

# Research on health and safety at work



## Working Programme 2014–2017



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# I Introduction

The Federal Institute for Occupational Safety and Health is committed to safety, health and humane work design. With its partners and with key stakeholders, it aims to further develop the current state of scientific knowledge on humane work design on a multidisciplinary basis and thereby to respond at an early stage to trends in the modern working world. The BAuA has a broad range of methods at its disposal for implementing this knowledge – ranging from regulation of products and chemicals, advising on the consolidation and further development of the corresponding regulations to providing information and guidance for workplace protective measures – and deploys these instruments in a problem-oriented and interconnected manner.

On the basis of the Occupational Safety and Health Act (§ 2), the Works Constitution Act (§§ 90, 91), the Working Hours Act (§ 6), the Youth Employment Law (§ 28) and its own establishment decree, the BAuA's work is driven by the following established scientific requirements in the assessment and design of humane working conditions and develops them further against the background of the changing working world.

The topic of “**harmlessness**” deals with the fundamental requirements of safety and health protection. Accordingly, the chemical, physical and climatic working environment – including work equipment – is to be designed so that accidents or direct harm to mental and physical health can be largely ruled out, for which the BAuA advocates differentiated, risk-based methods. One aim, for example, is to work towards eradicating the use of hazardous substances in workplaces within the framework of the institute's statutory

tasks or towards ensuring that they are only used in compliance with strict protective measures (e.g. enclosed production processes). Work systems can also satisfy the “harmlessness” requirement if, for example, potential errors or faults in the workflow can be recognised by employees in good time and there are sufficient opportunities for intervention in order to correct the error.

The “**feasibility**” requirement ensures that the limits of human performance are taken into account in the design of work equipment and work systems. In this regard, performance relates not only to entirely elementary physical aspects of work design, such as when reaching distances and bodily strengths must be observed when setting up a workplace. A modern interpretation of “feasibility”, however, also addresses whether work systems can be adapted to the individual properties, abilities and skills of the human as they change over time. Special importance is afforded to the level of feasibility in the assessment of new technologies, such as in the field of ambient intelligence. Here, for example, the BAuA examines the question of whether the envisaged automatic assistance provided to the human does not, in many instances, lead to a sea of information that employees are no longer able to process.

The “**unimpairment**” requirement intends to ensure that work can be carried out without health impairments or serious impairments of well-being, including in the long term. In this regard, job characteristics and elements of the workflow and work organisation are to be identified and designed that, although they can be coped with in the short term, lead to health detriments in the long term. Important priorities here include

mental loads which are currently the subject of much discussion such as time and performance pressure, work interruptions and constant availability, as well as the short- and long-term effects of these loads on employees. The BAuA also investigates the complex interactions that contribute to musculoskeletal disorders and cardiovascular diseases when considered in the long term. Last but not least, the BAuA addresses ageing-appropriate work design that prevents the early onset of degenerative processes, i. e. even in young workers.

The theme of “**health and personality promotion**” addresses the opportunity to maintain and further develop health through work in a comprehensive sense, i. e. in a way that includes physical, mental and social abilities. Work should open up opportunities for learning and facilitate participation. Against the background of dynamic change in today’s working world, this requirement takes on a new, added significance. People will only be sufficiently able to learn new working procedures or cope with job change over through responsive work design that promotes learning. For this reason, the BAuA addresses the influence of work on mental health and cognitive performance, as well as the key work-related variables that influence employability.

In the BAuA’s view, well-designed work must consider all of these requirements. Work should both meet the fundamental requirements for safety and health protection and support the further development of employees’ occupational biographies and therefore their working capacity and employability. Last but not least, work should be designed so that the working person can

productively contribute to value creation in the respective organisation.

On all levels, **social framework conditions**, such as new forms of work or restructuring measures, must be considered in order to take account of the effects of the changing working world on employees’ working conditions. For the BAuA, this means systematically recording and analysing changing trends in the working world but also further developing the design knowledge in the field of occupational science.

In order to achieve these overarching goals with regard to humane work design, the BAuA – as a departmental research institution of the federal government – has access to the instruments of research and development and those of science-based services such as policy advice, sovereign tasks and knowledge transfer.

With its **research and development**, which focuses especially on changing trends in the working world, the BAuA is committed to considering technological and organisational innovations in the field of safety and health from the outset. As a result, it not only contributes to the further development of knowledge in work-related technical disciplines, but also applies these insights within the framework of its science-based services. The BAuA works in cooperative networks and strives for increased, competitive acquisition of third-party funds in order to further develop the quality of its high-level research.

The BAuA’s expertise in the regulation and further development of occupational safety is made available via its science-based **policy advice**.

Policy advice is mainly delivered through national and international committee work, as well as in the form of expert opinions, reports and analyses. It is aimed in particular at the Federal Ministry of Labour and Social Affairs, but also the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and other institutional stakeholders in the field of workplace prevention policy.

In recent years, the **statutory and sovereign tasks** for the regulation of chemicals and products have grown in importance. Based on scientific findings relating to unacceptable risks, authorisation and restriction procedures at the European level limit the use of substances of high concern (such as carcinogenic substances) to a necessary degree. In addition, constraints are established for the safe use of biocidal products, for example. With this consistent form of prevention, the BAuA contributes to effective occupational, consumer and environmental protection.

Finally, another of the BAuA's important functions is to build a systematic bridge between the generation and utilisation of knowledge. The recipient-specific processing, supply and communication of knowledge, information and practical aids relating to occupational safety is vital to the field of **transfer**. For this purpose, the BAuA uses various means and routes adapted to the respective requirements, such as publications in various formats, events, information systems and transfer networks, as well as the DASA Working World Exhibition.

Given the complexity of the tasks and the variety of areas for activity in the field of occupational

safety at the national, European and international level, the success of the institute's strategic approaches depends on a longer-term and, in many cases, also cooperative approach by stakeholders from the research stage right through to practical implementation. For this reason, the BAuA systematically utilises and develops its professional-networking activities with the research and occupational-safety community in both the national and European arenas, especially its cooperation agreements with third parties, its cooperation with departmental research institutions, and its collaboration in the Joint German Occupational Safety and Health Strategy (GDA).





# II

## Strategic fields of activity at the BAuA 2014–2017

With the present Working Programme, the BAuA aims at consistently focusing its efforts on problems to which a high priority is attached because of a need for scientific clarification as well as for political and practical intervention. For the sake of continuity, the BAuA will orientate itself – along its developed competences and will continue with long-term focal areas, but will also develop these in a target-oriented manner, taking into account new problems arising from changing working conditions. The BAuA's activities for the period 2014–17 relate to **five strategic fields of activity**:

### 1. Ensuring safe use of chemicals and products:

Through research and development, but especially through its statutory tasks in the field of chemical and product safety, the BAuA will contribute to the exclusion of products and substances from the market in the event of unacceptable risks and / or to ensure the safe use of such products and substances by way of hazardous substance and product information and suitable protective measures. Thereby, the BAuA will make a significant contribution to the safety and health of employees and to consumer and environmental protection.

### 2. Adapting working conditions to the needs of humans:

In this field, the BAuA will conduct research into the opportunities and risks of new forms of work and new technologies, as well as the handling of hazardous factors in companies. These will range from mental and physical workloads to physical factors of the working environment as well as chemical and biological hazards. The development of scientifically sound instruments and guidance that is intended to support companies in assess-

ing hazards and designing humane work also remains an essential objective in the current Working Programme.

### 3. Avoiding work-related diseases – promotion of health and workability:

Here, the BAuA's research and development strives, to continue activities aimed at clarifying the genesis of work-related diseases, especially in the musculoskeletal and cardiovascular systems and, based on this, to develop preventive approaches in order to improve humane work. Furthermore, emphasis will be placed on addressing relations between working conditions, mental health, cognitive performance and workability, as well as on the analysis and further development of approaches to Corporate Integration Management.

### 4. Understanding the impacts of a changing working world and further developing occupational-safety instruments:

The BAuA will generate and supplement design knowledge in the field of occupational science against the background of changing social framework conditions, especially demographic change, and will implement this into recommended courses of action for the purpose of differential and prospective work design. This encompasses topics such as structural change, demographics and increasing flexibility, as well as the organisation of occupational safety.

### 5. Communicating information on the working world and occupational safety:

As an active learning location of the BAuA, the DASA Working World Exhibition is outstandingly important for communicating information on

occupational safety. It offers basic knowledge and guidance relating to the working world and humane working design to a wide audience, raises visitors' awareness of the problems of a changing working world and presents possible solutions. The BAuA's transfer activities will focus on recipient-specific formats and instruments for providing and communicating knowledge relating to occupational safety.

The BAuA's research and development activities in the strategic fields of activity 1–4 are explained and specified in the BAuA's Research and Development Programme 2014–2017 (R&D Programme).

## II.1 Ensuring safe use of chemicals and products

Based on its statutory tasks, the BAUA is actively engaged in the fields of “**Chemical safety**” and “**Safe products and work equipment**”. The safety and health of employees and, at the same time, consumer and environmental protection are considerably strengthened if products, work equipment, chemicals and materials are designed in a safe-to-use manner when they are placed on the market. Safety of use means harmlessness by way of suitable construction and design of products (“safety by design”). This requirement can also be satisfied, however, if effective protective measures ensure safe handling, especially in the case of chemicals and materials. In the commercial and industrial sector, the responsibility for the safe use is also on the user’s side. Products for private consumers, on the other hand, must be designed to be safe from the outset.

### II.1.1 Chemical safety

Chemical safety is dependent on reliable and quality-proofed information on the hazard characteristics of chemical substances and mixtures, the risks to humans and the environment, and the measures needed for safe handling. Many chemical substances have not been sufficiently tested with regard to their hazard characteristics. In 2007, the European Chemicals Regulation REACH<sup>1</sup> made it the responsibility of manufacturers and importers to provide information on the safe use of substances over their life cycle from manufacture to disposal. The various testing and information requirements that had applied until then for newly developed chemicals (“new substances”) and for substances already marketed before 1980 (“old substances”) will be aligned by 2018 in three registration phases. Thereafter, reliable and accessible hazardous-substance information shall be available for more than 35,000 chemical substances depending on production quantity.

The activities in the programme period 2014–17 aim to:

- clarify presumed risks for chemical substances in a targeted manner;
- ensure valid, structured hazardous-substances information for the users of chemical substances and mixtures;
- reduce and avoid the use of chemical substances and products of high concern for humans and the environment;
- support small and medium-sized enterprises in their legal obligations and enforcement authorities when implementing chemical safety;
- provide proactive support to the further development of legislation.

With scientific findings on the safety of nanomaterials it became evident that European regulations on chemical safety do not yet take sufficient account of significant risks arising through the inhalation of dust particles and fibres. Even in the case of substances with no specific toxicity, biopersistent particles and fibres of low solubility can enter the lungs by inhalation and, once there, can trigger inflammation and cancers. In addition to some nanomaterials, this can also relate to other dust-forming materials. Within the framework of **research and development**, the focus will be expanded in the programme period beyond nanomaterials to include other newly developed materials (advanced materials), which are identified as a specific area of technology for support in the EU’s 8th framework programme for research (“Horizon 2020”). Measurement and testing methods are to be further developed and knowledge is to be generated in relation to the assessment of possible health risks. This will centre on investigations into dust generation by substances, the shape, surface and size distribution of released particles, and the biopersistence and cytotoxicity of such particles as first indications of a possible hazard. The medium-term aim of the activities is to consistently integrate protection from dusts and fibres that can enter the deep lung into the EU’s chemical safety regulations. Furthermore, model-based consultation will enable research institutions and start-up companies to recognise risks to humans and the environment as early as possible. In this way, safe design and the safe use of advanced materials are to be promoted even for production quantities

<sup>1</sup> REACH: Registration, Evaluation, Authorisation of Chemicals

that lie below the registration thresholds for REACH.

Already now, REACH's requirements for providing safety-related information in the supply chain have caused safety data sheets to grow to up to 1,000 pages in size. Implementing this into appropriate safety and occupational-safety measures represents an excessive demand, especially on small and medium-sized enterprises. **Research and development** at the BAuA therefore also focuses on simple tools for structured, comprehensible communication of necessary risk-reduction measures. In the field of occupational safety, methods have proven effective that revert to easily accessible information (control banding approaches) for the derivation of protective measures, such as the Easy to Use Workplace Control Scheme for Hazardous Substances (EMKG). In the programme period, instruments for simple and yet sufficiently detailed communication of measures will be developed and tested for efficient risk management by manufacturers and importers of chemical substances and mixtures. Established using funds from the EU and the BAuA, the online portal SUBSPORT is intended to serve as a platform for distributing examples of successful substitution of hazardous substances. The concepts for socio-economic analysis (cost/benefit analysis) are also to be further developed for substances with a high risk to humans and the environment. The programme period will see continued evaluation of measurement methods and calculation procedures for estimating exposure to substances in the workplace, with a focus on improving the estimation of skin contact with chemical substances in workplaces.

Within the framework of its **statutory tasks**, the BAuA will contribute to the quality assurance of chemical-substance registration dossiers registered with the European Chemicals Agency (ECHA) under REACH. It will support the ECHA in harmonising classification and labelling, as is foreseen for carcinogenic substances, for example. REACH additionally offers EU Member States the option to propose chemical substances for assessment where a reasonable presumption of risk gives rise to a particular need for testing and information. For this purpose, the BAuA

prepares proposals and assessments from the point of view of occupational safety. Another important pillar of the REACH Regulation is the authorisation and restriction of the use of chemical substances of high concern for humans and the environment. The BAuA is responsible for selecting and identifying corresponding substances, preparing dossiers for restrictions, and supporting the ECHA in reviewing authorisation and restriction procedures. Here, socio-economic analysis plays a key role in the technical decisions. In the programme period, findings from previous authorisation and restriction procedures are to be compiled and used to refine existing instruments.

Because of their use to control harmful organisms, biocidal products are also fundamentally associated with concern for humans and the environment. Marketing such products has therefore been limited by an authorisation procedure for a few years. In a market dominated by small and medium-sized enterprises, approximately 35,000 biocidal products are currently traded in Germany. So as to remain marketable, these must be authorised by the BAuA over the coming years. Within the framework of the new European Biocides Regulation, the manufacturers will also be offered the option of a unified European authorisation of biocidal products (union authorisation). In addition to national authorisation, the BAuA's tasks will therefore be extended to include participation in European authorisations. Another task, partly performed in cooperation with the other competent federal authorities, remains the assessment of risks posed by active substances used in biocidal products as a basic prerequisite for authorisation. In addition to risks for humans and the environment, the BAuA also tests the respective biocidal product for sufficient efficacy against the target organisms.

Because of the complexity of European chemical-safety requirements, there is a need for expert advice at many of the affected companies. In the field of **transfer**, the BAUA has the statutory task to support small and medium-sized enterprises through a REACH-CLP<sup>2</sup> Helpdesk. This is now also offered to companies that are affected by the authorisation procedure on the basis of the new EU Biocides Regulation. At the heart of this is the online portal [www.reach-clp-biozid-helpdesk.de](http://www.reach-clp-biozid-helpdesk.de), which counts approx. 7 million visitors and some 5,000 enquiries to the BAUA each year. An increasing need for advice is expected in the programme period due to expansion to include biocidal products, among other factors. This is also to be met by continuing to produce the “REACH Info” publication series and further information materials. As before, further-training events will be offered and individual companies will be advised on legal matters on request. Information on the safe use of biocidal products will be provided via an additional online biocides portal for companies, consumers and enforcement authorities.

As the Federal Office for Chemicals, the BAUA coordinates the assessment and units that implement the law in Germany with regard to the placing of chemicals and biocidal products on the market. The BAUA delegates experts to the decision-making bodies of the EU Chemicals Agency (ECHA). One essential objective in this regard is the proper organisation of interfaces between the regulations for marketing chemicals and the legal occupational-safety requirements, e. g. in the requirements for biocidal products. Within the framework of its **policy advice**, the BAUA provides support to the competent ministries, especially the Federal Ministry of Labour and Social Affairs (BMAS) and the Federal Ministry for the Environment (BMU). In doing so, the BAUA acts both on request and proactively on issues extending beyond occupational safety to include environmental and health protection, e. g. in setting priorities for the assessment and regulation of substances of high concern for humans and the environment. It supports political decision-making by analysing possible risk-management options and by presenting alternative courses of

action. In the current Working Programme, too, the BAUA will contribute to increasing objectivity in conflicts that arise between chemical safety and other government objectives, e. g. with regard to the High-Tech Strategy and the Energy Reforms. Intensive assistance and support will be provided for the evaluation and further development of regulations relating to chemicals legislation, especially the EU Commission’s planned revision of REACH during the programme period.

### II.1.2 Safe products and work equipment

The second field of activity, “Safe products and work equipment”, will focus on manufactured, e. g. products and devices. The legal requirements have been harmonised in the European Union under the term “product safety” for more than 20 years and are intended to ensure the safety of employees and consumers. Nevertheless, the RAPEX information system (Rapid Exchange of Information System), which is supported by the BAUA, recorded more than 2,000 reports of products that entail a serious danger to users’ safety and health in 2012 alone. In addition, 129 fatal industrial accidents in Germany due to mechanical hazards in the same year illustrate the substantial need for action, now as before, in order to achieve harm-free product design. The activities in the programme period 2014–17 aim to:

- inform manufacturers, importers, dealers, commercial buyers, private consumers and the authorities responsible for market surveillance on products that pose risks;
- support designers and product developers in designing safe products that are fit for purpose through design aids and guidelines;
- provide technical support to the further development of legislation and standards and their integration into practice.

Within the framework of its **statutory tasks**, the BAUA is mandated to support the authorities (of the Federal States) that are responsible for market surveillance in accordance with the Product Safety Act. The BAUA keeps records of accident statistics and maintains the national reporting system for dangerous products. It forwards

<sup>2</sup> CLP: Classification, Labelling and Packaging of Substances and Mixtures

reports of dangerous products from the German market-surveillance authorities to the European Commission and to the Member States of the EU using fast reporting systems and officially publishes bans on the sale of products (“prohibition orders”). The BAuA publishes all of the product recalls in Germany pursuant to the Product Safety Act, as well as making public those products reported in the RAPEX procedure that present a serious danger. It also ensures that the corresponding information is supplied to the German Federal States by other EU states. Lists of standards are published who allow designers to assume that a product meets the legal safety and health requirements (“presumption of conformity”) when they are applied. Furthermore a list of testing bodies that confirm the conformity of a product with these requirements with the “GS symbol”. A further objective in the programme period will be to identify and assess safety and health risks in the use of dangerous products and to develop proposals for risk reduction in coordination with the market-surveillance authorities. In addition, specific products will be assessed if there is sufficient evidence that they present a direct danger to people’s safety and health or if they are associated with a serious risk.

In terms of product safety, the definition of fundamental safety and health requirements in EU directives forms the legal framework for placing safe products on the market. In this regard, the focus is on the interplay between national regulations and standards that have been harmonised at the European level. Within the framework of **policy advice**, the BAuA lends its technical expertise to the establishment of both European and national regulations, as well as to standardisation, by providing opinions and participating in relevant committees. In product safety, as in chemical safety, the focus currently lies on organising the communication between the product manufacturer and the user, who, as an employer, has a duty to conduct a risk assessment. The legislative and standard-setting authorities must ensure that the information needed for selecting suitable work equipment is available in a practical form. In this regard, the focus in the period of the Working Programme will be less on detailed, product-specific standardisation and more on basic and horizontal standardisation (“A and B

standards”). One example is the establishment of practice-oriented measurement procedures for determining machines’ noise emissions. Furthermore, the BAuA manages the affairs of the Committee for Product Safety (AfPS), which was set up by the BMAS. At the same time BAuA is engaged with its expertise in the committee.

The **development activities** focus on design aids and the selection of products whose design is safe, healthy and fit for purpose. Product safety is not only a legal obligation for all economic operators (manufacturers, agents, importers and dealers), but can also contribute to increasing companies’ competitiveness if organised appropriately. However, it is a considerable challenge for designers to take account of the often-large numbers of relevant European regulations, directives and standards. The BAuA will continue the work it began in the last Working Programme under the development focus “Practical aids for products with safe and healthy design”. Hazard-specific threshold values, parameters, assessment procedures and protective measures will be determined, developed further based on insights from occupational science, and processed in a manner specific to the target group. As a further objective, safe and healthy design is to be established as a quality criterion for products, in conjunction with fitness for purpose, and integrated into the training of future product developers.

In order to promote safety in a global market of technical work equipment and products, the BAuA supports the effective public **transfer** of official and scientific findings through an online product-safety portal (**[www.produktsicherheitsportal.de](http://www.produktsicherheitsportal.de)**). Here, manufacturers, importers, dealers, commercial buyers and private consumers, on the one hand, and the authorities responsible for market-surveillance, on the other, can find current official announcements and technical information from market-surveillance and research and development at the BAuA covering all aspects of the topic “Safe products and work equipment”.

## II.2 Adapting working conditions to the needs of humans

Concrete working conditions in workplaces are changing at an increasing rate. New technologies and new forms of work are being introduced into the workplace before anything is known about their effects on humans. At the same time, well-known hazards are not addressed at companies in a way which corresponds to actually available scientific knowledge and technology.

The BAUA aims at making substantial contributions to the human related design of working conditions. In its research, it focuses on those hazards that have not yet been sufficiently investigated, e.g. “innovative technologies”, “mental workload” and “biological and chemical hazards”. Activities particularly oriented towards practice and implementation focus on specific physical factors that pose a risk, as well as the working environment.

- For the new “intelligent” technologies, the need for action arises above all from largely unsolved questions as to how such innovations in work equipment can be adapted to the needs of humans – especially with regard to mental load – and how they can be integrated into work systems. It is not only important to avoid negative effects, but also to take advantage of the versatile opportunities for achieving humane work design offered by innovative technologies.
- The BAUA projects in the area of mental workload follow the principle that design in this area should not aim at reducing existing mental load, but at optimising it. Accordingly, the planned research and development projects include investigations into work intensity but also into the prerequisites of healthy leadership and into recovery in the case of mental and / or service work. In addition, aids shall be developed for performing risk assessment of mental load in order to provide companies with more certainty of action.

- Employees in workplaces in animal husbandry are exposed to considerable hazards due to bio-aerosols. In addition to impacts from complex mixtures of often-unknown composition, concerns have recently been raised about the increasing level of multidrug-resistant bacteria and previously unknown pathogens. The BAUA aims to apply the methods it has developed in these workplaces and to utilise the findings obtained for other working areas in which biological agents are used.
- The statistics on sickness absence and occupational diseases show widespread and significant risks resulting from physical workload (e.g. lifting and carrying), from the physical working environment (e.g. noise, climate, and optical or electromagnetic radiation) and from inadequate ergonomics. The BAUA develops practical methods and measurement procedures in order to facilitate risk assessments in workplaces. Furthermore, it will expedite the implementation of sound findings into regulations or standards in order to underpin the foundations of occupational-safety measures.

### II.2.1 Innovative technologies in work equipment and work systems

In both the production and services sectors, the introduction of technological innovations is seen as key to increasing the competitiveness of companies. From the perspective of occupational safety, however, it is crucial that the health and well-being of individual employees benefit from these developments. For this purpose, the BAUA has established a new focal area for researching the opportunities and risks coming along with new information and communication technologies (ICT) in the working environment. The projects initiated within the area of **research** under the keyword of “ambient intelligence” (AmI) illustrate the necessity of being able to estimate the consequences of technology at an early stage in order to influence current technology-driven developments in the working environment by focusing on people and in order to combat risks such as deskilling, loss of competence and psychological stress. At the same time, the previous results show that AmI-based technologies offer new possibilities for differential and dynamic

work design. This means adapting work to the abilities and skills of each person, including with regard to ageing-appropriate work design.

For these reasons, the BAuA will continue to research AmI-based technologies and will now primarily investigate methods, concepts and computer-based work systems and products that support work activities in a manner specific to the context and even, in part, autonomously – so-called adaptive work assistance systems (AAS). In the 2009–2013 programme period, some of the findings already led to the **development** of practical recommendations for the use of new technologies, e. g. for the use of head-mounted displays, intelligent protective clothing, or new lighting technologies. In the current programme period, the previously obtained findings are to be developed further in order to form integral design approaches, in the sense of interaction between humans, technology and organisation. Because the topic will readily link up with research programmes funded nationally or on a European level, the BAuA has set itself the objective of acquiring third-party funding in this area. Against the background of the potentials of new technologies, including for supporting older employees, the BAuA will compile the findings in a manner suitable for **policy advice**.

### II.2.2 Mental workload: stressors and resources

Mental workload and its individual and company-wide consequences have gained a great deal of public, professional and political attention. Accordingly, one important aim is to introduce scientifically sound findings into the debate on mental workload. At the same time, both companies and occupational-safety institutions shall be supported in checking and optimising psychologically relevant working conditions – both stressors and resources – with respect to the criteria for humane working design.

Furthermore work intensity is an important problem which has to be investigated. In this regard, the focus will be on handling of time and performance pressure by the company and the individual, as well as on new forms of work control. In addition, the working condi-

tions of managers and the prerequisites for healthy leadership will be explored.

A further focus of research and development will be on preparing procedural guidelines for conducting the legally prescribed risk assessment of mental workload in order to establish greater certainty of action. Results from workplace case studies show that different methods and procedures could be adequate for assessing mental workload. Furthermore the process of conducting a risk assessment is of high relevance. For this reason, the process of performing a risk assessment shall be examined in greater detail. It is important to get a better understanding of the practical requirements. Based on the results gathered, the derivation of recommendations for a better implementation of risk assessment of mental workload is aimed at.

In the programme period, the BAuA actively supports the Joint German Occupational Safety and Health Strategy (GDA) in the field of “mental health in the workplace”. Furthermore, the BAuA will reinforce its **policy advice**, on mental workload, especially BMAS, on the base of empirical findings. It is also important to systematically clarify the importance of work-related technical and organisational factors and their influence on the experience of stress and strain. Mental load not only results from the social and individual circumstances at work, but is also founded in the technical / organisational aspects of a work system. The BAuA sees it as an important objective to process its findings for the purpose of standardisation, legislation and regulation, especially for the technical committees on the health and safety work act and the Ordinance on Industrial Safety and Health.

### II.2.3 Biological and chemical hazards

In Germany, some 5 million employees have contact with biological agents. This can lead to infections, the development of allergies, or toxic responses. In order to maintain health and employability, therefore, a better estimation must be made of the hazard posed by biological agents in workplaces. It is difficult to make an assessment of this kind, however, because most workplaces entail contact with complex mixtures of largely



unknown composition. This is in addition to current issues such as the importance of antibiotic resistance. Knowledge gaps make it harder to:

- unambiguously characterise exposure to biological agents in workplaces;
- estimate the health consequences of the exposure for employees;
- derive proposals for workplace design and preventive occupational health care.

Within the framework of **research and development**, the cultivation-independent methods tested in the previous programme period for identifying and quantifying microorganisms in the workplace will be applied in field studies on activities in animal husbandry and biogas production. New methods for surveying the health impact of biological agents, as well as for classifying them, will be developed in order to establish long-term scientific bases for regulation and occupational-safety recommendations for other areas of work involving exposure to biological agents.

Deficits in occupational safety can also be observed for activities in which chemical and biological exposure is linked to the use of processes, devices, machines and vehicles that release dusts, gases, vapours or mists. Here, the most important information sources from the field of chemical safety are missing for conducting the risk assessment in accordance with the Occupational Safety and Health Act: labelling and safety data sheets. This also relates to new workplaces in the “green economy”, e.g. in energy production and recycling. Here, too, within the framework of **development**, comprehensible and verified recommendations for harm-free design of working conditions will be derived from field studies with systematic determination of loads and will be put into practice as Control Guidance Sheets or Technical Rules.

Within the framework of **development and transfer**, the overall awareness of chemical and biological hazards is to be improved, and the proportion of companies that conduct a proper risk assessment is to be further increased. With the Easy to Use Workplace Control Scheme for Hazardous Substances (EMKG), a simple tool is available for this purpose that is tailored to the

needs of small and medium-sized enterprises.

In addition to the chemical hazards posed by inhalation and skin contact, a new version of the EMKG with a revised didactic concept, which is, developed in the programme period, will also take account of measures for fire and explosion protection and for safe storage of hazardous substances.

**Policy advice** on issues relating to hazardous substances and biological agents is structured into the pillars of management and technical participation in the Committee on Hazardous Substances (AGS) and Committee for Biological Agents (ABAS), as well as direct provision of advice to the BMAS through analyses and opinions. Focal topics are pursued in addition to providing basic advice relating to ongoing legislation and regulation. In the programme period, these topics will relate in particular to:

- establishing the risk concept for activities involving carcinogenic hazardous substances in the Hazardous Substances Ordinance;
- adapting the general dust limit value for bio-persistent dusts in the workplace that can reach the deep lung<sup>3</sup> to reflect current scientific findings from particle toxicology;
- switching over to the new globally applicable hazard symbols and labelling information for hazardous substances;
- integrating the rules on fire and explosion protection into the Hazardous Substances Ordinance;
- adapting the requirements for biocidal products in Germany’s hazardous-substances legislation in line with the EU’s newly designed authorisation procedure;
- the BMAS’s initiative to classify biological agents and to firmly establish them in the Biological Agents Ordinance and in the ABAS.

#### II.2.4 Physical load, physical factors and working environment

Both conventional and modern work systems are subject to “classic” hazards. Here, it is the implementation of state of the art solutions which raises difficulties, such as for the manual handling of loads or the design of the working-

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<sup>3</sup> respirable dusts

environment. The problems often result from a lack of methods and processes, and lead to uncertainty of action in companies. The BAuA therefore develops practice-relevant methods and procedural guidelines and is active in regulation and standardisation.

Unfavourable postures and heavy lifting / carrying are associated with serious health consequences and considerable economic implications. Correspondingly, the BAuA works on practical methods and measurement systems for recording these load factors aiming at prospective work design. Within the framework of activities connected with the GDA, a tested inventory of methods for the purpose of analysing, assessing and redesigning all forms of physical workload – the key-indicator method – will be further developed in the programme period in cooperation with the Institute for Occupational Safety and Health (IFA) of the German Social Accident Insurance (DGUV). The cooperation with the IFA also reinforces the **transfer** into workplace practice.

Within the framework of risk assessment, physical parameters for evaluating various factors of the work system such as noise, climate, optical radiation, mechanical hazards or ergonomics are often inadequately determined in workplace practice. Especially small and medium-sized enterprises lack, above all, the necessary technical expertise. As a result, these factors are not considered, or the hazard is estimated incorrectly or with large uncertainties. In the preceding Working Programme, the BAuA has therefore established a focal topic incorporating the **development** of practicable measurement methods for physical parameters used to evaluate the hazard factors. This work will be continued in the current programme period. By supplying procedural guidelines, the BAuA will transfer its project results into workplace practice thereby enabling companies to properly determine hazards that occur in the work system by using practicable methods.

The BAuA also aims at avoiding hazards due to physical factors by ensuring that these are already taken into account during the selection of work equipment. Right from the procure-

ment stage, workplace protagonists should select work equipment fulfilling the criteria of safe, health-conform and utilizable design. The BAuA provides evaluation specifications and prepares procedural guidelines. This **development focus** will be supplemented by a systematic **transfer** of the findings into practice, taking particular account of user requirements.

Within the framework of **policy advice**, the BAuA will get involved in the amendment of European directives, national regulations, Technical Rules and standards with its expertise on hazard factors during the programme period. Scientific **policy advice** on specialist policy issues relating to safety and health protection focuses on:

- the design and operation of workplaces, especially the Committee for Workplaces (ASTA);
- work activities with hazards due to noise, vibration, electromagnetic fields or artificial optical radiation and design questions relating to machine and workplace safety, including the use of work equipment, especially the Advisory Committee on Protection at Work (ABS).

### II.3 Avoidance of work-related diseases – promotion of health and working capacity

Health-preserving working conditions make a significant contribution to safeguarding employees' occupational participation. In this regard, it is particularly important to understand the long-term and complex effects of work. The BAuA therefore investigates the health consequences resulting from work, and from the associated workplace design, in order to elucidate the genesis of relevant work-related diseases, as well as the role of individual and work-related resources in the workplace. Building on its research, the BAuA intends to intensively contribute to the evaluation of workplace prevention approaches as well as to the implementation of Corporate Integration Management. The aim is to identify starting points for measures that contribute both to the harmlessness and freedom of impairment of work, in the sense of maintaining health and workability, as well as to the promotion of personality and social compatibility of work. Preference will be given to evidence-based methods.

- The economically most significant groups of illnesses during working age include cardiovascular diseases (CVDs) and musculoskeletal disorders (MSDs). CVDs have significant impact on early retirement and premature death in workers. MSDs are the most frequent cause of sickness absence. Both groups of illnesses can also be a consequence of mental workload, among other things. For this reason, elucidating the conditions of genesis of these illnesses and of the possibilities for their prevention through humane work design forms is a long-term research priority for the BAuA. During the Working Programme period, investigations into the risk and prevention potentials arising from specific as well as overarching work-related stressors and resources will be conducted with a focus on those that are especially relevant, particularly for workplace practice.
- The consequences of mental workload for the persons affected, for society as a whole and for the economy justify further research that takes into account new load constellations of the modern working world and relates these

to mental-health impairments. An overarching objective in this regard is to clarify the relations between workload and mental disorders, which nowadays represent the main reason for disability pensions. In light of changes in the age structure of the workforce and of the increasing prevalence of information and communication technology, the BAuA will continue its research into the cognitive performance of older employees. Here, it is essential to investigate beneficial as well as impairing factors in order to be able to create working conditions that allow a longer working life.

- Corporate health management (CHM) represents a suitable framework for preventing work-related diseases and preserving and promoting the health of employees. Access to CHM can be achieved by consistent implementation of corporate integration management, which in turn can provide additional stimuli for implementing adequate health-promoting measures. However, the process of implementing corporate integration management into workplace practice is only gradual. The BAuA will therefore investigate beneficial and impeding factors of corporate integration management, taking into account individual, workplace-related and social conditions. The aim is to develop recommendations for the design of corporate integration management for the responsible actors in the workplace (e.g. occupational physicians) thereby contributing to a workplace-oriented prevention culture. Within the framework of activities in the field of safety and health at work, promoting the health and workability of persons in specific life situations is of utmost importance due to demographic change and extended working life and hence, remains an important field of activity for the BAuA.

Within the framework of **policy advice**, the BAuA makes significant contributions in the form of active scientific and administrative collaboration in committees within the remit of the Federal Ministry of Labour and Social Affairs. For example, the BAuA is responsible for managing the Committee for Occupational Medicine (AfAMed) which advises the Federal Ministry of Labour and Social Affairs in all matters relating to preventive

occupational health care, as well as in other matters relating to medical occupational safety. Furthermore, the BAuA supports the BMAS in fulfilling its duties regarding the development of occupational-illness legislation (according to § 9 paragraph 1 of Volume VII of the Social Code) through the Medical Expert Council for Occupational Diseases (ÄSVB), which advises the relevant federal ministry on medical- / scientific matters.

### 11.3.1 Work-related disorders of the musculoskeletal and cardiovascular systems

The research and consultation requirement with regard to CVDs during employment will increase considerably -and the significance of work-related MSDs will persist due to the following reasons:

(a) the proportion of older employees increase the statutory work life is extended lifestyle-associated of health-related conditions in the population increase (e.g. increasing prevalence of excess weight), capabilities of health care will improve.

In the newly established focal topic “Aetiology of work-related CVDs” the BAuA therefore works towards collecting the necessary knowledge for the prevention of work-related CVDs with long-term strategic relevance. Successful, evidence-based prevention concepts in the setting of the working world require knowledge on occupational factors influencing the genesis of work-related complaints and diseases. Building on the current research activities, one important objective of the BAuA’s research is to investigate the causes of work-related cardiovascular diseases and musculoskeletal disorders, as well as their significance in the workforce. For this purpose, systematic reviews and secondary analyses of research and register data will be conducted. Beside this the BAuA will participate in high-quality cohort studies on selected physical and psychosocial influencing factors of the working world, for example in order to answer complex questions on the work-related genesis of CVDs.

The established field of research on the prevention of work-related MSDs focuses on those diagnoses that are of current relevance to health policy. For this purpose, the results of a long-term line of research into inpatient morbidity

(hospital diagnoses) – bases on the WISMUT data archive – shall be used that aims at thoroughly investigating the relation between physical workloads and musculoskeletal disorders and cardiovascular diseases. Research shall be conducted on the occurrence of shared underlying risk factors for both CVDs and MSDs in the domain of the working world (e.g. heavy physical demands and psychosocial workload) and in the domain of lifestyle (e.g. physical inactivity and excess weight). Furthermore the effectiveness of complex prevention strategies shall be evaluated using evidence-based approaches. As both disease groups are generally considered to be widespread diseases, the BAuA will also intensify its efforts to clarify work-relatedness of CVDs and MSDs in the scientific discourse in the current programme period.

The anticipated results will be used to continue providing **policy advice** with a high scientific standard in the established field of MSDs (ÄSVB, AfAMed, GDA and committees of the German Social Accident Insurance (DGUV)), as well as proactively with regard to work-related CVDs. The reduction of work-related health hazards and disorders in the musculoskeletal system is also one of the three foci of the Joint German Occupational Safety and Health Strategy of the federal government, the states and the accident insurance organisations for the years 2013–2018.

For the purpose of **transfer**, proposals will be developed for the assessment and evaluation of prevention and intervention strategies based on the early identification of occupational groups with increased health risks for CVDs and MSDs, and evidence-based recommendations will be prepared for example issues in relation to existing workplace prevention concepts (e.g. the S3 guideline): key stakeholders (occupational physicians, social partners and politicians) can implement these proposals, e.g. for corporate health management, and the BAuA will evaluate them within the framework of its research.

### 11.3.2 Work, mental health and cognitive performance

Mental health is of great importance for every individual and for its personal and professional

environment. It includes not only mental disorders but also individual resources such as workability, functional capabilities, well-being, job satisfaction, job motivation and job commitment. New load constellations of the modern working world justify a need for research on the relation between changing mental and physical work requirements and mental health. The BAuA's **research** will concentrate on clarifying, on the one hand, what factors in the working world are related to an impairment of mental health, i. e. depression, burnout and impairment of cognitive performance and, on the other hand, what protective factors and / or resources maintain and promote mental health and cognitive performance at work. As the BAuA's previous findings show, cognitive performance is particularly relevant to maintaining workability over the work life course.

The BAuA will therefore continue to investigate how work-related and personal factors influence cognitive abilities and how these factors are associated with human information-processing. Furthermore, the investigations will focus on objectifying cognitive load using continuous-recording methods for mental stress and strain under realistic work conditions.

In parallel to the BAuA's activities in the field of **policy advice** and **transfer** for addressing new mental load factors in the workplace, the BAuA also aims at supporting the public and political debate with scientifically sound insights and at providing the public with factual information on the topics of mental disorders and mental health.

### II.3.3 Corporate integration management

The prevention principles contained in Volume IX of the Social Code (SGB) supplement occupational safety and workplace health promotion by introducing the concept of corporate integration management. Corporate integration management approaches and return-to-work programmes therefore represent a significant component in the field of workplace prevention and can contribute to healthy aging of employees in the workplace. So far, however, corporate integration management has not yet been satisfactorily implemented into workplaces practice. The BAuA's research

work therefore aims at identifying the relevant factors influencing retention in the working process and successful reintegration into the workplace. To this end, methods of evidence-based medicine that shall be further developed if needed shall be used.

The BAuA will scientifically address the interaction of health factors and selected work-related factors, exemplarily considering young workers and workers with health impairments, in the programme period. Since the maintenance and promotion of health and participation in employment constitute important tasks of occupational physician, investigations are planned into the role of occupational physicians in dealing with particularly vulnerable people, leading to recommendations for occupational-medical practice.

## II.4 Understanding the impact of a changing working world and developing further occupational safety and health instruments

The BAuA pursues the objective of systematically recording and analysing changing trends in the working world. This entails, in particular, observing overarching structural changes and trends that subsequently necessitate further development of work design knowledge in the field of occupational science and of prevention structures, which allows the subsequent development of customized concrete solutions and guidance. In this regard, it is particularly important to consider both summative impacts and compensatory effects. Another objective is to specify impacts on the need for modernisation and adaptation of prevention structures on the organizational level and beyond.

- There are clear indications that a typical forms of employment and flexible working times, which are due to the modification of corporate organisational structures and of work control processes, can have strong effects on employees' social integration and health. Likewise, workforces are undergoing increasing diversification due to the demographic change. In this context, the BAuA has taken on the task of reassessing existing work design knowledge from the occupational sciences in view of differential work design. For the purposes of prospective work design, the BAuA is translating this knowledge into recommended courses of action for age- and ageing-appropriate work design.
- Especially in times of extensive change, politics, economy and science need current and reliable findings on working conditions and the workforce as bases for discussion, assessment and action. For this reason, reporting on the working world and establishing a systematic, data-supported reporting for the development of work and employee health will be essential fields of activity in the Working Programme 2014–2017.
- In a nutshell, it is an important question whether the changes in the working world

necessitate an adaptation of the structures and methods of the occupational safety system in order to further ensure continued safety and health at work. To address this question, the BAuA will also address the effects of occupational-safety instruments and measures and the consequences for organization a land industry-wide prevention structures in order to contribute to the efficiency of the occupational-safety system.

### II.4.1 Increasing flexibility and restructuring

Due to the increasing flexibility in workplaces and companies, the proportion of employees in a typical working-time arrangements and a typical forms of employment is continuously increasing. Together with the increasingly blurred boundaries between work and private life, this entails dissolution of temporal, spatial and social boundaries for many employees. The new types of work and working-time arrangements can be associated with considerable risks to health and social integration; at the same time, however, both spatial and temporal flexibility also offer opportunities for, among other things, better compatibility of private and professional interests. Despite numerous individual findings, there has so far been no systematic analysis of knowledge relating to work design potential. Currently, knowledge is also insufficient with regard to work that is primarily mental or interactive and the age- and ageing-appropriate organisation of work breaks: particularly in the field of classic shift work involving night work, demographic change is increasingly leading to problems for companies that are often tackled by switching to permanent night shifts – with inestimable consequences for the employees in this shift pattern. One of BAuA's goals in the field of **development** is therefore to review and assess standards for assessing the opportunities and risks of flexible organisational elements in the context of new types of work and working-time arrangements and, if necessary, to supplement these standards through research activities.

The findings that are generated using standardised scientific methods and with the involvement of employees and other organizational protagonists also form the basis for **policy advice** provided for the BMAS in the revision process of

the EU's Working Time Directive and for fundamental considerations in the field of working time legislation. Compiling and systematizing the current state of scientific evidence on working time arrangements and on flexible working time arrangements also provides organizational practitioners with a basis for humane work design.

In many situations, practical dealings with restructuring processes that take adequate consideration of social and health issues often lack an adequate scientific basis. This applies both on the level of companies (organisational structures, management competence) and on the level of employees (coping behaviour, qualifications). The European Parliament has therefore asked the European Commission to introduce corresponding supportive measures for companies and employees. The BAuA will contribute to a better understanding of the underlying mechanisms of restructuring measures and, on this basis, will promote the **development** of support instruments and resources for coping with their effects.

#### II.4.2 Demographic change

On the company level, the demographic development leads to a significant change in the workforce (e. g. through an increase in the employment of women) and to increased requirements related to the acquisition or preservation of professional skills. In addition to age- and ageing-appropriate work design, the differentiated design of the broader working conditions will become increasingly important (such as individual working time arrangements). The BAuA systematises and integrates the available scientific knowledge on age- and ageing-appropriate work design. It supplements missing knowledge in this area (e. g. on work design in the services sector) through its own **research**.

Within the framework of the federal government's demographic strategy and the "Dialogue on Germany's Future", the aim is to develop an integrative approach to overcome this challenge with the cooperation of all relevant partners on the company level and beyond. In its **policy advice**, the BAuA therefore makes its subject

matter expertise available to the BMAS in order to ensure that occupational-science knowledge is integrated into strategies, concepts and measures for coping with the demographic change. The scientific evidence shall be incorporated into, among others, the design of corresponding legislation.

Company-specific implementation concepts support the policy options developed in the political context. The BAuA promotes the further development of efficient instruments for company **transfer**, especially through its collaboration in the Initiative New Quality of Work (INQA). In this way, it intensifies the exchange between politics, the economy, science and society. In addition, the intensive interlinking of the BAuA and INQA through the administrative office located within the BAuA allows efficient collaboration in the existing expert networks in the topic area.

#### II.4.3 Reporting on the working world and systematic monitoring of data on work and employees

A comprehensive monitoring system is indispensable for the systematic analysis of changing trends in the working world and their consequences for the workforce's health, working capacity and employability. For example, the physical health of people of older working age has, on average, improved over recent decades. At the same time, there are signs of increasing health impairments in those employees who are entering working life. These altered performance prerequisites must be taken into account in work design.

– With regard to the changes in requirements in the work world, the BAuA currently has a stock of data – with the results of the BIBB / BAuA Workers' Survey 2012 – that provides representative statements in relation to working conditions, workloads and work demands in different groups of employees and different sectors. Furthermore, within the period of the Working Programme, the BAuA will contribute through its research to the definition and compilation of valid indicators for a fundamental description of working conditions and employees with regard to the workforce's

physical and mental demands, health and performance. One important aspect is the continuation of current research activities for the analysis of indicators for assessing employee biographies that are characterized by specific loads to. The aim is to identify these at an early stage and, through targeted interventions, to preserve working capacity up to retirement age and beyond, wherever possible.

The BAuA will continue to develop its concept for reporting on the working world and will improve its quality. In the implementation process of the federal government's demographic strategy, the BAuA's aim is to create an interdepartmental pool of data stocks relating to the working world and to systematically compile the numerous empirical pieces of information that can be found in expertises and publications. This reliable empirical foundation, which will be easily accessible to the interested public, will also contribute to the broader use of accurate and reliable parameters (e. g. a "demographic factor") that allow for a quantification of the demographic change, as well as its course and consequences. To enable the derivation of action demands, the BAuA presents **politicians** with the annual "Safety and Health at Work" (SuGA) report, as well as expert reports based on data from the BIBB / BAuA Workers' Survey, such as the Stress Report, for example.

#### II.4.4 Effects of instruments and measures of occupational safety and health

The changes in the working world also directly influence the effectiveness of the structures and processes of the institutional occupational safety system that serve to ensure safety and health at work and that are intended to promote and support the application of knowledge relating to humane work design in workplaces.

The GDA was established in 2008 at the level of the stakeholders of the institutional occupational-safety system in order to strategically realign and streamline the performance in occupational safety. In addition to managing the National Occupational Safety and Health Conference, the BAuA in particular contributes its methodological skills and research results to the conception and con-

tinuing support for the GDA's evaluation. In the programme period, the BAuA intends to contribute, through its **research**, to the identification and classification of the effects of both, the prevention measures and the legal requirements in the field of safety and health and to understanding and / or explaining their underlying mechanisms. The BAuA aims to derive recommended courses of action for efficient design, implementation and evaluation of sustainable and effective measures in the field of safety and health at work. These measures are also to be included in the further development of strategic and structural instruments of the GDA, the organisation of occupational safety in the workplace, and corporate health management.

The BAuA provides further **policy advice** to the BMAS on a national level in dealing with questions relating to the Occupational Safety Act (ASiG), Regulation 2 of the DGUV, and regulations on preventive occupational health care. On a European level, the BAuA actively participates in the development of European occupational-safety policy as a member of the European Commission's Advisory Committee on Safety and Health at Work. It provides impetus for effective implementation of the European Union's strategic approaches, such as the New Social Policy Agenda or the Community Strategy on Safety and Health at Work, for example.



## II.5 Communicating information on the working world and occupational safety

For the purpose of occupational-safety practice and humane work design, it is necessary to firmly establish the topic's importance in society. Beyond the narrower professional community concerned with occupational safety, the BAUA therefore also directly addresses broader sections of the population. In this regard, the DASA Working World Exhibition is extremely important as an active learning location.

DASA aims to communicate basic knowledge and guidance on humane work design to a wider audience. This includes both raising awareness of the essential problems of a changing working world and providing guidance on corresponding solutions. This likewise includes popularising science and research. DASA also especially includes research and development results from the BAUA into its information activities and transforms the results for the specific requirements of exhibitions and events. The topics of nanotechnology, demographic change and back health are successful examples. Within the framework of its events, DASA also takes up current topics of debate in society.

### II.5.1 Modernising the permanent exhibition

DASA was opened with its first exhibition units in 1993, so it is now 20 years old. Since opening, the exhibition has been expanded and maintained continually. These measures have contributed – and continue to contribute – to stable value retention at DASA. Despite this, against the backdrop of accelerated technical and social change, DASA faces the challenge of, on the one hand, renewing old, out-of-date exhibition areas through replacement investments and, on the other, adopting current and future working-environment topics into the exhibition. DASA focuses on topics of the present day and also tries to increasingly consider a forward-looking perspective in the exhibition's conceptual planning.

On the basis of increased flexibility of the investment title, larger, interrelated exhibition areas are to be updated in future in long-term planning

and implementation. Firstly, the entire “New working worlds” exhibition unit is to be reconceived and redesigned. The conceptual work for updating other exhibition units is also to be completed by 2017. The ways in which visitors can interact with the exhibition units are to be enhanced, and the overall experience of visiting the exhibition is to be improved.

At the same time, the forms of information in the permanent exhibition are to be continually developed with a view to adequately addressing target groups, and especially the guidance and communication of information are to be optimised. A central pillar of this will be to supplement the information level of audio tours by incorporating contemporary media such as smartphones or tablet PCs.

### II.5.2 Defining the focal topics of temporary exhibitions

Supplementing the temporary-exhibition programme with temporary exhibitions conceived and produced in-house offers the opportunity to intensify communication of DASA's topics through “travelling exhibitions” on a national level and, where applicable, in other countries in Europe. Given the limited internal resources, this necessitates collaborations with museums or other partners that are to be established on a sustainable basis and in accordance with the content focus and value orientation. For the purpose of longer-term further development of such collaborations, it is crucial to present DASA's technical expertise through publications and lectures, as well as by collaborating on research projects funded by third parties.

The temporary exhibitions highlight DASA's expertise in the respective fields and showcase DASA's subject range of “People – Work – Technology”. These exhibitions focus on today's working world, looking at current and especially important issues, not least those relating to the BAUA's fields of research. Examples include innovations in complex technical work systems (e. g. “ambient intelligence”). The range of topics also includes mental health, as well as the changing world of work in general. The topics are compiled for a wide audience and are intended, as

far as possible, to achieve national influence through travelling exhibitions. In this regard, it is both sensible and necessary to expand European collaborations with relevant institutions. Close cooperation will be sought with, among others, the Parque de las Ciencias in Granada.

Within the framework of the available resources, further topic areas will be opened up for large public events. In addition to attracting new visitors, the aims are to communicate relevant content to broad audiences and to further anchor the range of topics in the public consciousness.

### II.5.3 Sustainably improving the business dimension

Within the framework of its information mandate, DASA also addresses – in addition to the professional audience – especially those target groups that are otherwise hard to reach through museum work or other transfer media, e. g. teenagers and young adults in the occupational orientation phase. Visitor research will be expanded and made more permanent in order to address these target groups in a suitable manner and to attract them in growing numbers.

Personal communication of exhibition content to visitors will remain a priority. In this regard, DASA relies on professional demonstrators and supervisory staff that have been trained on the content. Further demonstration elements shall improve DASA's special form of personal communication as a unique selling point in the German museum sector.

Visitor satisfaction beyond the exhibition units also makes a very significant contribution to DASA's appeal. This includes DASA's entrance area and service facilities. Here, efforts to improve the visitor experience and service are to be stepped up. This will pave the way for increased takings from ticket sales and information programmes, as well as through improved service.

DASA's website was completely redesigned in 2012. The associated reinforcement of the online content is also to be continued over the coming years.

### II.5.4 Transfer – communicating knowledge and science

Depending on the problem in question, the BAuA uses a wide range of methods and contemporary science-communication media to communicate the results of its scientific work to the world of practice, as described in detail in the preceding chapters. This ranges from supplying its findings to advisory committees for the purpose of regulation to developing and distributing guidance for those directly involved in the workplace. The routes and intended end points of transfer, from knowledge generation to knowledge exploitation, must be systematically considered right from the work-planning stage if the transfer objectives are to be successfully implemented. The BAuA took greater note of these essential success factors in the design and course of its projects in the previous programme period and will continue to further expand the corresponding internal processes.

Compiling the findings and information in a manner specific to the recipient, as well as effectively and, at the same time, efficiently communicating them to the respective target groups, requires access to the corresponding tools, skills and infrastructure and that these be continually adapted to the changing communication structures and the findings from evaluation and transfer research.

- The medium- to long-term further development of the BAuA's online content will increasingly be based on the growing prevalence and use of mobile terminal devices and will be optimised for such devices.
- Digital publications in various formats will acquire even-greater significance in future and will therefore increasingly be offered by the BAuA.
- In addition to communicating scientific results on the internet in a manner specific to the target group, individual advice (e. g. helpdesk) and information events will remain important building blocks of knowledge transfer, especially since they allow valuable experience to be acquired from practice.
- The perception of the Federal Institute as a competent science service provider necessitates

modern press and public-relations work that rises to the special challenges posed by technical change in communication channels.

The BAUA's various transfer instruments are applied in regional and sector-specific approaches. These are characterised by, above all, inclusion of and collaboration by a wide range of occupational-safety stakeholders.

## BAuA project: Mental health in the working world – determining the current state of scientific evidence

Early retirement and incapacity to work due to mental disorders and diseases are increasing. Simultaneously, mental demands have been rising since approximately the mid-1990s. According to the current state of knowledge, it can be assured that the changes seen in the working environment play a part in influencing this development. In this regard, good mental health is increasingly becoming a prerequisite for successful and long-lasting participation in employment.

Correspondingly, humane work design that contributes to avoiding mental impairments and maintaining mental health and performance becomes a central challenge. In contrast there exists partly considerable technical ambiguity, with regard to the evaluation of effects of changes in work, especially requirements for cognitive and emotional performance.

In recent years various activities have been initiated in the field of safety and health at work, with the aim of avoiding mental impairments triggered by increasing mental demands and of maintaining employees' mental health and performance. Although there is a general consensus on a fundamental need for action in this regard, it is uncertain, especially in relation to the question of a possible and reasonable scope of regulation, to what extent current scientific evidence is sufficient to allow for a clear definition of possible hazards in their complexity and, furthermore, to allow the design of modern forms of work in a human manner.

Therefore the research project "Mental health in the working world" aims at producing a broad-based and scientifically sound of the current state of scientific evidence with regard to mental load. The project focuses additionally on increasing objectivity in the socio-political regulatory debate and policy development. Not only potential hazards but also personality- and health-promoting features will be considered in accordance with the overall concept of humane work design.

Overall, the project is intended to provide information on how mental load factors and resources are to be evaluated with regard to the sound state of scientific evidence, what new work requirements result from changes in the working world, and what gaps exist in knowledge on new load constellations. Furthermore, the project aims at the identification of existing design concepts and measures. The project is divided into three phases, which will build upon one another. Initially, in Phase 1, the available knowledge will be processed. For the mental load factors and resources in the working environment, scientific review papers will be prepared on the available theoretical approaches, methods and studies. Thereby transparent, scientifically recognised procedures, e.g. systematic reviews, meta-analyses or scientific analysis methods with a comparable standard will be applied. Furthermore, expert reports will be commissioned in subject areas for which, although they are highly relevant to the matter in question, relatively few studies are available, such that the review papers would not be sufficiently informative. In total, the aim is to summarise the current scientific evidence on a scientifically recognised level.

Subsequently, based on these review papers, Phase 2 will entail organising symposia, to which renowned national and international scientists in the subject area will be invited. The findings will be published extensively. The aim of this phase is to establish an understanding of current knowledge that is considered to be sound. Furthermore, gaps in current knowledge are to be identified and outstanding research questions are to be specified, that – if of high-priority – will be addressed within the framework of the envisaged project duration and that – if of medium – and long-term perspective – will be transferred to a research agenda.

In the third and final phase, the results of the symposia will be discussed in detail with the members of the relevant practical community such as occupational safety specialists, and with the representatives of social partners. In the process, the aim will be incorporate the result of Phases 1 and 2 of the project especially into the GDA's focal topic of "Protection and strengthening of health in the case of work-related mental

load” in order to combine the knowledge acquired with the occupational-safety expertise of the social security institutions. Phase 3 therefore focuses on ensuring the necessary acceptance of the results in the occupational-safety community, as well as deriving possible recommended courses of action for mental health. In addition to reaching a fundamental understanding of objectives, priorities and measures, operational recommendations for adequate regulatory instruments are also to be explored in close cooperation with the Federal Ministry of Labour and Social Affairs (BMAS), such as concrete connecting factors for regulations within the framework of the work of state committees or focal areas for action for supervisors within the framework of the Joint German Occupational Safety and Health Strategy.

In summary, a scientifically sound overview of mental load factors is to be prepared, providing information on the current state of evidence on load effects that are harmful and / or beneficial to health, demonstrating the availability of measurement standards and the possibility of recommended threshold values for mental load factors, and describing the practice-oriented knowledge relating to health-promoting work design.



### III

## Collaborations, third-party funding and young scientists

Systematic and strategic use of organisational, material and human resources forms the basis of long-term success for the BAuA's scientific work. For this purpose, the BAuA engages in national and international cooperative networks and utilises its strategic collaborations with departmental research institutions, as well as with other national institutions in the professional environment.

Special significance is awarded to the BAuA's professional networking within the local scientific community at its various locations (Dortmund, Berlin, Dresden). Collaborations with the following partners – established based on the research and development programme in recent years – will be consolidated: the University of Wuppertal, the Leibniz Research Centre for Working Environment and Human Factors (IfADo) in Dortmund, Berlin University Hospital (Charité – Universitätsmedizin Berlin), the Technical University of Dresden (TUD) and the German Statutory Accident Insurance (DGUV), which is the umbrella association of the statutory accident-insurance organisations. The aim here is to systematically expand joint activities in research, teaching, transfer of practical experience, and promotion of young scientists.

On a European and international level, the BAuA brings its technical expertise to a multitude of networks, institutions and committees. The focal topics for this originate from the BAuA's technical strategy and alignment with common European goals (e. g. “Europe 2020”, “Horizon 2020” and the EU's upcoming Community strategy). The BAuA supports the BMAS in the European Commission's Advisory Committee on Safety and Health at Work. The BAuA is actively involved in

several European cooperation projects as an active member of the European research association PEROSH (Partnership for European Research in Occupational Safety and Health), which was founded by European occupational-safety institutions to promote cooperation with European partners and to facilitate and support the attraction of third-party funds. Within the framework of R&D activities by the European Agency for Safety and Health at Work (EU-OSHA, Bilbao), the BAuA has seen considerable involvement in the work of the topic centre for “Occupational Safety and Health” (TC OSH) since 1999 for the purpose of recording and processing current research results and examples of good practice from companies. As a partner in the national information network of so-called Focal Points (FOPs) of EU-OSHA, the BAuA works alongside the BMAS. Furthermore, the BAuA is a WHO Collaborating Centre for occupational health and cooperates with the International Labour Organisation (ILO) in Geneva. In the field of chemical safety, the European Chemicals Agency (ECHA) in Helsinki is a significant cooperation partner.

Projects funded by third parties are of great significance for the continuing development of scientific competence at the BAuA and for the institute's ability to innovate. Such projects are an important indicator of the Federal Institute's technical integration into the scientific community and of the significance of its scientific projects and results. In addition, projects funded by third parties are an excellent opportunity for acquiring qualified personnel and for expanding cooperative networks with national and European partners. The BAuA will therefore strive to increase the proportion of third-party funds

acquired. This is to be achieved in particular through intensified participation in national and European funding programmes, such as those of the BMBF and the European Framework Programme for Research (“Horizon 2020”), as well as through close technical cooperation with German universities and research institutions and with European cooperation partners.

The promotion of young scientists, especially within the framework of scientific qualifications, is highly important for the innovative development of the BAuA’s technical work. Within the programme period, therefore, the BAuA will strive to increase the proportion of scientific qualifications issued whose topics are closely linked to the BAuA’s research and development focuses. For this purpose, the BAuA will use corresponding employment options for young scientists employed on a temporary basis, in particular by acquiring projects funded by third parties and through the option of temporary employment pursuant to the Temporary Science Employment Act (WissZeitVG). In addition to expanding innovation of the content and methodology of research and development, the BAuA therefore also aims to achieve longer-term systematic recruitment and personnel development. Creating a special budget item for project-specific employment of young scientists for R&D tasks proved to be an efficient instrument from 2010 onwards.



## **Imprint**

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Graphics: eckedesign, Berlin

Title Pictures: FOX Fotoagentur – Uwe Völkner, Lindlar,

iStockphoto.com©TunaTirkaz (Background)

Production: Bonifatius Druckerei, Paderborn

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April 2014

