INCREASING INNOVATION STRUCTURES
IN GOVERNMENT AND INDUSTRY – GERMAN EXPERIENCES AND IMPLICATIONS FOR MONGOLIA

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Abstract

East Germany and Mongolia both had been socialistic states until 1989. In the case of the German reunification several programs have been settled to build innovation structures in the universities as well as in the new build companies. The message of this success story is that you need sustainable efforts and strengths to become innovative and to build new structures. Further examples of high actuality are the strengths to modernize the German energy system. Renewable energies have now high priority instead of nuclear power. Very actual is the trend of “recarbonization”. Our example shows that a lot of systematic training is necessary to reach a sustainable change.

To compare Germany with Mongolia may be like a comparison of “apples and oranges”. But nevertheless the Mongolian examples which are mentioned in this article show that industry parks are founded and the cooperation between companies and universities is increasing. Joint ventures with foreign companies are often needed. But knowledge and technology transfer would occur giving rise to different learning opportunities.

Undoubtedly there are big differences in cultural as well as in institutional aspects but the German-Mongolian cooperation can help to implement environmental and social standards, setting up industry clusters that also include collaboration with research centers and to improve resource efficiency.
1. Innovation Structures in the Industry

1.1 "Entrepreneurial Regions"

The Federal Ministry for Education and Research’s (BMBF) innovation initiative “Entrepreneurial Regions” has the goal to develop regional alliances of a particular innovation profile into regional innovation clusters. Since 1999 the BMBF has pursued this objective through the systematic development of a range of programs for new German states joining the Federal Republic of Germany since reunification in 1990. The program policies are based on four guidelines, as follows:

- Only the best from the region: innovating from regional strengths.
- Innovations: creative, strategic and relevant.
- Innovations with a market orientation.
- Establishment of regions with an innovation profile, based on outstanding technological platforms.

Collectively these programs have contributed significantly to increasing the competitiveness of the East German economy, despite an ongoing need to catch up to the West. This represents approximately 20 years of support programs.

1.2 Program SIGNO for Small and Mid-Sized Businesses and Universities

The Federal Ministry for Economic Affairs (BMWi) supports technology transfer between universities, small and medium-sized businesses (SMB) and freelance inventors in addition to aiding in the legal protection and economic realization of their innovative ideas within the framework of the “SIGNO” program, or “Safeguarding Ideas for Commercial Usage”. This support program has been running since 1999.

SIGNO encompasses three activities:

a. **SIGNO-Universities** support the efficient collaboration between universities, business and other publically financed research institutions by ensuring the rapid transfer of the most current patented business-technical findings to the appropriate business entities.

b. **SIGNO-Inventors** support the creative potential of inventors with a holistic approach to providing information and expertise to individuals involved in inventing.

c. **SIGNO-Businesses** support small and medium-sized businesses (SMB) in their efforts to protect the results of their research and development through the application of industrial and intellectual property rights as part of an SMB-Patent-Action within a nationwide network of SIGNO-partners.

This action supports small and medium-sized businesses that are either engaging in the first-time establishment of industrial and intellectual property rights (patents and registered design) for their research and development results, or whose last property rights application was conducted more than five years prior.

### 1.3 The EXIST Program (University-Based Business Start-Ups)

EXIST\(^3\) is a support program of the Federal Ministry for Economic Affairs and Energy (BMWi) started in 1998 aimed at improving the entrepreneurial environment at universities and research institutions, and at increasing the number of technology and knowledge-based business start-ups. The EXIST program is part of the German government’s “**Hightech Strategy for Germany**” and is co-financed by funding from the European Social Fund (ESF).

The EXIST program includes three program lines: (See figure 1).

**Figure 1: EXIST Program Lines**

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The EXIST program line "Culture of Entrepreneurship" supports projects at universities to build up an infrastructure for providing skills and support for technology and knowledge-based innovative ventures. In support of these activities, universities receive an allowance from the German Federal Ministry for Economic Affairs and Energy (BMWi) over a three-year period up to five years.

The projects may include measures geared towards the following activities:

- establishing a lasting “culture of entrepreneurship” at universities and research institutions
- supporting consistent transfer of scientific knowledge into commercial output
- promoting the enormous potential of business ideas and entrepreneurial personalities at universities and research institutions in a targeted manner
- increasing the number and the chances of success of innovative business start-ups
EXIST Business Start-Up Grant\(^4\) supports the preparation of innovative business start-up projects at universities and research institutions. The grant aims to help scientists, university graduates and students developing their business ideas into business plans and to advance their ideas for products and services.

EXIST Transfer of Research\(^5\) promotes technology-based business start-up projects in the pre-start-up and the start-up stage. EXIST Transfer of Research” complements the broadly targeted EXIST Business Start-Up Grants with an excellence-oriented measure for high-tech start-ups.

2. “Entrepreneurial Universities”

German universities are confronted with ongoing changes. One of these changes represents a paradigm shift that affects the university and research system as a whole. This paradigm shift is the so-called "third mission" or "entrepreneurial mission". Universities are asked to make contributions to the economic system via the transfer of knowledge and technology (Etkowitz 2003, 293). The following questions are relevant:

- How do universities integrate the "entrepreneurial mission" in their organizational structures?
- What structures exist for universities in the fields of technology and knowledge transfer?
- Who are the central actors within universities

The main objective of this exploration is to get a deeper understanding of how German Universities fulfill their “entrepreneurial mission”. Furthermore, practical input needs to be provided in order to implement knowledge and technology transfer at German universities (Reisswig 2013, 6).


“Entrepreneurial University Potsdam”

The University of Potsdam has the vision to be an entrepreneurial university in addition to achieving excellence in research and teaching. Initial technology transfer projects, start-up activities and efforts to found a technology transfer office began over 20 years ago in 1992. The EXIST-IV project started in October 2010 and was the culmination of a series of transfer projects. All the activities were concentrated in Potsdam Transfer\(^6\), the Center for Entrepreneurship, Innovation, Knowledge and Technology Transfer with four different branches:

- Research (Research projects, studies, scholarships, PhD-projects)
- Education (Bachelor and Master courses in Innovation and Entrepreneurship, Executive Education, Entrepreneurship Academy)
- Start UP (Entrepreneurship qualifications, Business start-up services for Undergraduates, Postgraduates, Scientists, Professors, Alumni)
- Transfer (Project Development and Management, Intellectual Property Management, Technology Scouting, Events and Congresses, Trade Fairs and Presentations)

The most important ongoing projects are:

- **The Entrepreneurship Academy**: The Entrepreneurship Academy has the goal to promote entrepreneurial thinking. Students from all faculties learn to develop and implement founding ideas. The Academy has multidisciplinary offers from various professorships in order to strengthen individual and team-oriented skills and talents.

- **Technology Scouting** A central goal is to identify the potential utilization of technologies in different research areas (Hoelzle et al. 2014, VII). Typical instruments are technology roadmaps, the screening of complementary technologies, applications, customers a markets and technology radar (Potential analysis and evaluation).

\(^6\)http://www.uni-potsdam.de/wirtschaft-und-transfer.html accessed 14 October 2014
Of paramount importance is the understanding that the primary mission of universities is to conduct research and research-based teaching. Nevertheless knowledge and technology transfer is a field of growing importance for universities. By connecting the scientific community and industry, important regional economic structures can be developed, promoting job creation and the founding of new companies. Additionally, a well-educated workforce is requisite for developing regional infrastructure and contributes to the establishment of an efficient innovation culture in enterprises and public administration.

3. Cluster Development Energy Technology

This section analyzes the development of the cluster Energy Technology by focusing on the newly developed capacity building system for this cluster. The “Capacity Building System Energy Technology” is a model project of the Berlin Senate Department as an innovative approach to practical development (Steinhoefel 2014, 1). The objective is to develop a relevant market system of capacity building in energy technologies to be realized within companies that are accompanied by authorized educational institutions with recognized training modules.

This capacity building system is part of a national cross-industry cluster and should create solutions for the professional needs of today and tomorrow. In this respect, the “Capacity Building System Energy Technology” includes competence modules for qualification in the work process and makes funding available in the German capital region of Berlin-Brandenburg. Competence modules are based on the professional images of Energy Technology, with modules generated by experts. The experts define which competence and skills are needed. The result is a well-defined requirement for the modules in practical contexts.

The long-term perspective is to achieve a structural foundation in the German capital region of Berlin-Brandenburg. Capacity building as a public-sector offering and support system for businesses, employees and job-seekers in the states of Berlin-Brandenburg requires support from social partners, associations and chambers. Cooperation with established educational institutions and companies in the development and testing of
modules is needed, as well as with universities to develop specific modules in order to build academic capacity and for creating a broadly deployed solution.

Capacity building in the cluster of “Energy Technology” is possible in the following topics:

- Wind and bioenergy
- Solar Energy / Photovoltaic
- Turbo machinery and power plant technology
- Networks, storage, e-mobility
- Energy efficiency technology
- ET components and services

The following figure illustrates the current capacity building modules for the cluster Energy Technology: (See figure 2).

Figure 2: **Summary of modules for the cluster Energy Technology**

*Source: Brueckner/Steinhoefel 2014, 14*
The illustration shows that in the context of the continuing education system for energy technology, the specified individual modules are assigned to the six fields of technology. The continuing education system follows the principle of orientation based on competencies and occupation.

The intention is to incorporate learning into existing workflows and to document, evaluate and certify the resulting learning outcomes and development of competencies. A modularly structured continuing education system will contribute to the systematic planning of knowledge acquisition, knowledge transfer, competency development and the acquisition of additional qualifications. This is the result of a close cooperation with enterprises, training companies and scientific institutions, as well as the Energy Technology Cluster in Berlin-Brandenburg (Steinhoefel 2014, 2).

4. German-Mongolian Cooperation in field of Energy and Mineral Resources

4.1 Main Priorities of Germany’s Cooperation with Mongolia

At the end of 2010 the Federal Government presented a natural resources strategy in order to secure the supply of critical metals and minerals. A cornerstone of this strategy is partnership agreements with select natural resource rich countries. The first of the natural resource partnership contracts was completed in October 2011 between Mongolia and the Federal Government. The Federal Government committed itself to develop natural resource processing industries in the partner country and to support measures for improved resource management.

As a technological center, Germany has a high resource demand (Dahlmann/Mildner 2012, 1). Germany is dependent upon imports of a variety of mineral and metal raw materials like copper. Despite the fact that it is among the third largest consumers of copper in the world after China and the United States, there are no copper producing mining operations in Germany (DERA/BGR 2012, 2). Germany imports approximately
85.5% (total requirements: 1,312,200 tons/year\(^7\)) of its copper needs annually from countries across the globe. The largest users are the electronics, building, machine construction and coin minting industries.

For Mongolia, the raw materials partnership with Germany is particularly interesting because it offers a roadmap for diversification of its raw material consumers and reduces dependencies on China and Russia (Dahlmann/Mildner 2012, 3). Like many resource-rich countries, Mongolia has not been able to use its rich supply as a springboard for further development. In order to strengthen and diversify the larger economy, Mongolia continues to be dependent on outside investment. It is incumbent upon the Mongolian government to attract international investment and negotiate investment contracts.

The significance of Mongolia relative to raw materials, such as copper, is underscored in the recent research studies of the German Raw Materials Agency (DERA) and the Federal Institute for Geosciences and Natural Resources (BGR). The copper mining at Ouy Tolgoi has moved Mongolia to the number 6 position among copper producers in Asia, following China, Russia, India, Indonesia and Kazakhstan (DERA/BGR 2012, 5). Over 6000 coal, copper, gold, silver and uranium deposits have been identified. In addition, Mongolia has rare-earth deposits that are important for the high-tech industry.

{For more on this, see paper by Terry Surles in this volume.)

From the outset of developmental collaboration with Mongolia, the government of the Federal Republic of Germany has provided assistance during the transformative years of developing a market economy and has continually provided support to the Mongolian people\(^8\). Within the timeframe of 1991 to 2011, the volume of bilateral technical and financial cooperation totaled 274.6 million euros. The government of the Federal

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\(^8\)Embassy of Mongolia 2012, 4 Protokoll der Verhandlungen ueber die Entwicklungs zusammenarbeit zwischen der Regierung der Mongolei und der Regierung der Bundesrepublik Deutschland, http://www.botschaft-mongolei.de/PDFdaten/protokoll_german_rv.pdf accessed 03 November 2014
Republic of Germany also agreed to provide the government of Mongolia with up to 26.5 million euros to support bilateral technical and financial cooperation.

Chancellor Angela Merkel announced during her travels in Asia in 2011 that the country’s difficult geographic position between Russia and China made it very interested in partnerships with third countries. She emphasized that, “Mongolia is making a concerted effort to find a democratic path despite the lack of ideal conditions. Germany can offer support in education and technology transfer.” (Handelsblatt 20119). The proposal from Chancellor Merkel and President Elbegdorj in October of 2011 to create a joint mining academy was pursued and subsequently the German-Mongolian Institute of Resources and Technology (GMIT) was dedicated on the 4th of September 2014 in Nalaikh near Ulan Bator10.

The main priorities of Germany's cooperation with Mongolia (BMWi 2011) are:

- to improve raw materials and resource efficiency,
- to implement environmental and social standards in the extraction and processing of raw materials;
- to set up industry clusters that also include collaboration with research centers;
- to improve conditions for investment and innovation.

On the 24th of October 2014, the German-Mongolian Working Group of Governmental Cooperation reached an agreement to include and intensify collaboration in the areas of renewable energy and energy efficiency, as well as education and continuing education programs within the framework of the existing technical and industrial cooperation on natural resources (IHK Hannover 201411). Mathias Maching, State Secretary in the Federal Ministry of Economic Affairs and Energy stressed that, “Mongolia has a great potential for renewable energy. We can deepen our collaboration by contributing our

experience in developing renewable energies here in Germany.” (BMWi 2011\textsuperscript{12}). In the following sections, current projects and provisions related to the focal points determined by Germany in its cooperation with Mongolia are presented. The assistance should make important contributions within the framework of the agreement between both countries covering raw materials, industry and technology.

4.1.1 Field of Energy Efficiency and Renewable Energy

The central challenge in the energy sector of Mongolia is to meet rising energy requirements in an environmentally sustainable manner within the context of expected economic growth, particularly in the mining sector. President Ts. Elbegdroj\textsuperscript{13} is quoted as saying: “\textit{I ardently look forward to a day when the Mongolian Gobi becomes the heart of the regional renewable energy production – the Gobi-Tech, a Gobi-centered powerhouse localizing global technological progress}”.

German contributions within this field are concentrated on energy policy consulting, capacity development as well as the increased energy efficiency in currently operating power plants. In addition, a central theme is the improvement of conditions for rational and strategic investment in the area of energy efficiency and its application on the demand side within power plant sectors. Germany supplies technical support on the further development of quality infrastructure with particular focus on the energy sector\textsuperscript{14}. The modernization of the Mongolian system for electrical transmission and energy creation is supported by the targeted adoption and implementation of German, European and international scientific and technical standards.

The Finance Ministry of Mongolia will serve as project manager with implementing organizations expected to be the Mongolian Agency for Standardization and

\textsuperscript{12}\url{http://www.bmwi.de/EN/Press/press-releases,did=445890.html} accessed 4 December 2014
\textsuperscript{13}Tsakhia, Elbegdorj, Greetings of the President of Mongolia to the participants of Mongolia Renewable Energy-2012, \url{http://www.president.mn/eng/newsCenter/viewNews.php?newsId=709} accessed 8 November 2014
\textsuperscript{14}Embassy of Mongolia 2012, 5/6 Protokoll der Verhandlungen ueber die Entwicklungszusammenarbeit zwischen der Regierung der Mongolei und der Regierung der Bundesrepublik Deutschland, \url{http://www.botschaft-mongolei.de/PDFdaten/protokoll_german_rv.pdf} accessed 03 November 2014
Meteorology as well as the Energy Authority. The first phase covers the period from August 2012 through July 2015. The grant amount is 1.4 million euros.

### 4.1.2 Integrated Mineral Resource Initiative (IMRI)

Within the framework of the raw materials agreement, the German Federal Enterprise for International Cooperation (GIZ) has been leading a large development project “Integrated Mineral Resource Initiative” (IMRI) in Mongolia with the goal of good governance in the mineral resource sector. A concentration is on promoting small and medium-sized companies in the raw materials sector. Through the integration of German companies in developmental policy measures, the natural resource agreement between Germany and Mongolia contributes to support the entrance of German companies into the Mongolian market.

Within the framework of the program “Integrated Mineral Resources Initiative” the GIZ\(^\text{15}\) is conducting the following measures in Mongolia:

- Capacity development at the holding company SIC LLC for the development of the Sainshand Industrial Parks;
- Capacity development at the Mongolian Mining Association;
- Development of mining supplier cluster and Supplier Qualification Program (SQP) and training for small and medium-sized companies within the selected areas.

The Governmental grant funding totaled 3.9 million euros for the timeframe of August 2011 to July 2014.

### 4.1.3 Field of Sustainable Resource Management

The newly defined focal point of “sustainable resource management”\(^\text{16}\) within the German-Mongolian developmental cooperation agreement seeks to improve

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institutional, economic policy and human resource requirements for a sustainable and broadly applicable resource-based economic growth that integrates the German, Mongolian and foreign private sectors. The focus is on measures that will increase professional expertise in Mongolia in the area of raw materials management. Effective and long-term changes in the area of resource management require competent contributions from the private sector, state-run institutions and civil society. The successful advancement of this sector requires a clearly formulated and fact-based, long-term developmental strategy that includes aspects such as the integration of direct foreign investment, technology and knowledge transfer as well as clear government regulations and implementation criteria.

In this context, the German support includes the following areas:

- Support for human resource and institutional capacities of important institutes within the sector.
- Improvement of the administrative and legal frameworks of the natural resource sector.
- Good governance related to the administration and use of revenues from natural resources.
- Improvement of corporate governance rules and their implementation by state-run companies.
- Systematic integration of German “Know-How” and German Companies in the development of strategic areas of the natural resource sector.
- Improving coordination within the German-Mongolian Working Group and associated ministries for the introduction of European norms and standards.

The Federal Agency for Geosciences and Natural Resources (BGR) supports the Mongolian governmental oversight agency GASI (General Agency for Specialized Inspection) to draft regulatory mandates and procedural rules, introduce modern

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monitoring methods as well as consulting in the area of mining cultivation\textsuperscript{18}. The Federal Institute for Geosciences and Natural Resources (BGR) provides complementary competencies to the areas of responsibility of the Federal Ministry of Economics and Energy (BMWi). In the year 2005 commenced the project “Environmental Protection in Mining”. Its partner is the State Specialized Inspection Agency. From January 2008, until October 2011 BGR provided assistance to the Minerals and Petroleum Agency in the economic evaluation of selected mineral deposits. The projects of BGR focused on supporting the build-up of institutional und human resource capacities. In this way, the Mineral Resources Authority of Mongolia (MRAM) should contribute to the sustainable management of the natural resource sector and establishing development and investment services. In 2009 and 2010, BGR provided training opportunities in the area of modern coal technologies to the Ministry of Mineral Resources and Energy of Mongolia. Since 2007 BGR has supported the Central Geological Laboratory in the production of Certified Reference Materials which expired at the end of 2012. Since 2013 the laboratory has received assistance in proficiency testing for inter-laboratory comparison. The total grant awarded for the timeframe of September 2012 to September 2014 is 1.6 million euros.

The government of the Federal Republic of Germany will continue to support Mongolia through the CIM-Program\textsuperscript{19} for returning, integrated skilled personnel and development aids. The Center for International Migration and Development (CIM) located in Eschborn near Frankfurt am Main, was founded in 1980 and is a working group of the International Placement Services office within the Federal Employment Agency and the German Society for International Cooperation. It has the central task of placing skilled laborers and executives in developmentally important positions from developing countries and transformational countries like those of Eastern Europe.

The organization offers two programs:

\textsuperscript{18}http://www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Laender/mongolei_en.html accessed 4 October 2014

\textsuperscript{19}http://www.cimonline.de accessed 4 December 2014
1. The CIM Program for Returning Experts aids the reintegration of talented and experienced experts from developing and newly industrialized countries that have qualified themselves in Germany who wish to return to their home countries.

2. The CIM Program for Integrated Experts makes it possible for governmental and private entities in developing countries to bridge human resource shortfalls through temporary employment of skilled labor. These experts are primarily sources from the German labor market.

To support bilateral industrial contacts the German Center of Excellence (GCoE) in Ulaanbaatar offers (Weyler 2013, 8) the following services:

- Establishing contacts with Mongolian ministries and institutions,
- Investment consulting to support the selection of investment objects and general consulting on business activities within Mongolia.
- Help with recruiting.
- Workshops and seminars to train and qualify employees.
- Providing expo space and the usage of training space.

4.1.4 Cooperative Vocational Education in the Natural Resource Sector

The new sustainable resource management project module “Integrated Initiative Vocational Education” will contribute significantly to the stipulated support for Mongolia in the qualification of skilled professionals as part of the partnership agreement on natural resources. Together with the vocational education project of the European Union (EU) and Swiss Agency for Development and Cooperation (SDC), this project can provide the basis for a program-based approach. In April of 2012 a labor market needs analysis was conducted. It is envisaged that the accompanying the vocational education module will implement complementary Human Capacity Development²⁰ (HDC). This developmentally oriented qualification program should

strengthen the technical and didactic capacities from project leaders in the vocational education sector and the private economy in the natural resource sector. Special consideration for continuing education programs is given to management and instructional personnel from vocational schools as well as to instructors within companies of the natural resource sector. In addition, there are plans for cross-linkage between the future German-Mongolian Institute for Resources and Technology (GMIT). The governmental grant total for the “Integrated Vocational Education Initiative” is 3.8 million euros and the component “Human Capacity Development” (HDC) received 1.2 million euros.

The university sector in Mongolia has yet to acquire the technical and organizational resources and the expertise required to meet the needs of industry and society in terms of highly trained engineers and technology experts. Shortcomings in the Mongolian university sector include an inadequate practical orientation and a lack of international quality standards. The German and Mongolian governments and private enterprises in the two countries are aware of the need for reform. In light of the need for reform, they decided to establish the German-Mongolian Institute for Resources and Technology (GMIT). In September 2013, the university welcomed its first 40 or so students, who enrolled in a one-year preparatory study program in engineering. Since September 2014, three bachelor programs also have been available in the subjects of mineral resources engineering, mechanical engineering and environmental engineering.

The significant challenges of GMIT (ibid., 9) are:

• Cooperative solutions that are oriented on existing scientific and economic structures
• Implementation of a phase model starting with joint course of studies, faculty and growing ultimately to an independent establishment.

As a statutory university for scientific teaching and research, the German model should be applied to reform the higher education sector in Mongolia21.

4.2 Main Priorities of Mongolia’s Cooperation with Germany

The Mongolian government favors (ibid., 7) support in the following areas:

- Cooperation on build-out and development of industry clusters and scientific parks that are based on high-technology and innovation with the goal of mineral processing to the production end-products in mining regions and centers of high population density;
- Cooperation in the framework of building a metallurgy complex in Mongolia;
- Collaborative build-out of a center for technology transfer for the application of strategic metals (Zinc, Wolframite, etc.).

The Mongolian Working Group of Governmental Cooperation with Germany reports on “High Technology” centers that should be built up in the five sub-regions of the country. First stages involve the commissioning of pre-feasibility studies, followed by comprehensive feasibility analysis as well as creating general and detailed master plans. The Mongolian Working Group of Governmental Cooperation indicated that the feasibility studies are open for participation by foreign partner institutes. Mongolia is interested in German expertise and participation in the bidding process. The reasoning behind the Mongolian government’s desire for deepening ties with Germany in the aforementioned focal areas of technical and developmental cooperation is apparent in the example of the industry cluster in Sainshand City.

The industry park in Sainshand is a political and economic imperative of the Mongolian government and has met with broad support. As a result, the innovation park plays a considerable role. It should be a driver for economic and social development in Mongolia. Next to the industrial park, an innovation park with connections to universities and vocational institutions should be erected. The required land and the necessary building should and will be made available by communal institutions. For this important project, Mongolia has contracted for consulting services (NDIC 2012, 8) with the Boston Consulting Group.

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The following infrastructure for integrated mining and railway strategies are envisaged. (See figure 3).

Figure 3: Industry Cluster in Sainshand City, Mongolia

Source: NDIC 2010, 8

The graphic shows in Sainshand Industrial Cluster a Coke Plant, Iron Pellets Plant (Metallurgical facilities), Cement Plant, Coal chemical facility (Coal Gasification), Copper Treatment, Copper Smelter, Cluster Power Plant (800 MW), Mine Power Plants (650 MW), Water facilities, Housing and other off sites. The mineral resources come from the Copper & Cold Mining Ouy Tolgoi, Coal Mining Tavan Tolgoi, Iron Mining Tomortei and others, Crude Oil Mining Tamsag and others. The railway complex connects the mining and export paths in the direction of China. Coking coal, copper concentrate and copper cathodes are to be exported.

The anticipated economic and social impact is illustrated in the following figure. (See figure 4.)

Figure 4: Vision, Strategy and Goals of the Government of Mongolia
From the above graphic it should be clear that one of the most important national goals of the Mongolian government is security and independence. The approaches to the development of concepts (i.e., the Industry Cluster) show that the objectives and visions are strongly informed by and derived from the current political, economic and social transformation processes. Achieving the stated GDP per capita in 2015 of $5000 as opposed to the $3300 in 2009 would be higher than the current valuations in countries like China, Thailand and Indonesia. In 2021 the GDP per capita should be raised up to $12,000 just below countries like Taiwan, Korea, Hong Kong, Brunei, Japan and Singapore. It is presumed that these economic development estimates are based on the assumption that resources such as copper, coal and iron will be produced in Mongolia, in addition to end products. The enormous natural resource riches discovered in the Sainshand region within the last decade, including copper, contributes to the positive scenarios described above.

In conjunction with this ambitious project of the Mongolian government, the building of an adjoining industry park with connections to universities and vocational institutions is planned, with the required land and buildings provided by communal institutions. The industry park in Sainshand has the dimensional characteristics of an industry cluster within the region due to the physical proximity of innovation actors (production
companies, business-oriented service providers, universities, government agencies and customer). Sainshand is the capitol of Dornogovi Province in Mongolia. It is located in the eastern Gobi desert steppe, on the Trans-Mongolian Railway, 470 km from the capital Ulaanbaatar. Sainhand has a population of 61,764 (Dec 2013). The province has an area of 109,500 square km.

4.3. Relevant institutions for Germany-Mongolian Cooperation in Field of Energy and Mineral Resources

The Integrated Mineral Resources Initiative (IMRI) brings together three German federal ministries- the Federal Ministry for Economic Development and Cooperation (BMZ), the Federal Ministry of Economics and Technology (BMWi) and the Federal Foreign Office (AA) – in partnership for the first time, alongside the German Federal Enterprise for International Cooperation (GIZ), the Federal Institute for Geosciences and Natural Resources (BGR), the Federal Physical and Technical Institute (PTB) and the private sector. The German Federal Enterprise for International Cooperation (GIZ) is a services rendering company (Limited Liability Corporation) that supports the Federal Government in the development of its goals related to international cooperation for sustainable development. The GIZ has two locations within Germany: Bonn and Eschborn near Frankfurt am Main.

The starting point for Mongolia with respect to the IMRI program, is described by the GIZ office in Ulaanbaatar as follows; “...structural measures are necessary to make the mining sector in Mongolia more attractive for direct foreign investments. There is an absence of platforms for dialog to enable a constructive exchange of ideas between the local populations, administration and industry.” For this reason the program is structured around multiple actors with a multi-level approach. In this way, local companies are able to offer ambitious customized solutions within their markets based on German technologies. Measures of the IMRI program of Mongolia should

24GIZc, Global reach - the company at a glance http://www.giz.de/en/aboutgiz/profile.html accessed 8 December 2014
25GIZd, Intergrierte Rohstoffinitiative; Programmkurzbeschreibung, 1-2 http://www.giz.de/de/weltweit/17750.html accessed 1 November 2014
ensure that the most important Mongolian actors such as universities, members of the media and small to medium-sized business actively and constructively contribute to social and political discussions and developments. Cooperation and the transfer of product and management know-how are targeted for promotional grants. Approximately 70 small and medium-sized companies were intensively consulted and supported to function as suppliers to mining companies.

Current 
The following Mongolian partners are currently in the GIZ project “Integrated Mineral Resources Initiative”:

- Mongolian National Development and Innovation Committee (NDIC)
- Ministry of Mineral Resources and Energy,
- Ministry of Food, Agriculture and Light Industry
- Ministry of Foreign Affairs and Trade
- Mineral Resource Authority, Government agency
- Stock exchange
- Mining Association of Mongolia

The National Development and Innovation Committee (NDIC) of Mongolia is working to develop networks of companies. NDIC will also advise on the development of a strategy based on value chains. A working group headed by Mongolia’s Deputy Prime Minister is addressing both this issue and the development of quality infrastructure, which is to run in parallel. Together with IMRI, the National Security Council and a parliamentary working group, NDIC is also preparing a national strategy paper on the subject of rare earths and the accompanying statutory regulations.

The partner organizations may need to ask themselves the following questions (Koschatzky/Bross 2001, 144) in order to effectively promote sustainable collaboration between universities, research institutes, SMBs in the Sainshand region, namely:

- How can cooperation between small and medium-sized business and research institutions be promoted? What are the relevant types of collaboration which will support economy development in the region? Which characteristics need to be present?
• Which Mongolian universities or research institutions are important partners that
the Mongolian government and industry can support? What role does the
ownership structure of the company, university or research play?
• How can the instructional and research approaches be aligned within the relevant
problem definitions?
• How can start-ups and spin-offs from university membership and scientists from
research institutions receive government support?

Networks and collaborative projects between universities, research institutes and private
companies enjoy a high level of significance in Germany and play a central role in
national and regional economic policies (Braun 2001, 166). The largest and most
renowned universities and research institutes from Germany collaborate in order to offer
applicable know-how to enterprises. As a result of diverse Federal and State
government promotional programs, the number of collaborations and networks between
universities and private companies has grown immensely in the last 15 years (ibid.,
166).

The German economy also has the ability to offer very competent and professional
research and study results as well as expert assessments and consultations for industry,
government and ministries. The close collaboration between funding institutions like
ministries and developers and applicants for network and collaboration projects is well
defined and regulations are strictly observed. The implementation and successes of
Federal and State promotional programs in knowledge and technology transfer in the
New Federal States of Germany like the BMBF-Program “Entrepreneurial Regions26”,
the SIGNO-Universities27 and the nationwide EXIST28 program along with its resulting
collaborative structures in the region of Brandenburg like Potsdam Transfer29 (PT), UP
Transfer GmbH30, Co-Incubator GmbH31, continuing education “Cluster Energy

26https://www.unternehmen-region.de/media/DIW-Abschlussbericht.pdf accessed 1 October 2014
29http://uni-potsdam.de/wirtschaft-und-transfer.html accessed 14 October 2014
30http://up-transfer.de accessed 14 October 2014
31http://www.go incubator.de accessed 14 October 2014
Technology” and the Future Agency Brandenburg (ZAB) demonstrate the synergies between universities, research institutes and industry are achievable.

5. Some Challenges of German Mongolian Cooperation with respect to collaboration

Were a variety of mining and metal processing firms, new railway lines as well as large power plants to emerge in this region, the prerequisites for the build-up and expansion of an innovation park would certainly be met. Experience has shown that among the companies that would be operating in this industrial park in the future, only a handful would be 100% Mongolian owned. The investment level for these types of projects is very high, often requiring joint ventures with foreign companies. A variety of knowledge and technology transfer forms would occur, giving rise to numerous learning opportunities.

There are significant differences in the collaborative competencies of Germany and Mongolia. The successful German companies have a particular method of collaboration with scientific and research institutes due to highly educated personnel particularly from the areas of machine construction, electro technology, chemistry and biotechnology. In particular, large affiliated groups and successful SMBs from the mining and natural resource sectors have a long and successful tradition as well as enjoying expert collaboration competencies in their cooperation with research institutions, universities and with their small and medium-sized business suppliers. Additionally, training and continuing education in Germany as well as within industry, the scientific community and research is of great importance.

An excerpt from the science and technology master plan of Mongolia 2007-2010 from the Ministry of Education Culture and Science states:

“In the past, the Government of Mongolia has developed several policy documents and national programs on science and technology development, very few have come to realization. Without a system and infrastructure that supports these linkages, the public

32https://www.zab-brandenburg.de/ accessed 14 October 2014
awareness on importance of Science and Technology will remain low. Therefore, there is even a greater necessity for coordinating cross-sectorial activities, establishing accurate information and monitoring system, adopting effective innovation system, and setting accurate and feasible policy development strategies (UNESCO 2007, 19).

At this point it can be assumed that the Mongolian government will face significant challenges to create the requisite structures for:

1. The creation of regional innovation networks.
2. Development of collaboration between regional companies, universities, research and institutes of education as well as public administration.
3. Identification of regional particularities.
4. Strengthening the innovation capability and the economic performance of the supported companies that belong to the industrial park.
5. Development of marketable innovations and the commensurate strategies for principal markets, building on currently available competencies or mineral resources in the region.

To properly overcome these identified challenges, the following questions may be applicable in the event that an innovation park with a connection to universities and vocational institutions should be erected within the framework of the “industrial park in Sainshand”:

- Which universities and vocational institutions of Mongolia could play an appropriate role, and
- Which German universities and research institutes or regions serve as models for the establishment and implementation of internal and external collaboration with industry?

The question with respect to what Mongolia can learn from German is certainly interesting. In actuality, the more pertinent question would be, what experience and attitudes do Mongolians have about collaboration.

The Mongolian economy and scientific community has a varied base of experience and attitude toward collaboration. In the last twenty years there have been numerous
collaborative and development projects with many countries such as the USA, China, Japan, Korea, Russia and Germany during its transformative years on a broad array of topics and challenges within the economy, sciences and policies which have had or currently enjoy great significance. In this context, of note is a developmental project that aided the continuing education of officials and management teams from State Universities, State-controlled companies and research institutions (Steiner-Khamsi 2003, 150). However, the sustainability of such a project was minimal due to the fact that the exchanging of trained officials coinciding with a change in government administration or after a large election is viewed as a matter of course. Elections are held every four years and each results in a change in government determined by the party that receives the majority vote. In the 90s there were numerous small formations of new governments between the larger elections. Changes in the management and staffing were not limited to ministries, agencies, and large state-owned companies in Ulan Bator and in the provincial cities and administrative centers, but also included chancellors of universities, kindergarten teachers, and leaders of research institutes (ibid., 150). Each of these is viewed as a state employee and is replaced each time in conjunction with the formation of a new government. It is well understood that coordinators and moderators play a decisive role in successful collaborations on a national and international level (Braun 2001, 177). The consequences of such political practices in Mongolia prevent the sustainability of collaboration projects like development cooperations with partnership countries.

The challenges and obstacles to collaboration in the framework of developmental cooperation in Mongolia with other countries are a result of systemic differences in the economy, scientific community and politics of the country (Reisswig 2014, 26). The economy, scientific community and politics pursue different objectives and have different functions. The mode of operation, reputation system and the career paths are vastly different. They are based on different cultures, principles and values. These differences exist internally within the country in different regions. Next to these systemic obstacles there are further institutional and structural challenges. The lack of time afforded the various actors, absence of resources and human resource shortages represent challenges to universities as well as within industry. According to REISSWIG, solutions to institutional and structural impediments can be found. On the
other hand, the differences between the respective systems and their functioning rational will remain (ibid., 27).

In the negotiations on development cooperation between the government of Mongolia and the Federal Republic of German from March 26-27, 2012 in Bonn, the German Working Group of Governmental Cooperation stressed that a certain flexibility and in some cases, innovative approaches would be required in order to engage in the project initiated by Mongolia. Constructive efforts toward an effective developmental cooperation should be intensified. The national development strategy of Mongolia and the corresponding operational framework (i.e. planning, budget and result checking) should be strengthened33.

33Embassy of Mongolia 2012, 8 Protokoll der Verhandlungen ueber die Entwicklungszusammenarbeit zwischen der Regierung der Mongolei und der Regierung der Bundesrepublik Deutschland, http://www.botschaft-mongolei.de/PDFdaten/protokoll_german_rv.pdf accessed 03 November 2014
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