

27 Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Technology and Innovation/Competence Networks Germany, Copenhagen/Berlin, p. 59

How flexible and bureaucratic a programme actually is depends on the national budget law provisions and the length of decision making processes.

There are three strong arguments for the long-term support of cluster management organisations:

- First, without having a stable basis of financing cluster managers are constantly pressed to search for alternative sources. This is quite time consuming and results in a situation in which less time can be spent on liaising with cluster participants to develop and implement services and projects.

- Second, the realisation of some activities, in particular the establishment of a new cluster management organisation, may require financing over a longer period of time.

- Third, it takes several years (at least five) from the date a cluster organisation is established before the full benefits and impact on business and the economy is achieved.

However, long-term financial support should be conditional by subjecting it to regular performance evaluation. With this programme owners have the possibility to interfere if the development of the cluster is not on track with regard to the objectives of financial support. The Norwegian Centres of Expertise (NCE) programme serves as role model in this regard. The NCE programme supports twelve cluster management organisations for ten years, but the project period is divided into three contract periods (3.5, 3 and 3.5 years). At the end of each contract period each cluster management organisation is evaluated. The renewal of the contract depends on a positive evaluation.

5 WORLD-CLASS BENCHMARKING, MONITORING, EVALUATION AND IMPACT ASSESSMENT OF CLUSTERS AND CLUSTER POLICY

Monitoring and evaluation of clusters, cluster programmes and cluster policy is important, but methods, key performance indicators and data collection differ across countries. A single set of agreed upon evaluation and impact assessment methods and key performance indicators does not exist. The needs and scopes of the analyses also vary, making it difficult to compare programmes, cluster policies and impacts across regions and nations.

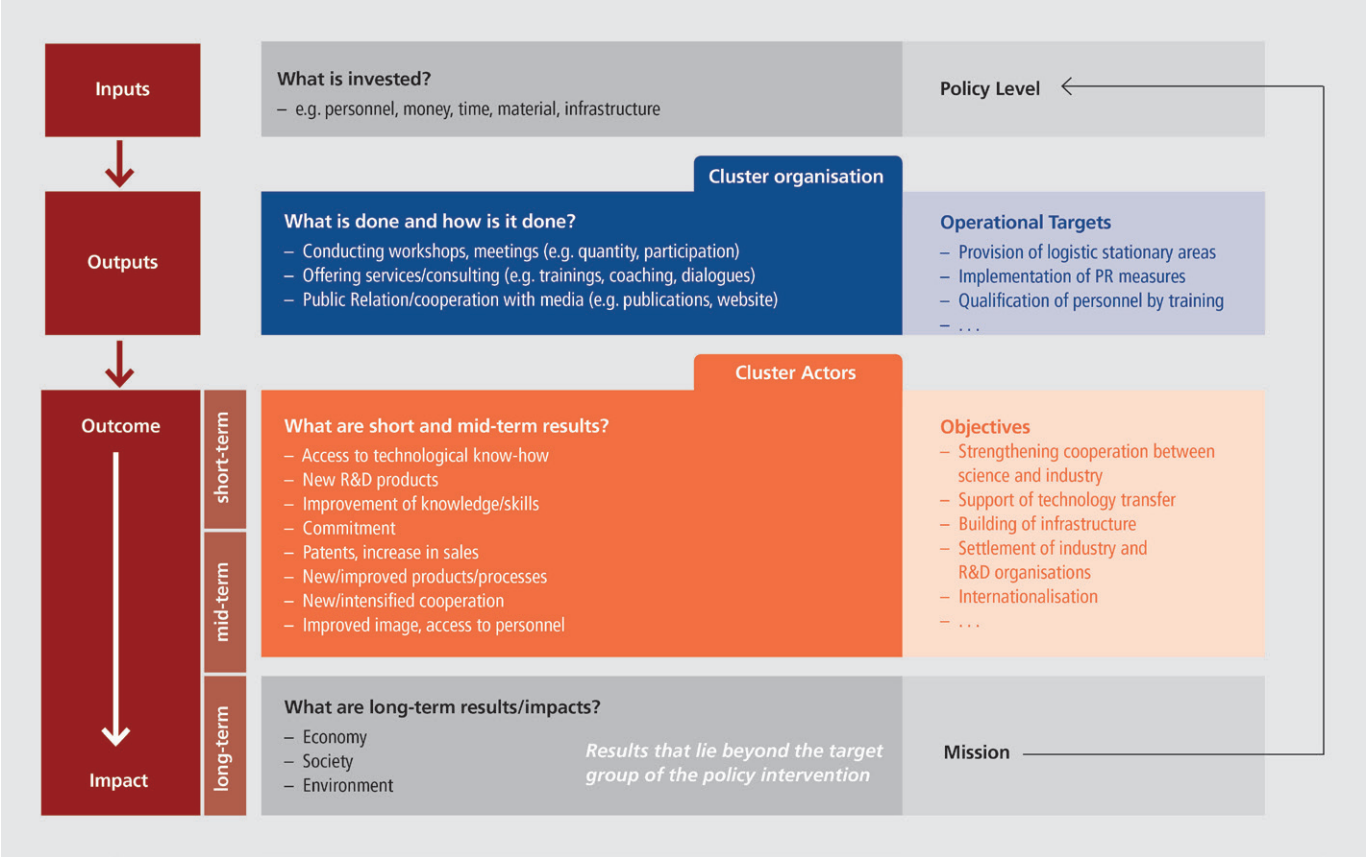
This section sets up a paradigm for monitoring, indicators, benchmarking and impact assessments which follow the best international methods for excellent benchmarking and impact assessment. It is based on the findings in the NGPExcellence project on cluster benchmarking and policy benchmarking as well as in national[28] and international studies, such as the European Commission's Pro-Inno projects on indicators and impact assessments.

In the course of the implementation of cluster programmes and cluster policies, most cluster programme owners and policy makers experience that there is continuous room for improvement when it comes to monitoring, evaluation and impact assessment of a programme and of cluster initiatives.

Hence, policy makers and programme owners are searching for a system that balances the interest in obtaining programme governance-related information with the interest in keeping the burdens for beneficiaries that derive from the participation in monitoring and evaluation as low as possible.[29]

Figure 9 provides an overview of the key focus areas of the perfect league of the various evaluation concepts. The focus area are four types of key performance indicators which either have an impact on cluster organisations, cluster actors or the society.

Figure 9: Cluster and Network Evaluation Model [30]



28 See Guidance on evaluating the impact of interventions on business, Department for Business, Innovation and Skills (BIS), August 2011, and Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy, Christensen, Thomas Alslev, Danish Ministry of Science, Innovation and Higher Education, 2012.

29 Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Eco-nomic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Innovation and Higher Education/Competence Networks Germany, Copenhagen/Berlin, p. 53

30 Kind, Sonja/Meier zu Köcker, Gerd, 2011: Evaluation Concept for Clusters and Networks. Prerequisites of a Common and Joint Evaluation System, Working paper, Institut für Innovation und Technik in der VDI/VDE-IT (iit), iit-perspektive Nr. 07, www.iit-berlin.de; This concept was developed primarily in the context of the project "Expertise on developing a common evaluation/benchmarking system for all Hamburg clusters" for the Ministry of Economic Affairs, Transport and Innovation of the Free and Hanseatic City of Hamburg – Cluster Policy Department (IT3). This project was carried out between February and June 2011 by the iit – Institute for Innovation and Technology in cooperation with dsn Analysen & Strategien | Kooperationsmanagement.

These four types of indicators can be described by the key performance indicator for inputs, outputs, outcome and impact. Input and output indicators are typically the focus of cluster organisations. Output and outcome are typically the focus of cluster actors and cluster programme owners. Finally, outcome and impact are typically the most relevant indicators for policy makers.

The figure states the interrelationship between inputs, outputs, outcome and impact as well as their relationships to cluster organisations, cluster actors and the society.

A perfect strategy for monitoring, benchmarking and evaluation of clusters and cluster policies should address each of these levels which are further developed below.

Based on international best practice, a "perfect cluster evaluation league of benchmarking, monitoring and impact analyses" could consist of the following three levels which characterise the evaluation needs of clusters and cluster managers, programme owners and policy makers:

1. Benchmarking and performance statistics of cluster organisations *(key performance indicators focus typically on input and output)*
2. Cluster programme evaluation and performance statistics of cluster actors (*key performance indicators focus typically on outcome)*
3. Impact assessment and analyses of cluster policies *(key performance indicators focus on impact)*

Firstly, the creation and sustainability of well-performing and excellent clusters with high impact require a well-established system of monitoring performance, benchmarking and learning for cluster organisations and their managers. Such a system might reveal and systemise information on which investments decisions are made in cluster organisations (input) and what are the direct outputs of these investments in terms of activities, cluster services, and so forth.

Secondly, developing and implementing a perfect cluster programme requires a system of evaluation and performance statistics that can monitor the development of a cluster programme and it's impact, increase the effectiveness of the cluster programme and ensure a programme owner an efficient learning system which gradually improves the impact and performance of the cluster programme and ensures a high return on investment. This will provide programme owners and policy makers with knowledge about the outcome of the programme in terms of results such as new goods and services, new collaboration projects, access to new markets, new patents and licenses, new technologies, new export markets, new ideas for future innovations, and so on.

Benchmarking, monitoring and evaluation should all use data that is already available and avoid redundant questioning. The effort required of the actors involved should be reduced to a minimum. Hence the two approaches (benchmarking and evaluation) should be integrated as far as possible. There is a need to strike a balance between the interest in revealing a "full picture" and the effort that is associated with in-depth surveys. The advantage of integrating the two levels of monitoring (at the cluster organisation level and at the cluster programme level) would be the recycling of data and would also ensuring data consistency between the two levels and administrative efficiency at all levels.

Thirdly, the objective of a cluster policy is to contribute to an impact on the society in terms of economic development, economic and productivity growth, international competitiveness and the solution of societal challenges such as social, environmental, energy or climate problems. Hence, a perfect cluster policy should be based on knowledge of the economic and non-economic impact of the existing cluster programmes, the performance of clusters, and the return of the investments in cluster activities. The best international research based analyses should be used to create such knowledge.

5.1 BENCHMARKING OF CLUSTER MANAGEMENT ORGANISATIONS – MEASURING INPUT AND OUTPUT

In contrast to evaluations and economic impact assessments, benchmarking is an efficient and effective way to identify the potential of a cluster and its cluster management organisation and to develop strategic recommendations for its further development within a short time frame. The objective of benchmarking is to learn from better performing peers or other entities in order to improve one's own structures, processes, products and services. Currently,

a benchmarking methodology developed by VDI/VDE-IT is being used in a wide range of projects, including the NG-PExcellence project and the European Cluster Excellence Initiative.

The benchmarking focuses on the cluster management organisation that is responsible for managing the cluster and its activities, and on the community of the cluster actors. Economics or other effects of the cluster on entire industrial sectors or the development of regional strengths cannot be reliably measured through benchmarking and are therefore not part of the analysis. The benchmarking covers 36 indicators that analyse the cluster and the cluster management organisation with regard to six dimensions, including the structure of the cluster, the governance and strategy of the cluster, the financing of the cluster management organisation, services provided by the cluster management organisation, contacts and the interaction with relevant players (Table 2).

Data is collected through a personal interview of two to three hours with the manager of the cluster organisation. The data is compared to a portfolio of at least180 clusters from different European countries. The results of the analysis will draw a detailed picture of the cluster as compared to its peers in terms of the structure of the cluster, cluster management and cluster governance, financing, services provided by the cluster management organisation and the achievements of the cluster management organisations. Based on the findings, recommendations for further action to improve the performance of the cluster management organisation are made.

Table 2: Benchmarking dimensions and indicators

INDICATORS OF THE ECEI CLUSTER MANAGEMENT EXCELLENCE LABEL ASSESSMENT	
1.	Age Of The Cluster Organisation
2.	Legal Form Of The Cluster Organisation
3.	Nature Of The Cluster: Driving Forces
4.	Nature Of The Cluster: Degree Of Specialisation
5.	Composition Of The Cluster Participants (Committed Participants)
6.	Geographical Concentration Of The Cluster Participants (Committed Participants)
7.	Utilisation Of Regional Growth Potential
8.	International Participants Of The Cluster
9.	Nature Of Cooperation Between Cluster Participants
DIMENSION: CLUSTER MANAGEMENT AND GOVERNANCE / STRATEGY OF THE CLUSTER ORGANISATION	
10.	Clear Definition Of The Roles Of The Cluster Manager / Implementation Of A Governing Body / Degree Of Involvement Of The Participants Of The Cluster In The Decision Making.
11.	Number Of Cluster Participants Per Employee (Full-Time Equivalents) Of The Cluster Organisation
12.	Human Resource Competences And Development In The Cluster Organisation
13.	Strategic Planning And Implementation Processes
14.	Thematic And Geographical Priorities Of The Cluster Strategy
DIMENSION: FINANCING OF THE CLUSTER MANAGEMENT	
15.	Share Of Different Financial Sources (Public Funding, Chargeable Services, Membership Fees And Other Private Sources) In The Total Budget Of The Cluster Organisation In Relation To The Age Of The Cluster
16.	Financial Sustainability Of The Cluster Organisation
DIMENSION: SERVICES PROVIDED BY THE CLUSTER ORGANISATION (SPECTRUM AND INTENSITY)	
17.	Acquisition Of Third Party Funding
18.	Collaborative Technology Development, Technology Transfer Or R&D Without Third Party Funding
19.	Information, Matchmaking And Exchange Of Experience Among Participants
20.	Development Of Human Resources
21.	Development Of Entrepreneurship
22.	Matchmaking And Networking With External Partners / Promotion Of Cluster Location
23.	Internationalisation Of Cluster Participants
DIMENSION: CONTACTS AND INTERACTION WITH RELEVANT PLAYERS	
24.	Regular Contacts With Cluster Participants
25.	Integration Of The Cluster Management Organisation In The Local And National System Of Innovation
26.	Customer And Membership Satisfaction
DIMENSION: ACHIEVEMENTS AND RECOGNITION OF THE CLUSTER ORGANISATION	
27.	Number Of External Cooperation Requests Received By The Cluster Organisation
28.	Institutional Origin Of External Cooperation Requests
29.	Geographical Origin Of External Cooperation Requests
30.	Characteristics Of Cooperation With Other International Clusters
31.	Visibility In The Press
32.	Impact Of The Work Of The Cluster Organisation On R&D Activities Of The Cluster Participants
33.	Impact Of The Work Of The Cluster Organisation On Business Activities Of The Cluster Participants
34.	Impact Of The Business-Oriented Services Of The Cluster Organisation On Sme Participants
35.	Degree Of Internationalisation Of Cluster Participants
36.	Impact Of The Work Of The Cluster Organisation On International Activities Of The Cluster Participants

5.2 EVALUATION AND PERFORMANCE STATISTICS OF CLUSTER – MEASURING OUTCOME

Key concern of cluster evaluation from a programme owner's and policy maker's point of view is whether the competitiveness and innovation capacity of the cluster has improved over the past years and what was the actual contribution of cluster policy, cluster and cluster management. In order to answer these questions, the Institute for Innovation and Technology (IIT Berlin) has developed a performance and evaluation concept for clusters and networks, in close collaboration with cluster policy makers, programme owners and cluster managers, which is introduced in the following paragraph and is summarised in Table 3. [31]

The concept understands clusters in a comprehensive way by considering three different dimensions of a cluster – the framework conditions, the cluster participants and the cluster management organisation - as three different subjects of evaluation. According to this concept, both ex-post and formative evaluations are key elements of a comprehensive approach to the monitoring and evaluation of clusters. The concept is based on eight assumptions as stated in Table 3. In summary these assumptions are:

- the concept should be applicable for any type of cluster since "clusters are individuals";
- a mix of quantitative and qualitative methods should be used;
- broad acceptance of the evaluation process;
- learning circle with practice oriented recommendations;
- compatibility between different monitoring or evaluation systems across clusters and programmes;
- recycling of data;
- a mutual learning system should be a part of the evaluation and monitoring process;
- biannual evaluation interval.

Table 3: Principles for benchmarking and evaluations of cluster organisations and cluster programmes

1.	**APPLICABILITY AND VALIDITY FOR THE EVALUATION OF ANY CLUSTER** The evaluation concept must be applicable to any cluster while taking into consideration their individual heterogeneity regarding such criteria as industry sector, size, age, structure, etc. The evaluation system must find a balance between individual cluster specific indicators and common overall indicators applicable to any cluster.
2.	**APPROPRIATE MIX OF METHODOLOGIES** Both quantitative and qualitative indicators should be assessed in order to reveal the cluster's success and potential. The results can also trigger learning, resulting in the improvement of processes among different stakeholder groups.
3.	**TRANSPARENCY AND BROAD ACCEPTANCE OF THE MONITORING AND EVALUATION PROCESS** The evaluation process should be open and transparent right from the start in order to achieve the desired validity of results and broad acceptance of the cluster actors and the people directly involved in the process. Thus, relevant cluster stakeholder groups should be included in processes such as the conception of questionnaires and interview guidelines.
4.	**LEARNING CIRCLE WITH PRACTICE-ORIENTED AND IMPLEMENTABLE RECOMMENDATIONS** The evaluation system should involve a learning cycle for the actors involved that also leads to practice-oriented results and derives hands-on recommendations for cluster managers and policy-makers.
5.	**COMPATIBILITY TO ALREADY EXISTING MONITORING/EVALUATION SYSTEMS** The evaluation system should be compatible with regard to already existing benchmarking, monitoring and evaluation systems or other monitoring concepts. Compatibility will have the advantage of reducing the administrative burden of cluster organisations and cluster actors and make it easier to compare results of different monitoring and evaluation systems across cluster organisations as well as across regional or national cluster programmes.
6.	**RECYCLING OF DATA AND TOLERABLE EFFORT – TIME AND RESOURCES** The evaluation should use data that is already available and avoid redundant questioning. The effort for the actors involved should be reduced to a minimum. There is a need to balance between the interest in revealing a "full picture" and the effort that is associated with in-depth surveys. Advantages of recycling data would also include data consistency and administrative efficiency.
7.	**MUTUAL LEARNING SYSTEM** The evaluation and monitoring process could be a part of a mutual learning system. In order to contribute to mutual learning, the evaluation results should be discussed among programme owners, cluster managers and cluster actors. However, the desired exchange should not be limited to a single programme. The learning process could be more open and include national and transnational perspectives (e.g. workshops to discuss lessons learnt).
8.	**EVALUATION INTERVAL** The benchmarking or evaluation should at least be repeated every two years.

31 Kind, Sonja/Meier zu Köcker, Gerd, 2011: Evaluation Concept for Clusters and Networks. Prerequisites of a Common and Joint Evaluation System, Working paper, Institute for Innovation and Technology (iit), iit-perspektive Nr. 07, www.iit-berlin.de

5.3 IMPACT ASSESSMENT AND ANALYSIS OF CLUSTER POLICIES – MEASURING IMPACT

There is no single indicator system that can be applied to measure the success of a cluster programme or of cluster policies, because indicators always depend on the objectives of a specific programme or policies. Thus, which indicators are used will depend on the individual programmes and policies and their targets.[32] However, once the key performance indicators of a programme have been chosen by policy makers and programme owners, several different methods of impact analysis can be chosen in order to measure the impact of the policy.

It is possible to analyse the economic as well as the non-economic impact of cluster policies. In an ideal world, the impact of a cluster policy should be found by comparing the performance of an enterprise that participates in cluster activities with the performance of an identical enterprise that does not participate. Such an analysis is not possible since either an enterprise is part of a cluster or the enterprise is not part of the cluster. Since the ideal situation from the point of view of an impact analysis does not exist, alternative methods are used.

One possibility is to choose an arbitrary group of enterprises and select a subgroup by a random selection; one group participates in cluster activities and the development according to a number of performance indicators is compared with the development of the subgroup of non-selected enterprises. Of course this is not the way enterprises decide whether or not to participate in a cluster. And it is unrealistic to imagine that enterprises would accept such a test to satisfy the curiosity of programme owners or policy makers.

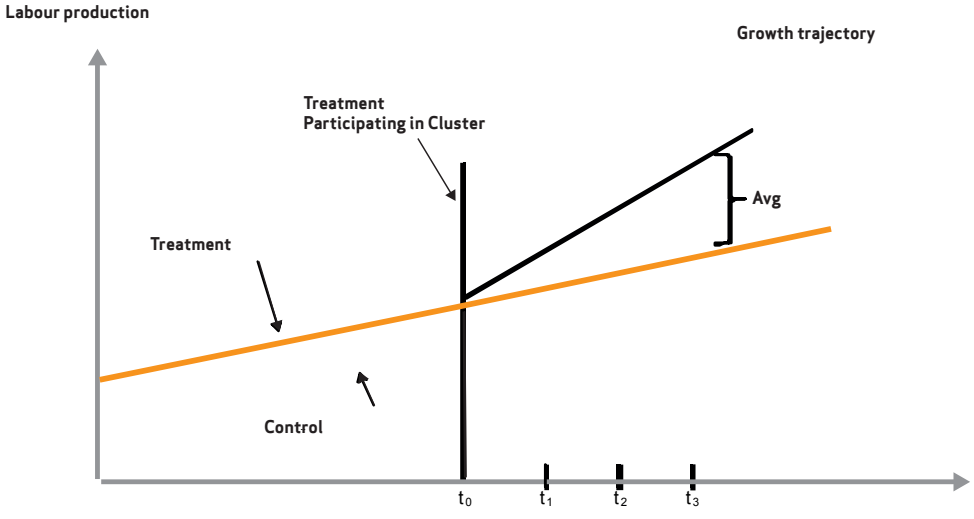
Therefore, when evaluating or analysing the impact of cluster policies the preferred analytical method in the research is the so-called propensity score matching method.[33]

The recommended standard method is the 'Propensity Score Nearest Neighbour Matching Method', which is used to establish and delimit, on a one-to-one scale, the group of cluster, and a statistically comparable control group of non-cluster enterprises, but could have done so, since it is impossible to find a control group that is completely identical. Most countries have sufficient statistical data and observations for their enterprises to use the recommended standard method, although it requires a sufficient number of relevant parameters for each enterprise in order to establish a relevant control group based on sufficient statistics.

The idea behind the method is that for an enterprise T, which has the desired cluster activity, an enterprise C is found among the other enterprises in the relevant statistics, and which for a number of statistical parameters resembles enterprise T by having the same probability ('propensity score') of taking part in the relevant cluster activity, except that in actual fact, enterprise C has not participated in the cluster activity. In this way, enterprise T (designated as 'treatment' or 'participating' enterprise) can be compared to a similar enterprise C (designated as 'comparison' or 'control' enterprise) located in the statistics (Figure 10).

Statistically, enterprise C must resemble enterprise T with regard to industrial sector, enterprise size, export pattern, staff education, profit, contribution margin and composition as well as for instance R&D activities or innovation activities.

Figure 10: The development in "treatment group" versus "control group" (example: labour productivity)



32 Lämmer-Gamp, Thomas/Meier zu Köcker, Gerd/Christensen, Thomas Alslev, 2011: "Clusters Are Individuals. Creating Economic Growth through Cluster Policies for Cluster Management Excellence", Danish Ministry of Science, Technology and Innovation/ Competence Networks Germany, Copenhagen/Berlin, p. 53

33 See Guidance on evaluating the impact of interventions on business, Department for Business, Innovation and Skills (BIS), august 2011, and *Central Innovation Manual on Excellent Econometric Impact Analyses of Innovation Policy*, Christensen, Thomas Alslev, Danish Ministry of Science, Innovation and Higher Education, 2012.

It is clear that another control group selection may give different results. In most cases, it will be an advantage to put together a control group that has as many control enterprises as possible – based on the law of large numbers. Accordingly, a one-to-one comparison is a minimum requirement, but it one-to-many would be preferred. Furthermore, this could be supplemented by various statistical tests to make sure that the control group is relevant.

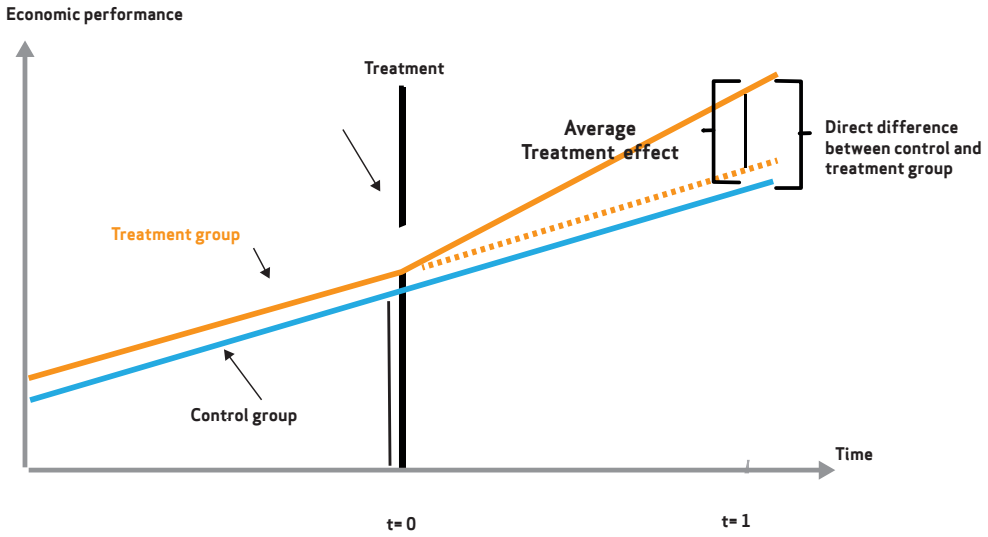
In addition, the analyses should use independent data collected by national statistic offices in order to ensure that data are collected in a consistent manner over the course of time. This will also help to make the quality of data better and avoid bias in the data, since the data is not collected for the purpose of impact analysis but for other statistical purposes.

In international literature the following parameters have been analysed by using the propensity score matching method: Innovation, collaboration projects, labour productivity, export growth, employment growth, gross profit development, total factor productivity and patent activities. Other indicators could be analysed as well. If policy makers attach importance to impact assessments which are based on the best possible research methods, policy makers should not use key performance indicators which cannot be subject for an independent econometric impact analysis.

Very often the difference in the direct effect between the "treatment group" and the "control group" does not show the impact of cluster activities since there can be many other explanations for different development in the economic performance or the non-economic performance between the two groups. In order to isolate the impact of cluster activities, all possible differences between the two groups should be handled. This could be difference in the average size between treatment group and control group, the difference in levels of economic or non-economic performance before participation in cluster activities and other structural differences which could explain the development in performance indicators after participation in cluster activities.

Therefore, it is recommended that analyses make use of the so-called difference-in-differences method and balanced panel data in order to establish a proper control group with the possibility to compare over time, to handle causality problems and compare different types and sizes of enterprises (Figure 11).

Figure 11: Difference-in-difference model



The following table provides programme owners and policy makers with a list of principles which could be used as guiding principles for best practice impact analysis (Table 4).

5.4 OVERVIEW OF POSSIBLE INDICATORS

Figure 12 gives an overview of "groups of indicators" that correspond to the policy and programme interventions into the different cluster dimensions as well as methodologies to collect the relevant data.

As already stated above, there is no single indicator system that can be applied to measure the success of a cluster programme or of cluster policies, as indicators always depend on the objectives of a specific programme or policies. Thus, which indicators are used will ultimately depend on the individual programmes and policies and their targets.

While indicators to measure the potential performance of a cluster management organisation are already introduced in chapter 5.1, Table 5 gives an overview of a comprehensive set of input, output and impact indicators to measure the effect of a cluster on a company.

Table 4: Principles for cluster policy impact analysis

1.	**LISTING CLUSTER POLICY PERFORMANCE INDICATORS WITH REGARD TO OBJECTIVE** Establishing a set key performance indicators formulated as indicators for effects (input variables), throughput variables and results (output variables) which are in accordance with the objective of the cluster programme or cluster policy and which can be measured.
2.	**CLUSTER DATA COLLECTION** Establish standards for cluster data collection, including standards for input variables and registra-tion in databases, so it is possible to conduct impact analysis with control groups. Ensure high data quality with long time series of at least 6 years with a minimum of data gaps in the time series. This requires collaboration between clusters, programme owners and researchers.
3.	**DATA QUALITY** Application of national registers for enterprise data or similar high quality enterprise data
4.	**TREATMENT OF DATA AND QUALITY REQUIREMENTS IN IDENTIFYING CONTROL GROUPS** Selection of comparable (control) enterprises must be based on matching as many relevant parameters as possible. Use of alternative control groups / comparison groups with a clear and un-ambiguous interpretation option: e.g. propensity score matching group, group of enterprises within the same industrial sector etc.
5.	**USE THE DIFFERENCE-IN-DIFFERENCES METHOD** Use of the difference-in-differences method and balanced panel data in order to establish a proper control group with the possibility to compare over time, handle causality problems and compare different types and sizes of enterprises.

Figure 12: What kind of indicators should be looked at?

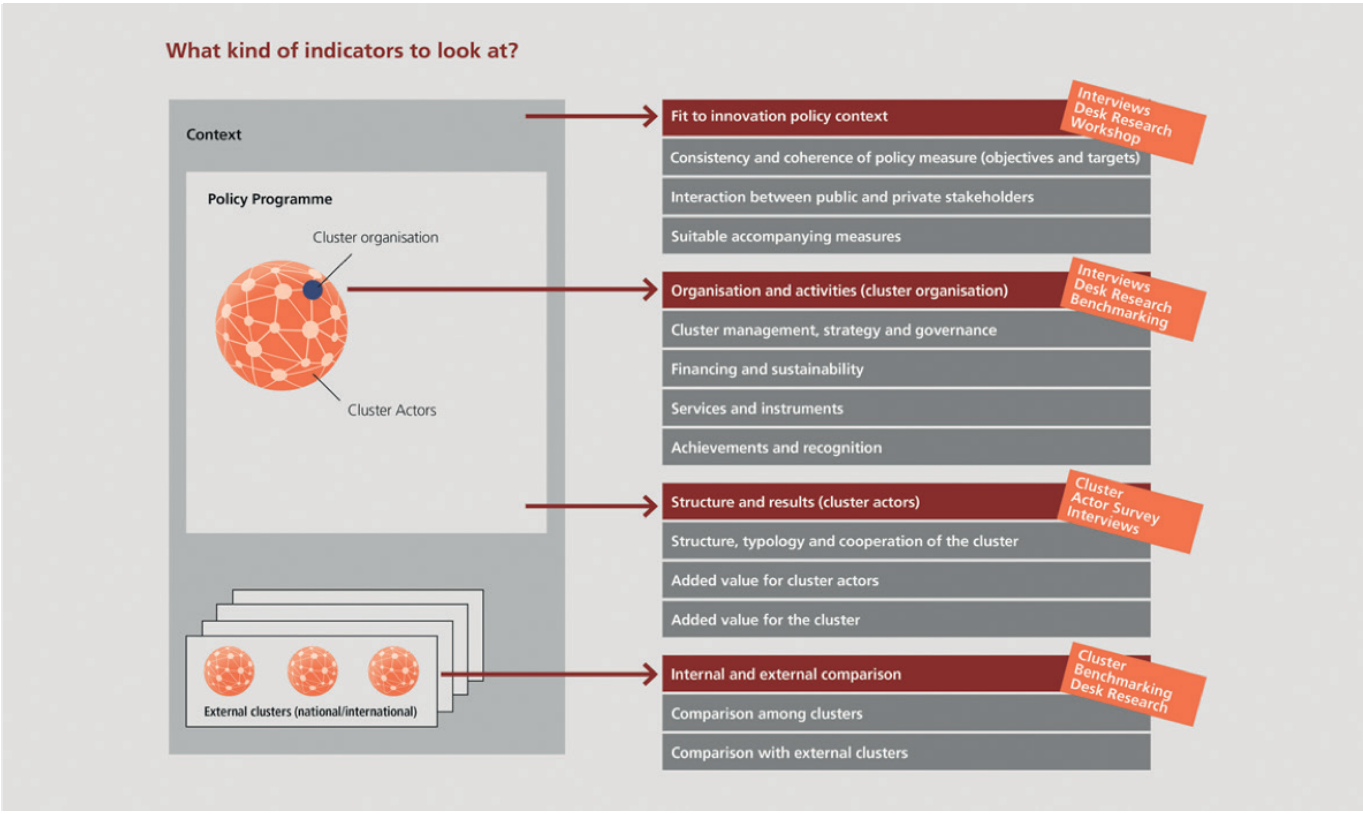


Table 5: Set of input, output and impact indicators to measure the effect of a cluster on a company

INPUT AND OUTPUT →	OUTCOME →	IMPACT
• What is the % of company-funded R&D? • What is the % of company-funded innovation/development activities targeted at developing process innovation? • What is the % of company-funded innovation/development activities targeted at developing organisational innovation? • What is the % of company-funded innovation/developments activities targeted at developing ad hoc innovation? • What is the % of company-funded innovation/development activities targeted at developing market innovation? • What is the % of company-funded innovation/development activities conducted in conjunction with customers? • What is the % of company-funded innovation/development activities conducted in conjunction with suppliers? • How large is the company's investment in innovation/development activities? • How large is the company's expenditure on innovation? • How large are the company's investments in technology and innovative techniques? • Does your company spend resources (time and money) on development activities? How many resources did you spend? • Does the company rely on employee-driven innovation? • Do the company's employees have time specifically dedicated to innovative activities? • What is the share of the company's employees dedicated to innovation/development activities/R&D? • How large are the company's investments in education associated with innovation? • Does the company spend time/money on in-house training of employees in innovation/development activities? • Does the company spend time/money on competence development regarding innovation/development activities? • What is percentage of the company's employees have a higher education? • What percentage of technicians have (highly) specialised knowledge in the company? • Does your company have partnerships with: public institutions, research institutions, knowledge institutions, other companies, etc.? • How many research environments does the company participate in? • Does the company rely on customer driven innovation?	• Has your company introduced new trademarks (branding)? • Has your company obtained or sought exclusive rights protection for one of your services within the last three years? • Has your company obtained or sought industrial Design Protection for one of your services within the last three years? • Has your company obtained or sought intellectual property rights protection for one of your services within the last three years? • Has your company obtained or sought licensing rights protection for one of your services within the last three years? • Has your company obtained or sought copyrights protection for one of your services within the last three years? • Has your company obtained or sought service mark protection for one of your services within the last three years? • Has your company obtained or sought patenting protecting for one of your services within the last three years? • Has your company obtained or sought certification protection for one of your services within the last three years? • Did your company use its market position to protect its services? • Did your company introduce new designs? • Did your company introduce new processes? • Did your company introduce a new type of marketing? • Did your company introduce an organisational development/change/innovation? • Did your company develop new customer oriented service processes? • Did your company introduce incremental (stepby-step) innovations in larger concepts? • Did your company introduce a new standard for your service offerings? • Did you develop a new technology/digitalisation with modifications from a previous technology? • What did you change/adjust? • Did you introduce a new technology/digitalisation, developed from scratch? • Did your company couple a service to physical products within the last year?	• What is the % of your company's sales came from innovative services within the last three years? • What is the innovation's share of market? • What is the innovation's rate of returns? • What is the innovation's profit-margin? • Have you internationalised your service offerings in the form of FDI or exporting? • Value added per service employee? • Did you introduce a service offering that reached the market? • Did the innovation reduce your company's costs? • Did the innovation reduce your company's use of materials, energy, time, etc.? • Did you create a service innovation that improves your business model within the last year? • What is the productivity (per employee)? • Did your company experience increased motivation of the company's employees following the service innovation? • Did your company experience increased satisfaction among the company's employees following the service innovation? • Did your company experience increased effectiveness in the organisation following the service innovation? • Did your company create an innovation which improved the customer experience within the last year? • Are the innovations related to the employees' skills/education? • Did the innovation result in the hiring of new employees? • Did the innovation result in movement of employees to the area of the service innovation? • Mobility of employees between public and private sector • Employees' salary • Did the company create novel facilities or sur-roundings utilizing for example virtual technology?

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