

Leitbild WaBe

MODEL OF SUSTAINABLE GROWTH AND EMPLOYMENT IN THE
NUREMBERG METROPOLITAN REGION

REPORT

WISSENSCHAFTLICHE UND STRATEGISCHE
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1. A STRATEGY IN ACTION IN A SUCCESSFUL REGION

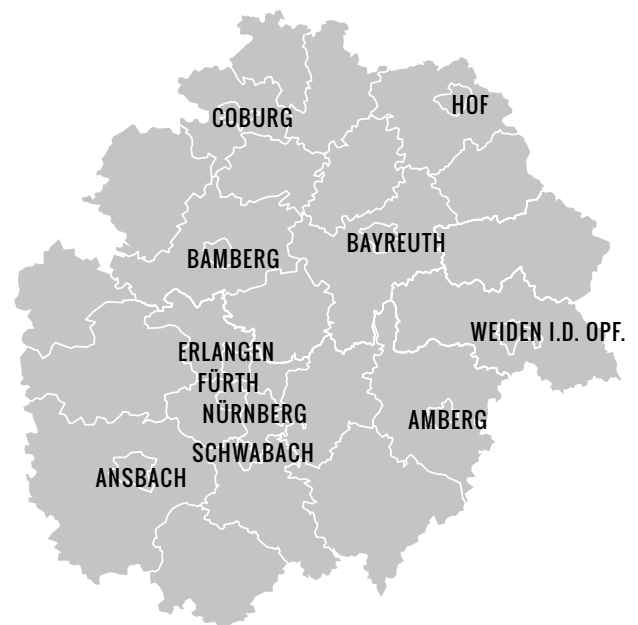
The Nuremberg Metropolitan Region approved its model of sustainable growth and employment (German: “Wachstum und Beschäftigung”, WaBe) in 2010, identifying seven cross-linked areas of competence which, in some cases, can be traced back to the development strategy implemented by the Nuremberg Economic Region in 2005. The areas of competence are designed as clusters, in which production and technology, specific services, research and development are all closely interlinked. The region displays above-average strengths here when compared internationally.

The strategy sought to pool the fortes of all participants in the region, giving the Metropolitan Region a chance to collectively shape its future development. The overarching aim was and still is to permanently ensure a dynamic, sustainable metropolitan region through joint efforts by many regional players. This is therefore being implemented in various projects spread across the entire region, with the players in the seven areas of competence co-operating with one another as part of the regional competence initiatives. In addition to these initiatives, particular key players include the municipalities’ universities, research institutes, economic chambers, trade unions and business development facilities.

They also share responsibility for strengthening social cohesion in the Nuremberg Metropolitan Region.

In 2015, after successful years of economic prosperity, the Nuremberg Metropolitan Region revisited the question of whether it is suitably prepared for the future. Over the course of time there have been changes in both economic and social challenges. Climate change and the shift in energy policy are coming more intensely into focus, and increased migration to Germany offers both challenges and new opportunities. Digitalisation has revolutionised all areas of life and work, bringing with it new potential for design. For these reasons, the strategy was revised with the intense involvement of regional decision-makers and players from all areas of competence. Workshops and numerous talks saw the work of recent years reviewed, successful projects and issues identified, and new options for organisational cooperation explored.

Trends which have influenced the areas of competence and metropolitan region in general were outlined, and specific challenges which are shaping future work were analysed. The players came from



AREA (2014):	21,800 km ²
POPULATION (2014):	3.5 Million
WORKING POPULATION (2014):	1.9 Million
GDP (2013):	118 bn €
EXPORT SHARE (2014):	47%

all over the region, thereby supporting the idea of it being a dynamic, living place.

The players' assessments and perceptions of the metropolitan region play a key role in the success of the strategy. The developments from recent years were collectively evaluated with the help of quantitative data analysis and qualitative appraisals. A comparison with several benchmark regions helped to further elaborate the Nuremberg Metropolitan Region's strengths, while areas offering opportunities and potential for improvement were also identified.

For the Metropolitan Region, the "Leitbild WaBe" approach is part of a larger regional strategy, establishing the guidelines for economic, technical and scientific focuses. It is not, however, expressly considered an approach for tourism, social, cultural or other matters, instead serving as a compass for deep, regional interrelationships which maximise the potential for added value. As such, it shapes the region's image, and gives it a distinct profile, both nationally and internationally.

THE "LEITBILD WABE" MODEL ...

- serves to position the Nuremberg Metropolitan Region in a state, national and EU context. The technological areas of competence are to be collectively developed and strengthened by building on the mega trends.
- is considered a guideline for the metropolitan region's economic/technological/scientific

development. It provides a pan-regional perspective based on sub-regional responsibilities and focus areas.

- serves as a vision for the region. It outlines various fields of innovation presenting excellent future prospects for the years to come.
- contributes to long-term developments in employment through the future-oriented focus of its economic and scientific focus areas and areas of activity. In doing so, it concentrates on job market integration, social co-operation, and good working conditions.
- acts as an orientation guide and argument basis for detailed master plans.
- is a marketing instrument designed for internal and external communications.

"Leitbild WaBe" assessment			"Leitbild WaBe" development	
QUALITATIVE AND QUANTITATIVE ASSESSMENT	ASSESSMENT OF STRATEGY IMPLEMENTATION TO DATE AND BENCHMARK	DEVELOPMENT TRENDS AND RECOMMENDATIONS	DOCUMENTATION AND COMPLETION	PASSING THE MODEL
<ul style="list-style-type: none"> • Overview and initial assessment of strategy to date • Analysis of regional areas of expertise 	<ul style="list-style-type: none"> • Overall assessment of strategy implementation to date • Benchmark in a national and international context, identification of G&E highlights 	<ul style="list-style-type: none"> • Processing the development trends • Establishing recommendations for G&E further development 	<ul style="list-style-type: none"> • Establishing recommendations for G&E further development 	<ul style="list-style-type: none"> • Signing the common declaration of the model within the Nuremberg Metropolitan Region
APRIL 2015	JULY 2015	NOVEMBER 2015	MAY 2016	JULY 2016

The Metropolitan Region has already been able to position itself successfully in recent years. All players involved in the update understand that the Nuremberg Metropolitan Region is a strong, successful location with enormous future potential.

DYNAMIC ECONOMIC AREA The Metropolitan Region is a prospering and extremely dynamic economic area. The employment rate is well above the German average, and is the highest in all of Bavaria. This dynamism is also reflected in economic performance. Over the past ten years, the region has not only recorded a steep rise; it has developed better than Bavaria as a whole. Many people have found work, lastingly taking the pressure off the social systems. Relationships have also been developed at an international level. There is hardly any branch of industry whose exports did not rise by a double-digit percentage over the past decade. Further international networking and ongoing increases in the workforce participation rate also offer additional medium-term and long-term potential for these developments to continue in future.

SPACE FOR QUALITY OF LIFE The Metropolitan Region is today home to around 3.5 million people. The attractiveness of this scenic and culturally appealing region is also reflected in the positive migration ratio, which has significantly been on the rise since 2010. While the demographic shift has revealed itself in all its facets throughout the Metropolitan Region, the region has been able to tackle these challenges, and made considerable gains in areas such as medical care. This is evidenced by the dynamic development in health-industry workers. The Metropolitan Region is also a pioneer in renewable energy, with its share of total power consumption from these sources well above the national average. In addition to this is its good accessibility. And when it comes to further developing the region and attracting skilled workers, the issues of affordable housing and good public services are equally important factors.

A WIDE RANGE OF CAREER OPPORTUNITIES The Metropolitan Region provides jobs for 1.9 million people. Its varied economic structure, with large corporate groups, internationally operating SMEs and small-scale businesses, offers a great number of opportunities for employees. The region's companies produce for the international market, create new materials, develop environmentally friendly technologies, perform research into health, and organise national and international logistics. In the spirit of lifelong learning, the Metropolitan Region invests in education and further training, offering all sections of the population the opportunity to secure long-term employment.

A HIGHLY INNOVATIVE SPACE The Metropolitan Region promotes ideas, and is a very innovative region. Germany, in general, has an exceptionally high concentration of research institutes. As such, the Metropolitan Region does not cling onto old mindsets, instead supporting research in cross-cutting industries, because further potential lies in networked innovation and research. In view of this, areas such as the Nuremberg-Fürth "Science Corridor" provide the ideal setting for technological facilities. The aim of the Science Corridor is to pool infrastructure, resources and expertise in science and research to ensure that local scientific innovation are incorporated into the value chain. By thinking outside the box and engaging in national and international co-operations, it encourages technology transfer in future-oriented fields. The labour market permanently benefits from these developments, having recorded an exceptional rise in academics in recent years. The Metropolitan Region's focus on SMEs also makes it less susceptible to crises, while the large business and various global market leaders which are based there guarantee a good reputation at an international level.

2. SUCCESSFUL AREAS OF COMPETENCE - THE SITUATION 10 YEARS ON

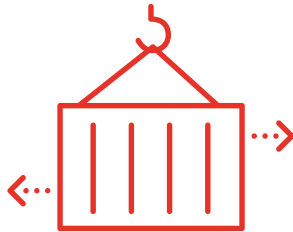
The Growth & Employment strategy has given rise to a regional communication platform incorporating scientific, business and political players, and particularly the competence initiatives, into one strategic process, and to the outside world it documents the region's unity in the competition between regions. The Nuremberg Metropolitan Region has gained significant momentum in recent years through numerous projects in start-ups, education, innovation and infrastructure.

The question "What have we achieved with the strategy?" is answered through the "G&E highlights" shown in the expertise descriptions below. Backed up with examples, the following key messages can be established:

IN THE NUREMBERG METROPOLITAN REGION ...

- ... Business and science are setting a visible tone and high-lighting new paths in important innovation fields of the future! For example with the Energie Campus Nürnberg (EnCN) as a beacon of energy research in the region.
- ... Universities and research institutes are conducting top, internationally recognised research in a number of fields, such as drive technology (E|Drive-Center), medical technology (national leading-edge cluster in medical technology) and energy (Fraunhofer UMSICHT).
- ... Prominent, successful trade fairs and conventions of international importance are right at home! E.g. SPS IPC DRIVES or Integrated Plant Engineering Conference IPEC in the field of automation and production technology.
- ... Public and private investments lay the foundations for growth and employment! Such as the development of cluster infrastructures with the Medical Valley Forchheim.
- ... Companies with a highly regional identity successfully do business and invest in the business hub that is the Nuremberg Metropolitan Region, e.g. Siemens with the Elektronikwerk Amberg (EWA) as a pioneer in "smart factories".
- ... Science, business, policymakers, unions and administration forge networks, and work together to create success! E.g. in specific projects such as smash smart assisted secure home.

2.1. TRANSPORT AND LOGISTICS



THE AREA OF COMPETENCE The world is becoming increasingly connected at a rapid speed. This not only applies in relation to the digital age, but also to the ever growing exchange of goods and services. The transport and logistics industry benefits from this through the new opportunities provided by digitalisation. Electronic data transmission systems offer new prospects for transport control, while simultaneously increasing transport safety. The Metropolitan Region makes a significant contribution here, boasting exceptional expertise particularly in the field of railway technology. For example it is home to the world's first fully automated mixed-service subway. As a logistics hub for Central and Eastern Europe, it also offers excellent conditions to benefit from the neighbouring foreign markets.

Around 120,000 employees were recorded in this field in 2014. Based on total employment in the Metropolitan Region, this equates to 8.9% of all workers. The field has also grown by a further 6.5% compared to 2008.

This area of competence focuses on railway technology, electronic data transmission and drive technology, while also specialising in various fields of logistics, intermodal mobility and the automotive industry.

THE COMPETENCE INITIATIVE Promoting interrelationships in the region is the task adopted by the CNA e. V., as the responsible initiative in this field. The aim is to enhance synergies and thus create competitive advantages for the over 130 members and further 650 competence partners. To speed up innovation processes, the CNA is particularly focused on increasing cross-links between science and business. It is driven by a vision of sustainable, intermodal mobility powered by smart systems.

Over 13,000 participants have already been reached through more than 200 events. By awarding an annual innovation prize for products or services which significantly contribute to sustainable economic growth, securing jobs or preserving competitiveness, the CNA further underlines its mission to promote innovation in the region.

SUCCESSSES Recent years are evidence of the Metropolitan Region's successful work. An innovative new course has been created in the form of the "Urban Mobility" Masters course at the Nuremberg Technical University, while the "Logistik Forum" and "Forum Bahntechnik" further support the region's great expertise. The Metropolitan Region also boasts excellent international connections with the CNA as founding member of the European Railway Cluster Initiative (ERCI).

Interdisciplinary exchange is alive and well here. In addition to its own networking activities, the CNA is also responsible for managing the Railway Technology Cluster in Bavaria, and is simultaneously the coordination centre for the "Logistik Initiative Bayern". Pooling expertise into one initiative creates synergies, and illustrates the region's prominence in the field of transport and logistics.

Since mid-2013, the Metropolitan Region has been part of the Model Region for Hybrid and Shunting Locomotives. Deutsche Bahn AG spent eight years testing innovative drive systems here for rail transport, with the aim of significantly reducing fuel consumption, as well as pollutant and noise

emissions. 12% of diesel consumption in German rail transport currently comes from shunting operations. The project has been a milestone in the development of ecological and environmentally friendly rail vehicles, and is funded by the Free State of Bavaria

TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	+6.1 %
BAVARIA:	+10.4 %
GERMANY:	+10.7 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 8.9 %	

LOGISTICS

- Logistics expertise across all modes of transport
- Logistics hub for Central and Eastern Europe
- Combined transport
- Environmentally friendly logistics

ELECTRONIC DATA TRANSMISSION

- Intelligent transport systems and traffic control
- Automatic driving
- Door-to-door navigation in local public transport

RAILWAY TECHNOLOGY

- Infrastructure and energy
- Operation and maintenance
- Train control and safety
- Vehicles

INTERMODAL MOBILITY

- For people
- For goodse
- Urban mobility

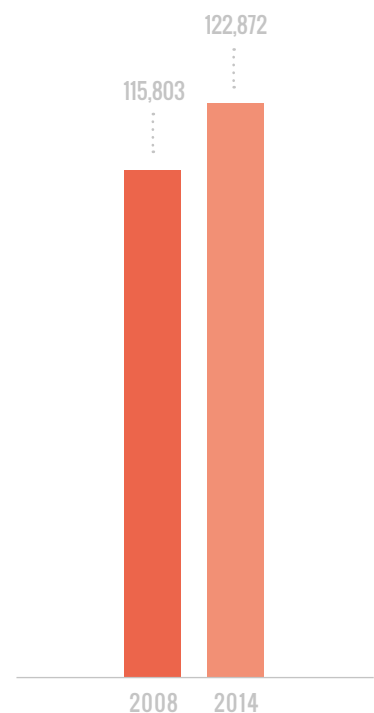
DRIVE TECHNOLOGY

- Alternative energy source for mobile applications
- Alternative drive systems for rail cars
- Alternative drive systems for commercial vehicles and buses

AUTOMOTIVE

- State-of-the-art testing and measurement techniques
- Onboard network system
- Components for hybrid and electric drive technology

EMPLOYEES IN THE AREA "TRANSPORT & LOGISTICS"
 ↗ 6.1 % (2008 - 2014)



2.2. AUTOMOTIVE



THE AREA OF COMPETENCE Ever increasing digitalisation and growing environmental awareness are already changing the automotive industry for the long term. Assistance systems park vehicles independently, and are giving an initial impression of what automated driving could look like in future. Electromobility is gaining in importance, and it is only a matter of time before it permanently replaces classic combustion engines. With its broad mix of suppliers, the Metropolitan Region is perfectly equipped to promote and critically shape these and other future issues. One of its key strengths lies in its high level of material expertise, and the associated possibilities for lightweight construction. While the corporate landscape is more SME-based, it is also home to global market leaders from a wide range of industries. Coupled with this is a research landscape tailored precisely to specific needs in the form of the E|Drive Centre at the University of Erlangen-Nuremberg or the Automotive Technology Transfer Centre at Coburg University of Applied Sciences.

This area of competence recorded around 88,000 employees in 2014, and therefore 8,000 or 10.0% more than was the case six years prior to this. This is an excellent achievement even by German standards, where the national growth was only 5.3%.

This field revolves around material aspects, electromobility and drive technology. The global players based here mean that warehouse technology, modular door systems and onboard electrical systems also play a very significant role.

THE COMPETENCE INITIATIVE ofraCar e. V. is the mouthpiece of this area of competence. The Bayreuth-based automotive network considers itself a central communication platform for national and cross-company information exchange. Through specific qualification measures and field-based cooperations, ofraCar systematically increases the competitive advantages of its members and network partners. The network activities are geared directly around the concrete needs of the member companies, thereby ensuring a high degree of relevance. The good networks across the region help with finding the right contacts for specific challenges, and provide opportunities to jointly formulate new solutions through cross-company collaborations. Since its establishment, the network has been constantly growing, and currently has around 50 permanent member companies.

SUCCESSSES Permanent survival in the competition requires having specialist staff who are always familiar with the latest developments and methods. A special competence offensive saw over 250 staff from more than 30 companies in the Metropolitan Region receive targeted training in the “Six Sigma” approach alone.

The region’s competence and high degree of innovative spirit is evidenced by companies like the multi-award winning Concept Laser GmbH. This subsidiary of the Hofmann Innovation Group in Lichtenfels is considered a global technology leader and driver of innovation when it comes to laser melting metals, and holds a patent in laser cusing. This technology is used to manufacture highly complex prototypes and small series through



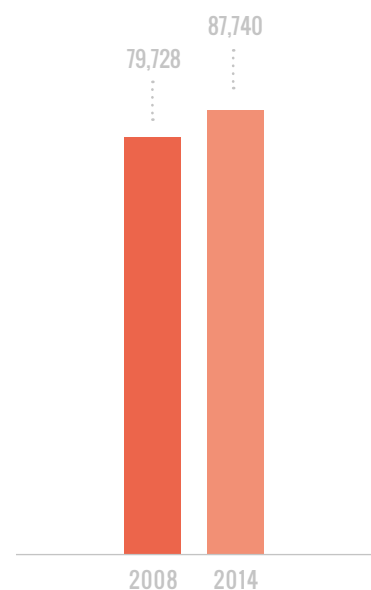
3D printing for the worldwide automotive industry. The patented process significantly reduces tension in the component, enabling solid, large-volume parts to be generated without distortion.

The quantities of data produced daily at the company are enormous. The joint Smarte Dienstleistungs-Fabrik ("Smart Services Factory", Smarte DiF) project aims to use these data volumes safely, transparently and sustainably across company boundaries. It also aims to significantly increase both the speed and quality of services for factory production. The highly innovative project was initiated by Schaeffler AG and the University of Erlangen-Nuremberg, among other establishments, and has received € 1.6 million in federal government funding.

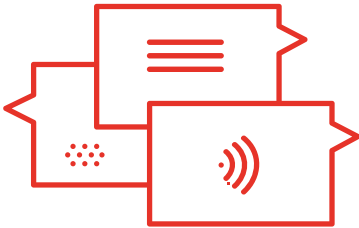
TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	+10.0 %
BAVARIA:	+7.1 %
GERMANY:	+5.3 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 6.3 %	

- MATERIALS**
 - Technical textiles in seat or protective hose production
 - Plastic processing
- MODULAR DOOR SYSTEMS**
 - Customised production
 - Merging of several functions (window lifter, lock) into one product
- DRIVE TECHNOLOGY**
 - First series production of hybrid modules
- ONBOARD ELECTRICAL SYSTEMS**
 - High degree of expertise in assistance systems
- STORAGE TECHNOLOGY**
 - Global market leader in roller bearing technology
- ELECTROMOBILITY**
 - Know-how in electric drives and power electronics

EMPLOYEES IN THE AREA "AUTOMOTIVE"
 ↗ 10.0 % (2008 - 2014)



2.3. INFORMATION AND COMMUNICATION



THE AREA OF COMPETENCE Information and communication technologies (ICT) have permanently changed our everyday life, and an end to the digital revolution is nowhere near in sight. While IT solutions used to be predominantly applied in work situations, they are today found in all aspects of life. As such, the economy benefits from connected production or goods flows that can be monitored in real time, while Smartphones and mobile applications allow people to control heating in their own homes or complete bank transactions online. This also means issues like data security and stable network connections are gaining importance, and the Metropolitan Region is making a critical contribution here. Around 20,000 small and medium-sized businesses are developing software solutions both for everyday challenges and for highly specific needs, e.g. in the medical field. Projects like the Nuremberg digitalisation offensive are similarly constantly creating innovative approaches that put companies in a position to actively tackle and shape the effects of digitalisation.

Around 84,000 people were working in the information and communication technologies sector in 2014. Compared to 2008, this field has developed excellently, recording 24.9% growth! This also holds true in a state and national context, with Germany as a whole “only” recording 14.4% and Bavaria 18.7%.

This area of competence revolves around aspects such as smart data and security, as well as open source software. Broadband communication systems and specific software solutions for the automation and medical industries are other key competencies in the Metropolitan Region.

THE COMPETENCE INITIATIVE The NIK – Nuremberg Initiative for the Communications Industry strives to enable its members to work innovatively and successfully, and serves as a central platform for them during project and partner searches. It offers companies professional advice when selecting suitable funding programmes, and also assists with running events and PR. The initiative has around 100 members from businesses, research institutes and universities.

SUCSESSES The Metropolitan Region is one of the top ICT regions in Europe. According to the European Commission, it is distinguished by a successful corporate landscape, innovative products and approaches, and high research intensity¹. The networking between these individual areas is reflected, for example, in the “eBusiness-Lotse” competence centre which raises companies’ awareness about ICT applications and their benefits. The project is funded by the federal government.

The region’s multidisciplinary aspect is embodied by the smash – Smart Assisted Secure Home network, which prepares the housing industry for future challenges, such as demographic change. It brings together equipment and service providers from the fields of home automation, energy and facility management, IT-based health services, e-commerce, leisure and social affairs to create comprehensive solutions. This involves transcending system boundaries, and interlinking trends such as Smart Home, Smart Metering and Ambient Assisted Living (AAL). As such, the project pursues a

¹ Cf.: European Commission (2104): Mapping the European ICT Poles of Excellence: The Atlas of ICT Activity in Europe.

very innovative approach, and is funded by the Central Innovation Programme for SMEs (ZIM).

In the L.I.N.K. Test and Applications Centre the Fraunhofer IIS pools the key technologies of localisation, identification, navigation and embedded communication in one location. The centre provides the perfect combination of technological environment and realistic, application-focused test conditions for developing new technologies and services. It is also available to companies, which are able to optimise their processes here. The project has been funded by the Free State of Bavaria, the German federal government and the European Union.

TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)

METROPOLITAN REGION:	+24.9 %
BAVARIA:	+18.7 %
GERMANY:	+14.4 %

PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014):	6.0 %
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IT SERVICE PROVIDER AND TELECOMMUNICATION

- Systems vendors (installation, maintenance, operation)
- Service providers, data processing centres
- Advice for corporate IT (Data warehouse, automation, logistics, CRM etc.)

OPEN SOURCE

- Development of open source software

BROADBAND COMMUNICATION SYSTEM

- R&D projects in infrastructure (network, network access, applications and content)

SMART DATA & SECURITY

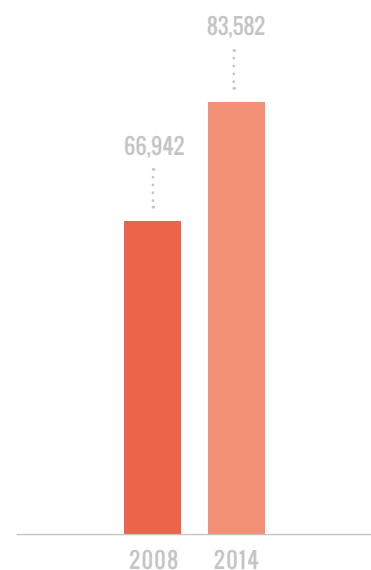
- Business Intelligence
- Big Data
- IT-Security

SOFTWARE SOLUTIONS FOR AUTOMATION, MEDICINE AND BUSINESS APPLICATIONS

- Software development
- Software quality

EMPLOYEES IN THE AREA "INFORMATION & COMMUNICATION"

↗ 24.9 % (2008 - 2014)



2.4. MEDICINE AND HEALTH



THE AREA OF COMPETENCE An ageing society is one way to guarantee growth in the health industry. The need for preventive, diagnostic and therapeutic services is increasing, along with the industry's overall economic importance. Medical technology, pharmaceuticals and biotechnology are the technological drivers of medical advancements, and the Metropolitan Region is contributing significantly to this. In medical technology alone, it has over 500 mostly small and medium-sized businesses, although global players, including those from the related field of sporting goods, are also present, and equally shape this area of competence. More than 80 university institutes, as well as 20 non-university establishments, similarly research and teach in the field of medical technology.

The exceptional concentration of companies and research institutes in the region is also reflected in employee figures. Around 127,000 people were recorded as working in this area of competence in 2014, constituting an increase of 17.3% compared to 2008. With 9.2% of all employees in the Metropolitan Region, approximately one in 11 employees is affiliated with this cluster – a really fantastic statistic!

This area of competence particularly revolves around medical technology and the health industry. The region leads the way in technologies used in imaging diagnostics, smart sensors, therapy systems, ophthalmology and healthcare IT.

THE COMPETENCE INITIATIVE As the central mouthpiece for this field, the Medical Valley e. V., has set itself the task of promoting interrelations between producers, hospitals and research & science. Close exchanges between research and application enable highly innovative products to be developed, while effective, efficient solutions seek to optimise healthcare structures over the long term.

The initiative's successes are evidenced by the amount of funding received. Since 2010, over € 65 million in public money has been obtained, with the total project volume being around € 100 million. The more than 1,000 press reports released in the same time frame illustrate the outstanding marketing work performed, and position the Medical Valley and Metropolitan Region as excellent brands and attractive locations, also at an international level.

SUCCESSSES The innovation potential of this area of competence is similarly demonstrated by the large number of patent applications. 42% of all Germany's initial patent applications in the fields of diagnostics, surgery and identification come from the Metropolitan Region. The cluster is also a model region for digital health, and runs one of Germany's leading conventions in medical technology and health in the form of the Medical Valley Summit.


The Medical Valley e. V. was named the national leading-edge cluster for medical technology in early 2010, making it Germany's only cluster in this field. Over a space of five years it thus benefited from € 40 million in public funding, though this also requires the economy to participate financially in regional development. As such, a total of 45 innovative projects



have been initiated, and international attention is increasing. For example, the potential savings for the German health system up until 2020 have been calculated at almost € 1.5 billion. The federal government's grant regarding the internationalisation of leading-edge clusters followed in early 2016.

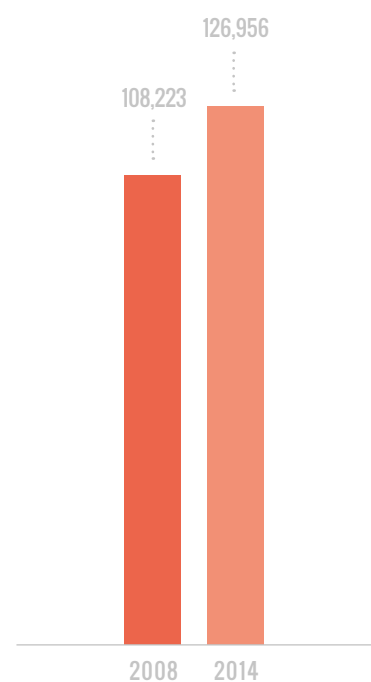
A cluster's success is also largely dependent on an excellent start-up scene. The Medical Valley Center has been in Erlangen since as early as 2001, when it was known as the Innovationzentrum Medizintechnik und Pharma ("Innovation centre for medical technology and pharmaceuticals"). As of mid-2016, the services are being expanded to include the Medical Valley Center Forchheim, which features over 4,000 sq m of modern infrastructure with offices, laboratories and conference rooms. The proximity to other companies encourages networking and interdisciplinary knowledge transfer, while new businesses are provided with extensive services. The focus is on consultancy relating to issues such as business management and planning, funding, marketing support, and contact with international customers and partners.

TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	+17.3 %
BAVARIA:	+17.4 %
GERMANY:	+15.1 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 9.2 %	

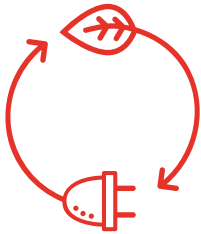


- MEDICAL TECHNOLOGY**
 - German leading-edge cluster
 - Close networking between research and application
 - Global players like Siemens
- GLOBAL LEADER IN TECHNOLOGY**
 - Imaging diagnostics
 - Smart sensors
 - Therapy systems
 - Ophthalmology
- HEALTH INDUSTRY**
 - German leading-edge cluster
 - Healthcare IT
 - Development of P4 medicine (preventive, predictive, participative, personalised)
- IMPLANTS**
 - Transplants, bone replacement materials
 - InnoPlan T.NET network
- LEADING INTERNATIONAL RESEARCH**
 - Member of EIT Health

EMPLOYEES IN THE AREA "MEDICINE & HEALTH"
 ↗ 17.3 % (2008 - 2014)



2.5. ENERGY AND ENVIRONMENT



THE AREA OF COMPETENCE Climate change will permanently affect the personal and working lives of people around the world. Germany's shift in energy policy is, however, already acting as a pioneer, significantly counteracting climate change. The Metropolitan Region also plays a key part in this pioneering role. It is home to around 14,000 businesses focused on the energy and environment industry/technology and which cover the entire value-added chain from energy production, to conversion, storage and distribution, and efficient use, making the Metropolitan Region a unique location. The corporate landscape here is characterised by SMEs, but also has some global players. Cutting-edge research is conducted at around 30 universities and non-university establishments, which similarly profile the region as a hub for the energy industry and research, including at an international level.

Even the most recent employment figures attest to the high degree of competence here. The cluster recorded around 71,000 workers in 2014, constituting an increase of 4.7% compared to 2008. A further 40,000 workers have also joined from the energy-related trades.

The technological specialisations of this area of competence revolve around energy and environmental technology, power electronics, automation and energy-efficient buildings.

THE COMPETENCE INITIATIVE The ENERGIEregion Nürnberg e. V. is the central information and network platform for energy and environmental matters in the Metropolitan Region. It provides ideas and stimulation, supporting the development and implementation of projects in the region. The shared vision is one of safe, low-cost, climate-friendly, accepted and sustainable energy supply for the Metropolitan Region. To achieve this, it brings together players from various areas of energy management and research, and encourages technological and knowledge transfer on topics such as smart grids and combined heat (cooling) power. The initiative currently has some 75 members from business, science, politics and associations, and was awarded the Silver Label by the European Cluster Excellence Initiative for its outstanding work in 2015.

SUCCESSES The Helmholtz Institute of Erlangen-Nuremberg for Renewable Energies (HI ERN) was founded in 2013. It is a branch of the Jülich Research Centre, and is funded by the Helmholtz Association (€ 5.5 million) and the Free State of Bavaria (€ 32 million). The Campus Future Energy Systems (Campus FES) was founded that same year with the aim of developing sustainable, reliable and affordable energy systems. The founding members of the research co-operation are the University of Erlangen-Nuremberg, the Fraunhofer Institute and Siemens, which wants to invest an eight-figure amount in the Campus over the coming years.

The Energie Campus Nürnberg (EnCN) is an example of how well the region is positioned in terms of research. The campus is an interdisciplinary energy research platform in the Metropolitan Region and Bavaria. It is funded for 5 years by the state government (€ 50 million) and industry (€ 27 million). The University of Erlangen-Nuremberg and the Bavarian Centre for Applied Energy Research (ZAE), with their locations in the Metropolitan

Region, are also involved in the Smart Grid Solar project, which, until 2017, is examining the types of stores capable of storing electricity over the short, medium and long-term, and their costs.

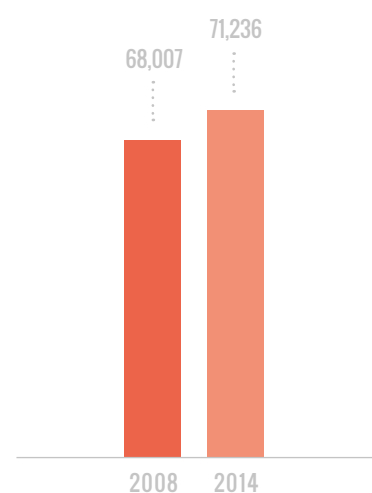
As the first building for green meetings & events in the Metropolitan Region, and winner of the 2014 EU-Green Building Award, the Energiepark Hirschaid is a demonstration facility for renewable energy technologies. The aim of the energy park is to implement concrete energy engineering projects, and bring renewable energies to life. The Green Building Award is considered one of the most recognised sustainability certifications right across the EU.

The N-ERGIE Aktiengesellschaft heat store is a beacon of the region's energy industry. It commenced operation at the end of 2014, and is currently one of the tallest and most modern in Europe. It is also Germany's first hot water store designed for temporary heat storage. It enables more flexible operation of the adjacent biomass co-generation plant, and therefore also more flexible use of renewable energies.

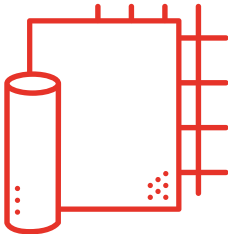
TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	+4.7 %
BAVARIA:	+10.6 %
GERMANY:	+9.2 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 5.2 %	

- ENERGY TECHNOLOGY**
 - High degree of expertise in turbine and power-plant engineering
 - Power-plant and power system management
- ENVIRONMENTAL TECHNOLOGY**
 - High degree of expertise in water management
 - Waste and recycling management
- POWER ELECTRONICS**
 - Development and production of power electronics and related components
- AUTOMATION**
 - Development of smart control and instrumentation systems
 - Development of efficient drive technology
- BUILDINGS AND THE ENVIRONMENT**
 - Buildings and the environment
 - Development and use of new construction and insulation materials
 - Use of renewable energies in buildings

EMPLOYEES IN THE AREA "ENERGY & ENVIRONMENT"
 ↗ 4.7 % (2008 - 2014)



2.6. NEW MATERIALS



² The cross-sectoral industry covers textile manufacturing, rubber and plastics manufacturing, glass and ceramics manufacturing, metal production and processing, surface refinement, heat treatment, and instrumentation and navigation devices.

THE AREA OF COMPETENCE Car bodywork must now be increasingly lightweight, insulation material increasingly robust, and transplants increasingly hard-wearing. Some products are forced to meet increasingly stricter requirements, and the further development or substitution of the materials used offers extremely high potential for innovation here. The development of new materials is a cross-sectoral task covering a number of industries, and the application options are just as diverse as the choice of specific materials. This is where the Metropolitan Region's strength lies. It is a leader both in developing technical textiles and, for example, in metal research and application. Nowhere else in Germany can boast such a wide range of products. The conglomeration of materials-research establishments is unique, with over 1,200 scientists working in the field. The Engineering of Advanced Materials cluster of excellence is one example of this expertise; the Central Institute for New Materials and Process Technology at Erlangen-Nuremberg University is another.

While the trends in this field, with some 83,000 employees², have declined slightly, this can largely be traced back to the metal production and processing sectors. Plastics processing, on the other hand, has developed extremely dynamically, with an increase of 12.1%. A comparison with the rest of Bavaria (-1.7%) and Germany (-1.9%) similarly shows that, at -1.3%, the Metropolitan Region is more positive overall.

THE COMPETENCE INITIATIVE This area of competence revolves around surface engineering, materials testing and lightweight construction, as well as composite materials, technical ceramics and textiles, and plastics processing.

The New Materials Competence Initiative (KINEMA) has set itself the task of strengthening materials research and the resulting development of new products and systems. As a central communication and information platform, KINEMA brings together players from science and business, and encourages the implementation of application-oriented projects. The network systematically involves SMEs in the innovation process, and is responsible for the field's PR.

SUCSESSES The pooled research competence of the Metropolitan Region and the area of competence is reflected by the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT) in Sulzach-Rosenberg, among other things. The institute seeks to promote sustainable business, environmentally friendly technologies and innovative activities. It also conducts research and develops business-related concepts and processes for providing and using energy, raw materials and other materials. The UMSICHT has a worldwide network, and supports international co-operations.

With the Neue Materialien Bayreuth GmbH and Neue Materialien Fürth GmbH, the Free State of Bavaria pools two state research institutes from the field of materials research in the Metropolitan Region. Here, prototyping and shaping processes are developed and honed, regardless of materials. The size and number of the produced components are so great that they often enable direct transfer to industrial production. The main work



fields include additive manufacturing, lightweight sheet-metal construction, plastics processing and magnesium injection moulding.

The Development Centre for X-Ray Technology (EZRT), run by the Fraunhofer Institute for Integrated Circuits (IIS) in Fürth, is yet another beacon of materials research in the Metropolitan Region. It boasts the world's largest computed tomographs, enabling cars and entire containers to be scanned. This is a first in contactless, non-destructive materials testing and unlocks completely new areas of application. With this, new innovative services in instrumentation and in the characterisation of materials and components can be provided for industry.

TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	-1.3 %
BAVARIA:	-1.9 %
GERMANY:	-1.7 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 6.0 %	

TECHNICAL TEXTILES

- Textiles for aerospace, construction industry, medical technology etc.

COMPOSITE MATERIALS/MATERIAL COMPOUNDS

- Polymer, metal and ceramic materials

METAL PRODUCTS/PROCESSING, LIGHTWEIGHT CONSTRUCTION, NANO/PARTICLE TECHNOLOGY, POWDER METALLURGY

- Manufacturing of granulates, nano-particles, pigments
- Manufacturing of lightweight metal products for the automotive industry

MATERIAL TESTING

- Material-specific test processes for various materials

SURFACE ENGINEERING

- Surface treatment and refinement, functionalisation

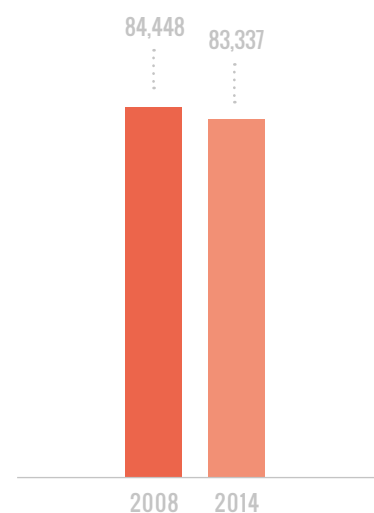
PLASTICS PROCESSING

- Processing of plastics in all upstream and downstream areas of the plastics industry, e.g. mould-making, packaging, coating

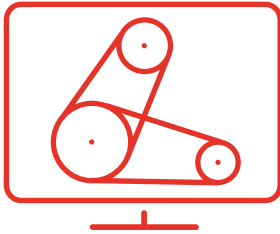
TECHNICAL CERAMICS, GLASS AND BUILDING MATERIALS

- Technical ceramics for medical technology, automotive engineering, aviation, mechanical engineering etc.
- Tubes, rods and profiles made from specialised glass

EMPLOYEES IN THE AREA "NEW MATERIALS"
 ↘ -1.3 % (2008 - 2014)



2.7. AUTOMATION AND PRODUCTION ENGINEERING



³ Economic sectors taken into account are data processing systems, measurement, control and navigation devices, production of electrical equipment, mechanical engineering, and information technology services

THE AREA OF COMPETENCE The issue of Industry 4.0 has long been on everyone's lips. The Industry 4.0 ideal is one of self-organising manufacturing. Products, machinery and storage systems have their own artificial intelligence and are able to communicate with one another. This automated production process is driven by digitalisation. The Metropolitan Region already boasts several examples of networked digital production, and is one of the leading regions in automation technology, including on the international stage. It is home to global market leaders in production technologies. Establishments such as the Bavarian Laser Centre in Erlangen and the Nuremberg Campus of Technology (NCT) demonstrate that the Metropolitan Region is also perfectly equipped when it comes to research.

As a cross-cutting industry, this area of competence is essentially characterised by five economic sectors³, and in 2014 employed around 165,000 people. This is an increase of 12.9% compared to 2008, and is an extremely good performance also compared to the rest of Bavaria (+6.1%) and Germany (+8.4%).

The key focuses of this area of competence are electric drive technology, instrumentation and control technology, and software development, as well as system integration, production technologies, and mechanical and plant engineering.

THE COMPETENCE INITIATIVE Promoting human-compatible, safe and environmentally friendly automation solutions is the aim pursued by Automation Valley Nordbayern. The network pools together some 300 companies and institutions from the field of electric automation technology, with the objective of strengthening regional competitiveness, placing particular focus on broadening R&D skills. As the central industry representative, the Automation Valley helps initiate regional co-operations, and also positions Northern Bavarian as a top location for automation solutions, including at an international level.

SUCCESSSES The Metropolitan Region is one of Europe's premier addresses for automation technology trade fairs. Every year, Nuremberg hosts the SPS IPC Drives, the leading trade fair for electric automation, while the Power Conversion and Intelligent Motion, (PCIM Europe) and SMT-Hybrid-Packaging are trade fairs specialising in power electronics, smart drive technology and system integration in microelectronics.

The E|Drive-Center at the University of Erlangen-Nuremberg has bridged the gap between research and industrial manufacturing in the Metropolitan Region. It researches innovative drive concepts and production technologies designed for later use in industries such as the automotive industry. Its areas of specialisation include analysing and optimising usage and designing processes in the production of electric drive technology systems and components.

Siemens' Elektronikfabrik Amberg is an example of tomorrow's networked, automated production. Setting itself the aim of making production safer and more efficient through effective error prevention, 75% of the manufacturing process has been automated, with communication between



machines introduced across the board. This has minimised errors in production, meaning 99.99885% of all produced parts meet the company's high quality standards. An amazing statistic!



ELECTRIC DRIVE TECHNOLOGY

- Research into drive concepts, production technologies etc.
- Manufacturing of electric drive trains
- Modelling and simulation

INSTRUMENTATION AND CONTROL TECHNOLOGY

- Manufacturing of measurement and testing systems
- Image processing systems
- Research into sensor systems

AUTOMATION SOFTWARE

- Leading providers in industrial communication

SYSTEM INTEGRATION/COMPLETE SOLUTIONS FOR FACTORY AUTOMATION

- Integration of products/components made by various manufacturers to create complete solutions in the manufacturing industry, processing industry, power plants, energy plants etc.

MANUFACTURING TECHNOLOGY

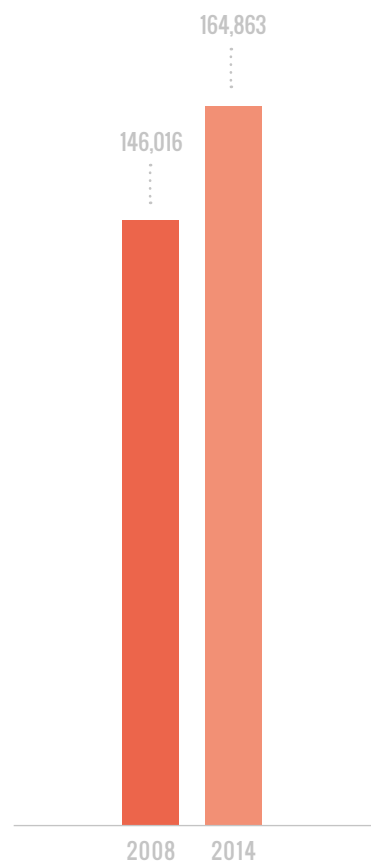
- Developments and concepts
- Custom manufacturing in construction technology, laser production, electronics, tool-building, plastics processing

MECHANICAL AND PLANT ENGINEERING

- Production of capital goods, hydraulic and pneumatic power units, as well as basic mechanical elements for production technology

TREND IN EMPLOYEES SUBJECT TO SOCIAL INSURANCE (2008-2014)	
METROPOLITAN REGION:	+12.9 %
BAVARIA:	+6.1 %
GERMANY:	+8.4 %
PERCENTAGE OF ALL EMPLOYEES SUBJECT TO SOCIAL INSURANCE IN THE REGION (2014): 11.9 %	

EMPLOYEES IN THE AREA "AUTOMATION & PRODUCTION ENGINEERING"
 ↗ 12.9 % (2008 - 2014)



3. DRIVERS OF INNOVATION - MOTOR FOR R&D

Cross-cutting technologies, innovative services and the cultural and creative industries act as a driver of innovation for the areas of competence's development. They have an effect on nearly all seven areas of competence and can therefore not be individually assigned to specific core competencies.

CROSS-CUTTING TECHNOLOGIES

Cross-cutting technologies are research and development-intensive, have an interdisciplinary focus, and can be used across multiple industries. They lay the foundations for new growth fields, and can permanently change existing industries. They aim to increase competitiveness, secure existing jobs and create new ones. The following cross-cutting technologies contribute to the region's profile and are regional driver of innovation. Some infiltrate all seven areas of competence, and can therefore not be individually assigned to specific core competencies. Based on their importance and regional prominence these are: mechatronics, power electronics, optical technologies, nanotechnology and biotechnology.

MECHATRONICS

IMPORTANCE AS AN DRIVER OF INNOVATION The aim of mechatronics is to enable maximum integration of mechanics, electronics and information technology both on functional elements and in the development process, in order to create intelligent machinery and devices. Mechatronic solutions are used in a wide range of industries, for example: automotive engineering, machine tool building, industrial and service robotics, electronics production, medical technology, environmental and analysis technology, and consumer and household electronics. Mechatronics is a key technology for ensuring that existing industries remain competitive in light of Industry 4.0.

OPPORTUNITIES FOR THE REGION Mechanical and electrical engineering are the most prominent industrial sectors in the Nuremberg Metropolitan Region, and mechatronics is able to significantly boost these industries' innovative strength. The Nuremberg Metropolitan Region has produced key players in the Bavarian cluster for mechatronics and automation, as well as the Automation Valley Nordbayern. The high potential for application among companies, coupled with the R&D competence at universities and R&D institutions (e.g. "Auf AEG", the Forschungsfabrik in Nuremberg, and Coburg University of Applied Sciences), enables synergies for almost all areas of competence.

POWER ELECTRONICS

IMPORTANCE AS AN DRIVER OF INNOVATION Power electronics is part of all electric and electronic products requiring a drive control/power supply. The range covers applications in a wide variety of fields, such as transport technology, medical technology, energy engineering, information and communication technology, industrial electronics and consumer electronics. It is also playing a key role in the change in energy policy. The trend towards mobile applications in the form of Notebooks, mobile phones etc. as well as the trend towards electric and hybrid vehicles has provided a significant boost to electricity supplies controlled by power electronics.

OPPORTUNITIES FOR THE REGION The Nuremberg Metropolitan Region acts as a globally leading “sub-cluster” in power electronics, and is home to numerous companies operating in the field of technology. A high level of research expertise has a key element in achieving this top position. The nationwide Performance Centre for Electronics Systems (LZE) is an example of this. Bavaria-wide and international networking by the centre is promoted at the European research and technology network ECPE, which also sponsors the Bavarian cluster for power electronics. Europe’s leading trade fair for power electronics, the PCIM in Nuremberg, is the international meeting place for experts in the field. Many customers and users of power-electronics products also live in the region.

OPTICS, LASERS, PHOTONICS

IMPORTANCE AS AN DRIVER OF INNOVATION Optical technologies play a key role in numerous markets of the future. Their numerous areas of application, such as medical technology, biotechnology, mechanical and plant engineering, security, information and lighting technology, and transport, mobility & logistics mean that optical technologies offer great potential for cross-innovation. In semi-conductor production, every microchip is manufactured using optical technologies. Lasers have established themselves as manufacturing tools and precision measurement/monitoring devices. The increasing use of long-

lasting light-emitting diodes (LEDs) is replacing more than just bulbs in buildings, vehicles and traffic control systems. The many different light properties are already being used to transfer and store data in communication technology. The EU is planning a billion-Euro flagship funding programme for quantum technology for 2018.

OPPORTUNITIES FOR THE REGION Laser technology is deeply rooted in the Nuremberg Metropolitan Region through the Bavarian Laser Centre (BLZ) and the Faculty of Photonic Technologies (LPT) at the University of Erlangen-Nuremberg: an excellent basis for additive manufacturing processes, smart materials and 3D printing. The research performed by the “Centre for modern optics” (ZEMO) at the University of Erlangen-Nuremberg is also being intensified by the Max Planck Institute (MPI) for the Science of Light and its own post-graduate school specialising in the field. The objectives are to conduct co-ordinated basic research, and provide teaching and training in optics for the specialised areas of classic optics, nano-optics, optical materials, image storing, image acquisition and processing, laser physics, optoelectronics and atom optics. Non-university establishments also include the Fraunhofer Institute IIS (optical transfer technology), and the Application Centre for Polymer Optic Fibres (POFAC) at the Nuremberg technical university. The support group for the development of laser technology at the University of Erlangen-Nuremberg constitutes a regional network pooling research and business. Technology transfer to the industry is actively implemented through new companies being founded out of the BLZ (e.g. Laserquippment AG, Erlas Erlanger Lasertechnik GmbH).

NANOTECHNOLOGY

IMPORTANCE AS AN DRIVER OF INNOVATION The nano-sciences are today one of the richest sources of new and groundbreaking discoveries. Researchers from the fields of physics, chemistry, biology and engineering consider it one of the most attractive industrial fields of the future. Nanotechnology is today still primarily R&D-driven, and will increasingly occupy the technical fields and markets of present-day micro-

technologies. But it is more than just the next step of miniaturisation. The nanoscale combines physical, chemical and biological functions, resulting in solutions for applications not viable with today's micro-technology. The current areas of specialisation here are nano-electronics, nano-materials, nano-optics, nano-production, nano-chemistry, nano-biotechnology and nano-analytics.

OPPORTUNITIES FOR THE REGION The Nuremberg Metropolitan Region provides optimum conditions for research and development: The science faculties in Northern Bavaria are complemented by the technical and medical faculties in nanotechnology research. Erlangen's Fraunhofer Institute for Integrated Systems and Device Technology (IISB) is already operating on an international scale in the field of nano-electronics. Applications in material, transport, medical, energy and environmental technology in the relevant areas of competence offer particular opportunities for the region. The fact that the Bavarian cluster management and nano-technology cluster office are based in Würzburg is of key importance to utilising potential. The field of technology is a top priority, especially when it comes to the area of New Materials, with its applications in nano-particles and nano-production. The government-funded "Engineering of Advanced Materials" cluster of excellence at the University of Erlangen-Nuremberg is the only one of its kind in Germany, and perfectly complements Northern Bavaria's activities in the sector. Key R&D players primarily include the universities in Bayreuth, Erlangen and Würzburg, the Fraunhofer Institute for Silicate Research (ISC) in Würzburg, and the universities of applied sciences in Nuremberg and Amberg.

technology has been recorded double-digit growth. At a European level, Germany is a leader in terms of number of biotechnology companies; and Bavaria is clearly positioned at number 1.

OPPORTUNITIES FOR THE REGION In addition to "red" and "green" biotechnology, the trend towards cell-free biotechnology is also playing a key role. It is able to use modern production technology to generate biomolecules and combine them into new functional units for material, energy and information technologies. This offers potential for promising synergies with existing areas of competence. University-based developments are taking place in molecular and microbiology as well as in biotechnology and bioprocess technology at the University of Erlangen-Nuremberg, and in biotechnical teaching and research content at the universities of applied sciences in Nuremberg, Triesdorf and Ansbach. The Erlangen Medical Valley Center as an innovation and start-up centre, the MV EMN e. V. competence initiative, and the Nuremberg-based Medizintechnik und Pharma e. V forum are key hubs in the region, while the University of Würzburg has particular scientific expertise in bioinformatics. Application-based biotechnology can be found at clinics in the Bavarian Rhön spa region and at rehabilitation clinics in Bad Kissingen. The Rhön-Saale start-up centre in Bad Kissingen and the Biomed/ZMK start-up centre for biotechnology in Würzburg are both nuclei for biotechnological developments at companies.

BIOTECHNOLOGY

IMPORTANCE AS AN DRIVER OF INNOVATION Bio and gene technology is a strategically important 21st-century technology. Future opportunities offered by biotechnology have been identified in human medicine, pharmaceuticals, nutrition, raw materials production/chemistry, energy, agriculture and environmental protection. For years, this cross-cutting

SERVICES/CULTURAL AND CREATIVE INDUSTRIES

The Nuremberg Metropolitan Region's strengths in technology-driven areas of competence provide good conditions for system businesses resulting from industrial products and additional services. Along with product and process innovations, services contribute significantly to competitiveness, growth and employment in the Metropolitan Region. The Nuremberg Metropolitan Region is a European centre for market research, with other particular fortes in the fields of HR services, accounting, insurance and consulting. Yet the cultural and creative industries also act as a strong innovation factor here.

CULTURAL AND CREATIVE INDUSTRIES

PROMINENCE AS AN DRIVER OF INNOVATION In 2015, the European Commission analysed the ten strongest growing economic fields of the next ten years, and found the cultural and creative industries to be the most dynamic. These industries bring together companies from eleven sub-areas, all of which operate gainfully in the production, use and distribution of cultural and creative goods and services. The areas include architecture, design and software/games, but also advertising, the book market, as well as fine and performing arts. In Bavaria, this covers 40,000 companies employing around 200,000 workers. According to a monitoring report from the German Federal Ministry for Economic Affairs and Energy (2014), these cultural and creative companies are distinguished by a particularly high degree of innovative activity. For example, 85% of the companies examined in the report had been able to create innovations in the three years prior.

OPPORTUNITIES FOR THE REGION The region's cultural and creative industries report (2010), the first report by a Metropolitan Region in Germany, had already identified the economic strengths of the cultural and creative companies based in the region. Creativity is one of the key innovability factors for the economic area, where almost 8,500 companies from the cultural and creative industries were active in 2012. Innovative, cross-sectoral co-operations enable this location-based advantage to translate into many different innovation and added-value drivers for companies from other industries. More intense networking would lead to strong synergies with the areas of competence in the EMRN, because creativity propels digitalisation solutions and their business models and value chains. In view of this, the Bavarian State Ministry for Economic Affairs and Media, Energy and Technology has established the Bavarian Centre for the Cultural and Creative Industries at Bayern Innovativ, the Bavarian Society for Innovation and Knowledge transfer, in Nuremberg.

4. SMART SPECIALISATION - AN EYE ON THE FUTURE

Even futurologists and forecasters have to wait until tomorrow before being certain about what the next day will bring. Despite sophisticated projections and innovative scenario calculations, the future repeatedly surprises us. Futurologists and forecasters agree, however, that certain trends will shape Germany, Europe and the world over the long term. These so-called mega trends will not only have an impact on certain areas of life, but will gradually also change society, business and politics. The Nuremberg Metropolitan Region must keep an eye on these mega trends, help shape them, and position itself accordingly. It must rely on its own strengths, and specialise in key areas.

DEMOGRAPHIC CHANGE Germany's population will drop by some 5% by 2040 due to the consistently low birth rate. The simultaneously increasing life expectancy means there will be considerable shifts in age structure. By 2025, the number of people over 65 will rise by over 30% compared to what it is today, and this will have lasting effects on the job market. For instance, the number of people of employable age will drop by a massive 7%. Immigration can, however, significantly slow down these developments. The diminishing working population has direct consequences for macroeconomic growth potential. Involving all sections of the population more intensively in the job market will at least partly counteract these effects. But work productivity also needs to increase considerably in order for the same output to be produced despite the declining number of workers. Demographic change simultaneously opens up opportunities for industries catering more keenly to the needs of the elderly. Workers will also grow increasingly older in future, and this is something

both companies and employees will have to prepare for through special advanced training measures and suitable working conditions.

The Nuremberg Metropolitan Region can expect a more moderate population decline over the next few years; its current population of around 3.476 million people will drop to around 3.449 million by 2020. But the demographic change will be apparent as early as 2030, when the Metropolitan Region will be home to just 3.363 million people, constituting a decline of 3.3% compared to 2015.⁴

GLOBALISATION Globalisation has far-reaching effects on the national and regional economy, on politics and on society. From an economic perspective, these include the worldwide expansion of goods and service trading, the increased networking of financial markets, and the elimination of trade barriers. The social impacts are particularly reflected through ever increasing migration and the now indispensable communication via social media. It is impossible to

say for certain what the consequences of ongoing global networking will be. Companies are also called to act responsibly and further develop global market rules into socially responsible trading. It is also clear, however, that globalisation creates new (market) opportunities in completely different areas. National borders are becoming increasingly blurred in preliminary interrelations and value-added chains, which is why international networking is essential in order to be able to operate successfully on the market in the long term.

The Metropolitan Region's interrelations with international markets are evidenced by its excellent export rate. At 47%, it is somewhat above the German national average of 46.3%. The global players based here also give the Metropolitan Region a good reputation at an international level. Involvement in the global market is not, however, limited only to large companies. SMEs are also operating successfully on the international stage.

CLIMATE CHANGE Global warming, the rise in natural disasters, and increasingly prevalent extreme weather events are all proof of worldwide climate change. In order to reduce a key cause of global warming – the emission of greenhouse gases like CO₂ – the European Union has agreed to reduce GG emissions by 20-30% by the year 2020 (compared to 1990). By 2050, Germany hopes to meet 80% of its energy requirements using renewable energies and decrease primary energy consumption by 50%. But the consequences of climate change will be clearly felt. They include greater protection of industrial facilities against extreme weather events and preparation of the energy and health system for extreme seasons. This gives rise to both challenges and opportunities, particularly for the energy sector. Efficiency technologies need to be improved, new drive systems must be developed, and alternatives must be found in material usage.

The Metropolitan Region is already a leader in the aforementioned areas of technology, while also helping sustainably reduce greenhouse gas emissions. The renewable energy share of total power consumption is currently 28.3%, and therefore above Germany's total share of 25.4%.

DIGITALISATION There is no doubt that the mega trend of digitalisation will lead the way for the development of various industries and markets in the years and decades to come, and will see information and communication technologies continue to gain significantly in importance. Digitalisation is a key driver and enabler for the developments associated with the radical production-process changes known as Industry 4.0/Economy 4.0. Consumer behaviour is also changing. Personalisation, online order and configuration processes, online goods tracking, and options for information and control anywhere, anytime have become commonplace for private consumers through the introduction of Smartphones. At the industry end, this requires suitably flexible processes, as well as experts who are able to meet the new requirements. Education and further training, also during employment, is gaining in importance. Modern technology and means of communication are also pushing boundaries between work and leisure. New ways of making this beneficial for both employers and employees need to be established.

One indicator of digitalisation is broadband availability. 87.2% of all households in Germany are able to surf the Internet at a speed of at least 16 Mbit/s. For speeds of at least 50 Mbit/s, availability reduces to 70.1% of all households. There is some catching up to do here, particularly in rural parts of the Metropolitan Region. In 7 of the 34 districts, a 16 Mbit/s connection is only available to 50-75% of households, while this figure drops to just 10-50% in 6 districts for 50 bit/s connections. The regional centres reflect what things can potentially look like, with more than 95% connected to a 50 Mbit/s+ cable.

The mega trends see Germany and the Metropolitan Region face new challenges shaping all areas of life and business over the medium and long term. The lines between work and life are blurring, e.g. through the sharp rise in home offices. At the same time, old industry boundaries are also increasingly dissolving, their individual sectors in turn forming cross-cutting industries. The now almost omnipresent information and communication technologies are key drivers here. They are the pre-requisites for digitalisation. They speed up globalisation, are considered glimmers of hope for overcoming demographic change and promise support for efficiency measures seeking to contain climate change.

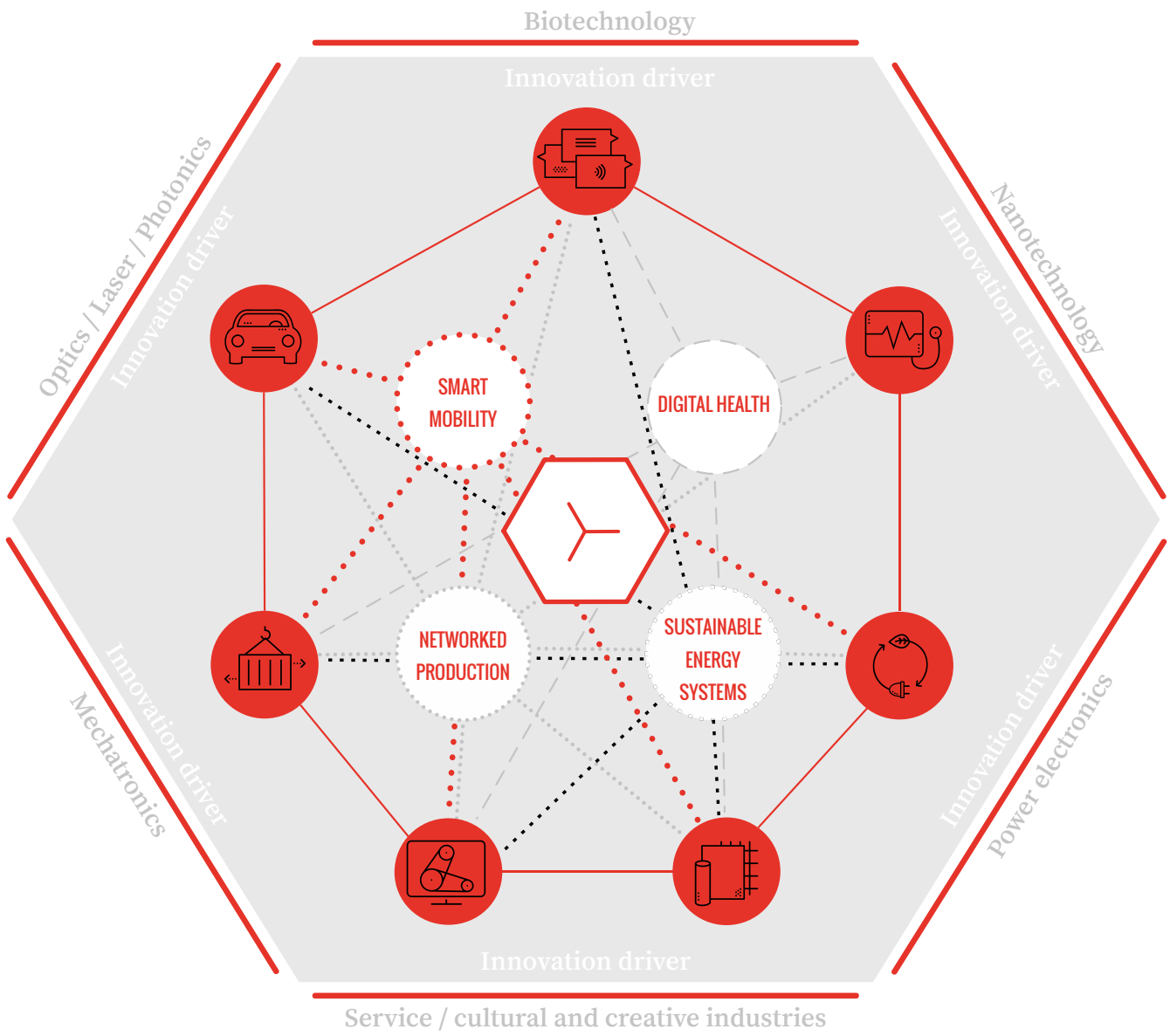
⁴ BBSR (German Federal Institute for Research on Building, Urban Affairs and Spatial Development) (2012): Regional development forecasts based on census 2012-2035, not taking into account immigration by asylum-seekers.

THE ROAD TO THE FUTURE Technologies drive innovation and developments in the various areas of competence, and it was for this reason that the 2010 approach focused on technologies such as optics, power electronics and mechatronics. This “Technology push” approach continues to apply to day; one key component is lacking, however: Solutions to the social challenges of the future, such as demographic change, climate change, the transformation of the energy policy, the requirements of (global) mobility and logistics structures or the further development of the health system.

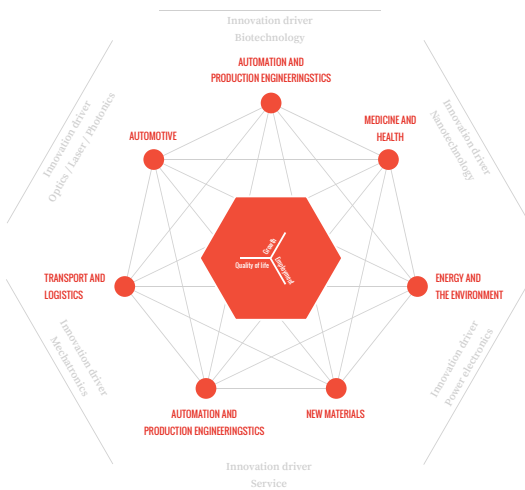
In future, traditional boundaries between individual industries and fields of technology will increasingly break down in the face of the “technology push” approach. The specific economic sectors have now become so intensively interlinked that some of the existing industry definitions have lost their relevance. It thus no longer suffices to record what has been produced. The question of why and under which social and ecological aspects something has been produced is also becoming increasingly important.

Trends like climate change or digitalisation are paving the way here. They outline the need for solutions in all kinds of areas. At the same time, the extensive expertise available in each field lays the foundations for providing answers to the future challenges. The individual competencies have been systematically listed, assessed in terms of their suitability regarding imminent challenges, and interlinked. In doing so, it has become apparent that some of the areas of competence have already adopted this direction in their research and work. Building on this status quo, the next step has been to define various spheres of action designed to enable and promote co-operation between the areas of competence. They address future challenges, have an interdisciplinary slant, and more intensively encourage the areas of competence to push cross-innovation. As such, they pool the Metropolitan Region’s wide range of competencies and boost its existing strengths. Through targeted networking of players from all kinds of fields, the spheres of action are thus consciously based on a broad approach, creating a unique selling point compared to other cluster regions.

The combined actions of all players ensure that expertise remains in the region. Several approaches have been discussed with all players, resulting in four main spheres.



WABE 2016
Solutions for social and technological issues of the future



WABE 2010
Technology as an innovation driver:
“Technology push”

THE VISION Issues like electromobility of the Internet of Things are on every-one's lips nowadays. In the Metropolitan Region in future, however, they will cease being merely buzzwords, and will instead have become fully infiltrated in our lives and work. People will commute to work in a CO₂-neutral manner using their own car, which simultaneously acts as a storage facility for excess electricity produced from renewable energies. Production processes will be controlled from home via high-speed Internet, and surgery will be performed in a highly sterilised environment on a computer miles away. The notion of combining some work fields has become a reality, and inevitably benefits from the constant knowledge exchange in the region. This vision cannot be achieved on the drawing board, but rather only by rolling up our sleeves and working together here and now as a Metropolitan Region!

The wide range of challenges to be faced by the Metropolitan Region in the years to come requires an equally diverse approach. The Metropolitan Region must be made a leading location for the social and technological challenges of the future. The aim is to profile a Metropolitan Region moving away from old structures, developing them further and highlighting solutions. The aim is to shape the future: actively, innovatively and collectively as a region!

THE MISSION In order to implement this vision, the Metropolitan Region must draw on its strengths. We want to more actively identify social and technological needs, and increasingly develop systemic solutions which adopt a holistic approach. These efforts not only see us combat individual symptoms, but also tackle the challenges holistically. The extensive know-how existing in the Metropolitan Region's seven areas of competence is pooled in the areas of activity, and systematically used to solve specific problems.

The aim is to achieve smart solutions in the areas of energy efficiency, production processes in a digital world, mobility and transport management, medicine and health, and to link these through technological solutions with the help of information systems and shared data use. The areas of activity apply to. (see page on the right)

The areas of activity involve systematic exchanging of knowledge and information in order to promote the development of cross-sectoral and integration technologies. In doing so, the idea of traditional boundaries for industries, technologies and areas of competence is broken down. The growing importance of technological and systemic interfaces requires even more inter and trans-disciplinarity, as well as multiple qualifications.

It is critical that at least three areas of competence actively incorporate their competence in the areas of activity. For example, logistics plays just as much of a role in future factory concepts as automation or production engineering. Alternative drive technologies encompass both energy engineering and automotive engineering. And the health industry benefits both from the new possibilities offered by information technology, as well as from the development and use of new materials.

The areas of activity give the areas of competence a platform for more intensive exchange. It is a case of building on what already exists and further developing it through innovative processes. In doing so, the areas of activity strengthen cohesion in the Metropolitan Region and hone its profile as well as boosting its reputation on an international level also.

AREAS OF ACTIVITY



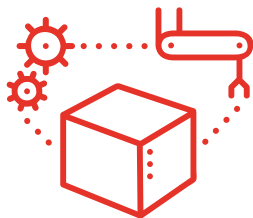
DIGITAL HEALTH ECONOMY

The “digital health” area of activity is based on the Metropolitan Region’s excellent medical technology. Combined with the various specialisations in the individual areas of competence, the region is setting the pace for the future of medicine.



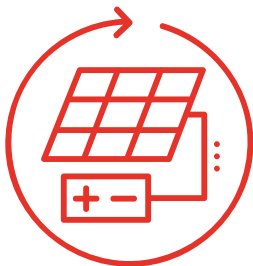
SMART MOBILITY

As a Metropolitan Region, we stand for connected, intermodal mobility. We offer smart logistics concepts which redefine CO2 efficiency through the latest drive technology!



SUSTAINABLE ENERGY SYSTEMS

As a Metropolitan Region, we provide answers to the challenges posed by ambitious climate-protection targets. We exemplify the integration of renewable energies and define standards in storage technology.



CONNECTED PRODUCTION

Due to our leadership in the area of electrical automation, we provide impetus for new innovations and establish the Metropolitan Region as an important industrial hub. The production processes are interlinked and perfectly co-ordinated through smart technologies, including at an international level.

5. FUTURE AREAS OF ACTIVITY - WHERE THE JOURNEY IS HEADING

5.1. DIGITAL HEALTH ECONOMY



The global health market grows by around 6% a year. The world's increasing population, standardisation in medical care, and the development of new treatments and therapies imply good growth prospects even for the long term. In Germany, demographic change will lastingly shape healthcare. The ageing population will see a rise in non-transmittable diseases, such as diabetes, cardiovascular disorders and cancer. The increasing cost pressure in the health system will then require innovative approaches to maintain the country's extensive care services at a high level.

The dynamics of demographic change vary greatly depending on the region. Rural populations have long been in decline. The rise in digitalisation, however, provides hope of being able to guarantee adequate care even in remote areas. The challenge will lie in implementing the new systems in a way which is intuitive and comprehensible to older people. As such, so-called healthcare IT will gradually start infiltrating the health system, though this can only partly address the question of personal and participative medical care.

Even more importance will be placed on prevention in future. The areas of fitness, wellness and consumer electronics will increasingly merge. Mobile applications and ICT already offer users the opportunity of recording and analysing training successes. The sport of the future will no longer only be played on tennis courts or football fields. Managers will meet in virtual worlds for a few hits before meetings

with clients, and teams will meet for a sweat-inducing interactive kick. Meanwhile, functional clothing will control the participant's body temperature, and ensure their muscles are always at the right "operating temperature".

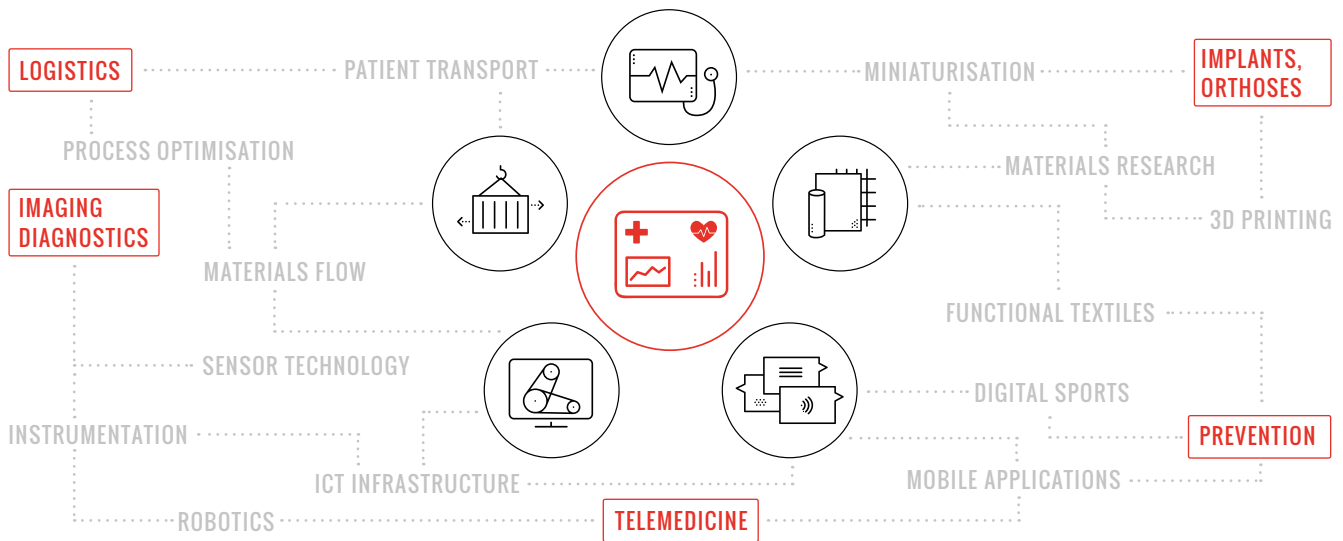
In order for these future visions to become a reality in the Metropolitan Region, the know-how in each area of competence must be pooled. What will the hospital of the future be like? How will medical care in rural areas develop? What new innovative processes will there be in medical technology? And which diseases will thus be able to be treated better? The answers to these and other questions must be found together as a region. The "Digital health" area of activity provides an ideal point of contact here to reflect on innovative solutions across all areas of competence.

The area of activity thus not only focuses on the Metropolitan Region's excellent medical technology, but rather also seeks to further develop cross-sectoral areas, such as logistics. The experiences gained from the area of "Transport & logistics" are just as helpful here as examples of applications from the medicine & health field, while experiences in production planning and process optimisation similarly tie in with the "Automation" area of competence. Factory-planning concepts may also be applied to hospital planning, offering opportunities to improve the processes. The various specialisations in the individual areas of competence result in excellent prospects for the Metropolitan Region here.

The aim of a dynamic, living Metropolitan Region must be to pool the existing know-how from the areas of competence, and promote cross-innovation. Below are some aspects which can hone the region's profile and create clear unique selling points:

The **TELEMEDICINE** provides opportunities to maintain functional medical care across the board. This requires a well-developed ICT infrastructure. Smart sensor technology and robotics systems will enable more and more procedures to be performed by distance.

IMPLANTS AND ORTHOSES must meet increasingly stricter standards. The Metropolitan Region's extensive ex-



expertise in plastics and ceramics processing must be utilised here. The ever improving possibilities of 3D printing have potential to also permanently reduce costs.

The **BIMAGING DIAGNOSTICS** is one of the Metropolitan Region's core competencies, and can be further advanced using the existing potential offered by materials research and instrumentation. The ongoing further development of ICT also constantly facilitates new simulation options and improved, high-resolution images.

Medical **LOGISTICS** encompasses the challenges of patient transport, but also the improvement of hospital logistics processes. This results in conceptual approaches for improved standardised intralogistics at hospital with areas such as operational concepts, process control as well as material and human flows in comprehensive logistics systems.

PREVENTION is already starting to shape healthcare, for it offers enormous potential in terms of avoiding costs. ICT is increasingly infiltrating sport, merging into digital sports, while functional textiles help athletes and improve training results.

5.2. SMART MOBILITY



Transport infrastructures are the lifeblood of modern societies and their business activities. The systemic understanding of mobility, which encompasses both passenger and goods transportation locally and long-distance, and which is characterised by the guiding principle of “sustainable mobility”, is gaining importance. And it covers more than just a few specific vehicle providers. Developments in vehicle technologies are being dominated by the electrification of drive trains and the digital networking of vehicles with one another and/or with the infrastructure. Car-sharing models and the emerging possibilities of automated driving are currently giving rise to new forms of mobility and alternative business models.

The impacts of these drastic changes are apparent at every level, and are shaping international trade just as much as they are influencing the regional and local transport habits of individual people. Demographic change will also alter mobility needs. Intermodal transport networks are becoming increasingly important, while the role of personal cars is similarly changing, especially in urban centres. These developments are driven in no small part by rising transport costs and stricter climate protection requirements. Digitalisation additionally provides new opportunities for interoperability between certain modes of transport.

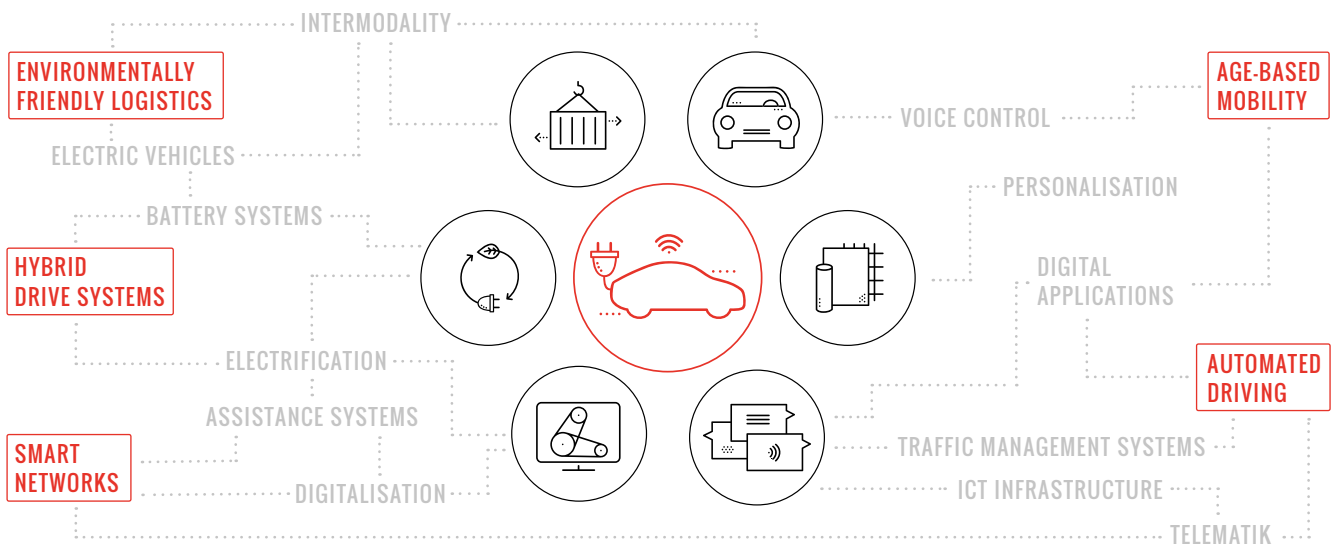
Looking ahead we can thus expect to see extensive changes. Goods transportation by road will be automatically controlled by traffic management systems, giving drivers time to perform other tasks in the me-

anwhile. This will also fundamentally alter the drive systems. CO₂-neutral mobility will become a reality, and cars will be powered via power point or hydrogen fuelling stations. Supply chains will increasingly adapt to enable private households to have their online purchases delivered to their door via drone. The scale of networking between various modes of transport is taking on new dimensions; intermodality is not a buzzword, but rather something everyone takes as given.

In order for these future plans to become a reality, however, the Metropolitan Region’s strengths need to be better interlinked, and synergies boosted. Industry boundaries are increasingly dissolving, while mega trends are lastingly influencing future mobility. For these developments to be taken into account, it is important to engage in more intensive interdisciplinary co-operations and promote cross-innovation.

This is precisely where the “Smart mobility” area of activity comes in, pooling the knowledge of the individual areas of competence. For example, the further development of battery systems is a basic requirement for hybrid drives and electric vehicles. Technologies, such as energy recovery in braking systems, are already being widely used in goods transportation. In future, however, they will also be prevalent in private transportation. The experiences gained by the “Transport & logistics” area of competence, e.g. in hybrid shunting locomotives, enable it to make just as valuable a contribution here as the “Energy & the environment” area of competence. But battery systems and electrification are also playing an increasingly prominent role in automation. This example illustrates the Metropolitan Region’s extensive expertise in this field. In order to fully penetrate and successfully promote this and other aspects of smart mobility, however, the exchange between the individual areas of competence must be continued.

The Metropolitan Region has already largely identified mobility trends, and both science and business have developed expertise and networks here in recent years. The region’s focus is on private and goods transportation. It has promoted innovative developments clearly constituting a unique selling point for the region.



The following areas offer possible approaches for interdisciplinary co-operation:

More and more vehicle manufacturers are already turning to **HYBRID DRIVE SYSTEMS**, whose success depends on a long-lasting, efficient battery. Developing and using storage technologies is one of the Metropolitan Region's core competencies, which must be intensively applied in all areas.

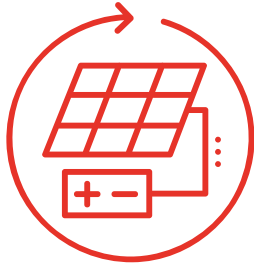
ENVIRONMENTALLY FRIENDLY LOGISTICS will increasingly be based on intermodal supply chains. Information and communication technologies provide opportunities here to optimise networking between certain modes of transport and perfect just-in-time deliveries. Greater focus will be placed on the use of electric motors as well as on innovative lightweight construction concepts.

SMART NETWORKS help use the existing infrastructure more efficiently. The possibility of retrieving and processing information in real time also offers great potential when it comes to developing traffic management systems. Alternative routes can be calculated, traffic distributed and jams avoided. This, combined with modern assistance systems, enables key improvements in transport safety.

AUTOMATED DRIVING will revolutionise passenger and goods transportation. And the digital networking of vehicles and infrastructure is a key driver here. Some systems are visibly merging into an automated process chain which makes its own decisions, therefore defining completely new requirements for drivers.

AGE-BASED MOBILITY will shape urban transportation just as much as door-to-door navigation in rural areas, i.e. the infrastructure in local public transportation will have to be increasingly adjusted to the changing requirements. Digital applications must be capable of being operated easily and intuitively. At the same time, electric motors in cars will assist with seat adjustment and door opening, and therefore noticeable increase comfort in private transport.

5.3. SUSTAINABLE ENERGY SYSTEMS



Germany's energy system is currently undergoing dramatic changes: Climate protection requirements, nuclear phase-out, the development of renewable energies and the necessary increases in energy efficiency in terms of consumption are all leading to a revamp in the energy system. This also involves overcoming some technological challenges. Energy technologies, however, are heavily influenced by other fields of technology, such as ICT or production and materials technologies. The development of energy technologies currently places major emphasis on systemic aspects, such as the issue of network infrastructure but particularly also on energy storage, which is especially gaining prominence in light of the fluctuating properties of renewable energy sources. Other aspects shaping energy supply are the development of sustainable market designs and the use of smart technologies.

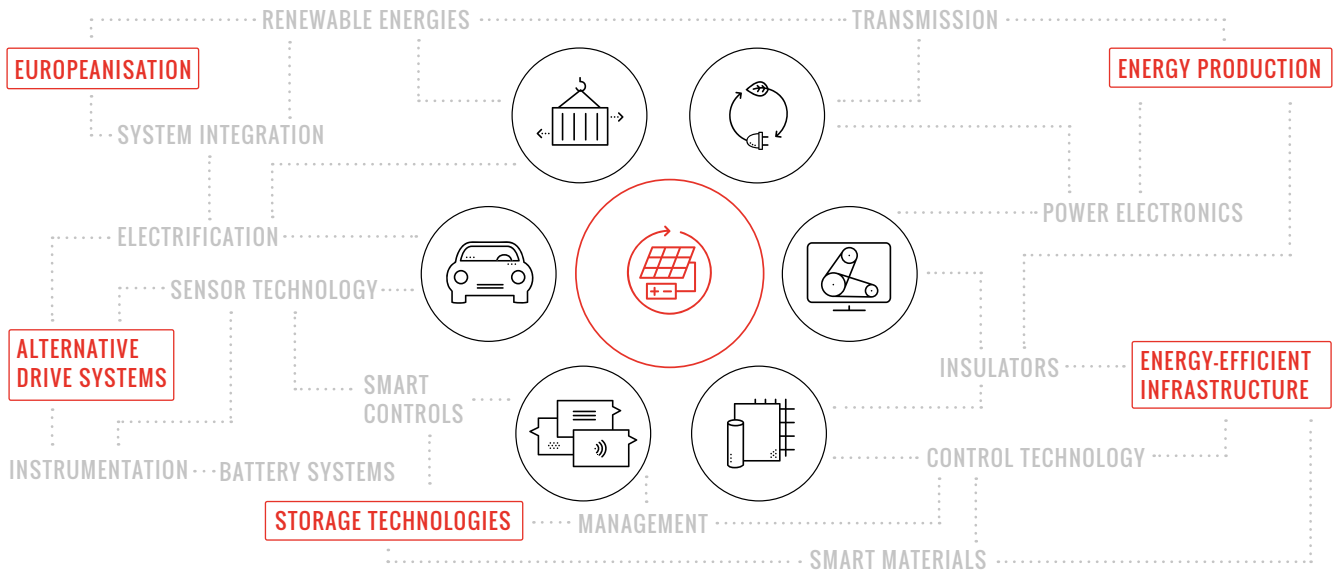
The switch in energy policy will not happen overnight, but it will entail a complete overhaul of the entire energy system. One of the influencing factors here is the rapidly increasing digitalisation. Electronic measurement and regulation instruments ensure power and heating systems are controlled appropriately and as per requirements. Smart sensors independently decide when heating and cooling equipment is booted up. As such, the new technology promises to provide increasing energy efficiency, but is itself also dependent on sustainably available energy.

More and more emphasis is being placed on tying certain technologies into areas of life when it comes

to energy efficiency and generation. A visionary look into the future shows widespread implementation of electromobility and the wind-generated electricity from Europe's coasts being stored in car batteries overnight. By day, the cars communicate with the home's heating systems, and report to these as soon as the return journey commences. In well temperature-controlled houses, building insulation ensures a pleasant room temperature. Electricity is not only produced somewhere peripheral in Europe, but also locally. All roof tiles feature integrated photovoltaic systems, enabling people to live predominantly self-sufficiently in terms of energy. The roof tiles will of course be available in all conceivable colours.

In order for this vision to be fulfilled, a few questions first need to be answered. How will we achieve comprehensive system integration of renewable energies and their fluctuating supply? How can power-transmission losses be minimised over long distances? And how can energy remain affordable for both the private and industrial sectors? With its existing expertise, the Metropolitan Region has already demonstrated that it is an energy leader. In order to respond to the pressing future challenges on the one hand and further develop existing competencies, e.g. in drive technology, on the other it will be necessary to pool the strengths of all areas of competence. That is the aim of the "Sustainable energy systems" area of activity.

It combines the strengths of the individual areas of competence and systematically tackles the specific challenges associated with various issues. As such, storage technologies will continue to gain importance in future. The "New materials" area of competence can contribute significantly here, e.g. in the field of insulation and so-called smart materials. The automotive sector's experiences in battery systems are, however, also very valuable. These systems will regulate themselves in future. Developing the necessary software is one of the daily focuses of the "Information & communication" area of competence.



Through interdisciplinary co-operation, the “Sustainable energy systems” area of activity provides enormous potential for creating synergies and promoting cross-innovation. The following areas offer possible approaches:

ENERGY-EFFICIENT INFRASTRUCTURES cover building technology, as well as the transmission and management of energy over longer distances. New materials, so-called smart materials, enable new insulation techniques, and offer the opportunity to drastically reduce buildings’ energy use. Digital networking regulates the power and heating supply in certain buildings and big cities, allowing individuals to access them even while en route.

ALTERNATIVE DRIVE SYSTEMS are being developed both for the automotive sector and for the rail and trucks. Electric drive systems are not just limited to transport, but instead also include mechanical and industrial production as well as automation technology.

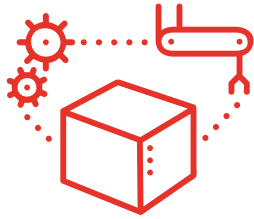
ENERGY PRODUCTION has always been one of the Metropolitan Region’s particular strengths. The region is a leader in developing and operating gas turbines. Materials research and automation technology provide approaches to make the products even more powerful.

With 10% of the world’s installed photovoltaic systems, Bavaria is also leading the way in solar energy. This potential must be further tapped.

STORAGE TECHNOLOGIES are another key component for regulating the increasingly fluctuating energy supply. On the one hand this means investing in the development of suitable storage facilities, such as batteries or heat stores. The “New materials” field is particularly deemed to have huge potential. On the other hand, the use of storage technologies requires smart management to ensure it is used precisely where needed.

The **EUROPEANISATION** of the power supply system is also a cross-sectoral task. More and more emphasis is being placed on developing a so-called super grid in times of increasingly fluctuating energy supplies. The focus here is not only on energy aspects, but also on the developing and operation of suitable infrastructures.

5.4. CONNECTED PRODUCTION



Interlinking industrial production systems with modern information and communication technology is sparking an extensive transformation in existing processes and value chains. Digitalisation in the industrial sector is often described as “Industry 4.0”, denoting the smart networking of products and processes in industrial added value. Industrial production, automation technology and ICT are merging to form a holistic approach, facilitating completely new prospects for growth. 70% of all companies currently expect to be able to achieve a clear increase in sales as a result of Industry 4.0.

Most studies identify the smart networking of manufacturing processes in cyberphysical systems (CPS) as a central technical element. The vision of fully digitalised processes sees jobs ultimately being able to guide themselves through entire value chains, from reserving the necessary materials to delivering to the customer, based on CPS. This link between the virtual and real worlds is then established through the so-called Internet of Things, a term denoting an age of mobile devices which can independently exchange information with one another via the Internet.

Constant availability of all relevant information through the Internet of Things will enable new forms of industrial production. The ability of people, machines and objects to communicate with one another directly, independently and in real time via the Internet of Things creates dynamic, real-time-optimised, self-organising and connected production plants, known as “Connected production”.

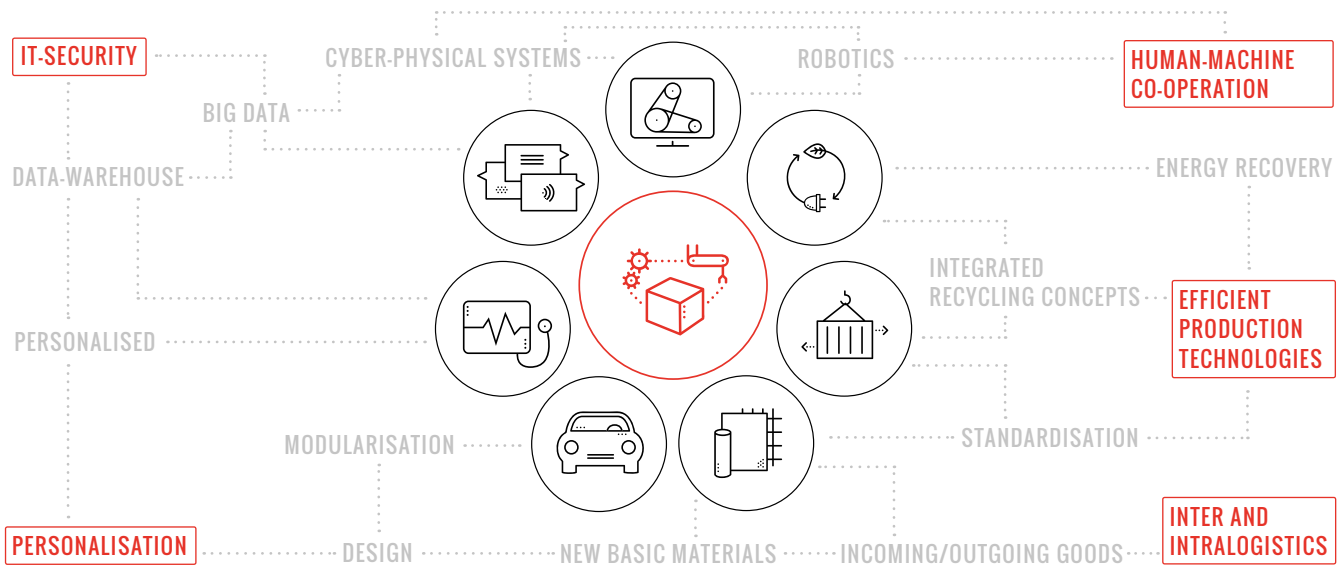
In future, private individuals will design their products from their home desks, and send them to the

factory with the press of a button. Changes can be made to the product throughout the entire manufacturing process. If there is even time for it; once ordered in the morning, the dream item will already be on the doorstep by the evening. Particularly hazardous production stages will only be performed by machines, thereby minimising the risk of injury. During other production stages, machines will be used to aid factory workers. So-called exoskeletons – wearable, power-assisting external skeletons – help specialists lift, carry and work with heavy products and machinery. This will see the human-machine co-operation reach a completely new dimension, which workers must also be equipped to handle.

It will no doubt be several years before all of the aforementioned developments become a reality. With its existing expertise, however, the Metropolitan Region is perfectly prepared not only to participate in these developments, but also actively help shape them. The areas of competence have extensive experience in a wide range of fields. It is a question of now bringing these together, thinking laterally, and thus jointly devising solutions to highly specific research issues.

The “Connected production” area of activity covers an aspect pooling the Metropolitan Region’s competencies into one very specific area of research. In future, for instance, the desire for personalisation will become increasingly important in production. But connected production also stands for efficient manufacturing, where standardisation plays a key role. Attempts are already being made to unlock this field through modular manufacturing. The region’s automotive industry has been focusing on this production process for years. Together with the “New materials” field, there is potential here to develop completely new, innovative designs with maximum material and resource efficiency.

A joint strategy for the areas of competence, pooling the individual strengths and further developing everything as a whole, offers great potential for clearly positioning the Metropolitan Region and establishing unique selling points. The following areas provide possible starting points for the “Connected production” area of activity:



IT SECURITY plays a critical role in the manufacturing processes of tomorrow. One central requirement revolves around establishing a secure factory Intranet for efficient CPS communication. At the same time, however, digital networking to suppliers and customers must also be guaranteed. Security systems combating data misuse by third parties must constantly be further developed.

EFFICIENT PRODUCTION TECHNOLOGIES guarantee the highest quality standards and a fault rate of nearly zero. ICT enables the individual production stages to communicate with one another, and control manufacturing according to requirements. Using waste heat from machinery also allows an extremely high degree of effectiveness to be achieved in terms of energy.

HUMAN-MACHINE CO-OPERATIONS are increasingly playing a role in connected production, not only facilitating existing work processes but also offering completely new work and production methods through features like virtual reality. In the production of robotics systems this results in a wide range of possibilities for mechanical and plant engineers, in the development of ICT or in the use of new, high-performance materials.

INTER AND INTRALOGISTICS is gaining huge prominence in fully automated production. The focus here is on

self-regulating material flows through self-driving transport systems. In order to guarantee an efficient production process, however, new concepts for incoming and outgoing goods must also be developed.

The further **PERSONALISATION** of products is an opportunity which has only gained importance through Industry 4.0. The modular manufacturing already being demonstrated by the Metropolitan Region's automotive industry is a reflection of increasingly flexible production. Modern information technologies ensure no gaps in processes despite flexible manufacturing. The use of new, innovative materials is seeing alternative designs gain prominence.

6. OUTLOOK - SHAPING THE FUTURE

The Leitbild WaBe (model of sustainable growth and employment) has been establishing the guidelines for the economic, technological and scientific orientation of the Nuremberg Metropolitan Region since 2010. It is an integral part of the EMRN's strategy. The Growth & Employment concept does not claim to direct the focus towards cultural, social, tourism or other areas. As a "compass", it seeks to show the way from the status quo to the EMRN's long-term development perspectives. This creates a framework where regional economic players can network and promote the deepening and expansion of regional value chains. The approach provides positive stimulation for image-building, and strengthens the EMRN's national and international profile as a dynamic, innovative economic area with a high standard of living.

When the approach was passed in 2010, seven areas of competence closing interlinking production and technology, specific services, research and development were identified:

-
- TRANSPORT & LOGISTICS
 - AUTOMOTIVE
 - INFORMATION & COMMUNICATIONS
 - MEDICINE & HEALTH
 - ENERGY & ENVIRONMENT
 - NEW MATERIALS
 - AUTOMATION & PRODUCTION ENGINEERING
-

These are the areas of competence in which the EMRN already displays particular strengths on the international stage, with above average development potential for the years to come. The areas of competence are identified based on a cluster approach: Industries are not viewed individually, but rather integrated into broadly defined technological areas of competence as part of value chains. Key technologies with a high level of cross-cutting (power electronics, nanotechnology, biotechnology, optics/laser/photronics, mechatronics), as well as services and the cultural and creative industries act as innovation drivers in further developing the areas of competence. The evaluation conducted on the areas of competence by Prognos during the follow-up process confirmed

their status as the region's economic and technological fortes.

Prospective solutions to the social and technological challenges of the future cannot, however, be developed purely within the areas of competence. Mega trends such as demographic change, climate change, globalisation, resource shortages and digitalisation require intensified interdisciplinary co-operation between industries and individual areas of competence.

Interlinking the areas of competence with their extensive expertise enables products, services and processes to be developed in order to jointly find answers to the challenges posed by the mega trends. The latest stage of strategy development initially outlined four areas of activity:

-
- SMART MOBILITY
 - DIGITAL HEALTH ECONOMY
 - CONNECTED PRODUCTION
 - SUSTAINABLE ENERGY SYSTEMS
-

These areas of activity address central economic, environmental and social issues of the decades to come, adopt an interdisciplinary approach, and encourage the areas of competence to promote cross-innovations more intensively than before. The aim is to achieve intelligent solutions in the fields of energy efficiency, production processes in a digital world, mobility and traffic management, health promoti-

on and health care, and to interlink these through technological solutions with the help of information systems and shared data usage. Co-operation and systematic exchanging of knowledge and experiences within the areas of activity pool together the Metropolitan Region's extensive competencies. The targeted networking of players from a wide range of fields allows the areas of activity to be consciously based on a broad approach, thereby creating a unique selling point compared to other cluster regions.

WE WANT ...

- ... to strengthen bridges between the areas of competence, and therefore promote the areas of activity being used to more intensively position the Metropolitan Region as a prominent location!
- ... a Metropolitan Region which works across disciplines, carries out joint projects, and provides room for innovations!
- ... to further perpetuate the knowledge transfer between science and business!
- ... to achieve an optimum international network and lasting economic success!
- ... to develop future-proof employment, and increase prosperity for everyone in the region!

With this fundamental regional consensus and joint efforts by all involved, the European Metropolitan Region of Nuremberg can build on its international position as an attractive, dynamic and innovative location, and realise the overarching development goals of sustainable growth and employment to increase quality of life.

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