



# Prospects for Indo-German Collaboration in High-Technology Manufacturing



**Embassy of India**  
Berlin, Germany





**Narendra Modi**  
**Prime Minister of India**

“India and Germany are made for each other. Both are bound by democratic values and have the complementary skills and resources to power the next generation of industrial development through partnering in manufacturing and infrastructure development.”

“India has three things to its credit - Democracy, Demography and Demand. And I am sure, you will not find all of them together at any other destination. India offers you the potential of low cost manufacturing. India has low cost and high quality manpower ... We are trying to further harness these strengths through better management and good governance.”

नरेंद्र मोदी

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# Foreword

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I am delighted to present to you the study “Prospects for Indo-German Collaboration in High-Technology Manufacturing” on the occasion of India’s participation as Partner Country at the Hannover Messe 2015. The study was commissioned by the Embassy with the objective of exploring new avenues for Indo-German partnership in the manufacturing sector, especially in High-Tech areas.

While Germany’s inherent strength lies in its high precision manufacturing and sound R&D, India’s advantage is in its large talented manpower with high appetite for innovation. Together they offer strong possibilities for cooperation in High-Technology sectors. It is my conviction that this convergence could be harnessed to take our bilateral cooperation in the manufacturing sector to the next level.

The study has attempted to leverage German expertise in the High-Tech sectors to “Make in India” and the other national programmes initiated by the Prime Minister such as “Digital India”, “Clean India”, “Skill India”, “Smart Cities” etc. The study has identified various sub-sectors within the High-Technology area that hold the most potential for trade and investment in the coming years. The sectors covered in the study include the Digital sector encompassing ESDM, Photonics and optics and IT; Transport infrastructure including railways, aviation, ports and roads; Renewable energy and water; the Engineering sector including Heavy electrical and Mechanical engineering and Machine tools; Medical and Life sciences; Defence; and Space. The study has been carried out through extensive rounds of consultation with the Ministries, industry



**Mr. Vijay Gokhale**  
**Ambassador of India to Germany**

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associations and companies. These inputs have been fully reflected in the study. I am extremely glad that we could succeed in preparing this report through this consultative approach.

Sections 1 and 2 of the Study form the core of EY research. They highlight the sectors that hold maximum potential for business collaborations. The market potential, technology gaps, convergence of strengths and challenges in each of the focus sectors have been covered in detail. The new avenues for collaborations in the context of liberalization of FDI in Defence, Railways, Insurance, etc. have been taken into account. These sections provide a deep insight into the sectors under focus which will be useful to investors as well as policy makers.

Section 3 of the report outlines the existing regulatory framework in both countries, particularly the laws governing export controls and dual use goods which have significant bearing on trade and investments in High-Technology sectors.

An impact analysis of the existing laws in the sectors under focus has been carried out which will be useful to industry and governments. A brief outline of India's IPR regime has been included to reassure German industry that India's IPR system is robust, effective and balanced and conforms with international treaties, conventions and agreements to which India is a party.

In Section 4 a case study on Indo-German collaboration in the Machine tools sector has been incorporated into the study to present an example of the ongoing cooperation in one of the important areas within the manufacturing sector.

In Section 5 a roadmap has been presented which has been prepared in consultation with various stakeholders. This could help both industry and governments to undertake necessary steps to further the cooperation in High-Technology sectors.

I wish to compliment the EY team's efforts in preparing this report. I am thankful to the German Federal Ministries of Foreign Affairs, Economics & Energy for their support in preparation of the study. I also appreciate the efforts of the European School of Management and Technology (ESMT), Berlin for contributing a case study in the Machine tools sector. I also wish to express sincere thanks to all the industry

associations and German and Indian companies that provided inputs for the study.

I am confident that the study will help support our bilateral cooperation mechanisms such as the Indo-German High-Technology Partnership Group (HTPG) which has been set up to facilitate High-Technology cooperation. While both governments will work together to address the existing barriers to trade and investments in the High-Technology sectors, there is ample scope to achieve greater trade and investment even within the existing regulatory framework.

The objective of this study has been to lead us on the dual path of Indo-German High-Tech partnership. With our collective efforts, I am hopeful that in the coming years Indo-German economic partnership will move to the next level of business collaboration characterized by reduced barriers to High-Technology trade, technology transfer, joint-research, co-development and co-production, across a wide range of High-Technology sectors.

A handwritten signature in black ink, appearing to be 'HTG' with a long horizontal stroke extending to the right.

# From the editor's desk

It was during the summer of 2014 that the idea of conducting a study on Indo-German Collaboration in High-Technology Manufacturing found its genesis. It was also the time when India was witnessing sweeping changes in its polity and governance. For the first time in more than 30 years, the people of India had elected a new government with a clear majority. The assumption of office of the new government led by Prime Minister Narendra Modi had created a new wave of optimism not just in India but across the world.

It was time for new ideas, new initiatives, a new mind-set, new processes and new partnerships.

At the Embassy, while brainstorming for new ideas and initiatives to support the efforts of our Prime Minister, the idea of initiating a new partnership with Germany in the area of High-Technology Manufacturing came up. Some initial steps had already been taken in this regard through the setting up of the Indo-German High-Technology Partnership Group (HTPG) in 2013, but the initiative needed a new thrust. Taking a fresh look at the issue, the idea of promoting High-Technology trade and investments within the existing legal and regulatory framework, was conceptualized.

It was decided to undertake a study to explore the potential areas of cooperation in High-Technology sectors within the

existing regulatory/legal framework. The objective was to reap the untapped potential for cooperation in those High-Technology sectors which remained outside or at the periphery of regulations. The scope of the study was to identify sectors with maximum potential, the challenges limiting the flow of investment from German companies into India in those sectors and to recommend policy instruments for Indo-German High-Tech Partnership. The exercise was meant to complement the efforts under the HTPG.

The study had to be prepared in consultation with all the stakeholders - Ministries, industry associations and academia - to take on-board the views of all concerned. A stakeholders' meeting organised by the Embassy in July 2014 offered useful inputs in preparing the framework for the study. EY Germany joined hands with the Embassy to prepare the study. With its strong database, research capabilities, experience of supporting German companies and understanding of the Indian market situation, EY was an able partner to undertake this joint effort.

Manufacturing processes have become increasingly technology driven, constantly moving up the technology value chain. Therefore, it was a challenge to define what constitutes High-Technology and what does not. However, we are confident that we have exercised fair judgement in selecting the High-Tech



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sectors. Importantly, the initially identified sectors were reclassified and regrouped to converge with the new national programmes initiated by the the Government of India (Gol).

For undertaking the market research, feedback on the Delphi questionnaire methodology was adopted. Several rounds of the Delphi questionnaire and extensive consultation with industry

associations helped in understanding both the potential and challenges as seen by the industry. We have made a bold attempt to reflect these challenges perceived by the industry and offered policy recommendations to overcome them. It is perhaps the most unique aspect of this study which makes it different from other studies. This is reflective of the new mindset in Gol, that it is willing to address the concerns of the industry and is fully committed to providing a stable and conducive environment to the industry.

As the prime focus of the study was to present the market potential of India to German companies in the area of High-Tech Manufacturing, we have prepared this study keeping the industry perspective in mind. The study has also presented a number of instruments for the governments to implement that are critical to supporting High-Tech collaborations. Circumscribed by the sensitivities associated with High-Technology in Germany, the study has trod a careful path and we are confident that we have not strayed from our course. We hope that German companies, whether already in India or considering entry, will find this report useful. We further hope that the efforts of the Embassy and EY in putting together this study will result in improved understanding and conditions leading to greater investment and technological collaboration by German companies in India.

# Key findings

## **Key finding 1: German companies are favorably inclined to invest in the Indian High-Tech market**

The EY Delphi study reveals the readiness of German companies to invest in India. Investors recognize India's market growth, large market size and efforts to attract FDI. Perceived obstacles, meanwhile, are its infrastructure, administration and regulation.

## **Key finding 2: India is assumed to be the highest performing country among the BRIC markets**

According to the CEOs and CFOs of leading German High-Tech companies, India currently offers a better investment climate than other BRIC countries (Figure 1).

## **Key finding 3: There is high market readiness in India for High-Tech products**

Stimulated by far-reaching government programs, India is reshaping its infrastructure and opening further to global markets. German know-how well complements India's High-Tech Manufacturing needs.

The High-Tech consumer market in India is being driven by the rapidly growing section of Indian society with medium levels of income. Increasing disposable incomes, in combination with a high demand for technologically advanced products and applications, create an attractive environment for High-Tech Manufacturing.

## **Key finding 4: Indo-German collaboration in High-Tech Manufacturing can become an important part of the Make in India initiative**

Combining the strengths of German manufacturing with India's high quality and cost competitive human resource can be beneficial to both countries.

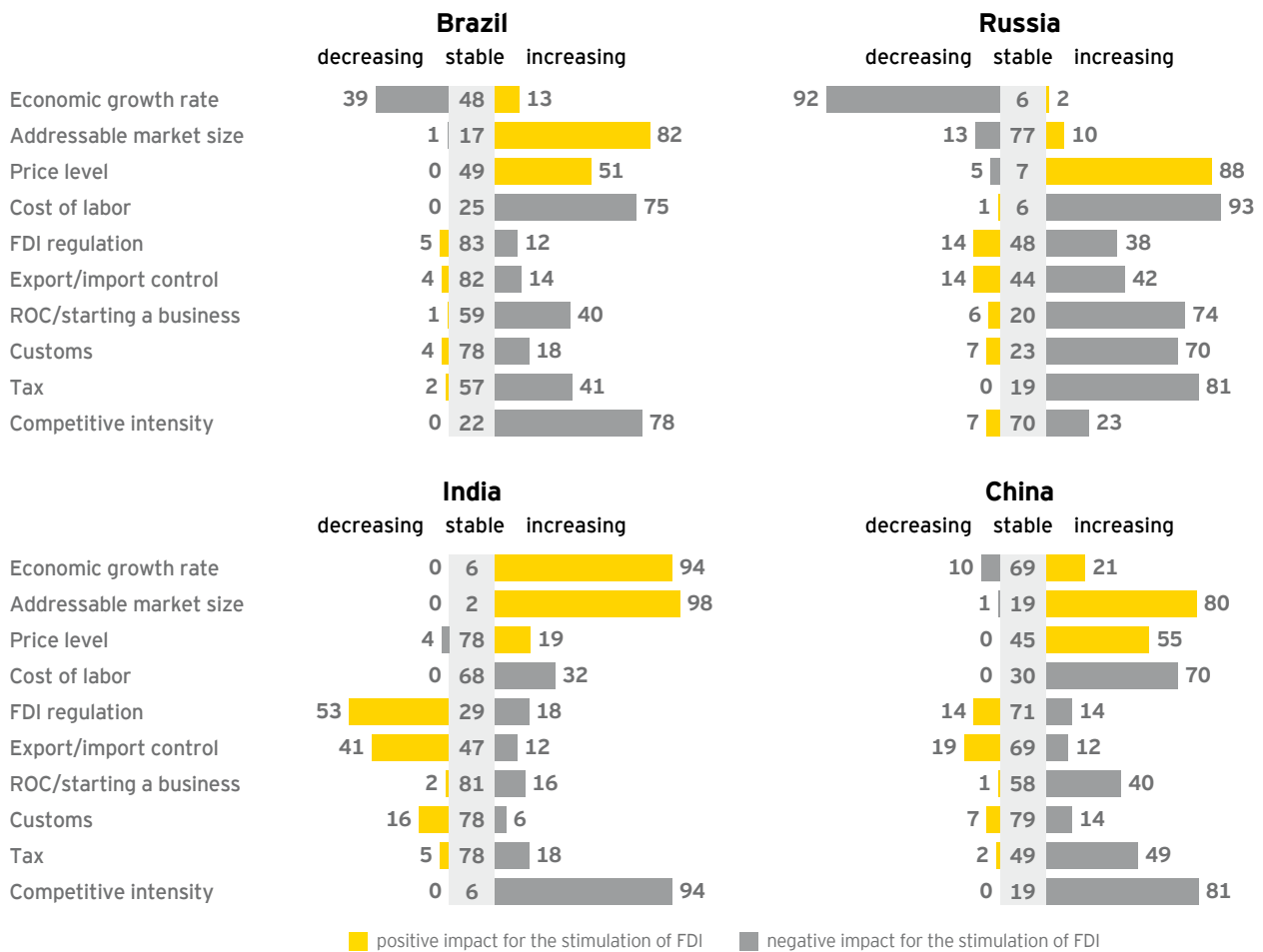
Application of leading edge technologies supported by outstanding skill development, can trigger higher incomes and spending power. Developing indigenous products and scaling up the production base can help provide supplies, not just for the local market, but also for export, leading to a stable trade balance.

## **Key finding 5: A set of challenges are impacting German companies' investment decisions**

Across all High-Tech Manufacturing sectors and investor groups - including companies starting a business, companies already operating in India, and potential investors which operate in other BRIC countries - several perceived challenges have been identified. They would require e.g. improvement in infrastructure, simplification of regulatory procedures, liberalisation of FDI and simplification of the tax system.



**Figure 1: BRIC countries - comparison of investment climate**



In %  
 EY Delphi survey, 92 CEOs and CFOs from leading German High-Tech companies

## **Key finding 6: Seven High-Tech sectors offer greatest convergence for Indo-German collaboration**

Out of 13 High-Tech Manufacturing sectors analyzed, seven offer greatest convergence for Indo-German collaboration: the ESDM sector; the Automotive sector; Civil aviation and airports; Transportation infrastructure; Water; Renewable energy; and Heavy engineering.

## **Key finding 7: India has strong IT and Space sector capabilities that German companies could benefit from**

The analysis of High-Tech Manufacturing sectors shows that India holds strong capabilities in IT and Space. Driven by a huge skilled labor force in the IT sector - in particular in software development and digitization of processes - India carries tremendous know-how. In the Space sector India's expertise in the production of space-related software is a strong asset for collaboration.

## **Key finding 8: Recent GoI initiatives in FDI, ease of doing business and infrastructure can significantly impact the business environment in High-Tech sectors**

The Government of India has increased the FDI in the railways, defense, insurance and construction sectors. A number of initiatives are being implemented to improve the ease of doing business. These include an e-Biz platform, new PPP model, National IPR policy and a roadmap for implementation of GST. An improved tax compliance system, an open investment climate, stricter IPR enforcement and a deeper financial sector have the potential to improve the business environment for German companies in the High-Tech sectors.

## **Key finding 9: Indo-German collaboration in High-Tech Manufacturing has the potential to favorably impact both economies**

To further stimulate collaboration between Europe and Asia - and in particular between India and Germany - it is important to build and improve institutionalized bilateral mechanisms. An improved business environment will have immediate positive effects on collaboration and create further opportunities for investment. It will also create spillover for adjacent sectors, while medium- and long-term investment will generate multiplier effects, with positive effects on both economies.





### Key finding 1:

German companies are favorably inclined to invest in the Indian High-Tech market

### Key finding 2:

India is assumed to be the highest performing country among the BRIC markets

### Key finding 3:

There is high market readiness in India for High-Tech products

### Key finding 4:

Indo-German collaboration in High-Tech Manufacturing can become an important part of the Make in India initiative

### Key finding 5:

A set of challenges are impacting German companies' investment decisions

### Key finding 6:

Seven High-Tech sectors offer greatest convergence for Indo-German collaboration

### Key finding 7:

India has strong IT and Space sector capabilities that German companies could benefit from

### Key finding 8:

Recent GoI initiatives in FDI, ease of doing business and infrastructure can significantly impact the business environment in High-Tech sectors

### Key finding 9:

Indo-German collaboration in High-Tech Manufacturing has the potential to favorably impact both economies

# Approach

# and methodology

This study combines insights from expert interviews with existing market and economic data. This delivers an integrated picture of the High-Tech Manufacturing market comparing economic reality based on robust facts with the personal perception of key market players.

In order to capture a realistic reflection of market experts' views, Delphi interviews with CEOs and CFOs of 92 companies from the German High-Tech Manufacturing industry which are already operating in BRIC economies or are considering investments in the near future were conducted. The aim was to get the C-level view on the perception of India's potential and its attractiveness for investment as well as expected drawbacks and barriers.

For a deep dive into the triggers and motivations behind the stated opinions, furthermore, in-depth interviews were conducted with a number of key stakeholders, such as VDA (Germany's automotive industry association), ZVEI (the German electrical and electronics industry association) and VDMA (the German engineering association) and KfW Bank Group. This helped to form the right context between primary data insights and market facts.

As a result of this study it was possible to identify sectors that are most attractive for German FDI, and to draw conclusions as to how the German Government and the Government of India (GoI) can improve the economic and business environment in general, and support future bilateral FDI activity in particular.

In section 1, the focus is on High-Tech Manufacturing in India. The chapter outlines India's economic situation in comparison to the other BRICS countries (Brazil, Russia, China, and South Africa); explains the study's definition of High-Tech Manufacturing; and introduces the relevant sectors. In addition, the chapter provides a short insight into consumer market trends, introduces GoI initiatives that have a positive impact on the sectors' economic dynamics, and gives a summary of examples of Indo-German collaboration in High-Tech Manufacturing.

Section 2 is the main part of this study. It contains an economic profile of each High-Tech Manufacturing sector, describing its current situation and expected growth, along with trends, strengths and weaknesses. The economic profile of each sector has been created using official statistical data from various institutions, such as the Federal Statistical Office of Germany, the Ministry of Commerce and Industry India (MOCI), and the Ministry of Statistics and Program Implementation India (MOSPI). The study characterizes each sector's potential for market growth, by evaluating a set of indicators - from institutional factors and policies to growth drivers - which help determine that potential (for further explanation about the sector analysis see call-out box). Each section also outlines why the sector is interesting for German investors, lists the main areas of opportunities for German companies, and explains what challenges investors might face.

Section 3 of the study gives an overview of the legal environment for Indo-German business relations. It summarizes EU, German and Indian export control regimes and trade regulation, and outlines the implications for the sectors described in the study. The existing IP rights of India and the continuous process to strengthen and modernize IP offices are outlined at the end of this section.

The ESMT case study in section 4 outlines the Indo-German collaboration in the Machine tools sector; current barriers of bilateral cooperation and, furthermore, prospects for greater Indo-German cooperation in the future are described.

Derived from the analysis above section 5 offers a roadmap for Indo-German collaboration in High-Tech Manufacturing. It outlines the actions needed to promote both growth and German FDI in the relevant sectors.

The last part of the study offers a conclusion and outlook for the future.



The CEOs and CFOs of 92 medium-to-large sized German companies were asked for five key words that came to mind when thinking about investing in India. The size of words in the word cloud correlates to the frequency of entries.

Source: EY Delphi analysis

1.

# High-Tech Manufacturing market in India

# 1.1 India in context

## Global focus: Emerging markets

The global economy is transforming into a multi-polar world, where developed market hubs no longer dominate. In this new environment, when it comes to future business decisions, emerging markets occupy the center stage. But success in these markets is not a straightforward prize. While they offer vast potential for economic growth, they are still facing challenges that developed markets have conquered already. Growth in the BRICS countries continues to outpace that in mature economies. These five countries differ from other emerging countries in their political and economic framework and social structure. In recent decades, India has demonstrated the ability to grow rapidly, yet the gap between itself and its emerging Asian counterpart China remains significant.

Following the recent economic and financial crisis, the recovery in global growth remains subdued. The International Monetary Fund (IMF) revised its growth outlook for 2015 downwards due to the weakening in the Eurozone and a corresponding slowdown in some emerging markets.<sup>1</sup> Public debt, volatile demand and deflationary tendencies, that are fought by the European Central Bank (ECB), are retarding growth within the EU. In emerging markets, generally tighter monetary policies and a less favorable financial environment are weakening investments and the overall growth pace. Nevertheless, the second half of 2014 showed signs of visible recovery and positive growth rates.

**Table 1: GDP and population 2013**

	GDP (€)	Population (million)
<b>India</b>	<b>1.5 trillion</b>	<b>1,243.3</b>
Brazil	1.8 trillion	198.3
China	7.6 trillion	1,360.8
Russia	1.7 trillion	142.9
South Africa	0.3 trillion	53.0
Eurozone*	10.2 trillion	*334.6
US	13.4 trillion	316.4

Source: IMF (2015), GDP estimates are based on current prices; \*Eurostat

**Figure 2: Forecast GDP growth rate**



The rate of global economic growth for 2015 is predicted to be 3.5%. Unlike Russia and Brazil, India is expected to be back on the road to recovery this year (Figure 2).

With a population of 1.25 billion and a median age of 27 years in 2014 India has a more favorable demographic profile than its BRICS peers. By 2050, the median age of India's population will be 37 (Figure 3) combined with a working age population that is expected to top one billion. That year approximately 68% of the population will be of working age (between 15 and 64).<sup>2</sup> The average consumption of India's households is expected to increase from €801.4 billion in 2012 up to €2,189 billion in 2025.<sup>3</sup> This does not only indicate a significant affluent class measured by India's income distribution (with an annual disposable income over INR240,000, over €3,430) but a rising middle class, leading to increased private consumption and higher domestic demand. The expansion in the workforce and the emerging middle class fulfill two important conditions for India's future growth.

China and India are, therefore, likely to take leading roles as new growth poles in the multi-polar world.

<sup>1</sup> IMF (2014)

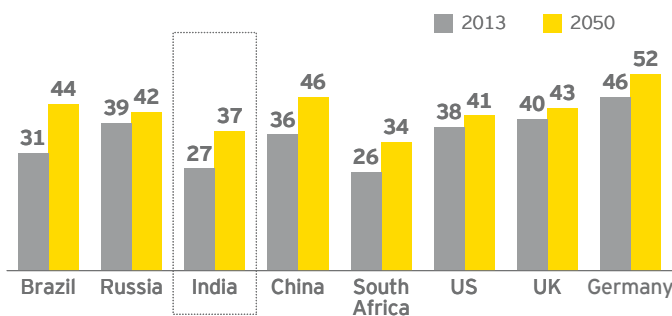
<sup>2</sup> United Nations, Department of Economic and Social Affairs (2014)

<sup>3</sup> Kotak Institutional Equities Research (2013)





**Figure 3: Comparative age structure**



Median age (years)  
 Source: CIA Factbook (2015) United Nations,  
 Department of Economic and Social Affairs (2015)

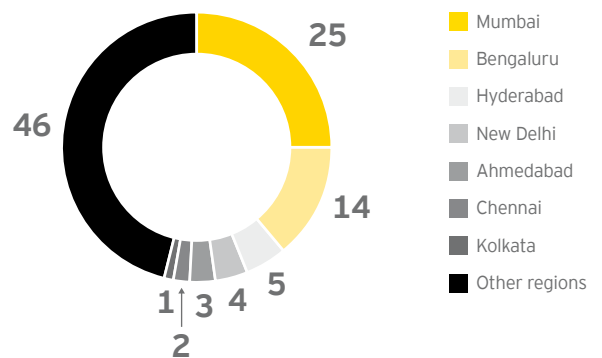
Due to India's growing workforce and promising domestic market, the country is a favored destination for investment. The sovereign ratings of S&P, Moody's, and Fitch give India a stable outlook and thus a stable environment for investment for this year.<sup>6</sup> In 2013, the country received €22.4 billion in foreign direct investment, ranking 14th in the list of countries by FDI received.<sup>7</sup> The country accounted for 5.5% of global FDI inflow and almost 10% of jobs created by FDI worldwide.<sup>8</sup>

In 2013, direct FDI inflow in Germany totaled €21.6 billion, with the country coming 15th in the global list of countries by FDI received.<sup>9</sup> The most popular German FDI sectors for investors are ICT (18% of all projects in 2013) and service-driven projects (financial and business services) which represent 15% of all projects.<sup>10</sup>

### Indo-German trade and FDI relations

Germany is India's most important EU trade partner, ranking ninth among the country's global trade partners as a provider of goods.<sup>4</sup> The bilateral trade volume in the 2013/14 financial year was €16 billion. Almost one third of German exports to India are of machinery and engineering goods (excluding electronic components, metal and chemical goods, automobiles and automotive components). In 2014, Germany had an "Indian trade surplus" of €1.9 billion. This suggests great potential for German companies, not just in new markets but in Indian-based production - and therefore investment - to meet domestic Indian demand. India is, in turn, an important trade partner for Germany, which is the eighth highest buyer of Indian goods. These are primarily textiles, followed by chemical products and electronic components and applications.<sup>5</sup>

**Figure 4: Locations for German investments in India (FY 2012/13)**



In %  
 Source: KAS and ICRIER (2014)

Overall Mumbai attracts the biggest share of all German FDI with a total of €174.8 million, followed by Bengaluru.

4 German Foreign Office (2015)  
 5 Federal Statistical Office (2015), German Foreign Office (2015)  
 6 Morgan Stanley (2014)  
 7 UNCTAD (2015)  
 8 fDi Intelligence (2013)  
 9 UNCTAD (2015)  
 10 GTAI (2015)

## 1.2 High-Tech Manufacturing sectors

The definition of High-Tech, and consequently what constitutes High-Tech sectors, shifts with time and technological development. Generally, a High-Tech industry harnesses the “cutting edge”, with the most advanced technology available. This explains why such sectors are expected to have the biggest growth potential and the highest economic impact.

Today, most High-Tech industry incorporates advanced computer electronics. Given both India’s economy, as described above, and its past focus on IT and electronic components the current demand for “High-Tech” should provide the country with great potential for long-term manufacturing development in certain industries. Taking GoI initiatives into account and using the OECD definition of the High-Tech sector as a starting point, this study identifies suitable potential High-Tech Manufacturing sectors for FDI in India.<sup>11</sup> These sectors are defined by an annual R&D investment rate of more than 8% that underpins a significant research intensity.

The study identifies 13 potential sectors that could act as a catalyst for Indian economic growth over the long term. In order to align these industries with existing programs and the GoI’s new initiatives to promote domestic growth they are clustered into seven groups. These clusters, which are summarized below, represent the most promising industrial sectors for future German FDI in India:

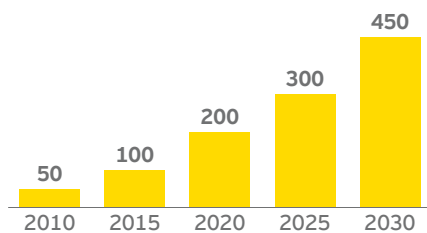
- ▶ **Digital:** This cluster includes Electronic systems design and manufacturing (ESDM), IT (Hardware and software products) and Photonics and optics (e.g., Laser and fiber optics). On first consideration, this may be the best way to accelerate the Indian economy.
- ▶ **Transportation:** The Transportation cluster includes the Automotive sector (Automobiles and Automotive components), Civil aviation and airports (aircraft components and airport projects, including their facilities) and the Transportation infrastructure, which covers the expansion of India’s road, rail and shipping networks.
- ▶ **Water and energy supplies:** This cluster covers the Water sector (including water supply and waste water treatment) and Renewable energy (e.g., wind and solar power).
- ▶ **Engineering:** This incorporates all sectors that involve Heavy engineering and Heavy electrical engineering, including Machine tools and Mechanical system engineering.
- ▶ **Medical and life sciences:** This cluster includes Biotechnology and Pharmaceuticals and is strongly driven by population growth and an expanding middle-class.
- ▶ **Defense:** This cluster covers civil and non-civil applications, including control systems and counter-terrorism mechanisms.
- ▶ **Space:** India’s Space industry is a success story. It therefore makes sense to take Space into account, when analyzing potential High-Tech Manufacturing sectors. Thus this cluster focuses on India’s Space industry, including launching gear (e.g., as for satellites) and aerospace telecommunication systems.

<sup>11</sup> OECD/GD(97) 216

## 1.3 Indian consumer market for High-Tech products

Since the start of economic liberalization in 1991, the consumer power of the Indian growth story and the rise of the Indian middle class have been in the focus of potential investors. There are numerous studies circulating that try to predict the size and growth of the middle class. Depending on heterogeneous definitions the estimates for its size range from 50 to 300 million people and beyond.<sup>12</sup> The following chart highlights one example of the potential growth of India's middle class.

**Figure 5: India's middle class 2010-2030**



Million people  
Source: IEMS

The shift of the population from the lower to the middle classes is linked to increasing income and, accordingly, the capacity for higher spending. For investment purposes, it is critical to understand households' spending power and how it will change in the medium and long-term. With an estimated 1.25 billion people representing 17.5% of the total world population<sup>13</sup>, India has 247 million households.<sup>14</sup> In comparison, Germany with a population of 81 million has 40 million households.<sup>15</sup>

It is important to consider how such statistics impact spending behavior and, in addition, how the country's rural/urban breakdown influences spending power. In 2011, 68.8% of the population lived in rural areas, while 31.2% were city-dwellers.<sup>16</sup> For the first time since Independence, the increase in population has been higher in urban than in rural areas.

The steadily growing shift from rural to urban environments, as well as significant intercity migration, shows a society searching for new orientation. A new economic consciousness is signaling the end of the traditional mass market, with today's Indian consumer markets driven increasingly by segmentation and fragmentation.

High-Technology sector investors face an especially fragmented and pluralistic consumer market, one that is multilingual and multi-ethnic, with enormous cultural diversity. This patchwork pattern of divergent lifestyles and changing mind-sets is spawning widely varied consumer behaviors. Business models and go-to-market strategies need to be adapted to this wide array of "different Indias". The divergence is not just between different cities, districts and states, it even segments consumer markets within individual cities.

India has encouraged global High-Technology communication platforms to venture into the market. Besides multinationals, Indian companies also feature on these platforms. The unfolding "intelligent environment" is accelerating market growth and, at the same time, presenting new challenges to the existing indigenous High-Technology market.

Anticipating these effects, the GoI established with 'Digital India' one of the key growth drivers for the High-Tech consumer market in India. The new information and communication environment nurtures new consumer attitudes and expectations. Consumers who organize their financial requirements through online banking, book their travels and shop online and maintain their personal relations via social media, will contribute radically to an extended growth of the Indian High-Technology market.

But it will be a different High-Technology market challenging the global investors. Embedded in the upcoming intelligent environment the Indian High-Tech market will demand smart adaptations for the Indian consumer multiplicity, with a unique selling proposition that holds against the information transparency in the digital world and meets the prevailing low-cost pricing expectations.

<sup>12</sup> IEMS (Ernst & Young Institute for Emerging Markets Studies) (2010), Kotak Institutional Equities Research (2013), McKinsey Global Institute (2007), NCAER (National Council for applied Economic Research) (2010)

<sup>13</sup> United Nations, Department of Economic and Social Affairs (2014)

<sup>14</sup> GoI: Census Info (2013)

<sup>15</sup> German Federal Statistical Office (2014)

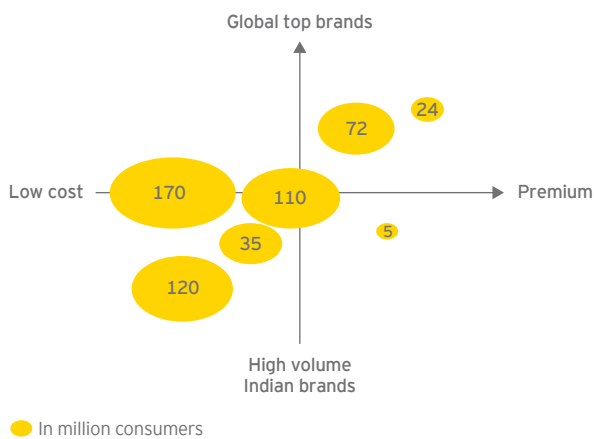
<sup>16</sup> GoI: Census Info (2013)

This reality needs to be reflected in investment strategies. Investors can't expect to sell their "one size fits all" global product to this emerging middle class. This may be the strategy for high price luxury brands. The course Indian society and markets take will ultimately not be determined by the growth of the middle class, but by the polarization of opposing ends of the class hierarchy.

The aggregation of geo-location based consumer preference data of Indian micro-markets linked with personalized lifestyle data for the Indian High-Technology consumer market results in a highly fragmented demand structure today: it will be even more so in the next decade.<sup>17</sup>

German companies that are already well established in India recognized this trend early. The "BharatBenz" truck series is a good example of a successfully indigenized product, using so-called "frugal engineering". It was developed in India by Mercedes-Benz for India and the surrounding markets. The original high quality German product was adapted to cope with India's challenging infrastructure conditions, meeting Indian requirements with reduced features, including a lower price. Such frugal High-Technology innovations were necessary to cater for the requirements of this unique High-Technology market. One that demands high quality at a low cost.

**Figure 6: Consumer segmentation example for digital High-Tech products in 2015**



Source: MMS.IND Master universe of Indian consumers (840 million consumer entries); Propensity search: Affinities "Digital India" consumer market (2015)

<sup>17</sup> MMS.IND Market Intelligence Platform: Platform is based on 840 million consumer data records allocating individual preferences through their individual residences.

“SLM Solutions has been doing business with India in the growing High-Technology manufacturing field for more than 20 years. We could supply advanced Rapid prototyping equipment to nearly all the players in the Indian automotive industry. We are very proud that we, as a company, can contribute to a large and fast growing economy like India. We value our business relationships with our Indian partners, who we consider to be absolutely reliable and of a similar mind-set. We had confidence in the Indian manufacturing sector and the High-Technology market from early on, and this has paid off very positively. We are experiencing growing demand for High-Technology manufacturing equipment for the aerospace, medical and automotive industries. We are seeing very fast growth of our industry and company in Europe and wish to spread this positive spirit to important High-Technology target markets like India as well. Therefore, we look forward to positive and beneficial cooperation with our Indian partners and friends in future with the High-Technology Partnership initiative.”

**Dipl. Ing. Stefan Ritt, Head of Global Marketing and Communications,  
SLM Solutions GmbH**

## 1.4 Ongoing government initiatives

The Government of India is looking for a new way to harness the country's existing potential to fuel domestic markets and industries. It has set up several umbrella programs to facilitate financial investment and enhance skill development, and so promote the transition to a High-Tech-based economy which can deliver both social progress and financial benefits.

### **Make in India**

The Make in India initiative aims to achieve long-term sustainable growth of 10% in manufacturing, leading to significant job creation and skill enhancement. The overall goal is to build a best-in-class manufacturing infrastructure. The initiative focuses on 25 sectors, including automotive, biotechnology and defense. FDI limits for these sectors have been relaxed to 49%.

### **Digital India**

The Digital India initiative, E-kranti, is the world's most ambitious broadband project. It kicked-off with a €15.2 billion investment to bring broadband communication to 250,000 villages by 2017. It seeks to provide digital access to all citizens, including those in rural areas, the elderly and the poor. The program has three key emphases, which will boost the development of India's ESDM sector:

- ▶ Digital infrastructure as a utility to every citizen
- ▶ Governance and services on demand
- ▶ Digital empowerment of citizens<sup>18</sup>

### **PPP**

In the 2015 Union Budget, a proposal to revitalize the Private-Public Partnership model of infrastructure development was made. For rebalancing of risks is required, in particular that the sovereign will have to bear a major part of the risks, without absorbing it entirely.

### **Innovate in India**

An Innovation Promotion Platform, Atal Innovation Mission (AIM) will be established, involving academies, entrepreneurs and researchers in order to achieve a culture of innovation, R&D and scientific research in India, and to promote a network of world-class innovation hubs.

To enable start-ups that experiment in leading edge technologies, create value out of ideas and convert them into business, the liberalization of systems for raising global capital, incubation facilities, funding for seed capital and growth as well as ease of doing business needs to be readdressed. With the Self Employment, Incubation and Talent Utilization (SETU) mechanism, all aspects of start-up businesses and other self-employment activities in technology driven areas will be supported.

### **Smart Cities**

Recent research suggests that, by 2050, more than 50% of the Indian population will live in cities. By 2035, the ratio is likely to be 35%. India has 11 metropolitan areas with a population of more than one million, including Delhi (National Capital region) and Kolkata in the north, and Mumbai on the coast.<sup>19</sup> Rural areas that are close to cities are experiencing faster economic growth, via the so-called "suburban growth effect".<sup>20</sup> The development of "Smart Cities" is directly linked to the development of India's infrastructure. The GoI proposes to develop 100 Smart Cities in India by 2020, backed by an investment of approximately €0.96 billion. It is allowing 100% FDI under the automatic route and has halved the minimum capital requirement from €8 million to €4 million.

### **Skill India**

Skill India's main goal is to promote high quality education for young Indians. The initiative will continue to support the growth of certain industrial sectors which have already benefited from skill development in recent years. Additional sectors for skill development will be identified. The new program aims to provide training and skill development to 500 million youngsters by 2020, covering every village in the country. Various schemes are proposed to achieve this objective.

### **Clean India**

The focus is on building sanitation facilities, waste disposal systems, village cleanliness and safe and adequate water supply. The expected required expenditure amounts to €8 billion of which the government will contribute €1.6 billion.

<sup>18</sup> Digital India program by GoI

<sup>19</sup> Census of India 2011 (2012)

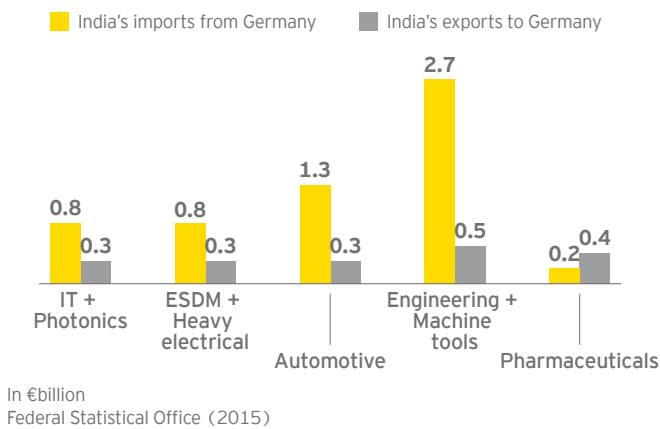
<sup>20</sup> World Bank (2013)

# 1.5 Indo-German High-Tech Manufacturing collaborations

## Trade in High-Tech Manufacturing

Stable business relations already exist between India and Germany (Figure 7). As might be expected, Engineering goods and Machine tools dominate German exports to India, to a value of €3 billion, followed by automotive goods (vehicles and components) which amount to €1.3 billion. India mainly exports chemical products and pharmaceuticals; in this sector, therefore, its level of technology can already be considered mature and able to meet foreign market demands.

**Figure 7: Indo-German High-Tech trade 2013**

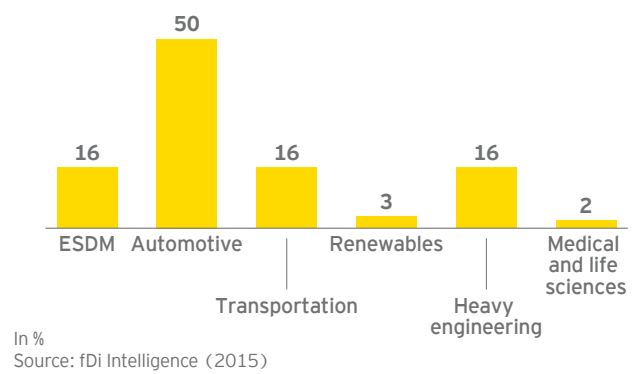


## FDI in High-Tech Manufacturing

Between 2010 and 2014 half of German FDI in India flowed into the Automotive sector, followed by ESDM and Heavy engineering, at 16% each (Figure 8). Although the IT and telecommunications industry will remain of interest, investors expect other sectors, e.g. the infrastructure sector and industrial goods sectors, to become more attractive in the near future.<sup>21</sup>

**Figure 8: German FDI in High-Tech in India**

Total volume 2010-2014



Some major FDI announcements during November 2014 back this development. For example, Cisco, a major computer networking company, plans to invest €1.36 billion annually in India, focusing on the Smart Cities and Digital India projects.

In recent decades Germany has consistently been one of the top 10 FDI players in India; it currently ranks eighth, having invested almost €5 billion since April 2000.<sup>22</sup> In 2014 Germany invested €1.3 billion in India's High-Tech Manufacturing sectors. India is also investing in Germany. Between 2007 and 2013 around 31% of India's total FDI flowed into Germany, with the country being the 20th most popular destination for Indian FDI.<sup>23</sup> The IT sector continues to be the most attractive target for Indian investors in Germany. Since 2003, India has initiated around 20 projects in the ICT sector, representing half of the total number of German FDI projects it has invested in during that period.<sup>24</sup>

21 EY's 2014 India attractiveness survey (2014)  
 22 German Foreign Office (2015)  
 23 KAS and ICRIER (2014)  
 24 FICCI (2013)

2.



# **High-Tech**

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# **Manufacturing**

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# **sectors**

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# Sector analysis methodology

This analysis describes the different sectors and compares them with appropriate indicators. These indicators represent a set of institutions, policies and growth drivers that determine market growth or growth potential. The indicators are organized in five dimensions, representing each sector's growth dynamics (1), their macroeconomic impact (2), sector expert perception (3), capital investment activity (4), and "sector-specific enablers" (5). The data used comes from official statistics, industry association data collection, and EY analysis.

To identify the most promising High-Tech Manufacturing sectors in India, and to evaluate their potential and the investment opportunities for German companies, this study uses spider (or radar) charts. This is a graphical method of displaying multi-dimensional data in a two-dimensional way. Several axes build up the frame of the “spider”, with each axis representing a different indicator. To ensure the data is comparable, the variables in absolute figures are translated into ratings measured on a fixed seven-point scale. It is important to keep in mind that the sector comparisons are based on relative values not absolute figures. In this analysis, seven is the highest ranking and one the lowest, with seven representing “high intensity” and one representing “low intensity” – always in comparison with the other sectors. The indicators are listed and explained below:

### 1. Sector dynamics

- ▶ Market size: Current domestic market size in India in 2013/14 financial year (FY)
- ▶ Market growth to date: Observed market compound annual growth rate (CAGR) between 2010 and 2014
- ▶ Market growth forecast: Estimated market CAGR between 2014 and 2020
- ▶ Level of Indo-German collaboration: Evaluates existing institutional collaboration and German market presence

### 2. Macroeconomic impact

- ▶ GDP impact: Evaluates the potential impact of each sector on India's GDP (2013/14 FY); derived from current market size and future CAGR
- ▶ Import share: Sector-specific imports in relation to total imports of all sectors (2013/14 FY)
- ▶ Export share: Sector-specific exports in relation to total exports of all sectors (2013/14 FY)

### 3. German sector expert perception (primary data collected by EY)

- ▶ Perceived German expertise for investment and support in India
- ▶ Perceived competitive intensity through global companies in India, which are already operating in India

### 4. Investment priority

- ▶ FDI Inflow: Shows the total FDI inflow between 2010 and 2014 for each sector
- ▶ Planned government investment: shows the level of planned government financial investment in this sector

**5. Sector-specific enablers** harness two indicators that have a high impact on each sector's individual growth potential, e.g. quality of roads, technology absorption or labor skill level. These factors are indicators of the Global Competitiveness Index (GCI) by the World Economic Forum, which compares India to the rest of the world.

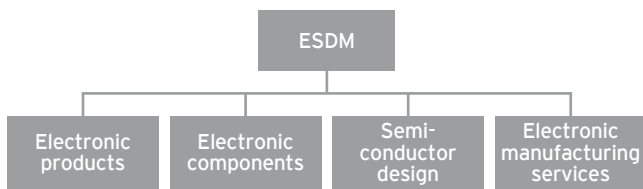
# 2.1 Cluster: Digital

## Sector 1: ESDM

### Definition and applications

Electronic system design and manufacturing (ESDM) comprises four sub-sectors: electronic products, electronic components, semiconductor design and electronic manufacturing services (Figure 9).<sup>25</sup>

**Figure 9: Sub-sectors of ESDM**



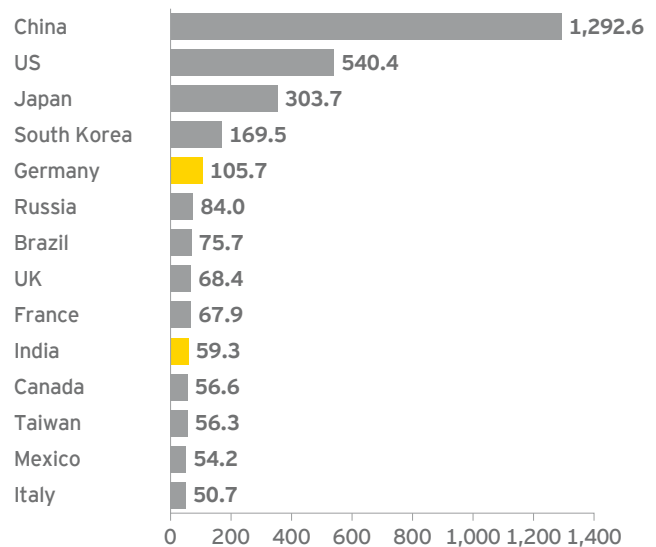
Source: IESA (2014)

Important applications in the sector include mobile phones, notebooks, desktops, memory cards, set-top boxes, servers, smart cards, tablets, routers, switches and energy meters.

### Global sector overview

Electronics is one of the biggest global industrial sectors, with a market volume of €3,703 billion in 2013 - a figure predicted to rise to about €4,100 billion in 2015. While the sector remained static in industrialized countries in 2013, emerging countries recorded a 6% increase in market volume in the sector in the same year.<sup>26</sup> In recent years India has grown to become the 10th largest electronics market in the world (Figure 10). From 2000 to 2013, the Indian electronics sector more than tripled in volume from €17.2 billion to €59.3 billion. Production also tripled, from €13.3 billion in 2000 to €37.8 billion in 2013.<sup>27</sup>

**Figure 10: The global electronics market in 2013 - top 14 countries**



Revenue in €billion  
Source: ZVEI 2014

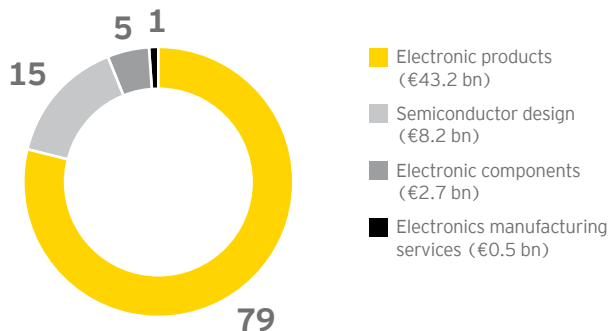
### Indian ESDM sector

With a projected demand of more than €300 billion by 2020 India is one of the fastest growing markets for electronics worldwide.<sup>28</sup>

The ESDM sector is currently among the fastest growing sectors in India. A changing global landscape in electronics design and manufacturing capabilities, cost structures and a tremendously growing demand is drawing attention towards India's ESDM sector. Sector revenues in the country are forecast to reach €75.4 billion in 2015, compared to €47.2 billion in 2010 - which would represent a CAGR of close to 10%.<sup>29</sup> Steady growth is predicted for years to come: ESDM is expected to reach a volume of €320 billion by 2020.<sup>30</sup>

<sup>25</sup> IESA (2014)  
<sup>26</sup> ZVEI (2014)  
<sup>27</sup> ZVEI (2014)  
<sup>28</sup> DeitY (2014)  
<sup>29</sup> IESA (2014)  
<sup>30</sup> Data Quest (2013)

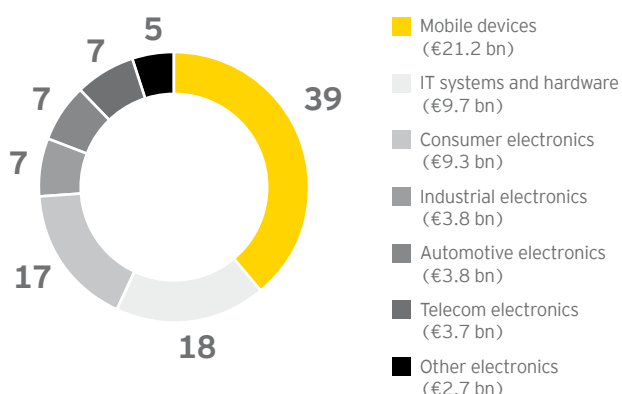
**Figure 11: Revenue of ESDM sector by sub-sector in 2012**



In %  
Source: IESA (2014)

The biggest sub-sector of the Indian ESDM market is electronic products, with an estimated market share of 79% in 2012 (Figure 11). The market for electronic products, domestically and for export, is expected to grow from €38.7 billion in 2010 to €59.7 billion by 2015.<sup>31</sup>

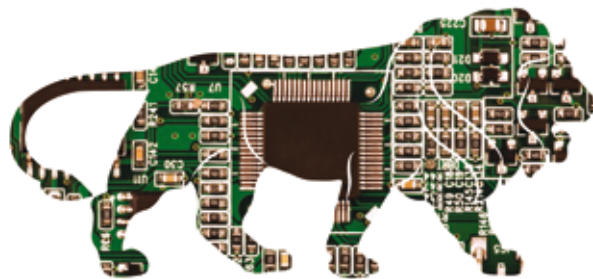
**Figure 12: Indian electronic products market by end-user segment 2012**



In %  
Source: IESA (2014)

Mobile devices dominate the electronic products market (Figure 12). Thanks to the rapid growth of mobile phone connections in India, these devices are set to remain dominant. India already has more than 900 million wireless telephone subscribers<sup>32</sup>; 123 million of these are smart phones, a figure predicted to reach 279 million by 2018.<sup>33</sup> Imports make up a significant share of domestic electronics consumption in India. This could have a negative impact on the country's trade balance.

31 IESA (2014)  
32 Telecom Regulatory Authority of India (2015)  
33 eMarketer (2014)  
34 DeitY (2014)  
35 IESA (2014)  
36 Make in India (2015)  
37 IESA (2014)



## Sector trends

The uninterrupted growth of India's ESDM sector can be attributed firstly to demographic factors - which have helped increase consumer spending on electronic products and IT - and secondly to rising corporate investment in electronic systems. The Indian market is marked by a strong demand for innovative electronic products and electronic components at low cost. India's improving telecommunications infrastructure, and in particular the rollout of 3G (LTE) services, will lead to high demand for related electronics. Reflecting the high importance of ESDM for India's economy, the Government of India has launched several initiatives to promote the sector. These include the National Policy on Electronics (NPE), which aims "to create a globally competitive electronics design and manufacturing industry to meet the country's need and serve the international market".<sup>34</sup>

Highlights of this policy include:

- ▶ The Modified Special Incentive Package Scheme (M-SIPS)
- ▶ Electronic manufacturing clusters (EMCs)
- ▶ The Electronic Development Fund (EDF)
- ▶ A domestic semiconductor wafer fabrication plant<sup>35</sup>

Other major initiatives include the Digital India program (see Outlook), the National Telecom Policy and the National Manufacturing Policy.

For investments, the GoI allows 100% foreign direct investments (FDI) in the ESDM sector under the automatic route. These investments are subject to all applicable laws and regulations. Electronic items for defense are not included in the automatic route. Instead, FDI of up to 49% in ESDM is allowed under the government approval route, while FDI of more than 49% can only be carried out with approval of the Cabinet Committee on Security.<sup>36</sup>

Domestic manufacturing and services are predicted to reach around €34 billion in 2015, compared to a forecast market size of €75 billion. This leaves a €41 billion gap between supply and demand, which has a negative impact on India's trade balance.<sup>37</sup> This gap could create opportunities for manufacturers to set up in India, benefit from GoI initiatives in the sector and cater for the huge domestic market.

## Analysis: ESDM

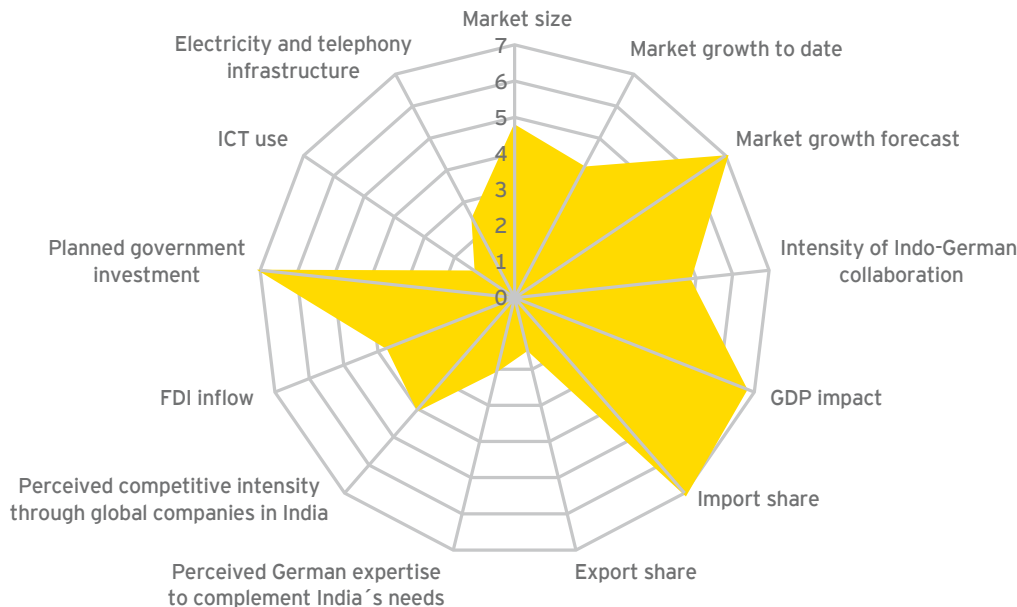
### Why is this sector interesting?

- ▶ The ESDM sector within India is already of considerable size; in years to come, more growth is expected, and ESDM's contribution to India's GDP is expected to grow.
- ▶ Fueled by huge planned government investments (such as the "National Policy on Electronics" and "Digital India") India's ESDM sector will accelerate in years to come.
- ▶ Market potential is fueled by high market readiness, with a pattern of huge increases in consumption and high demand for all sub-segments of the ESDM sector.
- ▶ The rising penetration rate of mobile phones, along with growing internet usage, will boost the development of India's ESDM sector. In 2014 India had 243 million active internet

users, representing year-on-year growth of 14%.<sup>38</sup> At the end of 2014 it had close to 940 million mobile phone subscriptions, illustrating the enormous demand for digital devices.<sup>39</sup> India is already the third largest smart phone market in the world, with 123 million users in 2014; by 2016, India is expected to exceed 200 million users and become the second largest smart phone market globally. This growth will be underpinned by the growth of affordable smart mobile devices, tailored to Indian market preferences.<sup>40</sup>

- ▶ The large low-cost labor force and huge domestic market combine to make India an attractive manufacturing base for the ESDM sector.

### Sector analysis: ESDM

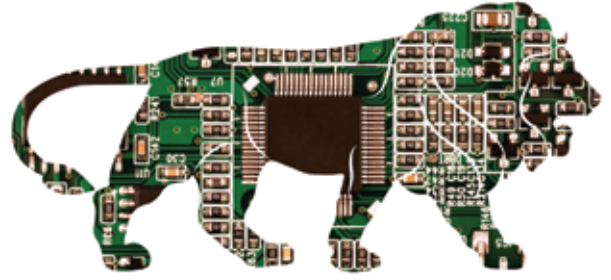


Source: IESA/F&S, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

<sup>38</sup> Internet Live Stats (2015), Internet & Mobile Association of India (2014)

<sup>39</sup> Telecom Regulatory Authority of India (2015)

<sup>40</sup> eMarketer (2014)



### Existing Indo-German collaborations and German market presence

- ▶ Electronica India and Productronica India are leading fairs for electronic components, applications, and systems in South Asia. Organized by Messe München International India Pvt. Ltd. and supported by the German Federal Ministry for Economic Affairs and Energy, the fairs represent an essential occasion for information exchange.<sup>41</sup>
- ▶ The Diotec Semiconductor AG produces semiconductor diodes for the electronics industry. In 2007, the company set up a new production facility in Pune, India.<sup>42</sup>
- ▶ Gustav Hensel GmbH & Co. KG is a leading manufacturer of power distribution systems and electrical installations for equipping buildings. The company set up a production and administration facility in India in 2010.<sup>43</sup>

### Key ESDM areas for German investors in India

#### Infrastructure projects

- ▶ Network electronics, broadband technology and telecommunications equipment
- ▶ ATMs

#### Consumer products

- ▶ White goods and household appliances
- ▶ Consumer electronics, such as set-top boxes, and navigation devices

#### Industrial products

- ▶ Smart meters and smart home appliances
- ▶ Semiconductor design and manufacturing

### Market challenges in the ESDM sector for German investors

- ▶ The fact that global players dominate the ESDM market and already cover most market segments in India, represents a strong entry barrier for investors.
- ▶ Strong competition from other emerging low-cost manufacturing destinations in South East Asia, such as Vietnam and Taiwan.
- ▶ The need to establish a suitable manufacturing ecosystem. Currently, India's ESDM sector strongly depends on imports for various key components such as memory, LCD displays and system-on-chip. India faces tough competition from the Chinese ESDM sector due to a well-established manufacturing ecosystem in China.<sup>44</sup>
- ▶ The need to adapt electronic products to meet Indian market preferences.
- ▶ The lack of wafer fabrication plants operating in India, which increases dependency on imports. Nevertheless, India has grown into one of the world's most important hubs for semiconductor design, with more than 20,000 engineers in multiple areas of chip design and verification, producing almost 2,000 chips per year.<sup>45</sup>

<sup>41</sup> *Electronica (2015)*

<sup>42</sup> *Diotec Semiconductor AG (2015)*

<sup>43</sup> *Gustav Hensel GmbH & Co. KG (2015)*

<sup>44</sup> *IESA (2014)*

<sup>45</sup> *Data Quest (2013)*

## Sector 2: Photonics

### Definitions and applications

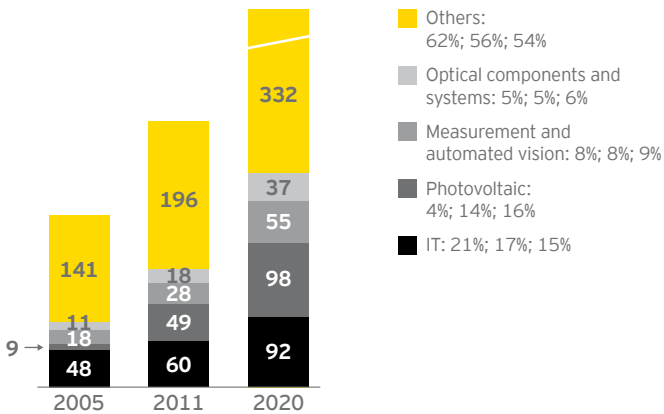
The Photonics and optics sector comprises the design and manufacture of devices and systems that create, use or modify light for technological applications. Such applications include lasers, LED lights, fiber optic cables and microscopes. Due to the versatility of these applications, they are found in a variety of sectors such as IT, Medical and life sciences, and ESDM.

### Global sector overview

The global Photonics market grew from €228 billion in 2005 to €350 billion in 2011, representing a CAGR of around 7.5%. Projections predict further growth, to €615 billion by 2020.<sup>46</sup>

**Figure 13: Global Photonics market, 2005-2020**

Product market shares: 2005, 2011 and 2020

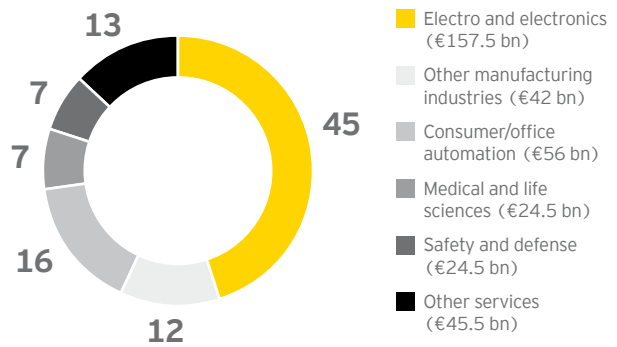


€billion  
Source: SPECTARIS (2013)

Photonics and optics applications are delivered to other industry sectors, e.g. Medical and life sciences sector.

Figure 14 illustrates the shares of those sectors such as the ESDM, the manufacturing, the safety and defense as well as the medical and life sciences sector.

**Figure 14: Global Photonics market, 2011**



In %  
Source: SPECTARIS (2013)

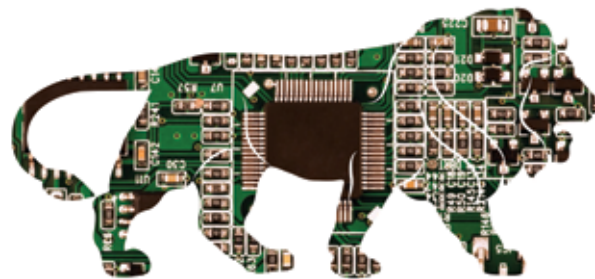
<sup>46</sup> SPECTARIS (2013)



## Indian Photonics and optics sector

The Photonics and optics sector has shown continuous growth in recent years, driven by rapidly rising demand from the automotive and ESDM sectors. The sector also benefits from increasing complexity in applied manufacturing technology, because it delivers pivotal components for High-Tech machinery.<sup>47</sup> India's import market for Photonics was worth €2.2 billion in 2011.<sup>48</sup> Germany accounted for €253.6 million of imports in 2012, a share of 11.7%.<sup>49</sup> The GoI's Digital India initiative aims to digitally empower the country's society and economy. Infrastructure initiatives include the National Optical Fiber Network (NOFN), which aims to install high speed internet connectivity across India.<sup>50</sup>

47 *Germany Trade and Invest (2013)*  
48 *Germany Trade and Invest (2013)*  
49 *Germany Trade and Invest (2013)*  
50 *Make in India (2015)*



## Sector trends

Photonics and optics applications are important enabling technologies for various High-Tech industries. The high growth levels of such sectors - including IT, Medical and life sciences, ESDM, power generation and general manufacturing - create a sound basis for strong growth in the sector.

In the medical sector, for example, photonics technology enables non-invasive and real-time medical diagnostics, treatment and disease prevention. The market for optical in vitro diagnostics, in particular, plays a pivotal role: it already accounts for €29.6 billion and is predicted to grow to €49.5 billion globally in 2020.<sup>51</sup> Medical lasers and endoscopes, meanwhile, offer great future potential for investment. Both applications are expected to show impressive growth of 8.0-9.2% between now and 2020.<sup>52</sup>

Optical fiberglass connections have an important role in the high-performance internet connectivity required for major IT technologies, such as cloud computing and machine-to-machine communication.

LED technology, meanwhile, will outperform traditional lighting systems in terms of both production and operational cost by 2020. India's LED market is predicted to grow to €888 million in 2016.<sup>53</sup> By providing an attractive investor environment, India might take a share of this market as it reaches the mass market. China already provides financial incentives to stimulate production of this new lighting technology. Investment stimuli from the GoI, such as the installation of LED street lamps in Kolkata and Pune, can contribute to domestic demand. India already possesses the knowledge necessary to succeed in the Photonics and optics market.

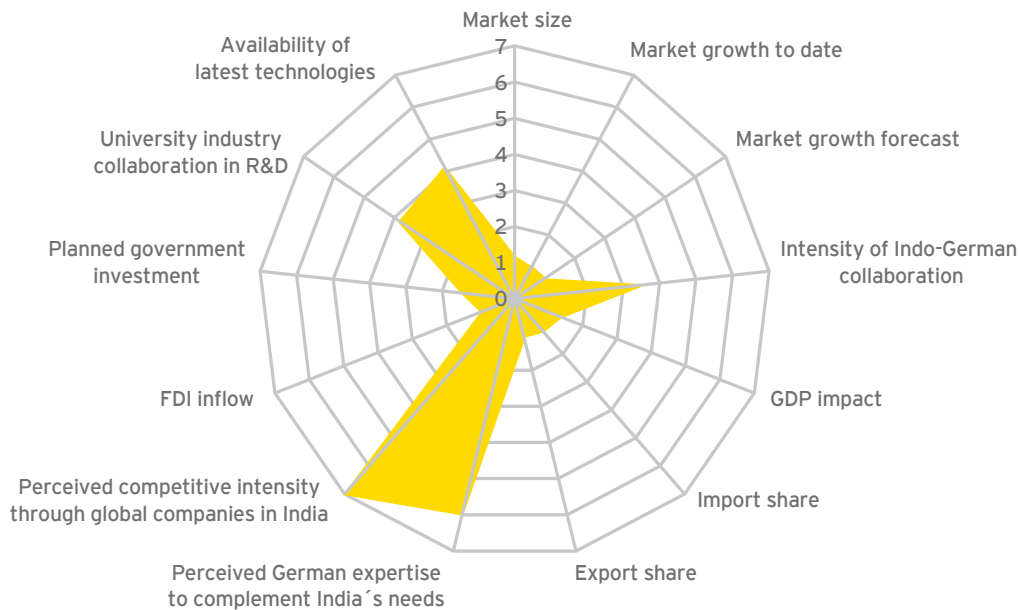
51 *A.T. Kearney (2013)*  
52 *A.T. Kearney (2013)*  
53 *A.M. Mindpower Solutions (2014)*

## Analysis: Photonics

### Why is this sector interesting?

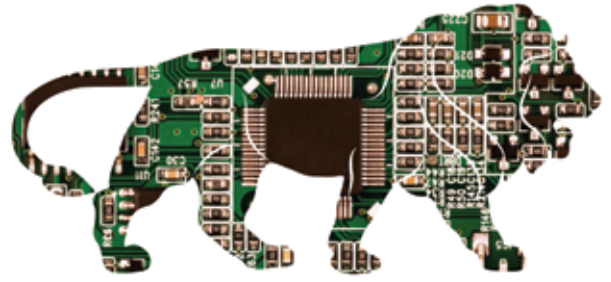
- ▶ Photonics is an important enabling technology for a variety of sectors. Applications include telecommunications, consumer electronics, medical technology and nanotechnology.
- ▶ As a cross-sector technology, photonics is most likely to benefit from predicted upturns in other High-Tech Manufacturing sectors, especially as domestic production in India is steadily increasing, combined with rising technological complexity and computerization of manufacturing machinery.
- ▶ High-end academic research institutions exist in India - including the Indian Institute of Technology (IIT) and the Tata Institute of Fundamental Research (TIFR) - but the potential for industrial applications in this field is widely unmet.<sup>54</sup>

### Sector analysis: Photonics



Source: GTAI, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

<sup>54</sup> Germany Trade and Invest (2013)



### Existing Indo-German collaborations and German market presence

- ▶ The Laser World of Photonics Conference, which takes place in June 2015 in Munich.
- ▶ German High-Tech companies in the field of photonics and optics, such as Carl Zeiss AG, are already aware of India as an attractive investment destination for production facilities.
- ▶ Carl Zeiss AG runs three production facilities, a R&D center, global IT services, and 30 sales and service offices throughout India.<sup>55</sup>
- ▶ The BAG electronics Group, a member of TRILUX Group located in Arnsberg, Germany and operating in the field of lighting electronics, has owned a production site in India since 2005.<sup>56</sup>

### Key Photonics areas for German investors in India

An analysis of India's 2012 Photonics imports from Germany reveals opportunities for:

- ▶ LED and laser diodes
- ▶ Machines, equipment and apparatus for semiconductor manufacturing
- ▶ Ophthalmological instruments
- ▶ Endoscopes, spectrometers and spectrographs<sup>57</sup>
- ▶ Glass fiber cables; these are of high importance, especially in the light of the GoI's "Digital India" program, which seeks to bring broadband connections to the whole country (see Outlook).

### Market challenges in the Photonics sector for German investors

- ▶ Establishing knowledge transfer from India's world-class research facilities - such as the Indian Institute of Technology (IIT) Madras, the University of Kanpur and the Tata Institute of Fundamental Research (TIFR) - to the domestic Indian photonics and optics industry.
- ▶ If India is able to capitalize on the existing know-how of these institutions, it might build a photonics sector to compete with, and excel against, strong East Asian competitors.
- ▶ Facilitating R&D collaborations and the joint development of industrial applications.
- ▶ The fact that Germany lags in application development, despite having a good basic academic research landscape.

<sup>55</sup> Carl Zeiss AG India (2015)

<sup>56</sup> BAG electronics Group (2015)

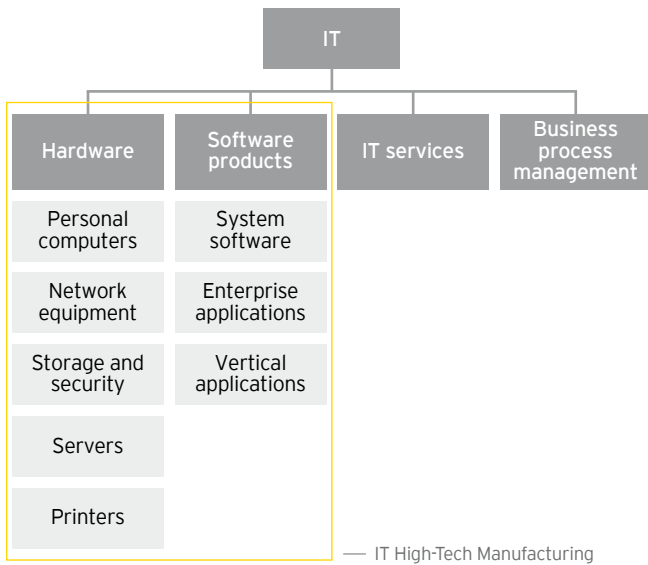
<sup>57</sup> Germany Trade and Invest (2013)

## Sector 3: IT

### Definition and applications

The IT sector, also referred to as IT & ITeS (IT-enabled services) comprises four main segments: IT services, Business process management (BPM), Software products and Hardware products.

**Figure 15: IT sector segments**



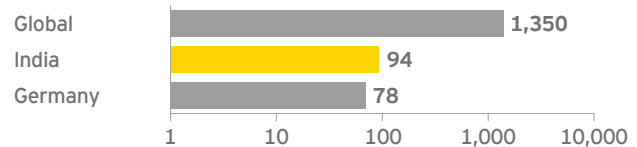
Source: NASSCOM (2014)

This analysis of India's IT sector focuses on Hardware and Software products, not IT services and BPM.

### Global sector overview

In 2014, the global IT sector (including IT services and BPM) reached a market size of €1,350 billion; this reflects a CAGR of 6.6% compared to €1,045 billion in 2010.<sup>58</sup> The Indian IT sector, meanwhile, accounted for around €94.4 billion in 2014, a market share of 7% of the global market.<sup>59</sup> The German IT sector had a total volume of €77.8 billion and thus a global market share of 5.8%.<sup>60</sup>

**Figure 16: Global IT market share of India and Germany 2014**



In €billion  
Source: NASSCOM (2014), BITCOM, EITO

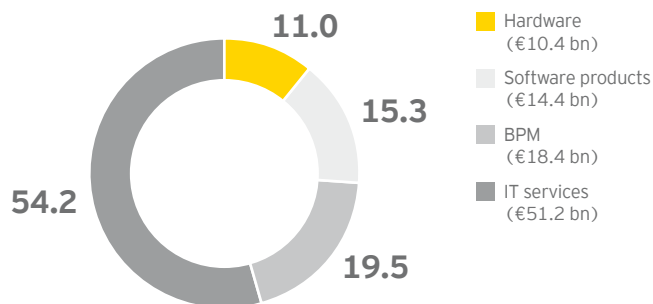
### The IT sector in India

India holds a leading position in the global IT sector, as is well reflected by the country's global market share. The total market, including BPM, grew by 8.3% from €87.2 billion in 2013 to €94.4 billion in 2014.<sup>61</sup> The sector will remain important to India's economy, and is projected to amount to around €180 billion by 2020.<sup>62</sup> In 2014, the IT services segment dominated the sector, with a market size of €51.2 billion, followed by BPM (€18.4 billion), Software products (€14.4 billion) and Hardware products (€10.4 billion).<sup>63</sup>

More than 77% of revenue from Software products, some €11.2 billion, resulted from exports in 2014.<sup>64</sup> India is globally well known for its thriving export-based software industry. By contrast, for Hardware, the domestic market accounts for almost the entire market share, as the penetration rate of personal computers in India is rising rapidly.<sup>65</sup>

58 Statista (2014)  
59 NASSCOM (2014)  
60 BITCOM (2014)  
61 NASSCOM (2014)  
62 Invest India (2015)  
63 NASSCOM (2014)  
64 NASSCOM (2014)  
65 NASSCOM (2014)

**Figure 17: Indian IT market by segments, 2014**



In %  
Source: NASSCOM (2014)

Driven by massive government support and imminent investments, 2015 is expected to be a particularly promising year for the Indian IT sector. The GoI recently announced an initial investment of €960 million for the Smart Cities project. Since Smart Cities are technology-driven projects, it is to be expected that much of this budget will be spent on IT.<sup>66</sup> The GoI's Digital India initiative, meanwhile, will also have an impact on the sector.

At the moment, infrastructure constraints affect India's IT sector; the sector is concentrated in the top six or seven tier one cities, with very limited exposure to tier two and three cities.

An essential growth driver of the Indian IT sector is its low-cost advantage. India is a financially attractive location, with a robust business environment and a large talent pool: in recent years, it has developed both experienced professionals and talented graduates.

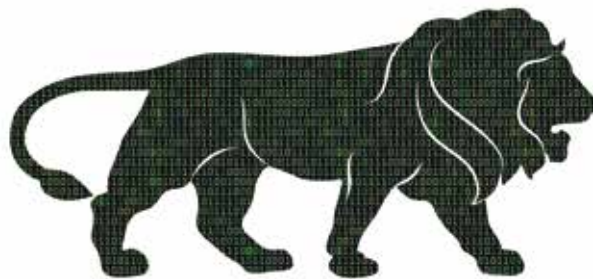
India's manufacturing sector is expected to spend more on IT: forecasts predict a 5.3% increase in 2015, while by 2018, the sector's IT spend is estimated to exceed €3 billion. The GoI's focus on Make in India and the increasing adoption of the Internet of Things mean there could be considerable activity in this field in the near future.<sup>67</sup> Between 2000 and 2014, India's Software products and Hardware products segments received FDI worth €8 billion. Up to 100% FDI is permitted under the automatic route in data processing, software development and computer consultancy services, software supply services, and business and management consultancy services.

Major GoI fiscal incentives have been driving India's IT sector: the most significant incentives have been for export-oriented units (EOUs), software technology parks (STPs) and special economic zones (SEZs).<sup>68</sup>

<sup>66</sup> Exhibitions India Group (2015)

<sup>67</sup> InformationWeek (2014); NASSCOM (2014); Make in India (2015)

<sup>68</sup> Invest India (2015)



## Sector trends

One important trend for the IT sector is the offshoring of engineering to India. In recent years, India has become a preferred location for engineering offshoring from across the world. Many companies have already started to offshore entire product responsibilities.<sup>69</sup>

IT is also a preferred sector for R&D investment; this focus has led to rising numbers of patents filed by IT firms. From 2009 to 2012, the number of patents filed by the top three IT companies increased from 150 to 858.<sup>70</sup>

India is already the third largest country in terms of total internet users, with approximately 240 million in 2014;<sup>71</sup> this figure is predicted to reach 346 million by 2018, which would make India the second largest internet-using country behind China.<sup>72</sup> The internet economy will constitute a bigger share of India's GDP: in 2010, the segment's contribution to GDP stood at 4.1% (€56 billion), and is expected to increase to 5.6% (€194 billion) in 2016.<sup>73</sup> This trend will further stimulate demand for devices and software, enabling broadscale internet usage. In addition, this development will increase demand for data storage, as exponential growth in email traffic leads to a rise in data management services. Suitable infrastructure and digitization is needed to manage enormous databases. This is already leading to a significant growth in the number of new data centers.<sup>74</sup>

<sup>69</sup> InformationWeek (2014)

<sup>70</sup> IBEF (2014)

<sup>71</sup> Internet Live Stats (2015)

<sup>72</sup> eMarketer (2014)

<sup>73</sup> BCG (2012)

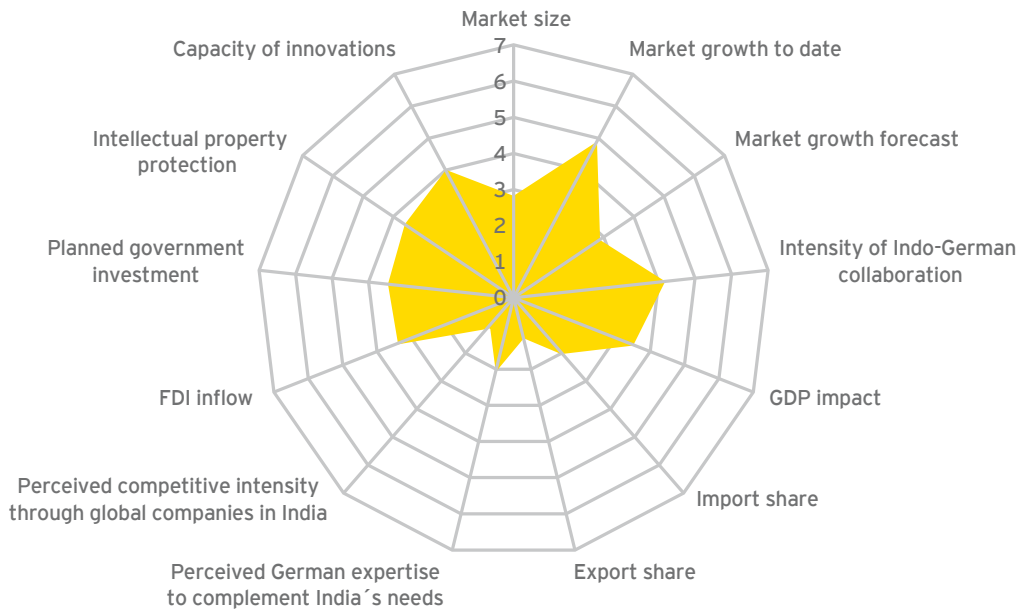
<sup>74</sup> EY Industry Overview of the IT Services Industry Including Software (2014)

## Analysis: IT

### Why is this sector interesting?

- ▶ There is high market readiness in India, based on its strong affinity for innovation and innovative IT products.
- ▶ India is the third largest country in terms of total internet users, with approximately 240 million in 2014. By 2018, forecasts predict India will become the second largest internet market, surpassing the US.<sup>75</sup>
- ▶ Disruptive technologies such as cloud computing and data analytics will provide new opportunities for IT firms to grow, as these sectors increasingly depend on technology support. Technologies such as telemedicine, remote monitoring and clinical information systems, are expected to boost demand for IT enabled solutions.<sup>76</sup>
- ▶ The existing base of highly skilled software and hardware engineers is an advantage for IT manufacturing in India. In combination with a mature competitive landscape, this creates an excellent business infrastructure. The development of the IT sector benefits from the full support of the Govt.
- ▶ With “Internet of things” and “industry 4.0” gaining importance in High-Tech Manufacturing, process automation and end-to-end digitization of business will become a key driver for enhancing production and cost efficiencies. The Indian IT sector holds strong know-how on software development and on digitization of business processes from which collaboration partners can benefit.

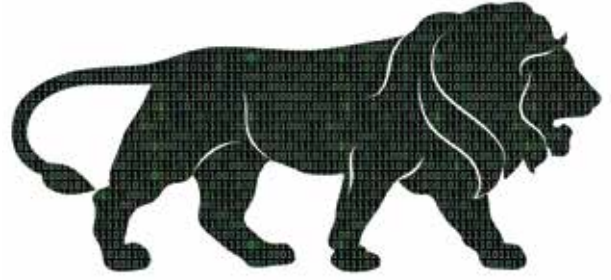
### Sector analysis: IT



Source: NASSCOM, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

<sup>75</sup> Internet Live Stats (2015) IAMAI & BCG India@Digital. Bharat p.3

<sup>76</sup> IBEF (2014)



### Existing Indo-German collaborations and German market presence

- ▶ In September 2014 Tech Mahindra Ltd. and Bosch Software Innovation announced a collaboration to develop and implement connected systems, e.g. for companies, smart cities and smart home solutions.<sup>77</sup>
- ▶ The Indo-German Max Planck Centre for Computer Science (IMPECS) at the Indian Institute of Technology in New Delhi. The research center is jointly operated by Germany and India.<sup>78</sup>

### Key IT areas for German investors in India

- ▶ Software products for store management and distribution management in the retail FMCG market. Besides retail, healthcare and utilities are rapidly growing verticals.<sup>79</sup>
- ▶ Even though new business and technology opportunities in this sector for German investors are limited for manufacturers, some applications and technologies may provide opportunities in the IT sector. Germany has know-how for development and implementation in the field of software products for e-services. Massively promoted by the Digital India program, in particular e-government, e-education and e-health will be of growing importance.
- ▶ Smart cards are another application which can provide opportunities in the future with increasing digitization.

### Market challenges in the IT sector for German investors

- ▶ Adaptation of applications to India-specific requirements will be key to success.
- ▶ Strong competition from China and other Asian countries.<sup>80</sup>
- ▶ Trend to virtualization of servers is increasing leading to declining server sales.
- ▶ Despite various employee retention strategies such as employee stock ownership plans (ESOPs) and job rotations IT companies are facing a growing demand for IT professionals due to increasing job hopping.<sup>81</sup>

<sup>77</sup> Tech Mahindra (2015)

<sup>78</sup> The Indo-German Max Planck Center for Computer Science (2015)

<sup>79</sup> IBEF (2014)

<sup>80</sup> BMI Research (2014)

<sup>81</sup> EY Industry Overview of the IT Services Industry Including Software (2014)

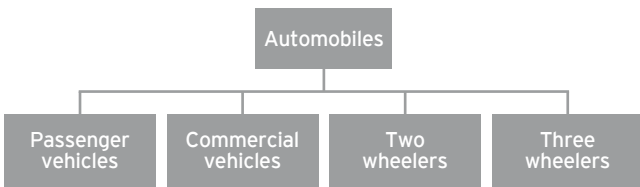
# 2.2 Cluster: Transportation

## Sector 4: Automotive

### Definition and applications

The Automotive sector can be split into two sub-sectors - Automobiles and Auto components. While being quite distinct, the two sub-sectors have strong interdependent relationships and are affected by the same market forces and developments.

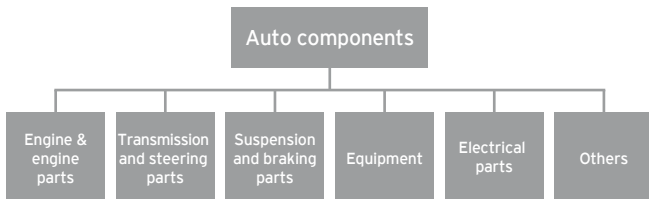
**Figure 18: Segments of the Automobiles sector**



Source: IBEF (2014)

The Automotive components sector is more fragmented than the automobile market, comprising six segments.

**Figure 19: Segments of the Automotive components sector**

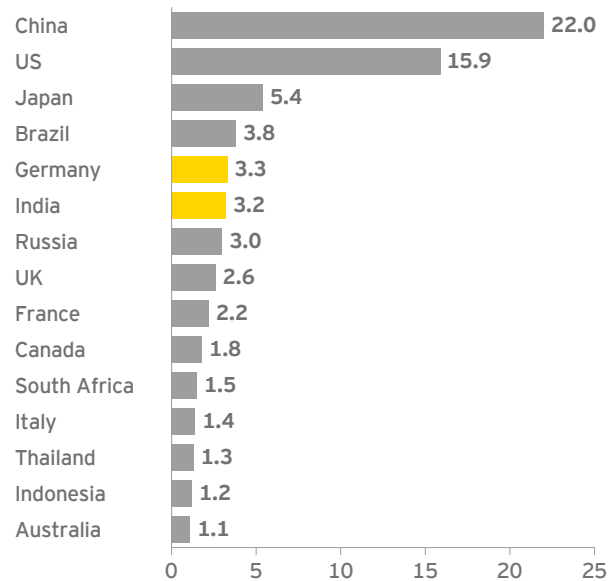


Source: IBEF (2014)

### Global sector overview

In 2013, global vehicle sales (passenger and commercial vehicles) totaled 85.6 million, 4.3% up on 2012. This growth significantly exceeded expectations following the weak first half of 2013. Although three of the four BRIC countries could not keep up the momentum of previous years, it is estimated that global growth of the Automotive sector will be primarily driven by the BRIC countries together with the US, especially as the Automotive sectors in Western Europe and Japan are decreasing or stagnant.<sup>82</sup>

**Figure 20: Global vehicle sales by country in 2013**



No. of vehicles (in millions)  
Source: OICA (2014)

The ranking for global automobile production (passenger and commercial vehicles) is similar to that for sales. In 2013, India ranked sixth, with 3.9 million manufactured vehicles, while Germany was fourth with 5.7 million.<sup>83</sup>

82 VDA (2014)

83 OICA Database (2014)

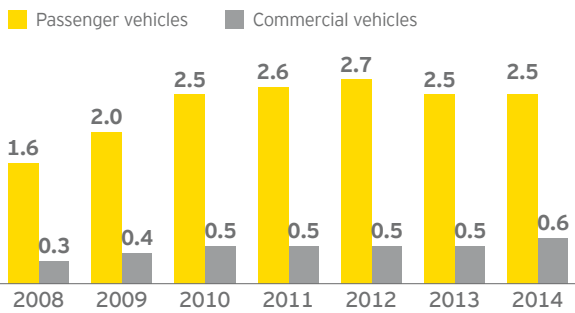




## Indian Automotive sector

India has one of the largest Automobiles markets in the world, with the sector accounting for almost 7% of GDP.<sup>84</sup> While the passenger car market did not meet expectations in 2013, there was some recovery last year, particularly in the second half. This followed increased consumer confidence, arising from the election of a new government, an improving economy and the introduction of excise duty reductions.

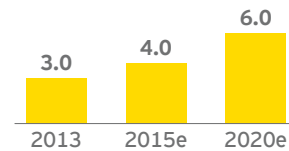
**Figure 21: Vehicle sales in India 2008-2014**



In millions  
Source: SIAM (2014)

From 2008 to 2013, sales of passenger cars grew from 1.6 million to 2.5 million, representing a 8.4% CAGR. By 2020, sales volumes are forecast to reach more than 6 million passenger cars.<sup>85</sup> Due to stagnation in sales in recent months, the Society of Indian Automobile Manufacturers (SIAM) has lowered forecasts from 5 million to 4 million in 2015 (Figure 22).

**Figure 22: Future size of passenger car market in India**



Million vehicles  
Source: SIAM (2014), Make in India (2014)

The sales volume of the whole Automobiles sector including two and three-wheeled vehicles, was 18.4 million in 2014. The two-wheeler segment accounted for 80% of overall volume. The gross turnover of automobile manufacturers in India has been growing constantly and reached €54.1 billion in 2013.<sup>86</sup>

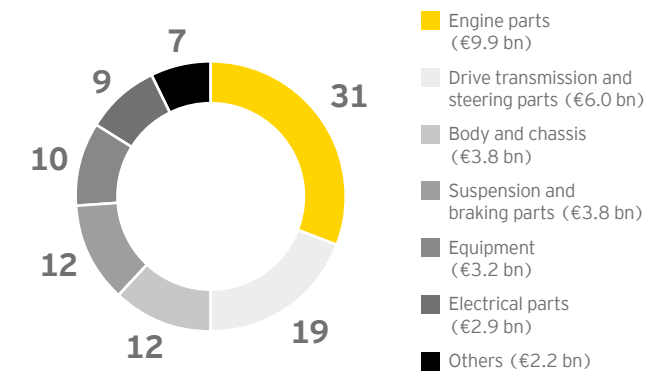
<sup>84</sup> Make in India (2015)

<sup>85</sup> Make in India (2015)

<sup>86</sup> SIAM (2014)

The development of the Automobile market is closely linked to the growth of the Automotive Components sector. In 2013, the aggregated turnover of the Indian automotive components sector was €32.5 billion: it is forecast to reach around €92 billion by 2020.<sup>87</sup> Engine parts dominate the sector, accounting for 31% of total production. The largest domestic customer segment is in two-wheeled vehicles. Exports of Automotive components increased at a 15% CAGR, reaching €8.2 billion in 2013/2014.<sup>88</sup>

**Figure 23: Indian Automotive components production segments revenue shares in 2013**



In %  
Source: ACMA (2014)

During 2014, the Indian passenger vehicle industry experienced a recovery, driven by renewed market confidence and economic sentiment, following the election of the new government. However, after growing for five consecutive months, sales fell in September and October. They revived in November and December, as automakers offered attractive year-end discounts and customers were encouraged to purchase by excise duty cuts.

Sales of commercial vehicles also saw some recovery. The Medium and Heavy Commercial Vehicles (M&HCV) segment picked up, with August the first month of positive growth following 29 consecutive months of decline. The segment's growth followed a turnaround in the heavy trucks sub-segment, which has been growing for the past nine months, on the back of pent-up demand, excise duty cuts, infrastructure spending and the recent lifting of mining bans. Passenger vehicle exports grew by 6.0% in 2014<sup>89</sup>, despite the Indian tax structure potentially disadvantaging local manufacturing compared with other regions, such as Eastern Europe.<sup>90</sup>

The FDI policy underlines both the economic importance of the Automotive sector and the Government of India's commitment to stimulating it further. The GoI allows 100% FDIs under the automatic route for both the Automobiles and Automotive components sectors. These investments are subject to all applicable regulations and laws.<sup>91</sup> Since 2009, the Indian Automotive sector has reported FDI equity inflows of €5.9 billion.<sup>92</sup>

87 IBEF (2014)  
88 ACMA (2014)  
89 SIAM (2014)  
90 The Economic Times (2014)  
91 Invest India (2015)  
92 IBEF (2014)



## Sector trends

The Automotive sector is well positioned for growth, both domestically and internationally. Besides the general domestic growth drivers, such as increasing demand arising from higher disposable income, an expanding middle class and easy access to financing options, the Indian Automotive sector is likely to benefit from heightened export demand. Estimates forecast 7.9% average growth in the production of passenger vehicles and 7.6% average growth in their export in 2015/2016.<sup>93</sup>

The GoI aims to develop India's Automotive sector into a global manufacturing and R&D hub for both Automobiles and Automotive components. It has therefore initiated a wide range of favorable initiatives, such as SOPs, excise duty cuts and FDI encouragement. Another key move has been the launch of the National Automotive Testing and R&D Infrastructure Project (NATRiP). This is the most significant ever initiative in the Indian automotive sector and involves unparalleled collaboration between the industry, state governments and the GoI. Besides developing world-class expertise in Automotive R&D, it aims to integrate India's automotive industry with the global market and to raise the country's global automotive profile.<sup>94</sup> To enhance the development of the sector and increase attractiveness for global players, India's Automotive sector could benefit from a further opening of the market in particular regarding tax and duty regulations.

The Automotive sector offers great opportunities for creating sizeable market segments through Indian-specific innovations: Tata Nano, for example, opened up the

potentially large "ultra low cost" car segment. Passenger car density figures per 1,000 people demonstrate India's growth potential: in 2014, the country had a personal vehicle density of 30, compared to 611 in Western Europe, 341 in Russia, 154 in Brazil, and 86 in China. The personal vehicle fleet amounts to 27 million in India, 24 million in Brazil, 41 million in Russia, 98 million in China and 214 million in Western Europe.<sup>95</sup> To meet Indian requirements, vehicles need to perform urban commutes (of around 50 to 100 km per trip), and be robust enough for Indian summers. The GoI aims to limit exhaust emission levels for automobiles on the basis of European regulations. This will require additional investment and industry innovation and has led to the introduction of the Bharat Stage Emission standards. The emission standard aims at regulating outputs of air pollutants from internal combustion engine equipment of mobile sources e.g. motor vehicles.

Such opportunities offer huge potential to manufacturers of automobiles and components. As India aims to become a global supplier, operating across various product types and regions, and serving all original equipment manufacturers (OEMs) as an integrator and preferred supplier, the sector offers opportunities for all types of auto components manufacturers.

<sup>93</sup> Sarangi et al (2014)

<sup>94</sup> NATRiP (2014)

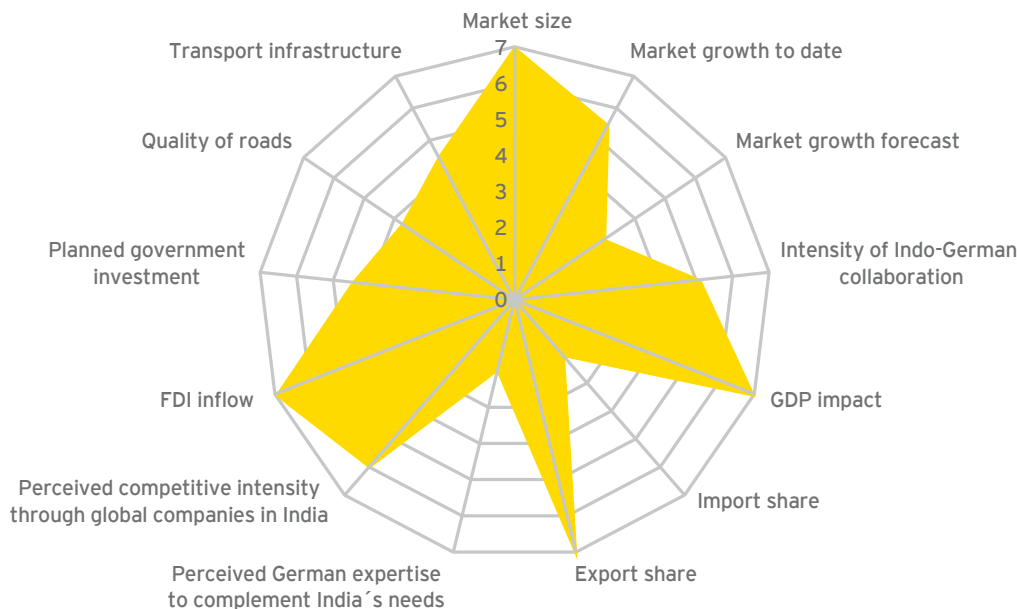
<sup>95</sup> LMC Automotive, 4Q2014

## Analysis: Automotive

### Why is this sector interesting?

- ▶ The Indian Automotive sector is well established, as reflected by the size of the market. The sector has been steadily growing, leading to 22.6 million registered vehicles (passenger and commercial) in 2012. Within the passenger car segment the number of registered vehicles increased from 7.6 million in 2005 to 16.9 million in 2012, a CAGR of 12%.<sup>96</sup>
- ▶ As global manufacturers, with a strong German presence, are operating in India, the country offers a mature sector infrastructure, with well-placed production clusters. This provides opportunities for manufacturers of auto components and new vehicles, and for repair and maintenance.
- ▶ India has the potential to become an export hub for the pan-Asian market. GoI investments aim to establish India as a global center for automobile manufacturing and design.
- ▶ The rising middle class (up to 200 million people by 2020 and 450 million by 2030) has growing mobility needs.<sup>97</sup> India has a strong need for small-to-medium size passenger cars, which are adapted from global models to meet local preferences and demands. The market therefore offers huge potential to exploit new customer segments, in addition to already successful models.
- ▶ The Automotive sector is a major contributor to India's GDP (currently 7%) and labor market.<sup>98</sup>

### Sector analysis: Automotive



Source: SIAM, ACMA, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

<sup>96</sup> OICA Database (2014)

<sup>97</sup> IEEMS (EY Institute for Emerging Markets Studies) (2010)

<sup>98</sup> Make in India (2015)



### Existing Indo-German collaborations and German market presence

- ▶ The International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI) Hyderabad of India and the Fraunhofer Society Germany signed a cooperative R&D agreement for automotive technologies.<sup>99</sup>
- ▶ The International Motor Show (IAA) traditionally hosts the *India-Day*, jointly organized by VDA, SIAM, ACMA, The International Finance Corporation (IFC) and Indo-German Chamber of Commerce, serving as a meeting forum for representatives from industry, institutions and government.
- ▶ German components manufacturer Hengst SE & Co has signed a JV with Indian filtration specialist Luman Industries. Hengst Luman India will manufacture filtration modules at its plant in Delhi.<sup>100</sup>

### Key Automotive areas for German Investors in India

- ▶ Adaptions for the local market are key to success. Examples are the VW Vento, essentially a VW Polo sedan with a stretched wheelbase developed especially for the Indian market. The VW Polo and Skoda Fabia, which are both produced on the same production line in Pune, offer stripped down features and a strengthened horn at lower prices than in the Western world. However VW uses the production in Pune as an export hub for small cars made in India.
- ▶ Demand for luxury and sedan cars is forecast to be especially high.
- ▶ To boost demand for German cars, BMW, Daimler and Volkswagen Group have established financial services organisations, because interest rates for car loans from Indian banks have traditionally been very high
- ▶ Daimler India Commercial Vehicles (DICV) has entered the Indian commercial vehicle market. In 2014 the Indian subsidiary of Daimler AG, accomplished annual sales of over 10,000 units of its BharatBenz trucks.
- ▶ Automotive components (engine and engine parts, including low-emission technology; transmission and steering parts; suspension and brake parts; equipment, electrical parts, and safety and security components).

### Market challenges in the Automotive sector for German investors

- ▶ High competition from Asian low-cost car and component manufacturers
- ▶ Cost of auto components imports are rising due to e.g. the volatile rupee exchange rate
- ▶ Interest rates on financing on passenger vehicles and motorbikes are traditionally high. A decrease in the cost of financing would boost India's wider Automotive sector
- ▶ Infrastructure capacity needs due to increasing number of vehicles is considered to exceed current expansion of roads and highways
- ▶ Auto component manufacturers are facing an increasing uncovered demand for skilled workers

99 German Mission in India (2015)

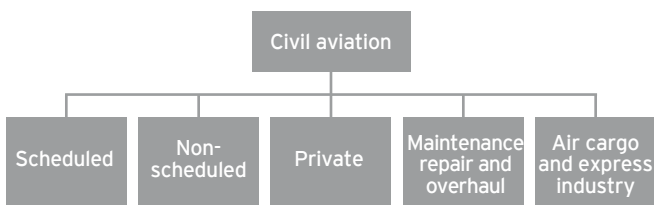
100 Hengst (2015)

# Sector 5: Civil aviation and airports

## Definition and applications

The Civil aviation and airport sector includes companies that design, develop and produce aircraft and airport facilities. It also includes development, overhaul and repair facilities and all related support services for aircraft and airports.

**Figure 24: Sector overview - Civil aviation and airports**

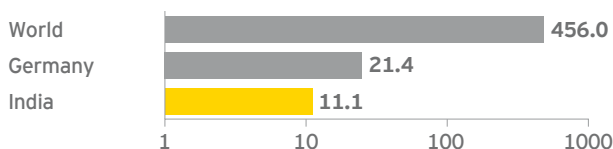


Source: Ministry of Aviation (2012)

## Global sector overview

The global Civil aviation sector accounted for €456 billion in 2013. Of this, Germany represented €21.4 billion and India €12.8 billion (Figure 25).

**Figure 25: Global Civil aviation market, 2013**

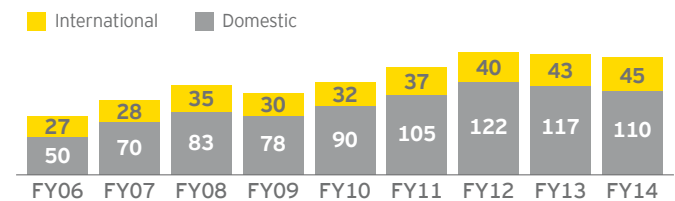


In €billion  
Source: Statista (2015) BDLI (2013); Ministry of Aviation (2012)

## Indian aviation sector

The Indian aviation market had 159 million flight passengers in 2013.<sup>101</sup> The turnover of the aviation industry of €11.1 billion makes India already the ninth largest market worldwide. Figure 23 illustrates this impressive development in domestic and international passenger traffic in India.

**Figure 26: Indian flight passenger traffic, 2006-2014**



Million passengers  
Source: IBEF (2014)

Prospects for future development are very promising. The fast-growing Indian middle class has an increasing demand for both business and leisure flights. The Indian civil aviation market is expected to grow by 16% by 2020.<sup>102</sup> India could, therefore, have the world's third largest aviation market within five years. To satisfy the enormous demand, India-based airline carriers, which operate nationally and internationally, have been established. These include Air India GoAir, Jet Airways, Spice Jet and IndiGo. In order to modernize the aviation industry, the Gol plans to privatize Air India.

Rising numbers of airline passengers have created a need for additional airport capacity, like the new airport projects in Bengaluru, Hyderabad, Delhi and Mumbai. In the airport infrastructure sector, the Gol has relaxed the FDI cap to 100% under the automatic route.<sup>103</sup>

<sup>101</sup> IBEF (2014)

<sup>102</sup> IBEF (2014)

<sup>103</sup> Make in India (2015)



## Sector trends

Currently only 3% of the Indian population travel by plane. The increasing popularity of low cost airlines will inevitably lead, as in Europe and North America, to a higher demand for flights and in additional aircraft. The switch in travel preference from railways to aircraft is another growth opportunity. Today, India's passenger traffic stands at 160 million but it is tipped to increase to up to 452 million by 2020.<sup>106</sup> Increasing air traffic will create investment opportunities in the facilities and management of airports and ground facilities. In addition, to satisfy long-term demand and market growth, it has been estimated that the Indian market needs 1,450 new airplanes, requiring an investment of €20.5 billion by 2020. Investment in 300 business jets, 300 small aircraft and 250 helicopters will be necessary by 2020.<sup>107</sup>

The Government of India is making further positive moves. The Directorate General of Civil Aviation is harmonizing regulatory standards with international standards. The procurement and clearance processes should also be digitized for better transparency and accountability.

Such steps, along with the current economic policy of liberalizing Civil aviation, could pave the way for a booming Civil aviation sector in India.

Despite such positive developments, the number of flight passengers is still relatively small. One challenge for India's aviation industry is the lack of qualified personnel for the construction and overhaul of aircraft. There is also a lack of facilities for maintenance, overhaul and repair.

As a result many airlines prefer other destinations, like Dubai and Sri Lanka, for their maintenance work. For the Indian Civil aviation sector the relatively high taxes on aviation fuel make India less attractive as an investment destination.<sup>104</sup>

The main reason for the immaturity of the Indian Civil aviation industry was the strong regulatory framework for this sector in India that complicates investments. Before 2012 foreign airlines were not permitted to invest in this segment but the GoI has passed laws to lower investment hurdles in the aviation sector. The GoI significantly lowered the FDI barriers; raising FDI up to 75% or even 100% for crucial services for the Civil aircraft industry. Beyond that GoI has implemented useful stimulations for the aviation industry, for example tax exemptions are possible for airplane parts.

The GoI Department of Industrial Policy & Promotion has declared that the Civilian aircraft manufacturing sector is of great strategic importance for the Indian economy. Therefore, the GoI is pursuing large-scale, domestic production of aircraft in India.

The first steps for the Indian Civil aviation industry were taken as long ago as 1988, with an agreement between Airbus and Hindustan Aeronautics Limited to manufacture the door of the Airbus A320 aircraft in India. In addition, an Airbus construction center with 350 engineers in Bengaluru boosted the development of the industry in India. These existing facilities and competencies have the potential to propagate a large-scale and high-end Indian aviation industry. Notable foreign companies which have already invested there include: Airbus (France), Boeing International Corporation (US), Rolls-Royce (UK) and GE Aviation (US).<sup>105</sup>

<sup>104</sup> GoI - Draft Civil Aviation Policy (2014)

<sup>105</sup> Make in India (2015)

<sup>106</sup> CAPA-SITA (2012)

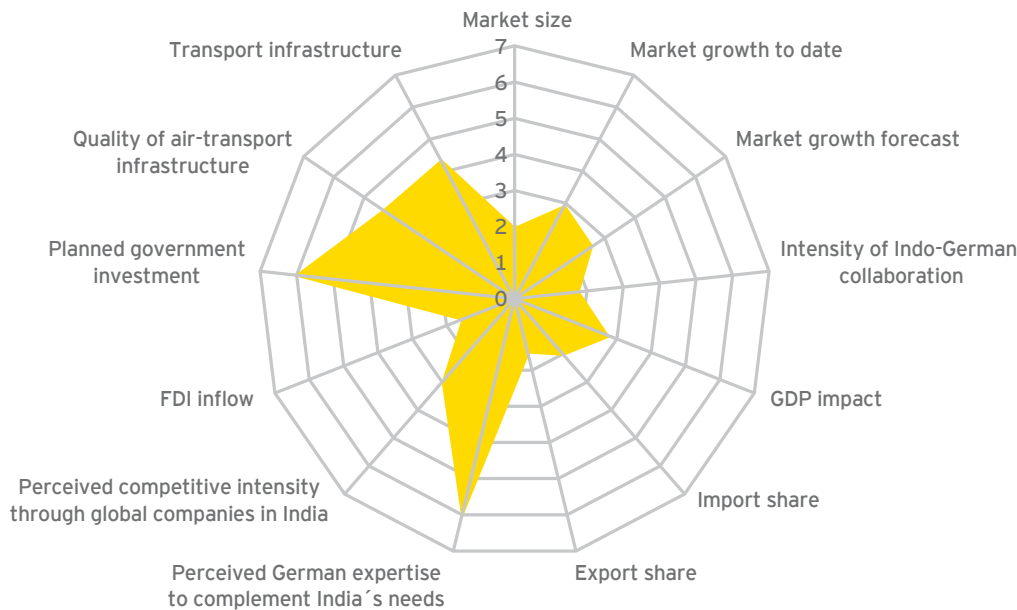
<sup>107</sup> Make in India (2015)

## Analysis: Civil aviation and airports

### Why is this sector interesting?

- ▶ Market growth is forecast with an estimated CAGR of almost 8% between 2014 and 2020.
- ▶ The sector plays an important role for GoI, which plans high investments.
- ▶ Overall economic growth, rising disposable incomes and an expanding middle class provide vast potential for the sector. As a result, several private-public partnerships have been launched in recent years to develop an adequate airport infrastructure, simultaneously functioning as pilot projects for other transportation infrastructure projects.
- ▶ Business and leisure travel is likely to increase rapidly due to the rising demand for mobility.
- ▶ Economic development will increase the need for freight traffic.
- ▶ Growth in flights will necessitate an established infrastructure of traffic management and aviation security/safety.
- ▶ India is aiming to rise from its current category II air safety rating to a category I position.

### Sector analysis: Civil aviation and airports



Source: Make in India, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis





### **Existing Indo-German collaborations and German market presence**

- ▶ In the 1980s, Airbus started its industrial collaboration with Hindustan Aeronautics Limited. Today about 50% of all A320 forward passenger doors are manufactured in India.

### **Key Civil aviation areas for German investors in India**

German companies offer expertise in a broad range of necessary applications that align with the International Civil Aviation Organization (ICAO). Among those are:

- ▶ Air and ground traffic control systems
- ▶ Signaling technology
- ▶ Regulation control systems
- ▶ CAD technology for parts and component development in the aviation industry
- ▶ Aircraft component manufacturing expertise (Airbus technology)
- ▶ Security systems at airports
- ▶ New airport development and building projects
- ▶ Expansion and modernisation of existing airports

### **Market challenges in the Civil aviation sector for German investors**

- ▶ Landing and taking off infrastructure
- ▶ Number of facilities in maintenance, repair and overhaul (MRO) infrastructure may be increased
- ▶ Ground handling infrastructure to be extended
- ▶ Infrastructure for operation for large aircrafts such A380 to be implemented at more airports

# Sector 6: Transportation infrastructure

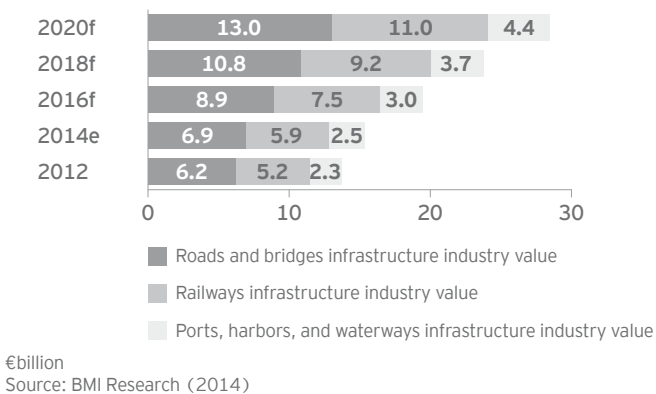
## Definition and applications

The Transportation infrastructure sector includes all activities linked to the construction of roads, highways, railways and related components. It also includes development, overhaul and repair facilities and all support services for ports and harbors. Logistics elements relate to the storage and distribution of goods.

## Global sector overview

Today's integrated international economy increasingly demands mobility of people and goods. To meet this rising demand, it is projected that there needs to be global investment of €30.1 trillion in the transportation infrastructure between 2013 and 2030.<sup>108</sup> Figure 24 shows the value of the Indian Transportation infrastructure industry, from 2012 to 2020.

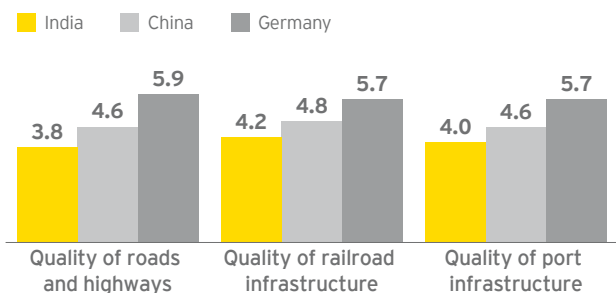
**Figure 27: Indian Transportation infrastructure industry value, 2012-2020**



## Indian Transportation infrastructure and logistics sector

The Global Competitiveness Index chart in Figure 25 ranks the infrastructure of China, Germany and India in 2014. The benchmarking extends from one (lowest performing country worldwide) to seven (highest performing country worldwide) and illustrates India's enormous potential to upgrade its transportation infrastructure and incentivize foreign investment.

**Figure 28: Global Competitiveness Index Transportation infrastructure, 2014**



Source: World Economic Forum (2015)

The state-run Indian Railway carries more than 23 million passengers a day and its 64,000 km network is one of the largest in the world. The Government of India aims to build new railways and upgrade existing ones in order to increase rail speed and reliability. To this end, it plans to modernize railway technology and improve technological safety standards. To enable mass transportation inside India's emerging megacities, the GoI plans to establish metros in Delhi, Mumbai, Hyderabad, Kolkata and Chennai.

The GoI is looking to attract private local and foreign investors. Thus, FDI in the railway system is allowed under the automatic route at 100%.<sup>109</sup> The GoI's commitment to infrastructure investment is also clear from such public investment projects as the Western and Eastern Freight Corridor, Chennai-Bengaluru Industrial Corridor, Amritsar-Delhi-Kolkata Industrial Corridor, and the Mumbai Elevated Rail Corridor and High Speed Corridor.

<sup>108</sup> McKinsey Global Institute (2013)

<sup>109</sup> Make in India (2015)



## Sector trends

Infrastructure projects typically require high initial capital investment. Due to tight Union and Federal budgets, the GoI increasingly prefers alternative forms of financing. PPPs have become a popular instrument of financing infrastructure projects. For example, so-called “build-operate-transfer” (BOT) infrastructure projects are initially financed and executed by private investors. In return, they can charge fees for use of the highways, etc.

This form of financing offers a great opportunity for investors to secure reliable long-term returns on investment in the rapidly growing Indian economy. Through a bidding system the government can select the most economic offering for publicly announced transport infrastructure projects.<sup>115</sup>

India's 4.8 million km road network is the second largest in the world: of this, 235,538 km are national highways, expressways or state highways.<sup>110</sup> The National Highway Development Program aims to develop and upgrade the road system. This may help to improve the current infrastructure, which suffers from poor quality roads and highways, especially in the areas of Jammu, Kashmir and the North-Eastern States. The GoI's long-term aim is to switch transportation from road to railway, to achieve higher energy efficiency. It seeks to do so by policy measures, such as tax exemptions for road construction within the first decade of a 20 year project, and duty free imports for certain construction plant and equipment. In addition, the government has raised the FDI cap to 100% under the automatic route.<sup>111</sup> The National Highway Authority of India (NHA) has begun to identify public-private partnership (PPP) projects for road and highway construction.<sup>112</sup>

India already has a port capacity of 800 million freight tons: by 2020, it intends to increase this capacity to 2,500 million metric tons. GoI plans in its “Maritime Agenda 2010–2020” to further promote the 13 major ports of India. It launched 87 port projects between 2010 and 2014, with a total volume of €6.14 billion. Of these, 73 were PPPs.<sup>113</sup> Most of these port projects are consciously located near Special Economic Zones (SEZs) in order to promote trade activities. The Government of India seeks to privatize 12 of the 13 state-run ports, which account for more than 50% of India's maritime trade volume. It also plans to invest €1.66 billion in the Outer Harbor Project in Tuticorin and €600 million in the so-called “Jal Marg Vikas” between Allahabad and Haldia.<sup>114</sup>

Infrastructure facilities, such as ports, harbors, roads, highways and railways, can receive 100% investment via the automatic route. To make investment in infrastructure projects more attractive, the GoI has extended tax holiday periods and granted government-backed loans to investors. These measures, which have already taken effect, have attracted a variety of foreign investors to the sector, including Bilfinger SE, Tecnimont and Aker Solutions.

<sup>110</sup> Ministry of Roads Transport & Highways (2014)

<sup>111</sup> Make in India (2015)

<sup>112</sup> EY Attractiveness Survey India 2014 (2014)

<sup>113</sup> Make in India (2015)

<sup>114</sup> Make in India (2015)

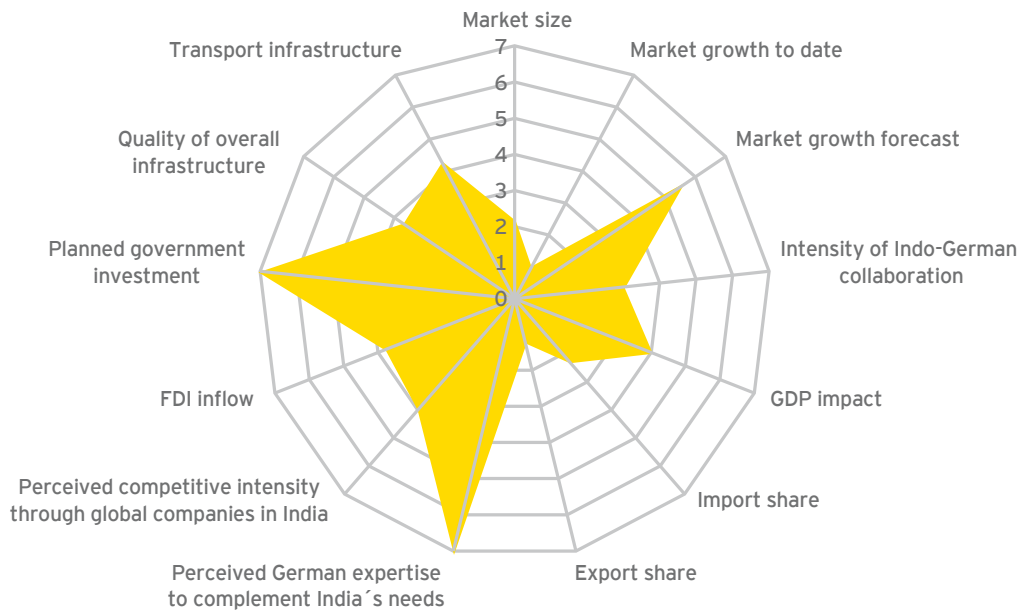
<sup>115</sup> IBEF (2013)

## Analysis: Transportation infrastructure

### Why is this sector interesting?

- ▶ The infrastructure and transportation sector is predicted to grow at a CAGR of more than 20% between 2010 and 2014.
- ▶ The GoI has announced massive financial investment in infrastructure expansion and upgrading for road, rail and sea, e.g. the so-called "corridor programs" that seek to connect metropolitan areas across the country.
- ▶ The Smart City programs will also support further infrastructure improvement, supported by GoI investment of approximately €960 million.
- ▶ The Transportation sector is crucial to the development of the Indian economy and its High-Tech industries. This factor, along with the ever-increasing rate of urbanization and rising disposable incomes, is creating a steadily growing demand for mobility and transportation of freight and passengers.
- ▶ In the medium to long-term, a modernized sea-based transportation infrastructure could become a hub for cross-Asian freight traffic, like Dubai and Singapore. Therefore Indian ports may form a major Indian Ocean hub and increase competition for other Asian shipping lines.

### Sector analysis: Transportation infrastructure



Source: BMI Research, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis



### Existing Indo-German collaborations and German market presence

- ▶ Deutsche Bahn (DB) International and the Indian Railways signed a memorandum of understanding on technological collaboration in the rail sector, especially signaling technology in April, 2013.<sup>116</sup>
- ▶ Hindustan Construction Company (HCC) started a successful joint venture with DSD Brückenbau GmbH and VNR Infrastructures.<sup>117</sup>

### Key Transportation infrastructure areas for German investors in India

German companies have great expertise in many different applications within the Transportation sector, including necessary safety and control systems:

#### Road:

- ▶ Road manufacturing machinery
- ▶ Tolling and signaling systems
- ▶ Traffic technology expertise

#### Rail:

- ▶ Upgrading the existing railroad infrastructure and improving the quality of the railway system
- ▶ Electrification of the railroad system
- ▶ Manufacturing of electrical locomotives
- ▶ Signaling systems and IT-based control equipment
- ▶ Upgrading the existing railway system to enable higher speed levels
  
- ▶ Introduction of trainsets in place of loco hauls
- ▶ Station redevelopment
- ▶ Introduction of High Speed Rail
- ▶ Environment friendly Urban Mobility Projects in tier I and tier II cities

#### Sea:

- ▶ Loading and unloading machinery for ships e.g. cargo and container cranes
- ▶ Harbor technology expertise e.g. access control systems, building technology and automation
- ▶ Shipbuilding yards, ship manufacturing and maintenance facilities
- ▶ Development of inland navigation
- ▶ Port-led development model

### Market challenges in the Transportation infrastructure sector for German investors

- ▶ Attracting potential investors for PPP transportation infrastructure projects
- ▶ Transferring knowledge in infrastructure development
- ▶ Conducting feasibility studies for market entry of German manufacturers
- ▶ Financing of large infrastructure projects

<sup>116</sup> Deutsche Bahn International (2013)

<sup>117</sup> VNR International (2014)

# 2.3 Cluster: Water and energy supplies

## Sector 7: Water

### Definition and applications

The Water sector contains four sub-sectors: Water collection and treatment, Water distribution and supply, Sewage and sanitation, and Other services (Table 2). Applications include sewage and effluent treatment equipment, process equipment and pumps, and membrane technology.<sup>118</sup>

**Table 2: Water value chain**

Segments	Key activities
Water collection and treatment	<ul style="list-style-type: none"> <li>▶ Collection of fresh water</li> <li>▶ Fresh water treatment plant</li> <li>▶ Desalination plant</li> </ul>
Distribution and supply	<ul style="list-style-type: none"> <li>▶ Supply to domestic consumers</li> <li>▶ Supply to industrial consumers</li> </ul>
Sewage and sanitation	<ul style="list-style-type: none"> <li>▶ Waste water collection, treatment, re-use and disposal</li> </ul>
Other services	<ul style="list-style-type: none"> <li>▶ Irrigation</li> <li>▶ Water purification</li> <li>▶ Bottled water</li> <li>▶ Bore wells</li> </ul>

Source: EY Water Sector in India (2011)

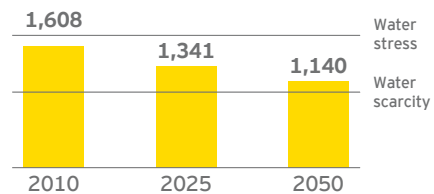
### Global sector overview

The growth of the global population and economy is fuelling an increasing demand for water, which is a particular challenge for emerging countries. Whereas in the 2050 scenario, OECD member states reduce their total water demand to 16% of the world's total use (from 28% in 2000), the BRICS states are expected to experience an increase in their share from 51% in 2000 to 60% in 2050. This increase is driven by higher industry demands, particularly from the manufacturing and electricity sectors.<sup>119</sup>

### Indian Water sector

Water represents a current and future challenge to India. The country suffers from water stress, which could turn into water scarcity after 2050.

**Figure 29: Annual water availability per capita**



In m<sup>3</sup>  
Source: Central Water Commission India (2013)

According to Central Water Commission India estimates, annual water availability per capita will drop from 1,608m<sup>3</sup> in 2010 to 1,140m<sup>3</sup> in 2050, as depicted in Figure 29. Water "availability" does not necessarily equate to "accessibility" since conditions vary considerably between regions and seasons. Taken this into account, there could be critical water stress levels by 2020.<sup>120</sup>

This scarcity reflects a growth in demand, which is linked particularly to the following three factors:

- ▶ India's population is projected to grow steadily and to increasingly urbanize. A gap already exists between basic service demand and supply which will widen further by 2030.<sup>121</sup>
- ▶ Consumer preferences and consumption patterns are shifting towards more water-intensive products.
- ▶ Industrial growth is leading to more water-intensive technologies and boosting the output of the energy sector which is, itself, a large-scale water consumer.<sup>122</sup>

<sup>118</sup> Frost & Sullivan (2012)

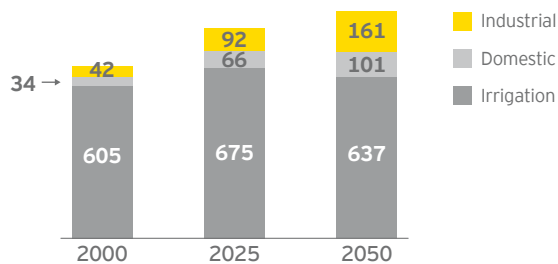
<sup>119</sup> OECD (2012)

<sup>120</sup> European Business and Technology Centre (2011)

<sup>121</sup> EY Water Sector in India (2011)

<sup>122</sup> EY Water Sector in India (2011)

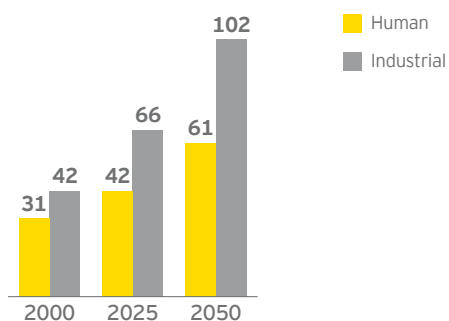
**Figure 30: India - water demand by sector, from 2000-2050**



In billion m<sup>3</sup>  
Source: International Water Management Institute (2007)

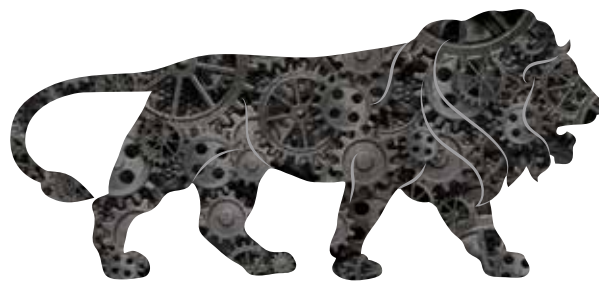
Agriculture will use most water, consuming 71% of the total in 2050, despite diminishing demand from the sector. Nevertheless, industrial and domestic water consumption will account for a steadily rising amount, increasing their ratio of total demand from 6.2% and 5% respectively, in 2000, to 17.9% and 11.2% in 2050 (Figure 30).<sup>123</sup> The impact of industrial growth on total water demand becomes more apparent when observing industrial water demand levels per capita per year; these will accelerate faster than domestic ones (see Figure 31). Capital expenditure in the water and Waste water sector stood at €2.3 billion in 2011 but is expected to triple to €7.3 billion in 2018.<sup>124</sup> Besides the water Distribution and supply sub-sector, the focus is increasingly moving to Sewage and sanitation-related activities. Waste water management, including all related sub-activities, is crucial in times of increasing health awareness and population pressure.<sup>125</sup> However, waste water treatment is not forecast to keep pace with the growth in waste water discharge, accounting for approximately 33% in 2018. Therefore, around 67% of total waste water will not be treated.<sup>126</sup>

**Figure 31: India - water demand per capita per year**



In m<sup>3</sup>  
Source: International Water Management Institute (2007)

<sup>123</sup> International Water Management Institute (2007)  
<sup>124</sup> Global Water Intelligence (2014)  
<sup>125</sup> European Business and Technology Centre (2011)  
<sup>126</sup> BMI Research (2014)



## Sector trends

To tackle the challenges outlined above, the GoI has initiated several programs. For instance, the Namami Ganga project aims to cleanse the Ganga River via stricter pollution laws and massive investment in water infrastructure, such as sewage treatment plants, process equipment and pumps. Estimates suggest business opportunities worth €4.4 billion to €5.1 billion for sewerage and effluent treatment manufacturers in this project alone.<sup>127</sup> A further program, the Clean India campaign, which was introduced by the GoI in 2014, focuses on constructing sanitation facilities and providing a safe and adequate water supply. The total expected expenditure amounts to €8.9 billion, of which €2 billion will come from the government. Further Clean India business opportunities are implied.<sup>128</sup> Overall, private sector involvement is being fostered by the GoI's 2010 move to permit FDI of up to 100% under the automatic route.<sup>129</sup> Despite India's water sector needs and Germany's expertise, trade and collaboration could increase. India is not among Germany's top 10 export markets, which clearly indicates growth potential in this sector: for example, exports in water filtration and purification systems have fallen from €14.6 million in 2009 to around €7.0 million in 2014.<sup>130</sup>

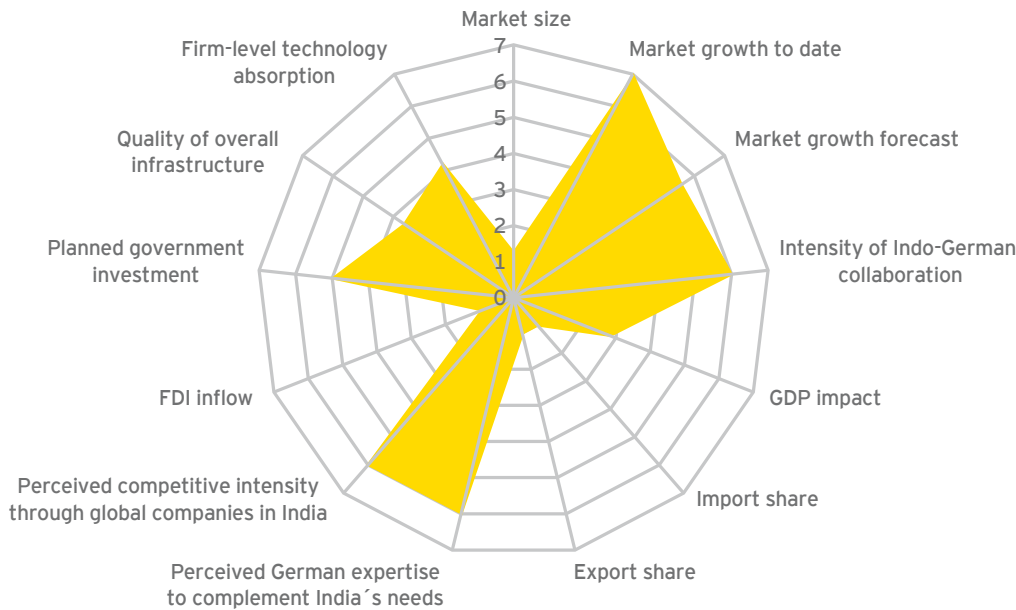
<sup>127</sup> Phillip Capital (2014)  
<sup>128</sup> Ministry of Urban Development (2014)  
<sup>129</sup> EY Water Sector in India (2011)  
<sup>130</sup> VDMA (2015)

## Analysis: Water

### Why is this sector interesting?

- ▶ The Water sector will play a key role in India's future economic development, as it is important for both the end consumer market and industrial manufacturing. Unsurprisingly, the sector has experienced constant market growth in recent years, with a CAGR of around 18%. It is expected to stay at this level until 2018.<sup>131</sup>
- ▶ The demand for better water sanitation and hygiene - or "WASH" (water, sanitation, hygiene) - is rising quickly, particularly in urban India. This is mirrored by a rising industry demand for water for manufacturing. In addition, improvements in environmental conditions require higher technological standards in water treatment and supply.
- ▶ The GoI has launched several investment programs, such as Clean India and Namami Ganga. These initiatives will have a broad reach and are expected to affect other clusters, like Heavy engineering, Transportation, and Medical and life sciences. Such factors, along with a favorable FDI policy, lead to high market readiness in the sector and offer new technology opportunities for German companies.
- ▶ Compact water supply for small settlements represents a promising sphere for further development, especially in rural areas.

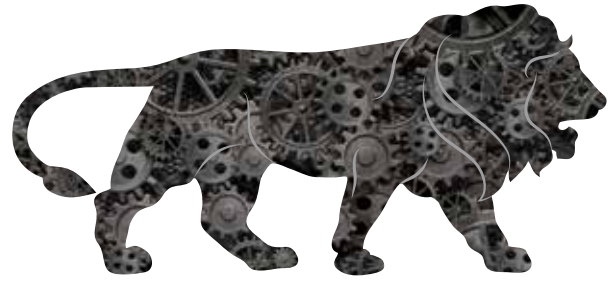
### Sector analysis: Water sector



Source: Global Water Intelligence, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

131 Global Water Intelligence (2014)





### Existing Indo-German collaboration and German market presence

- ▶ The Indian Water sector and the German one (represented by the German Water Partnership) are collaborating and plan to form an expert steering group. They are considering such topics as river regeneration, compact water supply for small settlements, waste water treatment systems for urban areas, energy-efficient irrigation, energy recovery from waste water and PPPs. The latter offers opportunities for foreign private firms as indicated by the increasing number of such partnerships in India.<sup>132</sup>
- ▶ The Indo-German Centre for Sustainability (IGCS). The IGCS focuses on the protection of the environment regarding water resources, energy, land use and rural development and waste management. It fosters cooperation between Indian and German scientists with regard to research, teaching and training, and information dissemination.<sup>133</sup>
- ▶ The Indo-German Environment Forum<sup>134</sup>

### Key Water areas for German investors

German companies have cutting-edge technology and expertise in many different water industry areas, including:

- ▶ Water harvesting/collection systems
- ▶ Collection of fresh water
- ▶ Fresh water treatment plants
- ▶ Industrial and end-consumer water supply
- ▶ Waste water collection, treatment, re-use and disposal
- ▶ Micro irrigation systems
- ▶ Filtration and purification
- ▶ Developing customised water solutions
- ▶ Modernisation of common effluent plants

### Market challenges in the Water sector for German investors

- ▶ High price sensitivity of Indian buyers, especially government procurement departments, which usually favor the lowest bidder
- ▶ Extending existing partnerships and leveraging them to create further business opportunities
- ▶ Insufficient knowledge of available technologies

<sup>132</sup> *Water and Sanitation Program (2011)*

<sup>133</sup> *IGCS (2015)*

<sup>134</sup> *BMUB (2015)*

## Sector 8: Renewable energy

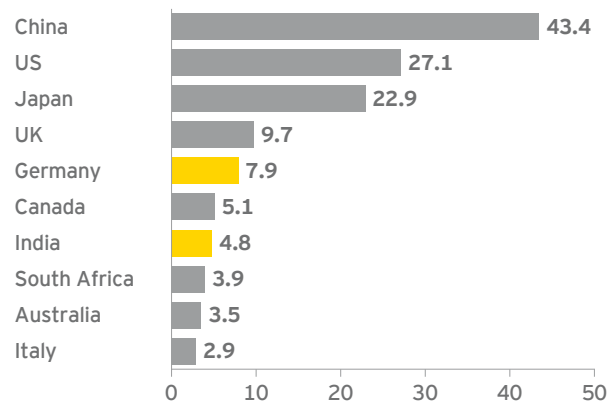
### Definition and applications

The Renewable energy sector can be divided into five sub-sectors. First Solar energy, for which applications include photovoltaic panels and modules, solar power inverters, concentrating solar thermal power (CSP) plants and solar collectors. Second Wind power, for which applications include wind turbines and blades. Third Hydropower, including big turbine generators, small-scale in-stream units as well as wave and tidal energy generators. Fourth Bioenergy, for which applications include hardware components and equipment for converting biomass into useful energy carriers. Fifth Geothermal energy, for which manufacturers offer integrated plant solutions or highly specialized components.<sup>135</sup>

### Global sector overview

In recent years, governments have focused more attention on Renewable energy - in response not only to global debate about climate change, energy security and the environment, but also to the business opportunities these themes present. In 2013, €171.5 billion was invested in Renewable energy worldwide (excluding hydropower plants of more than 50MW). China led the way, investing €43.4 billion excluding R&D (Figure 32), while Germany ranked fifth with €7.9 billion. India was seventh with €4.8 billion, sharply down on its peak of approximately €10 billion in 2011; this slowdown was mostly due to a decline in asset finance, especially in the solar power market. Global investment also fell from its record level of €223 billion in 2011; this was mainly due to declining investments by developed countries, partly related to uncertainty over incentive policies. Developing countries, by contrast, accounted for a growing proportion of total investment, up from 20% in 2004 to around 43% in 2013.<sup>136</sup>

**Figure 32: Investments in Renewable energy (excluding R&D), 2013**



In €billion  
Source: REN21 (2014)

<sup>135</sup> REN21 (2014)

<sup>136</sup> REN21 (2014)

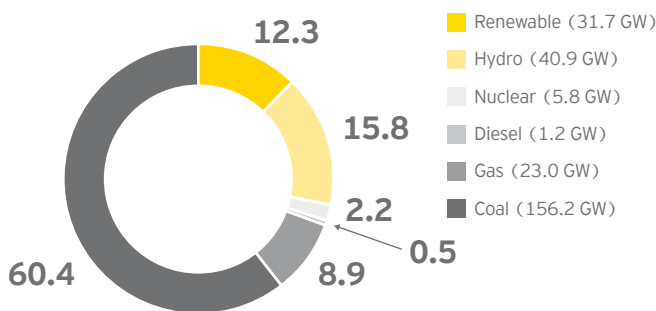
## Renewable energy in India

India is the fourth highest energy consumer worldwide, accounting for the fifth largest power generation portfolio. India's total installed power capacity more than doubled between the financial year 2004 and January 2015, rising from 114GW to 259GW.<sup>137</sup>

By 2022, the GoI aims to increase the installed capacity of renewable energy to 175GW of which solar power will have the lion's share (100GW), followed by wind energy (60GW), biomass energy (10GW) and small hydro projects (5GW).

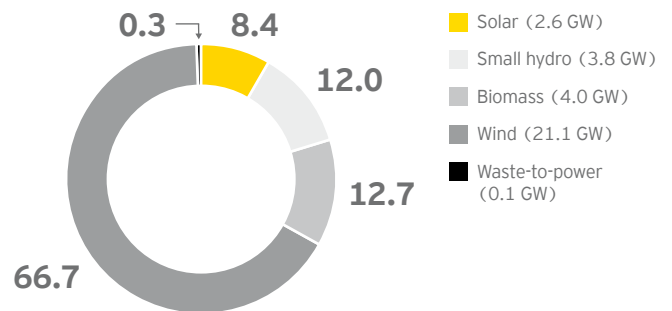
Renewable energy, taken together with hydropower, constitutes 28.1% of India's total power generation capacity, as of January 2015 (Figure 33). While coal is still the main source of energy, with 60.4%, energy production from renewable sources is on the rise: excluding large-scale hydropower, renewable energy capacity grew from 5.3GW in the 2004 financial year to 31.7GW in the 2014 financial year, a CAGR of 19.6%. Wind power makes up the largest share of total renewable energy capacity, with 66.7%, followed by energy from biomass (including bagasse cogeneration), small hydro, solar, and waste-to-power (Figure 34).<sup>138</sup>

**Figure 33: Installed power generation capacity in India, as of January 2015**



In %  
Source: Central Electricity Authority, India (2014)

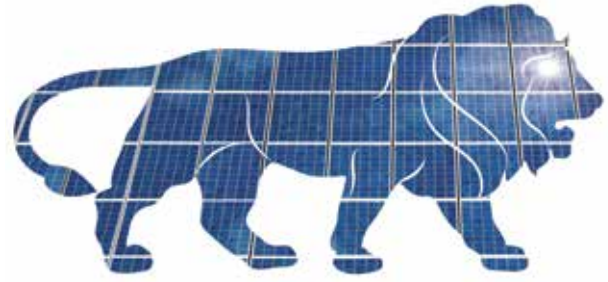
**Figure 34: Renewable energy capacity by technology, FY 2014**



In %  
Source: Ministry of New and Renewable Energy (2014)

<sup>137</sup> Central Electricity Authority India (2005,2014)

<sup>138</sup> Ministry of New and Renewable Energy (2014)

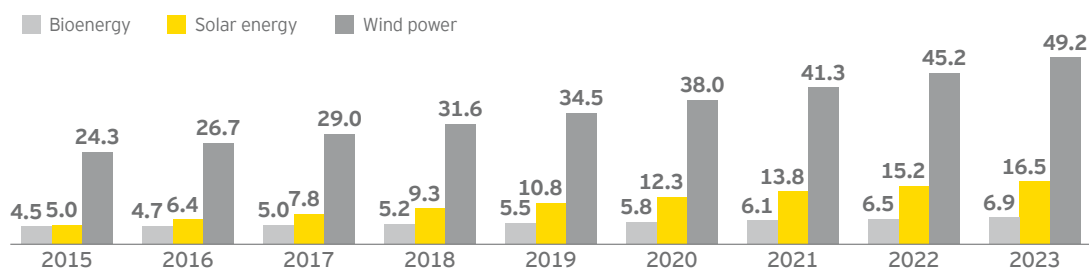


## Sector trends

Industrial growth and more energy-intensive lifestyles mean India's demand for energy is on the rise. Electricity demand, for example, is predicted to grow 9% annually between the 2007 and 2022 financial years.<sup>139</sup> To help meet these challenges, the GoI established the Bureau of Energy Efficiency in 2002 - within the framework of the Energy Conservation Act 2001 - with the goal of increasing energy efficiency and using renewable energy sources. Simultaneously, the tremendous potential of employment generation and social entrepreneurship for human resources trained in almost all streams of technology, engineering, science and humanities are implied.<sup>140</sup> The Make in India program also aims to foster renewable energy as part of its energy strategy, which due to India's immense energy needs still includes traditional thermal energy. FDI of up to 100% under the automatic route is permitted in this sector.<sup>141</sup> The GoI recently announced that total government spending in renewable energy is likely to hit €80 billion in the next five years.<sup>142</sup>

Overall renewable energy capacities are targeted to increase to almost 55 GW by 2017.<sup>143</sup> The potential capacity for wind power is estimated to be 102.8GW, of which 21.1GW (20.5%) has been installed. In 2013, around €2.9 billion was invested in wind energy, more than half of the total investment in clean energy in India.<sup>144</sup> The country ranked fifth worldwide in terms of total wind power production in 2013, with a CAGR of 23.6% from 2004 to 2013.<sup>145</sup> Solar energy offers huge potential: an estimated 6 billion GWh annually. The GoI aims for total solar energy capacity of 10GW by 2017 and 20GW by 2022, which will further fuel demand and investment. Installed capacities of wind power, solar energy and bioenergy are all expected to grow significantly from 2015 to 2023 - with projected CAGRs of 9.2%, 16.2% and 5.6% respectively (Figure 35).<sup>146</sup>

**Figure 35: Wind, solar and bioenergy capacity forecast, 2015-23**



Energy capacity (GW)  
Source: BUSINESS MONITOR INTERNATIONAL (2014)

<sup>139</sup> IBEF (2014)

<sup>140</sup> Bureau of Energy Efficiency (2015)

<sup>141</sup> Make in India (2015)

<sup>142</sup> The Economic Times (2014)

<sup>143</sup> Make in India (2015)

<sup>144</sup> Ministry of New and Renewable Energy (2014); EY Mapping India's Renewable Energy Growth Potential (2013); Bloomberg (2014)

<sup>145</sup> Global Wind Energy Council (2014)

<sup>146</sup> BMI Research (2014); EY Mapping India's Renewable Energy Growth Potential (2013); Make in India (2015)

“ThyssenKrupp has been active in India since 1860. We are pleased to be an important partner as well as an integral part of the Indian economy. Therefore, we will strive to intensify a sustainable relationship with the country, especially in the field of High-Technology products and services. ThyssenKrupp is present in India with eleven operating units, ranging from manufacturing to engineering services as well as marine systems. ThyssenKrupp recognizes the importance of partnering a fast-growing economy. We are expanding our facilities across the region with significant investments in our new aerospace facility in Bengaluru, our elevators and escalators manufacturing unit in Pune and the expansion of our system engineering business. We also believe in the Make in India vision. For us, being successful in India has always meant designing and manufacturing to suit Indian needs. As a leading diversified industrial company we are also committed to qualifying and promoting promising talent by imparting excellent vocational skills. With the second generation of reforms on the anvil, we are excited to participate in the next leg of India’s growth story.”

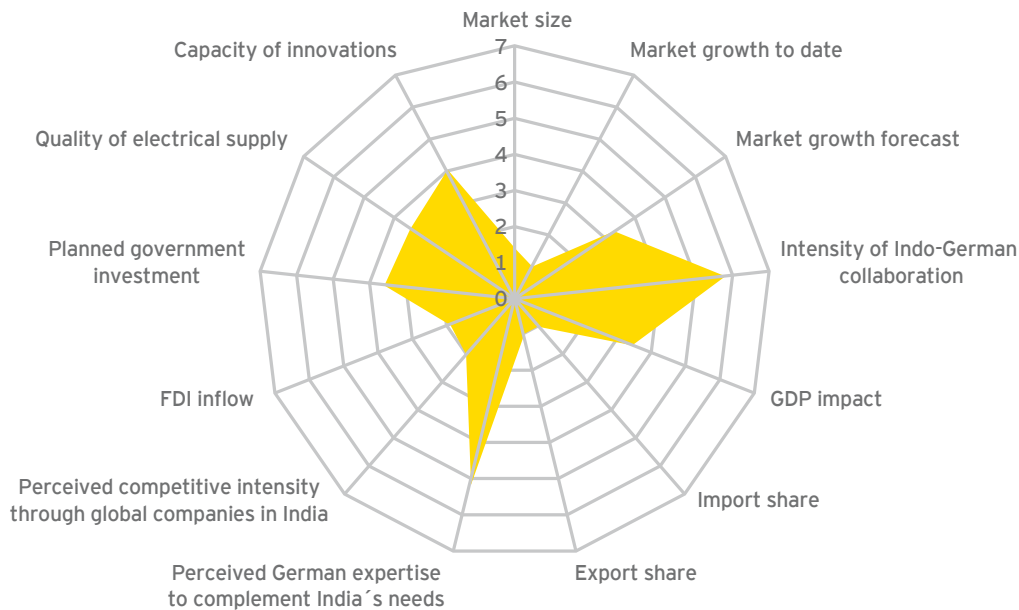
**Dr. Michael Thiemann, CEO ThyssenKrupp India**

## Analysis: Renewable energy

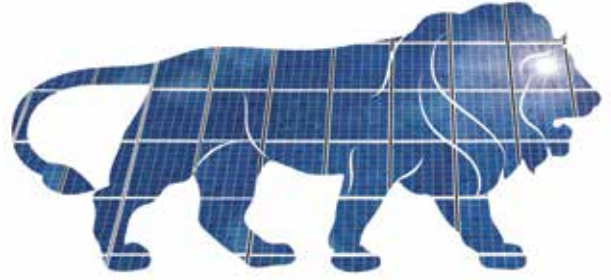
### Why is this sector interesting?

- ▶ India's Renewable energy sector is expecting high market growth compared to other sectors, which is partly due to a slump in investments in recent years caused by asset finance issues.
- ▶ Economic growth is driving India's energy consumption: the country is already the fourth-largest energy consumer worldwide. While today the main energy source is coal, the GoI aims to shift its energy supply infrastructure toward renewable sources.
- ▶ The Renewable energy industry in India faces moderate competition, but in future, this is expected to grow as East Asian companies enter the market.
- ▶ Germany is destined to be a market leader due to its regulatory system: Indian Renewable energy applications offer vast sales potential for German-manufactured products.

### Sector analysis: Renewable energy



Source: REN2, BMI Research, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis



### Existing Indo-German collaborations and German market presence

- ▶ A memorandum of understanding between Germany and India for cooperating in the field of environmental protection was signed in 1998. Cooperation has expanded to cover waste management, water and renewable energy<sup>147</sup>
- ▶ The Indo-German Energy Programme (IGEN), commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), working with the Bureau of Energy Efficiency (BEE), the Central Electricity Authority (CEA), the Ministry of Power (MoP) and the Ministry of New and Renewable Energy (MNRE) in India<sup>148</sup>
- ▶ The Indo-German Energy Forum (IGEF), commissioned by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), working with the Bureau of Energy Efficiency and the Ministry of Power in India<sup>149</sup>
- ▶ The Indo-German Environment Forum<sup>150</sup>

### Key Renewable energy areas for German investors in India

- ▶ Wind power and turbines
- ▶ Solar power and photovoltaics
- ▶ Electrical components and systems for renewable power generation, including wind power, hydro power, solar energy (photovoltaic and solar thermal), and combined heating and power (CHP)
- ▶ Generators, electrical motors and drives (see section on Heavy engineering)
- ▶ Control equipment and regulation technology (e.g., for network stability and resilience, load management, smart grids, electric power transmission and distribution - including high-voltage transmission lines (HVDC) - and uninterruptible power supplies (UPS))

- ▶ Off-shore wind parks
- ▶ Green Energy Corridors (transport of renewable energy to the national grids)
- ▶ Island Solutions
- ▶ Energy Efficient Technologies

### Market challenges in the Renewable energy sector for German investors

- ▶ Need for expansion of transmission and distribution (T&D) infrastructure to integrate installed capacities adequately; energy losses need to be minimized to profit from gains in capacity. This is one of the biggest challenges for the sector's development, and is an area where Indo-German collaboration can be a key part of achieving India's ambitious plans
- ▶ The Renewable energy sector relies heavily on subsidies, so government policies are of decisive importance

<sup>147</sup> German Missions in India (2015)

<sup>148</sup> GIZ (2015)

<sup>148</sup> GIZ (2015)

<sup>150</sup> BMUB (2015)

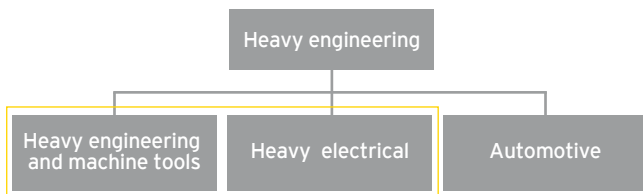
# 2.4 Cluster: Engineering

## Sector 9: Heavy engineering

### Definition and applications

The Heavy engineering sector comprises the following three major sub-sectors: Heavy engineering and Machine tools, Heavy electrical and Automotive. Heavy engineering and Machine tools includes construction equipment, cement machinery, dies, molds and tools, earth moving and mining equipment. Heavy electrical covers boilers, switch gears and control gears, turbines, generator sets and transformers. Automotive is covered in the preceding Automotive sector section.

**Figure 36: Sub-sectors of Heavy engineering**



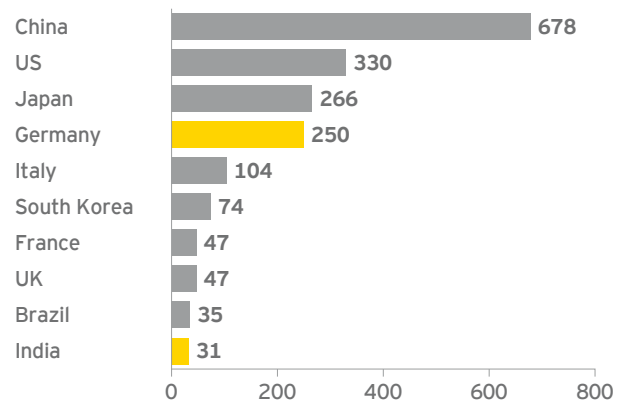
Source: IBEF (2014)

### Global sector overview

The global turnover in Heavy engineering goods was €2,250 billion in the 2012 financial year.<sup>151</sup> The global trade in machinery grew by 8% to €942 billion in 2012.<sup>152</sup>

Figure 37 ranks the 10 countries with the world's largest turnover in Heavy engineering goods in 2012. China, as the chart shows, is by far the world's leading producer of Heavy engineering goods, with a total production of €678 billion. Germany is in fourth place with €250 billion, behind Japan and the US. India generated a total turnover of €31 billion, coming 10th in the global ranking.

**Figure 37: Heavy engineering production, top 10 countries, 2012**



€billion  
Source: VDMA (2013)

In the period from 2007 to 2012 the industrial sector made 8.7% of the total volume of FDI inflows to India.<sup>153</sup> Indian Heavy engineering shows the characteristic properties of a high concentration of production capacity among domestic as well as international market players. One key characteristic of the Indian Heavy engineering sector is its large, government-owned companies, the so-called central public sector enterprises (CPSE). Examples of those public sector enterprises are Bharat Heavy Electrical Enterprises and Andrew Yule & Co Ltd. Examples of Indian privately owned companies are Larsen & Toubro, Crompton Greaves Ltd. and Kirloskar Oil Engines Ltd.<sup>154</sup> Examples of major foreign companies in the Heavy Engineering Sector in India are Siemens India Ltd. (Germany), ABB India Ltd. (Switzerland) and Hitachi (Japan).<sup>155</sup>

<sup>151</sup> VDMA (2013)

<sup>152</sup> VDMA (2014)

<sup>153</sup> EY's Attractiveness Survey India 2014 (2014)

<sup>154</sup> Invest India (2015)

<sup>155</sup> Make in India (2015)





## Sector trends

India's manufacturing industry has failed to exceed growth in GDP, unlike that of other emerging countries. This trend might be reversed if opportunities in the sector are realized.

A major source of growth for India's Heavy engineering sector is its emerging domestic market. Several upcoming public projects should lead to large-scale investments in industries such as rail and road construction, electric power generation and distribution. Private investments in Construction and in the Automotive industry, too, should stimulate high demand for Heavy engineering. Rising demand for electric power supply, and consequent demand for higher capacity in both power generation and transformation and distribution, will also generate activity.

High investments in infrastructure projects, meanwhile, require a variety of machinery, from construction equipment to Machine tools. On the basis of these opportunities, India's Department of Heavy Industry aims to significantly increase the domestic market share of Heavy engineering by 2020. The demand from other emerging markets for Heavy engineering applications also promises great opportunities. Especially as those countries' industries show similar needs in the design and construction of machinery as Indian companies.<sup>159</sup> Another promising trend has been the rising demand for highly energy efficient Heavy engineering goods due to steadily increasing energy prices and stricter climate regulations. India has the potential to significantly benefit from the physical relocation of heavy engineering goods production from Western industrialized economies to countries with lower costs of production. The example of China shows the great potential of production relocation in this sector. Additionally the trend toward outsourcing of engineering services is also attractive, as it promises a market of €880 billion by 2020. India is expected to bring home around 25% to 30% of this outsourced revenue.<sup>160</sup> The Indian economy can benefit from the gathered knowledge and expertise of its outsourcing companies in this respect.

<sup>159</sup> IBEF (2014)

<sup>160</sup> EY Transfer pricing study: Engineering and industrial chains industry (2014)

The Heavy engineering sector offers great potential for the development of the Indian economy and the creation of new employment. Another strategic implication would be reduced dependency from High-Tech imports. For building an internationally competitive Heavy engineering sector, GoI realized the high importance of foreign capital inflows. Hence it has allowed FDI for machinery and machinery tools up to 100% under the automatic route.<sup>156</sup> In addition, GoI reduced customs and regulations as the Heavy engineering sector had experienced high degrees of regulation and significant investment hurdles in the past.

Beyond that GoI offers a 15% tax exemption for heavy engineering companies, if they invest over €14.3 million in plants and machinery.<sup>157</sup> Another measure of GoI to promote investment and generate exports are the so-called "Special Economic Zones" (SEZs). Those areas enjoy privileges such as investor friendly tax regulations and liberal regulations, e.g. E. Complex Pvt. Ltd. in Amreli, Gujarat.<sup>158</sup> GoI is also interested in the promotion of R&D and offers a weighted tax deduction of 200% to companies that conduct their own R&D activities. The Heavy engineering sector finds applications in a large variety of industries. Hence the competitiveness of this sector is considered to have positive technology and knowledge spillover effects on other industries.

Something that gives the Indian Heavy engineering sector an edge on the competition is the, for once, very competitive cost of production structure through low labor costs for engineers as well as factory workers. Furthermore India has relatively low energy prices. In order to put the Indian Heavy engineering sector on the investor map, GoI has recently started a campaign called "Make in India" (Chapter 1.4).

<sup>156</sup> Ministry of Heavy Industries and Public Enterprises (2014)

<sup>157</sup> Make in India (2015)

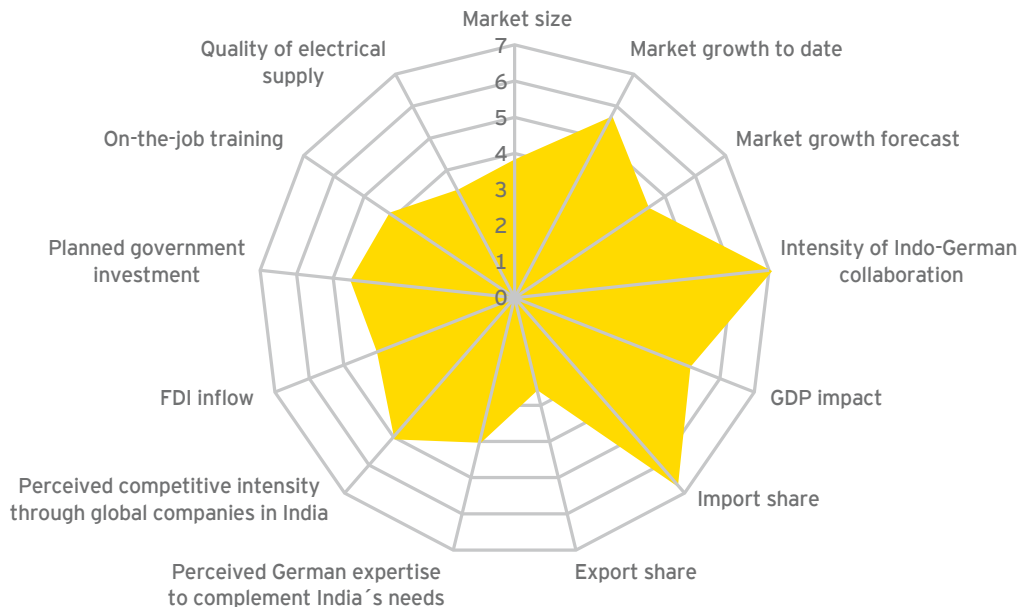
<sup>158</sup> IBEF (2014)

## Analysis: Heavy engineering

### Why is this sector interesting?

- ▶ The Heavy engineering sector in India is expected to experience steady market growth. CAGR was 14% between 2010 and 2014, and is expected to be 17% between 2014 and 2020.
- ▶ There is limited domestic availability of High-Tech manufactured engineering goods: about 70% of domestic demand in this field is met by imports.
- ▶ The growing consumer market is set to have a positive impact on Heavy engineering. The Heavy engineering sector will benefit from the accelerating development of the Transportation and Automotive sectors, ESDM, and Energy infrastructure (the Heavy electrical industry).
- ▶ The GoI is investing €264.8 billion in India's Energy infrastructure.
- ▶ India's employee pool can cover the lower and very top end of the labor market, but struggles to provide non-academic but formally trained workers.

### Sector analysis: Heavy engineering



Source: DHI, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis



### **Existing Indo-German collaborations and German market presence**

- ▶ The German research society of “Fraunhofer” keeps an office in Bengaluru to promote Indo-German collaboration in the field of High-Tech Heavy engineering goods.
- ▶ The German Engineering Federation (VDMA), which is based in Kolkata. The federation is a facilitator for Indo-German collaborations in the field of Heavy engineering.
- ▶ The VETnet project (Vocational and Educational Training) aims to implement core parts of the German dual system. Additionally, the Indo-German Training Center (IGTC) promotes education programs in business administration and management.<sup>161</sup>

### **Key Heavy engineering areas for German investors in India**

- ▶ Heavy engineering
  - ▶ Cement machinery
  - ▶ Earth moving and mining
  - ▶ Food processing machinery
  - ▶ Pumps and compressors
  - ▶ Process plant equipment
  - ▶ Textile machinery
- ▶ Machine tools
- ▶ Heavy electrical
  - ▶ Boilers
  - ▶ Turbines
  - ▶ Generator sets
  - ▶ Transformers
  - ▶ Control equipment and regulation technology

### **Market challenges in the Heavy engineering sector for German investors**

- ▶ Gaps in the transportation infrastructure; railways, roads and highways are crucial for the transportation of heavy loads
- ▶ Inadequate power supplies
- ▶ Technology lags which stifle the penetration of the world market by Indian goods such as Machine tools
- ▶ The availability of a skilled workforce for local production
- ▶ Machine tools are subject to export controls due to dual-use of goods regulations
- ▶ Pricing and competition from other Asian countries

<sup>161</sup> Indo-German Chamber of Commerce (2015)

# 2.5 Cluster: Medical and life sciences

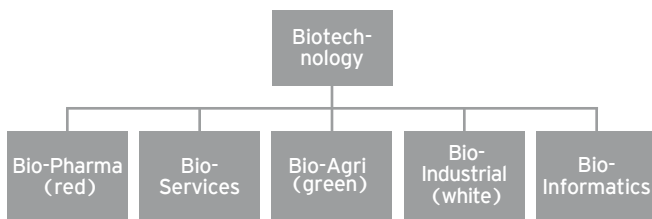
## Sector 10: Biotechnology

### Definition and applications

Biotechnology is the use of (manipulated) organisms to develop or produce products. Bio-Pharma (red biotechnology) involves the use of biotechnological methods to produce pharmaceuticals. Bio-Pharma applications include vaccines, diagnostics and therapeutics. Bio-Agri (green biotechnology) covers agricultural production. Examples for products of Bio-Agri industry are hybrid seeds, Bio-fertilizers and Bio-pesticides. Bio-Industrial biotechnology (white biotechnology) produces applications for industrial outputs, e.g. industrial enzymes.

Beside these three major application fields there are also Bio-Informatics and Bio-Services. Bio-Informatics includes database services, integrated research app software and biotech software services. Bio-Services covers contract research organizations and custom manufacturing.

### Figure 38: Segments of Biotechnology

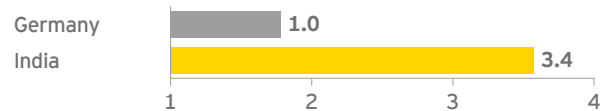


Source: IBEF (2013)

### Global sector overview

Between 2012 and 2013 the global Biotechnology market experienced an increase in turnover of more than 10%, with products and services totaling €79 billion in 2013.<sup>162</sup> Germany is one of the world's most advanced nations in biotechnology, yet India outstrips the German biotechnology industry when it comes to turnover. In 2013, Germany produced biotechnology products and services worth €1.0 billion, while India generated €3.4 billion.

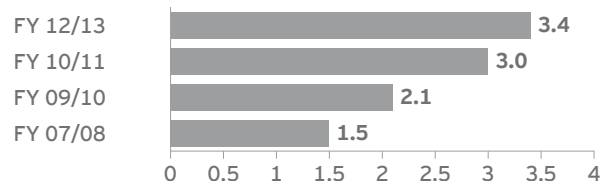
### Figure 39: Biotechnology sector turnover, Germany and India, 2013



In €billion  
Source: EY: Deutscher Biotechnologie-Report 2014 (2014); IBEF (2014)

India is the second biggest biotechnology market in Asia, after China. Figure 40 shows how the Indian Biotechnology sector grew to €3.4 billion in 2013. This great success story began in 1978, when India's first biotechnology firm Biocon was founded.

### Figure 40: Development of revenue in the Indian Biotechnology market



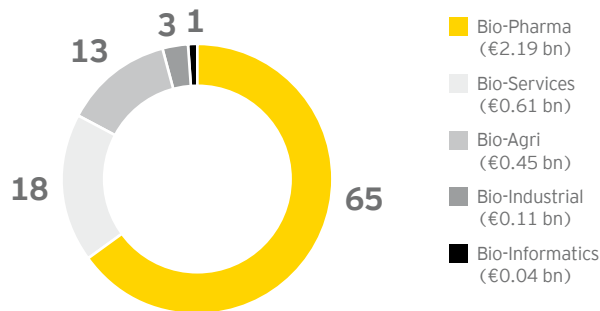
In €billion  
Source: IBEF (2013)

<sup>162</sup> EY - Biotechnology Industry Report (2014)

<sup>163</sup> Make in India

Initially, the production of generic drugs and biosimilars was the main focus of the Indian biotechnology industry. Since then, the GoI has made continuous efforts to establish facilities for the industry's own product development. India is already the world's number one producer of hepatitis B vaccines.

**Figure 41: Indian Biotechnology sector revenue 2013**



In %  
Source: IBEF (2014)

Bio-Agri is a flourishing industry in India, in contrast to Germany. Biotechnologically manipulated plant seeds are widely used in Indian agriculture, e.g. especially for mustard and cotton seeds. The research and production sites of the biotechnology industry in India are predominantly located in biotechnology clusters. The main industry hubs are Lucknow, Hyderabad, Kochi, Bengaluru, New Delhi and Faridabad. The promotion of new biotechnology clusters is already planned and ongoing. The established parks promote incubation facilities for investors which provide laboratory facilities as well as laboratories. A large number of international investors have already realized the great potential of the biotechnology market in India, e.g. Endo Pharmaceuticals (US), Sanofi Aventis (France) and Hospira (US).<sup>163</sup>



## Sector trends

The fundamental drivers of biotechnology growth in India are the large pools of well-educated, English-speaking employees in the labor market. The relatively low labor costs of these well trained academics, combined with a fast-growing domestic market, make India an attractive destination for biotechnology investment.

GoI has also provided a favorable climate for the creation and protection of intellectual property by the Indian Copyright Act and other laws that enforce the protection of formal intellectual property. The protection of intellectual property is formally well guaranteed in India in comparison to other emerging markets. Patent disputes, however, are important challenges for investors in Indian biotechnology.

GoI has realized the key role that biotechnology can play for the future of the Indian economy. It has set itself the goal of developing the biotechnology sector in India to a €80 billion industry by 2025. In order to achieve this goal, GoI seeks to attract additional FDI in this sector. The current level of FDI investments that are allowed are 100% by the automatic route for greenfield investment projects. For brownfield investment activities the government route has to be taken for pharmaceuticals. For the additional promotion of foreign direct investments in India, GoI has granted several tax exemptions and subsidies for biotechnology companies. Also there is a 150% weighted tax deduction on R&D expenditures.<sup>164</sup>

The field of Bio-Informatics promises huge progress in a variety of application fields such as clinical research. Hence India might become the world's leading hub for biotechnology R&D and production. India's large agricultural sector also offers the opportunity to conduct R&D and test in the field of genetically modified plants. The large agricultural market offers great investment opportunities for the future.<sup>165</sup>

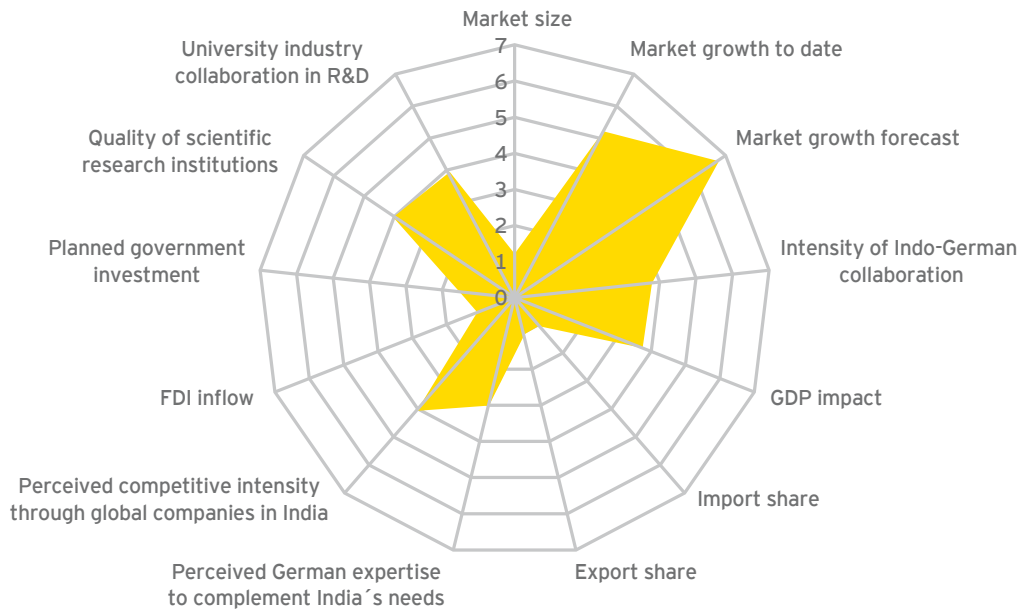
<sup>164</sup> Make in India  
<sup>165</sup> IBEF (2014)

## Analysis: Biotechnology

### Why is this sector interesting?

- ▶ In the future, India's Biotechnology sector is forecast to have dynamic growth. However, the general macroeconomic impact is low, due to the modest impact on GDP, an insignificant labor market share and limited export activities.
- ▶ The sector's attractiveness is based on a combination of a highly skilled labor force and a well-established market and R&D infrastructure.
- ▶ India's strong infrastructure is represented by biotechnology clusters and technology parks in, e.g. Pune, Kochi and Bengaluru.

### Sector analysis: Biotechnology



Source: IBEF, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis



### Existing Indo-German collaborations and German market presence

- ▶ The Indo-German Science and Technology Centre (IGSTC) in New Delhi is a venture between the German Federal Ministry of Education and Research (BMBF) and the Indian Department of Science and Technology (DST). It provides €2 million each year to cover research in specific fields, such as biotechnology. It promotes and supports both industry collaboration and scientific partnerships.<sup>166</sup>
- ▶ The German Federal Ministry of Education and Research's links with the Department of Biotechnology (DBT) has led to strong research collaborations with Indian institutions such as DBT, ICMR, DBT and CSIR, e.g. for the promotion of scientist mobility.<sup>167</sup>
- ▶ Indo-German Max Planck Center on Lipid Research at the National Center of Biological Sciences in Bengaluru<sup>168</sup>

### Key Biotechnology areas for German investors in India

- ▶ The Biotech sector offers attractive opportunities in Bio-pharma (red biotechnology) which, in India, is well established and relatively competitive. For example, investment opportunities arise in contract research and production offshoring for the pharmaceutical industry.
- ▶ Contract manufacturing and research, especially the red biotechnology, has a well-established and well-functioning infrastructure in India, with roots in the long history of this sector.

- ▶ Bio-agri (green biotechnology) has great investment potential for German investors due to high public acceptance and the vast application of genetically modified plants. A variety of German companies are active in this field of biotechnology but have no domestic market in Germany. Hence the Indian market is attractive for German chemical companies as these applications are widely accepted and used in Indian agriculture.<sup>169</sup>

### Market challenges in the Biotechnology sector for German investors

- ▶ The attraction of more venture capital, as this form of financing is crucial for biotechnology start-ups
- ▶ Collaboration between academic research and the pharmaceutical industry<sup>170</sup>
- ▶ Lack of trust in India's IPR system

<sup>166</sup> Indo-German Science & Technology Center (2015)

<sup>167</sup> Indian Embassy (2015)

<sup>168</sup> Max Planck Society (2015)

<sup>169</sup> Biotechnologie.de (2013)

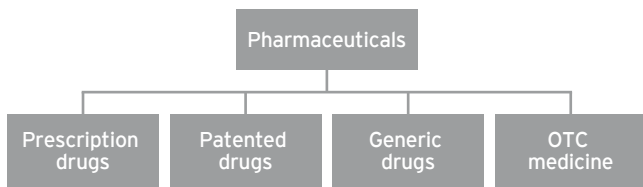
<sup>170</sup> Biotechnologie.de (2013)

# Sector 11: Pharmaceuticals

## Definition and applications

Pharmaceuticals describe the category of products which are used to diagnose, cure, treat and prevent diseases. The Pharmaceuticals industry develops, produces and distributes those pharmaceutical products. Pharmaceutical drugs can be categorized in the following four groups: prescription drugs, patented drugs, generic drugs and OTC medicine (Figure 42).

**Figure 42: Segments of Pharmaceuticals**



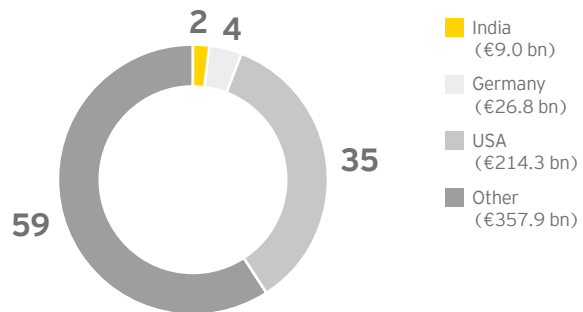
Source: BMI Research (2015)

In the case of patented drugs, governmental authorities grant pharmaceutical companies exclusive production and distribution rights for a defined time span. After this period the patented drug can be freely imitated and becomes a generic drug. If this generic product is produced by biotechnological methods they are called biosimilars. Beyond that, over-the-counter pharmaceuticals describe drugs that are available without any prescription. Examples of groups of pharmaceutical drugs are analgesics, antiseptics, antibiotics, oral contraceptives and artificial hormones.

## Global sector overview

The world market for pharmaceutical products reached €608 billion in 2013.<sup>171</sup> In comparison to Germany, the Indian market is relatively small with revenues of €9 billion in 2013 (Figure 43).<sup>172</sup> Hence the pharmaceutical market in India has a share of about 1.5% of the global market.

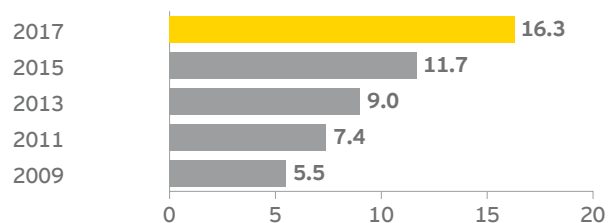
**Figure 43: Share of Pharmaceuticals industry's global turnover by selected countries, 2013**



In %  
Source: MarketLine (2014)

The volume of the Indian Pharmaceuticals market has been growing strongly in the last few years (Figure 41) and is predicted to grow up to €16.3 billion in 2017.

**Figure 44: Indian Pharmaceuticals market**



In €billions  
Source: MarketLine (2014)

171 MarketLine (2014)  
172 MarketLine (2014)  
173 Able (2014)  
174 IBEF (2014)  
175 Make in India (2015)



The production of generic drugs is currently the key competence in India's pharmaceutical industry. Pharmaceutical companies in India produce, for example, the biosimilars of human insulin, human growth hormones, granulocyte colony stimulating factor (G-CSF), Erythropoietin and Streptokinase.<sup>173</sup> India already delivers 20% of the worldwide exports in generic drugs.<sup>174</sup> This is due to the fact that the Indian pharmaceutical industry is highly skilled in reverse engineering processes and specializes in the field of generic drugs. One of the reasons for India's great success is the very competitive cost structure of production for pharmaceutical products in India. And a well-educated, highly specialized workforce gives access to required expertise. One further key competitive advantage is India's strong biopharmaceutical sector. Successful Indian pharmaceutical companies are Dr. Reddys Labs, Cipla, Lupin, and Ranbaxy Pharms. The Indian pharmaceutical market also benefits from a growing number of people with health care insurance and a rising standard of living: these result in a higher demand for a variety of drugs. Moreover, due to the increasing incomes of many households a leap in the demand for high-end drugs is expected. In addition, India has become one of the most attractive locations worldwide to conduct the testing procedures for the approval of new pharmaceutical drugs.

Patents play a decisive role in the pharmaceutical industry as fixed costs are typically very high due to intense R&D efforts whereas the costs of reproduction are low. Since the implementation of the Patent (Amendment) Act in 2005, India has robustly enforced intellectual property rights. Such actions yielded results as many multinational pharmaceutical companies from all over the world have realized the benefits of the Indian market and increasingly invest in the country. Other of these multinational pharmaceutical companies had already recognized this beneficial investment climate in the pharmaceutical sector, such as Procter & Gamble (USA), Pfizer (USA), Johnson & Johnson (USA) and AstraZeneca (Sweden-UK).

India has experienced several cases of the counterfeiting of drugs. These episodes seriously damaged both consumers' and investors' trust in Indian production sites. The GoI has initiated measures against these criminal activities. FDI in India in the pharmaceutical sector is allowed under the automatic route for greenfield projects and by the government route in the case of brownfield investment projects. In both cases investment shares up to 100% are allowed.<sup>175</sup> But the competitiveness of the Indian pharmaceutical market suffers from a very high degree of regulation in the form of strict price regulation of drugs. To protect consumers, the GoI regulates prices of selected essential drugs.



## Sector trends

The global Pharmaceuticals industry faces key challenges over the upcoming years: particularly the so-called "patent cliff". This means that many patents for blockbuster drugs run out in the coming years. This fact gives the Indian generics and biosimilars producers the opportunity to invest in the production of those patent free pharmaceuticals. The GoI has been making significant investments in the country's research infrastructure, in order to help Indian manufacturers engage in more sophisticated R&D and production - and to develop India's own pharmaceutical innovations.

India will be the world's sixth largest market in the field of pharmaceuticals by 2020.<sup>176</sup> India's billion plus population and a growing middle-class with its increasing disposable income for healthcare expenditure should create the fundamentals for a steadily increasing demand for drugs. Because the average age of the Indian population today is relatively low, the future potential will grow as the population ages.

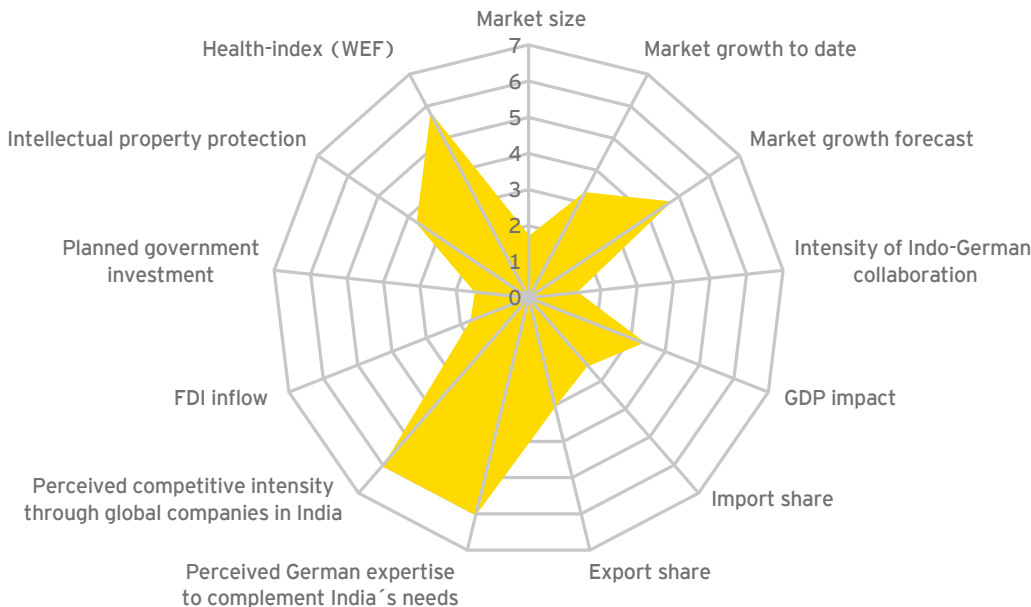
<sup>176</sup> IBEF (2014)

## Analysis: Pharmaceuticals

### Why is this sector interesting?

- ▶ The Indian Pharmaceuticals sector experienced steady growth between 2010 and 2014 with €6.4 billion growing to €10 billion, with a CAGR of 9%. The market is expected to grow faster in the future, with an estimated future CAGR of almost 15.5% by 2018 to a total volume of €17.8 billion.<sup>177</sup>
- ▶ In addition, including generic drugs India already covers 20% of total global exports.<sup>178</sup>
- ▶ India's pharmaceutical industry is highly skilled in reverse engineering processes and specialized in the field of generic drugs. Here, India benefits from its favorable cost structure of production for pharmaceuticals. Furthermore, the competitive pressure in this sector is relatively low compared to other sectors.
- ▶ The ongoing development of a nationwide hospital infrastructure provides interesting growth potential - not just in medical equipment but in pharmaceuticals also. Due to a rising middle class the number of people with health care insurance is increasing leading to higher overall demand for a broader variety of drugs. Therefore the Pharmaceuticals sector will be significantly impacted by consumer growth.
- ▶ India's low labor-cost advantage provides significant outsourcing opportunities for German companies.

### Sector analysis: Pharmaceuticals



Source: MarketLine, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

<sup>177</sup> MarketLine (2014)

<sup>178</sup> IBEF (2014)



### Existing Indo-German collaborations and German market presence

- ▶ The €456 million acquisition of Germany's Betapharm Arzneimittel by Dr. Reddy's is the Indian Pharmaceuticals industry biggest overseas investment.<sup>179</sup>
- ▶ Successful joint ventures such as the German pharmaceuticals company Schott AG with Kaisha Manufacturers Pvt. Ltd.<sup>180</sup>

### Key Pharmaceuticals areas for German investors in India

German investors can offer expertise in many different applications, such as:

- ▶ Generic drugs
- ▶ Patented OTC medicine
- ▶ Bio-pharma

### Market challenges in the Pharmaceuticals sector for German investors

- ▶ Lack of trust in India's IPR system
- ▶ A shift from low-end pharmaceuticals to a more sophisticated product portfolio
- ▶ Increasing the comparatively low shares of R&D spending.
- ▶ Collaboration between academic research and the pharmaceutical industry
- ▶ Increasing production standards to an internationally competitive level

<sup>179</sup> Betapharm Arzneimittel GmbH (2015)

<sup>180</sup> SCHOTT Glass India Pvt. Ltd (2015)

"ATLAS ELEKTRONIK sees the Make in India concept as a great mutual opportunity. India is one of the largest potential markets for our products and given this scale, it makes commercial and economic sense to develop products in India, for India and beyond. We see in India a fantastic talent pool and have been very impressed by some of the excellent companies, especially the medium and small High-Technology enterprises that we have come across. We are actively pursuing partnerships for the long term across the spectrum of Indian companies which we believe is necessary in order to build the supply chain for complex products like ours. We are encouraged by the positive developments towards foreign investment and collaboration that we are seeing and sense a real willingness to move forward in India. We look forward to doing so together with our Indian partners."

**Khalil Rahman, CEO, Atlas Elektronik India Pvt Ltd**

# 2.6 Cluster: Defense

## Sector 12: Defense manufacturing

### Definition and applications

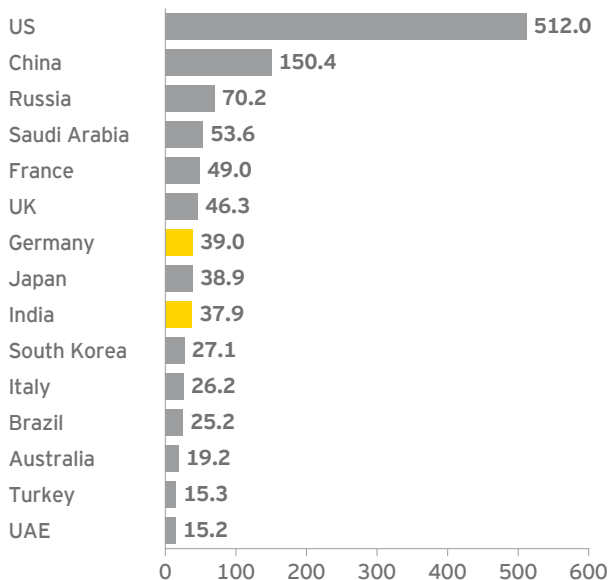
The Defense sector is made up of both public and private-sector organizations, which support military operations; conduct R&D; design, manufacture and integrate systems; maintain depots; and service weapon systems and components.

Defense manufacturing sub-sectors include aerospace, naval and land systems. Possible applications include aircraft, ships, armored vehicles, missiles, electronics and soldier systems.<sup>181</sup>

### Global sector overview

Defense manufacturing is traditionally regulated to a great extent, and accounts for high spending worldwide.

**Figure 45: Military spending in 2013, top 15 countries**



In €billion  
Source: SIPRI (2014)

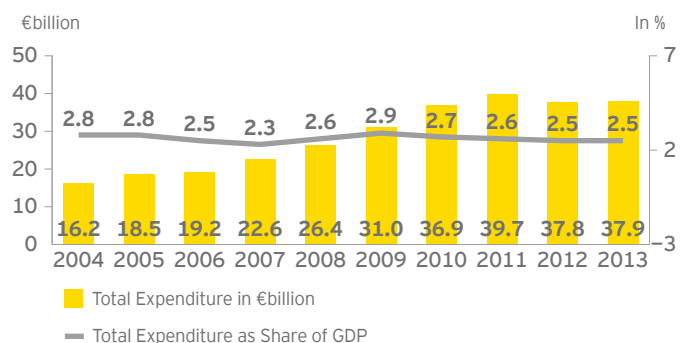
In 2013, total global spending on defense was €1,398 billion; the top 15 countries were responsible for more than 80% of this.<sup>182</sup> The US leads the list of top spenders, with expenditure of around €512 billion in 2013 - about as much as the next nine countries combined (Figure 45). In the same year, India was the ninth largest military spender with about €37.9 billion, and Germany seventh with €39 billion.

Increasing military budgets, in emerging and developing countries in particular, have fueled the growth of global military spending in the last decade.<sup>183</sup>

### Indian Defense sector

India's military spending grew in absolute terms from €16.2 billion in 2004 to €37.9 billion in 2013 (Figure 46), a CAGR of 10%. In the same period, spending per capita grew from €14.60 to €30.50.<sup>184</sup> But military expenditure as a share of GDP stayed in the range of 2.3% and 2.9%, therefore reflecting the accelerated GDP growth during this period.

**Figure 46: Military expenditure in India, 2004-13 (absolute and as share of GDP)**



Source: SIPRI (2014)

<sup>181</sup> U.S. Department of Defense (2010)  
<sup>182</sup> SIPRI (2014)  
<sup>183</sup> SIPRI (2014)  
<sup>184</sup> SIPRI (2014)



## Sector trends

Over the next five to seven years, India's military expenditure is expected to reach anything from €56.8 billion to €80 billion.<sup>188</sup> The GoI has launched measures to reduce dependence on imports, strengthen domestic production, upgrade technology and develop export capability in the defense sector.<sup>189</sup> It also aims to encourage greater private-sector involvement in defense. To do this, it has taken the following four steps.

- ▶ It has raised the FDI cap in the defense sector from 26% to 49%, under the government route, for investments that do not share technology. Investments above 49% are possible on a case-to-case basis, on approval by India's Cabinet Committee on Security, where they are likely to result in access to modern and state-of-the-art technology.
- ▶ The GoI has established and refined the Defense Procurement Procedure (DPP), aiming to encourage procurement of Indian-made products. The policy covers all capital acquisitions, except medical equipment, initiated by the Ministry of Defense (MOD), the Defense Services and Indian Coast Guard, from domestic and overseas sources.
- ▶ It has developed offset policies, under which a foreign contractor is obliged to reinvest at least 30% of the value of a project back into India, where the original contract is worth more than €43 million. Qualifying investments include FDI, technology transfer or the provision of equipment in Indian industries for industrial infrastructure. The aim is to channel investments and technology back toward preferred domestic sectors, in this case defense.
- ▶ It has extended the validity of industrial licenses required for entering the market from two to three years, reducing administrative cost and risk.<sup>190</sup>

Taken together, these measures will help the GoI achieve its goals, offering business opportunities alongside expected market growth. The FDI policies in particular are expected to help boost domestic production by attracting foreign investment.<sup>191</sup>

<sup>188</sup> EY Doing Business in India (2014)

<sup>189</sup> Make in India (2015), EY Doing Business in India (2014)

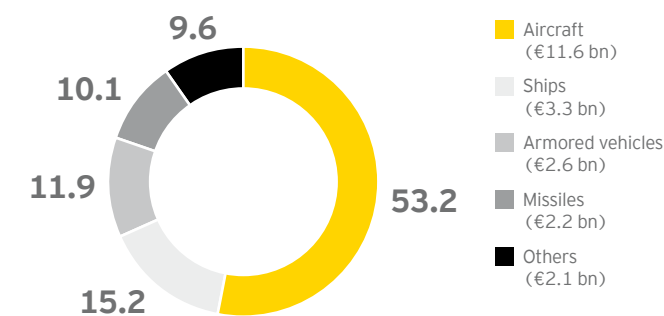
<sup>190</sup> Make in India (2015), EY Doing Business in India (2014), BUSINESS MONITOR INTERNATIONAL (2014)

<sup>191</sup> BUSINESS MONITOR INTERNATIONAL (2014)

India is the world's largest importer of arms, accounting for 14% of the worldwide total value in 2009-13. This is an increase of 111% from 2004-08; and represents a three times larger amount than China, the second largest arms importer. More than 60% of the country's requirements are met by imports.<sup>185</sup> India's main arms suppliers are Russia, with 75% of total supplies in 2009-13; the US, with 7%; and Israel, with 6%. India imported about €4.5 billion of arms in 2013 alone, and a cumulative total of €21.8 billion between 2004 and 2013.<sup>186</sup>

In this period, India's main import products included aircraft, air defense systems, armored vehicles, engines, missiles, sensors and ships (Figure 47). India exports arms to a few less developed countries, but total sales are negligible, amounting to just €129 million from 2004 to 2013.<sup>187</sup>

**Figure 47: Imports by type of weaponry, 2004-13**



In %  
Source: SIPRI (2014)

<sup>185</sup> Make in India (2015); SIPRI (2014); EY Doing Business in India (2014)

<sup>186</sup> SIPRI (2014)

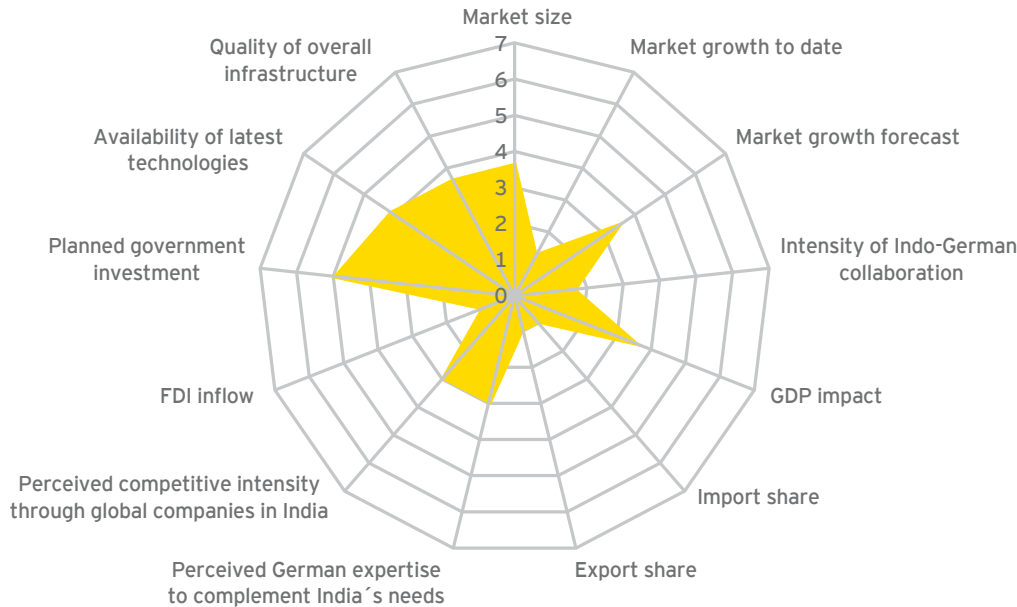
<sup>187</sup> SIPRI (2014)

## Analysis: Defense manufacturing

### Why is this sector interesting?

- ▶ India has the ninth highest military spending in the world and the third biggest armed forces; imports make up a large share of its Defense market. Germany, on the other hand, is the world's third largest exporter of Defense technology; its Defense industry offers world-leading weapon technology, partly in collaboration with its European and NATO partners.
- ▶ Germany's leading role in Defense development and manufacturing, combined with India's high demand for Defense products, means there are good opportunities for collaboration between the two countries.
- ▶ The GoI seeks to build a framework to grant Indian Defense technology manufacturers access to cutting-edge technology.
- ▶ In the long term, India plans to reduce its current dependence on imports, replacing them with domestic production.
- ▶ High planned government investments are another boost for investors in Defense technology.
- ▶ The expected modernization of the Indian armed forces, in both equipment and machinery, offers investment potential for Germany in future.
- ▶ India is the largest importer of Defense goods in the world. Recent FDI liberalization allows 49% FDI in all areas of defense and 100% FDI in critical technology areas. New trusts on domestic manufacturing of Defense goods are expected under the Make in India initiative.

### Sector analysis: Defense manufacturing



Source: SIPRI, BMI Research, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis



### Existing Indo-German collaborations and German market presence

- ▶ A High Defense Committee (HDC) meets on a yearly basis, co-chaired by the State Secretary of the German Federal Ministry of Defense and the Defense Secretary of the Indian MoD. It represents a regular strategic dialogue, and furthermore the HDC approves programs which entail about 30 to 40 projects per year.<sup>192</sup>
- ▶ In April 2013 the Indian Department of Science and Technology (DST) and the German Federal Ministry of Education and Research (BMBF) announced a collaboration to support joint civil security research.<sup>193</sup>
- ▶ As of February 2015, Airbus Helicopters is in the selection process with Indian companies concerning a joint venture to manufacture military helicopters for the Indian armed forces. Possible partners include Mahindra and Mahindra, Reliance Industries and the Tata Group.<sup>194</sup>

### Key Defense manufacturing areas for German investors in India

- ▶ Submarines (conventionally powered)
- ▶ Tanks and armored vehicles
- ▶ Handguns
- ▶ Anti-aircraft systems, radar technology, and missile defense technology
- ▶ Military aircraft, in collaboration with Germany's European and NATO partners
- ▶ Opportunities for joint R&D, co-development and co-production

### Market challenges in the Defense manufacturing sector for German investors

- ▶ German Defense technology exports are regulated under Germany's foreign trade laws, the War Weapons Control Act, and laws covering the dual use of products. The German Parliament must approve military technology exports - so agreements over these products must be reached at the highest political level.

<sup>192</sup> German Missions in India (2015)

<sup>193</sup> BMBF (2015)

<sup>194</sup> Reuters (2015)

# 2.7 Cluster: Space

## Sector 13: Space

### Definition and applications

The Space sector consists of three main sub-sectors: space manufacturing (including launching services), satellite operator services, and consumer services.

The sector covers organizations such as consultancies, components suppliers, Space equipment designers and manufacturers, Space systems integrators and suppliers, system operators, and providers of Space-related products and services for consumers.

Products include complete satellites and orbital systems, launch vehicles, control centers, electronic equipment and power subsystems.

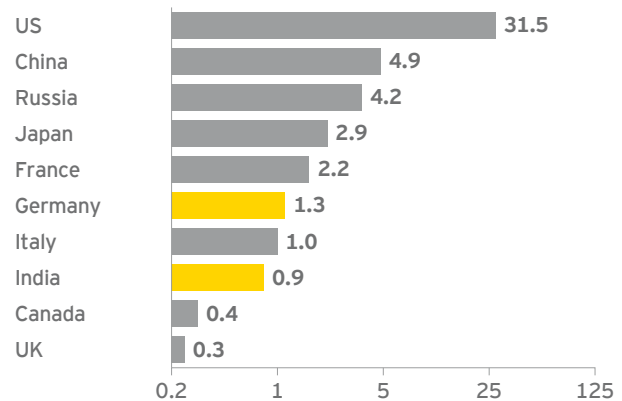
Consumer services include organizations usually thought of as outside the Space community, but who rely on satellite capacity for part of their revenues; for example, direct-to-home television service providers.<sup>195</sup>

### Global sector overview

The Space economy was a relatively isolated sector for many decades, but is now the focus of more attention, as governments and the private sector seek sources of innovation and economic growth. In many countries it is considered a strategic sector, and is relatively protected due to national policies, long lead times for building and launching satellites, and demand for commercial applications such as satellite telecommunications.<sup>196</sup> The world's total spending on the Space sector was more than €51.4 billion in 2013 - of which the US accounts for the largest share, €31.4 billion. India ranks eighth, spending about €0.96 billion; Germany is sixth with €1.34 billion (Figure 48).<sup>197</sup>

These institutional Space budgets are the main source of initial funding for R&D, and the main customer for many space products and services.

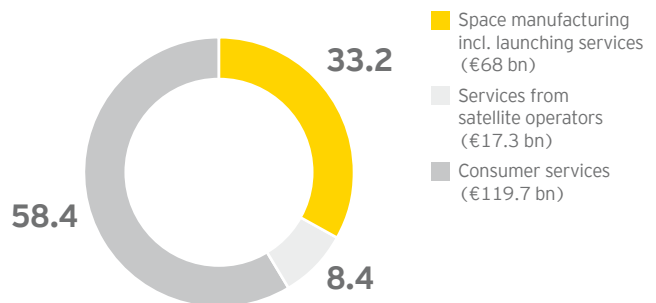
**Figure 48: Top 10 Space budgets by country, 2013**



In €billion  
Source: OECD (2014)

Total commercial revenue in the Space sector was €205 billion worldwide in 2013 - of which commercial services generated €119.7 billion, Space manufacturing €68 billion, and satellite operators €17.3 billion (Figure 49).<sup>198</sup>

**Figure 49: Space sector global revenues share by sub-sector, 2013**



In %  
Source: OECD (2014)

<sup>195</sup> OECD (2014)

<sup>196</sup> OECD (2014)

<sup>197</sup> OECD (2014)

<sup>198</sup> OECD (2014)

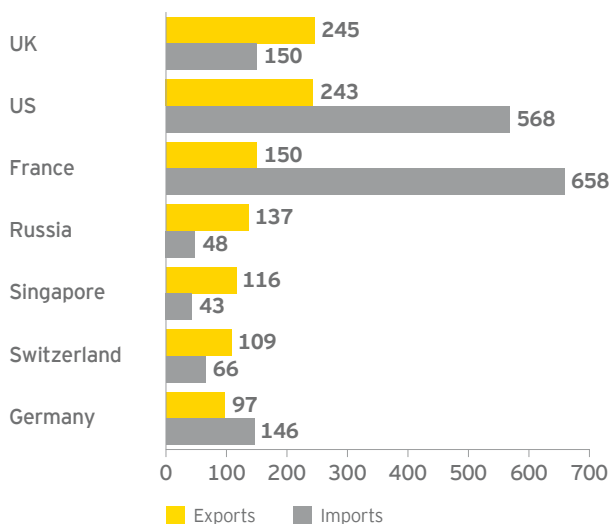




## Trends in the Indian Space sector

The Indian Space program has been active for more than 50 years: it was established in 1962 with the founding of the Indian National Committee for Space Research, which was superseded by the Indian Space Research Organisation (ISRO) in 1969. Today the ISRO has a multifaceted role: in contrast to many overseas Space agencies, it is the main manufacturer of Space equipment in India, and also assembles satellites and launch vehicles. More than 14,700 people were employed at ISRO in 2012, located at 11 centers, mainly in southern India. India's Department of Space (DOS) is responsible for managing the ISRO.<sup>199</sup> India's main destinations for aerospace export in 2012, including civil and military aviation, were the UK, the US, France and Russia. It imported mainly from France, the US, Germany and the UK. It exported goods worth €1.6 billion, but imported €2.1 billion (Figure 50).<sup>200</sup>

**Figure 50: India's main aerospace trade partners, 2012**



In €million  
Source: OECD (2014)

Aerospace industry revenues (including civil aviation) are expected to grow from €7.7 billion in 2013 to about €11.2 billion in 2018; this equates to a CAGR of around 7.8%, which should mean there are business opportunities in the sector.<sup>201</sup>

The GoI has ambitious plans to develop its Space program by fostering independent, domestic High-Technology capability. It aims to develop satellites and technologies for communication, navigation, meteorology, earth observation, Space science and exploring planets.<sup>202</sup> It is also promoting private sector involvement in meeting these goals, due to the ISRO's limited capacity. For instance, the demand for polar satellite launch vehicles (PSLVs) already exceeds ISRO capacity, demonstrating a need for additional private sector Space manufacturers.<sup>203</sup>

As part of the Make in India program, the GoI has taken measures to encourage greater private sector involvement in India. FDI, for example, of up to 74% is allowed for the establishment and operation of satellites, subject to the sector guidelines of the DOS and ISRO, under the government route.<sup>204</sup> In addition, India's Space program has focused on how to guarantee the seamless transfer of technology and products developed by Indian Space centers. This policy has led to more industrial participation in the Indian Space program, and has enabled industry-relevant applications such as broadcasting, geospatial information and meteorological services. The mechanism for transferring technology, introduced in the early 1980s, allows the commercial licensing of know-how from ISRO centers.<sup>205</sup>

India believes Space has dimensions beyond purely national interests, which can only be approached in collaboration with international partners. Such collaborations are strategically important for Space programs. The scope for international collaboration has increased as the ISRO has matured in experience and technological know-how.<sup>206</sup> Formal arrangements for cooperation are now in place with 33 countries and three multinational bodies.

199 OECD (2014); Indian Space Research Organisation (2012)

200 OECD (2014)

201 Statista Research (2014)

202 Indian Space Research Organisation (2015)

203 OECD (2014)

204 Make in India (2015),

205 Indian Space Research Organisation (2015)

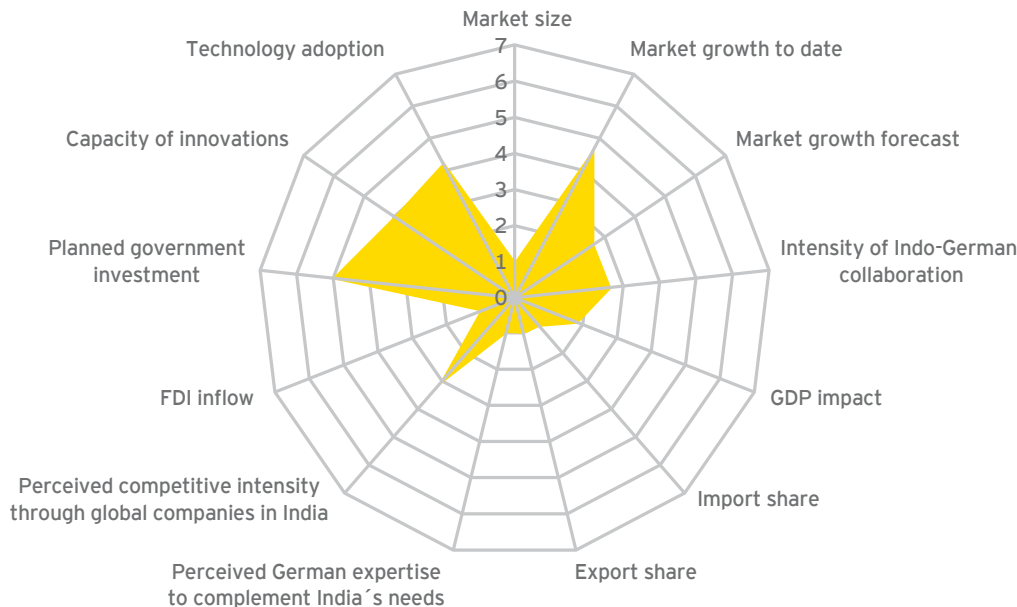
206 Indian Space Research Organisation (2015)

## Analysis: Space sector

### Why is this sector interesting?

- ▶ India is a leading nation in the Space sector. Its commitment is demonstrated by successful Space missions such as the Mars Orbiter Mission and the Chandrayaan-1 lunar probe.<sup>207</sup>
- ▶ India's Space sector, as in most countries, is highly driven by government. The IRSO's Space budget is the main source of funding for initial R&D and for many Space products and services. Although the budget is small compared to other sectors, it has grown in the past and is projected to do so again, further demonstrating India's commitment towards the sector.
- ▶ The ISRO is cooperating with NASA on a Mars Working Group, with a view to developing a joint Mars mission.
- ▶ India and Germany could work together to share their knowledge of the Space sector. Germany offers expertise in scientific systems such as climate research; India, meanwhile, has expertise in Space-related software production which is already being used in European Space Agency (ESA) missions in French Guiana. German companies entering the Indian market could profit from this expertise.
- ▶ To facilitate and foster foreign investments, the FDI cap has been raised to 74% under the government route.

### Sector analysis: Space



Source: GoI, Statista Research, fDi Intelligence, MOSPI, MOCI, CMIE, EY analysis

207 Indian Space Research Organisation (2015)



### Existing Indo-German collaborations and German market presence

- ▶ The ISRO-German Aerospace Centre (DLR) Technical Workshop, was held in Bangalore in 2013, in an effort to identify possible areas of cooperation between the two countries. Both sides shared their expertise and identified potential areas for cooperative and commercial activities. Areas included earth observation, mainly for climate monitoring, science missions and commercial opportunities such as launch services, ground stations support, and components procurement.<sup>208</sup>

### Key areas in the Space sector for German investors in India

- ▶ Ground and aerospace control systems and components
- ▶ Scientific research equipment

### Market challenges in the Space sector for German investors

- ▶ Dominant role of the ISRO as the main actor in the Space industry
- ▶ Need for suitable PPP models for risk mitigation and spread

*208 Indian Space Research Organisation (2015)*

“Water is the most important core to all human cultures. Due to industrialization and urbanization we face an increasing demand for this resource. To meet this demand we have to develop and implement modern technologies for water supply and waste water treatment. KUHN is already working in an equal partnership with Sovereign Tech in India. Our aim is to establish a long term Indo-German collaboration in High-Technology manufacturing for the water sector. Additionally we are engaged in broadening this activity by supporting other Indo-German collaborations through the German Water Partnership network. Make in India is an important initiative of the Government, and we are fully committed to it, both by producing our special technologies and equipment in India, and by solving the water and effluent challenges of the new and upcoming manufacturing bases all over India.”

**Dr. Micheal Kuhn, CEO / General Manager, KUHN GmbH Technische Anlagen & Head, India Desk, German Water Partnership e.V.**

3.

**Indo-German**  
**regulatory**  
**framework**  
**for High-**  
**Technology**  
**sectors**

**This section of the report evaluates the export control barriers between Germany and India. The text below provides an overview of export control regulation in both countries.**

**The assessment of applicability of export control laws in both countries, which comes towards the end of this section, aims to show the potential regulations for the identified industrial sectors within the existing policy frameworks.**

## German/EU policy framework

This section of the report has been drafted on the basis of information provided by the German export control authorities.

### **1. Germany's control regimes on dual use items**

*Germany's export control system is built on the direct responsibility of enterprises. That is, enterprises make their own business decisions to export goods, software, and technology, or to offer services, or to exchange knowhow with foreign countries.*

The entities have to follow the legal foreign trade regulations and the foreign trade restrictions and export license obligations. German export regulations for dual use items are embedded into the European legal framework. Both legal frameworks (German and EC) governing export controls of dual use goods and technologies take into account a number of international guidelines.

Within the global framework, the international export control regimes are:

- ▶ The Wassenaar Arrangement
- ▶ Export controls for conventional arms and dual use goods
- ▶ The Australia Group
- ▶ Export control of chemical and biological arms
- ▶ Nuclear Supplier Group
- ▶ Missile Technology Control Regime

Export controls in regard to the non-proliferation of unmanned delivery systems, applicable to weapons of mass destruction (WMD), play a key role in shaping national export controls. These regimes develop common lists of goods and technologies that are subject to controls and provide a platform for an enhanced exchange of information.

Where dual use items are concerned, German export control law is mainly governed by European regulations. This legal framework is largely defined by Council Regulation 428/2009, of May 2009 (EC Dual Use Regulation), which provides common rules for export of dual use items. This established a community regime for the control of exports, as well as for the transfer, brokering and transit of dual use items.

The EC Dual Use Regulation is legally binding and applies directly to all EU member states. Common lists of dual use goods and technologies, as agreed within international export control regimes, have to align with Annex I of the EC Dual Use Regulation.

Regulation (EC) 428/2009 also refers to the EU Code of Conduct for the export of armaments, which obliges all member states to observe standardized licensing criteria when considering licenses for items related to military use. Dual use items are goods that can be used for both civil and military (or related) purposes. They are not specially designed for sensitive use, being normally used for civil purposes and purchased by civil customers. However, they may also be used for military purposes, or used directly or indirectly in connection with chemical, biological or nuclear weapons, other nuclear devices, or missiles capable of delivering weapons of mass destruction (WMD).

To be classified as a dual use item, it is often sufficient that a good may potentially be used in connection with the development, production or use of armaments or WMD. Although such goods may be covered by relevant export control lists, they could also be beyond the scope of mandatory control (catch-all clause). Furthermore, such items must not necessarily comply with a special technological standard. This applies to numerous industrial products.

## 2. Export control authorities in Germany

The Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA) is the central licensing authority in charge of administrative implementation of the Federal Government's export control policy. It is a federal authority that comes under the Federal Ministry for Economic Affairs and Energy.

One of BAFA's main tasks is to check whether or not the export of an item is subject to licensing, and if a license may be granted. BAFA also cooperates with foreign authorities and international bodies as a specialized agency.

Together with other monitoring and law enforcement authorities, especially customs services, BAFA is part of a complex export control system. In particularly important cases, the Federal Ministry for Economic Affairs and Energy and the Federal Foreign Office are also involved in the decision-making process.

## 3. List of items covered by Article 3 and Annex I of EC Dual Use Regulation

An export license is required to export those goods listed in Annex I of the EC Dual Use Regulation to countries outside the EU.

The list of Items controlled by the EC Dual Use Regulation is divided into nine categories:

- ▶ Category 0 = Nuclear materials, facilities and equipment
- ▶ Category 1 = Special materials and related equipment
- ▶ Category 2 = Material processing
- ▶ Category 3 = Electronics
- ▶ Category 4 = Computers
- ▶ Category 5 = Telecommunications and information security
- ▶ Category 6 = Sensors and lasers
- ▶ Category 7 = Navigation and avionics
- ▶ Category 8 = Marine
- ▶ Category 9 = Aerospace and propulsion

It is important to note that an item not listed in the Annex of the EU Dual Use Regulation may still be subject to an assessment by export control authorities if the exporter knows, or was informed by the competent authorities, that the goods may be used in a sensitive manner (catch-all clause).

## 4. Principles of Annex I EU Dual Use Regulation

Any export of a dual use item listed in Annex I requires prior authorization. To assess whether an item is covered by Annex I or not, the following principles are taken into consideration by the export control authorities:

- ▶ Whether goods are listed or not is defined solely by objective technological criteria
- ▶ Whether goods have been designed for a special purpose depends solely on objective assessment of their technological design and functionality
- ▶ Listed main components - including those that are part of an unlisted item - retain their listing, if they can be easily removed or used for other purposes
- ▶ Spare parts are only listed if they are mentioned as specially designed components within an item
- ▶ Goods retain their listing if they are dismantled into fragments but can easily be reassembled (construction kits)
- ▶ Technology and software are not listed if they are generally accessible
- ▶ Basic research does not form part of the list

## 5. Criteria for export authorization decisions

Article 12 of the EC Dual Use Regulation provides a non-exhaustive list of factors for consideration by licensing authorities. In deciding whether or not to grant authorization, export control authorities therefore take into consideration the following points:

- ▶ Obligations and commitments based on international regimes or treaties
- ▶ Obligations under sanctions imposed by the EU, the Organization for Security and Cooperation in Europe (OSCE), or the United Nations Security Council
- ▶ Consideration of national foreign and security policy, including that covered by Council Common Position 2008/944/CFSP of 8 December 2008 defining common rules governing control of exports of military technology and equipment
- ▶ Consideration related to whether the exporter has installed an effective internal compliance system (ICP) when assessing applications for global export authorizations

## 6. Export of non-listed dual use items (catch-all clauses)

In general, exports of non-listed goods do not require prior approval by export control authorities. However, there are cases when the export of a non-listed item requires an export license (Article 4 of the EC Dual Use Regulation - catch-all clauses). That is, if:

- ▶ The good is objectively technologically employable for sensitive uses and
- ▶ The exporter knows about the potential sensitive use via information received from BAFA, or due to his own knowledge of a possible sensitive use of the exported good.

Article 4, Section 1 of the EU Dual Use Regulation deals with weapons of mass destruction and missiles capable of delivering such weapons. This is defined as the use, be it partly or entirely in connection with the development, production, handling, operation, maintenance, storage, detection, identification or dissemination of, chemical, biological or nuclear weapons, or other nuclear explosive devices or the development, production, maintenance or storage of missiles capable of delivering such weapons.

This catalogue makes clear that all exports with actual or potential connections to weapons of mass destruction are subject to export controls.

In practice, deliveries for the potential development and production are most important. It needs to be taken into consideration that weapon development can start in institutes of scientific research or laboratories that are far removed in time and geography from completed weapon systems. Authorization is also required for items that are, or may be, intended in their entirety or in part, for a military end use and their country of destination is subject to an arms embargo (Article 4, Section 2 of EC Dual Use Regulation). Currently the EC has no arms embargo against India in place.

## 7. Processing of license applications in Germany

*The exporter of dual use items normally has to apply via an electronic IT base (Elank2) for an individual export license.*

The licensing process is an administrative task and must be performed in accordance with the rule of law. The objective of the assessment is to find answers to the following questions:

- ▶ Who is the exporter?
- ▶ Who is involved in the whole business transaction?
- ▶ Which items will be exported?
- ▶ For which purpose will the item will be used?

The assessment of single cases may prove challenging, as it may involve an exhaustive analysis of the technological parameters and legal framework, as well as thorough investigation and risk assessment, prior to making a decision. The licensing procedure itself is divided into three phases and involves BAFA's Licensing and Technological divisions. The technological assessment of the case includes categorization of the goods in question on the basis of European and national export control lists, namely:

- ▶ Annex I of the EC Dual Use Regulation
- ▶ Annexes of relevant EU embargo regulations (e.g., restrictions on transfers to Iran or Syria)
- ▶ The German export control list for weapons and other armaments in Part I A of Annex AL to the Foreign Trade and Payments Ordinance (Außenwirtschaftsverordnung, AWV)
- ▶ The German export control list regarding the export of special dual use goods to certain countries of destination in Part I B of Annex AL (AWV)
- ▶ Technological suitability for sensitive uses within the meaning of Article 4 of the EC Dual Use Regulations

If the delivery of the goods in question to the end user is not prohibited, the export license will be displayed. In other cases BAFA will file a denial decision.

*From a practical point of view, the period between filing the application and the final BAFA decision will take about four weeks.*

## 8. Special BAFA statement about exports of technology

*The licensing requirements for cross-border transactions described above apply to technology and software as well as to goods. Generally speaking, if technology or software is listed in the German Export List or the EU Dual Use Control List, the transfer of technology will require an authorization, irrespective of the means of transmission.*

It does not matter whether the software or technology (technical data or documents) is transferred across borders in a tangible form (e.g., papers, DVDs, memory sticks, etc.) or whether it is transmitted electronically, for example, via email.



This includes making available such software or technology in an electronic form to persons outside Germany or the EU, e.g., on the internet or even within a company's intranet.

The provision of services or "technical assistance" by German people inside and outside of Germany can also be subject to controls. In line with EU provisions, technical assistance is defined by German legislation as any technical service "related to the repair, development, manufacture, assembly, testing and maintenance, or to any other technical service". Technical support can take the form of instruction, training or passing on of practical knowledge or skills, or it can be in the form of advisory services. It also includes support provided orally, by telephone, and by electronic means.

As in the case of non-listed items, technical assistance will generally be subject to licensing requirements if the service provider is aware, or was informed by the licensing authority, that the technical assistance is intended, or may be intended, for use in connection with a WMD or related missile program or may be in violation of an arms embargo. Especially in this area, UN and EU sanction provisions may stipulate wider-ranging restrictions.

## 9. Other licensing requirements

European and German legislation contains additional restrictions for related activities, in particular with regard to "brokering services" and transits.

Broadly speaking, brokering services cover the brokerage or arrangement of transactions and the movement of items between "third countries", that is, those that are not EU, NATO, and NATO-equivalent countries. According to German law, the provision of brokering services for military equipment and war weapons from German soil or by Germans abroad always requires a license. The provision of brokering services of dual use items is generally governed by the EU Dual Use Regulation. Restrictions would apply only if the broker - inside the EU or Germans acting outside of the EU - is aware, or has been made aware by the licensing authority, that the items in question will or may be used in connection with a WMD or missile program. Controls may also apply to transits, i.e., - in very general terms - the transport of items through the territory of Germany or the EU to a destination outside of Germany or the EU. In Germany, transit of war weapons requires a license. According to EU and German legislation, transit of dual use items can be prohibited if the items are, or may be, intended for use in connection with a WMD or related missile program.

German legislation also contains a few additional national controls for the export of selected dual use items.

## 10. National export regulation of conventional arms

German military equipment exports are governed by the German Constitution, the War Weapons Control Act and the Foreign Trade and Payments Act, in conjunction with the Foreign Trade and Payments Ordinance. A framework for the licensing authorities' activities is provided by the Political Principles Adopted by the Government of the Federal Republic of Germany for the Export of War Weapons and Other Military Equipment, of 19 January 2000 (Political Principles), the Council Common Position of the EU defining common rules governing control of exports of military technology and equipment, of 8 December 2008 (EU Common Position), as well as the Arms Trade Treaty.

The Foreign Trade and Payments Act and the Foreign Trade and Payments Ordinance require the licensing of all exports of military equipment from Germany. Military equipment is listed in full in Part I, Section A of the German Export List or Ausfuhrliste (Annex to Foreign Trade and Payments Ordinance). It is broken down into 22 positions (Numbers 0001 to 0022) with respective sub-divisions. The list corresponds to a list used by all EU member states, i.e., the EU's Common Military List, the positions of which are closely aligned with the corresponding list of the Wassenaar Arrangement (Munitions List).

Under German law, some of the military items falling under the Export List are also "war weapons", as defined by the German Constitution and the War Weapons Control Act (e.g., combat aircraft, vessels of war, combat tanks, etc.). They are displayed in the 62 positions of the War Weapons List (Annex to the War Weapons Control Act) and are also provided in full in Part I Section A of the Export List. Items qualifying as war weapons are subject to stricter controls. For the export of these weapons, two licenses are required. One license must be obtained under the War Weapons Control Act (a "transport permit for the purpose of export"), and, in addition, another export license must be obtained pursuant to the Foreign Trade and Payments Act and Ordinance. By contrast, the export of military items contained only in the Export List ("other military equipment") merely requires a license pursuant to the Foreign Trade and Payments Act and Ordinance.

Moreover, the War Weapons Control Act states that all activities in connection with war weapons (production, acquisition and transfer of actual control, every type of transport or brokering transaction) require prior licensing by the German Government. According to the War Weapons Control Act, applicants have no legal right to the issuance of a license for the export of war weapons. Also, licenses must be denied where there is a danger that the war weapons will be used in connection with acts that disturb the peace; that will impair the obligations of the Federal Republic of Germany under international law; or where the applicant is deemed unreliable. In all other cases, the Federal Government decides on the issuance of export licenses in accordance with the discretion it must exercise under the Arms Trade Treaty, the EU Common Position and the Political Principles mentioned above. The export of "other military equipment" is governed by the export rules in the Foreign Trade and Payments Act and Ordinance. In accordance with the principle of the freedom of external economic transactions, the applicant has a fundamental right to the issuance of an export license, unless a license may be denied due to the violation of interests protected under the Foreign Trade and Payments Act. Accordingly, transactions and actions can be restricted in order to guarantee the essential security interests of the Federal Republic of Germany; to prevent a disturbance of the peaceful coexistence of nations; or to prevent a substantial disturbance to the foreign relations of the Federal Republic of Germany.

The War Weapons Control Act and the Foreign Trade and Payments Act serve as a framework that gives the Federal Government sufficient leeway for assessment and decision-making. To guarantee the uniform exercise of political discretion and to ensure transparency around the politically important criteria used for reaching decisions, Political Principles were defined and have been in force since 1982 (being most recently updated in January 2000). These serve as a basis for decision-making in individual cases. The EU Common Position is an integral element of the Political Principles.

The Political Principles make a distinction between EU, NATO, and NATO-equivalent countries, as opposed to other countries (the so-called "third countries", mentioned above). For the first group of countries, licenses are the rule and denials are the exception; for the second group, there is a restrictive policy with respect to license issuance.

In this context, the following applies for the group of third countries: the export of war weapons is approved only in exceptional cases where, if justified by the specific situation, special foreign policy or security policy interests of the Federal Republic of Germany would support the granting of a license. For other military equipment, licenses are granted only in so far as such action does not endanger interests that must be protected under the respective foreign trade and payments statutes. The legitimate security interests of such countries may justify granting an export license in individual cases. This may apply in particular when the respective security interests are also internationally significant. Defense against terrorist threats and the combating of international drug trafficking are possible examples.

The factors that are taken into serious consideration in deciding whether or not to grant licenses for the export of arms to third countries include - apart from human rights, a factor which merits particular attention, and the external and internal situation - the extent to which the recipient country's sustainable development might be jeopardized by disproportionate spending on arms; the recipient country's conduct toward the international community concerning matters such as the fight against international terrorism and organized crime; and the extent to which the recipient country is meeting its international obligations, particularly with respect to international human rights legislation, as well as in the areas of non-proliferation, military weapons, and arms control.

“Infineon Technologies is Germany’s largest semiconductor and solutions provider. We are focused on the three central needs of modern society – energy efficiency, mobility and security. Infineon has had a presence in India for more than a decade and our Bangalore design center is a vital part of our global R&D footprint. We believe that the Smart Cities, Solar Energy, Make in India and Skill India initiatives among many others launched under the leadership of PM Narendra Modi will lay the foundation for the sustainable development of India over the next decade and beyond. Under the Make in India initiative, electronics and semiconductor manufacturing is one of the priority areas. Infineon has been actively engaged with the Indian government for the past few years on this topic and continues to explore strategic manufacturing partnerships with Indian companies in assembling and testing. To enable Make in India, developing a skilled workforce is vital. Infineon has many years of experience in creation of a highly skilled technical workforce in Germany to serve the needs of the semiconductor industry. We look forward to continuing our engagement in India and working together with the Indian government to lay the foundation for India’s sustainable growth over the next decade and beyond.”

**Dr. Reinhard Ploss, CEO Infineon Technologies AG**

# India's policy framework

## 1. India's control regimes on dual use items

India is currently not a member of the four main multilateral export control regimes:

- ▶ Nuclear Suppliers Group
- ▶ Australia Group
- ▶ Missile Technology Control Regime
- ▶ Wassenaar Arrangement

Most export regulations of the EEC are based on these international export control regimes. So the export regulations between EEC and India are not directly comparable.

*India is currently seeking membership of the four main multilateral export control regimes. To this end, the Government of India (GoI) has already begun to take significant steps to align its trade control system with the guidelines and practices of the regimes, including amending relevant laws, updating its national control list, and modifying its license procedures.*

The Foreign Trade (Development and Regulation) Act Number 22 of 1922 or FTDR (as amended by the FTR Amendment Act 2010) is the principal legal basis for India's strategic trade control system. It empowers the GoI to make provisions for prohibiting, restricting or otherwise regulating all, or specified classes, of exports or imports upon public notification in the Official Gazette. The FTR empowers the Directorate General of Foreign Trade (DGFT) within the Department of Commerce and Industry (DCI) to license the export on the Indian Tariff Classification - Harmonized System (ITC-HS).

ITC-HS is an eight-digit commodity classification system based on Harmonized System codes (HS-codes) that India uses to identify all trade-related transactions. Schedule 2 of ITC-HS contains the export regulations. India's national dual use export control list, the Special Chemicals, Organisms, Materials, Equipment and Technology list (SCOMET), is in Appendix 3 of Schedule 2 of ITC-HS.

## 2. Scope of control

FTDR defines an export as any goods, technology, or services taken out of India by land, sea or air. Goods, technologies and services which are subject to export licensing requirements are listed in India's national export product control list (SCOMET List).

The SCOMET List is divided into eight distinct categories (0-7).

The DGFT is the primary licensing agency for most items on the SCOMET List (Categories 1-7), while the Department of Atomic Energy (DAE) issues for all nuclear - and nuclear dual use - commodities are found in Category 0 of the SCOMET List.

The SCOMET List is structured as follows:

- ▶ Category 0: Nuclear material, other nuclear related materials
- ▶ Category 1: Toxic chemical agents and other chemicals
- ▶ Category 2: Microorganisms, toxins
- ▶ Category 3: Material, materials processing equipment and related technologies
- ▶ Category 4: Nuclear-related equipment, assemblies and components; test and production equipment; and related technology, not controlled under Category 0
- ▶ Category 5: Aerospace systems and equipment including production and test equipment, related technology and specially designed components and accessories
- ▶ Category 6: (Reserved)
- ▶ Category 7: Electronics, computers, and information technology, including information security

Each category contains an exhaustive list of the items which it covers.

## 3. License procedure

*To obtain a license for export of SCOMET items, an exporter must apply for a license with FORM ABF2 E and ANF1 and send, with necessary documents, to DGFT headquarters, New Delhi.*

All applications for licenses for export of SCOMET items are considered on merit by an Inter-Ministerial Working Group (IMWG) in the DGFT under the chairmanship of the Additional Director General of Foreign Trade.

Once a case is approved by the IMWG, a letter of permission is issued to the exporter, to enable them to obtain export authorization from the relevant zonal/regional office of the DGFT.

## 4. Other legal regulations/authorities

- ▶ Weapons of mass destruction and their delivery systems (Prohibition of Unlawful Activities) Act Number 21 of 2005 (WMD Act)

The WMD Act authorizes the GoI to regulate the export, re-transfer, re-export, transit and shipment of any item related to the development, production, handling, operation, maintenance, storage or dissemination of a WMD or missile device.

It also establishes a catch-all control that restricts exports of unlisted items destined for a WMD end use and provides a rudimentary legal basis to regulate technology transfers. Additional authorities establish controls on trade of other sensitive items, such as firearms, explosives, nuclear substances and chemicals designated in the Chemical Weapons Convention:

- ▶ Atomic Energy Act, 1962 (license of GoI necessary)
- ▶ Notification on the schedule of prescribed substances under the Atomic Energy Act (license by DAE)
- ▶ Resolution Number AEA/27/2005-ER, Guidelines for Nuclear Transfers (Export)
- ▶ Chemical Weapons Convention (CWC) Act, 2000
- ▶ Arms Act, 1959 (license of GoI necessary and transshipment activities)

## 5. Technology transfer

The DGFT is authorized to license and regulate electronic transmissions of strategic technologies designated on the SCOMET List. The WMD Act and the FTR define technology as any information, including information embodied in software, other than information in the public domain, that is capable of being used in the development, production or use of any goods or software, or the development of or carrying out of an industrial or commercial activity, or the provision of a service of any kind.

## 6. Catch-all control

India's WMD Act and the FTR impose restrictions on trade in non-listed commodities that appear to be destined for a WMD-relevant end-use.

A trader must apply for an export license from the DGFT, even if an item does not appear on the national control list (SCOMET List), if they (the trader or exporter) know that the item is intended to be used in the design or manufacture of WMD or in their missile delivery systems.

The Indian catch-all control also covers brokering or intermediaries' activities.

## 7. End user controls

*India prohibits transfers to non-state actors or terrorists of any material, equipment or technology that could contribute to the development of WMD. India also abides by UN Security Council (UNSC) resolutions and has enacted export prohibitions against several countries, entities and terrorists.*

India therefore prohibits the direct or indirect import or export of designated arms and WMD-related goods to or from Iran, North Korea and Iraq.

Furthermore, India still has a Denied Entities List (DEL) and an exporter blacklist. The GoI denies licensing privileges to commercial entities that appear on the DEL and to people who control these entities. The DEL is not publicly available.

## 8. Standard operating procedure (SOP) for issue of no objection certificates (NOC) for export of military stores by public or private sector units

The relevant authority for export regulation in case of export of military products is the Ministry of Defense Department of Defense Production (DODP).

The DGFT Policy Circular Number 45 (RE-08)/2004-09 form, 4 December 2008, states that no export of commodities which are apparently in the nature of military stores (public or private sector units) may be allowed without a no objection certificate (NOC) from the DODP. This regulation includes all units, export oriented units (EOU), electronic hardware technology parks (EHTP), software technology parks (STP), and biotechnology parks.

However, commodities specified at Export Licensing Note I can be freely exported without NOCs. The export license procedure is set out below.

The DODP has finalized a revised list of Defense products requiring an industrial license from the Department of Industrial Policy and Promotion (DIPP) for manufacturing. This list has been modified by including software and technologies for purpose of Defense applications. The listed products are named in Annex I of the SOP.

The SOP contains five categories of licensing regulations and required information or documents.

- ▶ Part A: For export of military stores as in Annex I (classic military arms and equipment)
- ▶ Part B: For export of military stores other than in Annex I
- ▶ Part C: Export for exhibition purposes
- ▶ Part D: Export for testing and evaluation
- ▶ Part E: Export for participation in tender

The following information is confined to exports in line with Parts A and B of the SOP.

The information needed to make a decision for granting a license is mainly relevant to Parts A and B. Applications should be accompanied by an end user certificate (EUC) which is signed or stamped by the government of the end user or the ultimate end user country state. The EUC should give an undertaking, declare and certify as below (mainly information):

- ▶ That the items shall not be used for purposes other than those declared in the EUC
- ▶ That the items should not be re-exported without the prior authorization of the original exporting government
- ▶ That the items shall not be diverted, sold or transferred to any third party whatsoever, except as indicated in the EUC
- ▶ That the items shall not be used for any purpose of WMD-related activities

There will be an internal government information-gathering and consultation procedure with the Ministry of External Affairs, the Department of Defense and other agencies for comments. After internal agreement, the NOC will be signed and stamped by two officers, designated by the DDP for this purpose, and copies sent to the office of the DGFT, Customs, the MEA and the Embassy of India in the respective country.

“MIKROMAT GmbH values the trusted relationships that has been built over a period of time with India’s Ministry of Defense and aerospace companies. We are committed to our presence in India through strategic partnership with our partners to support the cause of the Indo-German High-Tech Partnership and Make in India, since it makes strategic and commercial sense for both our sides, we being a global supplier of High-Technology equipment. We look forward to developing comprehensive, stronger and long term partnerships with both public and private enterprises in an atmosphere of mutual respect.”

**Thomas Warnatsch, President, MIKROMAT Präzisionswerkzeugmaschinen**

# Other international export regulations that impact on the Indo-German export community

The US Government maintains two primary sets of export control regulations that may impact the global export community, including Germany and India. The Export Administration Regulations (EAR) regulates exports of commercial items with potential military applications (dual use items). The International Traffic in Arms Regulations (ITAR) regulates exports of items and services specifically designed for military applications.

In addition to these export control regulations, global export activities may be subject to US Government economic sanctions against certain countries, entities and individuals. These economic sanctions programs are administered by the Treasury Department's Office of Foreign Asset Controls (OFAC).

Since the 9/11 attacks, the US Government has increased its scrutiny of international industry to make sure it complies with these often complicated regulations. As a result, researchers whose work may have export control implications, particularly those who perform research on behalf of the Department of Defense or Defense contractors, must be aware of and comply with applicable laws and regulations.

## 1. Export Administration Regulations

The EAR governs exports (including re-exports and "deemed exports") of commercial and dual use goods, software and technology (i.e., items intended for non-military applications that nonetheless may be useful for military purposes). These regulations are administered by the Commerce Department's Bureau of Industry and Security (BIS).

Re-exports of items identified on the CCL may require a specific license from the Commerce Department, depending upon the controls applicable to the particular items, the country of destination and the purposes for which the items will be used. Items that are not specifically identified on the CCL (or the US Munitions List, see below) fall into a "basket" category known as "EAR 99". This category includes a wide range of common items, such as pencils, adhesive bandages, automobiles and household appliances. EAR 99 items can generally be exported without a prior license from the Commerce Department, other than to the sanctioned countries, entities and individuals discussed below.

Additional information and guidance regarding the EAR (15 CFR Parts 730 to 774) is available on the BIS website at: <http://www.bis.doc.gov>. In addition, the full text of the EAR, including the CCL, is available at: [http://www.access.gpo.gov/bis/ear/ear\\_data.html](http://www.access.gpo.gov/bis/ear/ear_data.html).

The BIS also maintains several lists of entities and individuals that are restricted from participating in re-export transactions. These are available at <http://www.bis.doc.gov/ComplianceAndEnforcement/ListsToCheck.htm>.

## 2. International Traffic in Arms Regulations

Administered by the State Department's Directorate of Defense Trade Controls (DDTC), the ITAR regulates exports from the US and re-exports from abroad of US-origin "defense articles" and "defense services", as well as certain temporary imports of foreign-made defense articles and "brokering" activities. These items and services have been identified by the US Government as being inherently or predominantly suited for military applications, and therefore are subject to extensive export and re-export controls.

The defense articles and defense services subject to the ITAR include those goods, software and technical data that are enumerated on the United States Munitions List (USML). In addition to the items on the USML, the ITAR also controls any other article that has been specifically designed, developed, configured, adapted or modified for military use and that does not have "predominant civil applications". With very few exceptions, the ITAR requires exporters to obtain prior written authorization from the DDTC before exporting or re-exporting defense articles or defense services or engaging in "deemed exports" of ITAR-controlled technical data.

Finally, it is important to note that the ITAR includes a list of "proscribed countries" that are subject to US arms embargoes. The State Department maintains a general policy of denying license applications for exports of ITAR-controlled items to the proscribed countries. The list of ITAR proscribed countries, which is available at <http://www.pmdtc.org/country.htm>, is significantly broader than the list below of countries subject to US economic sanctions.

Additional information and guidance regarding the ITAR is available on DDTC's website at <http://www.pmdtc.org>. In addition, the full text of the ITAR (22 C.F.R. Parts 120 to 130), including the USML, is available at [http://www.pmdtc.org/itar\\_index.htm](http://www.pmdtc.org/itar_index.htm)

### 3. Economic sanctions regulations

The Treasury Department's Office of Foreign Assets Control (OFAC) administers and enforces economic and trade sanctions against targeted countries for particular foreign policy and national security reasons. The scope of the sanctions applicable to these countries varies significantly, but may include restrictions on imports, exports, investment, facilitation of foreign transactions, and travel.

OFAC currently administers sanctions against the following countries: Belarus, Burma, Cuba, Iran, Ivory Coast, Liberia, North Korea, Sudan, Syria and Zimbabwe. (Sanctions against Iraq and Libya have recently been lifted.) The list is subject to

change at any time. A current list of OFAC sanctions programs and additional guidance regarding prohibited transactions is available at <http://www.ustreas.gov/ofac>

In addition, OFAC administers sanctions against designated entities and individuals found by the US Government to be agents of the sanctioned countries, terrorism-sponsoring organizations, international narcotics traffickers, weapons proliferators, or otherwise engaged in activities that threaten the security of the US. These entities and individuals are generally identified on the List of Specially Designated Nationals (the SDN List). Virtually all transactions with these entities and individuals are prohibited.

## Assessment of the applicability of export control laws on the identified sectors

An assessment of applicability was conducted, based on export control regulations and expert interviews with companies, associations and institutions.

A valuation matrix was then developed, featuring the identified industry sectors and each export control category (EU dual use and SCOMET). Under each category, three boxes reflect the impact of export controls.

These three boxes are called "High Impact", "Medium Impact" and "Low Impact". The impact evaluation is based on the nature of export control activities which companies in each industry sector have to execute.

This impact evaluation can only give a high-level view, as it reflects generic understanding of the main business activities of each industry sector. A more detailed and final risk assessment would require detailed knowledge of the specific business of every company and of each export product. This would clearly be impractical.

The following example demonstrates why such intimate understanding is necessary to deliver more precise results.

#### Example:

The core business of the Automotive industry is the production and selling of vehicles. From an export control point of view, the manufacturing or assembling of vehicles is normally not critical for Category 0 (Nuclear materials, facilities and equipment) of the EU dual use list. It is also not likely to be critical in categories 1 (Special materials and related equipment), 8 (Marine) and 9 (Aerospace).

However, if a customer wants to buy an armored or military vehicle, the evaluation would need to be "high impact". A more detailed and deeper export control activity would become necessary. A lot of categories would need to be checked (materials, defense, equipment, etc.).

Automotive companies like BMW, Daimler or Volkswagen do not only export vehicles. They export spare parts, manufacturing machines, electronic parts and navigation systems. In a case like that of the military vehicle customer, each category must be evaluated afresh.

The complications inherent in the above example indicate why it is necessary to focus an evaluation on core business activities. A more detailed evaluation would only be possible at the level of company and special company business activities and special manufactured products.

The above Automotive industry explanation also applies to the other identified industry sectors. Likewise, although it refers to EU laws, it could also apply to India's export regulations.



“At Airbus we deeply value the trusted relationship that we have already built with India and we are committed to growing our presence in the country through robust strategic partnerships with Indian industry. We completely embrace the thinking behind the Make in India concept, and indeed we were pursuing exactly those ideas in our global supply chain strategy long before they achieved their recent public prominence. We have been doing this because it makes commercial sense for our customer and for us being an independent global aerospace company. We welcome the increased limit on foreign direct investment in India, and we look forward to developing deeper and more comprehensive partnerships with both public and private sector enterprises in an atmosphere of mutual respect.”

**H. Bernhard Gerwert, CEO, Airbus Defence and Space**

**Table 3: Assessment of the applicability of export control laws - Germany**

Industry sectors	Category impact										
	0	1	2	3	4	5	6	7	8	9	Defense Aerospace use
Automotive	Low	Low	Medium	Medium	Low	Low	Low	Low	Low	Low	High
Heavy engineering	Low	Medium	High	High	High	Medium	Medium	Low	Low	Low	High
ESDM	Low	High	High	High	Medium	Medium	High	Medium	Medium	Medium	High
Photonics	Medium	High	High	High	Medium	Medium	High	High	High	High	High
Renewable energy	Low	Medium	Medium	Medium	Medium	Low	Low	Low	Low	Low	High
IT	Low	Low	Low	Medium	High	High	Medium	High	High	High	High
Defense	High	High	High	High	High	High	High	High	High	High	High
Aerospace / Civil Aviation	High	High	High	High	High	High	High	High	Low	Medium	High
Transport infrastructure	Low	Medium	Medium	Medium	Medium	Medium	High	High	High	High	High
Water 3R	Low	Low	Low	Medium	Medium	Low	Medium	Low	Low	Low	High

0 - Nuclear materials, facilities and equipment  
 1 - Special materials and related equipment  
 2 - Material processing  
 3 - Electronics  
 4 - Computers

5 - Telecommunications and information security  
 6 - Sensors and lasers  
 7 - Navigation and avionics  
 8 - Marine  
 9 - Aerospace and propulsion

Source: EY analysis based on national regulation laws and expert interviews

**Table 4: Assessment of the applicability of export control laws - India**

Industry sectors	Category impact								
	0	1	2	3	4	5	6	7	Defense Aerospace use
Automotive	Low	Low	Low	Medium	Low	Low	n/a	Medium	High
Heavy engineering	Low	Low	Low	Medium	Low	Medium	n/a	High	High
ESDM	Low	Low	Low	Medium	Medium	High	n/a	High	High
Photonics	Medium	Medium	Medium	High	High	High	n/a	Medium	High
Renewable energy	Low	Low	Low	Medium	Low	Low	n/a	High	High
IT	Medium	Low	Low	Medium	Medium	High	n/a	High	High
Defense	High	High	High	High	High	High	n/a	High	High
Aerospace / Civil Aviation	Medium	Medium	Medium	High	High	High	n/a	High	High
Transport infrastructure	Low	Low	Medium	Medium	Low	High	n/a	High	High
Water 3R	Low	Low	Low	Medium	Low	Low	n/a	Medium	High

0 - Nuclear material, nuclear-related other materials  
 1 - Toxic chemical agents and other chemicals  
 2 - Microorganisms, toxins  
 3 - Material, materials-processing equipment and related technologies  
 4 - Nuclear-related other equipment, assemblies and components, test production equipment; and related technology, not controlled under Category 0

5 - Aerospace systems, equipment incl. production and test equipment, related technology and specially designed components and accessories thereof  
 6 - (Reserved)  
 7 - Electronics, computers, and information technology including information security

Source: EY analysis based on national regulation laws and expert interviews

# Intellectual property protection in India

India has a well-established legislative, administrative and judicial framework to safeguard intellectual property rights (IPR). These meet India's international obligations while utilizing the flexibility in the international regime to address its developmental concerns. The IPR regime has made definitive strides in the protection, administration, management and enforcement of IP during the last two decades. The IP regime in India has adequate safeguards in the form of judicial review and appellate provisions. The Indian judiciary is a strong and independent pillar of the Government and has made immense contributions to enforcing IP rights. Judgments of Indian courts relating to IP disputes have clearly expressed the intent and purpose of the legislation.

India's comprehensive legal framework on IPRs includes the Trade Marks Act, 1999; Patents Act, 1970 (as amended in 2005); Copyright Act, 1957 (as amended in 2012); Designs Act, 2000; Geographical Indications of Goods (Registration and Protection) Act, 1999; Protection of Plant Varieties and Farmers' Rights Act, 2001; Semiconductor Integrated Circuits Layout-Design Act, 2000 and Biological Diversity Act, 2002. The nodal department for trademarks, patents, designs and geographical indications is the Department of Industrial Policy & Promotion (DIPP), which functions under the Ministry of Commerce and Industry; copyright is administered by the Ministry of Human Resource Development; semiconductor integrated circuit layout designs by the Department of Information Technology; plant varieties and farmers' rights by the Ministry of Agriculture; and biodiversity by the Ministry of Environment and Forests.

India's IPR statutory framework is robust, effective and balanced. It is in consonance with national development priorities while conforming with the international treaties, conventions and agreements to which India is a party. The accession to the Madrid Protocol in 2013 is a step towards global alignment for proprietors of marks. The Indian IPO has become an International Search Authority and an International Preliminary Examination Authority under the Patent Cooperation Treaty. This should lead to a further increase in IP filings. The increase in staffing for the IP offices is currently underway and will reduce backlogs considerably over the next two to three years.

The strengthening and modernization of IP offices is a continuous process to which the Government of India is committed. IP offices have been modernized and there is a perceptible change for the better. Indian laws provide both civil and criminal remedies for IP enforcement. The Government has taken effective steps at all levels to enforce IP rights. The legal, administrative and enforcement machinery has been strengthened. The customs and police enforcement machinery has been streamlined and the measures for curbing piracy and counterfeiting-related activities have become progressively more effective.

India has a very large copyright-based creative industry. The Copyright Act is comprehensive and, with the recent amendments, the rights of creators have been strengthened. India was the first country to ratify the Marrakesh Treaty 2013 for access to copyright works for visually impaired persons. Enforcement in copyright has been significant and will be further reinforced. Judgments of Indian courts have adequately balanced the rights of copyright owners with the rights of the public. Moral rights are fully recognized. The challenge for the future will be the enforcement of copyright of digital platforms for which the statute has adequate provisions. Indian copyright owners are also victims of copyright violations and piracy. India will continue to engage with the international community in efforts to protect copyright owners in general and Indian copyright owners in particular.

India is one of the few countries that recognized concepts like well-known marks, protection for color combinations and shapes in its trademark jurisprudence even before statutory enactment. One of the positive features of trademark protection in India is that trademarks are registered and enforced by small and large entrepreneurs alike. India has adopted a balanced approach towards patent law. It is committed to protecting innovation while promoting the larger goal of the welfare of its citizens. Courts and tribunals have upheld key provisions of India's patent law by their authoritative pronouncements. The system of pre-grant and post-grant oppositions introduced in 2005 ensures that only deserving patents are granted. Many of the procedural issues that arose from these amendments have been resolved. It is expected that there will be a steady evolution of patent jurisprudence in India. Patent filings too have gone up, rising by 10.56% from 2008-09 to 2013-14. More than 75% of patent filings are by foreign entities, with a need for concerted action to be taken to increase filings by Indians.

Industrial design law was amended in 2000. Courts have recognized the passing of rights and copyright in designs. Overall, the law of industrial design and its enforcement has been quite positive. At present, approximately 8,000 applications are filed annually. This is far below India's potential and there is scope for considerable improvement. Concerted steps shall be taken to increase sensitization to this law especially among MSMEs and the informal sector. Geographical indications (GIs) have seen a recent spurt in filings, with more than 200 registrations being granted. The Government of India is committed to ensuring greater and effective protection of GIs nationally and internationally. The creation of the Traditional Knowledge Digital Library (TKDL) has been a major achievement for India, which has a vast pool of traditional knowledge. India has been able to thwart attempts to misappropriate its traditional knowledge. The next challenge is to use India's strength in traditional knowledge for its effective promotion, development and utilization.

The Protection of Plant Varieties and Farmers' Rights Act, 2001, is a *sui generis* legislation in India, providing protection for plant varieties as well as rights of farmers. The trends in registration under this act are very encouraging. Since 2007, more than 8,000 applications have been filed for plant varieties. Benefit sharing and commercialization are two areas which need attention. The first registration under the Semiconductor Integrated Circuits Layout-Design Act, 2000 was granted in October 2014. It is expected that the industry will make increased use of this right to protect integrated circuit layout designs.

## National IPR strategy for India

*The Government of India is in the process of formulating a national IPR strategy that will be enacted in the coming months. The policy intends to reinforce the strengths of India's substantive laws with equally strong administrative and procedural mechanisms and improved judicial infrastructure. The policy will aim to foster predictability, clarity and transparency in the entire IP regime in order to provide a secure and stable climate for stimulating inventions and creations, and augmenting research, trade, technology transfer and investment.*

The National IPR Policy envisages IP as an integral part of India's overall development policy. It will integrate and create synergies with IP-related aspects of various sector-specific policies. It will also provide a roadmap for holistic, effective and balanced development of the IP system in India.

The salient features of the new national strategy include:

- 1. Measures for creating greater awareness about benefits of IP among all sections of society under the national slogan "Creative India; Innovative India - सृजन भारत; रचत भारत".**
- 2. Integration of IP with other national initiatives such as Make in India, Digital India, Skill India and Smart Cities.**
- 3. Indian inventors and creators will be enthused and enabled to create IP assets in India and utilize them in manufacturing. Foreign companies will be encouraged to bring their IP-protected inventions and creations to India along with investment and technology transfer and establish their manufacturing, R&D and outsourcing bases in India.**

**4. IP Promotion and Development Units (IPPDUs) will be set up in all states, smart cities, innovation and industrial clusters in order to provide one-window services to entrepreneurs, start-ups and manufacturing units for IP awareness, protection and utilization.**

**5. Putting in place strong and effective laws with regard to IP rights that are consistent with international obligations and which balance the interests of rights owners with the public interest.**

**6. Modernization and strengthening of IP administration for efficient, expeditious and cost effective grant and management of IP rights and user oriented services.**

**7. Strengthening enforcement and adjudicatory mechanisms for combating IP violations, piracy and counterfeiting; to facilitate effective and speedy adjudication of IP disputes; to promote awareness and respect for IP rights among all sections of society.**

**8. Augmenting commercialization of IP rights; valuation, licensing and technology transfer.**

**9. Strengthening and expanding human resources, institutions and capacities for teaching, training, research and skill building in IP.**

**10. Stimulating the creation and growth of intellectual property through measures that encourage IP generation.**

IP consciousness is on the increase in India both among creators and innovators, leading to the development of a strong IP culture. The Government of India is committed to providing a strong, balanced, predictable and transparent IP regime for this purpose. The Indian IP system will contribute to enterprise, competitiveness, employment and entrepreneurship. It will add value and support and also ease the conduct of business operations.

India and the European Patent Office (EPUO) have a cooperation agreement on patents and have recently agreed to renew this cooperation in an effort to support the development of patent systems and innovation and stimulate the transfer of technology between both regions. This is an important step forward in our bilateral relations with Germany and Europe as India becomes a major player in global innovation.

## Summary and conclusions

Both countries have special export control regulations for dual use products and military products. Whereas Germany follows the international control regimes as an official member state of these regimes, India has its own export control regulations which are not fully identical.

India's SCOMET List does not fully correspond with the lists of multilateral export control regimes (MECRs). This list utilizes a two to five digit classification scheme that bears some resemblance to Export Control Classification Numbers (ECCNs), but the categories, specific numbering of items, and technical descriptions tend to differ from those in the EU (and also from the US List).

The differences between the SCOMET List and the EU List may result in some confusion in companies of both countries and to much internal discussion in a bid to understand export-controlled goods and technology.

*Feedback from a questionnaire which was sent to industrial companies suggests that export control is a trade barrier but not a show-stopper for the expansion of cooperation in High-Tech Manufacturing.*

It would be very challenging to assess which industry sector in either country is most affected by export regulation.

*All industry sectors will be affected if they use special materials, deliveries of spare parts or intermediate products or if they use such items for special purposes.*

In summary, each exporter has to check the export regulations of the exporting country and to take responsibility for being compliant with the relevant export rules. Each exporter also has to check US export regulations and be compliant with these extraterritorial rules.

As mentioned by the GoI in its Policy Framework, India is currently seeking membership of the four main multilateral export control regimes (NSG, MTCR, WA and AG). Membership of these international regimes is likely to help facilitate High-Technology trade between Indian and German suppliers and lead to new opportunities for companies in both countries to establish lucrative trading relationships.

*Both countries are working together within the existing bilateral/multilateral mechanisms to achieve this desired result.*

*The GoI is in the process of formulating a National IPR strategy which intends to reinforce the strengths of India's substantive laws with equally strong administrative and procedural mechanisms and improved judicial infrastructure. The new policy is expected to foster predictability, clarity and transparency in the IP regime in order to provide a secure and stable climate for stimulating inventions and creations, and augmenting research, trade, technology transfer and investment.*

“As a local player in the Indian market, the BMW Group appreciates the government’s ambitious Make in India campaign. Since 2007, the BMW Group has been manufacturing vehicles in Chennai. BMW has partnered with major Indian suppliers for its local production. In addition, we continue to leverage the potential of the Indian supplier market for global sourcing. State-of-the-art machinery, latest technology, highly-skilled employees and advanced manufacturing processes ensure that vehicles from the BMW Plant Chennai achieve the highest international quality standards of the BMW Group. We believe that the government’s focus on skill development will provide a major impetus to the success of Make in India. Our modern Indian training center is a further example of our contribution to strengthening skills and competencies in India. We value our partnerships in India and remain fully committed to being a credible and reliable partner in India’s economic growth.”

**Harald Krueger, Member of the Board of Management of BMW AG, Production**

4.



**A case study**  
**of Indo-German**  
**cooperation**  
**in the Machine**  
**tools sector**

# A case study of Indo-German cooperation in the Machine tools sector

*Shirish Pandit, European School of Management & Technology, Berlin*



## Introduction

Machine tools constitute a critical component of the Heavy Engineering sector addressed in *Cluster 4 "Engineering India"* of this report. This case study takes a deep-dive into the Machine tools sector, describing its key characteristics, its relevance and history in the Indo-German context, and highlighting the key experiences of the company GDW in its five decades of operation in India. Based on these experiences, the case study identifies the barriers to, as well as prospects for, Indo-German cooperation in the Machine tools sector.

## Key characteristics of Machine tools

Machine tools encompass a wide variety of machines, all of which are powered to manufacture metallic (or other material) products and parts. They are also referred to as mother machines, since they enable the production of all the other machines, including themselves.<sup>209</sup> Machine tools work on a large variety of materials, metal in particular, to produce a required shape. There are many technical processes which can be used singly, or in combination, to obtain the desired results from the materials concerned, like *Cutting* (turning, milling,

boring, sawing, grinding, honing, finishing); *Forming* (various types of presses, rolling mills, bending, straightening, wire-drawing); *Physiochemical* (electrical or electrochemical discharge, thermal treatment); *Separating* (shearing, punching, blanking, nibbling, forming, beam cutting). Accompanying these processes, there are *Control Systems* and *Application Software* for the machines. Among the above types, *Cutting* and *Forming* are considered the two key types of machines. Machine tools may be powered and operated either manually, or electrically. Their degree of complexity ranges from ordinary lathes, through to complex machining centers.

## Snapshot of the global Machine tools sector<sup>210</sup>

Having peaked at €67.4 billion for the year 2012, global Machine tools production (excluding Parts and Accessories) slipped to €59.1 billion for 2013. China (22.8%), Germany (18.9%) and Japan (15.6%) were the top 3 producers in 2013. Until it was overtaken by China in 2010, Japan had been the leading Machine tools producer for about a quarter of a century. Following these top 3 producers are Italy, South Korea, USA, Taiwan and Switzerland. Domestic consumption - defined

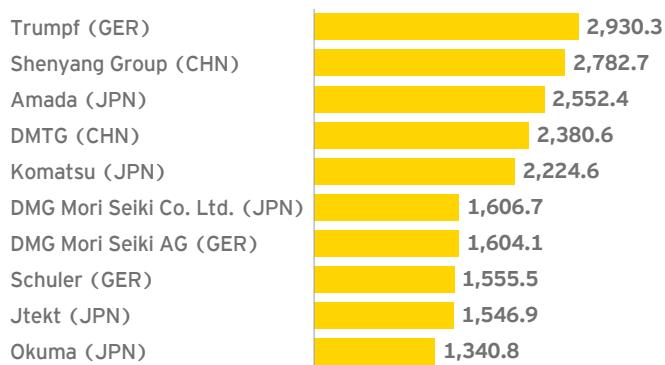
The report is based on information gathered from public sources, as well as through interviews with key stakeholders. The author would like to sincerely thank: Mr. P S Gangadhar, FS (E&C) Embassy of India, Berlin; Mr. A S Gill & Mr. A Madhavan, D&ISA, MEA, India; Mr. Dirk Matter, Deutsch-Indische Handelskammer; Dr.-Ing. Wilfried Schäfer, VDW; Mr. Rajesh Nath, VDMA India; Mr. Hermann Weiler, GDW Werkzeugmaschinen GmbH; current and past senior office bearers of IMTMA - Mr. Anbu Varathan, Mr. P J Mohanram, and Mr. N K Dhand; Mr. Abhijit Choudhuri and Dipl.-Ing. Mr. Thomas Warnatsch, Mikromat GmbH; and Prof. Dr. C B Bhattacharya, ESMT.

<sup>209</sup> <http://www.cecimo.eu/site/the-industry/what-are-machine-tools/>

<sup>210</sup> Report "The German Machine Tool Industry in 2013", VDW, Section "World Market", Page 47 ff.

as production plus imports less exports - is another key indicator of a country's market growth. China (32.8%), USA (10.2%) and Germany (9.3%) were the leading global consumers in Machine tools in 2013. China and Germany are not just heavy producers and exporters, but also importers, of Machine tools.

**Figure 51: Largest Machine tools manufacturers, FY 2013, revenue**



In US\$ million

## Significance of Machine tools in Indo-German context

Germany and India share decades of technological cooperation in the Machine tools sector. Although the size of this sector's output is small in comparison to the respective GDPs, the sector plays a key role in the overall economic development of the countries. In Germany, the apex body is the VDW (*Verein Deutscher Werkzeugmaschinenfabriken*, German Machine Tool Builders' Association), the Machine Tool sector specific body within the VDMA (*Verband Deutscher Maschinen- und Anlagenbau e.V.*, German Machinery & Plant Manufacturers' Association). The VDW represents 120 member companies from the German Machine tools sector, which employs some 71,400 people, and had an annual turnover of €14.6 billion in 2013. The Indian counterpart of the VDW is the IMTMA (Indian Machine Tools Manufacturers' Association), representing 492 members accounting for about 90% of the organized Machine tools and allied equipment manufacturers.<sup>211</sup>

In terms of industry structure, medium-sized entrepreneurs play a dominant role in Germany. Their flexibility in decision-making adds to Germany's competitiveness.<sup>212</sup> In India, the large, organized players cater to India's heavy and medium industries, while the small-scale sector meets the demand of ancillary and other units. Approximately 75% of the Indian Machine tools producers are ISO certified. Many Machine tools manufacturers have also obtained CE Marking certification to meet European market requirements.<sup>213</sup>

## History of Indo-German cooperation in Machine tools sector

Indo-German cooperation in the Machine tools sector was pioneered by Francis Klein, an Indian company established in 1928. Since its formation, Francis Klein has been engaged in technical collaborations with leading German and Swiss companies. Today, it has technical collaborations and joint ventures ("JVs") with specialized German players, like Liebherr Machine Tools, Nagel Special Machines, Bad Duben Profiroll Technologies, and Dango & Dienenthal. Its diverse product range also includes products of companies from Austria (Emco Group), Spain (ONA Electro Erosion), and The Netherlands (Hembrug Machine Tools).<sup>214</sup>

When India got its independence from the British in 1947, it was aspiring to become a self-sufficient, modern, industrial country. Hindustan Machine Tools ("HMT") was conceived by the Government of India in 1949, and incorporated as a Public Sector Undertaking ("PSU") in 1953, with the objective of producing a limited range of Machine tools that would ensure this industrial edifice.<sup>215</sup> The HMT Machine Tools Limited (HMT-MTL) division at HMT Bangalore was the oldest manufacturing unit of the company. Among its first foreign technical collaborations was the one it had for die casting machines with Reifenhäuser GmbH & Co. of West Germany. As a group, HMT subsequently entered a collaboration agreement for the manufacture of refractory presses, in 1976, with M/s Laeis Werke AG, Trier, West Germany, and in 1978, with Fortschritt Landmaschinen ("FLM") Export Import of the German Democratic Republic. In parallel, HMT-MTL entered into collaborations with German companies like Buderus, Carl Zeiss, Fritz Werner, Gildemeister, Hermann Kolb, Liebherr, Limex (GDR), Oswald Forst, and Siemens (Figure 51).

<sup>211</sup> Websites of VDW (<http://www.vdw.de>), VDMA (<http://www.vdma.org>), and IMTMA (<http://www.imtma.in>)

<sup>212</sup> Report "The German Machine Tool Industry in 2013", VDW, Section "Structural Data of the Machine Tool Industry", Page 62 ff.

<sup>213</sup> IMTMA website <http://www.imtma.in/index.php?page=3&subid=27>, accessed December 15, 2014

<sup>214</sup> Company website, <http://www.francisklein.in/>

<sup>215</sup> Company website <http://www.hmtmachinetools.com/evolution-of-hmt.htm>, accessed December 15, 2014, and company summary in *Economic Times of India* <http://economictimes.indiatimes.com/hmt-ltd/infocompanyhistory/companyid-11937.cms>

Within a decade, Indo-German cooperation in Machine tools also extended to private enterprises. In 1961, the Kothari Group of India established the cooperation - Bharat Fritz Werner ("BFW") - with Fritz Werner Werkzeugmaschinen GmbH of Germany. BFW was one of the few companies of German origin to actively manufacture in India, and has since gone on to become India's largest machine tool builder. Since 2011, it has held a majority shareholding in its subsidiary, Matec Maschinenbau GmbH, near Stuttgart, Germany, and is strategic partner of Spinner Werkzeugmaschinenfabrik GmbH, on the outskirts of Munich, Germany. In 2010, the world-famous German-Japanese cooperation, DMG Mori Seiki, started an Overseas Technical Center in Bangalore. Within two years, in 2012, the Swiss-German cooperation, Starrag Group AG (formerly StarragHeckert AG), had opened its first production plant in India, which in fact, was its first one in Asia.<sup>216</sup>

### Balance of trade in Machine tools sector

Germany holds a very strong competitive position in Machine tools even on a global basis. It is among the top 3 producers as well as domestic consumers of Machine tools globally. Germany's production of Machine tools exceeds its exports thereof, and exports exceed its imports thereof. Around 70% of Germany's Machine tools production is exported, and Germany has a positive trade balance in Machine tools. India's consumption of Machine tools exceeds its production thereof, making it a net importer of Machine tools.<sup>217</sup>

During the past couple of years, India's economic growth was below expectations. The Automotive sector in India, one of the key customers of Machine tools products, has particularly slowed down. These factors had a direct, adverse impact, on the value and volume of Indo-German trade in the Machine tools sector. For the period January to June 2014, Germany's Machine tools exports to India amounted to €75.0 million, down 45% from the €136.3 million for the corresponding period in 2013. Imports from India into Germany for this period in 2014 stood at €7.3 million, up 29% from €5.7 million for the corresponding period in 2013.<sup>218</sup>

India's contribution to the total value of Machine tools imported by Germany, as well as the value of Machine tools India itself imports from Germany, is rather low, as compared to the value

of Machine tools imported and exported by Germany. Dr. Wilfried Schäfer, Executive Director, VDW, is also of the opinion, that given India's large size and market potential, exports from Germany to India are underrepresented, as compared to Germany's exports to countries like China and USA. On the other hand, exports of medium-tech products from India have bigger takers in Italy and Spain, than in Germany.<sup>219</sup>

Indo-German trade in Machine tools has thus shown varying trends. There are barriers to this trade, as well as opportunities that can unfold the huge underlying trade potential. Both these aspects are covered later in this report.

## GDW - a case study in Indo-German cooperation

Like BFW above, Gedee Weiler ("Gedee") is an Indo-German venture. It was established in 1966 as a technical collaboration with what was then Weiler Werkzeugmaschinen GmbH. The Indo-German origins of the cooperation are symbolized in the GDW name itself: the initials "GD" refer to Mr. G. D. (Gopalswamy Doraiswamy) Naidu, an Indian engineer and inventor often referred to as the *Edison of India*. The "W" refers to the family name of Mr. Friedrich Weiler, who founded Weiler Werkzeugmaschinen GmbH in 1938 in Herzogenaurach (Bavaria) in Germany. Mr. Friedrich Weiler's son, Mr. Hermann Weiler, took over the helm at Weiler Werkzeugmaschinen GmbH in 1959. Following various developments, including the company's sale to Voest Alpine Steinel in 1990, followed by a management buyout a few years later, Mr. Hermann Weiler left the company in 1993. In 1994, he founded GDW Werkzeugmaschinen - Herzogenaurach GmbH ("GDW"). In 2014, GDW moved its headquarters from Herzogenaurach to its current location in the nearby town of Höchstadt a. d. Aisch, and Mr. Hermann Weiler made way for Mr. Hans Ort at the helm. The Naidu and Weiler families have nurtured and grown their friendship over the 50 years since. In the meantime, the initials GDW are also referred to as "*Genauigkeits Drehmaschinen Weiler*" (translated as Precision Turning Machines Weiler) - a tribute to the top quality and high precision levels that GDW machines have consistently stood for.

<sup>216</sup> Company websites: <http://www.bfwindia.com/index.php/about-us>, [www.matec.de](http://www.matec.de), [www.spinner.eu.com](http://www.spinner.eu.com), <http://www.dmgmorseiki.co.jp/en/>, and <http://www.starrag.com/>

<sup>217</sup> India's reported figures converted into €billion, using average rates for preceding 12 months, obtained from [www.oanda.com](http://www.oanda.com). INR 1,000 crore = €0.143 billion (2012-13) and €0.124 billion (2013-14)

<sup>218</sup> Special Report, *Indo-German Economy - The business magazine of the Indo-German Chamber of Commerce*, Volume 58, Issue 4, 2014

<sup>219</sup> Telephone interview by case study author of Mr. Schäfer, September 29, 2014

Today, Gedee in India is part of United Motor Services (“UMS Group”) started in 1928 by Mr. Naidu in Coimbatore. The German operations (GDW) and the Indian operations (Gedee) complement each other well. Cutting edge manufacturing technology and ideas for customer-driven solutions are developed through the R&D and innovation efforts undertaken at the GDW plants in Germany. In India, Gedee manufactures and markets a range of precision lathes and CNC machines. Customers served by GDW in Germany largely comprise training outfits in the D-A-CH region, while the machines from Gedee in India are exported to places as diverse as Europe, South East Asia and the Far East.<sup>220</sup> The workforce, comprising 220 employees with Gedee in India and 38 with GDW in Germany, helped generate a turnover of, respectively, €5.0 million (Gedee) and €11.0 million (GDW), in 2013-14. GDW/Gedee’s operations encompass not just world-class production of Machine tools, but also the provision of top-notch training to develop a skilled workforce capable of using these mother machines. Mr. Hermann Weiler’s first encounter regarding the training provision was in regard to the Okhla Production-cum-Training Center (PTC) in New Delhi in 1961. The Okhla PTC was a project supported by the (West) German Chancellor Konrad Adenauer, in response to a request by India’s then Prime Minister, Mr. Jawaharlal Nehru. The PTC was set up with the aim of training Indian workers in the use of basic industrial tools and equipment. Among the three German firms providing technical support was also Weiler of Herzogenaurach. Although well-intentioned, the Okhla PTC initiative, which was regulated mainly at the inter-governmental level, did not achieve its desired purpose. Mr. Hermann Weiler realized the importance of a PPP (Public Private Partnership) approach in case of such critical projects.

Decades later, in 2002, the vision of a PPP project to provide world-class industrial training in India became a reality, with the founding of the GTTI (Gedee Technical Training Institute) on the Gedee premises in Coimbatore, Tamil Nadu state, southern India. The main public entity in this PPP project was Deutsche Investitions- und Entwicklungsgesellschaft “DEG” (German Investment and Development Corporation), a subsidiary of the KfW (Kreditanstalt für Wiederaufbau). Other non-profit, trade cooperation bodies like the Indo-German Chamber of

Commerce Chennai, and Nuremberg Chamber of Commerce and Industry Germany, are also among the current cooperation partners. The private entities founding this PPP were GDW and G.D. Naidu Charities. In 2010, another German private entity - FESTO, a global leader in automation technology - was involved, and the Gedee FESTO Mechatronics Centre was established in Coimbatore.<sup>221</sup> FESTO was founded in 1925 by Mr. Gottlieb Stoll. Mr. G.D. Naidu and Mr. Stoll have been friends since 1939, and in the 75 years that have followed, subsequent generations of both families have nurtured the relationship.

GTTI has been inspired by the supreme quality of German engineering as well as of its highly skilled labor. It sees the merits of the German dual vocational training system and its focus on learning by doing. GTTI has adopted these principles for its own training programs too. It offers Diplomas in a range of skills, like Tool & Die Engineering, Machining Technology, Mechatronics, Polymechanics & Automation, Welding Technology, and so forth. These Diplomas involve a weightage of 70:30 for practical and theory components, and they are recognized the world over. Due to their stark contrast with the 40:60 weightage prescribed by the Indian government, GTTI has had to battle to gain acceptance and recognition from the Indian government, despite having an ISO 9001:2008 Certification from TÜV Rheinland of Germany. On January 20, 2015, GTTI achieved a significant milestone, when, out of 76 nominations received for the *Summit-cum Awards on Skilling India*, it was awarded the Gold Trophy and the first place as “Best Vocational Training Provider” in India.

The impact of training provided by GTTI extends well beyond the company’s boundaries. GTTI graduates are hired in India and abroad, by highly reputed domestic as well as international players like Bosch, Ford, Godrej, Hyundai, Kalyani, Titan, TVS, Tyco, and so forth. GTTI has conducted training programs for large corporates like Bosch, Hansen Transmissions, Larsen & Toubro, Michelin, and so forth. GTTI, whose origins are associated with GDW/Gedee, can be seen as a success story of an Indo-German PPP initiative, which positively contributes to skill development, and offers a win-win proposition for various German and Indian stakeholders.

<sup>220</sup> Company websites: <http://www.umsindia.com>, <http://www.gttiinfo.com>, <http://www.gdweiler.com>

<sup>221</sup> Interview with Mr. Hermann Weiler, CEO, October 16, 2014, at ESMT in Berlin; Company websites, [www.gdweiler.com/about-gedee-weiler.php](http://www.gdweiler.com/about-gedee-weiler.php), [www.gdw-werkzeugmaschinen.de/](http://www.gdw-werkzeugmaschinen.de/), [www.festo.com/](http://www.festo.com/)

Despite this success, it remains a challenge to attract interested candidates, who are willing to pay for the training they receive at GTTI. This challenge is aggravated by the trend among Indian youth to prefer white-collar jobs over blue-collar ones that ensue as a result of GTTI graduation. At GDW in Germany, Mr. Hermann Weiler introduced a scheme in order to attract and retain trainees. Part of the financial support that the trainees received from their families - along with part of the compensation that they were entitled to as interns - was put into an interest-earning savings deposit ("Sparbuch"). The term of this savings deposit was 10 years, entitling those interns who stayed on for that period with GDW to a substantial amount at the end of it. All interns who participated in this scheme did stay on with GDW.

Companies like GDW/Gedee, and PPP initiatives like GTTI, are examples of a long-standing, Indo-German cooperation in the Machine tools sector. This particular cooperation has grown steadily over the decades, despite experiencing numerous vicissitudes. On the one hand, the companies' experiences can provide best practice examples for other Indo-German cooperation initiatives. On the other hand, one also gets pointers towards some of the key barriers that are hindering Indo-German cooperation currently.

### Key barriers to Indo-German cooperation

Based on the experiences of GDW and feedback received by ESMT from other companies, Indo-German cooperation in Machine tools is experiencing not just real, but also perceived barriers.<sup>222</sup> These can be summarized as follows:

- ▶ **Price sensitivity:** High-quality German Machine tools are priced correspondingly high. Indian consumers of Machine tools would generally be willing to settle for the next-best quality, if it offered them greater value for money. Likewise, they might prefer options that entail lower upfront costs, rather than lower overall lifecycle costs. As a result, German companies prefer to restrict their India-based presence to post-production activities, like sales and services.
- ▶ **Skills, training and job attractiveness:** The dual vocational system in Germany, which combines on-the-job practical experience with the requisite theoretical inputs, is well-suited for equipping Machine tools operators with the necessary practice in precision of operation. While India has a very large number of educated youngsters, they lack the specific training in Machine tools. Contemporary Indian youth prefer white-collar jobs, which are more respected than blue-collar jobs like those in Machine tools, and they are less willing to invest in, i.e. pay for, even a very valuable vocational training.
- ▶ **Infrastructure and Logistics:** The need for investment in modernizing Indian infrastructure is well-known. In addition to delays caused by poor infrastructure in the physical transport of goods, there are other repercussions as well. Companies like Gedee not only suffer from delays in the physical transport of goods, they have to find ways to ensure that their expensive machines arrive at their destination in the desired condition. When transporting expensive, yet sensitive, modern machinery via road/trucks, the poor condition of roads can result in physical damage of these machines to a considerable extent. In order that the truck driver is particularly careful on such roads, companies like Gedee have to engage another person to keep the driving behavior of the truck driver under control.
- ▶ **Dual use:** Germany, along with its key Machine tools export destinations, viz. China, Russia, USA, is a member of the Nuclear Suppliers Group (NSG), whereas India is not.<sup>223</sup> Exports of goods, like defense equipment, to non-NSG member countries are subject to particularly strict restrictions regarding "Dual Use". This reduces the potential market size for German Machine tools equipment in India, and also leads to delays in customs clearance. Indo-German bilateral agreements will be subordinated to broader agreements such as NSG, when it comes to critical issues such as Dual Use of arms.
- ▶ **Protection of Intellectual Property Rights (IPR):** From an Indian perspective, the German Machine tools manufacturers' apprehensions that their intellectual property will not be adequately protected in India, is a perceived barrier. About 78% of the patents registered in India during 2013 were registered by non-resident Indians. This put India well ahead of China (18%) and USA (50%). Yet, while this reflects the confidence displayed by MNCs in India's IPR protection, it also brings to the fore the low level of awareness that Indian companies have regarding the potential benefits of patenting their own innovations.<sup>224</sup>

<sup>222</sup> Presentation by Mr. P S Gangadhar at the Wegweiser Indo-German Investment Summit, November 12, 2014, Berlin

<sup>223</sup> Website [www.nuclearsuppliersgroup.org/en/participants1](http://www.nuclearsuppliersgroup.org/en/participants1), accessed December 15, 2014

<sup>224</sup> "NRIs filed 78% of the patent pleas in India", *The Times of India*, November 7, 2014

## Prospects for greater Indo-German cooperation

Measures to address the key barriers above (infrastructure, dual use, IPR) are already under way. At the same time, there are tangible signs that can help to boost Indo-German cooperation in Machine tools:

- ▶ **Positive economic outlook in India:** The Machine tools sector is cyclical. Various reports suggest that India's economy will grow in 2015 and in the coming years. Campaigns like "Make in India", "Digital India" and "100 Smart Cities", along with the thrust on domestic growth of India's defense sector, will increase the demand for, and consumption of, capital goods and heavy machinery. All these factors will provide a stimulus to the Machine tools sector.<sup>225</sup>
- ▶ **Indo-German High-Technology Partnership Group ("HTPG"):** A bilateral HTPG platform has been in force since April 2013 to promote the technology partnership between India and Germany. This could serve as a useful mechanism to address some of the challenges that are hindering realizing the full bilateral trade potential.
- ▶ **India at the Hannover Messe 2015:** India's participation with its largest contingent of 400 companies will help Indian companies, particularly the SMEs, gain international branding and promotion.<sup>226</sup>
- ▶ **India as a Center of Excellence:** Companies like DMG Mori Seiki, GDW and Starrag Group AG are examples of German companies that have established manufacturing capabilities in India. By investing in R&D, they help to make India a Center of Excellence in manufacturing and (reverse) innovation, with India becoming a hub for supplying products to other countries in Asia, Africa and Eastern Europe. Likewise, EMAG, Guhring, and MAPAL are examples of other German companies, which have started investing in R&D and setting up smaller demo centers in India.<sup>227</sup>
- ▶ **Other ongoing measures:** These include the high-level consultations between Germany and India, financial incentives like the 15% SME Investment Allowance in the manufacturing sector and the EU-India BTIA (Bilateral Trade and Investment Agreement).

## Conclusion








Given the depth and breadth of historical, diplomatic and economic relations that Germany and India share, the value and volume of bilateral cooperation in the Machine tools sector is still underrepresented. This cooperation has been through ups and downs over the past many decades. From being primarily a recipient of Germany's technological expertise, India has progressed to develop its own competitive advantages in certain niches in the Machine tools sector. Companies like GDW/Gedee, and PPP initiatives like GTTI, provide encouraging examples of how Indo-German cooperations can be made to work successfully and sustainably. They also bring to the fore some of the barriers affecting Indo-German cooperation. Many of the actual and/or perceived barriers hindering bilateral cooperation are being addressed actively from both sides. Maintaining momentum and commitment at the highest political levels in both, Germany and India, while continuing the dialogue with key stakeholders of the industry, will help implement policies that are conducive to unfolding the true potential underlying Indo-German cooperation in the Machine tools sector.

<sup>225</sup> Welcome note by Mr. L. Krishnan, President IMTMA and MD TaeguTec India Pvt Ltd, MMI Modern Manufacturing India magazine, November 2014

<sup>226</sup> The Big Interview: "Global branding is the need of the hour", MMI Modern Manufacturing India magazine, November 2014, Page 48 ff.

<sup>227</sup> Telephone interview by author, of Mr. Rajesh Nath, VDMA India, on November 6, 2014

**Table 5: Overview of HMT-MTL's international collaborations\***

Year	Collaborator		Country	Product
<b>Turning</b>				
1949-66	Oerlikon		Switzerland	High Precision Centre Lathes
1959-66	ErnaultBatignolles		France	Production Centre Lathes (LB)
1964-74	Haut Rhin		France	Single Spindle Automatics
1966-74	Gildemeister		FRG	Multispindle Bar & Chucking Automatics
1966-74	Haut Rhin		France	Single Spindle Automatics
1966-77	Ernault Somua		France	Copying Lathes (S. Pilote)
1966-71	Jones & Lamson		USA	FAY Automatic Lathes
1966-71	DivisionWaterburyFarrel			
1966-71	Gildemeister		FRG	Drum Type Turret Lathes
1969-74	Oerlikon		Switzerland	Multipurpose Lathes (DA)
1970-75	American Tool Works		USA	Heavy Duty Engine Lathes & Machining Centres for Drilling Milling & Boring Operations
1971-78	Petermann		Switzerland	Sliding Headstock Automatics
1984-92	Gildemeister		FRG	Multispindle Automatics (GF, GS)
1986-91	Gildemeister		FRG	GDM Series Chuckers
<b>Machining Centers &amp; Milling Machines</b>				
1957-63	Fritz Werner		FRG	Milling Machines (M2 & M3)
1963-70	Fritz Werner		FRG	Milling Machines (Electrically Controlled)
1966-77	Ernault Somua		France	Copying Lathes (S. Pilote)
1970-77	Fritz Werner		FRG	Ram Bed Type Milling Machines
1970-75	American Tool Works		USA	Heavy Duty Engine Lathes & Machining Centres for Drilling Milling & Boring Operations
1971-78	Fritz Werner		FRG	Unit Assembled Bed Type Milling Machines
1983-91	KTM		UK	CNC Machining Centres
<b>Grinding</b>				
1959-66	Olivette		Italy	Cylindrical Grinding Machines
1961-71	Limex		GDR	Hydraulic Surface Grinding Machines (SFW)
1985-93	Buderus		FRG	Precision Internal Grinding Machines
<b>Gear Cutting</b>				
1963-70	Drummond Brothers		UK	Gear Shapers (Maricut 2A & 3A)
1964-71	Liebherr		FRG	Gear Hobbing Machines (L series)
1976-79	Cross		USA	Gear Chamfering Machines
1983-91	Liebherr		FRG	Heavy Duty Gear Hobbers
1983-91	Liebherr		FRG	High Speed Gear Shapers (WS1)
<b>Metal Forming</b>				
1969-79	Interfonda		Switzerland	Diecasting Plastic Injection Moulding Machines
1969-79	Verson		USA	Presses & Press Brakes - Hydraulic & Mechanical
1982	Interfonda		Switzerland	Diecasting Dies
1981-89	Reifenhauser		FRG	Plastic Extrusion Machines
1982-89	Verson		UK	Presses
1996-98	Clearing-Niagara		USA	Presses
<b>Special Purpose Machines</b>				
1961-68	Renault		France	Special Purpose Machines
1970-77	Fritz Werner		FRG	Ram Bed Type Milling Machines
1971-78	Fritz Werner		FRG	Unit Assembled Bed Type Milling Machines
1976-79	Cross		USA	SPMs
1980-87	Pegard		Belgium	Horizontal Boring Machine
<b>General Purpose Machines &amp; Others</b>				
1958-65	Hermann Kolb		FRG	Radial Drilling Machines (RM)
1967-77	Oswald Forst		FRG	Broaching Machines - Horizontal & Vertical (Internal & External)
1968-73	Fin Motil		Switzerland	Clamping Chucks
1969-76	Ateliers GSP		France	Drilling & Boring Machines
1982-90	Oswald Forst		FRG	Surface Broaching Machines
1984-90	Carl Zeiss Jena		GDR	Ballscrews
1984-94	Siemens		FRG	CNC Control Systems

\* German flag denotes collaborations with East German ("GDR") and West German ("FRG") companies





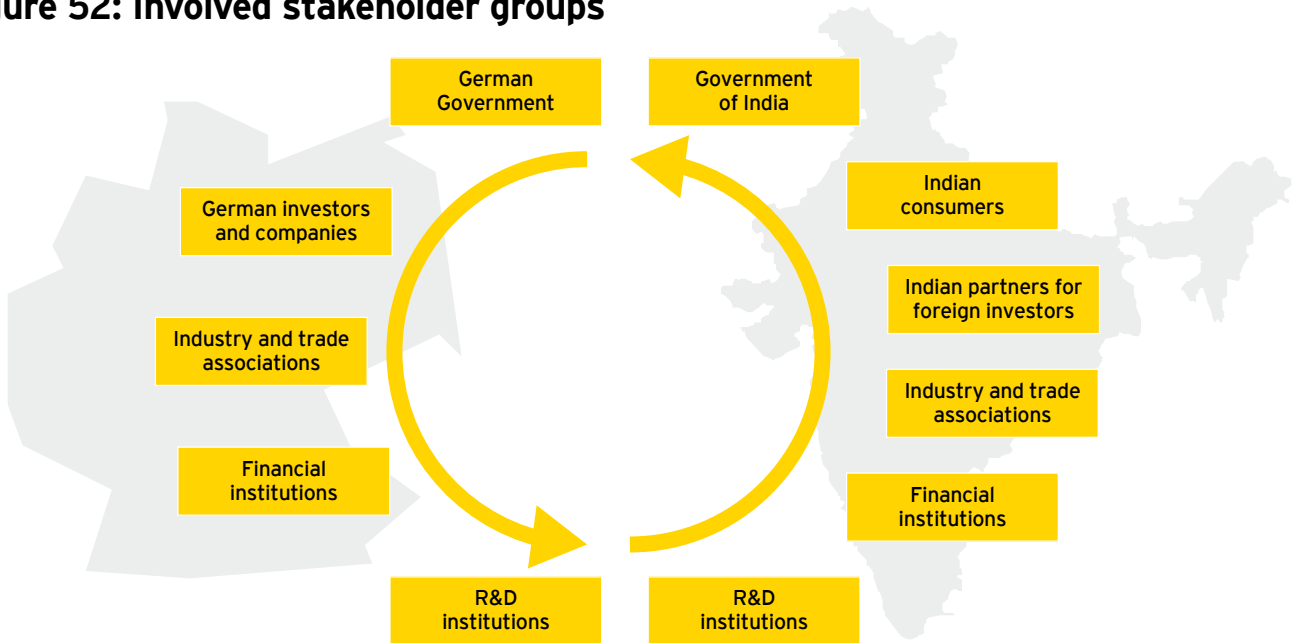
5.

# Roadmap for Indo-German collaboration in High-Tech Manufacturing

This section of the report attempts to provide a roadmap for Indo-German partnership in High-Tech Manufacturing.<sup>228</sup> The roadmap has been prepared with the following objectives:

- ▶ To forge a transformative collaboration between the two countries in manufacturing technologies that goes beyond buyer-seller cooperation, to promote joint and wholly owned ventures through strong industry linkages, R&D collaborations and skill development across a wide range of High-Tech sectors.
- ▶ To facilitate entry of German companies and their technologies to India across the High-Tech sectors. To that effect, to identify steps that can help create a favorable environment for High-Tech trade and collaborations.
- ▶ To initiate Indo-German High-Tech partnership at the political level with the involvement of industry and other stakeholders.
- ▶ To create the appropriate political, administrative and economic instruments for successful High-Tech trade and collaborations.

**Figure 52: Involved stakeholder groups**



Source: EY

<sup>228</sup> The proposals made in this section are only suggestive and should not be interpreted to mean definitive steps that had been agreed by the governments and other stakeholders.

## Key stakeholders

Many different stakeholder groups are involved in the mechanism of creating bilateral arrangements. The stakeholders include governments, industry and trade associations, and financial and R&D institutions.

While both governments set the framework for economic and business interaction, their policies prepare the ground for successful investment projects in both countries. Government institutions may also act as investors or co-investors in certain projects.

Other stakeholders, such as industry and trade associations, provide information and support for investors. Where they have India-based offices, they have access to region-specific information and can support investors locally during all business-related procedures.

Financial institutions play a relevant role; not just as potential investors, providing venture capital and private equity, but also in providing other financial products (e.g., insurance to cover product warranties and other liability claims) and financing options (e.g., leasing models for machines).

R&D institutions support joint research, helping companies to adapt both products and production to Indian market needs.

## Approach

### **Holistic approach to High-Tech cooperation**

A holistic approach for High-Tech cooperation that involves all stakeholders and integrates all verticals in manufacturing, R&D, product and service standards, skill development, and financing mechanisms can help to better realize the objectives enumerated earlier.

### **Dual strategy: harvest early while planting seeds for long term success**

While both countries could work to unlock the potential in the strategic sectors, the immediate focus could be on harvesting low hanging fruit. Exploring cooperation in High-Tech areas that deal with mass civilian industrial application should be the first

step. An integral element of this approach is the need to provide a conducive business environment and ecosystem attracting investments and technologies in the High-Tech sector. Regarding the applications used in sensitive applications (e.g. Defense, Space, arms and ammunition etc.), efforts to ease the existing regulations can be taken up simultaneously. Most of the sectors identified by the study as sectors with significant potential relate to the former than the later. Both countries can begin to work through this incremental and dual approach.

### **Confidence building**

Building greater trust and confidence in each other is critical to ensure success in both approaches, particularly for the strategic components sectors. As High-Tech cooperation entails transaction in sensitive technologies, it is important that confidence building measures are initiated to build trust between the governments, the industry, media, think tanks and civil society to create better conditions for greater openness and willingness to succeed in the High-Tech partnership.

While German companies need to be assured about various aspects of the Indian regulatory systems including IPRs, tax systems, the land acquisition process and judicial review mechanisms etc., Indian companies require greater predictability on German export control matters for sourcing dual use goods. Therefore, it is critical to address the concerns of each other on the aforementioned issues. Similarly, to move forward in the 'strategic sectors', addressing concerns over safety and security relating to critical technologies could create the desired conditions.

### **High-Tech partnership oriented to the Gol's national programs**

Integrating the High-Technology collaboration with the national programs of Gol such as Make in India, Digital India, Skill India, Innovate in India, Clean India and Smart Cities will achieve greater convergence and better outcomes.

### Strategic instruments

To support Indo-German High-Tech collaborations both within the framework of existing regulatory framework as well as in the strategic sectors for the future, the following strategic instruments are recommended for implementation:

#### **1. High level political support for High-Tech cooperation**

Within the framework of strategic partnership, both countries need to lay special emphasis for promoting investments and trade in High-Tech sectors through high level political support and through creation of appropriate bilateral mechanisms to achieve this. This could be done by creating new mechanisms as well as effective use of the existing ones such as the High Technology Partnership Group (HTPG), Indo-German Committee on Science and Technology, joint working group (JWG) on vocational training, High Defense Committee, Indo-German JWG on higher education, JWG on quality infrastructure, and others. While the HTPG can primarily address the issues concerning export controls and dual use goods in the strategic sectors as well as those sectors that are at the periphery of regulations, other bilateral mechanisms can pursue other elements of High-Tech partnership that are seamlessly integrated with the HTPG initiative. Through this approach each of these groups could work on different aspects of High-Tech cooperation under the existing mechanism and platforms. All the existing bilateral mechanisms could be strengthened with a proactive role for the industry with a view to further industry-to-industry linkages and collaborations.

#### **2. Stakeholder group for High-Tech partnership**

A stakeholder group for High-Tech partnership consisting of all relevant stakeholders including the governments and representatives from industry, R&D institutions, financial institutions, think tanks and academia could be set up. These groups could identify areas of interest and projects and develop mechanisms for implementation. On the one hand, the group should work to support the ongoing initiatives under various bilateral mechanisms without creating parallel structures. On the other hand, it can help create new mechanisms for implementation. Additionally, the group could help remove the existing bottlenecks in High-Tech sectors that are beyond the export control matters. A permanent institutional structure with office-bearers and staff will be critical to ensure that such a stakeholder group can make significant contribution to the High-Tech partnership.

#### **3. High-Tech partnership for Make in India**

Make in India is the flagship program of GoI in the manufacturing sector. It is crucial that the Indo-German High-Tech partnership is dovetailed into this important program to become one of its sub-sets. The study has identified the High-Tech sectors that hold maximum potential. Going further, specific products and projects could be identified for collaborations under Make in India. The focus should be on High-Tech Manufacturing products with strong international competitiveness. Implementation of sector-specific programs within the scope of the Make in India program, to create effective incentives for technology transfer leading towards local production in India, will be critical.

#### **4. Setting up of High-Tech industrial clusters**

Setting up of High-Tech industrial clusters in India with integrated facilities for R&D, product development, design and testing facilities. Manufacturing units, research labs and technical universities are an integral part of such clusters. This will help to create the necessary networks that promote new technologies, accelerate the process of making new technology products marketable, and identify research topics, specific application areas and future markets. Germany's successful experience in the development of such clusters holds many lessons for India. Cooperation in development of High-Tech clusters through sharing of expertise should be an integral part of the High-Tech partnership. Sectors such as Machine tools, Automotive, Defense, Aviation and semiconductor device fabrication, etc., are potential areas for such collaborations. These High-Tech clusters can act as catalysts in bringing German FDI into the critical High-Tech sectors.

#### **5. Setting up of centers of excellence**

The Indo-German Excellence Enhancement Centre (EEC), set up under the Indo-German Energy Forum (IGEF) for the Indian power sector, is a good example that is worthy of emulation for other sectors, especially the High-Tech sectors. Such centers can facilitate development of advanced solutions and adoption of best practices, and foster skill development. Sectors such as Machine tools, Automotive components and semiconductor device fabrication are some of the potential sectors for undertaking this initiative.

## **6. National network of manufacturing technology centers**

A national network of manufacturing technology centers could be set up in cooperation with manufacturing companies in India. It could be a PPP project with strong industry linkages modelled on institutions like the German Fraunhofer, Leibniz or Max Planck institutes. The capacities of existing institutions such as the Indo-German Science and Technology Centre (IGSTC), Global Innovation & Technology Alliance (GITA) and Indian academic institutions could be harnessed to support industrial R&D programs of Indian and German companies. In this regard, establishing institutional linkages between technical universities and institutions of strategic importance between the two countries is of importance. The High-Tech partnership could support this initiative.

## **7. Skill development in High-Tech sectors**

Skill development is perhaps the most potent area of bilateral cooperation between Germany and India. The strengths of the German dual principles of training are well established. Greater collaborations in skill development with dual principles of training in High-Tech Manufacturing sectors could become the cornerstone of the Skill India initiative of the GoI. Standardized on-the-job training programs in the relevant High-Tech Manufacturing skills targeting the High-Tech clusters should be implemented.

## **8. Promoting intelligent manufacturing**

Significant engineering skills, with the combination of hardware, software and system integration skills, are required in the evolution stage of advanced technology products. This niche area is called intelligent manufacturing. These are usually High-Tech products which provide high value addition but low volumes in the highly quality-conscious capital goods sector. India has a competitive advantage in this sector, where a large proportion of value addition is through software and system integration. Establishing joint and wholly owned ventures with German companies, which have manufacturing strengths and substantial market share in third world countries, would help in not only catering to the domestic market but exports to markets in Africa and the Middle East.

## **9. Development of cost efficient manufacturing technologies**

While German companies are known for high-end precision technologies and products, the price-sensitive Indian market is sometimes a challenge for them. Development of cost-effective, but efficient manufacturing technologies and products, customized to the Indian market, will be critical to their success in the Indian market. German companies that have shown great adaptability in this regard have proved to be successful. Others, especially the German "Mittelstand" need to follow this path. India's large pool of low cost High-Tech talent has attracted global companies into the country to set up R&D and high-end facilities in sectors such as Automotive, IT, health care, Engineering, etc. In the same way, India's talent pool can also be the catalyst for German companies as well.

## **10. Venture capital and start-ups as High-Tech stimulators**

Venture capital and start-ups promote greenfield FDI inflows into the High-Tech Manufacturing sector, facilitating technology transfer and capacity development in domestic manufacturing. They lead to development of new technology, new products and new production techniques. In its 2015 Budget, the GoI announced several initiatives such as an innovation promotion platform; a more liberal system of raising global capital; incubation facilities in centers of excellence; and a techno-financial incubation and facilitation program to support all aspects of start-up businesses with INR10 billion support from the GoI. This program will create the necessary spin-offs that are beneficial to German investors.

## **11. Information campaigns**

"Mittelstand" companies (MSMEs) form the backbone of the German economy and its manufacturing strengths. Many of these are 'hidden champions'. Unlike the large companies, these companies often lack proper information about the market potential of India and the procedures involved in market entry. The GoI, through its Embassy and consulates, has been reaching out to them through various channels and campaigns. These campaigns could be further intensified through availability of more resources to carry out such initiatives in the future.

### 12. Right market entry strategy

India remains an interesting market for most German companies. It is important that this 'interest' is translated into intent. Due to complexity in the business processes, different market conditions, divergent business styles and cultural differences between the two countries, the German entrepreneur is often found looking for the right market entry strategy. The role of government and industry stakeholders is important in helping German companies to address this challenge. A resource centre to support German companies looking for guidance and consultancy in formulating market strategies would be helpful. The expertise of existing institutions such as the Indo-German Chamber of Commerce (IGCC) could be harnessed to this effect.

### 13. Investor facilitation and "hand-holding"

German companies, especially the "Mittelstand", are in need of facilitation and "hand-holding". While platforms such as Invest India are available, there is a need to create an investor support cell dedicated to German investors. Such a cell could be set-up under a PPP model involving the Ministry of External Affairs, Department of Industrial Policy and Promotion (DIPP) and other ministries on the Indian side, the Federal Ministry for Economic Affairs and Energy (BMWi), and agencies such as the IGCC. Such a supportive institution should have its 'first point of contact' for companies located at the Embassy and consulates in Germany.

### 14. Setting up of B2B platforms

For certain sectors, where inter-industry linkages are crucial for business development, setting up B2B platforms will help serve as a match making platform. Industry associations such as BDI, the Confederation of Indian Industry (CII) and the Federation of Indian Chambers of Commerce and Industry (FICCI), as well as sector specific associations such as EEMA, EEPC India, the Automotive Component Manufacturers Association of India (ACMA) and the Indian Machine Tool Manufacturers' Association (IMTMA), should take a leading role in setting up such a B2B platform with relevant industry associations and chambers in this regard.

### 15. Direct linkages with Indian states

India has a strong federal structure. The state governments play an important role in facilitating investments, technology adoption and skill development. Therefore, it is extremely important that German industry, federal states, R&D institutions and technical universities are supported to develop strong

linkages with Indian states. In this regard it would be highly useful to develop mechanisms to facilitate direct contacts with the states. The Ministry of External Affairs (MEA) has already initiated steps in this regard. The MEA, through its Embassy and consulates, can act as a facilitator in this regard.

### 16. Grievance redressal mechanism

German companies affected by policy or procedural bottlenecks often find it difficult to approach the relevant authorities for assistance. A help desk for addressing such matters should be set up to liaise with the concerned government departments and ministries for solution.

### 17. Export control workshops

Regular organization of export control workshops by both governments would help the industry better understand the export control procedures in each other countries. The improvement in ease of doing business on that account could have spin-offs by way of increased business in sectors that are currently subject to export controls.

### 18. IPR workshops

IPR is a vital regulatory issue that has a bearing on High-Tech trade and investments. Given the lack of trust among the German companies over India's IPR regime, efforts should be made to reach out to them to build greater trust and understanding. Workshops on India's IPR could be undertaken to achieve greater clarity and confidence, especially in the light of the new national IPR strategy being implemented by the GoI.

### 19. Other recommendations for improving investor interest

- ▶ In large-scale projects - particularly in the infrastructure sector (e.g., airports, roads, rail and ports) risk should be diversified and entry barriers lowered for investors.
- ▶ Information and process platforms for government procurement to enable investors to take part in tenders and undergo vendor registration. Establishing tender platforms that provide necessary information can help investment decisions.
- ▶ Improvements in free inter-regional and international trade infrastructure could support and secure the global supply chain.
- ▶ Changes in tax policies - for example, excise duties - for domestic High-Tech Manufacturing, could facilitate investor decisions and guarantee an unrestricted inter-regional and global supply chain.



## Role of other stakeholders

### **Financial institutions**

Financial institutions such as banks, insurance companies, venture capital firms and private equity houses can do much to improve financial market conditions in India, by:

- ▶ Providing financial support in the form of loans and equity, to act as kick-off funding and help incentivize further private investment such as venture capital. There is huge demand in particular for finance to cover the high overhead costs of investments, e.g., for leasing models for engineering system machines.
- ▶ Also providing an adequate range of financial products (such as general insurance and tools to cover warranties or liability claims), to cover specific risks connected to High-Tech manufacturing; this will help to attract more German investors.

### **R&D institutions**

It is necessary to develop a culture of continuous Indo-German collaboration, including:

- ▶ Inter-institutional projects focusing on academic exchange and collaboration
- ▶ Collaborations between research institutions and private companies, for example, to develop products to become market-ready

### **Industry**

Private companies can help improve overall market conditions to further attract investments in High-Tech sectors by:

- ▶ Implementing standardized vocational training processes within companies, to further develop the High-Tech Manufacturing skills of India's workforce. This also requires support from government and other institutions
- ▶ Collaborating with other companies, governments or academic institutions, to develop products that meet the needs of Indian markets, and to help create a future-focused High-Tech sector.

### **Gol ongoing initiatives**

Driven by the need to provide a stable and conducive business environment for the industry, the new Government under Prime Minister Narendra Modi has initiated a number of steps to improve the ease of doing business in the country. These include:

#### ***eBiz - an instrument to ease doing business in India***

To ease processes while starting a business, and at the same time, ease executional business procedures the Gol designed the digital platform eBiz providing a single-window gateway for delivery of investor services.

#### ***Industrial corridors and smart cities - creating spillover effects***

Another initiative launched by the Gol is the development of industrial corridors and smart cities projects. These projects meet the need for regionally linked funding and the establishment of a high quality business environment.

#### ***PPP - promote public and private collaboration***

By further implementing PPP, the Gol covers a large range of investors' needs. PPP support the privatization processes through tenders, and they further support large-scale projects - particularly in the infrastructure sector (e.g., airports, roads, rail and ports).

# Strategic instruments

## 1. High level political support for High-Technology cooperation

- ▶ Creating new bilateral mechanism to promote investments and trade in High-Tech sectors
- ▶ Increased use of existing bilateral mechanisms such as High Technology Partnership Group (HTPG)

## 2. Stakeholder group for High-Tech partnership

- ▶ A group with all relevant stakeholders to support ongoing initiatives and bilateral mechanisms
- ▶ Which creates new instruments to overcome existing bottlenecks that are beyond export control matters

## 3. High-Tech partnerships for Make in India

- ▶ Focus on High-Tech Manufacturing products with strong international competitiveness
- ▶ Create an attractive environment for technology transfer to promote local production in India

## 4. Setting up of High-Tech industrial clusters

- ▶ Indo-German cooperation for High-Tech clusters to share German experience
- ▶ Create necessary networks to promote new technologies working as catalysts to promote further German FDI

## 5. Setting up centers of excellence

- ▶ Facilitate development of advanced solutions, adoption of best practices, skill improvement
- ▶ Special focus for the Machine tools, Automotive components and semiconductor device fabrication sectors

## 6. National network of manufacturing technology centers

- ▶ Establishing an institutional Indo-German linkage between technical universities and institutions
- ▶ PPP projects modelled on institutes like the German Fraunhofer, Leibniz or Max Planck institutes

## 7. Skill development in High-Tech sectors

- ▶ Indo-German collaboration within Skill India with regard to elements of the German dual use system
- ▶ Establishment of standards by Gol regarding on-the-job training programs in the relevant sectors, targeting High-Tech clusters

## 8. Promoting intelligent manufacturing

- ▶ Establishing collaborations with German companies by using India's experience in software and system integration
- ▶ Catering both for India's domestic market and export to other markets

## 9. Development of cost efficient manufacturing technologies for German SMEs

- ▶ Production needs to make use of the low-cost advantage of India and its workforce
- ▶ Products need to be customized to Indian market needs to be successful

## 10. Venture capital and start-ups as High-Tech stimulators

- ▶ Push-up budget of INR10 billion (€142 million) announced by Gol to support all procedures
- ▶ Liberalization of system for raising global capital and creation of incubation facilities

## 11. Information campaigns (support for potential investors)

- ▶ Facilitate information access especially for German SMEs
- ▶ Embassy and consulates address them directly through campaigns and special information channels

## 12. Right market entry strategy (support for starting businesses)

- ▶ Establish a resource center to support decision-making of German investors
- ▶ Help with guidance, information access and formulation of market entry strategies

## 13. Investor facilitation and “hand-holding” (support for starting/established businesses)

- ▶ Special support for German investors to help them do business in India
- ▶ Set up a point of first contact through a collaboration of Indian and German government institutions and trade chambers

## 14. Setting up of B2B platforms

- ▶ Establish match-making platforms for sectors where inter-industry linkage is crucial
- ▶ Industry associations to build bilateral network with trade associations and commerce chambers

## 15. Direct linkages with Indian states

- ▶ Develop mechanisms to facilitate direct contacts between the Indian states and German stakeholders like R&D institutions, industries etc.
- ▶ Embassies and consulates will act as an interface to implement and support the mechanisms

## 16. Grievance redressal mechanism

- ▶ Implementing a help desk for German companies to help them contact to government departments
- ▶ Similar to the investor help desk (no. 13)

## 17. Export control workshops

- ▶ Regular organization of Indo-German workshops to improve the understanding of export control procedures in both countries
- ▶ Increased ease of doing business in affected sectors

## 18. IPR workshops

- ▶ Establish workshops to achieve clarity and confidence of Indian IPRs as part of the new national IPR strategy
- ▶ Build up trust of German companies in India's IP framework

## 19. Other recommendations for improving investor interest

- ▶ PPP in large-scale projects, such as airports, infrastructure; risk diversification and decrease of entry barriers for investors
- ▶ Information and process platforms for public tenders and public procurement
- ▶ Improve free interregional and international trade to support global supply chain
- ▶ Changes in tax policies, such as excise duties for domestic High-Tech Manufacturing, to facilitate investor decisions and further support global supply chain

# Conclusion

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# and outlook

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India is in the process of transforming itself into an open and investment welcoming country. The recent policy changes being implemented by the Government under Prime Minister Modi, particularly the opening of sectors for foreign investments and measures to improve the ease of doing business, are proof that the Government of India is rebuilding trust among global investors.

The initiatives that began with the Make in India program are the most comprehensive economic reforms India has seen since its independence. Investment in education and skill development is a basic instrument, but suitable to empower its population to achieve sustainable growth through a wide robust middle class. The creation of infrastructure, Smart Cities and sustainable water and power schemes are initiatives, will not only attract foreign investors but their successful implementation will cause a win-win situation supporting India on its sustainable way to healthy inclusive growth.

The creation of millions of new jobs every year will boost disposable incomes and accordingly create the basis for millions of people to shift into the fast growing middle class. The clear orientation of Indian society to a wide range of diversified indigenous products is forcing investors to develop products that are adapted to the Indian market and beyond, opening up the huge potential of different surrounding markets.

The Government of India has announced huge investments in different sectors in order to achieve the goals of a sustainable India that caters for the needs of its population. Based on past experience, those investments can be interpreted as fruitful investments that again ignite a multiplicity of further investments. The combination of push-start investments in connection with the launched reform package is likely to boost foreign direct investment and help to accomplish the desired high quality of life in a connected, green and smart India.

The stimulators for investments in High-Tech sectors as in any other sector will be an improved business environment that results in greater capital and technology flows. Also, measures to support private entrepreneurs with regard to collaboration in sensitive areas will open new routes of convergence, in particular, to get leading edge technologies into India. Enabling the financial sector to provide investors better access to equity and debt will offer a wide range of instruments to finance new operations. India's movement towards membership of the international export control regimes and the new national IPR strategy will facilitate and promote international trade and the transfer of High-Technology from across the world.

The Indo-German High-Tech Partnership for manufacturing has the potential to significantly benefit both countries and contribute to the betterment of their societies. Germany and India have complementary potentials that together are suitable for a healthy and sustainable partnership. While Germany has well established High-Technologies, its population is getting into an ageing structure which will not provide a sufficient young skilled workforce and academics in the long run. On the other hand India has a vast, young and high quality manpower that Germany could benefit from. Together, both countries have the complementary resources to overcome the challenges of the future. Greater trust and understanding between both the partners can bring about a close cooperation between the two - and wider Europe - in the High-Technology sectors. When accomplished, this could unlock the significant potential for mutual growth. Implementation of the strategic instruments detailed in the roadmap section of this report will hold the key to this success.

“India has undertaken the ambitious task of reconfiguring its energy landscape. The increasing demand for electricity in combination with game changers like the shift toward higher shares of renewables, ask for a quick and fundamental transition towards a reliable and sustainable electrical system. Over the last 10 years, the transmission system operators of the Elia Group – Elia in Belgium and 50Hertz in Germany – have created important preconditions for a similar energy transition in Europe – with 50Hertz as a world leader in integrating renewable energy sources in its transmission system. Based on the expertise and best practices in Europe, we can contribute to India’s ambition to create a reliable, secure and performant electrical system. Experts from the international division Elia Grid International could support local transmission specialists in the development of the future Indian power system. The benefits of this would not only be felt by the energy market itself, but also by the overall economy and the entire Indian society.”

**Boris Schucht, CEO, 50Hertz Transmission GmbH, Berlin**

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# Abbreviations

2W	Two-Wheeler	DHI	Department of Heavy Industry
4W	Four-Wheeler	DICV	Daimler India Commercial Vehicles
ACMA	Automotive Component Manufacturers Association of India	DIPP	Department of Industrial Policy & Promotion
AG	Aktiengesellschaft	DLR	German Aerospace Centre
AIM	Atal Innovation Mission	DODP	Department of Defence Production
AMP	Automotive Mission Plan	DOS	Department of Space
APAC	Asia Pacific Area	DPCO	Drug Price Control Order
ARCI	Advanced Research Centre for Powder Metallurgy & New Materials	DST	Department of Science and Technology
Art.	Article	e.V.	eingetragener Verein
ATM	Automated Teller Machine	EAR	Export Administration Regulations
AWV	Außenwirtschaftsverordnung	EC	European Council
BAFA	Bundesamt für Wirtschaft und Ausfuhrkontrolle	ECB	European Central Bank
BDLI	Bundesverband der Deutschen Luft- und Raumfahrtindustrie e.V.	EEC	European Economic Community
BEE	Bureau of Energy Efficiency	EECN	Export Control Classification Numbers
BFW	Bharat Fritz Werner	EHTP	Electronic hardware Technology Parks
BIS	Bureau of Industry and Security	EMCs	Electronic Manufacturing Clusters
BMBF	German Federal Ministry of Education and Research	EMS	Electronic manufacturing services
BMU	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	EOU	Export Oriented Units
BMWI	Federal Ministry for Economic Affairs and Energy	ESA	European Space Agency
BMZ	German Federal Ministry for Economic Cooperation	ESDM	Electronic System and Design
BOT	Built-Operate-Transfer	ESMT	European School of Management and Technology
BPM	Business Process Management	ESOP	Employee Stock Ownership Plan
BRICS	Brazil, Russia, India, China, South Africa	EU	European Union
BSE Sense	Bombay Stock Exchange Sensitivity Index	EUC	End User Certificate
BTIA	Bilateral Trade and Investment Agreement	EUR	Euro
CAGR	Compound Annual Growth Rate	FDI	Foreign Direct Investment
CBIC	Chennai Bengaluru Industrial Corridor	FICCI	Federation of Indian Chambers of Commerce and Industries
CEA	Central Electricity Authority	FMCG	Fast Moving Consumer Goods
CEO	Chief Executive Officer	FY	Financial Year
CFO	Chief Financial Officer	GCI	Global Competitiveness Index
CFSP	Council of Foreign National Security Position	GDP	Gross Domestic Product
CHP	Combined Heating and Power	GIZ	Gesellschaft für internationale Zusammenarbeit
CII	Confederation of Indian Industry	Gol	Government of India
C-level	Company Executive Board	GST	Goods and Service Tax
CPI	Consumer Price Index	GTTI	Gedee Technical Training Institute
CPSE	Central Public Sector Enterprises	GW	Gigawatts
CRT	Cathode Ray Tube	HCC	Hindustan Construction Company
CSP	Concentrating Solar Panel	HDC	High Defense Committee
CWC	Chemical Weapon Convention	HMT-MTL	HMT Machine Tools Limited
DB	Deutsche Bahn	HS-codes	Harmonized System Codes
DCI	Department of Commerce and Industry	HTPG	Indo-German High-Technology Partnership Group
DDTC	Directorate of Defense Trade Controls	HVDC	High-Voltage Direct Current
DEL	Denied Entities List	IAA	International Motor Show
DGFT	Department of Commerce and Industry	IBEF	Indian Brand and Equity Foundation
		ICAO	International Civil Aviation Organization
		ICP	International Compliance System
		ICT	Information and Communication Technology



IESA	Indian Electronics and Semiconductor Association	NOC	No Objection Certificate
IGC	Intergovernmental Consultations	NOFN	National Optic Fiber Network
IGCC	Indo-German Chamber of Commerce	NPE	National Policy on Electronics
IGCS	Indo-German Center for Sustainability	NSG	Nuclear Suppliers Group
IGEF	Indo-German Energy Forum	OECD	Organisation for Economic Co-operation and Development
IGEN	Indo-German Energy Programme	OEM	Original Equipment Manufacturer
IGSTC	Indo-German Science and Technology Centre	OFAC	Office of Foreign Asset Controls
IGTC	Indo-German Training Center	OSCE	Organization for Security and Co-operation in Europe
IIT	Indian Institute of Technology	OTC Medicine	Over-the-Counter Medicine
IMF	International Monetary Fund	PPP	Public Private-Partnership
IMPECS	Indo-German Max Planck Centre for Computer Science	PR	Public Relations
IMTMA	Indian Machine Manufacturers Association	PSLV	Polar Satellite Launching Vehicle
INR	Indian Rupees	PSU	Public Sector Undertaking
IPO	Initial Public Offering	PV	Photovoltaic
IPR	Intellectual Property Rights	Pvt. Ltd.	Private Limited
ISO	International Organization for Standardization	R&D	Research and Development
ISRO	Indian Space Research Organization	ROC	Registrar of Companies
IT	Information Technology	ROI	Return on Investment
ITT	Indian Institute of Technology	S&P 500	Standard & Poor's 500
ITAR	International Traffic in Arms Regulations	SCOMET	Special Chemicals, Organism, Materials, Equipment and Technology
ITC-HS	Indian Tariff Classification - Harmonized System	SE	Societas Europaea
ITeS	Information Technology Enabled Services	SETU	Self-Employment, Incubation and Talent Utilization
JV	Joint Venture	SEZ	Special Economics Zones
JWG	Joint Working Group	SIAM	Society of Indian Automotive Manufacturers
KfW Bank Group	Kreditanstalt für Wiederaufbau ("Reconstruction Credit Institute" is a German state-owned bank)	SME	Small and Medium Enterprises
LCD	Liquid Crystal Diodes	SOP	Standard Operating Procedure
Ltd	Limited	STP	Software Technology Parks
M&HCV	Medium and Heavy Commercial Vehicles	T&D	Transmission and Distribution
MEA	Ministry of External Affairs	TIFR	Tata Institute of Fundamental Research
MFD	Multi-function Displays	TMT	Technology, Media, and Telecommunication
MNC	Multinational Corporations	U.S.	United States
MNRE	Ministry of New and Renewable Energy	UK	United Kingdom
MOCI	Ministry of Commerce and Industry	UN	United Nations
MOD	Ministry of Defense	UNSC	United Nations Security Council
MoP	Ministry of Power	UPS	Uninterruptible Power Supplies
MOSPI	Ministry of Statistics and Programme Implementation India	USA	United States of America
MRO	Maintenance Repair Overhaul	USML	United States Munich List
M-SIPS	Modified Special Incentive Package Scheme	VC	Venture Capital
MSME	Micro Small and Medium Enterprises	VDA	German Association of Automobile Industry
MTCR	Missile Technology Control Regime	VDMA	German Engineering Association
MW	Megawatts	VDW	Verband Deutscher Werkzeugmaschinenfabriken
NATO	North Atlantic Treaty Organization	VW	Volkswagen
NATRIIP	National Automotive Testing and R&D Infrastructure Project	WA	Wassenaar Arrangement
NHAI	National Highway Authority of India	WMD	Weapons of Mass Destruction
		WPI	Wholesale Price Index
		ZVEI	Zentralverband Elektrotechnik- und Elektronikindustrie

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“My Government’s Make in India initiative is the centerpiece of our efforts to enhance the share of manufacturing in our economy on a sustainable basis while generating employment for millions of young men and women. This initiative will also create value and jobs for German companies that invest in India. Germany’s core competence in engineering, innovation and skills is well recognized. They fit in well with my Government’s programmes including Digital India, Clean India and Skill India. We invite German companies to join us in creating a world-class manufacturing infrastructure that leverages our advantages; Democracy, Demography and Demand; with German technology and engineering skills. Germany is a preferred partner to transform India into a global manufacturing hub.”

**Narendra Modi**  
**Prime Minister of India**

### Supporting partners



Investment & Technology Promotion Division  
Ministry of External Affairs  
Government of India



Disarmament & International Security Affairs Division  
Ministry of External Affairs  
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