

Research on health and safety at work



BAuA Work and Research Programme 2022–2025



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Note:

This brochure uses a gender equitable language. Where this is not possible or readability would be severely limited it uses the masculine or feminine form. Where it does so, all genders are included.

I Introduction

1 BAuA's tasks and understanding of its role

As a departmental research institution within the authority of the Federal Ministry of Labour and Social Affairs (*Bundesministerium für Arbeit und Soziales*, BMAS), the Federal Institute for Occupational Safety and Health (*Bundesanstalt für Arbeitsschutz und Arbeitsmedizin*, BAuA) has the following core tasks: the scientific clarification of central issues in the field of occupational safety and health (OSH) through **research and development** (R&D) work, the performance of **statutory and official tasks**, in particular relating to the regulation of chemicals and products, the provision of scientific **policy advice** to the German Government and other institutional actors in occupational safety and health, the presentation of OSH-relevant findings for the **transfer into practice** in forms appropriate to their intended recipients, and the communication of basic and practical knowledge about the world of work to a broad public through the **DASA Working World Exhibition** (*DASA Arbeitswelt Ausstellung*).

The diverse activities undertaken to perform these core tasks are summarised by BAuA in a medium-term programmatic framework adopted for four years. Since 2018, this framework has – as recommended by the German Council of Science and Humanities (*Wissen-*

schaftsrat) – taken the form of an integrated work and research programme that sets out the systematic connections between the Federal Institute's research and development activities and its other scientifically based core tasks. A solid basis of research is required in order to perform BAuA's portfolio of tasks, which means large proportions of its financial and human resources have to be allocated to research and development. This programme provides a structure for the tasks performed and topics worked on, ensuring their coherence and continuity, and sets out plans for BAuA's scientific and strategic further development, which are reflected in the adoption of new substantive and methodological priorities.

Apart from critical reflection on the outcomes of the Federal Institute's own work in all its areas of responsibility, the driving forces behind its further development include the new challenges posed by the transformation of the world of work, the evolving requirements of policymakers, scientists, and the occupational safety and health community and, in the present programme, the dominant event of the SARS-CoV-2 pandemic. With its Work and Research Programme, BAuA will not least help to address the central challenges for European occupational safety and health policy, as formulated in the recently presented EU Strategic Framework on Health and Safety at Work 2021–2027.

2 Continuation of BAuA's strategic fields of action and focus on the digital world of work – new focus on the infection control / OSH interface

The Work and Research Programme 2022–2025 is structured around the four strategic fields of action established in the previous two programme periods:

1. Safe-to-use chemicals and products
2. Humane work design
3. Promotion of health and work ability – prevention of work-related diseases
4. Understanding the impact of a changing world of work and advancing occupational safety and health instruments

With a view to the further development of BAuA's role as outlined above and following the recommendations of the German Council of Science and Humanities, innovative topics will be addressed in these fields of action, particular technical issues foregrounded and, at the same time, long-term research lines pursued further in a systematic manner. On account of its strategic significance across all the Federal Institute's fields of action, the "Safety and Health in the Digital World of Work focus programme" will be carried over from the 2018–2021 programme period, while a stronger emphasis will be placed on questions about the human consequences of digitalisation and nomadic working with information and communication technologies. Additionally, a new focus programme on the technical interfaces between infection control and occupational safety and health will be established in order to draw conclusions from the experience gained during the SARS-CoV-2 pandemic. Moreover, BAuA will observe developments in the world of work, enter into close dialogue with researchers and policymakers, initiate future research and, where appropriate, take the initiative to provide further policy advice, doing so on the foundation of the technical competences and resources at its disposal and in close coordination with the Federal Ministry of Labour and Social Affairs. This may also involve the development of new focus programmes.

Overall, the new Work and Research Programme seeks to further strengthen the approach BAuA has already applied successfully in many cases, bringing together experts from different divisions to work on topics using interdisciplinary methods.

3 Overarching aspects of the 2022–2025 programme period

The Work and Research Programme 2022 – 2025 touches on a range of aspects that cut across multiple fields of action and areas of responsibility, and are consequently of overarching significance for BAuA's activities. The thematic complex **Mental Health in the Working World** played a prominent role under the 2014–2017 Programme, in part as a temporary focus.

The key factors for mental health in the world of work identified under this focus will also be addressed and studied in relation to various fields of action and research lines during the forthcoming programme period. This will, firstly, mean researching previously unexplained correlated effects between central stress factors, combinations of stressors, and resources at work, on the one hand, and mental health, on the other. Approaches to work design are to be elaborated on the basis of these correlations. Secondly, risk assessment will be further developed as an important instrument in the prevention-oriented handling of mental workload by organisations.

Various technologies based on **artificial intelligence (AI)**, which have the potential to change value creation and work processes and activities in far-reaching ways, are central elements of digitalisation. Positive effects may result from improved support for the performance of complex tasks, while non-transparent system behaviour or the unclear distribution of functions between humans and technologies may have negative repercussions.

The – highly contradictory – effects of AI systems on workers and occupational safety and health will be looked at systematically during the 2022–2025 programme period in order to sound out the possibilities for safe, healthy, humane work design under the conditions created by the application of these technologies, and to support the German Federal Government's AI Strategy and the implementation of the EU's horizontal legal framework as instruments with which to pursue this aim. Relevant research questions will need to be dealt with by bringing together expertise from different fields of action. AI-related research will be pooled strategically under the Safety and Health in the Digital World of Work focus programme.

High-quality basic data are of outstanding significance for the acquisition of scientific knowledge and provision of policy advice on occupational safety and health. During the forthcoming programme period BAuA will therefore continue to drive ahead the **expansion and utilisation of its empirical data holdings**, in particular the data from its own major surveys and the surveys to which it contributes, such as the Employment Survey (*Erwerbstätigenbefragung*) conducted jointly with the Federal Institute for Vocational Training (*Bundesinstitut für Berufsbildung*, BIBB), the BAuA Working Time Survey (*Arbeitszeitbefragung*, AZB), and the Mental Health at Work Study (*Studie Mentale Gesundheit bei der Arbeit*, S-MGA). The datasets will be used across different fields of action in BAuA's in-house research projects and made accessible to the academic community for the purposes of further research to a greater extent than they have been in the past. This will be managed in future by the newly founded Research Data Centre (*Forschungsdatenzentrum*, FDZ) which has been accredited by the German Data Forum (*Rat für Sozial- und Wirtschaftsdaten*, RatSWD). Together with the findings from intervention, monitoring, and evaluation studies, these data will also be used to further develop OSH instruments (e. g. legislation, rules and regulations, risk assessment methods).

The sections that follow describe the Federal Institute's activities in the fields of research and development, policy advice, regulation, transfer, and communication across its four strategic fields of action and under the focus programmes "Safety and Health in the Digital World of Work" and "The Infection Control / OSH Interface". The concluding section on BAuA's principles and working methods sets out the guiding ethos for its organisational development and its work in the areas for which it is responsible.

II

Strategic fields of action

1 Safe-to-use chemicals and products

One essential basis for the protection of people (as workers and consumers) and the environment is to ensure that only safely designed chemicals and products are placed on the market. This can be done, for example, by constructing products suitably or manufacturing low-dust formulations of industrial chemicals, such as granulates (“safety-by-design”). The safe use of chemicals and products is supported by the specification of protective measures that guarantee they are handled safely and without adverse impacts on human health – above all in the commercial sector. Products and chemicals associated with unacceptable risks are to be excluded from the market by the instruments of market surveillance and chemicals regulation.

For the most part, the requirements and procedures that help ensure chemical and product safety are now regulated at the European level by binding common legislation and harmonised technical standards. BAuA plays a part in their implementation and further development by contributing to the work of European and national bodies, organisations, and initiatives, performing its official tasks, providing policy advice, disseminating good practice, and conducting research. It thoroughly scrutinises technical innovations both relating to the products and chemicals to be regulated, and relating to methods for the identification of risks and dangerous products.

BAuA performs a range of important tasks under the Chemicals Act (*Chemikaliengesetz*, ChemG). As the Federal Office for Chemicals (*Bundesstelle für Chemikalien*, BfC), it is responsible for the implementation and coordination of the REACH, CLP, BP, and PIC regulations at the national level and has an active role at the EU level (REACH = Registration, Evaluation, Authorisation of Chemicals, CLP = Classification, Labelling and Packaging of Chemical Substances and Mixtures, BP = Biocidal Products, PIC = Prior Informed Consent). In its function as the Assessment Unit for Occupational Safety and Health (*Bewertungsstelle für Sicherheit und Gesundheitsschutz der Beschäftigten*), BAuA supports various procedures with its competence in the OSH field. Over the next few years major challenges will be thrown up by the Chemicals Strategy for Sustainability, part of the European Commission’s “Green Deal”, and its implementation at the national and EU levels.

1.1 Chemical safety

In its roles as the Federal Office for Chemicals and the Assessment Unit for Occupational Safety and Health, BAuA will develop positions and concepts concerning the European Commission’s new Chemicals Strategy.

The focus will be placed in particular on

- topics connected with the identification and regulation of substances (restrictions on extensive substance groups, e.g. perfluorinated and polyfluorinated compounds), and
- the implementation of OSH-relevant amendments.

of substitution (SUBSPORTplus portal), and the further development of the REACH and CLP regulations are central topics for BAuA. Both regulations are to be amended in the near future to take account of the changed parameters in place under the Chemicals Strategy, and will thus generate an increased need for policy advice from the Federal Ministry of Labour and Social Affairs and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (*Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit*, BMU). At the same time concepts for risk-based regulatory approaches, the harmonisation of derived limit values, the better availability of exposure and use-related information, and the introduction of new hazard classes will be particularly relevant to occupational safety and health. Support will also be given for the legally watertight formulation of the restrictions on more than 4,000 perfluorinated and polyfluorinated substances (PFASs), which are planned because these substances are highly persistent in the environment and pose dangers to human health.

Strengthen the leading role of the Federal Office for Chemicals nationally and internationally, further raise the profile of the National Help Desk (*Nationale Auskunftsstelle*) as a point of contact and centre of competence on chemical safety.

The role of the Federal Office for Chemicals as Germany's "competent authority" is to be further expanded by providing technical support, facilitating the formulation of joint concepts and positions for the technical authorities, representing them in dealings with the German Federal Government, the European Chemicals Agency (ECHA), and the European Commission, and ensuring the National Help Desk focusses more strongly on the parties affected by legislation and the exchange of relevant information with the federal states.

Develop a coherent European regulatory strategy for fibrous dusts.

Coherent, preventive regulatory approaches to protection against carcinogenic fibrous dusts are to be identified and assessed within the framework of European chemical safety and OSH policy. This is to be done by a risk management

options analysis (RMOA) – supported by BAuA's own research results and a working group of higher federal authorities acting as an early-warning system.

Strengthen the significance and quality of exposure and user-related data in all statutory procedures, further develop and standardise regulation-relevant measurement, testing, and assessment methods.

Efforts will be made to support the registration of substances with a comprehensive toolbox for the assessment of workplace exposures, the systematic identification and assessment of low-emission formulations of chemical products, and the OECD standardisation of testing methods for nano and fibrous forms of substances.

Identification and REACH regulation of risk-relevant substances and groups of substances among industrial chemicals.

At present the European Chemicals Agency's database contains data on approximately 23,000 substances in approximately 100,000 registrations held by companies. Substances of very high concern are to be identified on the basis of this information so that they may be subjected to EU-wide regulation. The Member States' right to initiate regulatory procedures will be exercised for this purpose.

Further drive ahead harmonised, binding classification under the CLP Regulation in the EU.

The procedure for the harmonised classification and labelling of substances is a core element of the activities and provisions on the safe handling of substances. BAuA will contribute to substance safety in the EU by assessing large numbers of substances and initiating procedures for their harmonised, binding classification under Annex VI to the CLP Regulation. In its role representing the German Federal Government, for example, it will also drive ahead the further development of the UN's Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Expedite the reviewing of biocidal products and further develop assessment criteria.

The reviewing of biocidal products under authorisation procedures at the national and European levels is to be driven further ahead.

Over the next few years initial assessments are increasingly to be completed as part of the Review Programme for the examination of biocidal active substances and submitted under the EU authorisation procedure. At the same time the criteria for assessment and risk management will be further developed to ensure the products on the market are as safe as possible.

Address and systematise the increasing conflicts of objectives consequent upon restrictions imposed under the biocidal product authorisation procedure.

Conflicting objectives can arise because more restrictions have been placed on significant biocidal products or they have not been authorised at all. On account of the risks to humans and the environment from their use that are identified in chemicals / substances' authorisations, this can result in sufficient quantities of important products no longer being available, if an epidemic breaks out for example. Such conflicts of objectives are to be highlighted and discussed in good time.

1.2 Safe products and work equipment

Analysis of the options for and limits on the deployment of intelligent procedures for the processing and analysis of data available online to identify and categorise dangerous products.

Safe products and work equipment are a critical prerequisite for successful, effective occupational safety and health. In view of the increasing diversity of products on sale, partly as a consequence of online trading, more tools will be required in future to identify dangerous products. Software-supported procedures, AI procedures especially, will be suitable for the analysis of large quantities of data and information for this purpose in the medium-to-long term. The aims are to investigate appropriate AI procedures for the analysis of large volumes of poorly structured information about products on a pilot basis, and to trial prototype analytical tools for selected data sources and database systems.

Continued investigation of the correlation between functional safety and IT security with examples from the internet of things (IoT).

It is not only IoT products, but modern

machines and work systems as well that are typified by the possibilities they offer for networking with other IT systems. At the same time, however, this networking makes them vulnerable to attacks from external parties. The resultant security risks are to be considered in a comprehensive security analysis and risk assessment, because conflicts can also arise between the two aspects of security and safety. Over the long term the foundations for comprehensive security and safety analyses are to be laid in collaboration with external partners.

Further development of methods for the comprehensive risk assessment and safe design of complex, interconnected cyber-physical systems.

Cyber-physical systems (CPSs) are characterised by great application variability, partly as a result of their interconnectedness. This means their configurations and operating parameters can be modified dynamically, even while they are in operation. The risk assessments required come up against their limits in these cases on account of the great complexity and dynamic behaviour of the overall systems. The first foundations for a method for risk assessment will be developed and their general applicability will be analysed.

Formulation of requirements for AI-based products and systems from the OSH point of view, derivation of constructional knowledge.

Work equipment and systems that incorporate AI constitute a complex, wide-ranging thematic field. As described in the German Federal Government's AI Strategy, extensive research will be conducted at various research, innovation, and excellence centres and hubs. In order to build on this and to be able to derive practically relevant knowledge about occupational safety and health aspects, it will be necessary to continuously monitor the issue, but also to identify specific, unanswered research questions from an OSH perspective. The first technical contributions relating to the EU Artificial Intelligence Act are to be developed during the programme period, and operative structures for its medium and long-term implementation built up within the framework for the future national division of responsibilities, for which appropriate resources will be required.

2 Humane work design

In this field of action, BAuA is examining the opportunities and risks of new forms of work and technologies, as well as how to deal with hazards and stress factors in companies. These range from biological and chemical hazards to physical factors in the world of work, physical workloads, and psychosocial stressors and resources. Attention will also centre increasingly on correlated effects between individual stress factors and the application of findings when risks are assessed in the workplace. Against the background of technological change, the aims are to establish a sound scientific basis for the further development of work design standards, and to support organisations in the assessment of risks and the design of humane work using scientifically founded instruments and tried-and-tested methodologies.

Above all, the application of artificial intelligence and innovative technologies based on it are leading to permanent changes in the world of work with potentially far-reaching impacts on workers' safety and health. There is no fundamental reason to assume human work will be completely replaced in the course of the digital transformation. It continues to be a central part of the world of work. Nonetheless, the tasks and activities individuals perform at work are changing, sometimes dramatically, with the increasing deployment of AI-based technologies and work systems. These changes in the tasks individuals carry out represent a central challenge for occupational safety and health, including the design of humane work in organisations.

BAuA's activities in this field of action are characterised by cooperation between various scientific disciplines. They are directed towards the fundamental determination of the consequences these technologies are having, the trialling of proposed new occupational safety and health solutions, and the evaluation of such solutions at the workplace. The results reached will assist in the further development of legislation, rules, and regulations, and form the basis for practical tools and recommendations, and help to support workplace practitioners in carrying out risk assessments.

2.1 Biological and chemical hazards

Provision of advice to the Federal Ministry of Labour and Social Affairs on the revision of both the Ordinance on Hazardous Substances (*Gefahrstoffverordnung*), with amended provisions on asbestos, and the Risk Concept for Carcinogenic Substances (*Risikokonzept für Kanzerogene*), including the further development of relevant methods.

BAuA will, among other things, contribute to the adaptation of the measurement procedure for asbestos in the workplace (measurement of even low concentrations, detection of thin fibres, (partial) automation of sample evaluation using AI image acquisition methods). BAuA was one of the organisations involved in developing the Risk Concept for Carcinogenic Substances and has supported its implementation. It is now to be fully implemented in Germany with this revision.

Support for the risk assessment of activities involving the handling of hazardous substances by updating control guidance sheets for the Easy-to-use workplace control scheme for hazardous substances (*Einfaches Maßnahmenkonzept Gefahrstoffe, EMKG*).

Wider application of the Easy-to-use workplace control scheme is to be encouraged with a "starter set" for small enterprises and microbusinesses. The control guidance sheets on the reduction of emissions at source (Control Strategy 2) will be revised and adapted to take account of the latest technological developments.

Leading the Roadmap on Carcinogens (RoC 2.0) initiative as an EU contribution to protection against carcinogens at the workplace level, support for the Joint German Occupational Safety and Health Strategy (*Gemeinsame Deutsche Arbeitsschutzstrategie, GDA*) work programme Safe Handling of Hazardous, Carcinogenic Substances.

The RoC is a voluntary, European action programme that brings together state agencies, employers' organisations, and trade unions, developing and exchanging examples of good practice in order to reduce the risks faced when employees are exposed to hazardous, carcinogenic substances. At present twelve projects are being worked on in four thematic fields

with a time horizon of 2024. In addition, BAuA is carrying out technical work to support the GDA work programme's aim of minimising and, if possible, preventing risks caused by hazardous, carcinogenic substances in the workplace.

Expansion of the methodological inventory with “omics” methods and cell culture models for the measurement and assessment of bioaerosols’ toxic characteristics in different workplaces.

To date there have been no standardised methods for the practical measurement and assessment of bioaerosols’ toxicity in workplaces. “Omics” methods and cell culture models are highly promising approaches for this purpose and are to be further developed. “Omics” methods involve the analysis of the entirety of defined types of molecule. In proteomics, for example, all the proteins in a sample are analysed. Research projects will further develop proteomics methods for the detection of exposures, for example to toxins of biological origin, allowing them to be identified in complex bioaerosols. In parallel, cell culture models will be established to review bioaerosols’ potential toxicity, with the focus being placed on air-liquid interface (ALI) technology. These models will be intended to mimic bioaerosols’ action in the lung and will be required for exposure assessment. At the same time they are also to be established in order to supply transparent results for substances’ characterisation as toxigenic when pathogens are scientifically classified. It will be examined whether the findings reached could be incorporated into the work of the Committee on Biological Agents (*Ausschuss für Biologische Arbeitsstoffe*, ABAS) and translated into practice.

2.2 Physical factors

Continuation of work on priority research topics relating to the impact of physical factors in the work environment with a view to the assessment and minimisation of relevant risk factors.

These factors primarily include noise, optical radiation, climatic conditions in the workplace, and ventilation – which has become much more prominent due to the pandemic. Acoustic issues in the work environment include noise emissions, the acoustic assessment and design of low-noise products and work systems, and the strains caused by the extra-aural effects of noise.

With regard to questions about the effects of light, the effects of innovative optical systems are of most concern. On the one hand, they affect photobiological safety; on the other hand, they cause physiological / psychological effects, such as cognitive strain and fatigue.

Climate change and its impacts on working conditions.

In this thematic field, BAuA will look at climate change’s impacts on working conditions.

Climate change is posing new challenges for occupational safety and health that need to be discussed. The most recent advances in the research will be scrutinised in a meta-analysis of climate change and occupational safety and health that focusses on the organisational context and organisational challenges. All possible hazards are to be considered in this analysis, from heat and UV radiation to the spread of vectors capable of transmitting infectious diseases (see Focus: The Infection Control / OSH Interface).

The further research needed into future challenges for safety and health in the world of work will be identified and explored so that climate change’s possible impacts on occupational safety and health can be detected at an early stage. On the basis of available findings, BAuA will contribute to the provision of policy advice in this thematic area, which is of increasing significance in political and public discussions.

Investigation of multi-factorial aspects in realistic work environments.

Little research has been done to date into the combination of different physical factors in the work environment. The intention is therefore to use realistically designed, experimental work environments that simulate authentic practices to investigate combinations of influencing factors and their effects on workers’ well-being and health. One priority will be climatic parameters in workspaces, especially air flow, ambient temperature, and relative humidity, and their combination with other parameters, both environmental (e.g. light and noise) and spatial (e.g. different workplace configurations). The results are also to be drawn on for the parameterisation and verification of simulation models, in the field of ventilation and air conditioning for example.

2.3 Physical workload

Adaptation and, where necessary, further development of key indicator methods.

The cross-cutting research line “Prevention of the Consequences of Excessive Physical Loads at Work” will bring together expertise from different fields of action (see also Thematic Field 3.1), and work towards the adaptation and, where necessary, further development of the key indicator methods elaborated during the 2018–2021 programme period. This will be done, for example, by the integrative assessment of different types of physical workload, the holistic analysis of physical workloads together with other workloads (e.g. psychosocial), and the consideration of further pressures (e.g. physical underload).

Strengthening of national and European practice transfer, combination of key indicator methods with modern measurement technologies, support for the German Occupational Safety and Health Strategy’s Musculoskeletal Disorders (MSDs) work programme.

The transmission of knowledge about the risk assessment of physical workloads will be intensified at the national and European levels, above all under the GDA Musculoskeletal Disorders work programme and the European Agency for Safety and Health at Work (EU-OSHA) campaign on musculoskeletal disorders. The aspiration is to combine risk assessment based on key indicator methods with modern techniques for surveying physical workload and strain, in particular using wearable sensors. This will also be pursued through European cooperations, for example within the Partnership for European Research in Occupational Safety and Health (PEROSH) network.

2.4 Psychosocial stressors and resources

Expansion of design knowledge about key factors for mental health in the world of work and their interaction.

In particular, attention will be paid to

- work intensity, above all time pressure and pressure to perform,
- information overload, and
- recovery.

The “Mental Health in the Working World – Determining the Current State of Scientific Evidence” project (cf. BAuA Research Programme 2014–2017) identified stressors and resources that have proven to be important, design-relevant key factors for mental health. The information gathered to date suggests there are still gaps in the empirically backed design knowledge available about these factors. In particular, there is still a lack of practical studies looking not only at individual stressors or resources, but also at how they interact with organisationally relevant influencing factors. The aim is therefore to complement the empirically founded design knowledge on the key factors mentioned and to make the existing findings available for workplace practitioners. The results will also be used to maintain support for the “GDA Psyche work programme” during the current third programme period.

In concrete terms, the topic of work intensity will be explored further, with time pressure, pressure to perform, and information overload being examined as important variables for workplace design practice. Apart from this, empirically backed findings on arrangements for rest breaks and recovery (see also Thematic Field 3.2) are to be elaborated as resources for organisations characterised by high levels of work intensity, the aim being to review the effectiveness of design options. Furthermore, social relationships are to be investigated (above all in the light of activities transformed by digitalisation) so as to develop preventive strategies against any reduction in the availability of resources.

The research findings reached on healthy leadership will be presented in suitable formats for practical application and are also to feed into policy advice to a greater extent in future – in the debate about mental health for example. There are unanswered research questions concerning the impacts of organisational change on managers’ work. For instance, new forms of leadership and collaboration are becoming ever more relevant due to the spread of practices such as virtual leadership, shared leadership, and self-management. What is more, new forms of collaboration are also placing fresh demands on workers’

ability to self-manage, as well as managers' conduct and understanding of their roles. It is to be investigated in detail what impacts this is having on managers and workers' well-being and health. The (im)balance between (new) stressors and resources is to be examined in particular.

Humane Work Organisation in the Health Sector will expand the hitherto transfer-oriented work done on safety and health in the caring and nursing professions with a specific new research perspective on humane work design, in particular psychosocial stressors and resources.

The health sector is increasingly being focussed on at various levels (Concerted Action for Nursing (*Konzertierte Aktion Pflege, KAP*)), National Prevention Conference (*Nationale Präventions-Konferenz, NPK*), Council of the Working World (*Rat der Arbeitswelt*), SARS-CoV-2 pandemic). BAuA possesses many years of expertise in this thematic field, which it is continuing to build on in its research. The research line Humane Work Organisation in the Health Sector will be concerned with the investigation of work and organisational characteristics, combinations of stressors in specific health sector settings (above all in care and nursing), their interaction with work-relevant individual factors, and the consequences of the strain employees find themselves under. It will also analyse in depth the parameters for and consequences of the deployment of digital technologies to organise work. The conditions under which employees recover and recovery strategies will be a substantive priority (connecting here with Thematic Field 3.2).

In line with its increased significance, the humane design of interactive work – which is increasingly being mediated by technology – will be explored further, building on the findings reached to date.

Workers' communication and cooperation with other groups of individuals (who are usually external to the organisation) is termed interactive work. The research done on this topic will be intended to fill in the current gaps in what is known about the roles of customers or comparable groups, and the mental workload and strain they induce among employees. Apart from the special requirements of working with people and their impacts on employees,

the organisational and societal contexts that influence interaction processes will also be prioritised.

2.5 Time- and location-flexible working

The opportunities and risks of various flexible working time models and forms of location-flexible working will be analysed in detail, looking at different groups of employees. Design recommendations will be drawn up, while possible gaps in the relevant rules will be identified.

Both flexible working times and location-flexible working (e.g. teleworking, mobile working) have become more significant due to globalisation and digitalisation. They also accommodate many employees' desire for a better balance between their working and private lives. While some groups of employees have comparatively wide scope to decide how they work flexibly, others tend to find themselves confronted with demands to show more flexibility. In this context, the limits of employees' freedom of choice about flexible working (e.g. where highly motivated employees engage in self-endangering behaviours), and options for the healthy design of flexibility requirements will be analysed in detail to gain insights into the health-related consequences in each case and relevant design options. Furthermore, the role of presence in the workplace and direct communication for well-designed work is to be analysed systematically, with the findings informing appropriate design requirements (e.g. for various forms of interactive work).

The impacts of changes in work on atypical working times (shift work and on-call duty in particular) are to be surveyed and design options developed with the aim of keeping the established findings of ergonomics on working time arrangements up to date.

Ergonomics has already arrived at comprehensive findings about the design of different atypical working time models, which are also updated regularly. For instance, BAuA was involved in various ways in drawing up the Guideline on Night and Shift Working (*Leitlinie zur Nacht- und Schichtarbeit*) of the German Society for Occupational and Environmental Medicine (*Deutsche Gesellschaft für Arbeits- und Umweltmedizin*,

DGAUM), the elaboration of which saw yet more questions identified (e.g. about activity-specific design advice). Apart from this, the constant changes taking place in individuals' work and work requirements make it necessary to update the findings of ergonomics regularly, and examine them in the light of new developments. This is particularly true with regard to shift work, but also forms of on-call and standby duty.

2.6 Innovative work systems

Analysis and further development of comprehensive modelling and simulation procedures for the conception, design, and planning of work systems and activities.

The deployment of modelling and simulation for prospective work design and planning already extends to various elements and levels of work systems. The existing digital ergonomic approaches to human modelling and simulation will be further developed. Innovative virtual anthropometric methods, for example using 3D laser scans, are showing the way forward in this field, and will supply the up-to-date data needed for the modelling and simulation of work systems. Another new challenge at the moment is the representation of cognitive functions. Current approaches will be analysed in this context with the aim of contributing to and advancing complex modelling in this thematic field.

Further development of findings on and opportunities for the integration of occupational safety and health aspects into process-based planning methods for workplaces.

At present the various aspects of occupational safety and health are primarily taken into account in the operation or equipment of workplaces. This thematic field will broaden the perspective, and investigate the possibilities for the integration of occupational safety and health requirements and measures into digital systems for the integrated planning, construction, and management of buildings. This will result in a broad spectrum of different requirements and parameters, which will be addressed using appropriate procedures and technologies. For example, the use of building information modelling for this purpose will be investigated and its implications for occupational safety and health explored.

Further investigation of human-robot collaboration against the background of new sensor technologies, data processing algorithms, and flexible / adaptive automation and task assignment.

New robot technologies, including supportive exoskeletons, are becoming more flexible, while it is possible for adaptive algorithmic functions to be integrated into these systems. As a result, new scope for flexible human-robot collaboration is being opened up, the intention being to use this for humane task design that promotes employee learning. Fundamental concepts for this approach are being developed so that examples of good implementation can be highlighted.

Analysis and design of human-technology interaction, in particular in service and knowledge work, taking account of smart information and communication technologies.

Service and knowledge work are undergoing major changes in the course of digitalisation. This relates to activities that, for example, are being transformed by the integration of AI systems, but also of value-creation processes as a whole. Networked, agile structures are gaining ever more in significance at all organisational levels. They are imposing new requirements with regard to systems' sustainably healthy configuration. The research being done into innovative work systems demands close collaboration with academic and partners from practice, usually in consortiums and occasionally across national borders.

3 Promotion of health and work ability – prevention of work-related diseases

Working conditions that preserve and promote employees' health and work ability are an essential element in the prevention of work-related diseases and a decisive factor in ensuring participation in working life. The physical, mental, and social dimensions of health and their multifactorial determinants in individuals' behaviour and (work) environments are to be analysed to develop modern preventive occupational safety and health interventions that make the most of the various factors with potential to help prevent disease. This is to be done using an interdisciplinary approach, which it is hoped will shift the dynamic continuum between health and sickness in the direction of preserving and promoting health.

For this purpose, Field of action 3 will look at primary prevention, secondary prevention (preventive occupational healthcare), and tertiary prevention (return-to-work (RTW) processes and occupational integration management) together. Preventive measures are predicated on knowledge about the causal correlations between work and health. Longitudinal epidemiological studies (above all the "Mental Health at Work Study" and the "Gutenberg Health Study" (*Gutenberg-Gesundheitsstudie*, GHS)) will be used to gather this knowledge, as will other evidence-based occupational medicine methods (above all systematic reviews). In view of their socio-economic relevance and prevalence in the working population, attention will be centred on musculoskeletal, cardiovascular, and metabolic conditions and mental health problems.

There are increasing numbers of employees with pre-existing conditions. Given this is the case, work ability, functioning, and participation in working life will continue to be investigated with the aim of helping to reduce the frequency with which individuals become incapable of working and retire early.

Where employees have pre-existing conditions, successful reintegration into working life is an aim of great significance for individuals, companies, and social policy. Accordingly, this research will not only trace the return-to-work process for workers who have suffered mental illnesses, but also investigate concepts for RTW management, RTW approaches, and aftercare services to ascertain how widespread and effective they are.

In addition, the health impacts of the digitalisation of the world of work on the working population are to be examined, in which respect digital technologies' preventive potential will also be analysed. Since the increasing heterogeneity of the working population is a defining feature of the modern world of work, another priority will be to gain a better understanding of the capabilities, needs, and vulnerabilities of specific groups of employees and how these characteristics correlate with work ability and employability.

In order to ensure effective health protection, BAuA will cooperate with other scientists, institutions, and ministries to build on the key features of the 2021 Public Health Strategy for Germany, and systematically bolster the efforts being made to safeguard and promote workers' health ("health-in-all-policies approach").

3.1 Causation and prevention of work-related diseases

Continued monitoring of physical workloads and associated strains, investigation of selected aetiological questions of relevance to occupational medicine with a focus on musculoskeletal disorders, evaluation of holistic approaches to preventive occupational healthcare.

As also stated in the EU's new Strategic Framework on Health and Safety at Work 2021–2027, work-related musculoskeletal disorders remain a priority on account of their major socio-economic significance. The monitoring of physical workloads and associated strains will be continued with a focus on musculoskeletal disorders, while selected aetiological questions of relevance to occupational medicine will be investigated.

The holistic approach to preventive occupational healthcare will be examined by looking at the example of musculoskeletal disorders.

Scientific supervision of interventions relating to sedentary work and their effect on risk factors for cardiovascular and metabolic parameters, investigation of correlations between psychosocial risks and (pre)clinical outcomes as part of a cohort study.

The research line “Maintaining and Promoting Cardiometabolic Health in the Workplace Setting” will focus on cardiovascular and metabolic conditions (above all diabetes), and will identify, scientifically supervise, and evaluate possible interventions relating to sedentary work.

As part of a high-quality longitudinal study (Gutenberg Health Study), aetiological questions about correlations between psychosocial risks (e. g. in the context of work with digital media, communication technologies, and new technologies) and clinical or innovative preclinical outcome indicators (e. g. arterial stiffening / pulse wave velocity) will be investigated. The results will be drawn on to draft recommendations for medical OSH interventions (holistic care, guidelines and recommendations, above all on diabetes) and workplace practice (design of working conditions, workplace health promotion services, workplace health management).

Drafting of recommendations for the recognition of new work-related conditions as occupational diseases, updating of the existing list of occupational diseases in the annex to the Ordinance on Occupational Diseases (*Berufskrankheiten-Verordnung*).

The Medical Expert Advisory Committee on Occupational Diseases (*Ärztlicher Sachverständigenbeirat “Berufskrankheiten”, ÄSVB*) to the Federal Ministry of Labour and Social Affairs draws up scientific recommendations and statements on the inclusion of new occupational diseases in the list and the updating of its current entries. The grounds for almost half the currently listed occupational diseases are already more than thirty years old. In addition, account has to be taken of the changes taking place in the nature of work, which are being accompanied by a growing proportion of female workers, the deployment of new materials, and

digitalisation in the world of work. In order to be able to ensure the quality of decisions on the recognition of occupational diseases, recommendations are to be drawn up with the Scientific Office of the Medical Expert Advisory Committee on Occupational Diseases that has been newly established in 2021. These recommendations will be based to a far greater extent than in the past on epidemiological research projects, including systematic reviews of the latest international developments in scientific research. Wherever expedient or necessary, synergies are also to be exploited by cooperating with other experts within BAuA and external occupational health institutions.

3.2 Correlations between work factors and mental health / well-being

The research on working times and time-flexible working will be further developed in the direction of identifying causal correlations between the characteristics of working time arrangements, working conditions, stressor characteristics, and health / well-being.

Extensive correlations between requirements relating to working times and workers’ health and well-being have previously been investigated in cross-sectional studies based on the 2015 and 2017 waves of the BAuA Working Time Survey. The longitudinal extension of this survey and the waves conducted in 2019 and 2021 have now also made it possible to analyse medium and long-term effects and intrapersonal changes, permitting conclusions to be drawn about causal correlations.

Work will continue on the research line

“Promoting Mental Health and Participation”.

This research line will pursue the aim of determining aetiological correlations between working and employment conditions, mental health, work ability, functioning, and participation in working life based on a high-quality longitudinal study (Mental Health at Work Study). Continuing the “Mental Health at Work Study” and extending it with a new wave will create opportunities for the differentiated investigation of chronological /dynamic correlations between exposure and outcome (duration of exposure, commencement of impact, duration of impact), as well as

the determination of the influence exerted by mediators (work ability, functioning) and what is referred to as “reversed causality” (i.e. reciprocal effects). From the point of view of possible interventions with the potential to prevent mental health problems, it remains relevant to identify predictors for career transitions and leaving paid employment because this allows the consequent work-related costs of such events to be appraised more accurately. In addition, the spread of information and communication technologies makes it necessary to survey the consequences of digitalisation.

The research on recovery in and away from work contexts is to be continued, partly with a focus on reviewing the effectiveness of design options. The work being done on how employees recover is to be continued and expanded to cover design options that improve recovery. In addition to situational measures and interventions, behavioural interventions that can be combined with them will be looked at because workers’ individual competences and capacity for self-management are becoming increasingly significant. The aim is to investigate, develop, and evaluate design options of this kind.

3.3 Workforce diversity and promotion of occupational participation

During the programme period BAuA wishes to contribute to the efforts being made on participation in working life and inclusion from the perspective of differential work design. The aim is to promote employability through work design approaches for specific groups who would not have opportunities to do particular jobs if they did not receive appropriate support. In particular, use will be made of assistive technologies and work design for groups of employees with physical and mental impairments or disabilities, thus allowing them to access further areas of activity.

The objective of humane work design that takes account of the diversity of people in employment is to be pursued for a heterogeneous working population. This context-sensitive research will involve looking to a greater extent at the interactions between activity-related working conditions, contextual factors in organisations, and the interplay of relevant macrosocial dynamics with (individual and employment-related) diversity features.

The correlations between working conditions (stressors and resources) and health will be investigated in various groups of employees, which will be identified on the basis of different heterogeneity features (e.g. age, gender, ability or disability, sexual and/or ethnic / cultural diversity), life situations, and types of employment (e.g. low-skilled work). The aim is to achieve a better understanding and awareness of the needs and vulnerabilities of specific groups of employees and as well as how they correlate with employability.

The impacts of demographic change on the labour market deserve to be accorded particular attention in this connection.

These include the increasing ageing of workforces and the need to design working conditions age-appropriately, and indeed ageing-appropriately. This places the focus on adapting working conditions for all employees in ways that enable them to stay healthy in the work process. Finally, demographic change is helping to make the working population more heterogeneous, while humane work design for all groups of employees (including people with disabilities or backgrounds of migration) is gaining in significance.

Analysis of the opportunities for and risks to occupational participation by people with physical or mental impairments or disabilities on the labour market. There will be an increased focus on the opportunities of innovative technologies to strengthen inclusion and employability. Among the various heterogeneous groups of employees, particular attention will be devoted to people with physical or mental disabilities. The labour force participation rate for people with disabilities is markedly lower than the rate for the total population. Therefore, the work situation of people with disabilities is highlighted

and the opportunities as well as risks for successful inclusion are examined. Innovative technologies, especially, are opening up new opportunities for inclusion, but can also be linked with barriers and both positive and negative changes in individuals' activities.

3.4 Return-to-work management

Analysis of RTW processes, phased reintegration, and the effectiveness of RTW measures.

Successful reintegration into working life after mental illness is a highly significant aim for individuals, businesses, and social policy. The research line “Strengthening RTW Management and Promoting RTW Processes” will be concerned with the description and analysis of return-to-work processes, the current practice of phased reintegration, and the effectiveness of return-to-work measures, such as more intensive aftercare at psychiatric hospital outpatient clinics. BAuA will use mixed-methods approaches (quantitative, qualitative) to describe and evaluate targeted preventive measures in workplace practice.

Anchoring of occupational integration management and RTW management and processes in workplace prevention work.

In future occupational integration and return-to-work management and processes are to be analysed to a greater extent in the context of prevention on organizational level, in particular as part of workplace health management. For example, attention will be paid to favourable and unfavourable factors at the individual and organisational levels that affect how successfully prevention projects / workplace health management measures are implemented in an organisation. At the same time consideration is also to be given to the impacts of digitalisation on mental health.

The results from this thematic field will feed into concrete recommendations for practitioners in order to bolster the confidence actors inside and outside organisations have in the action they take. Established structures for transfer – for instance in the field of rehabilitation (Federal Rehabilitation Council (*Bundesarbeitsgemeinschaft Rehabilitation*, BAR)) – are to be expanded and

policy advice placed on a more permanent basis – for instance with the BMAS Prevention and Health Promotion in the World of Work Network (*Netzwerk Prävention und Gesundheitsförderung in der Arbeitswelt*) and the various bodies established by the German Social Accident Insurance (*Deutsche Gesetzliche Unfallversicherung*, DGUV). The understanding of stay-at-work interventions is to be further developed in order to identify starting points for action that allows workers with health impairments to remain in their jobs over the long term.

Consideration will be given to links between return-to-work management and other prevention measures that apply OSH instruments, such as risk assessment or preventive occupational healthcare (see also thematic fields 3.1 and 4.2).

4 Understanding the impact of a changing world of work and advancing occupational safety and health instruments

In the fields of action 1 to 3, BAuA will work on issues arising from the changes in the world of work for research and work design in the context of work.

In addition, BAuA will use its monitoring of the world of work, which is based on empirical data, as a central instrument in order to generate research questions and hypotheses, and so analyse and understand the impacts societal and technological developments are having on the world of work. Fundamentally, the gathering of data will be oriented towards central issues in the field of occupational safety and health. The methods used to collect data will include, firstly, repeated cross-sectional surveys aimed at mapping changes in activity structures, working times, combinations of stressors and resources, and organisational characteristics. Secondly, empirical longitudinal surveys will be carried out with the aim of recording individual changes over time. These surveys will make it possible to investigate cause-effect relationships, thus marking an interface with the aetiologically oriented research in the field of action 3. The large-scale data collections and data-based studies will concentrate on thematic areas relevant to the BAuA and constitute a unique selling point of the Federal Institute. This data infrastructure will also provide a foundation on which to develop policy options for political decision makers and design recommendations for workplace practice. Following the establishment of its Research Data Centre, BAuA will make its own datasets available for science-based applications, so promoting scientific cooperation. Activities of this kind are highly prominent in the Work and Research Programme 2022–2025.

The changes to be observed in the world of work are not only having impacts on organisational parameters and combinations of stressors, but also imply questions about the appropriateness and efficiency of OSH instruments and structures, including preventive occupational healthcare.

Alterations in individuals' terms of employment and the flexibilisation of working times and work locations raise questions about the "visibility" of occupational safety and health, the effectiveness of its instruments, and compliance. The addition of behavioural measures to the set of instruments used by occupational safety and health practitioners will also be a matter for discussion during the programme period.

4.1 Reporting on the world of work

BAuA's reporting activities continue to have the aim of describing the world of work with suitable, up-to-date indicators and using them both to construct hypotheses in research and as a central basis for the provision of policy advice.

BAuA will regularly gather data for this purpose (in particular with the BIBB / BAuA Employment Survey, the Working Time Survey, and the Mental Health at Work Study), creating and analysing indicators that allow the best possible description of the world of work and its developments. This will be done both on the foundation of these in-house surveys and by exploiting secondary data. Additionally, BAuA will make use of relevant surveys in this thematic field (e.g. the Quality of Work and Economic Success (*Arbeitsqualität und wirtschaftlicher Erfolg*) survey) and contribute to the collection of data by cooperation partners (including Digitalisation and Change in Employment (*Digitalisierung und Wandel der Beschäftigung*, DiWaBe)), in order to look at the impacts of the increased use of AI-based technologies on the changes happening in the world of work, as an example.

The European dimension will be further strengthened by examining options for the greater use of suitable basic data.

To this end, European datasets that relate to topics on BAuA's agenda (e.g. the European Working Conditions Survey (EWCS)) will be evaluated in research projects and publications, and drawn on to aid the interpretation of results.

Evaluation of the impacts of the statutory minimum wage.

On the one hand, the focus of the evaluation work being done will continue to be on regular research into the effects of the minimum wage on central variables such as hourly and monthly earnings, working times, employment, and unemployment. On the other hand, specific aspects and groups will also be focussed on repeatedly in future research, for example the impacts of the minimum wage on the development of pensions, people in employment who claim benefits under Book II of the Social Code (*Sozialgesetzbuch, SGB*), and seasonal employees. Unlike when the introduction of the statutory minimum wage was evaluated, something that led to large pay rises for about four million employees, the methodological challenge will increasingly be to identify the effects of adjustments to the minimum wage that, by comparison, are more modest in scale.

As part of the scientific community, BAuA will pursue the aim of expanding the Research Data Centre's provision of data on the world of work.

The Research Data Centre makes high-quality data available for subsequent use by external researchers. In this way, BAuA is contributing to the further development of the research data infrastructure in Germany, supplementing the research data landscape with innovative data on the world of work and its impacts on employees' health. This will be beneficial to ergonomic science as a whole and enrich BAuA's research by fostering dialogue with those who make use of its data. The Research Data Centre will further expand the volumes of data it provides during the 2022–2025 programme period.

4.2 Impacts of occupational safety and health instruments and measures

Analysis of the effectiveness of OSH structures, strategies, and instruments in a dynamically evolving world of work with a focus on the determinants and aspects of prevention cultures in small enterprises and microbusinesses.

In this field, BAuA will build on findings from its research into forms of prevention culture in German organisations and direct its attention above all at networked work structures, in which organisations and workers are involved in work processes along supply chains and /or through platform-mediated working. In addition, findings about how models of workplace OSH organisation are implemented practically in small enterprises and microbusinesses will be further complemented, consolidated, and systematised, thus supporting efforts to make microbusiness mentoring concepts more demand-responsive.

Gathering and presenting information about the effectiveness of inspection activities.

At the end of 2020 a binding uniform requirement for the occupational safety and health authorities of the federal states to carry out on-site inspections of 5 per cent of all organisations within their jurisdiction each year was introduced into the German Safety and Health at Work Act (*Arbeitsschutzgesetz, ArbSchG*). The implementation of this requirement, which is to be met by 2026, will be evaluated and supervised by the Federal Specialist Office for Occupational Safety and Health (*Bundesfachstelle Sicherheit und Gesundheit bei der Arbeit*) based at BAuA. The purpose of the Federal Specialist Office's work is to put the German Government in a position to quantitatively and qualitatively assess the inspection activities carried out by the federal states with greater precision on the basis of transparent, reliable evidence. This is intended to make performance-based monitoring possible, and contribute to national and international reporting.

In addition, it is also to be analysed how changes in the world of work are impacting on inspection practice. Firstly, inspectors' perspective on changed forms of work organisation (e.g. mobile working) and digitalised work

processes (e.g. mobile access to information, machine learning / AI) in organisations will be of interest. Secondly, the research will look at inspectors' situation as a group of employees whose own activities are being influenced by the digital transformation, both at the level of the tasks they perform and at the level of their working environment.

Evaluation of regulatory decisions at the interface between chemical safety and occupational safety and health based on the example of the restriction of diisocyanates.

It is hoped synergies and improvements in protection for workers will be achieved with the instruments of European chemical safety (Art. 114 Treaty on the Functioning of the European Union (TFEU)), in conjunction with the provisions on occupational safety and health (Art. 153 TFEU) (see also Thematic Field 1.1). Such improvements have been initiated successfully by BAuA with a REACH restriction on the marketing of diisocyanates. The restriction requires manufacturers to provide mandatory training, which is intended to support employers in meeting their general obligations to give employees instruction under EU occupational safety and health legislation. The effectiveness of this regulatory measure as a means of improving employees' protection against severe asthma is to be evaluated jointly with the Institute for Prevention and Occupational Medicine (*Institut für Prävention und Arbeitsmedizin, IPA*) by conducting an extensive epidemiological study.

Research on psychosocial risk assessment and management will be continued, and the focus widened to take in methodologies, measures, actors, the conditions under which action is taken in workplace practice, the problems faced when this is done, and model projects relating to SMEs.

Among other things, it has become apparent from the projects conducted on psychosocial risk assessment that, although small enterprises certainly implement targeted measures to manage psychosocial risks, they do not necessarily associate such measures with the term "risk assessment". This research line is aimed at appropriately surveying and reaching a better understanding of how SMEs assess

and manage the risks attributable to mental workload in practice. This will allow a more accurate picture of risk assessment and its implementation to be gained.

Recommendations on the promotion of individual self-regulation (behavioural prevention) will be drawn up to supplement preventive situational measures and OSH instruments.

The primary aim of (organisational) occupational safety and health is to positively influence the factors that determine working conditions as a form of situational prevention, but this approach sometimes comes up against its limits. Increasing remote working, ever more complex work processes, multinational, multidisciplinary teams, etc. require workers to possess self-management skills. What is needed in these circumstances is health-promoting interaction between external regulation (by society, organisations, etc.) and workers' self-regulation / self-management as a means of actively shaping their own work situations. Approaches and recommendations intended to promote self-regulation are accordingly to be elaborated and their interaction with regulatory measures evaluated.

III

Focus: Safety and Health in the Digital World of Work

Advancing technological change forms the foundation for distinct alterations in the world of work, and is having far-reaching consequences for workers' safety and health. While digital technologies have now penetrated almost all areas of activity, intelligent and flexible systems in particular are becoming more significant. Self-learning systems (artificial intelligence) open up opportunities for differential and adaptive work design, but also pose risks that may undermine such approaches. Continual technical innovations and the changes they entail in how employees collaborate and their work is organised justify the continuation of the focus on Safety and Health in the Digital World of Work adopted under the previous Work and Research Programme.

The BAuA-overarching interdisciplinary approach taken to this focus will make it possible to gain a coherent picture of digitalisation's significance for the world of work. At the same time it will allow new stressors, resources, and impacts on employees to be investigated promptly and holistically so that the findings can be used to draw up recommendations. An activity-specific approach has proved its worth as a way of ensuring the heterogeneity of the changes taking place can be examined properly. The research conducted to date has made it clear that technological change occurs incrementally and initially alters individual activities. Continuous monitoring of these alterations will permit the new opportunities and risks of technological change to be identified.

Against this background, the current programme period will see a focus on artificial intelligence technologies, innovative forms of organisation, and their consequences on humans, with questions about sustainable design being addressed. Requirements concerning system transparency, the fair use of data, and the opportunities for innovative OSH measures and work design will have central roles, especially in the field of artificial intelligence. As far as organisational forms are concerned, attention will centre on location and time-flexible working. The unifying theme will be the differentiated analysis of stressors' consequences, depending on technological changes and the demands technological change is making of occupational safety and health.

Continuous monitoring of technological change and its impacts on the world of work.

BAuA has created a comprehensive databasis with which to survey the impacts of technological change on the world of work. The focus will be placed on the new criteria for well-designed work in the digitalised world of work that have been drawn up, as well as the consequences for well-being and health, differentiated by activities, technologies, and groups of employees. In addition, it is necessary to identify longer-term trends and capture the phenomenon of "digitalisation" at other levels. For instance, collaboration with robots, control by algorithms and artificial intelligence, the increasing use of mobile, networked auxiliary devices, and mobile working on laptops will all be looked at.

Human and, in particular, health-related consequences and opportunities of digitalisation.

The deployment of digital technologies is changing workplace stressors and resources. Against this background, the impacts on employees' motivation, experienced significance, occupational identity, work-embedded learning, and health (e. g. inadequate recovery processes, potential for recovery, musculoskeletal disorders, cardiometabolic conditions, mental health) will be investigated. At the same time the handling of these impacts is also to be analysed as part of workplace health and return-to-work management. New learning and competence requirements, the possible impacts of changing roles (including responsibilities and the division of labour), and the design requirements they entail will be looked at in the context of AI.

Location-flexible working with digital information and communication technologies (ICTs).

Recent developments have shown the tremendous dynamism and continuing great significance of location-flexible working (see Thematic Field 2.5), which have been clearly boosted by the pandemic, with the trends towards teleworking and home offices for example. At the same time digital technologies are also growing in significance for classic forms of mobility at work (e. g. business trips, activities away from the workplace). The focus will therefore be on investigating the scientific foundations for the continuous adjustment of design recommendations in response to new technical and organisational developments in location-flexible working with digital ICTs. Increasing consideration is also to be given to the medium and long-term consequences of location-flexible working with digital ICTs.

New challenges for occupational safety and health in the context of digitalisation and AI.

Digital technologies and AI are increasingly shaping the work process and making occupational safety and health more dynamic and complex. Modern information technologies permit a great range of forms of location and time-flexible working. What is more, digital technologies are capable of autonomously controlling parts of the work process in real time. AI systems can take over decision-making functions and initiate

actions for which employees were previously responsible. The challenges this poses at the interface between workplace occupational safety and health and product safety will be analysed along with the adjustments required in the OSH system. Apart from this, the opportunities opened up by digital technologies and AI for the derivation and implementation of OSH measures, and the provision of occupational health-care (telemedicine) will be investigated.

Technological impacts of the increasing spread of artificial intelligence.

Technologies based on artificial intelligence have the potential to bring about far-reaching changes to processes in organisations and workers' activities. As also when other technological innovations have been introduced, this is entailing opportunities and risks for work design. BAuA hopes its research will make an OSH-related contribution to trustworthy AI of the kind posited by the EU's legal framework and the German Federal Government's AI Strategy.

Attention will centre on questions about system transparency, informational self-determination, the authority to take decisions, the monitoring and assessment of work, and the associated impacts on workers' health and well-being. In addition, however, requirements will also be laid down concerning accuracy, robustness, cybersecurity, and fair, appropriate appraisal and assessment methods, in particular in relation to AI systems with high risk potential, and how to ensure these requirements are complied with throughout AI applications' life cycles. The aim is to survey the opportunities for and risks to differential and adaptive work design, as well as safety and health protection requirements for products / work equipment that incorporate AI systems.

Under this focus programme, additional resources are to be allocated for a young scientists group that will contribute to research activities on AI.

IV

Focus: The Infection Control / OSH Interface

If infection risks, up to a pandemic, impact on societal and economic life, well-founded solutions have to be found to link together infection control, occupational safety and health, and economic activities in such a way that a functioning compromise is reached between their different objectives, guaranteeing employees' safety and health while ensuring they are able to carry on working. This is true for all areas of economic life, and therefore many specific exposure situations and contexts in which OSH instruments are applied. BAuA wishes to contribute to the further development of occupational safety and health and infection control as a way of achieving this objective. It also hopes to bring the results of its work to bear on the EU's new occupational safety and health strategy, which will, among other things, prioritise the "lessons learned" from the pandemic.

In future the experience of SARS-CoV-2 that has been gained will form the starting point from which BAuA is able to respond better to challenges thrown up in the world of work by pathogens with the potential to cause a pandemic or epidemic. The inter-divisional focus programme on The Infection Control / OSH Interface is not just intended to learn lessons from the current pandemic. Rather, over the medium term it will also develop solutions for the handling of other, new biological agents or mutations of known pathogens that may emerge (e.g. anchoring them in pandemic planning), so that society will be better prepared in future.

Interdisciplinary collaboration on the description of the risks created by newly occurring pathogens and protective measures tailored to their specific

characteristics will make it possible to draw up solutions for a broad portfolio of different activities and workplaces. The first step taken by BAuA was to initiate several research projects with the aim of rapidly gathering information about organisations' handling of the pandemic and the general work-related health risks connected with the SARS-CoV-2 virus, thus contributing to the development of efficient options for the action taken by organisations to deal with these specific challenges. These activities are to be continued and intensified.

Identifying risk hotspots and evaluating the effectiveness of infection control measures at work.

Analysing the effectiveness of individual protective measures at the workplace has been made more difficult by the fact that ever more measures have been modified simultaneously during the pandemic, and the effects of individual measures are not entirely clear. The knowledge gathered about the epidemiology of work-related infection risks is to be consolidated so that reliable statements can be made about infection risks in particular activities or sectors. Work-related factors (that act as confounders) are to be taken into consideration as well when this is done. There are also major gaps in the descriptions of how bioaerosols spread indoors, just as there are in the information available on technical methods of inactivating or reducing the concentrations of infectious agents in occupied indoor spaces. Exposure science supplies suitable methods for this purpose with measurement, modelling, and simulation techniques. Finally, it has become apparent that there are a number of unanswered questions around the topic of

protective masks, among other things about the strain workers experience when wearing protective masks, protective masks' capacity to retain infectious agents, face covering hygiene, and normative questions relating to product safety.

Promoting the integration of infection control into workplace occupational safety and health.

The pandemic has given good reason to reflect on the functionality of the institutional OSH system and its component parts in order to derive the implications for occupational safety and health. This will, for example, involve analysing the rules, regulations, and recommendations for OSH action in response to the corona pandemic or the work organisation measures taken to manage its consequences. The experience gained during the pandemic has shown that researchers' knowledge of the mental and, where relevant, physical workloads imposed on workers by inadequate equipment is not yet sufficient to give well-founded recommendations. The return-to-work process is another aspect that has gained new facets due to the pandemic. The stigmatisation of particular occupations and the reintegration of individuals with long COVID are issues on which organisations and employees will have to be supported. The research into the topics discussed here is to be complemented by the objective of using what is learned to draw up practical recommendations.

Developing communication strategies for pandemics and networking research activities.

The pandemic has shown that interdisciplinary collaboration is the key to dealing with topics at the interface between infection control and occupational safety and health. Inter-divisional collaboration on policy advice and the planning and conduct of R&D projects will be continued and centrally coordinated. In addition, efforts will be made to network with other ministerial research institutions working on topics connected with infection control. As a means of doing this, BAuA will contribute to the work of the Steering Committee of the Competence Network Public Health COVID-19 (*Kompetenznetz Public Health zu COVID-19*). Together with the Robert Koch Institute (RKI), the Federal Institute for Drugs and Medical Devices (BfArM), the Paul Ehrlich Institute (PEI) and the Federal Institute

for Risk Assessment (BfR), results achieved so far are to be reflected upon, research activities coordinated and experiences on adequate communication strategies exchanged.

Additional posts for staff with relevant specialist expertise have been requested for this focus programme under the 2022 federal budget.

V

DASA Working World Exhibition

The Federal Institute for Occupational Safety and Health operates the DASA Working World Exhibition at its site in Dortmund. This exhibition centre boasts 13,000 square metres of exhibition space and is visited by 200,000 people each year. It is to be regarded as an outstanding place of dialogue between science and the public, and aims to attract a broad audience, which ranges from the specialist OSH community to school classes and leisure visitors. The topics covered encompass all aspects of the world of work and convey the fundamental ideas behind humane work design. In order to address relevant topics, DASA takes up findings on social and technological change from research projects conducted at BAuA – and elsewhere. It is not the technical dimension that stands in the foreground. Rather, technical issues are looked at as they interact with other developments, such as demographic change, globalisation, and changing life plans. DASA is concerned with the opportunities and risks created by the transformation of the world of work. In view of the rapid changes that are taking place, visitors are to be motivated to discuss what work means – for individuals and for society as a whole.

In 2020 DASA was evaluated against the Leibniz Association's criteria for research museums. The evaluation concentrated on the quality of the work done to disseminate scientific knowledge in its exhibitions and education programmes, as well as appraising its visitor and audience research. The strategy for the updating of the permanent exhibition was particularly praised – as it was in the evaluation carried out by the German Council of Science and Humanities. This strategy allows scientific knowledge

to be incorporated into the exhibition through an ongoing process. In consequence, references to contemporary life and future developments are integrated systematically into the permanent exhibition.

This strategy will also be pursued further in the years 2022–2025. After the updates made to some of the exhibitions over the last few years (New Working Worlds (2018), Healing and Caring (2021)), the communication spaces with displays on rest breaks and new work will be the next to be refreshed (2022). The updating of the exhibitions on the upper floor will be completed by 2024 with an exhibition on service work / interactive work. This will be followed by the exhibitions where action is most urgently needed, which include the displays on technical OSH interventions in the construction industry. In parallel to these major updates, minor adjustments will continue to be carried out to reflect important new research results and make changes that are urgently desirable from visitors' point of view. Among them will be a new orientation system, which will be implemented by 2023 and will make it easier for visitors to find their way around DASA.

Temporary exhibitions raise DASA's profile on a range of topics relating to "people / work / technology" and support its image as a place of learning with attractive, interactive displays. The exhibition introduces the visitor to different aspects of the world of work – and therefore not least the fields in which BAuA conducts research. DASA uses its temporary exhibitions to address current topics, which allows it to respond more swiftly than it can in the permanent

exhibition. Furthermore, temporary exhibitions curated and produced in-house offer opportunities to communicate the issues BAuA is working on more widely when they go “on tour”. Such exhibitions travel around Germany, and in some cases to other European countries as well. To facilitate this, international cooperation has been agreed on four different exhibitions that will be devoted to questions about innovation and sustainability. Furthermore, DASA holds smaller temporary exhibitions intended to complement the “classic work design” themes that dominate the permanent exhibition.

Education and communication services, increasingly delivered in digital and new formats, help to ensure permanent and temporary exhibition projects are relevant to individuals and society, and accessible to a diverse audience. DASA attaches great significance to the digital extension of its exhibitions, but sees the analogue space as the priority for its work. Nonetheless, digitalisation and digitality are to be intensified at three levels: firstly, in the exhibition depicting and explaining digital technology in contemporary lifeworlds and the world of work; secondly, in the use of digital displays around the exhibition; and, thirdly, in the connection of these displays to the digital public sphere.

DASA has succeeded in noticeably increasing the attention it gets from the public and on the museum scene over the last few years with its innovative exhibition formats and content. Its audience research will be continued and, in particular, visitors’ behaviour evaluated to enhance its exhibitions’ effectiveness and further develop them as a medium. Quantitative audience research (visitor surveys) has been established at DASA and specifications have been drawn up for it in recent years. It will be continued on this basis with repeated cross-sectional surveys and will supply important basic data for the management of the exhibitions. In addition, qualitative audience research has been systematised and expanded. Two research projects set up for this purpose will be concluded by 2023.

Furthermore, DASA will accelerate the establishment of national and regional visitor research networks in order to drive ahead the hitherto non-existent academic dialogue in this field.

VI

BAuA's principles and working methods

As a ministerial research institution funded by the German Government, the Federal Institute for Occupational Safety and Health advises the Federal Ministry of Labour and Social Affairs on all matters relating to occupational safety and health, and contributes to humane work design. At the same time the spectrum of BAuA's tasks includes research and development, policy advice, the performance of official tasks, the transfer of scientific findings to workplace practice, and the education and communication work carried out by DASA. It therefore acts at the interface between science and politics, translating knowledge produced by the science system into forms that are useful for policymakers, workplace practitioners, and society and vice versa. In addition, it performs the tasks of the Federal Office for Chemicals under the technical supervision of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

Research and development

It would not be possible for BAuA to perform its various tasks if it were not for the systematic technical activities with which the Federal Institute surveys, analyses, and assesses current problems and relevant developments in occupational safety and health, building on them to develop the solutions and options for action it proposes. In this respect, its in-house research and development projects and its stable expert knowledge lay the scientifically based foundations for its advisory services and implementation measures. At the same time BAuA combines scientific expertise that can be tapped into at short notice with the capacity to work continuously on issues over the long term.

BAuA's research and development work is guided by the German Federal Government's principles of modern departmental research. In consequence, BAuA is committed, in particular, to the vision of permanently maintaining a high level of R&D expertise through consistent quality assurance, participation in national and international competition, encouragement for early-career scientists, and networking across the science landscape.

In its work, BAuA follows the "Guidelines for Safeguarding Good Research Practice" (*Leitlinien zur Sicherung guter wissenschaftlicher Praxis*) adopted by the German Research Foundation (*Deutsche Forschungsgemeinschaft*, DFG), ensuring the topicality and quality of its research and development projects with appropriate structures, processes, and concepts. These include consultations with a Scientific Advisory Board made up

of external appointees, the close linkage of research and development processes to the Institute leadership's strategic processes and decision-making structures, the operative management of the R&D process with binding procedures for the conception, approval, and conduct of R&D projects, the implementation of projects' results, and comprehensive quality assurance concepts for concrete research tasks and activities, those carried out in BAuA's own laboratories for instance.

BAuA competes nationally and internationally to attract third-party funding, and has defined the specific targets and principles it follows in this area of activity in its third-party funding strategy. The strategy is centred on strengthening the central technical concerns of occupational safety and health, encouraging talented early-career scientists, and enhancing BAuA's visibility. BAuA's efforts to attract third-party funding are focussed on publicly financed R&D projects that complement its strategic / programmatic orientation. On the one hand, it will engage in strategic cooperations intended to introduce specialist OSH perspectives at an early stage into larger projects, on chemical safety or technology development for example; on the other hand, BAuA's international visibility is to be further enhanced in the fields where its reputation is particularly strong.

Various activities ensure BAuA is networked throughout the science community. An important role is played in this respect by the teaching work BAuA's academic staff do, which has been considerably expanded in recent years. BAuA also uses its links with higher education institutions to introduce relevant OSH topics into course plans and content, offering lectures and seminars on these subjects. The priorities for the Federal Institute's commitment to higher education teaching are the supervision of doctoral students, final degree dissertations, and job placements for university students.

BAuA's professional networking in the science landscape at its different locations (Dortmund, Berlin, Dresden) is particularly significant. The aim is to further expand collaborative activities relating to research, teaching, practice

transfer, and the encouragement of early-career scientists. Over the last few years BAuA has been successful in fulfilling its aspiration to establish close and in some cases formal ties between distinguished BAuA scientists and higher education institutions. This has been done, among other things, by making joint appointments, creating extraordinary professorships, taking on teaching duties, and conducting concrete cooperative research projects. During the 2022–2025 programme period BAuA will strive to further expand collaboration with its higher education partners, backing this up with the joint appointment of further (junior) professors, the co-option of distinguished BAuA scientists to work at higher education institutions, and the joint establishment of young researchers groups.

With the help of the "Health in the Future World of Work" (*Gesundheit in der Arbeitswelt der Zukunft*) research funding programme, which is currently in preparation, BAuA and the Federal Ministry of Labour and Social Affairs wish to jointly enhance the effectiveness of research on health in the world of work by generating scientific findings, and acquiring socially and politically significant knowledge about how to strengthen health outcomes in the workplaces of the future. The central component of this programme will be longer-term funding for research structures and early-career researchers, which will be delivered by establishing professorships and setting up young scientists groups.

Networking with the specialist communities interested in particular thematic fields and BAuA's German and European counterparts is also of great significance for successful research on occupational safety and health. BAuA regularly engages in scientific discourse, presenting the results of its work at events such as the two-yearly A + A international OSH congress, and the annual conferences held by the "German Ergonomics Society" (*Gesellschaft für Arbeitswissenschaft*) and the "German Society for Occupational and Environmental Medicine" (*Gesellschaft für Arbeits- und Umweltmedizin*). At the European level, intensive collaboration within PEROSH, the main European network for OSH research, helps to ensure, above all, that

proven specialist expertise is pooled in research consortiums, partly because this is essential if the Federal Institute is to compete successfully for third-party funding.

Statutory and official regulatory tasks

The Federal Institute for Occupational Safety and Health performs tasks assigned to it by legislation, the Federal Ministry of Labour and Social Affairs, and other federal ministries in consultation with the BMAS.

Division 5, the Federal Office for Chemicals, makes BAuA the principle national authority responsible for chemicals regulation. As the Assessment Unit for Occupational Safety and Health, Division 4 assesses chemicals from an OSH perspective.

Within BAuA's jurisdiction, tasks are performed in accordance with the REACH, CLP, and Biocid regulations, as well as other pieces of chemicals legislation.

Under the REACH and CLP regulations, the European Commission takes decisions about chemicals regulation measures. The Federal Office for Chemicals implements the necessary procedures at the national level, and functions as the interface between the other German authorities concerned (the assessment bodies of the Federal Environment Agency (*Umweltbundesamt*, UBA), the Federal Institute for Risk Assessment, and BAuA), the German federal states, the European Chemicals Agency in Helsinki, the European Commission, and applicants. As a coordinating agency, the Federal Office for Chemicals has to interpret the (partial) assessments that are produced and mediate between the interests of assessment bodies, policymakers, and industry.

BAuA brings its scientific expertise to bear on REACH and CLP procedures when assessing dossiers that have been submitted and identifying substances subject to authorisation. It proposes substances for harmonised classification and labelling under the CLP Regulation,

and supports the scientific work done by the ECHA's Committee for Risk Assessment (RAC) and Committee for Socio-economic Analysis (SEAC). Apart from this, it articulates Germany's technical positions on the Member States Committee (MSC), and advises the Federal Ministry of Labour and Social Affairs and Federal Ministry for the Environment, Nature Conservation and Nuclear Safety in the run up to decisions taken at the EU level.

As the Federal Office for Chemicals, BAuA is the authorising body in biocidal product authorisation procedures. Its in-house scientific personnel are responsible for determining the identity and physical / chemical characteristics of chemical substances, evaluating their effectiveness, and assessing their risks to workers (Division 4). Furthermore, it advocates Germany's technical positions on the ECHA's Biocidal Products Committee (BPC), and coordinates procedures at both the European and national levels, in particular those involving the Federal Environment Agency's assessment bodies, the Federal Institute for Risk Assessment, and BAuA (Division 4).

In the field of product safety, BAuA is the EU's national contact point for the Information and Communication System for Market Surveillance (ICSMS) and the Rapid Exchange of Information System (RAPEX). This makes it the central actor in Germany responsible for the rapid exchange of information about dangerous or potentially dangerous products. It therefore functions as a communicative interface between the market surveillance authorities of the German federal states and the German Federation, on the one hand, and the European Commission and the other EU Member States, on the other. Pursuant to the Product Safety Act (*Produktsicherheitsgesetz*, ProdSG), BAuA runs a product safety portal, on which it publishes the latest product recalls and alerts daily, as well as announcing the steps taken by the national authorities and reporting to the European market surveillance authorities with RAPEX alerts. Furthermore, it is the point of contact for the risk assessment of products.

Policy advice

Policy advice is another of BAuA's core tasks. It provides advice both on request and by proactively feeding scientific findings and science-based proposals into OSH policy decision-making processes. It addresses current social, technological and economic issues and identifies important future challenges for the state and society. In response to enquiries from the German Government, the Bundestag, the social partners or European and international organisations on issues relating to safety and health at work, the BAuA provides its specialist expertise and overarching advisory services. In doing so, it abides by the fundamental concept of modern departmental research, which ensures its specialist expertise is heeded when enquiries are made about policy matters, primary or secondary legislation is adopted, standards are harmonised, and public authorities conduct decision-making processes. Although it is subject to competing pressures from policymakers, practitioners, and society, BAuA is scientifically independent and adheres to rules, procedures, and quality principles that guarantee the excellence of its policy advice.

An institutionalised form of advice is provided by the committees established under the Safety and Health at Work Act, the ordinances adopted for the Act's implementation, and the Product Safety Act:

- Committee on Safety and Health at Work (*Ausschuss für Sicherheit und Gesundheit bei der Arbeit*, ASGA)
- Occupational Medicine Committee (*Ausschuss für Arbeitsmedizin*, AfAMed)
- Committee for Workplaces (*Ausschuss für Arbeitsstätten*, ASTA)
- Committee on Work Equipment (*Ausschuss für Betriebssicherheit*, ABS)
- Committee on Biological Agents (*Ausschuss für Biologische Arbeitsstoffe*, ABAS)
- Committee on Hazardous Substances (*Ausschuss für Gefahrstoffe*, AGS)
- Product Safety Commission (*Ausschuss für Produktsicherheit*, AfPS)

The committees' main tasks are to further develop national rules and regulations in a

practical manner, adapt them by taking account of technical and scientific developments, and close regulatory gaps. One recent example is the SARS-CoV-2 occupational safety and health rule (*SARS-CoV-2-Arbeitsschutzregel*), the development of which was coordinated jointly by BAuA and the BMAS occupational safety and health committees. During the pandemic, the rule has helped organisations ensure they comply with the law when implementing the SARS-CoV-2 Occupational Safety and Health Ordinance (*SARS-CoV-2-Arbeitsschutzverordnung*). BAuA administers the committees' business on the basis of the relevant legal basis, and draws on their expertise in its advisory processes by involving them in the work done on technical questions.

Furthermore, the Scientific Office of the Medical Expert Advisory Committee on Occupational Diseases has been based at BAuA since earlier this year. Apart from supporting the Advisory Committee technically and administratively, BAuA carries out a range of tasks for it, including the drafting of scientific reports and opinions on occupational diseases, preventive occupational healthcare, and other occupational medicine issues. In addition, BAuA provides technical support for the Committee on Maternity Protection (*Ausschuss für Mutterschutz*, AfMu) of the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (*Bundesministerium für Familien, Senioren, Frauen und Jugend*, BMFSFJ), among other things by chairing one of its subcommittees. Furthermore, it is an active partner in the Occupational Medicine Action Alliance (*Aktionsbündnis Arbeitsmedizin*) and supports efforts to encourage young occupational physicians.

Thanks to its involvement in standardisation bodies and other bodies established by law to directly implement and harmonise standards, BAuA plays a part in the harmonisation of the secondary legislation that governs occupational safety and health matters. In its standardisation work, it prioritises central strategic bodies, such as the Commission for Occupational Health and Safety and Standardization (*Kommission Arbeitsschutz und Normung*, KAN) and the steering committees of the German Institute for Standardization (*Deutsches Institut für Normung*, DIN)

standards committees, in particular the Standards Committee Safety Design Principles (*Normenausschuss Sicherheitstechnische Grundsätze*, NASG), the Standards Committee Acoustics, Noise Control and Vibration Engineering (*Normenausschuss Akustik, Lärminderung und Schwingungstechnik*, NALS), and the Standards Committee Ergonomics (*Normenausschuss Ergonomie*, NAErg). It is also highly involved in the standardisation road maps for Industry 4.0 and artificial intelligence. The Federal Institute usually plays a leading role on the steering committees of the DIN standardisation committees and therefore helps direct their work, which makes it possible for its central concerns to be brought to bear on standardisation processes. The Federal Institute currently holds the chair of the Working Group “Air Analyses” (*Arbeitsgruppe “Luftanalysen”*) of the DFG Senate Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area (*Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe*).

The Joint German Occupational Safety and Health Strategy (*Gemeinsame Deutsche Arbeitsschutzstrategie* (GDA)) is of particular significance for policy advice. The German Federation, the federal states, and the statutory accident insurance providers have joined forces under its auspices to ensure the work done on OSH issues benefits from a shared strategic orientation and make concerted action on OSH matters possible. BAuA is a member of the steering group of the National Occupational Safety and Health Conference (*Nationale Arbeitsschutzkonferenz*, NAK), the central decision-making body for the implementation of the Joint German Occupational Safety and Health Strategy, and also administers its General Office. In addition, it is represented on three of the GDA's working groups (on musculoskeletal stress, mental workloads, and the safe handling of hazardous, carcinogenic substances).

Pursuant to Section 9 (3) Minimum Wage Act (*Mindestlohngesetz*, MiLoG), the Minimum Wage Commission (*Mindestlohnkommission*) is tasked with the ongoing evaluation of the minimum wage's impacts on protection for employees, competition conditions, and employment. The Coordination and Information Office for

the Minimum Wage (*Geschäfts- und Informationsstelle für den Mindestlohn*), which is based at BAuA, assists this work, in particular, with the research activities on the effects of the minimum wage discussed in the section on Thematic Field 4.1. The Federal Specialist Office for Occupational Safety and Health, which has been established at BAuA in 2021, supports the German Federation in exercising its legal supervision of the federal states' inspection activities. The Specialist Office helps ensure the federal states' inspection activities can be assessed on an empirical basis by evaluating compliance with the on-site inspection quota and carrying out performance-based monitoring.

At the European level, BAuA supports the Federal Ministry of Labour and Social Affairs on the Management Board of the European Agency for Safety and Health at Work (EU-OSHA) and the European Commission's Advisory Committee for Safety and Health at Work (ACSH). Furthermore, it acts as the national Focal Point for EU-OSHA, promoting active dialogue with European and national networks of OSH actors. BAuA is a collaborating centre on occupational health for the World Health Organisation (WHO) and cooperates with the International Labour Organisation (ILO) in Geneva.

Practice transfer

Scientific findings play a central role in the analysis and humane management of social and technological change in the modern world of work. It is one of BAuA's tasks as a ministerial research institution to make its findings available to the public and present them in forms that facilitate their application in workplace practice.

BAuA has a communication and transfer strategy with which it conveys its research and development results to practitioners. Continual updating and further development ensure this strategy is sustainable and future-proof even when there are changes in how the Federal Institute's target groups consume and respond to information.

Depending on the objective, the issue at stake, and the group being addressed, BAuA uses

different approaches, methods, media, and contemporary (science) communication formats, offering its services and products in forms that are appropriate to their intended recipients and so differentiated in terms of their content, language, and design.

BAuA's most important information, communication, and transfer channels are its website, its publications, the events and trade fairs it organises and contributes to, its engagement in networks and initiatives, and its targeted press work. Furthermore, its information centre functions as a central point of contact for questions from the specialist community, workplace practitioners, and interested citizens. In addition, the legislatively anchored REACH-CLP-Biocidal Products Help Desk of the Federal Office for Chemicals answers questions about the proper application of chemicals law.

BAuA's homepage (www.baua.de) is the central gateway to the results of its work and research, as well as its current services, such as practical tools, events, etc. In accordance with its open-access strategy, the publications issued by BAuA itself are freely accessible online on its website, while certain formats are also made available as print products. These publications are aimed at different target groups and therefore vary in terms of their length, technical depth, and editorial presentation.

Apart from its internet presence and publications, BAuA regularly holds events in different formats for different target groups – experts, the specialist audience, and multipliers. Over the next four years it will be necessary to do more to integrate the possibilities of digitalisation strategically into BAuA's communication concept. Finally, BAuA's target groups are also reached by attending and helping to organise specialist trade fairs, in particular the A + A, the biggest international fair for the OSH community, as well as sector-specific and regional events.

Cooperation with central OSH actors such as the Joint German Occupational Safety and Health Strategy, and involvement in initiatives and networks like the New Quality of Work Initiative (*Initiative Neue Qualität der Arbeit*, INQA), the

Healthy Care Campaign (*Offensive Gesund Pflegen*), and the Mental Health Offensive (*Offensive Psychische Gesundheit*) are of particular significance for practice transfer. This cooperation enables BAuA to feed its research results into the discussions about modern preventive OSH measures, take up issues raised in dialogue with practitioners for its own research, and contribute to the development and dissemination of demand-oriented tools for workplace practice.

Organisation – human resources

BAuA is divided into units, which are grouped into a number of divisions. In turn, these are overseen by the Institute leadership – the President and Vice President –, who are supported by the Management Division, the International Affairs, Scientific Cooperation Staff Unit, and the Strategic Research and Development Management Staff Unit, in which the Research Data Centre is also based. This three-level structure ensures decision-making channels remain short. The substantive issues dealt with by BAuA's individual divisions flow from the extensive tasks assigned to the Federal Institute by the ministerial order with which it was established.

- Division 1 **Changing World of Work** (Dortmund, Berlin) deals with the demands imposed by the transformation of the world of work. Among other things, this requires it to report continually on workplace developments. Furthermore, the General Office of the German Occupational Safety and Health Strategy, the Coordination and Information Office for the Minimum Wage, the Federal Specialist Office for Occupational Safety and Health, and the coordination unit responsible for the technical supervision of projects conducted under the New Quality of Work Initiative are all integrated into Division 1.
- Division 2 **Products and Work Systems** (Dortmund, Dresden) concentrates on the safe, healthy, humane design of technical working conditions. Its focusses are product safety, technical / organisational work structures and processes, and the work environment.

- Division 3 **Work and Health** (Berlin, Dresden) researches how work and health interact, presenting well-founded knowledge on this topic for policymakers, workplace practitioners, the general public, and the academic community. It focusses both on risks in the workplace and on individual and work-related resources. The Scientific Office of the Medical Expert Advisory Committee on Occupational Diseases has been based in Division 3 since 2021.
- The main responsibilities of Division 4 **Hazardous Substances and Biological Agents** (Dortmund, Berlin) are the identification, assessment, and management of risks in activities involving the handling of hazardous substances and biological agents. It also conducts extensive research in this field.
- Division 5 **Federal Office for Chemicals** (Dortmund) performs BAuA's official tasks under the Chemicals Act, in particular administering authorisation procedures for biocidal products marketed in Germany and implementing the REACH Regulation for all industrial chemicals.
- BAuA's own exhibition centre, **DASA** (Dortmund), educates the public with a permanent exhibition, temporary and touring exhibitions, communication activities, and events about the world of work, its meaning for individuals and society, humane work design, and the transformation of work.
- The in-house services required to run BAuA are delivered by its **Central Division**, which consists of two pillars, Z 1 (Human Resources, Organisation, IT, Scientific Information) and Z 2 (Budgeting, Internal Services). Its modern, service-oriented administration and efficient processes support the Federal Institute's performance of its duties.

For the further development of its strategic orientation, BAuA is advised by three bodies made up of distinguished external experts: the Board of Trustees (*Kuratorium*), the Scientific Advisory Board, and the DASA Advisory Board.

The Board of Trustees has sixteen members, including representatives from employers' organisations, trade unions, and occupational safety and health institutions, as well as the chairs of the Scientific Advisory Board and the DASA Advisory Board. The expert dialogue that takes place within the Board of Trustees enables BAuA to systematically take account of other institutions' activities and ensures their interests are pooled.

The fourteen members of the Scientific Advisory Board are tasked with providing expert advice from a scientific perspective. The composition of the Advisory Board with scientists from different disciplines that relate to BAuA's research activities is intended to do justice to this objective.

The DASA Advisory Board comprises twelve museum and communication experts. It advises DASA on the development of its medium and long-term objectives, supervises the formulation and implementation of its multi-year exhibition and education programme, and promotes DASA's collaboration with relevant institutions.

It is critically important for BAuA to recruit highly qualified personnel, gain their loyalty, and develop their capabilities if it is to perform its diverse tasks. Equality of employment opportunities for women and men, and extensive, targeted human resources development activities play central roles in this respect.

Equality between women and men is a firm component of the Federal Institute's human resources policy to which high priority is attached. The proportion of female employees at BAuA has been approximately 60 per cent for some years, while they hold roughly the same proportion of higher service posts. Just under 40 per cent of BAuA's managers are female. Its efforts to ensure equality can be illustrated by an abundance of measures, such as the drafting of a Gender Equality Plan to promote gender equality in research, and a human resources policy that is sensitive to employees' family responsibilities and responsive to their needs during different life phases. The policy has been audited and certified as family-friendly by "berufundfamilie" since 2011.

In summary, it is a central concern for BAuA to further enhance its image as an attractive employer well equipped to meet future challenges. This is essential in order to recruit, motivate, and gain the loyalty of highly qualified experts and talented young people. It seeks to do this by consistently further developing its organisation and its human resources work, applying established methods such as surveys, focus groups, and Institute leadership conferences, and integrating culturally sensitive organisational development instruments into these processes.

BAuA sets great store by the opportunities for personal development its employees enjoy. Its human resources development work therefore encompasses a broad range of measures such as management qualifications, high-quality specialist further training courses, chances to attend international congresses, interdisciplinary continuing professional development, initial vocational training provision, and further IT training. Apart from high-quality specialist training relating to each employee's area of responsibility, opportunities for them to upgrade their qualifications are also supported (e.g. by taking a bachelor's or master's degree).

In-house training provision is brought together under the auspices of the BAuA Academy and divided into three programmes, Management, Science+, and Trainings. BAuA runs a structured, modular management qualification programme (Management Academy) for the development of its managers, under which specialised and interdisciplinary topics are dealt with in depth and students do supervised learning projects.

The English-language qualification programme Science+ has a modular structure as well and is intended for early-career scientists at BAuA. Its objectives are to support their scientific training beyond the supervision of their doctoral theses, broaden their career options by systematically refining their profiles and portfolios, and draw their attention to career paths inside and outside science.

The continually expanding provision under the BAuA-Trainings in-house training and con-

tinuing professional development programme is aimed at all groups of employees. It involves further training on specialist topics and methodological issues, covering a broad range of competences – from basic knowledge about organisation and records management to health issues, work techniques, IT courses, and the acquisition of subject-specific English skills.

As is to be expected in view of BAuA's diverse tasks and activities, the Federal Institute's specialist personnel come from a wide spectrum of disciplines. At the same time attracting highly skilled experts in occupational healthcare continues to be of great significance for BAuA's research, advisory, and regulatory responsibilities. BAuA and the Federal Ministry of Labour and Social Affairs therefore hope the "Health in the Future World of Work" research funding programme mentioned above will make important contributions to the establishment and enhancement of the Federal Institute's structural and human resources (e.g. through the establishment of young scientists groups and junior / endowed professorships).

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