



Federal Ministry
of Education
and Research

**HIGH-TECH
STRATEGY** 
Talents. Skills. Innovations.

Research for Civil Security 2018–2023

A Federal Government Framework Programme



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Summary

Security is fundamental to freedom, quality of life and prosperity. Civil security has a bearing on all spheres of life in modern and cosmopolitan societies. It enables citizens to develop freely and individually and strengthens the formation of democratic communities where social cohesion and societal participation take centre stage. A changing security policy environment, the growing trend towards digital technologies – both in private life and in the world of work – and societal change are all calling for a new response from civil security research. This response needs to include holistic solutions that help us to address the consequences of international terrorism and organized crime and enhance the protection of critical supply infrastructures. At the same time, national and international measures are needed to reduce the impact of natural disasters and extreme weather phenomena. Public and private safety and security organizations are facing great and in part new challenges regarding civil security.

Civil security research has been firmly enshrined in the High-Tech Strategy since 2007 and has become an established field of interdisciplinary research with a thriving research community. With its “Research for

Civil Security 2018–2023” framework programme, the Federal Government is assuming responsibility for fostering public safety and public order in the interconnected world of today and tomorrow. Under the new framework programme, innovative solutions are being developed and put into practice to enhance people’s security, safety and quality of life and protect vital infrastructures.

Funding in the field of civil security research is provided exclusively for research on civil scenarios involving research, industry and end users. Technological advancement and societal progress are inextricably linked in security research. This means that societal aspects are taken into consideration from the very beginning when developing security solutions. The consistent and early involvement of end users in the public and private sector ensures that civil security solutions are developed to meet practical needs.

The Federal Government is investing in the security of tomorrow with its “Research for Civil Security 2018–2023” framework programme. Civil security research is the key to enhancing security in all spheres of public

life without curtailing the freedom of the individual. It creates the preconditions for strengthening prosperity in Germany and enhancing the quality of life for everyone.

The new “Research for Civil Security 2018–2023” framework programme

The Federal Government’s new “Research for Civil Security 2018–2023” framework programme builds on Germany’s experience and success with two predecessor programmes and over ten years of civil security research. The programme focuses on research on current civil security needs and issues.

It follows a holistic approach with a view to firmly anchoring civil security research in the broader context of the social debate around security. The programme constantly extends its perspective beyond aspects of research in the narrower sense and considers research topics in a broader overall context. It makes it easier to understand the steps involved in translating innovative research into practical applications.

Security research overlaps with many diverse policy areas and neighbouring fields of research. This results in a vast portfolio of research topics which are carefully reflected in the framework programme, which will run from 2018 to 2023. These research topics demonstrate the many facets and dimensions of civil security as a task for society as a whole. On the one hand, security is a public responsibility that goes beyond the state’s monopoly on the use of force. On the other hand, security is also a basic individual need for which everyone must take (and share) responsibility.

The new “Research for Civil Security 2018–2023” framework programme builds on the key factors underpinning the success of its predecessor as confirmed in an evaluation of the predecessor programme¹, that is to say: a broad range of topics and the involvement of end users. A structured agenda process² was carried out

involving experts from public authorities, rescue and relief organizations, industry and non-governmental organizations as well as researchers from all related disciplines in order to discuss objectives, topics and needs. The agenda process was supported by the Scientific Programme Board, the independent body which advises the Federal Research Ministry on the strategy and content of German civil security research.

Key focus areas

The central responsibility of civil security research is to better protect the public against threats emanating from natural disasters, terrorism and crime. There are also increasing demands with regard to effective and sustainable security solutions that guarantee the protection and resilience of societal structures in the long term – in no small part due to the impact of global and societal change and the increasing speed of technological advancement.

Research aims on the one hand to strengthen public resilience and people’s ability to take responsibility themselves, and on the other to support end users. Under the civil security research programme, end users are those entities that put security solutions into practice. These include in particular authorities and organizations responsible for safety and security such as fire services, police forces and criminal investigation departments, the Federal Agency for Technical Relief, rescue services such as the German Red Cross, the Johanniter Emergency Service and the German Sea Rescue Service, as well as disaster management and regulatory agencies. Other end users include the operators of critical infrastructures (such as energy and water utilities and transport entities) and private-sector safety and security companies.

One focus of the new framework programme is on supporting rescue and emergency staff from the authorities and organizations responsible for safety and security and protecting such staff from hazards. The development of new technologies, funding for new organizational competences and measures to open up new ways of communication help to ensure that disasters and everyday operations can be dealt with more effectively and more safely.

The digital transformation has a far-reaching impact on all spheres of human life and thus also on civil secu-

1 Final report: “Evaluation of the Federal Government’s ‘Research for Civil Security (2012–2017)’ framework programme”, available in German at www.sifo.de/de/evaluation-des-programms-forschung-fuer-die-zivile-sicherheit-1703.html

2 www.sifo.de/de/agendaprozess-zur-fortschreibung-des-rahmen-programms-forschung-fuer-die-zivile-sicherheit-2257.html (only available in German)

rity. Another key forward-looking task under the civil security research programme therefore is to ensure that good use is made of the many opportunities and potentials related to digital change. In this context it is important to take account of both the requirements for using digital technologies and applications, and the risks involved.

The framework programme does not only provide funding for civil security research but also supports the transfer of civil security solutions into practice. The programme therefore also covers measures for the practical implementation of new research findings. Apart from providing funding for field tests and practice-oriented evaluations, the programme also provides funds for training courses and modules as well as business models. One important factor here is that many of the end users are public-sector entities which are subject to special rules regarding the procurement of new security instruments.

The precondition for the successful transfer of innovation and knowledge is close cooperation between the research community, industry and end users that meets user needs for practically relevant research (and its development). The establishment of centres of competence, clusters of research excellence and innovation labs in particular enables the even closer interlinking of research on the one hand, and the specific practical requirements of end users on the other. Other central initiatives are the funding measures for innovative SMEs (“KMU-innovativ”) and innovative end users (“Anwender-Innovativ”), which are aimed at strengthening the innovativeness of small and medium-sized enterprises and end users in Germany in order to speed up the translation of research findings into practice.

The three pillars of the framework programme

The “Research for Civil Security 2018–2023” framework programme is structured in three programme pillars (Figure 1). Against the backdrop of global technological and societal challenges, these three core areas deal with relevant research topics and questions under the headings of “Protection and rescue of people”, “Protection of critical infrastructures” and “Protection against crime and terrorism”.

Current technological and societal developments are also addressed as topics cutting across the three pillars. The primary goal in this context is to analyse the potential offered by novel technologies and societal change and to feed the results of this analysis into the development of future civil security innovations.

Figure 1:
Programme pillars and cross-cutting topics under the “Research for Civil Security 2018–2023” framework programme



The cross-cutting topics of “International cooperation” and “Development of structures, transfer to practice and competence-building” address overarching questions of civil security research. The objective is to ensure the sustainability of German civil security research along the entire innovation chain and to strengthen European and international cooperation involving researchers, industry and end users.



1 Security as a precondition for freedom, quality of life and prosperity

Living a secure life is not only a key basic human need but also an important prerequisite for the well-being of a society and the success of an economy. This is why civil security is firmly anchored in the Federal Government's High-Tech Strategy as one of the priority areas of particular relevance for ensuring growth, prosperity and quality of life.

Civil security research plays a major role in securing social cohesion, a trusting democratic society and Germany's economic strength in the long term.

The current framework programme builds on the successes of over ten years of civil security research. Based on a comprehensive evaluation and broad-based agenda process, the programme will address both future technical and social requirements. People are always at the centre of the programme – be it as vulnerable individuals who need to be protected or as self-determined players who take empowered action.

1.1 Perspectives and stakeholders in civil security

Ensuring safety and security in all areas of human life

Civil security has a bearing on all spheres of life in modern and cosmopolitan societies. Many people associate a safe and secure home for example with the uninterrupted supply of electricity and water and the best possible anti-burglary protection. A sense of safety also means people not having to be afraid of criminal attacks when using public transport on their way to work. The same applies when travelling on holiday: Security measures at airports and train stations ensure that passengers can reach their destinations quickly and safely. Last but not least, the protection of public spaces and large-scale events enables people to participate safely in cultural and leisure activities.

Protecting people in their everyday environments continues to be a shared central responsibility. This means that those people and organizations that work on a full-time or voluntary basis to ensure security

must be able to rely on the best possible protection and equipment. Police forces, rescue workers and skilled professionals who work to ensure around the clock civil security in Germany need to be particularly well protected against hazards and violent assaults.

Stakeholders share responsibility

All societal stakeholders are called upon to help shape civil security in the future: the government sector, citizens and rescue and emergency workers in particular.

The primary task of the government sector is to create the legal and structural framework that enables people in Germany to live safe, free and self-determined lives. However, absolute security can never be guaranteed. That is why there needs to be a continuous dialogue about the right balance between security and freedom, bearing in mind the residual risks for society.

Citizens bear an important share of the responsibility for safeguarding and improving civil security in the context of societal security provision. This involves strengthening and expanding the skills and abilities of the individual in order to prepare for emergencies and ensure an appropriate level of responsible self-protection.

It is first and foremost the rescue staff and skilled experts from the authorities and organizations responsible for safety and security and the operators of critical infrastructures who use their know-how and commitment to ensure the best possible protection for people and infrastructures. Civil society's existing technological and organizational competences need to be consistently developed in order to meet the high security demands of a modern industrial and knowledge society.

Researchers, industry and civil society play a significant role in shaping and integrating security solutions that are tailored to practical needs. Their research findings provide the technological and social innovations needed to ensure that civil security strategies meet the challenges of the future. Security solutions with the 'made in Germany' trademark are also in high demand at the international level and are thus an important economic factor.

1.2 The central missions

The "Research for Civil Security 2018–2023" framework programme is based on four central missions:

1. Enhancing the protection and resilience of societal structures and the population

Global changes in societal structures and security policy – as well as the use of new technologies – are giving rise to a variety of opportunities and risks with regard to civil security. Civil security research helps to strengthen society's resilience. Innovative solutions, instruments and options for action can enhance the safety and security of the population and enable the comprehensive protection of societal structures.

2. Enabling societal innovation for civil security

Civil security is a pillar of social cohesion and can therefore be an important driver of positive societal change in Germany and Europe. Civil security research provides a powerful stimulus for accelerating the practical application of social and technological innovations that make society more secure and thus enable everyone to develop freely and individually.

3. Strengthening the role of the state as the guarantor of security

Ensuring civil security requires organizations at the national and international level to take joint action. Authorities at the federal, Länder and municipal level are important intermediaries when it comes to promoting and coordinating cooperation between civil society, industry and organizations responsible for safety and security. Civil security research provides the know-how and technological capabilities to support authorities and organizations responsible for safety and security in fulfilling their protection and prevention duties. A particular focus is on unlocking the potential offered by the digital transformation.

4. Understanding civil security as a task for society as a whole

While it is the task of the state to create the political and legal framework for action, it is the shared responsibility of all societal actors to safeguard civil security. Civil security research strengthens social

dialogue and provides suitable instruments to facilitate the development and expansion of civil society cooperation.

1.3 Objectives of the framework programme

- We aim to enhance everyday safety and security by actively involving the population in civil security research.
- We will provide funding for civil security solutions that improve the ability of rescue and emergency workers to protect themselves.
- We will provide funding for forward-looking solutions and instruments for the overall provision of security organized by all sectors of society.
- We will create the preconditions for the practical application of innovative services and products to enhance civil security.
- We will make technological, scientific and societal developments available to the civil security community.
- We aim to promote social, organizational and cultural innovations for civil security.
- We will provide funding for the development of reversible security solutions that can be removed entirely if required.
- We will expand the platforms for networking and exchanges in civil security research.
- We aim to provide funding for cooperation between civil security organizations in the private and public sector.
- We will dovetail the implementation of government initiatives such as the National Strategy for Critical Infrastructure Protection, the Civil Defence Concept and the Global Initiative on Disaster Risk Management with our own independent measures.
- We will play an active role in the development of civil security policies at the European and international levels.
- We aim to strengthen the international competitiveness of Germany's civil security industry and the 'Security made in Germany' trademark.



INNOVATION

2 Research and innovation for civil security: Developing solutions for a changing world

We will provide funding for civil security research under three programme pillars with a view to strengthening the resilience of the people and societal structures in Germany:

- **Protection and rescue of people**
- **Protection of critical infrastructures**
- **Protection against crime and terrorism**

Research and development of practice-oriented and value-driven security solutions under the programme pillars should in particular:

- Continuously take account of the dynamism of current security policy developments and long-term societal change processes.
- Take into practical consideration the opportunities, risks and requirements of digital change for authorities and organizations responsible for safety and security with regard to connecting critical infrastructures and protecting civil society.
- Integrate the results of inter- and transdisciplinary research during the two previous programme phases and the vast expertise of all relevant actors in science, industry, government authorities and security organizations.

2.1 Protection and rescue of people

Shaping the future of civil protection

Advancements in digital technology and the resulting interconnectedness will have a profound impact on working conditions, communication and information processes and on opportunities for participation in civil protection activities. Professional and voluntary workers in the fire services, police forces, rescue services and disaster management units work together in the field of civil security research with citizens, operators of critical infrastructures and private-sector security providers to make use of digital technology and thus ensure sustainable civil protection in Germany.

Strengthening Germany's emergency response system

Germany's emergency response system is unique by international standards and founded on a broad societal basis of both voluntary and full-time workers. Rescue and emergency staff from the authorities and organizations responsible for safety and security are primarily responsible for protecting citizens and vital supply infrastructures. Emergency workers must be able to take quick and effective measures in order to save lives in the event of major incidents such as natural disasters,



the escape of hazardous CBRN³ substances, large-scale fires in factories and accidents.

Civil protection organizations must receive support in order to be prepared for dealing with complex or transregional crises better and more efficiently and limiting the impact of such crises as much as possible. Additional efforts need to be made to enhance prevention, coordination and communication in crisis and operations management.

It is equally important to foster the ability of individuals and communities to respond faster and more competently to natural disasters, CBRN hazards and other emergencies.

³ CBRN stands for chemical, biological, radiological and nuclear substances.

Relevant research topics under the programme pillar “Protection and rescue of people” include in particular:

The digital transformation of civil protection (BOS 4.0)

- Practical application of digital technology in risk and crisis management systems, public safety equipment and training for emergency staff and team leaders from the authorities and organizations responsible for safety and security
- Impact of digital change on human-technology interaction as well as on organizational structures and practices in civil emergency management

The human face of the emergency response system

- Encouraging potential volunteers to engage in voluntary civil protection
- Modern, user-oriented training courses for rescue and emergency workers
- Strategies for the development and evaluation of realistic training scenarios and exercises
- More efficient communication and coordination between full-time professionals and volunteers, taking into account the secure and constitutional handling of personal and sensitive data

Civil protection and danger prevention at the local authority level

- Training and information strategies to overcome inhibitions about providing neighbourly help
- Enhancing the ability of private households to help and provide for themselves in different emergency scenarios
- Protecting particularly vulnerable groups of society before, during and after an emergency
- Strengthening cooperation between society and industry in the event of an emergency
- Developing tools for socio-technological cooperation in danger prevention at the local authority level

Public action in the event of a crisis and the resilience of civil protection

- Impact of hybrid threats – i.e. emergency situations caused by state and non-state actors that can inflict coordinated damage below the war threshold and destabilise societies – on civil protection and relevant adapted strategies to prevent and control crises
- Approaches to a real-time analysis and assessment of complex crisis situations (for example CBRN hazards)

- Technologies and strategies for enhancing the public capacity to respond to and ward off threats in the event of CBRN emergencies
- Bolstering the resilience of authorities and civil protection organizations – within and across organizations
- Enhancing the capability of authorities and organizations responsible for safety and security to improvise in the event of an emergency
- Strategies to strengthen the ability of the health-care system to respond to complex crisis situations (including CBRN hazards), taking account of changing structures and aspects of disaster medicine

The impact of innovations on civil protection

- Impact of the practical application of technological and societal innovations on the entire danger prevention system and the everyday work of rescue and emergency workers
- Analysis of unintended consequences of innovations with a particular focus on the growing complexity and interconnectedness of technological systems

The international dimension of an emergency

- Networked real-time early warning systems, risk analysis and assessment of international disasters
- Analysing the economic and social impact of international disasters
- Bolstering the resilience of state and societal structures in countries and regions particularly affected by disasters
- Stepping up the fight against the threat of transnational health crises such as those triggered by infectious diseases
- Developing strategies and technical solutions for treating patients with severe infectious diseases in the event of an international health crisis and evacuating these people from international operation areas

2.2 Protection of critical infrastructures

Protecting infrastructures and ensuring supply security

The level of supply security in Germany is above the international average. This gives Germany a competitive advantage that enables a high standard of living. At the same time, however, a high level of supply security can also create a false sense of security which leaves people inadequately prepared for incidents.

Critical infrastructures and services (Figure 2) play a central role for the community. Disturbances or breakdowns can lead to considerable disruptions such as supply shortages. These disruptions can jeopardize public security and cause major economic damage. Critical infrastructures are exposed, for example, to the threat of natural disasters. But technical failure and terrorist or criminal attacks also pose a threat.

Critical infrastructures and services must also be considered in a supranational context. Complex products, for example in the automotive or mechanical engineering industries, are often made of components that are not only manufactured in Europe but in factories around the globe. The global import and export of oth-



er critical goods such as food and medicines is also on the rise. As a consequence, there is an increasing need for secure, integrated and transparent supply chains and logistics processes.

Integrating critical infrastructures while safeguarding their resilience

Civil security research places a particular focus on the protection of critical infrastructures and their resilience to disruptions and attacks. It is important in this context to expand the focus to also include infrastructure systems such as banks, cultural assets, the media, and the health and care system since these systems are as essential as the basic supply of water, energy and internet access when it comes to maintaining a functioning society.

Today, many infrastructures in Germany depend on the smooth operation of the information infrastructure. This increases dependence on the secure and efficient performance of information technology.



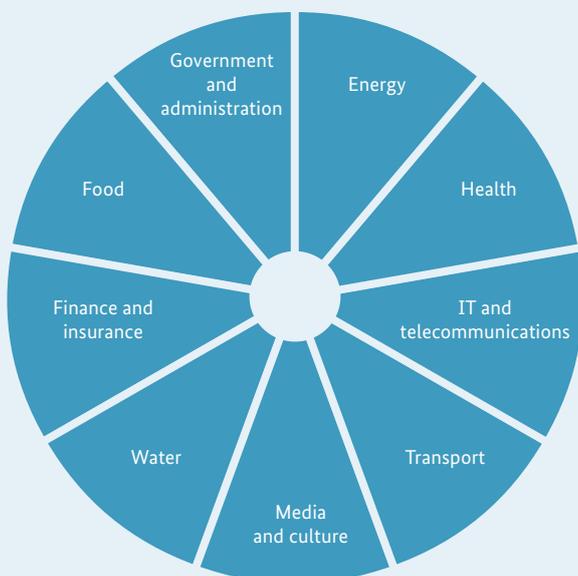
The current trend is towards the formation of what are known as ‘mega-infrastructures’. The big challenge is to ensure the fail-safety of these complex and highly integrated infrastructure systems. Already today, disruptions in one infrastructure can have a cascade effect with major and far-reaching consequences for other infrastructures. That is why critical infrastructures need to be considered from a broader angle in the future, across sectoral and national borders.

Civil security research aims to support public and private-sector operators in increasing the resilience of critical infrastructures against disruptions.

Ensuring the safety and security of people, machines and infrastructures in a digital world

The vision of ‘Industrie 4.0’ is characterized by networked, automated and autonomous systems and stronger human-machine interaction. Open, sometimes global and fully coupled information networks play a central role in this context. The potential they bring for critical infrastructures is obvious: Faster and more transparent processes, decentralized control, cross-institutional communication among systems and a more sustainable economy are significant factors in enhancing society’s quality of life, efficiency and supply security.

Figure 2:
The different critical infrastructure and services sectors (Source: own chart based on the National Strategy for Critical Infrastructure Protection (or KRITIS Strategy))



The rising number of networked systems means that new risks are emerging with regard to the efficient functioning of critical infrastructures. Security aspects need to be considered in complex control systems right

from the start. This includes considering ethical and legal issues, for example whether and when autonomous or partially autonomous systems should be allowed to take critical security decisions.

Relevant research topics under the programme pillar “Protection of critical infrastructures” include in particular:

The security architecture of networked infrastructures and mega-infrastructures

- Increasing the resilience, adaptability and self-organization of security-relevant infrastructure components and systems while taking account of socio-technological interaction
- System-relevant fallback levels to maintain, disconnect and restore critical infrastructures and services
- Strategies for ensuring timely emergency management measures and for the swift provision of minimum supplies for the population in the event of a crisis
- Analysis of socio-technological interaction and interfaces in the context of operational safety and resilience to attacks, so-called safety and security applications in critical infrastructure systems and processes along the entire life cycle

Securing socio-economic infrastructures

- Ensuring the continuity of vital services in critical supply areas (e.g. medical care and the media) in crisis situations
- Ensuring the functioning of economic infrastructures during a crisis (e.g. cash supply, payment transactions, online and stock exchange trading)
- Strategies to enhance the protection of cultural assets

Transport in a modern society

- Enhancing the safety and security of transport infrastructures in the light of automation and the use of digital technology
- Using digital transport technology for managing emergencies and crises (e.g. through traffic routing and control)

Manufacturing and logistics

- Risk analysis of highly integrated, automated and (partially) autonomous infrastructures and their behaviour and protection in the event of a crisis
- Increasing the resilience of international supply chains

Securing critical services

- Ensuring the provision of critical services in the energy, water, transport, food, health, finance and insurance sectors in the light of processes of societal change and current or future threats
- Impact of the integration of decentralized energy generation and storage systems and the use of digital control technologies (such as smart meters or smart grids) on the security of power grids and critical services
- Using the potential offered by networked communications and control infrastructures to protect critical infrastructures and ward off threats

Risk and complexity research

- Studying the risks and growing complexity developing in the wake of the digital transformation and the integration of critical infrastructure systems while taking account of technological, organizational, regulatory and individual perspectives
- Strengthening capacities to analyse future threat situations



2.3 Protection against crime and terrorism

Fighting crime and terrorism more effectively

Civil security is a fundamental prerequisite for an open and democratic society and social peace. However, globalization and the worldwide exchange of goods, data and capital have increased the threat of new and network-based forms of crime. International terrorism continues to pose a serious threat and jeopardize society's free and democratic lifestyle. These developments are raising a number of issues to which new responses need to be found.

Responding to new forms of terrorism

International terrorism aims to hit people primarily in public spaces where they normally experience a sense of community. The intention of terrorist attacks on festivals, large-scale events and transport hubs in various European cities has been to disrupt social cohesion in democratic societies and stir public fear. Terrorist groups are making use of digital technologies and social media to pursue their purposes.

Civil security research helps to fight terrorism effectively by analysing online propaganda more rapidly and developing suitable measures to raise public

awareness and enable the public to cope with terrorist events. To this end, it is also necessary to systematically pool interdisciplinary research on the early recognition and prevention of and fight against extremism and terrorism – as exemplified by the recently established cluster of research excellence on Islamist extremism. The aim is to build lasting bridges between research and practice in order to enable users to cooperate with researchers and respond swiftly and flexibly to changing threats.

Enhancing protection against everyday crime and violence

Everyday crime ranging from stolen bicycles to burglary and even assaults on life and limb can affect each and every one of us in our personal environment. The boundaries between everyday crime and organized crime are fluid. New and changing criminal phenomena affect social peace and social cohesion. Research in this context is therefore focusing, for example, on how the security needs of young and old people will develop in the future. The aim is to develop measures to improve prevention, people's capacity for self-help and law enforcement in order to prevent domestic violence and violence against children and other vulnerable groups (such as the elderly, refugees or the infirm).

Protecting businesses against crime and safeguarding economic strength

The rise of globalization and growing international interdependencies are not only opening up new economic and social prospects but are also opening new doors to criminal activities. German businesses in particular stand for technological progress and a high level of

quality and are therefore increasingly becoming the target of criminals. This threat applies to both large companies and small and medium-sized enterprises.

New digital technologies and methods can help to combat crime more effectively and ensure the quicker and more targeted prosecution of criminal offences.

Relevant research topics under the “Protection against crime and terrorism” programme pillar include in particular:

The fight against terrorism and crime

- Research on the roots and prevention of terrorism and extremism (e.g. processes of radicalization and de-radicalization and the reintegration of returning ‘foreign fighters’)
- Strengthening the ability to prevent and cope with terrorist events, including the protection of public spaces and the protection of emergency workers
- Analysing the impact of previous counter-terrorism measures and how society is dealing with terrorist attacks
- Conditions favourable to the development of organized crime (e.g. human trafficking, burglary rings or the organized theft of cultural assets)
- Legal and illegal markets and their criminal actors
- The impact of specific population structures and demographic change on the emergence and development of criminal activities (e.g. in the context of fraud or clan crime)
- Economic security, primarily the prevention and aversion of corporate and industrial espionage, with a particular focus on small and medium-sized enterprises
- New technological approaches to enhancing forensic procedures and methods
- New technologies to detect weapons and explosives
- New approaches to the prevention and prosecution of financial crimes (e.g. money laundering)
- Optimizing operations tactics and technologies used by police forces, specialist authorities, fire brigades and rescue services to recognize, assess and control emergency situations caused by the deliberate release of CBRN substances

The perception of security and crime prevention

- Empirical research on changing perceptions of general social anxieties during security threats and on the effect of crime prevention measures
- Impact of migration on civil security architecture, particularly with regard to changing requirements for danger prevention based on growing ethnic and cultural diversity
- Significance of intercultural skills within authorities and organizations responsible for safety and security
- Analysing and establishing institutional or informal security cooperation at the regional level
- Information and training strategies to strengthen moral courage in the social space

Digital technologies and social media for public security

- Contributing towards the swifter assessment of forms of organized crime on the Web or the Dark Web
- Using digital technology for the targeted prosecution of criminal offences and to secure court-admissible evidence
- Enhancing crisis communication by involving different media channels and social target groups



3 Cross-cutting issues of civil security research: Shaping the future, developing cooperation and strengthening expertise

3.1 Technological developments

Future innovations in the field of civil security will to a great extent depend on the use and adaptation of new technologies. This applies in particular to the introduction of digital technologies and progress in the areas of energy, environmental, nano and biotechnology as well as materials research and additive production techniques.

Technological developments trigger advances in civil security

The digital transformation opens up a broad range of possibilities for civil security research to develop future security solutions. This involves, for example, the exchange of real-time data in crisis situations, improved control of linked infrastructures and the systematic prosecution of criminal and terrorist activities. The fight against crime and terrorism increasingly requires

the development of big data solutions which enable the efficient collection and visualization of large amounts of data while safeguarding fundamental rights.

The digital transformation is also accelerating the development of robots and semi-autonomous machines into self-learning systems which act independently. While hybrid systems are subject to strategic human control, autonomous systems will increasingly be able to explore new territory and take their own decisions. In future, the collective intelligence of linked assistance systems will support rescue workers in assessing the situation on land, in water and in the air or in hard-to-reach and dangerous places. Autonomous systems will eliminate the risk of human injury or danger. They will be designed for intuitive, low-maintenance operation and use in the most varied civil security scenarios. It is absolutely essential that research addresses at an early stage questions relating to responsibility, liability and acceptance.

For example, new miniaturized sensors with improved cognitive features may be used to warn against imminent damage in critical infrastructures. Advances and new approaches to modelling and simulation help to better understand and visualize highly complex damage processes in networked infrastructures. Augmented/virtual reality technologies enable quicker and more effective damage management.

Developments in other science disciplines or research areas sometimes provide unexpected solutions. For example, biological design principles can be used to develop robust self-healing or self-organizing technical systems which can respond flexibly to external interference and damage.

Ensuring safer technological developments

New security technologies aim to ensure a higher level of safety and security for the population. These technologies must be designed in such a way that they themselves pose no risk and do not unduly restrict people's lifestyles.

The design and use of civil security systems is becoming ever more complex as new technologies become increasingly interlinked and integrated. It is therefore important that designers of socio-technological systems for civil security applications consider at an early stage the interaction and interdependence of opera-

tional safety on the one hand and security from outside attacks on the other.

Civil security research sees itself as a generic discipline. It will develop new important and promising technologies for the purposes of civil security. In this process, equal consideration will be given to both technological potential and ethical and legal criteria.

Relevant aspects of the cross-cutting topic of “Technological developments” include among others:

- Creation of competence centres and innovation labs to test and validate under real-life conditions autonomous systems in hostile-to-life environments
- Safe collaboration between humans and autonomous systems taking account of ethical and legal aspects
- Use of new technologies and design principles to design robust and fail-safe technical security systems
- Model-based analyses of specific socio-technological systems for the systematic development of resilience strategies
- Modular and flexible design of technical systems to accelerate exchanges and enable quicker disconnection in the event of interference or attack
- Study of the consequences and responsibilities involved in the use of new technologies in the area of civil security
- Holistic resilience strategies to firmly integrate aspects of robustness, flexibility and longevity in civil security
- Consideration of the criteria for sustainable development and resource efficiency in the future development and integration of civil security solutions and systems



3.2 Societal developments

Social, cultural and regional changes, for example as a result of demographic change or migration, have a direct impact on society's safety and security culture. This affects public confidence in the authorities and organizations responsible for security as well as people's sense of safety. The subjective perception of personal safety depends on the individual's age, social status, origin and sex. Security cultures and a sense of safety may also differ between regions. For example, the importance and perception of safety and security depend on different cultural, political and social factors in urban and rural areas. Civil security research must therefore address the question of how to reduce excessive safety concerns and consider what strategies can be developed to organize and ensure safety and security on a national scale.

Changes in the security architecture are an additional factor. For example, personal safety at events and rail stations, and passenger screening at airports is increasingly being provided by private firms. The increasing role of private service providers in the rescue and health sectors also has a direct impact on viable safety and security planning. Research must therefore focus more strongly on the conditions for and limits to the privatization of security services.

Strengthening participation and individual responsibility in civil security

People's desire to participate and have a say in safety and security matters has increased in recent years. This requires new forms of dialogue and cooperative participation.

Although there is great willingness to engage in social activities, it is becoming increasingly difficult for many people to balance work and family duties with voluntary activities including activities in the field of fire safety and disaster control. At the same time, expectations are high when it comes to government responsibility for providing relevant services. Ensuring effective nationwide disaster control is a joint task which re-

quires increasing private and community support. Civil security research must increasingly study the impact of societal trends on voluntary work and private commitment as well as possible ways of improving public involvement in the various fields of civil protection.

Societal change and life in a modern industrialized world are continuously changing people's risk and security awareness. Efforts to enhance people's risk literacy can help them to recognize hazards and respond appropriately as well as to implement practical solutions in the best possible way in the event of an emergency. This requires the continuous development of science-based training schemes in the field of safety and security. The aim must be to trace individual pathways towards enhancing risk awareness and encouraging precautionary behaviour in the population.

Studying the role of social media and their importance for public security

The use of social media is radically altering the forms and conditions of security communications. Authorities and organizations responsible for safety and security are increasingly communicating with the population via social media. For example, the police use Twitter to inform the public about accidents, demonstrations or disturbances at security-relevant events. The systematic analysis of communication in social media is becoming increasingly important, for example in order to improve the planning and organization of large-scale events. However, social media are also frequently used to spread false information which contributes to a feeling of insecurity in the population. Further research is therefore needed on the use of digital technologies in risk and crisis communication and regarding the impact of social media on security perception.



Relevant aspects of the cross-cutting topic of “Societal developments” include among others:

- Analysis of the causes of security-relevant societal developments, particularly the perception of insecurity in the population (including the impact of social media)
- Study of the limits to societal resilience
- Adaptation of existing risk and crisis management processes to social trends and changes
- Strengthening of people’s self-help and learning ability to enhance their risk awareness and precautionary behaviour in the long term
- Application of new digital technologies in security training and cooperative participation (digital teaching and learning approaches, use of social media, etc.)
- Strategies for participation and security provision

3.3 International cooperation

Crises and disasters do not stop at national borders. Natural events like floods, storms and heat waves as well as the disruption of critical infrastructures, terrorist or hacking attacks are a threat to millions of people worldwide and cause great economic damage. Securing the protection of the population and of critical infrastructures in the long term is a joint European and international task.

A strong Europe for greater security

The European Union has been committed to the thematic area of civil security for more than ten years now. Civil security was already become firmly established as a funding priority in FP7 and seamlessly continued under the current European framework programme for research and innovation, Horizon 2020. The European Commission is providing a total of 1.7 billion euros for European security research until 2020 under its ‘Secure Societies’ challenge.

Research cooperation in the European Union aims primarily to link national and European activities in civil security research and to use the resulting synergy. National research stakeholders contribute their expertise in numerous projects and initiatives, thus enabling the European security architecture to meet future challenges and strengthening the competitiveness of the security industry in Europe.

Encouraging international cooperation

Bilateral collaborations with strong European and international research and technology partners are needed to develop new prospects and solutions for global civil security problems. Existing national knowledge and technological know-how can be made available, exchanged and developed across borders through cooperation with stakeholders in selected countries. Bilateral cooperation contributes to the development of security solutions that meet the needs of international markets.

Current cooperation at EU level primarily involves Germany’s neighbours Austria and France. This successful cooperation will be continued and strengthened. Further international research alliances are based on intergovernmental agreements with India, Israel and

the United States. These strategic science collaborations will also be systematically expanded to include countries that are developing into major growth markets for civil security.

Developing and emerging countries often find it difficult to manage the social, economic and ecological effects of natural disasters. The question of how to cope with these risks and effects at governmental and societal level and how resilient structures can be supported has long since become a global issue.

Germany will contribute to improving international risk and disaster management. The national security research programme and the extensive scientific expertise of the German security research community provide an optimal basis in this context. The IKARIM “International disaster and risk management” funding measure provides a framework for cooperating with stakeholders from partner countries on an equal basis to develop civil security solutions that meet local needs.

In addition, the Federal Government launched the interministerial “Global Initiative on Disaster Risk Management” to improve global risk and crisis management by means of systematic innovation and knowledge transfer.



The objectives and aspects of the cross-cutting topic of “International cooperation” include among others:

- Strengthening of resilient structures in developing and emerging countries (for example under the IKARIM “International disaster and risk management” funding measure)
- Continuation and needs-based expansion of bilateral European collaborations and international research alliances
- Expansion of European cooperation in the field of pre-commercial procurement
- Efficient and effective dissemination and exploitation of the results of civil security research at European level
- Joint development of the European security architecture and strengthening of the competitiveness of Europe’s civil security industry

3.4 Development of structures, transfer to practice and competence-building

Special conditions apply to the translation of civil security innovations into marketable practical products and services. A major strength of civil security solutions is their specific focus on user needs. Civil society requirements and limits are always given equal consideration in this process. Only innovations which combine economic success and societal responsibility ultimately lead to greater security. With their extensive research and technology expertise, companies in the civil security sector play an important role in securing the future security architecture in Germany and Europe. In particular small and medium-sized companies are key players when it comes to successfully linking research and practice. The security research programme helps to create relevant structures for developing the innovative capacity of research-intensive companies.

Creating structures for the successful transfer of research results

An early research focus on application and development and efforts to link research with innovation transfer from the outset help us ensure that civil security solutions can prove their worth in everyday practice and on the market. The practical relevance of research results can already be evaluated at project level within the framework of field trials.

The establishment of centres of competence, clusters of research excellence and innovation labs is of key importance for ensuring even closer links between research and the specific practical requirements of users. The aim is to enable application-oriented cutting-edge research and to promote scientific excellence by encouraging close cooperation between scientific institutions and end users. Researchers will primarily develop solutions in selected fields which have particular potential for practical application, taking technological and societal aspects into account. The centres or labs will test and develop new security solutions under real-life conditions. The results will also contribute to the development of future-oriented training approaches.

Technology-based startups play a major role in knowledge and technology transfer. They creatively develop new products and business models based on research results and thus also provide incentives for established companies to try new paths. Startups and young firms with creative product ideas and new business models need special support. For this purpose, the newly established structures such as centres of competence and clusters of research excellence will be expanded to include startup assistance modules which will offer appropriate instruments such as counselling and mentoring as well as space for experimentation and test labs.

In addition, competitions are a suitable means to accelerate the practical application of research results. They provide an opportunity to demonstrate existing competence and test innovative approaches and solutions in regional application scenarios.

Using standardization for market access and stimulating innovation-oriented procurement

The “Research for Civil Security 2018–2023” framework programme aims to ensure early consideration of standardization issues. When planning a project proposal, applicants will submit a brief analysis of existing standardization provisions, outlining strategies for the introduction or adaptation of guidelines, norms and standards that may be required for the envisaged security solutions. Funding can be provided for project-related standardization activities in the case of eligible projects.

The annual volume of public contracts awarded by the Federal Government, the Länder and local authorities is of great economic importance. The government sector is one of the main users of civil security innovations. Measures to support innovation-oriented procurement can contribute to accelerating the translation of research results into marketable and procurable products and services and to providing end users with easier access to innovations.

Supporting young researchers and skill-building

As a young generic and practice-oriented discipline and cross-industry sector, civil security research needs qualified researchers and specialists who are able to work on an interdisciplinary basis.

The research community has developed and expanded since the first security research programme was launched in 2007. Today, almost 300 research institutes and universities in Germany are conducting research on civil security. About 200 universities offer study programmes on security. Extensive support for research and junior researchers in recent years has contributed to this development. This successful trend should be continued in order to further strengthen the science base for civil security in Germany and enhance the quality of research and teaching.

Junior research groups enable young researchers to raise their national and international profile. They promote scientific excellence and bring together researchers from the natural and engineering sciences and the humanities. In 2014, a Civil Security Graduate Network was launched to promote early links between young researchers and interdisciplinary exchanges across all research projects.



Networks and junior research groups must be expanded in future because excellently qualified and well-linked researchers involved in interdisciplinary cooperation create the basis for the quicker translation of pioneering innovations into successful products and services and thus for their practical application.

Skills training

Particularly when training rescue and emergency workers, it is becoming increasingly important to make better use of existing know-how and ensure easier access to this knowledge using modern training and simulation technologies.

Civil security research supports collaborations between users from companies as well as authorities and organizations responsible for safety and security in order to develop modern training and teaching formats that take equal account of the latest research findings and real-life scenarios and thus promote transfer to practice. This involves not only high-quality technical labs which serve to teach practice-related know-how to specialist staff and security officers but also the use of interactive media to share relevant knowledge and information on a broad scale.

The objectives and aspects of the cross-cutting topic of “Development of structures, transfer to practice and competence-building” include among others:

- Creation of competence centres and innovation labs to link scientific work more closely with practical user requirements
- Establishment of test centres and living labs
- Acceleration of the transfer of innovations and technologies from the precompetitive field to practical application, for example through the introduction of demonstration competitions
- Incentives for the innovation-oriented procurement of research services
- Promotion of scientific excellence and of interdisciplinary training and networking, for example through the further expansion of junior research groups and networks like the Civil Security Graduate Network
- Adaptation of training approaches and subjects to provide for a more systematic teaching of new skills and technologies
- Studies to establish the suitability of digital teaching and learning methods in the field of civil security
- Modern instruction and simulation technologies for training rescue and emergency workers
- Interactive training and teaching formats for in-service training of users from companies as well as authorities and organizations responsible for safety and security, for example in the context of learning labs



4 Funding instruments and measures

Building on success and working jointly to ensure civil security

“Research for Civil Security 2018–2023” is a learning programme which provides the framework for a flexible funding policy that will be developed continuously, taking account of programme implementation experience as well as current challenges.

Research funding is geared towards civil application scenarios based on the global, technological and societal challenges of civil security. The scenario focus avoids isolated solutions and supports the development of systems innovations. This provides the basis for a systematic, solution-oriented transfer of know-how and the successful development of security products and services.

The civil security research programme will involve cooperation between stakeholders from science, industry, authorities and security organizations along the entire innovation chain to find solutions to current and future civil security challenges. Collaborative projects should directly involve users as funded partners. All the relevant disciplines of engineering and the natural and

social sciences will be included to ensure successful research into security innovations that suit practical and social needs.

In order to ensure the transfer of innovation and knowledge, trans- and interdisciplinary research collaborations will be required to publish a joint final report upon conclusion of the project, describing the overall results. Thematically related research collaborations under a funding priority will engage in intensive cross-project exchanges and networking. These efforts can be supported by a scientific umbrella project.

Scenario-oriented research can be supplemented by the study of specific basic issues of civil security. These may include the social compatibility of technology developments, the sustainable design of security cultures and architectures, and the social discourse on basic rights and ethical aspects. Furthermore, empirical data will be systematically collected and provided as a basis for the qualitative and quantitative study of the impact and application of civil security solutions.

Funding regulations will be issued under the programme inviting project proposals in specific subject areas. The regulations will specify the respective goals, thematic priorities and modalities of funding. A transparent and competitive standardized procedure will be applied to select projects for funding from among the proposals submitted.

The specific funding measures KMU-innovativ and Anwender-Innovativ, which are part of the programme, will encourage greater participation by small and medium-sized enterprises and by government and private-sector users in civil security research while building on the success of the first two programme phases. These funding measures will strengthen the innovativeness of small and medium-sized enterprises and end users in Germany and speed up the translation of research findings into practice.

We must ensure that globally available knowledge and know-how can be used for the purposes of our national programme in order to further enhance Germany's strong position in research and innovation. In addition to international networking, bilateral international cooperation projects will enable researchers to jointly study innovative solutions to transborder challenges of civil security. As a rule, cooperation will take place under mutually open or coordinated calls for proposals.

The following instruments in particular will be used to pursue the objectives of the security research programme:

- Promotion of scenario-oriented research collaborations with partners from industry, science and the user community
- Continuation of the KMU-innovativ funding measure to strengthen the innovative capacity and market position of small and medium-sized enterprises
- Expansion of the Anwender-Innovativ funding measure to strengthen the users' potential to apply the research results
- Establishment of centres of competence, clusters of research excellence and innovation labs
- Promotion of bilateral international projects and support for international networking activities
- Support for young researchers
- Competitions for the practical application of research results

Promoting dialogue between stakeholders

The diverse and broad community of stakeholders which has developed since 2007 is providing major impetus for the development of civil security in research, teaching and practice. The BMBF's Civil Security Innovation Forum has been providing an opportunity for nationwide networking and an exchange of views within the security community since 2012. The focus here is on the presentation of current research findings and on a discourse between politics, science, industry and society.

Structured and target group-specific communication is the basis for the successful transfer of knowledge and research findings into practical application. The portal www.sifo.de is a key platform which provides the stakeholders in civil security research with comprehensive information on all the ongoing activities, fund-



ing priorities and research results of the framework programme.

Learning from experience and strengthening inter-departmental cooperation

There are plans for an ex-post evaluation to analyse the implementation of the “Research for Civil Security 2018–2023” framework programme. The evaluation will be so designed that its results will be available before the end of the programme period and can be used as a basis for deciding on further funding in this area.

In addition, a scientific programme committee will provide evaluation support during the programme period. The committee members include experts from all the relevant scientific disciplines, from industry and private-sector operators of infrastructures as well as from authorities and organizations responsible for safety and security. The programme committee is an independent body which advises the BMBF with regard to the strategic and content focus of civil security research and will be involved in the ex-post evaluation.

Cooperation between the Federal Ministries is an integral part of the framework programme. In particular the Federal Ministry of the Interior, Building and Community, the Federal Ministry for Economic Affairs and Energy, the Federal Ministry for Family Affairs, Senior Citizens and Youth, the Federal Ministry of Transport and Digital Infrastructure and the Federal Ministry of Health are among the key players in civil security research. All the competent Federal Ministries participating in the framework programme can send representatives to the Interministerial Steering Group on Security Research, which coordinates the Ministries’ activities in the field.



5 Civil security as a national challenge: Links with specialized programmes, institutional funding and departmental research

Relevant BMBF research and funding programmes related to civil security

- **Federal Government research framework programme on IT security “Self-determined and secure in the digital world 2015-2020”**
Further information: www.forschung-it-sicherheit-kommunikationssysteme.de
- **Research programme on human-machine interaction “Bringing technology to the people 2015-2020”**
Further information: www.technik-zum-menschen-bringen.de
- **Framework programme for the humanities, cultural and social sciences, 2013-2017**
Further information: www.bmbf.de/de/geistes-und-sozialwissenschaften-152.html
- **Health Research Framework Programme, 2011-2019**
Further information: <https://www.bmbf.de/en/health-research-2308.html>

Other relevant funding programmes and initiatives

- **Funding measure “Validation of the technological and societal innovation potential of scientific research – VIP+”**
Further information: www.validierungsfoerderung.de
- **Scheme “More opportunities for startups – Five points for a new entrepreneurial era”**
Further information: www.hightech-strategie.de/2359.php
- **Leading-Edge Cluster Competition**
Further information: www.spitzencluster.de
- **Lernende Systeme – Germany’s Platform for Artificial Intelligence**
Further information: www.plattform-lernende-systeme.de/home-en.html

- **Programme “Research at Universities of Applied Sciences”**
Further information: www.forschung-fachhochschulen.de
- **Ten-point programme “Priority for SMEs”**
Further information: www.bmbf.de/de/mittelstand-3133.html
- **Innovation funding programme “Support for diversification strategies of defence companies in civil security technologies”**
Further information: www.divers-bmwi.de

Departmental research and institutional funding in the area of civil security

Departmental research in the remit of the Federal Ministry of the Interior, Building and Community:

- Federal Office of Civil Protection and Disaster Assistance (BBK)
Further information: www.bbk.bund.de
- Federal Office for Information Security (BSI)
Further information: www.bsi.bund.de
- Federal Criminal Police Office (BKA)
Further information: www.bka.de
- Central Office for Information Technology in the Security Sector (ZITiS)
Further information: www.zitis.bund.de

Departmental research in the remit of the Federal Ministry for Economic Affairs and Energy:

- Federal Institute for Materials Research and Testing (BAM)
Further information: www.bam.de
- National Metrology Institute (PTB)
Further information: www.ptb.de

Departmental research in the remit of the Federal Ministry for Family Affairs, Senior Citizens and Youth:

- German Youth Institute (DJI)
Further information: www.dji.de

Departmental research in the remit of the Federal Ministry of Transport and Digital Infrastructure:

- Federal Highway Research Institute (BAST)
Further information: www.bast.de

Departmental research in the remit of the Federal Ministry of Health:

- Paul-Ehrlich-Institut – Federal Institute for Vaccines and Biomedicines (PEI)
Further information: www.pei.de
- Robert Koch Institute (RKI)
Further information: www.rki.de

Departmental research in the remit of the Federal Ministry of Food and Agriculture:

- Federal Office of Consumer Protection and Food Safety (BVL)
Further information: www.bvl.bund.de
- Federal Institute for Risk Assessment (BfR)
Further information: www.bfr.bund.de
- Friedrich Loeffler Institute (FLI)
Further information: www.fli.de
- Julius Kühn Institute (JKI) – Federal Research Centre for Cultivated Plants
Further information: www.julius-kuehn.de
- Max Rubner Institute (MRI) – Federal Research Institute of Nutrition and Food
Further information: www.mri.bund.de

Departmental research in the remit of the Federal Ministry of Education and Research:

- Federal Institute for Vocational Education and Training (BIBB)
Further information: www.bibb.de

Institutional funding at Fraunhofer (FhG):

- Fraunhofer Group for Defence and Security (VVS)
Further information: www.vvs.fraunhofer.de

Institutional funding at Helmholtz (HGF):

- German Aerospace Center (DLR)
Further information: www.dlr.de
- HGF horizontal topics “Security” and “Natural Disasters and Warning Systems”
Further information: www.helmholtz.de/ueber_uns/querschnittsaktivitaeten/

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