



# SICHERHEITSFORSCHUNG.NRW

An overview of the current state of security research  
in North Rhine-Westphalia



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Die Landesregierung  
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## P R E F A C E

Dear readers,

Security, according to American political scientist Joseph Nye, is like oxygen – only with increased absence it is noticed and missed. Thus, security is omnipresent, affecting every individual and social system in one way or another. Security research itself can therefore be counted as a central field of research.

The term ‘security’ builds on a long tradition in politics and research and is currently characterized by an enormous variety of research fields. As a result, the understanding of security among those academics researching the topic is highly trans- and interdisciplinary.

Science itself should not simply remain within the perspective of the ivory tower, but, in line with scientific honesty, its research should contribute to a better understanding of the investigated subject area in such a way that a (mostly rather indirect) sound contribution can be made to empirically based and sustainable political decisions as a result. In today's fast-moving security environment, characterized by increasing uncertainty due to global megatrends such as global power rivalries, the consequences of climate change and demographic shifts, the exchange and cooperation between science and politics is crucial for successfully tackling the aforementioned challenges.

This is where the CASSIS project **Sicherheitsforschung.NRW** comes in. With the help of a wiki, presenting the research landscape in North Rhine-Westphalia (NRW) in the field of security research, it aims at achieving a deeper connectivity between institutions and individuals researching security topics on the one hand and the public and decision-makers in politics and authorities on the other. We would like to express our deepest gratitude to all the contributors who supported the **Sicherheitsforschung.NRW** project and were available, for example, for background discussions or interviews, or who actively designed their entries in the newly created wiki. This project can only be effective in the long term if the mutual interest of the actors researching security topics in NRW persists in the direction of further networking through a joint exchange on their own investigated subject area and beyond, and in designing joint, networked solutions for security challenges.

This report provides an initial overview of the work of the **Sicherheitsforschung.NRW** project. Given the relevance of security research, this should be seen as the beginning of deeper cooperation among scientific actors to better address current and future security challenges.

We hope you enjoy reading this report and are looking forward to your feedback!

**The Sicherheitsforschung.NRW project team**

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## Executive Summary

*“Without security man is neither able to develop his strengths nor to enjoy the fruits thereof; for there is no freedom without security.”*

William von Humboldt

The world around us is changing rapidly. Challenges and opportunities from globalization, digitalization, climate change or structural geopolitical changes influence the lives of citizens in North Rhine-Westphalia, Germany and Europe in many ways. Thus, preventing and combating cybercrime, climate change, and terrorism are just three major areas of concern that have received increased attention from researchers in recent years. The security aspects resulting from these comprehensive developments affect on the one hand citizens in their everyday lives, and on the other hand economic and other global political fields of action on the macro level. On both the federal and state level the need for research on these topics has been recognized and strategies have been developed to promote it. Accordingly, the first goal of the research project **Sicherheitsforschung.NRW** is to identify these fields and to illustrate the research landscape.

The project aims to depict the entire range of security research in North Rhine-Westphalia for the first time in a database based on a comprehensive concept of security, to make it accessible via a wiki and to display it via a map. The collected data is processed within this report and presented by focusing on five identified research clusters. With its diverse and heterogeneous research community, North Rhine-Westphalia occupies a special position nationally and

internationally. In NRW, security research is not only found in scientific research and its various disciplines, but is also carried out by numerous state organizations as well as actors in the private sector. Without claiming to be exhaustive, the project was able to identify various focal points in the security research practiced in North Rhine-Westphalia and has focused more on these standout research clusters. With research activities in the areas of extremism as well as climate, energy, cyber and space security, special expertise in North Rhine-Westphalia was identified in five areas. Another goal of the project is to make the North Rhine-Westphalian research landscape in the field of security research more tangible and to identify and specifically promote opportunities for collaboration between researchers. Potentials can only be used and expanded if they are visible. The database, which has now been created, offers the possibility of cross-cluster networking of security research in order to further strengthen North Rhine-Westphalia as a research location within Germany and Europe.

In addition to a conceptual explanation, the focus in the clusters is on the description of the research landscape and the special features of the federal state of North Rhine-Westphalia. Noticeable differences exist, among other things, in the extent of the clusters, with the areas of cyber security and climate security being the most pronounced fields with a large number of actors. In addition, actors of national relevance were identified beyond the clusters. In North Rhine-Westphalia, supra-regional institutions such as the United Nations University, the German Development Institute (Deutsches Institut für Entwicklungspolitik, DIE) or the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt, DLR) are active in the field of security research and, in light of their international importance, contribute to a better scientific understanding of relevant problems in order to develop sustainable approaches to the various challenges of

our time. In addition, commercial enterprises such as Deutsche Telekom or public authorities and ministries complete the research landscape in North Rhine-Westphalia with their work. Aside from the well-known institutions, the project also gave a large number of smaller research institutions in North Rhine-Westphalia the opportunity for greater visibility. The relevance of the respective clusters and the research conducted within them is also the focus of this report on the [Sicherheitsforschung.NRW](#) project.

These data and findings, collected for the first time, are intended to highlight opportunities for expanding the existing potential for cooperation both within the clusters and between them and to provide suggestions for the targeted further expansion of these research focal points by means of suitable funding initiatives at the state, federal and EU levels.



## Thematic Introduction

### The global state of security and peace

Regarding the creation and maintenance of global peace with far-reaching security for people and societies, at first glance the last three decades allow for a certain optimism. With the end of the Cold War, globalization and the numerical increase of democratically organized states, there has been a remarkable reduction in the open use of force between states. Unlike earlier centuries, a war between states seems to have become more of an exception since the turn of the millennium. A closer look at the current situation, however, clearly shows that it would be wrong to conclude from a decline in inter-state violence that the world is generally more peaceful and secure. Despite their halving in number after the end of the Cold War, intra-state conflicts continue to show a high and even slightly increasing intensity. This leads in parallel to a significantly greater complexity of the global security situation.

The phenomenon of fragile statehood, in particular, contributes to a multitude of intra-state conflict situations worldwide. The reasons for this are extremely diverse. For example, geopolitical realignments after the end of the Cold War led to the (re)emergence of social, ethnic, and religious tensions in states previously affected by proxy conflicts, which were further fueled by global economic dynamics of the 1990s and 2000s. In addition to economic developments, cultural dynamics have also had, and continue to have, an impact on the global security situation: Thus, “Re-Islamization” (Stephan Conermann) can be cited

as a cause of domestic tensions in Muslim-majority states, the negative effects of which are measurable not only in the countries directly affected. Once again it becomes clear that, despite bloody attacks in many parts of the world, it is primarily the people in Muslim countries who suffer most from terrorist activities by Islamists. This is illustrated, once again, by the latest developments in Afghanistan.

A particular characteristic of fragile statehood is the emergence of spaces in which crucial state functions, such as an administration capable of acting or efficient institutions for balancing conflicts, are lacking. Under such circumstances, the establishment of internal peace and secure living conditions becomes difficult or even impossible. In addition to the erosion of state structures or the destruction of economic potential, the consequences of this persistent fragility also lie in the advancement of a general disintegration of society, for example in the form of ethnic cleansing or religiously motivated expulsions, as Christians, Jews or Yazidis in the Middle East, Muslims and Christians in the Balkans or Christians and Muslims in Myanmar, India and China, among others, have had to and still have to suffer. Conflicts charged with religious, ethnic or other identitarian motives (and quite often fueled by geopolitical dynamics) thus extend into the immediate neighborhood of the European Union (EU).

Another factor in the rise of weak statehood is the demographic growth in countries of the Global South, which further worsens socio-economic problems. According to the United Nations (UN), the number of people in Europe's neighboring continent of Africa, for example, will double from the current 1.3 billion to 2.6 billion by 2050 and reach approximately 4.5 billion in 2100, *ceteris paribus*. If the overall social and economic welfare of the countries concerned does not grow sufficiently, this demographic development can intensify internal tensions and even turn into open conflicts.

Another challenge is the advancement of a fundamental transformation process of the international system. Continuous shifts in power politics, driven by economic prosperity, especially in Asia, as well as technological progress, along with demographic change, are causing significant global changes. This leads to a resurgence of geopolitical thinking and puts the international order established after the end of the Cold War under enormous pressure to adapt. Parallel to an increase in prosperity due to globalization, which has enormously improved the average standard of living of people in all regions of the world, the defense expenditure of many countries has also risen. Thus, global defense spending, adjusted for purchasing power, has been higher for far more than a decade than it was at the height of the Cold War. At the same time, there are further shifts in power politics due to the demand for a greater say in the UN Security Council by emerging countries such as Brazil, South Africa and India. Both Russia and China also insist on more multipolarity and consideration for their national interests and criticize the foreign policy behavior of the USA and its allies, which is partly underpinned by the use of military means, as the unabating tensions in the South China Sea and the Kremlin's war against Ukraine illustrate. The case of China is particularly interesting in this regard because Beijing's power-political claims since the end of the Cold War are also reflected in the country's arms spending:

while US defense spending was still 22 times higher than China's at the end of the 1980s, Washington has 'only' spent just under twice as much annually on defense as Beijing in recent years, adjusted for purchasing power. The People's Republic has also increasingly developed into an open strategic adversary of the USA due to its stronger geo-economic ambitions within the framework of the so-called New Silk Road. The Sino-American rivalry threatens to fragment globalization in the wake of a new zero-sum thinking, splitting the world into isolationist economic and power blocs. The discussion about the participation of Chinese providers in the construction and expansion of Western 5G networks gives a first taste of what this could mean for Europe in the future. From a European perspective, it seems to have become clear in many ways that Donald Trump's America First policy was only partially compatible with Xi Jinping's Chinese Dream, particularly because both followed a very similar logic that maximized the self-interest of their states. Even under the new US administration of Joe Biden, it cannot be assumed that the geopolitical and geoeconomic competition between the two rival great powers will flatten out. Peacemaking prosperity through increased cooperation not only in trade but also, for example, in climate policy are thus endangered by new bloc thinking. The political decision-makers in the EU and its member states thus face great challenges in reconciling the Transatlantic Alliance on the one hand and a real 'strategic autonomy' of the EU on the other. Some challenges from the times of the Cold War, long thought to have been overcome, also seem to be reappearing on the horizon. The example of North Korea illustrates that the threat of nuclear wars, which endangers civilization, by no means ended with the fall of the Iron Curtain and seems to be undergoing a worrying resurgence in Asia.

The international security dilemma is thus further exacerbated at a difficult time of shifting power among great powers and an increasing rivalry mentality among revisionist middle powers.

Although inter-state conflicts have decreased since the end of the Cold War, intra-state conflicts, fragile states, demographic upheavals, the profound transformation processes of the international system including a relaunched geopolitical mindset, regional power shifts and rising arms spending as well as the latent existence of a nuclear-weapon-based threat are increasingly leading to instability of security and threats to peace worldwide. In addition to these developments, the 21st century poses other important challenges to the international community. Global migration movements are increasingly intensifying social conflicts in Europe as well. New as well as old religious, cultural and ethnic upheavals and disputes are putting a strain on the internal peace in many European states. Religious radicalization tendencies on the part of Jihadist and Salafist readings of Islam among European citizens can be observed, as well as a worrying increase in political extremism.

The same applies to the extremely diverse security policy consequences of climate change, which must be characterized as an accelerant for political and social conflicts. Likewise, the restructuring of the energy supply pursued to mitigate climate change poses an enormous challenge. The importance of ensuring a secure energy supply for the security and prosperity of citizens and the functioning of state and private institutions can hardly be overestimated – without secure, affordable and permanently available energy, it is difficult for modern societies to function and produce prosperity on a sufficient scale. At the same time, technological changes away from fossil fuels are unavoidable in order to mitigate the consequences of climate change. In this regard, the significance of technological structures for security policy is

particularly evident in but not limited to energy security. With cyberspace and outer space, two further technology-dominated realms are to be named as important security policy fields that have the potential to exacerbate the above-mentioned problems and rivalries, but at the same time also provide opportunities for their mitigation and peaceful resolution.

## Security research

Security research plays an essential role in overcoming the multiple challenges mentioned above. From the perspective of the humanities, natural and technical sciences, security policy research informs the responsible actors from politics, administration and security authorities. At the same time, researchers try to bring the security policy discourses of their respective disciplines to the wider public, through publications, (social)media contributions and specific event formats. This is intended to raise awareness of a changed and changing security policy picture and the associated implications for citizens and their state institutions in order to offer evidence-based approaches for addressing newer as well as more traditional security challenges.

## Security concept

Security research initially focuses on the conceptual examination of the notion of security. This is one of the most intensively discussed concepts in international politics and does not find an exhaustive, unambiguous academic definition.

However, the fact that the concept of security ultimately remains vague is not fundamentally an obstacle, but rather does justice to the complexity of human coexistence in modern societies amidst an ever-changing environment. A look back at the understanding of security in the classical theories of international relations clearly illustrates this change in meaning: While classical and structural realism focused primarily on a state-military centered concept of security, classical liberal considerations such as the concept of Democratic Peace (according to which democratic states are in a state of security among themselves), Liberal Intergovernmentalism (which sees domestic structures and processes as the origin of the external behavior of states) or constructivist approaches (which identify social systems as social and, at the same time, actually powerful constructions that can be changed through social learning and react specifically to context-related risks and threats), refer to further relevant factors and their significance for security policy.

The traditional understandings of security are further supplemented by various security concepts in modern literature. Current research debates, for example, are increasingly dissolving the traditional boundary between internal security, which is the defense against threats originating within the state, and external security, which is the defense against threats directed against the state from outside. The domestic security situation is also increasingly dependent on developments that originate outside the territory of the state, as is evident, for example, from Islamist terrorist networks, the consequences of climate change or the current SARS-CoV-2 pandemic. Internal and external security are closely interwoven in a security continuum. The concept of human security, which provides the basis for further conceptual developments of the concept of security, marks a paradigm

shift and likely represents the greatest expansion of the understanding of security. Instead of focusing on the national or international level, this concept redirects focus onto the individual one. The way of human life in a society is at the center of the concept, and fundamental freedoms such as psychological, social, economic and cultural freedom, but also the freedom to act independently, are to be ensured. The understanding of security here is not based on a state interest, but on attributed universal values. By emphasizing human rights, the security debate implicitly refers to a human-oriented concept of peace. However, the fact that the security concept of human security was used in the past as a diplomatic cover for controversial military interventions had serious consequences for the further practical implementation or a universally accepted international anchoring of this concept.

At the same time, there is a political and scientific temptation to declare everything a security threat under the paradigm of human security. The analytical model of 'securitization' describes this discursive process in which a topic or concern can be securitized or argumentatively framed as an existential threat or risk via actors in the course of a public debate in order to acquire resources for society as a whole and the corresponding legitimizing powers to combat it.

This can lead to a critically questionable expansion of the concept of security. In the course of this, the production of security leads to further empowerment of relevant, mostly state actors. The political debate in Western countries about the duty of the authorities to protect the health safety of citizens as best as possible in the face of SARS-CoV-2 and, on the other hand, to minimize the encroachment on their fundamental civil rights, illustrates this difficult balancing act, which affects the very essence of civil liberties in liberal democratic states.

Looking back at the various security concepts, security in the context of the project **Sicherheitsforschung.NRW** was deliberately understood broadly as a state produced by human processes, in which both the individual and social structures are the focus of attention. In addition to physical integrity, people should also experience economic and ecological security. Through the interactions of various actors, the affected individual must always be considered in his or her social systems of order, which are themselves in increasing interdependencies with other systems of order. Security threats do not necessarily have to be bound to spatial borders (although they sometimes are), but often occur as cross-spatial problem areas.

The understanding that any approximation of the concept of security cannot be a completed process, is essential for this report on the project **Sicherheitsforschung.NRW**. With a fundamentally realistic localization, security always remains integrated in a constructive-constitutive process of securitization of problem areas and challenges. Due to the peculiar character of the subject matter, interdisciplinary security research should ideally serve to keep other facets of security in view by analyzing the different dimensions of the examined aspect of security in order to achieve truly sustainable security for the benefit and the best possible development of all citizens as well as to guarantee resilient societal structures capable of averting danger.

## Concept of peace

Due to this interdisciplinary nature, a clear conceptual distinction from the field of peace research is hardly possible. Both fields of research are closely connected precisely because they deal with similar research subjects from different perspectives.

It is clear from everyday language that 'peace' is primarily used to describe a (social) state characterized by an absence of violence or the use of violence between individuals, groups and human institutions such as states. Peace would thus be commonly understood as the opposite term to war, a state of violent discord. One view within peace research, on the other hand, sees only negative peace in the absence of war. According to this view, only the presence of structural factors such as basic development, prosperity and sufficient supplies, which make the use of violence less likely, creates positive peace. Also relevant is the distinction between internal peace, which prevails within a country, and external peace, which prevails between different countries, in an international system that continues to be shaped by states.

Without a doubt, decisive conceptual divergences between peace and security can be identified. For example, fundamental differences can already be identified by looking at the etymology of the terms: The term 'security' (from the Old High German *sihhur* for "carefree, worry-free, without fear or doubt" and the Latin *securus* for "without worry, unconcerned") refers both to a sense of security and to a secure situation, and an examination of the history of concepts reveals the virtually social character of the term, which focuses on an individual actor who must protect himself from something or another actor.

Alliances or coalitions for the guarantee of security cannot be derived etymologically. The derivation of the term 'peace' from the Old High German *fridu*, on the other hand, points to the meaning of "protection and friendship" and makes it clear that this term is to be understood socially from the outset. The logic of peace thus has a purely etymological social dimension. It refers to the fact that no actor alone can achieve peace, but that this is only possible in a community.

Scholarly approaches to 'peace' and 'security' are closely linked; research in one field directly or indirectly regularly stimulates that in the other. This observation cannot and should not negate existing differences, for example regarding divergent theoretical, methodological or normative approaches, but it does make clear that the examined subject areas generally overlap considerably and are of a transdisciplinary nature.

## National and regional level

The increase in security challenges at the global, national and regional levels has led to a noticeable change in the Federal Republic of Germany's willingness to shape security policy in recent years. For a long time, Berlin had cultivated "oblivion of power" (Hans-Peter Schwarz) in which Germany often played a passive role as a free rider. Despite its historically special role, Berlin was not entirely alone in this passivity in the period after the implosion of the Soviet Union: in many liberal democracies, after the end of the Cold War there was a lack of realistic strategic thinking in the face of hopes for an end to power-political rivalries and a fiscal peace dividend. Moreover, security policy issues were tabooed for a long time, especially in the public discourse of the Federal Republic. The political awareness that the complex, highly globalized societies of the West have become fundamentally more vulnerable despite their comparatively high conventional military strength and economic prosperity has only gradually increased in recent years. Thus, traditional as well as modern challenges to internal and external security have only slowly been moved into the focus of German politics. Statements by leading German politicians at the Munich Security Conference or the International Security Forum Bonn, among others, nevertheless indicate that Berlin wants to further expand its own role in international peace and security policy within the framework of European cooperation and in view of the increase in new threats. To what extent the urgently needed resources will be made available for these intentions (and their scholarly reflection) remains to be seen. However, the fact that the Federal Republic, which is small on a global scale, axiomatically relies not only on the proven transatlantic cooperation but also on European answers to global challenges is fundamentally welcome with regard to the establishment of a lasting peace-generating confederation of states, as Immanuel Kant had already proposed around 200 years ago.

For an active and strategically oriented participation of Germany in security policy to better ensure the necessary framework conditions for a more peaceful and secure world, broad-based security policy research in Germany is indispensable. Due to its differentiated research landscape, which is reflected in the large number of universities and non-university research institutions, North Rhine-Westphalia plays an important role in this regard. North Rhine-Westphalia is in a geographically central position not only for security policy research in Germany, but also for the close cooperation of the wider European research community.

The federal state of North Rhine-Westphalia is home to a diverse range of security policy research from the social, technical and natural sciences. The project **Sicherheitsforschung.NRW** was born out of the desire to record this variety and diversity of security policy research in North Rhine-Westphalia in a mapping project that is unique in Germany and Europe and to make the findings available to the public at home and abroad.



# Project Presentation

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To meet the multiple challenges outlined above, security policy research conducted by researchers from the humanities and technical sciences informs the actors from politics, administration and security authorities, who are responsible for averting danger. Simultaneously, those researchers try to bring the security policy discourses of their respective disciplines to the broader public through media and specific event formats in order to raise awareness among citizens as well as authorities about the changed and constantly evolving security situation. The aim is to offer empirically based approaches for coping with old as well as new security challenges without dishonest trivialization or populist dramatization.

In order to create a suitable data basis for the database and the mapping of the project **Sicherheitsforschung.NRW**, as many relevant actors as possible in security policy research in North Rhine-Westphalia, that fulfill the criteria of the security understanding initially described, were identified. In addition to state institutions, universities and non-university research institutions, social actors such as associations or non-governmental organizations as well as private-sector companies were considered.

After classifying the identified actors into the categories 'universities', 'research institutions', 'state institutions', 'economy' and 'society', individual research was conducted on each of the identified institutions and their respective research projects. The result of the research was then presented in an individual profile for each institution. The profiles provide an overview of the work, current security-relevant projects

and contact details of the institutions. The entirety of all profiles forms the wiki and can be sorted by various keywords based on the type of institution, the type of research, the funding of the research, the location and various thematic focuses, which in turn enables the identification and presentation of clusters, networks and geographical research focuses. In addition to an entry in the wiki, each institution is also represented by a placement in an interactive research map of the state of North Rhine-Westphalia.

Once the wiki and map entries had been created, the actors were given the lasting possibility to edit their own individual profile.

So far, an important first result of the **Sicherheitsforschung.NRW** project is the website itself, which, with its wiki and research map. It provides the user with clearly presented information about the relevant actors in security policy research in North Rhine-Westphalia, thus simplifies the networking of researchers with each other as well as with actors in security provision and, additionally, makes the diversity and interdisciplinarity of security policy research in North Rhine-Westphalia more visible beyond the borders of the federal state. The wiki currently consists of around 330 profiles. This report concludes the first phase of the project. By focusing on five selected clusters, the following chapters present the initial findings on the dynamics and networks of research conducted in North Rhine-Westphalia and further illuminate the content through expert interviews.

# Identified Clusters





# Cluster Cyber Security



# In a nutshell

- With the digitalization of modern societies, their vulnerability and the potential for abuse in cyberspace is also growing, with cyber-attacks being able to cause very tangible social, economic, political and personal damage. They lead to impairments of societal livelihood, which is why the uninterrupted availability of cyberspace and the integrity, authenticity and confidentiality of the data it contains represent an existential challenge for the modern states and societies of the 21st century.
- The state's core task of ensuring freedom and security also gives rise to a responsibility to protect the population against threats from cyberspace and to prevent and prosecute attacks originating there. In this context, networking of state institutions is indispensable, since especially in cyberspace it is no longer possible to separate internal and external security. The primary goals of cyber security are to ensure integrity, the confidentiality of sensitive information and the availability of functions and services.
- The EU pursues a cyber diplomacy approach to cyber security, which is also taken up in the new EU cyber security strategy. Germany's current cyber security strategy also aims to enable the population to act freely, securely and in a self-determined manner in cyberspace, with a focus on interdepartmental cooperation due to the cross-border threats. Science, business and society therefore also play an important role in this strategy for ensuring cyber security.
- In North Rhine-Westphalia, the cyber security research cluster, with 68 actors, is the quantitatively largest cluster of security research. Leading roles within this field are assumed by the Max Planck Institute for Cyber Security and Privacy Protection in Bochum and the network of the Cyber Security Cluster Bonn, consisting of economy, society and science. Here, within the cooperation, both federal authorities and economic actors are involved with the scientific institutions, so that a coordinated and cooperating research landscape can exist.

As digitalization has led to a continuous transformation of all areas of public and private life, cyberspace and, consequently, also cyber security are becoming increasingly important. European cyber security is likewise becoming increasingly important in the current discourse, as conflicts are also being fought out in cyberspace, which is why a strategy for protecting the population and the state is necessary.

## 1. Conceptual understanding

Cyberspace is a virtual space, which encompasses all information structures that can be accessed via the internet across territorial borders. Cyberspace is based on the internet as a publicly accessible connection network, which can be extended by other data networks.

With the digitalization of modern societies, both their vulnerability and the potential for abuse are also growing, whereby the consequences of cyber-attacks are not limited to cyberspace, but can also cause social, economic, political and personal damage in completely in a variety of places. Serious attacks in cyberspace can lead to significant impairment of societal livelihoods. The security of the availability and integrity of this sphere thus represents an existential challenge of the 21st century.

The manifold threats in cyberspace are almost as old as networked digital work itself. As early as 1982, cyber sabotage of industrial control systems of the Trans-Siberian gas pipeline caused the largest man-made, non-nuclear explosion, resulting in lasting economic and geostrategic disadvantages for Soviet Russia. Moreover, the potential impact of attacks increases the more interconnected the structures of individual states are.

In addition to territorial integrity and sovereignty of the state, national security and defense policy must also ensure the security of cyberspace due to its increasing importance. This results in the state's responsibility to protect the population from threats from cyberspace and to prevent and prosecute crimes in cyberspace. This requires cooperation across political and departmental boundaries. Thus, networking of state institutions is essential, as a separation between internal and external security is no longer possible in cyberspace.

With the aim of ensuring cyber security and given the dependence on system-based technologies, appropriate measures for the protection of systems against manipulation will be developed and promoted. The primary objective is to ensure integrity, confidentiality of sensitive information and availability of (digital and non-digital) functions and services.

## 2. Cyber security in Europe and Germany

The EU pursues an own cyber diplomacy approach and positions itself as a force for peace as the diplomatic response framework provides predominantly for instruments of civilian institutions to counter threats.

In December 2020, the EU presented a new cyber security strategy titled “The EU's Cybersecurity Strategy for the Digital Decade”. Its aim is to strengthen Europe's collective resilience against cyber threats and to ensure that all citizens and businesses can fully benefit from trusted and reliable services and digital tools. Three areas of action are identified for this purpose. Firstly, to strengthen resilience as well as technological sovereignty and leadership. Secondly, to build operational capacities for prevention, deterrence and response, which is to be realized in the form of a joint cyber agency. Thirdly, the promotion of a global and open cyberspace is seen as essential, for which intensification of international cooperation is sought.

The current Cyber Security Strategy of the Federal Republic of Germany of 2021 provides the interdepartmental and strategic framework for the Federal Republic's activities in the field of cyber security. The strategy identifies new communication capabilities and knowledge access in communication technology as developments that are creating a cross-border cyberspace that requires innovative regulatory approaches. In this framework, the state is obliged to shape these changes in cooperation with the economy and other actors and to create the framework conditions for secure further development in order to enable the population to act freely, securely and self-determinedly in cyberspace in the future. As an important body, the Cyber Security Council is located at the interface between politics and business, where it provides strategic impulses and a platform for strategic exchange between the various authorities in the Cyber Defense Centre. The Federal Office for

Information Security (Bundesamt für Sicherheit in der Informationstechnik, BSI) is to be further expanded to become the decisive platform in the sphere between the federal government (Bund) and the federal states (Länder).

The Federal Government considers it an essential task to guarantee the security and freedom of its citizens in cyberspace as well. Nevertheless, the responsibility for security in cyberspace – in line with the broader concept of security used here – also lies with the economy, science and society. Close cooperation and coordination of efforts is therefore vital. Due to cross-border threats, this also applies to the European and international area. In 2016, four fundamental fields of action in the area of cyber security were identified: secure and self-determined action in a digitalized environment, cyber security as a joint task of the state and the economy, strengthening German CERT structures (“Computer Emergency Response Teams”) and involving science in actively shaping international cyber security. Since 2021, strengthening Germany's digital sovereignty has also been a central goal of the Federal Republic.

### 3. Research landscape in NRW

With 68 actors, cyber security is quantitatively the largest cluster in security research. There are particular research strengths in the civilian technical-scientific field, but also military security research is represented by the Center for Cyber Operations of the Bundeswehr and other specialist departments in the Federal Ministry of Defence (Bundesministerium der Verteidigung, BMVg).

**Sicherheitsforschung.NRW** can show that there is a geographically balanced and diverse distribution across the federal state, which has important focal points at the technical universities. Two locations stand out in particular: the Max Planck Institute for Security and Privacy in Bochum, which adds to the already existing top-level cyber research at the Ruhr-University Bochum. To the same extent, through the Cyber Security Cluster Bonn, a coordinated and cooperating research landscape can be identified in the UN and federal city of Bonn. Moreover, with the BSI and central organizational areas of the BMVg, multiple relevant federal authorities are also located

in North Rhine-Westphalia. The overview of the project clearly shows that the combination of major digital economic players such as Telekom and G-Data, academic institutions with existing cutting-edge research and political players with an interest in promoting this field has created an environment for the dominance of the research on cybersecurity in North Rhine-Westphalia that allows the state to be a leader in this future-oriented industrial sector in Germany. Growing cooperation and promotion at both the federal and state level favor a national strength that is necessary in international competition. An enriching transfer of knowledge and exchange between scientific and economic experts is already possible within the state borders and should be further promoted.





## Interview with Prof. Dr.-Ing. Tim Güneysu

*Prof. Dr.-Ing. Tim Güneysu is the spokesperson for the Horst Görtz Institute for IT Security at Ruhr-University Bochum, holds the Chair of Security Engineering there and is one of the Principal Investigators of the Excellence Cluster of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) “Cyber Security in the Age of Large-Scale Adversaries” (CASA).*



**Sicherheitsforschung.NRW: : Dear Professor Güneysu, thank you very much for taking the time to talk about the Sicherheitsforschung.NRW project. In your opinion, what makes security research a current topic?**

**Prof. Dr. Güneysu:** Security research touches a great many people, as it involves an immense number of cross-cutting issues that are highly relevant both to society as a whole and to individuals. I am referring to the special aspect of cyber security, which is primarily about the challenge of digitalization. Especially here, the global context of the world plays a central role, since a very broad effect already occurs as soon as a single global attack on the Internet is successful. This is what makes the field of cybersecurity so critical, because not only is it possible to create local problems in an individual company, government agency, or local energy or water supplier, but quite often it also achieves immediate global effects and damage.

**Sicherheitsforschung.NRW: In your view, to what extent is the topic of cyber security important in the context of security research?**

**Prof. Dr. Güneysu:** Globalization is omnipresent. Many areas of life are being digitized, which does not only affect individual industries, but actually almost all of them, including critical infrastructures such as energy and water supply, banks and numerous other sectors. In many areas, the concept of security in

general and cyber security in particular also plays a very significant factor here. In addition, especially when looking at history, the requirement of cybersecurity has very often been put on the back burner and still is, because it is not a functional feature that serves the purpose of the system in question. This, of course, is fatal. It is precisely when security is disregarded that dangers to individuals and companies in financial terms, but also to life and limb, cannot be ruled out.

**Sicherheitsforschung.NRW: How does cyber security stand out from other security topics?**

**Prof. Dr. Güneysu:** Basically, cyber security is initially seen as a very technical aspect of digitalization. However, other, non-technical aspects quickly play a decisive role here, e.g. factors such as the “usability” of the solutions. The user-friendly use of security functions is essential, especially for everyday use. In other words: What good is it if we have technically excellent measures with which cyber security could be fully achieved in digital applications, but these are not used by the user due to excessive complexity and poor usability or – even worse – are actively switched off?

**Sicherheitsforschung.NRW: Which current debates and topics within the cyber security research field do you consider to be particularly relevant?**

**Prof. Dr. Güneysu:** You can list many aspects here. At first glance, cyber security sounds like a specialized field of computer science, but it is a true cross-sectional field of the present day, as the issues involved often also affect less technical factors, such as data protection. This also includes not only legal aspects, but also sociological and ethical questions. Among other things, it is about how to evaluate the quality of security mechanisms by means of “good” hacking, i.e. we deliberately carry out attacks to find out how stable today’s security systems are. How can data protection be comprehensively preserved when patient records are transferred between treating physicians? Another important debate is the digital security of critical infrastructures and how to maintain it in the event of a crisis. Current issues in the area of communication systems, such as the 5G network expansion, are also part of this. Here, the discussion revolves around the question of where we get our security-critical technologies from in the first place. We see that with globalization, Germany and Europe have become very dependent on foreign technologies. With this wide-reaching usage of foreign technologies, under what circumstances can national interests still be guaranteed, so that we can operate our networks securely and reliably in the long term and also in the aforementioned crisis? Another topic is the perennial issue of “security awareness,” which is about making non-experts, i.e. every user, aware of the measures and rules of cyber security. Very often, we see the problem that although good protection is technically possible, it is too costly to implement for widespread use, which is why users regularly avoid it and switch it off. Technical, social and legal problems go hand in hand when it comes to cyber security.

**Sicherheitsforschung.NRW: That sounds exciting. In your opinion, to what extent are citizens still affected by possible dangers or challenges in the area of cyber security?**

**Prof. Dr. Güneysu:** I’ll take up the data protection aspect again. Here, of course, we see a lot of engagement of digital users in social networks, such as Facebook, WhatsApp, Google, and a lot of data is disclosed there. A user’s data is the new currency of the present. That’s why you often don’t pay for services financially, but with the disclosure of your own data and the advertising consent that often comes with it. This always leaves the question of how far one wants to implement protective measures when data is not yet classified by the individual as so critical and worthy of protection. Another example of new critical points of contact for citizens are technologies from the smart home sector. Using Alexa, Siri & Co. brings a multitude of microphones and other sensors into the home. The collected data is analyzed by the companies, according to extensive terms and conditions, which no one reads in detail due to their scope. This is an example of problems that individual citizens do not usually expect, but which affect them directly and in secret. The internet and digitalization introduce many new functions and achievements, but also create enormous security policy complexities and challenges that people often do not want to deal with in everyday life.

**Sicherheitsforschung.NRW: What is the focus of your personal research and perhaps related to this, what aspects of the content of your personal research do you consider particularly noteworthy in the context of cyber security and security research in general?**

**Prof. Dr. Güneysu:** At the Horst Görtz Institute for IT Security (HGI) we are doing research on a very broad spectrum of IT security. At the HGI in Bochum alone, a total of 26 professorships and research groups are working on this complex of topics, which shows how broad the field of IT security is – and we are currently filling further professorships. Work is being done at the HGI, for example, in the field of cryptography, where, among other things, basic research on the mathematical encryption systems used today is being implemented, or in the field of hardware, so that these can also be deeply integrated into modern computer chips. We have many experts in the field of network and software security who deal with vulnerabilities on the Internet, for example, via malware and viruses, but also with questions of secure programming and software in general. And in the area of “humans”, several chairs and working groups, as well as the research training group “SecHuman”, are dedicated to the effects that the human factor has in the area of cyber security. With this broad spectrum, we are very proud that our institute ranks among the best in Europe and the world in terms of research and teaching. And the recently established Max Planck Institute for Cybersecurity and Data Protection in Bochum will add several hundred more experts and researchers in the future, making this location a real hotspot in the field of cybersecurity.

**Sicherheitsforschung.NRW: Do you have a certain goal with your research?**

**Prof. Dr. Güneysu:** Here I would like to reference our broad spectrum once more. For example, there is our Cluster of Excellence CASA, which is funded by the German Research Foundation (DFG) and is dedicated to enabling security for individual citizens against powerful attackers as well as large institutions. This subject also covers all the areas mentioned above: From cryptography as a basis to the technical properties of devices in hardware and software, as well as the actual use by citizens.

**Sicherheitsforschung.NRW: With which security topics do your research topics overlap and to what extent does this interdisciplinarity influence your research?**

**Prof. Dr. Güneysu:** We have a very wide range of points of contact for interdisciplinary work, e.g. in industry and in companies in general. We are closely connected to the eurobits network, which creates the transition between our research at the university and companies in the greater Bochum and Ruhr area as well as in North Rhine-Westphalia. We also have a very lively start-up scene, with which we actively transfer research findings into practice and also utilize them for the economy. For example, according to a recent study by the RAG Foundation, the Ruhr region already ranks third after Berlin and Munich in the number of startups in the field of cyber security in Germany. With the HGI in Bochum, we currently have 17 spin-offs and thus a significant share in this ranking.

**Sicherheitsforschung.NRW:** *To what extent do you cooperate with other institutions on security-related research in North Rhine-Westphalia? And what is your general assessment of the networking of researchers in North Rhine-Westphalia?*

**Prof. Dr. Güneysu:** Networking is very important! The cross-cutting issue of IT security, in particular, makes it instantly clear that it simply won't work without this networking – the relevant aspects of cyber security are too diverse. In addition to us, there are many excellent institutions and universities in North Rhine-Westphalia in Aachen, Bonn, Paderborn or at the Westphalian University of Applied Sciences in Gelsenkirchen. We are actively expanding existing connections. Historically, we have also helped to establish and support various projects in the non-university sector in the Ruhr region and in North Rhine-Westphalia, such as NRW.units as a network for small and medium-sized enterprises. Networking security-related research, whether loosely, in project-related or permanent networks, is vital for bringing the knowledge gained on core issues of IT security to the broader audience of all of North Rhine-Westphalia.

**Sicherheitsforschung.NRW:** *How do you rate the quality and quantity of scientific research work in North Rhine-Westphalia compared to other federal states? And are there perhaps areas in which you think North Rhine-Westphalia is particularly strong in research?*

**Prof. Dr. Güneysu:** As already mentioned, according to several internationally recognized rankings, the HGI can count itself among the top ten research institutions worldwide. This also reflects our position in a Germany-wide comparison and shows that we have a hotspot for IT security in Bochum. Of course, there are other very prominent and good locations in Germany in the field of cyber security, such as Darmstadt, Karlsruhe and Saarbrücken.

**Sicherheitsforschung.NRW:** *In which areas would you still see a need for improvement in order to be able to continue researching the technological challenges in the field of cyber security at a world level?*

**Prof. Dr. Güneysu:** We see, especially in the discussion about the 5G network expansion, that many questions about high-tech products cannot be solved solely in Germany and only with German products, but that we are dependent on technical support from the Far East. As already mentioned at the beginning, this always raises fundamental questions about the trustworthiness of non-European products. Regardless of cyber security, we see major new challenges and initiatives worldwide associated with this topic – for example, in the area of machine learning. Germany also has large funding pots in this area, although quite a few initiatives abroad are even more extensive. We are also active in the field of quantum technologies in Germany, but many successes are currently coming from the large commercial players such as Google and IBM. To ensure that research in North Rhine-Westphalia and Germany does not fall behind in the future, politics and industry must keep a very close eye on these global developments and, if necessary, take corrective action. History has shown that metropolitan areas for high technologies, such as Silicon Valley, are particularly important to increase the appeal and attraction for the most renowned international experts.

**Sicherheitsforschung.NRW:** *What do you expect from more comprehensive networking of the actors, of security research within North Rhine-Westphalia and perhaps even later on at the national as well as European or international level? And how could your research benefit from such more extensive networking?*

**Prof. Dr. Güneysu:** The cross-cutting issue of security research can be found everywhere. Cyber security has also become essential, because without it we cannot live safely in our almost completely digitalized world. This must be front and center in everyone's minds at any level, and this can only be achieved through extensive networking. Cyber security is also slowly taking on a well-deserved higher status in many areas; for a long time, many people believed that security was not needed in the IT sector because attackers would not know where to attack. However, multiple cyber-attacks, which were also reported in the press, have not failed to have an effect here; after all, one single weak point in the system is already enough to cause a great deal of damage. In some areas, however, there are still not enough incentives or a requirement by the legislator to implement cyber security in the best possible way. And I hope that with better networking from the get go, a greater awareness of the high importance of security can be created among the industries affected by this.

**Sicherheitsforschung.NRW:** *What security policy challenges do you see for the future of the research field of cyber security? And from your point of view, are there perhaps already initial thoughts on measures and approaches that you would consider relevant for investigation from a researcher's point of view for tackling this challenge?*

**Prof. Dr. Güneysu:** A major issue in the field of cyber security is the creation of legal foundations and standards that must be implemented in a binding manner. The creation of standards is typically an extremely lengthy process. In this process, the functions are drivers of the developments of new products. The aspect of cyber security is often not yet sufficiently considered here, precisely because the standards and legal frameworks are lacking. It is important to react quickly to new technical challenges in the cyber area to guarantee a minimum standard of cyber security for citizens in the future.

**Sicherheitsforschung.NRW:** *Dear Prof. Güneysu, thank you very much for the interview!*



# Cluster Climate Security

# In a nutshell

- The topic of climate has gained enormous importance in politics and science in recent years, both socially and in terms of security policy. Since the goals of the Paris Climate Agreement and the German Climate Strategy can only be achieved if these strategies are also implemented at the regional level, the state of North Rhine-Westphalia, as the region with the largest population in Germany, plays an important role for the implementation.
- Since the 1970s, there have been approaches to call for a coordinated, multilateral agenda against climate change, with a turnaround in the climate debate from 2007 onwards with the 4th Assessment Report of the IPCC. Interest in climate change and its risks rose sharply worldwide. The associated security policy challenges also came more into focus. Since then, ever more far-reaching concepts have been developed at national and international level, which should lead to emission reductions and ultimately climate neutrality.
- Since the 19th century, climate research has evolved from viewing climate as a local phenomenon to studying a global phenomenon that must be researched not only internationally, but also in an interdisciplinary and transdisciplinary manner.
- The central goal of international climate policy is to limit the increase in the global average temperature to 1.5 degrees. The Paris Agreement forms the basis for national action plans of the states regarding the reduction of their emissions, whereby the intention of climate neutrality by 2050 has also been set at the European level.
- With the Climate Protection Plan 2050, German climate policy operates within an internationally defined framework that sets out the fundamental objective of the policy. The national climate strategy is thus oriented towards international legal obligations of the Paris Agreement and the United Nations Sustainable Development Goals. The topics of climate protection and climate change adaptation are also strongly represented in the research of the state of North Rhine-Westphalia.

“There is no planet B.” as Ban Ki-moon, former Secretary-General of the United Nations, among others, has remarked. This phrase is used to draw public attention to the explosive nature of the issues surrounding climate and climate change. Thus, awareness of the urgency for solution-oriented research and sustainable political action is raised. The research landscape in North Rhine-Westphalia, which will be presented in this cluster area, also contributes to this.

## 1. Conceptual understanding

The term climate describes the state of the atmosphere for a specific place or area over a longer period of time, which should be at least 30 years. When determining the climate in an area, measured data such as seasonal temperatures, precipitation rates, wind patterns and ocean currents are considered. Thus, different areas also have different climates. Weather, on the other hand, takes into account a much shorter period of several days/weeks and describes the general average character of the weather pattern in a defined area. Basically, climate change means that changes in the average values of a climate can be observed that are not of isolated but of regular character. Climate change can refer to a specific region or affect the earth as a whole system. The possible observations for a long-term trend would thus be a cooling or warming of the Earth's climate and the increased frequency of extreme weather events and the worldwide decline of mountain glaciers and snow deposits. The global warming that has become clearly evident in recent decades is accelerated by the accumulation of greenhouse gases such as carbon dioxide, methane and nitrogen monoxide in the atmosphere.

With this development, international climate policy with the goal of limiting global warming to 2°C or 1.5°C within the framework of the Paris Agreement of 2015 has steadily gained political importance, as evidenced not least by the adoption of the EU's European Green Deal and the intention to reduce EU emissions by 55% (previously 40%) by 2030.

The special feature of the subject area of climate security lies in its inter- and transdisciplinarity. Thus, in the increasing interconnection with energy, economic, foreign, security and domestic policy, climate protection is understood as a cross-cutting issue that requires security concepts that are as holistic as possible.

After the end of the Cold War, a trend reversal slowly took place on the world stage. Climate change was no longer perceived as a regional or local phenomenon, but the research community increasingly identified it as a global challenge for humanity requiring interdisciplinary and international cooperation. In a report in 2007, the Intergovernmental Panel on Climate Change (IPCC), established as early as 1988, made firm point of how inescapable climate change is and how urgent mitigation and adaptation measures are. In recent years, a major milestone in the international climate debate was the Paris Climate Agreement of December 2015, which is considered the successor to the Kyoto Protocol (2005). In the Paris Agreement, 196 countries and the EU agreed to keep global warming below the 2°C mark to counteract the climate-related consequences. This program finds global significance in the 17 Sustainable Development Goals (SDGs) of the United Nations, which are intended to ensure sustainable development worldwide at the social, economic and ecological levels; explicitly in SDG 13 (“Climate Action”).

The development of key concepts to mitigate climate change is the main objective for research, also in North Rhine-Westphalia. As one possible strategy for action, the concept of climate change mitigation pursues the reduction of negative impacts on the environment and the climate, in particular the reduction of greenhouse gas emissions, which contribute significantly to climate change.

Nevertheless, even in the case of immediate comprehensive and effective measures for climate protection, the earth would continue to warm for a long time. In this respect, the consequences of climate change for the environment and society would continue to occur. The effects are clearly noticeable and manifest themselves, for example, in form of extreme weather events. For this reason, the concept of adaptation to climate change was developed with the aim of increasing the resilience of societies. Through sustainable adaptations of humanity to the changing conditions in the environment, negative implications are to be absorbed or prevented and new opportunities (e.g. renewable energies) for a secure existence are to be created.

Climate change poses major challenges for our current and future way of life, not only in the area of the environment, but in almost all political and social aspects. Thus, climate changes also inevitably pose threats to security according to the understanding described above.

On the one hand, the connection between climate and security is based on the potential impacts that affect people and the environment, which allows climate change to be identified as a threat to human security. On the other hand, correlations between climate change impacts and international conflicts can also be identified. Examples such as the increasing scarcity of water due to weather extremes in form of heat and high average temperatures in the Sahel or events in Central Asia, where disputes over water resources are escalating in Tajikistan and Kyrgyzstan, among others, are exacerbating foreign policy tensions between states. Reasons for this are, for example, the loss of livelihoods and the insufficient supply of drinking water to the population. The negative impacts of climate change are shockingly evident in the poorest and most conflict-ridden regions. Climate change is thus not the original cause of violent conflicts, but can be a threat multiplier and thus a further cause for the escalation of conflicts.

In addition to water scarcity as such, other climate changes also lead to food shortages, which in turn have security implications. As a result of droughts, crop failures, unpredictable weather patterns and rising temperatures in water bodies, food insecurity occurs and might thereby trigger economic instability. Due to dwindling livelihoods, affected people may decide to leave their homes. This results in internal migration, but also regional and international migration movements, which in turn can lead to conflicts with already existing communities.

Thus, climate change should be considered a security issue for a variety of reasons: Threats to human security, loss of livelihoods, exacerbation of existing conflicts, emergence of new tensions between communities and forcing as well as amplifying of migratory movements. These underscore the acute need for action to mitigate the impacts of climate change and preserve the environment and with it human livelihoods. Climate change has cross-cutting consequences for international security issues in the future and thus a discussion on the relationship between climate change and security is essential.

## 2. Climate security in Europe and Germany

It is therefore not surprising that, for example, NATO and the EU have been dealing with and analyzing the security implications of climate change for many years. Such security challenges of climate change are now accepted in principle as part of a broader concept of security. The Pentagon had already examined the future security implications of climate change in a major study in 2002. From 2008 to 2018, the topic of climate change was anchored in the US national security strategy, was then repealed under Donald Trump, and has now been re-anchored by President Biden in his “Interim National Security Strategic Guidance”. In turn, the German Federal Government’s Foreign Office has proclaimed for years – in addition to “foreign energy policy” (since 2008) – the need for a “foreign climate policy”, which is also playing an increasingly important role in Germany’s global foreign policy.

The German government is taking a leading position in European climate policy and is playing a key role in driving forward the EU’s plan to make the Union climate-neutral by 2050.

The national “Climate Action Plan 2050” provides the framework for strategic decisions in economy, industry, trade unions, science and civil society. In this plan, various measures have been defined for Germany to achieve the targets of the Paris Climate Agreement. The central goal is Germany’s greenhouse gas neutrality by 2050 and consequently the transformation to a climate-friendly economy. This also forms central guidelines for Germany’s foreign and security policy actions.

## 3. Research landscape in NRW

As the most populous federal state and the largest industrial location within Germany, North Rhine-Westphalia plays a central role in the area of climate protection and the associated climate security. The federal state identifies one of its key tasks in supporting the federal government in its quest for a pioneering role in international climate policy and the realization of this ambition through concrete measures. For the climate security cluster, decisive ministries as well as actors from business, science and society could be identified, which means that this cluster has the second most members in the database. Due to the broadness of the field, the research landscape in the climate security cluster is extremely diverse.

The Ministry for Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia has designed the NRW Climate Protection Portal, which is responsible for developing a framework for action for the state’s own climate policy. In it, the state government commits to the Paris Climate Agreement and its goal of a globally climate-neutral economy by 2050.

To achieve this, the state government announces that it will support North Rhine-Westphalia’s industry on the path to climate neutrality through innovation and digitalization, with alternative energy sources being of particular interest. The state’s overarching goal is to develop North Rhine-Westphalia into the most modern as well as climate- and environmentally friendly industrial location in Europe.

Of course, science and research also have an important role to play in this project. The North Rhine-Westphalian research landscape dealing with the topics of climate and climate change is characterized by a high degree of diversity and a broad spectrum of research has been established. Despite the diversity of research, clear thematic focal points can be identified.

One focus, for example, is on the promotion of renewable energies, which are examined in greater depth in the energy security cluster. Both the Federal Ministry for Economic Cooperation and Development (Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung, BMZ) and the Federal Ministry of Food and Agriculture (das Bundesministerium für Ernährung und Landwirtschaft, BMEL) should be highlighted as governmental actors in the context of climate security in North Rhine-Westphalia, which strive for sustainability on a national as well as global level. In the area of humanities, the scientific support of the political objectives for climate protection has to be emphasized. For example, several institutions are conducting research on the implementation of the sustainability-oriented Agenda 2030, such as the Agenda 2030 project of the Bertelsmann Foundation in Gütersloh or the work of the Global Policy Forum Europe e.V., the research of the Development and Peace Foundation or the German Society for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit, GIZ).

The United Nations site in Bonn includes a large number of relevant international actors. With regard to climate research, the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) should be mentioned in particular, which, among other things, supports the implementation of the Kyoto Protocol and the Paris Climate Agreement and is thus one of the most important institutions in this segment worldwide. In addition, the United Nations Office for Disaster Risk Reduction (UNDRR), the United Nations Office for Outer Space Affairs (UNOOSA), the Secretariat of the United Nations Convention to Combat Desertification (UNCCD) and the United Nations University Institute for Environment and Human Security (UNU-EHS) are based in Bonn. While the former are particularly active in the field of disaster management and disaster risk reduction and also focus on the consequences of climate change such as extreme weather events and natural disasters, the latter clearly draws the link between climate and security and consider environmental impacts in the context of human security.

Climate security and the effects of climate change on international security are to be identified as a further research focus in North Rhine-Westphalia. In the humanities, the focus here is particularly on the connection between climate change and migration. In this context, actors such as Stiftung Mercator in Essen are worth highlighting.

In the natural and technical sciences, the connection between climate and security is addressed in particular in the form of strengthening resilience, disaster prevention and risk reduction in extreme weather situations. Among others, the Institute for Energy and Environmental Technology (Institut für Energie- und Umwelttechnik, IUTA) at the University of Duisburg Essen and the Faculty of Spatial Planning at the TU Dortmund University focus on this area. The HochwasserKompetenzCentrum (HKC) e.V. (Flood Competence Centre) in Cologne, which is primarily concerned with the consequences of heavy rainfall for the Rhineland region, should also be mentioned as a relevant actor. Resource security is another focus of research, especially in the university sector. Research in this area is conducted by the Cologne University of Technology, the Chair of Microeconomics, especially energy and resource economics, at the University of Münster, the FUTURE WATER research college at the University of Duisburg-Essen, the Centre for Development Research (Zentrum für Entwicklungsforschung, ZEF) and the European Cluster for Climate, Energy and Resource Security (EUCERS) at CASSIS at the University of Bonn. In the field of non-university research, the Wuppertal Institute for Climate, Environment and Energy should be mentioned in this context, as well as the Foundation Environment and Development NRW (Stiftung Umwelt und Entwicklung NRW).

In addition to researching climate change, its causes and effects, the research community in North Rhine-Westphalia also focuses on the field of ecology. By dealing with sustainable agriculture and nutrition, biodiversity as well as the general conservation of resources, the aim is to support the goal of socio-ecological change with the help of targeted research. For example, the Centre for Interdisciplinary Sustainability Research (Zentrum für Interdisziplinäre Nachhaltigkeitsforschung, ZIN) at the University of Münster conducts research on ecological and social sustainability, while the Institute of Geography at the University of Bonn focuses on climatology and landscape ecology.

Closely linked to this are the aspects of mobility and sustainable infrastructure, for which a large number of research actors can also be identified. The Faculty of Spatial Planning at the Technical University of Dortmund, for example, is working on green infrastructure, while the Institute for Mobility and Transport Systems in Bochum, the Department of Engineering and Mathematics at Bielefeld University of Applied Sciences and the Wuppertal Institute for Climate, Environment and Energy are conducting research on sustainable mobility.

One emphasis in the humanities is on sustainability research in the social and economic spheres as well as international cooperation on sustainable development. For example, all party-affiliated foundations have a focus in this area.

To summarize, this mapping of the research landscape in the field of climate and climate change in North Rhine-Westphalia suggests the following thematic research priorities: SDGs, disaster risk reduction, climate and security, resilience, resource security, ecology, mobility and sustainable infrastructure, and social and economic sustainability.





#### 4. Interview with Prof. Dr. Anna-Katharina Hornidge

*Prof. Dr. Anna-Katharina Hornidge is Director of the German Development Institute (Deutsches Institut für Entwicklungspolitik, DIE), Professor of Global Sustainable Development at the University of Bonn and a Member of the Steering Committee of CASSIS.*



**Sicherheitsforschung.NRW:** *Dear Prof. Hornidge, thank you very much for taking the time to talk about the Sicherheitsforschung.NRW project. In your view, what makes security research a current topic?*

**Prof. Dr. Hornidge:** Security research at the DIE, in the context of development research and development policy research, deals a lot with questions around fragile states. Current examples include Ethiopia and Lebanon, which are particularly challenged in this regard. This concerns structures of order or a rethinking of structures of order along lines of conflict, which can be of an ethnic, cultural or religious nature, for example, which emerge and then also include security issues.

**Sicherheitsforschung.NRW:** *To what extent is the topic of climate added at this point? What role does it play in the context of development and security research?*

**Prof. Dr. Hornidge:** We regard climate and climate change as one of a total of eight global megatrends, global structural changes that have been observed for decades. It should be emphasized that climate change is one of the three global megatrends that we at the DIE regard as megatrends of the first order. In addition to climate change, these also include demographic change and geopolitical power shifts. These megatrends lay the structures for dynamics that then continue to unfold between all other trends, such as urbanization processes or digitalization. Climate change is thus structure-forming. It shifts the foundations that determine how security policy issues will unfold in the future. From a security policy perspective, this affects political orders, for example.

**Sicherheitsforschung.NRW:** *Which current debates and topics within the Climate and Security Network do you see as particularly relevant?*

**Prof. Dr. Hornidge:** Quite clearly: the accelerating function of the Corona pandemic for further social, economic, political processes of rapid change. The interplay between the Corona pandemic and climate change will be a major challenge for the next few years – probably decades.

It is evident that Corona challenges and shakes up the socio-economic preconditions in many countries so much so, that climate change is unfortunately somewhat relegated in the consciousness even of political decision-makers. At the same time, it is becoming all the more urgent to tackle it. If we consider, for example, the recent slide from a section of a glacier in India, which killed many people, it becomes clear that climate change is already having a massive impact. The societal capacities to react to this – at the moment also additionally to the consequences of the pandemic – are not always given. In this respect, it is precisely this fire-accelerating function of the interaction between the Corona pandemic and climate change that is a topic of the future.

**Sicherheitsforschung.NRW: *Fire accelerant is an appropriate term for it. You had just mentioned the glacier collapse in India. If we move from the structural to the individual level: In your view, to what extent are citizens particularly affected by the dangers and challenges posed by climate change?***

**Prof. Dr. Hornidge:** I find it quite helpful to work here with the threefold concept of security according to Ulrich Beck, Scott Lash and Anthony Giddens. On the one hand, we observe an increase in danger, for example in physical or health terms. This could be, for example, extreme weather caused by climate change or SARS-CoV2. Then we observe a tremendous uncertainty – the new Corona virus is the best example of this. We are also observing something quite similar with regard to climate change. There is a general uncertainty: What actually is the ‘future’? What possibilities still exist? Do multiple futures still exist and what do they look like? This is where the idea of security comes in, which, in addition to political and social security, also means safeguarding. This threefold concept is particularly relevant with regard to the interaction between climate change and the Corona pandemic. It makes us realize how important it is for development research and security research to cooperate, especially because we are clearly dealing with different security concepts.

**Sicherheitsforschung.NRW: *Where do you see your personal focus within this nexus of development policy research and security policy research?***

**Prof. Dr. Hornidge:** I work on the interaction of environmental change and social change or socio-economic transformation processes. On the one hand, it is about helping to shape these processes of change (which we include under the umbrella term ‘development’); on the other hand, we work with the goal of mitigating the negative effects of processes of change or contributing to them in order to enable societal adaptation. This is then tangible in dealing with environmental change, with sea level rise, with the consequences of climate change. Therefore, for me, the most relevant questions are those including some form of crisis management – either with the future perspective of anticipating possible future crises and adapting to them or dealing with the current ones. This is basically the nexus between development research and security research.

**Sicherheitsforschung.NRW:** *Do you perhaps have a current DIE research project in mind where you say that it might symbolize this nexus, this overlap quite well?*

**Prof. Dr. Hornidge:** One research project we have just completed is a project funded by the German Research Foundation (DFG) in which we investigated how societies deal with sea-level rise in the three Southeast Asian cities of Jakarta, Manila and Singapore. In another project, funded by the Volkswagen Foundation, we are now going a step further and investigating the extent to which fictional and non-fictional framings of coastal change processes in public space shape narratives and the extent to which these narratives, in turn, guide political actors.

We ask ourselves: What better way is there to anticipate a crisis? Anyone who observes sea-level rise knows that Jakarta basically has to 'move' because of the impact. People are building the appropriate coastal protection, both in Manila and Singapore, and at the same time the crisis is currently just anticipated. It is not yet as tangible as the current Corona crisis is, for example. This poses an enormous challenge to the social organization systems and politics as a whole to deal with it. Of course, it makes any form of mitigation and creation of social acceptance more difficult.

**Sicherheitsforschung.NRW:** *To what extent do you currently cooperate with institutions working on security research in North Rhine-Westphalia?*

**Prof. Dr. Hornidge:** As part of the Bonn Alliance for Sustainability Research and within the framework of the Johannes Rau Research Association, we cooperate, among others, with the BICC (Bonn International Centre for Conflict Studies), which conducts conflict and peace research, but also repeatedly deals with security policy issues and focal points. We are increasingly cooperating with CASSIS. We also work with the University of Duisburg-Essen, the Käte Hamburger Kolleg / Centre for Global Cooperation Research (KHK/GCR21). Here, the focus lies on migration and flight, but also on conflict and peace research issues.

It is important to emphasize that in Bonn – and in North Rhine-Westphalia as a whole, but Bonn especially – very different interdisciplinary research areas at the interfaces of migration, security, development and sustainability are brought together and a real focus is laid upon social science. When I think about sustainability research in the German context, I know that natural science sustainability research is located in Potsdam, Leipzig and so on. But social science, political science, but also cultural science and economic research in the field of sustainability with interfaces in migration, security, development, sustainability is located in Bonn. Here we cooperate with UNU-EHS, the Centre for Development Research (ZEF), the University and the Bonn-Rhein-Sieg University of Applied Sciences. And from my point of view, this is really a strength that we already live by, but that we can also emphasize even more.

***Sicherheitsforschung.NRW: In your view, North Rhine-Westphalia in general and Bonn in particular are very strong in research on these topics. Are there perhaps other topics where you say that North Rhine-Westphalia could perhaps make some further improvements? Where could existing strengths perhaps be further enhanced?***

**Prof. Dr. Hornidge:** Perhaps two aspects: The Corona pandemic, in combination with climate change, will act as a massive accelerant for a whole range of our topics, including migration and flight. We practice migration research in the Bonn and NRW contexts. This is an area that I think needs to be strengthened. It is a very difficult topic (also politically). But we must – and this also concerns future federal governments – deal with this topic explicitly and devote more attention to it. And we have to find answers that also enable a social dialogue. Strengthening this field of research could also take on an important ‘third player’ role in enabling social dialogue.

That is one thing, the other is social science research in relation to future scenarios and to grasp and create these scientifically. This is a field of research that is controversial in the social and cultural sciences, I am well aware of that. At the same time, it is an area that I think needs to be strengthened. We can only provide meaningful policy advice if we anticipate now what the big questions will be in five or ten years’ time. We cannot continue to leave this area of research mainly to natural science disciplines. This creates a situation in which, for example, the research of the Intergovernmental Panel on Climate Change has found itself in recent years: Scenarios were developed on the basis of natural science, which – taken up by politics – suddenly became political targets. The scenarios had been developed as natural science-based scenarios without thinking about the political, societal, cultural context in which policies based on them would be implemented. In the policy design and implementation, however, it was precisely these socio-political contexts that then played a very decisive role in achieving the climate targets.

This means: I believe that we in the Bonn and NRW context must face this challenge much more consciously in order to design future scenarios and future research based on social and cultural sciences and then develop them in interdisciplinary exchange with the natural science research fields and partners, as well as to make them available to politics.

***Sicherheitsforschung.NRW: What would you expect from a more comprehensive networking of actors within security research and neighboring disciplines such as development policy, conflict research or migration research within North Rhine-Westphalia and perhaps later also at national and European level?***

**Prof. Dr. Hornidge:** Once again, I would like to refer to the topic of migration and flight, for example in connection with climate change processes, as well as social science futurology for crisis anticipation, which I consider very important. We are currently in a geopolitical breathing space. The Biden election has given us a two-year window to deal with some of the big issues of transatlantic cooperation, global climate policy, international debt problems, etc. We now have to make use of it. Of course, our election in Germany this year and the election in France next year are also important for action on these issues at the European level and for Europe as a whole. Especially in global climate policy, Europe and Germany must take responsibility.

What is important here is that this 'leadership' must be an 'intellectual leadership'. If we look at our own government's current approach to the Covid19 pandemic, it is scientifically informed, it is reflective and it is forward-looking. These are qualities that I would understand as 'intellectual leadership'. This form also has the potential to facilitate a 'coalition of the willing' at the multilateral level, but also at the European level. The spotlight is also on Germany, as Europe's largest economic powerhouse. We have a responsibility to fulfill.

I believe that the first major challenge is the 'Corona recovery'. This must be done in a way that is climate-friendly and also enables social cohesion. The issue of social cohesion, if we regard once more the election in France or our own federal election last year, is very important because it helps to enable democratic governance. The research of DIE and the science location Bonn contributes with a focus on understanding between regions.

***Sicherheitsforschung.NRW: Dear Prof. Hornidge,  
thank you very much for the interview!***

# Cluster Energy Security



# In a nutshell

- In addition to the availability of energy, the contributions to environmental and climate protection and their effects on energy policy are now also counted as part of energy security. Overall, a balance must be achieved between the three objectives of security of supply, economic efficiency and environmental and climate compatibility in order to ensure sustainable energy security. Accordingly, the resilience of the systems can also be seen as a conditional factor for energy security.
- The global expansion of renewable energies could reduce dependence on raw material imports and thus related import risks. However, this creates new security challenges, so that most of the current debate on future global energy security is focused on the transition from the fossil fuel era to a future era of renewable energies. This transition poses new risks, vulnerabilities and security challenges in terms of energy security.
- Until the mid-2000s, the majority opinion in politics and economy in Germany and Europe was characterized by an understanding that the state should largely stay out of questions of supply security and leave this to the private energy companies. It was not until 2008 that an understanding of energy security, which is also linked to questions of foreign, security and geopolitics and thus to national security, prevailed in Germany with the term “foreign energy policy”.
- Today, energy and climate policy are important foreign policy fields for the Federal Republic of Germany, and the EU also pursues “external energy relations”, which are a central field of work for its foreign, energy and neighborhood policy. In the common EU energy policy, the security of gas supply in relation to the dependence on Russia in this regard has been at the center of the energy security debates to date.

Access to energy gained importance in the course of the modernization of society and changes in lifestyles, as human existence relies on unrestricted energy use with increasing dependence. Consequently, the availability of energy is essential, resulting in a potential risk of its loss, so ensuring energy security becomes a priority.

## 1. Conceptual understanding

Traditionally, the term energy security is understood to mean the availability of energy at all times in various forms, in sufficient quantity and at an affordable price point. Uncertainty remains about what is actually understood by “sufficient quantity” and “affordable prices” in particular because this can vary greatly between importing and exporting countries. Additionally, for more than a decade, a larger emphasis is laid upon the efforts to protect the environment and climate and upon the impact on energy policy and energy security. Furthermore, the International Energy Agency (IEA) in Paris has differentiated between short-term and long-term energy security since 2012.

In 2007, the Asia Pacific Energy Research Centre (APEREC) defined the concept of the “4 As” of energy security: “availability, accessibility, affordability and acceptability”. But even this categorization has not solved the dilemma that different countries and experts each have a different understanding of the four factors. After all, there is a broad consensus among international experts that the complex multi-dimensional understanding of energy security cannot enumerate all risks and vulnerabilities or be defined in a generally binding way with supposedly simple concepts such as ‘energy self-sufficiency’ or ‘energy independence’. An approximation is offered by the following three questions (a) security for whom?; (b) security for what objectives and values?; and (c) what are the threats?.

This is also always dependent on the specific conditional factors of a country, the level of economic development, the perception of risks, the robustness (resilience) of an energy system and the geopolitical dimensions. In this context, the understanding of ‘energy security’ in producer and transit countries must also be distinguished from that in consumer countries. Whereas the latter are primarily concerned with supply security, ‘demand security’ plays a decisive role for the producing countries.

In contrast, transit countries (such as Ukraine and Turkey in case of gas) are interested in both supply security and demand security in view of high transit revenues from fossil energy transports (such as Russian gas for Europe) through their territory. Another concept and at the same time methodology is the approach of the 'energy triangle' or 'energy trilemma' of security of supply: economic efficiency as well as environmental and climate compatibility. The actual problem is to achieve a balance between these three objectives to ensure sustainable energy security.

In recent years, the factor of 'resilience' in particular has come into greater focus as an additional (conditional) factor in the conceptual understanding and assessment of energy security. In this context, resilience of energy security is equated with the capabilities of robustness, adequacy, adaptability, flexibility and reliability of energy systems, resources and infrastructures.

In general, insufficient and poor energy security results from negative economic and political-social developments on the physical availability of energy resources or prices that are no longer competitive or even too volatile. Historically, energy security has been associated primarily with security of supply of conventional crude oil since the 1973 oil crisis, especially as the global transportation sector has remained dependent on crude oil to this day.

While the previous understanding of energy (supply) security was primarily characterized by fossil fuels (especially crude oil and natural gas) and problematic import dependencies, renewable energies (RE) can indeed be seen as domestic energy sources that can significantly reduce dependencies on fossil raw material imports and corresponding import risks in the future.

This is another reason why the global expansion of RE and the associated decentralization of the future global energy supply is welcomed in principle. However, the expansion of RE creates numerous new security challenges, including new high import dependencies such as for hydrogen and critical raw materials, but also for the security and resilience of critical energy infrastructures and future electricity supply security. Most of the current debates on future global energy security are focused on the transition from the fossil age to decarbonization and consequently on a future era of RE.

Therefore, it can already be stated that a new non-fossil, RE-based era of international energy policy and security will not mean the end of geopolitics, but the emergence of new risks, vulnerabilities and security challenges. At the same time, traditional geopolitical risks to security of supply – at least in the longer transition period to a largely non-fossil age – will by no means disappear. In some areas, such as the maritime security dimension, concerning the security of sea routes and choke points (the bottlenecks in shipping lanes) for ship-borne energy exports of oil and liquefied natural gas (LNG) in the face of new power rivalries (USA-China, China-India, China-Japan, EU-Russia etc.), these could even increase significantly.

The national understanding of energy security in Germany requires ever greater consideration of the European dimensions – such as the common integrated EU energy and climate policy (especially as more and more sovereignty is gradually being handed over to Brussels in this regard) – and the effects of the global energy megatrends on Germany and the EU.

## 2. Energy security in Europe and Germany

Since 2006, the issue of gas supply security has increasingly moved to the top of the political agenda, especially in Europe and the EU, as a result of the first Russian-Ukrainian gas conflict in 2006. This conflict was also the main impetus for the common EU energy policy, which was launched a year later and where, from then until today, gas supply security has been at the center of EU energy security debates as a result of the second Russian-Ukrainian gas conflict of 2009/10, Russia's annexation of Crimea in violation of international law, the conflict over the Nord Stream 2 gas pipeline as well as the Kremlin's open war against Ukraine in early 2022.

Outside the EU and its member states, the international understanding of energy security had always been closely linked to questions of foreign, security and geopolitics and ultimately (as in the USA, Japan and other Western states; in the OPEC member states, Russia and others anyway) also understood as a question of national security. In Germany and Europe, however, the majority opinion in politics and economy until 2006 was characterized by a largely apolitical understanding to the extent that the state should largely stay out of questions of supply security and that this could be left to the (private) energy companies and that state interference was rather classified as counterproductive, which was considered undesirable.

Characteristically for this very apolitical understanding, the Federal Foreign Office also largely did not work explicitly on energy security until 2007/8. It was only after 2007 that the then Foreign Minister Franz-Walter Steinmeier shaped the concept of an "external energy policy" and saw the need to analyze the foreign and geopolitical dimensions of other countries' energy policies and their impact on Germany and the EU in the future. The EU, in turn, speaks of "external energy relations" in the context of its foreign and energy policy, which is also an important field of work for its foreign, energy and neighborhood policy.

## 3. Research landscape in NRW

As already mentioned in the Climate Security Cluster, a large part of North Rhine-Westphalia's research landscape focuses on the areas of energy security and renewable energies. However, the research in the Energy Security Cluster is much broader and bundles research in the economic, technical and political fields, among others.

As a central actor in energy security research in North Rhine-Westphalia, the Federal Ministry for Economic Affairs and Energy, based in Bonn, is particularly noteworthy, as its Energy Policy Department deals with political issues relating to energy security. The influence of the ministry is reflected in the diversity of funded projects in the research landscape, with a high concentration in the area of sustainable energies.

This focus on more sustainable energy is also reflected by various research institutions in North Rhine-Westphalia. The majority of these are located at universities and colleges. For example, the NOWUM-Energy Institute at Aachen University of Applied Sciences focuses on climate protection and renewable energies, as does the Future Energy Institute at the Ostwestfalen-Lippe University of Applied Sciences, which primarily conducts research on renewable energy supply and storage. In the non-university sector, the Wuppertal Institute for Climate, Environment and Energy should be mentioned, a think tank that conducts research on energy, especially in connection with climate change and environmental protection. The JARA research association of the Jülich Research Centre and RWTH Aachen University also focuses on research on renewable energy. Among other things, the focus here is on investigating the possibilities of generating energy from hydrogen. In addition, the SynErgie project is investigating the extent to which energy-intensive industrial processes can be made more flexible in order to adapt industrial electricity consumption to fluctuating generation from renewable energies.

Various other university institutes are also active in technical research. The Centre for Sensor Systems (ZESS) at the University of Siegen, for example, is conducting research in the field of sensor development, which is used in damage diagnosis and can thus also be used in energy supply protection.

In the area of non-university research, the German Aerospace Centre (Deutsches Zentrum für Luft und Raumfahrt, DLR), among others, is represented in energy security in addition to research on space security.

Another research focus in the field of energy security in North Rhine-Westphalia is energy economics. The Institute of Energy Economics (EWI) in Cologne, for example, produces energy economic analyses with the aim of creating the greatest possible knowledge gain for energy policy and energy industry practice, and at the Faculty of Economics and Social Sciences, a research group on the thematic focus “Energy Transition and Climate Change” not only establishes the link between energy security and the economy, but also between energy security and climate change.

Furthermore, in areas of development research that are closely intertwined with the field of energy security, the Centre for Development Research at the University of Bonn, among others, is represented by the project “Water and Energy Security for Africa” (WESA), primarily conducting research on water and energy security on the African continent. Moreover, with EUCERS at CASSIS, the University of Bonn has

also a dedicated section that does research on both energy and climate security matters from a strategic perspective. Lastly, the field of nuclear energy should be mentioned, on which, for example, the Jülich Research Centre works and which focuses, through its Institute for Energy and Climate Research, on the security of nuclear supply, the nuclear fuel cycle and the operation of nuclear systems. The Aachen Institute for Nuclear Training (AINT) should be mentioned as an economic actor active in research as well as competence building in the field of nuclear technology. The Gesellschaft für Anlagen- und Reaktorsicherheit (Society for Plant and Reactor Safety) in Cologne is also located in North Rhine-Westphalia and conducts research in the areas of reactor safety, waste disposal and radiation protection; topics that can also be assigned to the energy cluster. The company also conducts research projects on geothermal energy. In summary, it can be concluded that research in the energy security cluster is very broad. At the same time, a closer look at the research projects listed in the wiki reveals that they are often transdisciplinary in nature, with studies on energy security, for example, being directly linked to the fields of climate or cyber security.



#### 4. Interview with Prof. Dr. Manfred Fishedick

*Prof. Dr.-Ing. Manfred Fishedick is Scientific Director of the Wuppertal Institute for Climate, Environment and Energy and Professor at the Schumpeter School of Business and Economics at the University of Wuppertal.*



**Wuppertal  
Institut**



**Sicherheitsforschung.NRW:** *Dear Prof. Fishedick, thank you very much for taking the time to talk about the Sicherheitsforschung.NRW project. In your opinion, what makes security research a topical issue?*

**Prof. Dr. Fishedick:** We are in a globalized world in which, unfortunately, numerous conflicts and political instabilities can still be observed in many regions of the world. In addition, there are political actors who are in power in some countries but have, diplomatically speaking, a dubious reputation. In this respect, security research is a top issue and so are security policy issues. As a globalized world, we are dependent on flows of goods and logistics, and in addition we are confronted with the refugee problem. Thus, there are many different security policy issues and these belong at the top of the agenda.

**Sicherheitsforschung.NRW:** *In your view, to what extent is the topic of energy important in the context of security research? And perhaps also related to this, how does energy stand out from other subject areas in the field of security?*

**Prof. Dr. Fishedick:** First of all, energy or energy sources are internationally traded goods. And we know from the past that there have always been conflicts and disputes over oil or gas. For example, we are currently dealing with the trade policy dispute over Nord Stream 2. In this respect, energy was a security policy issue in the past, and it still is today, as the debate over Nord Stream 2 shows, and it will probably remain to be in the future, as questions are already being asked, for example, about the supply of hydrogen or hydrogen-based energy sources. In addition, there is an increasing shift to global energy source flows, which means that there are always geopolitical aspects involved, i.e. risk aspects. A second point, which is certainly another security policy issue, is cyber security. We live in a digitalized energy world. This means that our electricity systems in particular are quite vulnerable to attacks from outside. Cyber-crime is therefore also a security policy issue. Indirectly related to energy issues is, of course, also always water. Water is needed to run power plants and, in the future, to produce hydrogen. In many regions of the world, however, water is a highly controversial issue. I could extend this list indefinitely.

In the energy sector, there is a whole range of interfaces with security policy aspects that not only concern crisis situations, but also sabotage dangers. This multi-layeredness thus perhaps distinguishes the topic of energy from other topics that may be rather one-dimensional in terms of security policy aspects.

**Sicherheitsforschung.NRW: Which current debates and topics within the energy and security nexus do you see as particularly relevant?**

**Prof. Dr. Fishedick:** Actually, all the ones I just mentioned. The big issue that will now become relevant is actually the question of where we will get enough hydrogen in the future, which will be needed in many areas of application. We know that we do not have sufficient potential in Germany, at least to produce so-called green hydrogen. We know that we may have to become active in regions of the world that we consider relatively unstable from a geopolitical point of view, such as the Middle East and North Africa. We are of course also looking at Australia, Canada and Chile, but Russia and Ukraine are also within the discussion. Security policy aspects include the questions of how to design the hydrogen supply in order to ensure a high level of supply security and not have to constantly think about the risk of supply bottlenecks. That is why this is also one of the top issues we are dealing with as an institute.

**Sicherheitsforschung.NRW: In your view, to what extent are citizens affected by any dangers or challenges in the field of energy?**

**Prof. Dr. Fishedick:** I don't think that citizens will necessarily feel the negative effects directly. There is much more of an indirect impact due to the dangers already described around cyber security. If, for example, the power grid is sabotaged, then of course citizens are directly affected because the power goes out. So far, this danger is not very noticeable because nothing has happened yet – unlike in the USA or India, for example. The electricity system and its stability can be affected from the outside, which of course represents a security risk. In addition, there will be indirect adverse effects in the future, since – if we stay with the topic of hydrogen, for example, which is nicely captured here – the need to be in close contact with geopolitically unstable countries can automatically lead to risk surcharges and thus also to higher costs compared with other supply structures. At the end of the day, of course, citizens notice that in their wallets. In addition to the costs, there remains the fundamental risk of the physical vulnerability of the supply system. These are the sources of danger that citizens do not even notice in their daily lives – but when something happens, they notice it directly.

**Sicherheitsforschung.NRW: What is the focus of your personal research? And what aspects of the content of your personal research do you consider particularly noteworthy, especially in the context of security research?**

**Prof. Dr. Fishedick:** We as an institute and I, personally, work in an area we call transformation research. We look at the essential transformation arenas, i.e. the areas where really big changes will be necessary in the next two to three decades. This applies to the energy sector, mobility and the transformation of cities. But it also applies to industrial system transformations.

In all these areas we try to crystallize how the goals we have set ourselves as a society, for example, climate protection goals, can actually be achieved. Among other things, we work on these questions via system analysis. For example, we look at how a transformation path away from today's energy systems, which are heavily based on coal and oil, to the desired renewable energies for the year 2050 could look. In this context, we carry out multi-criteria assessments: We consider the technical possibilities, the economic aspects, questions of social acceptance, but also the vulnerability of the systems to the aforementioned aspects of external sabotage and geopolitical risks. The interplay of factors is crucial here: for example, citizens could say: "Hydrogen is all well and good, but please not from Saudi Arabia! Our oil already comes from there, now please not the green energy sources as well." We carry out such a multi-criteria evaluation for all potential new energy systems. Thus, for example, we look at how a global hydrogen infrastructure can be built, or how infrastructures for synthetic fuels from renewable energies can be built, and thus end up directly back at the geopolitical risk aspects that cannot be left out of shaping the future. On the positive side, however, one can of course also say that there is also a great opportunity in encouraging the Saudi Arabias, the Irans, the Iraqs of this world to move away from oil and towards a path based on green energy sources in the next ten to fifteen years, thereby perhaps reducing the internal social tensions they have and ensuring economic prosperity. Switching to a different business sector can substantially stabilize these regions. To give a specific projects as an example: We are currently conducting a large project for the German Federal Ministry of Economics and Technology called MENA Fuels. Within this framework, we are basically examining the entire countries in North Africa and the Middle East to see where there are any technical possibilities at all for producing synthetic fuels in the future. Whether hydrogen, ammonia or methanol, we are first looking at the production potential on a technical level. In addition, we examine whether the necessary industrial policy competences are available in the countries. This is necessary because a hydrogen production plant cannot be built without technical competence, and this should ideally already exist. So, we deal with questions like:

What is the initial situation? How could a situation develop in the future? How can energy systems be developed locally while building export markets? How could this in turn contribute to reducing risks while at the same time focusing on local economic development? In the project, we are conducting a country-specific analysis, at the end of which it will ideally become clear which three to five countries are promising and with which it would be worthwhile to establish hydrogen energy partnerships in the future. Security policy aspects play a very, very important role here, and we are also trying to break new ground methodologically by also evaluating the geopolitical risks and the risks of the regions as a whole in economic terms and including them in the cost-potential analysis, which is not trivial methodologically, but it helps to be able to make a comparative evaluation later on.

***Sicherheitsforschung.NRW: With which topics from the field of security does your personal research focus overlap and to what extent does this interdisciplinarity influence your research?***

**Prof. Dr. Fishedick:** We are primarily an institute that works interdisciplinary and even transdisciplinary. We unite about 20 different disciplines in the institute itself, so we are used to working on our projects in a fundamentally interdisciplinary way. Nevertheless, we realize time and time again that we as an institute, which has rather a generalist claim, also lack competences in regard to the highly complex problems we deal with. That's why, on the one hand, we work with technology specialists who, in the example already mentioned, can assess when a technology is mature enough to be deployed on a large scale and what the costs will be.

Of course, we also work with logistics and infrastructure experts, who know how to build global infrastructures and partner systems, how much time this takes and how flexible they are, if, for example, you suddenly realize after ten years that you now have to run completely different means of transport through this pipeline. Of course, we also work with political scientists, because at the end of the day, politically robust instruments are needed to change systems, because sufficient incentives have to be created for companies to invest. And finally, we also work with lawyers to be able to address the complex national and international legal issues. Above all, there is also cooperation with partners in the respective regions, including explicitly in the MENA Fuels project mentioned above. This is essential in order to be able to include the specific cultural backgrounds, to get to know the central actors and thus to better understand how the actors in this region act. In this respect, it is a very strong inter- and transdisciplinary, but also intercultural cooperation, especially in the thematic areas that also concern security policy aspects. In other areas, such as cyber security, we naturally work with experts who understand more about digitalization than we do. We do know where digitalization is needed and where it could be needed even more in the future. But of course we don't know in detail where and how exactly digital solutions can be sabotaged.

**Sicherheitsforschung.NRW: Are there also institutions from North Rhine-Westphalia with which you cooperate? And is there also, especially in North Rhine-Westphalia, a special area which you believe has security-relevant research to offer that is of interest to us?**

**Prof. Dr. Fishedick:** Absolutely! We are lucky to be part of the Johannes Rau Research Society. There are at least two institutes that are exciting for us. One is BICC, and the other is DIE. We work together with both of them. In cooperation workshops, for example, we look closely at different areas and see in which areas we can work together. Security policy aspects also play a role here; BICC, for example, works intensively on issues of conflict research and crisis management. For example, we also had a major joint project with BICC, which involved evaluating a solar thermal power plant in Morocco from different perspectives. This was done from very different perspectives, which were on the one hand technical-economic, but also dealt with questions such as: What are actually the impacts of the power plant on the ground? What do the local people gain from such a power plant? Does it lead to conflicts or can positive socio-economic contributions be made locally? Cooperation with institutions such as BICC is important and invaluable.

**Sicherheitsforschung.NRW: How do you assess the networking among the actors researching security topics in North Rhine-Westphalia?**

**Prof. Dr. Fishedick:** In my observation, this has increased greatly in recent years because the state has also tried to connect more potential partners, for example through energy research dialogues. Here, too, digitalization is an asset, of course, so that people simply know more about each other. Another good example of networking is the Johannes Rau Research Society, which brings together very different institutions. For example, the fact that we have defined guiding themes and regularly exchange ideas on these guiding themes results in intensive networking.

In order to find out whether cooperation is potentially possible, you first have to know about each other. There are also many other large-scale projects in the state in which many institutions work together. For example, we coordinate the scientific part of the state initiative IN4Climate.NRW. This is an initiative for climate-compatible large-scale industry, which is about how the steel, chemical, cement, lime or aluminum industries can become climate-compatible. We work together with the Fraunhofer Institutes, with RWTH Aachen University and with the Institute of German Business in Cologne. This complementarity of competences is essential for this and other projects because today there is hardly a transformation challenge that can be served from a single perspective. Even though the Wuppertal Institute is already broadly positioned, it still makes sense to work together with others – and that is also fun and enjoyable. Overall, North Rhine-Westphalia is really well positioned in the field of research. Of course, this is especially true in the area of technology research; North Rhine-Westphalia is very strong here, with institutions such as RWTH Aachen University, TU Dortmund University and the University of Duisburg-Essen. But the state has also done a lot in the area of social science research.

In our very own field of transformation research, there is still a large gap with regard to legal competences, for example. In the projects, we keep coming back to the point where we ask ourselves how the whole thing can be legally evaluated, how new regulations and policy instruments can be set up with legal certainty and how they fit together with European law or WTO law. Even in this small, manageable area of energy system transformation, there are unfortunately only very, very few actors who really know their stuff, and unfortunately only a few of them are located in North Rhine-Westphalia. So there is a real gap here, and more could be done. I would like to mention another example where more competences could be built up. In North Rhine-Westphalia we have a lot of practical experience with structural change, for example in the areas of steel or hard coal,

and we are currently in the middle of structural change in lignite. A lot of research has already been done in this regard, but in my opinion, there is a lot of room for improvement in order to penetrate even deeper into the system's interrelationships.

***Sicherheitsforschung.NRW: What do you expect from a perhaps even more comprehensive networking of security research actors within North Rhine-Westphalia and beyond at the national as well as European or international level? And how could your research at the Wuppertal Institute benefit from this?***

**Prof. Dr. Fishedick:** I have already given half an answer to that. If you deal with highly complex issues, as we and others do, networking is simply extremely important. Without it, you can't do anything. Today, you need many specialized disciplines, and you need some generalists who look at the highly complex transformation processes in context and try to look for solution options together and work on them. That is what science does: we can only name solution options and alternative courses of action, we can try to systematically evaluate and classify them. But the decisions have to be made by others, by those responsible in politics and business. This also requires networking: scientific findings must be prepared in such a way that politicians and businesses can make decisions. In some cases, science is not particularly good at preparing its findings in such a way that they can be 'consumed' and processed by the decision-makers in the short time they have and in the associated complexity. Connecting of competences is also useful for this task.

However, networking does not mean working on projects together; the fundamental added value already exists in the pure exchange of experience. That is why I am very grateful that the state government has created important networking platforms through the Energy Research Network and other research networks. Of course, this does not only apply to the regional level in North Rhine-Westphalia. Networking is also important at the national level. The Federal Ministry of Economics and Technology and the Federal Ministry of Research are doing a lot in this area, but sometimes the biggest problem is that although there are networking platforms, there are so many players that it can be difficult to network. If you just take the example of hydrogen and look at a networking meeting of the Federal Ministry of Economics and Technology, where suddenly a thousand actors are sitting, then of course interaction is not possible simply because of the sheer volume.

And with regard to the European and international level: I myself am a member of the Intergovernmental Panel on Climate Change (IPCC), which is also a networking body of scientists. We are trying to work out joint solution options for the global climate crisis. This is an inter- and multicultural body per se. We are 120 authors from 60 different countries, which is highly exciting and highly diverse. But that's exactly what is needed to solve these global issues, because the energy supply in South Africa, for example, has to be looked at very differently from the energy supply in Canada or Korea. You can only do that by not only bringing together experts from different disciplines but also by having them come from different disciplines and from different regions of the world. International networking is simply mandatory for solving the many global problems we face.

**Sicherheitsforschung.NRW: You are mentioning problems. What security policy challenges do you see for the future, for the research field of energy and security? And from your point of view, are there already initial thoughts on measures and approaches that can be assessed as relevant to research for overcoming this challenge?**

**Prof. Dr. Fishedick:** I'll come back to my example of hydrogen. Here we have learned from the past. It has been recognized that over decades we have repeatedly been in crisis situations in the field of energy supply and that is why we now have a much more alert view of the energy supply systems of the future and try not to get into such one-sided dependencies in the first place. At least we know that before entering into cooperation with more unstable, more risky regions of the world, we give careful thought to how these can be protected so that situations, like in the 1970s, of one-sided dependencies on two or three suppliers from other regions of the world can be avoided. In the oil sector, there is now a very diversified structure in which it is not so bad if one partner fails because the other can step in. This is something we are now paying attention to earlier, and we see it as a major challenge for the future. Diversification must also be possible in the hydrogen sector. As a general rule, people say: The closer you are geographically, the better. That would speak in favor of the MENA region, but stability considerations do not. If we think of Australia, which is further away but democratic and stable, the disadvantage is that hydrogen first has to be liquefied, which costs a third of the energy. In this situation, only a multi-criteria evaluation can help, in which security policy issues also play a very relevant role. Security policy has therefore become a very important issue for us, too, and considering the global challenges, it simply has to be.

**Sicherheitsforschung.NRW: Dear Professor Fishedick, thank you very much for the interview!**



# Cluster Extremism

## In a nutshell

- The field of extremism and radicalization is divided into four areas: Right-wing extremism, left-wing extremism, Islamist extremism and foreign extremism without an Islamist background. In Europe, the topics of right-wing extremism and Islamic extremism have become the focus of the security policy debate in recent years.
- The phenomenon of Islamist terrorism continues to be perceived as a threat within the population even after the territorial dismantling of ISIS. Thus, combating it is a priority at national and international level and manifests itself in increased global cooperation within international organizations.
- Interconnectivity at multiple levels is a distinctive feature. Thus, the different fields of extremism, as well as the actors in research and politics, are closely intertwined. Counter-extremism measures are characterized by cooperation between politics, civil society and the realm of research.
- The federal state of North Rhine-Westphalia offers a breeding ground for radicalization structures due to its population density and is increasingly the site of violent extremist acts. This is where the need for extremism research comes in, which not only recognizes the backgrounds and contexts of radicalization processes, but also advises politicians on the prevention of violent extremist acts.

In recent years, the global security policy debate has been strongly influenced by the topics of extremism and terrorism. Triggered by violent attacks and extremist tendencies around the world, the population's concern is increasing and the influence of these issues on the security policy debate is growing. Research to better understand these threats and to prevent them has thus become increasingly relevant, also in Germany and North Rhine-Westphalia.

## 1. Conceptual understanding

Radicalization should be understood as the origin of extremism, as it describes the process by which a person becomes an extremist. It is a complex phenomenon on which factors such as individual psychological dispositions, social development and a person's private social environment have a strong influence. A key role in radicalization is being part of a defined social group and the active, hostile dissociation of this group from 'others'.

Since radicalization is to be understood as a process, it is difficult to determine a precise moment when it is completed and a person becomes an extremist. However, radicalization is not synonymous with the use of violence, which is why a distinction is made between cognitive and violent extremism.

The concept of political extremism allows for focusing upon the topic from a different perspective. By definition, political extremism in liberal democratic societies rejects the democratic constitutional state and focuses on the intention to eliminate it. A distinction is made between different types of political extremism. The basic types include left-wing and right-wing extremism. While left-wing extremism criticizes the existing market-based economic and social system and sees, for example, communism as a way out of this structure, right-wing extremism focuses on (often racist) nationalism. In addition, extremism research is examining religiously motivated fundamentalism as an independent branch of political extremism (in which, for example, a theocratic state is sought) as well as ethnic, ecological and regionalist extremism.

Beyond the term 'extremism', the term 'terrorism' is used to describe the threatened or executed use of illegal violence by state and non-state actors to achieve a political, economic, religious or social goal. In particular, methods of generating fear and intimidation, for example through armed attacks or other forms of violence (or the credible threat of violence), are used to achieve overriding political goals.

Some critics of extremism research point out that extremism is not a marginal phenomenon of society, but argue that all social strata display extremist tendencies. Accordingly, the two-dimensionality (left-wing and right-wing extremism) often used to categorize extremism conceals this fact. Relevant for the further development of extremism research was a reorientation of its research focus. The focus of extremism research has increasingly shifted from fundamental root cause research to research into possible preventive measures, which is also reflected in the research landscape in Germany and especially in North Rhine-Westphalia.

In addition to various forms of organized crime, extremism poses a central threat to the internal security of the state and society. This is especially true for liberal democratic states with a western character. Wilhelm von Humboldt saw the enlightened European constitutional state as responsible for protecting individuals from violent attacks by their fellow citizens and from unauthorized access by state authorities.

From a political science point of view, guaranteeing this state task is one of the primary functions of the modern state and a source of its legitimacy (and thus also that of its security organs: if they allow themselves to be turned into tools of repression also of those parts of the citizenry that act in conformity with the constitution, they inevitably lose legitimacy). Today's European states must fulfill this fundamental protective task for an increasingly heterogeneous citizenry. Through its opposition to the democratic constitutional state, in which the competition of conflicting political views is civilly regulated by democratic-parliamentary procedures, political extremism (especially in its violent-combative variant) can quickly become a veritable security challenge to the state's ability to guarantee the safe coexistence of its citizens. The link between counter-extremism and state security policy is thus obvious.

Terrorism, the militant form of extremism, aims at spreading fear and terror and thus endangers not only the state order but also and in particular the physical, psychological and social integrity of citizens, thus affecting core issues of human security.

Due to the transnational danger of extremism and terrorism, a global relevance, which is demonstrated, among other things, by the large number of extremist/terrorist attacks, is obvious. Accordingly, the international security policy debates of the 21st century are particularly characterized by the threat posed by and the fight against terrorism, with Islamist terrorism in particular drawing attention. The attacks in Paris, for example, but also the attack on the Berlin Christmas market in 2016, have made this exceptionally visible in the public perception in Europe and Germany.

Although, according to the Federal Ministry of the Interior (Bundesinnenministerium, BMI), international Islamist-motivated extremism poses the greatest extremist threat to security in Germany, political Extremism from the right and left should not be overlooked in the debate. Although these should initially be understood as phenomena that are primarily domestically rooted, they are nevertheless closely linked to the global security situation. For example, right-wing extremism, which itself occurs in international networks, is fostered among other things by

Islamist terrorism, in the sense that terrorist attacks abroad increase the fear of such attacks in Germany, whereupon racist and right-wing resentment toward immigrants can gain a foothold in society. This can result in a dwindling sense of democracy and a rejection of cultural plurality within the population. According to the Federal Ministry of the Interior, right-wing extremism thus poses a considerable threat to security in Germany and the peaceful coexistence of society.

In 2020, right-wing extremist offenses accounted for 3,389 of the 6,533 politically motivated offenses in North Rhine-Westphalia, according to the Report on the Protection of the Constitution. Almost 76% of these offenses were classified as propaganda offenses, such as the display of a swastika in public places and incitement to hatred (2,567). The number of violent offenses fell to the lowest level in a 10-year comparison (146), which, among other things, shows the great success of existing prevention and deradicalization programs in the state.

In the same year, 1,430 cases were registered by left-wing extremism, which at first glance appears to be significantly fewer than by right-wing extremism. However, if the propaganda crimes in right-wing extremism are excluded (for which there is not a real equivalent for left-wing extremism in German law), the two figures converge significantly. The proportion of violent crimes in the total number of politically motivated crimes is similar for left-wing extremism (135) as it is for right-wing extremism. Moreover, it also fell to the lowest measured value in a 10-year comparison. It seems likely that this can also be attributed to the changed situation of the occupier scene in Hambacher Forst, where a large proportion of the violent left-wing extremist crimes were recorded in previous years. Moreover, in the debate on left-wing extremism, reference is often also made to the riots and looting in the context of the G20 summit in 2017. Both examples highlight the international nature of this political brand of extremism, as the protests were not only carried out by German left-wing extremists, but also by members of international groups who had traveled to the area.

At the same time, the examples of the Hambach Forest and the Keyenberg Forest near the Garzweiler open-cast mine also show cross-connections to a climate movement that is radicalizing in parts and for which violence is a legitimate tool for implementing its ecological goals in order to achieve the desired change of central pillars of the liberal democratic constitutional state.

In addition to the international connection, which is increasingly strengthened by social networks, the international impact of extremism is expressed by the fact that right-wing and left-wing extremism not only influence the political landscape of the individual state, but also its foreign policy actions and thus indirectly have an impact on international politics. For example, authoritarian or totalitarian ideas of society have not disappeared in most democracies, which is also noticeable in some European states and influences the actions of the EU and its members among themselves. Overall, extremism threatens democratic constitutional states in Europe in many ways, with the potential threats varying from country to country.

In general, extremism lies at the interface of internal and external security. Therefore, cooperation between all respective ministries is essential in order to be able to successfully combat the causes and excesses of extremism.

## 2. Internal Security and Extremism in Europe and Germany

Far-reaching political actions in the aftermath of the 9/11 attacks in particular show that they can often be seen as a direct reaction to extremist/terrorist acts. In autumn 2001, for example, a Counter-Terrorism Group (CTG) was set up following a decision by the Council of EU Justice and Home Affairs Ministers on September 20, 2001, to exchange information on individual aspects of Islamist terrorism and to identify causes and countermeasures.

In 2005, the EU also developed an anti-terrorism strategy ("EU Counter-Terrorism Strategy") and, as of 2011, a network (Radicalisation Awareness Network, RAN), which brings together academics and practitioners to exchange knowledge and experience on radicalization and to jointly develop it further. Another milestone is the 2020 European Agenda on Security, which emphasizes, among other things, the importance of a society-wide strategy for common security and countering extremism.

When reflecting on the political responses to the extremist and terrorist threat, it is striking that in Germany there is a clear focus on prevention when it comes to countering extremism. Thus, targeted



measures are taken to prevent progressive radicalization in its early stages or to counteract it, for example, through a differentiated strategy that emphasizes social work and family support. Germany, with its variance in prevention models, national cooperation, and transparent regulations can therefore hold a distinguished position due to its focus on extremism research and policy. A national coordination strategy for extremism prevention would be beneficial for coherent cooperation between the federal states. The complexity of extremism prevention and democracy promotion makes it clear that this is a task for society as a whole and for all segments of the state, in which politics and civil society as well as research and security institutions must work together more closely at the regional, national and international levels.

### 3. Research landscape in NRW

In its report on measures to prevent extremism for the years 2012 to 2017, the state government identifies precisely these preventive strategies as essential for combating extremism and emphasizes specifically education and the provision of information for all relevant target groups, the promotion of civil society engagement and the networking of actors in prevention work as key areas of action. The goal is close cooperation between civil society and government agencies.

Public attention focuses on law enforcement agencies. In addition to the State Office of Criminal Investigation and the Military Counter-Intelligence Service in Cologne, the Federal Office for the Protection of the Constitution and the North Rhine-Westphalian Office for the Protection of the Constitution also support academic security research and use their findings.

Within these focal points, the focus in North Rhine-Westphalia is primarily on right-wing extremism and religiously motivated extremism and terrorism; left-wing extremist and ecological extremist movements are seldomly studied by North Rhine-Westphalian research institutions, although they are increasingly observed by the security authorities due to the challenges they pose to the internal security of the state.

Research also plays an important role in North Rhine-Westphalia in terms of practical findings. For example, the reports on the protection of the constitution in recent years repeatedly mention positively and explicitly the work of the network CoRE-NRW (Connecting Research on Extremism), which is coordinated by the Bonn International Center for Conflict Studies (BICC) and serves as a competence network primarily for research on right-wing extremism and Islamist extremism. Among other things, it promotes the scientific exchange of the network partners with relevant security authorities.

In the area of non-university research, the focus is also on research into radicalization processes and the prevention and countering of extremism. The Thomausius Research Institute on Political Extremism (TPX) in Düsseldorf, for example, focuses on the analysis of strategies for the prevention of radicalization processes and de-radicalization. It also looks at conflict regulation and prevention as well as the causes and manifestations of extremist currents. Social developments in Germany and abroad regarding the development of the extreme right, antisemitism, antiziganism, terrorism, as well as conflict regulation and prevention are dealt with by the Duisburg Institute for Language and Social Research (DISS). BICC is also a prominent research institution, both representing the societal sphere in its role as a non-governmental organization (NGO) and researching, among other things, the prevention of radicalization in its work, with this being studied in the context of peace and conflict research, migration, the military, armaments and international security.

The differences between the numerous practical and scientific approaches in North Rhine-Westphalia offer the fruitful possibility of an exchange of experience and knowledge, which represents a unique situation and opportunity across the various disciplines and actors in the federal state concerned with countering extremism.

#### 4. Interview with Dr. Marc von Boemcken

*Dr. Marc von Boemcken is a member of the senior management of the Bonn International Center for Conflict Studies (BICC), where he is Head of Research.*

**bicc** Bonn  
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for Conflict Studies



**Sicherheitsforschung.NRW:** *Dear Dr. von Boemcken, thank you very much for taking the time to talk about the Sicherheitsforschung.NRW project. In your opinion, what makes security research a topical issue?*

**Dr. von Boemcken:** First of all, I don't necessarily believe that security research is more topical or relevant today than it was ten, 20 or even 50 years ago, e.g. during the Cold War. In my view, security research is always topical when one feels particularly threatened. Threats and threat perceptions change constantly, of course, as does the way they are dealt with politically. But they are not necessarily increasing, and I believe that scientific monitoring and investigation of these processes is important at all times. What I find fascinating about your question, however, is what security research is in the first place. What do we mean by security research? And here I would like to make a distinction between two approaches to security. For many researchers, security is an objectively measurable state; you can have either more or less security, and security research would accordingly have the task of determining this state, measuring it, but also developing recommendations to increase security. How can we increase security from a particular threat? The consequence is: If the security level of a society is classified as low, then security research is all the more topical, all the more relevant.

My own approach to security research is somewhat different. From my perspective, security is less a state that can be measured. Security is a certain political practice that is characterized, among other things, by the fact that it suspends, at least temporarily and in part, previously valid norms of social coexistence. It must therefore always be critically questioned. Accordingly, I place myself in the so-called critical security research.

**Sicherheitsforschung.NRW:** *In your view, to what extent is the topic of extremism important in the context of security research? And how does extremism stand out from the other topics in the research field from a security policy perspective?*

**Dr. von Boemcken:** From the perspective of critical security research, the term extremism itself is not entirely unproblematic. What does it describe in the first place? One could say that 'extremism' generally stands for a rejection of the prevailing social and political conditions. From this perspective, however, different political currents that are critical or even hostile to the social order for very different reasons are lumped together. For example: right-wing extremism, left-wing extremism, Islamism. If we lump all these phenomena together with the concept of extremism, this implies to some extent that they are all similar or even equally dangerous.

I think that this is not a good onset for a serious scientific examination of these diverse political movements. I also find it problematic to place 'extremist' movements exclusively in the context of security research. By doing so, we are implying that these are primarily security problems, phenomena that we cannot deal with within normal political processes. They elude democratic political discourse and must be combated by police measures. In my view, the moment I call someone an extremist, he is no longer politically worthy to be discussed with, but instead poses a danger that must be eliminated. Especially in authoritarian systems, it is easy to see that the attributions 'extremist' or 'terrorist' are used to eliminate political opponents. Extremism is thus an important topic in critical security research, but not as a collective term for certain political currents – one should rather speak of non-state violent resistance movements there – but as an expression of a certain practice of 'securitization' that seeks to delegitimize political opponents.

***Sicherheitsforschung.NRW: Which current debates and topics within the research field of extremism do you see as particularly relevant? And where would you currently readjust?***

**Dr. von Boemcken:** Firstly, I think it is important to recognize that the concept of extremism conceals political conflict constellations. It is interesting that these are not the focus of so-called extremism or radicalization research. Much of the research field is concerned with factors of individual radicalization at the micro level (e.g., personal crises, family conflicts, criminal careers, and psychological problems). In the big picture, violent political resistance movements often therefore appear as a marginal phenomenon and are depoliticized. I think we need more studies

that identify the political conflict behind 'extremism' and examine it using the classical methods of conflict analysis. To do this, we need to look not only at the individual extremist or extremist group, but focus on their interaction with other conflict parties (such as states or other social groups). One should examine reciprocal provocation and escalation dynamics – and observe how parties fuel each other. Radicalization does not only take place in individuals or small groups, but involves all conflict parties. I would like to see more research on resistance movements in Germany and Europe. I think extremism research can learn a lot from the approaches of social movement research, especially on the mobilization of non-state armed groups in the conflict contexts of the South.

Secondly, there has been little research on prevention so far. This also applies to the concept of prevention itself. Radicalization prevention, for example, works with models that are still based on medical typologies from the 1960s and 1980s – models, in fact, that were developed for the prevention of infectious diseases. In my view, these can only be transferred to social phenomena to a limited extent.

A third, very topical issue is the demonstrations against government restrictions in the wake of the Corona pandemic. Here, peculiar alliances are emerging. On the one hand, we have people from the classic right-wing extremist spectrum who openly sympathize with National Socialism. On the other hand, we see people who would rather be assigned to the left-wing camp and who demonstrate against a supposed return of National Socialism. Both groups protest side by side and seem to have no problem with this at all. These are apparent contradictions that pose puzzles and blur the classic political constellations – an interesting development that begs to be fathomed.

***Sicherheitsforschung.NRW: In your view, to what extent are citizens affected by threats and challenges in the field of extremism?***

**Dr. von Boemcken:** The danger of falling victim to a terrorist attack in Germany is vanishingly low. The situation is different with right-wing extremist crimes, which according to police crime statistics have increased in Germany over the last ten years. In my view, the danger is therefore less the spectacularly staged terrorist attack, but rather the everyday harassment, assault, sometimes even killing of social minorities because of racist and anti-Semitic attitudes, in many places also because of sexual moral norms. In Kyrgyzstan, I myself have been able to observe first hand peculiar security practices of lesbians and gays, what it means to have to live in a state of permanent, existential danger because one could become the victim of an attack at any time. In Germany, there is a lesser feeling concerning threats of this kind, but still, many people live in a permanent state of danger, because in some areas they have to fear being the target of a right-wing extremist-motivated attack at any time.

***Sicherheitsforschung.NRW: What is the focus of your personal research?***

**Dr. von Boemcken:** The focus of my work is, of course, security research and critical security research in general. At BICC, we focus primarily on the ambiguity of organized violence. On the one hand, organized violence is a precondition for security, for example in the form of the state monopoly on the use of force. On the other hand, it is also a precondition for insecurity, for example for armed conflicts, wars and even genocide. At BICC, we look less at macro-structures such as international relations or international law in this regard, but work mostly with an empirical approach at the local level: How do practices and ideas of organized violence, of security and insecurity, manifest themselves in people's everyday lives? I can gladly give two concrete examples from my research on this. In a research project of the

Volkswagen Foundation, we studied the everyday security practices of acutely threatened social minorities in Central Asia over a period of several years. How do these people secure themselves in their everyday lives? I think the findings of this research are also of broader theoretical and conceptual significance for the field of security studies. For example, the practices we studied were less about drawing boundaries or differentiating between 'us' and the 'others'; they were not so much about making subjects visible and setting them apart-all practices that one would traditionally associate with security. Here, however, security consisted, on the contrary, in disguising oneself, not in drawing, but in crossing boundaries, in withdrawing and making oneself invisible. Thus, at the local level, one finds security practices that are radically different from state security practices. This is very interesting on a theoretical-conceptual level.

My second example has a much stronger practical reference. In the research project "Prevention of Radicalization in North Rhine-Westphalia", we are investigating the local needs and challenges of various prevention projects in the state with funding from the state government of North Rhine-Westphalia. For example, we go to schools and youth centers and talk to people who run prevention projects in these places, e.g. teachers or social work professionals. What are the particular challenges and needs that exist in this area? One finding that I found particularly interesting is that, especially in the field of Islamism prevention, there are always unintended stigmatization effects that have a counterproductive effect. Some young people with a Muslim family background perceive very clearly that certain youth work projects are only done with them because they are considered potential terrorists. In my view, more sensitivity is needed here. In general, there is a danger that normal social work with young people is increasingly connected to prevention and thus subjected to a security logic that stigmatizes certain milieus. These are important findings, not only for research, but also for politics, which help to develop and promote such prevention formats.

**Sicherheitsforschung.NRW: What role does inter- or transdisciplinarity play for you? Are there any specific cooperation partners for you?**

**Dr. von Boemcken:** As an institute, we work with many foreign and domestic partners. But I would particularly like to emphasize our good networking in the state of North Rhine-Westphalia. BICC cooperates with a whole range of research institutions in the state, all of which work on topics that are important for the field of security. These include the German Development Institute (Deutsches Institut für Entwicklungspolitik, DIE), which, together with BICC, is a member of the Johannes Rau Research Society, an association of non-university research institutions in North Rhine-Westphalia. We also work with university-affiliated institutes of peace, conflict and violence research in the state – for example with the Institute for Development and Peace (Institut für Entwicklung und Frieden, INEF) in Duisburg or – especially when it comes to the topic of extremism – the Institute for Conflict and Violence Research (Institut für Konflikt- und Gewaltforschung) in Bielefeld.

At BICC, we also coordinate the CoRE-NRW research network, which is funded by the state government. CoRE stands for “Connecting Research on Extremism”. The network brings together researchers from very different disciplines and career stages to exchange ideas on issues relating to extremism. Key-word transdisciplinarity: The network attaches great importance to the transfer of research findings into policy and practice. The workshops and network meetings that we organize regularly are attended not only by academics but also by practitioners, for example from prevention projects or representatives of state ministries. CASSIS is also cordially invited to attend.

**Sicherheitsforschung.NRW: You have highlighted North Rhine-Westphalia’s good networking in the field of extremism research. Where do you still see room for improvement?**

**Dr. von Boemcken:** If you look at what is being worked on in North Rhine-Westphalia in the field of extremism research, gaps also become apparent. Within the framework of CoRE-NRW, we produce a research report once a year that lists all the research projects in the state in the field of extremism. This includes not only projects funded by the state government, but also participation by research institutions in North Rhine-Westphalia in larger collaborative projects such as those funded by the BMBF or the EU. The section shows that North Rhine-Westphalia is very well positioned overall, but I still see a weak point. In the past, the projects funded by the state government in the area of extremism research focused exclusively on Islamism, or on extremist Salafism. In contrast, there is very little funding for research into right-wing extremism, even though the state’s Minister of the Interior now sees the greatest danger here. So I see a certain imbalance here. However, I would also like to say that this is changing at the moment. In the last round of funding, the state is increasingly supporting research projects on right-wing extremist movements and ideologies. I very much hope that this will also be the case in the future.

**Sicherheitsforschung.NRW:** *You mentioned left-wing extremism earlier. What is the situation in this area from your point of view?*

**Dr. von Boemcken:** There are some researchers in the country who also look at left-wing militancy. Nevertheless, it has to be said that there are far fewer of them, compared to right-wing extremism or Islamism. Of course, it is right and important to also research this area of political resistance. However, I would find it difficult to put left-wing extremism on the same level as right-wing extremism or Islamism. This is also somewhat related to what I said at the beginning. The general concept of extremism lumps all movements together. It is true that one can recognize a number of parallels between Islamists and right-wing extremists – especially with regard to group-related misanthropy. In my view, however, the so-called ‘left-wing extremists’ are a different matter. The vast majority of them do not represent an ideology that is anti-human at its core. That doesn’t mean that I approve of setting cars on fire. But I think this is really a different phenomenon, which – although certainly interesting as a research subject – simply does not belong in this series.

**Sicherheitsforschung.NRW:** *In which topics do you see a need for improvement in North Rhine-Westphalia, also beyond the research area of extremism?*

**Dr. von Boemcken:** I would welcome it if the state government, in its research funding on topics of internal security, would promote more projects that do not only deal with ‘extremist movements’, but also shed light on the larger and smaller structural causes of social conflicts in the country as well as the conflicts themselves and the way they are carried out. This then touches on questions of social and political participation, for example. I find research projects that want to understand and comprehend socio-spatial conflict constellations at the local level exciting. To what extent do social conflicts arise in certain social spaces and what possibilities are there for dealing with them and ensuring that they do not lead to violence? This is a question that partly overlaps with extremism research but clearly goes beyond it.

**Sicherheitsforschung.NRW:** *What would you expect from stronger academic networking of the actors in the field of security research in North Rhine-Westphalia?*

**Dr. von Boemcken:** First of all, I think security research is a very narrow field of research. I think that we should not leave research into the listed phenomena in the field of ‘extremism’ to security research alone. This means that networking should go beyond pure security research. I myself take a political science perspective when I understand ‘extremism’ as an expression of political conflicts, for example. But I believe that we need an interdisciplinary perspective to better understand these phenomena. Let’s take Islamism as an example: this is not just a topic for security researchers, although of course violent jihadists pose a threat.

It is also a topic for Islamic scholars, for researchers in sociology, criminology, psychology and also education, insofar as political Salafism is a youth phenomenon. Researchers in the field of social work are also needed. This also applies to research on right-wing extremism. The exchange within the framework of CoRE-NRW shows again and again how much the field of research benefits from an interdisciplinary dialogue.

***Sicherheitsforschung.NRW: What security policy challenges do you see for the research field of extremism in the future?***

**Dr. von Boemcken:** A very big challenge is undoubtedly the social polarization dynamics that are currently manifesting in a series of protests and protest movements on the right-wing edge of society. Within the United States, we have seen this in the storming of the Capitol. In our country, we have the aforementioned Corona demonstrations and, more generally, a strengthening of right-wing populist, but also far-right movements. Dealing with these developments is a political challenge. I very much hope that it does not become first and foremost a security challenge. Research has to show ways to re-engage the people who join or sympathize with these movements in a political discourse that prevents their further violent radicalization. More specifically: How can we create formats and offerings, especially at the local and municipal level, to resolve social conflicts, which always exist and which should always exist in a democratic society, without violence? I see a major challenge here.

***Sicherheitsforschung.NRW: Dear Dr. von Boemcken, thank you very much for the interview!***

# Cluster Space Security



# In a nutshell

- The use of outer space for civil, commercial, military and intelligence purposes has become indispensable in modern times, so that many technologies are dependent on the peaceful use of outer space and the further development of technical possibilities. Accordingly, this dependence also entails risks, which is why the use of outer space is of considerable importance for maintaining security.
- Space security refers to guaranteed access to space and the ability to use it freely for various purposes. Nowadays, a three-dimensional definition of space security is used, which includes the use of space for security and defense purposes, the protection of space resources and systems, and ensuring the sustainable development of space activities.
- Security is understood as an integral part of the EU's space policy. Most space technologies, infrastructures and services can serve both civil and military objectives and thus contribute to the development of the European defense technological and industrial base. Accordingly, space-based systems make an important contribution to the EU's common security and defense policy.
- German space policy is based on four pillars: Participation in EU institutions, participation in long-standing special EU programs, the national space program and the underlying space strategy, and support for German space research at the German Aerospace Centre (Deutsches Zentrum für Luft- und Raumfahrt, DLR). In this context, German technology is considered leading in the field of Earth observation and remote sensing.
- Quantitatively, the Space Security Cluster is the smallest of the five identified security research clusters in North Rhine-Westphalia. However, with the German Aerospace Centre, the Space Command, a few very relevant Fraunhofer institutes and a branch of the knowledge portal of the United Nations Office for Outer Space Affairs (UNOOSA), leading players are expanding North Rhine-Westphalia's research landscape in this forward-looking field. Research in this field is also being conducted at the local universities, so that a multi-layered composition of actors can be identified overall. As a result, North Rhine-Westphalia stands out in comparison with other German states.

When we talk about space research, we mean the use of (nearby) space for practical purposes of life on Earth and not the exploration of distant galaxies. These uses are manifold and it is hard to imagine today's world without them: no navigation, whether in a car, plane or ship, can do without satellites today. Television and radio channels, fixed and mobile radio services of everyday telecommunications, weather forecasts and climate models – they all depend on the peaceful and safe use of space and the further development of the technical possibilities. However, the use of these technologies also involves risks and dangers resulting from growing dependencies of modern societies and states.

## 1. Conceptual understanding

The National Aeronautics and Space Administration (NASA) defines space as the area outside the Earth's atmosphere. At the transition between the Earth's atmosphere and outer space, there is no fluent uniform boundary. Moreover, there is no binding altitude limit to outer space under international law.

In general, human space activities can be classified into four categories: civil, commercial, military and intelligence. The civil space sector pursues the long-term goal of a permanent human presence in space. In the commercial space sector, an international space industry has emerged and will continue to grow in the coming years. Space-based technologies are revolutionizing commercial and social activities and impacting businesses, schools, hospitals and government offices. Applications are emerging in transport, health, environment, telecommunications, education, agriculture and energy. In addition, for military purposes, space offers the possibility of using information picked up by or transmitted through satellites for government defense, for example in form of warning systems against attacks. Due to the global communication channels that take place via the satellite network, space also receives significant attention in the intelligence sector.

As satellite networks have increasingly become an integral part of military, economic and political power, the political science sub-discipline of International Relations is also increasingly researching the concept of 'spacepower', examining the use of space for political purposes.

Space security refers to guaranteed access to space and the ability to use it freely for various purposes. Traditionally, the concept of space security can be traced back to part of the strategic balance between the United States and the Soviet Union, focusing on military and economic aspects of space access and use. Since the end of the Cold War, a model has evolved along a military and an environmental dimension.

This understanding has been expanded over time to include a broader security perspective, now drawing on a three-dimensional definition for space security. The first dimension covers the use of space for security and defense purposes. The second is to provide protection of space assets and systems against natural and/or human threats and to ensure the sustainable development of space activities. Finally, space security in the context of the third dimension refers to the protection of human life and the Earth's environment from natural threats and risks from outer space.

## 2. Space security in Europe and Germany

Unlike the aerospace sector, which is characterized by a predominantly commercial market and private business enterprises, space worldwide is still strongly determined by government space strategies and government-funded players, despite a commercialization trend that can be observed internationally. The turnover of the global space industry was in the order of \$423.8 billion in 2019 and is expected to double by 2030. Europe accounts for a not inconsiderable share of this. Germany is the second largest European space nation after France. Nowadays, the German Federal Ministry of Economics alone supports the space industry and space research with more than one billion euros per year.

In general, security is understood by the European Commission as an integral part of the EU's space policy. This is because space-based assets and systems are crucial for ensuring security on Earth, while at the same time systems need to be protected from the challenging environments of space. Most space technologies, infrastructures and services can serve both civil and military objectives and thus contribute to the development of an innovative and competitive European defense technological and industrial base.

Space-based systems are making an increasingly important contribution to the European Union's common security and defense policy. Space assets, through their global surveillance, communication and positioning capabilities, provide important added value in addressing the ever-evolving security threats Europe faces.

German space policy is essentially based on four pillars. The first is participation in the relevant EU institutions, especially in the large European space organizations European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). The second pillar consists of participation in long-standing special EU programs such as Galileo and Copernicus. The third pillar is the national space program, which is based on the Federal Government's space strategy. The fourth pillar is support for German space research, which is concentrated in the German Aerospace Center (DLR).

German technology is considered a leader in the field of earth observation and remote sensing. Furthermore, the Federal Republic of Germany participates to a large extent in application-related programs, especially in various fields of telecommunications. Maintaining Germany's strong participation in the operation of the International Space Station (ISS) as well as the construction and further development of the EU's Ariane 6 rocket are also important issues. Finally, Germany is heavily involved in the monitoring of near-Earth objects and space debris, which are increasingly becoming the focus of activities not only at ESA but are now recognized worldwide as a major problem area in the use of space.

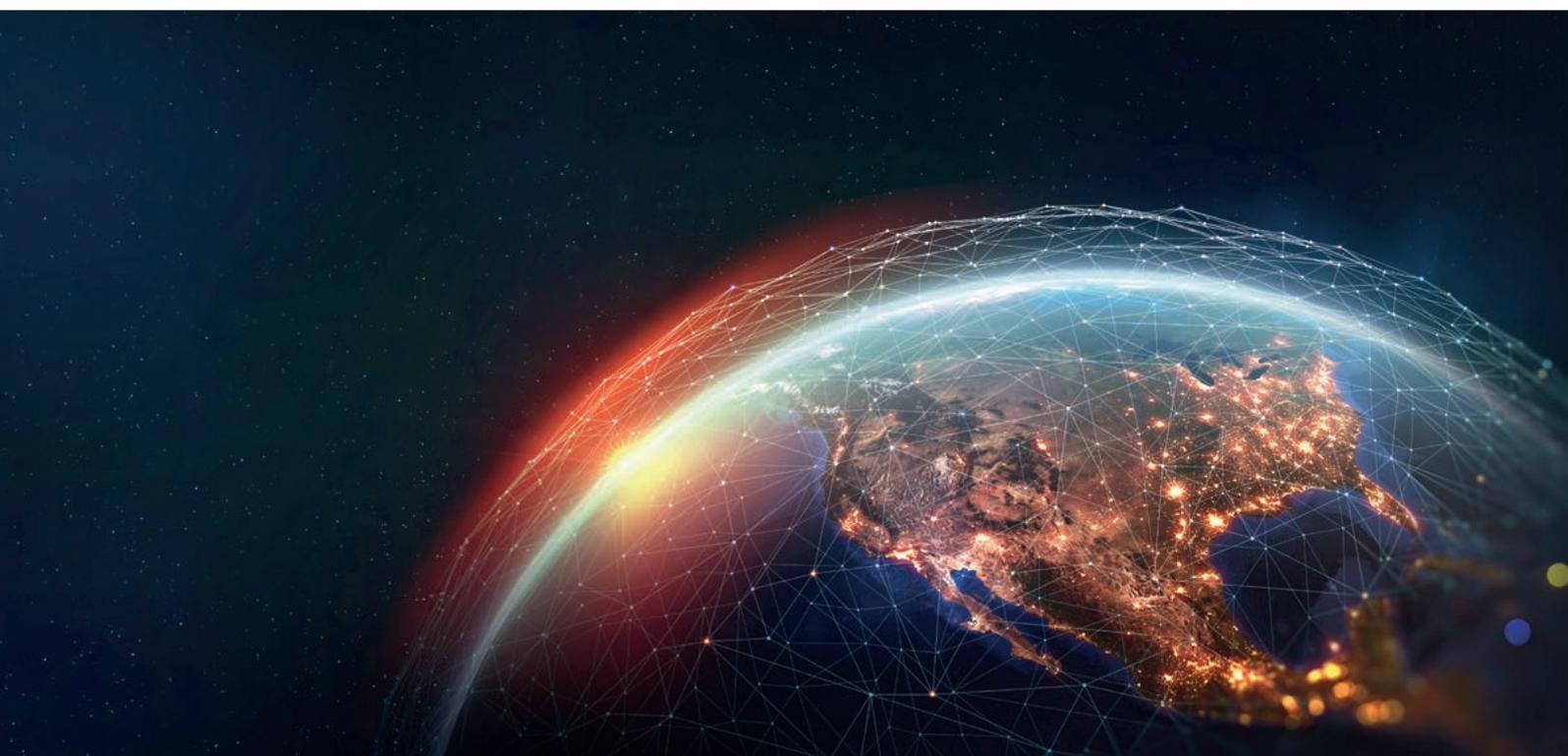
### 3. Research landscape in NRW

Quantitatively, at the actor level the space security cluster is the smallest of the five identified fields, but in addition to its future-oriented significance, the outstanding actors qualify space security for a closer and detailed look into the overall security research landscape. Generally and in a national comparison, the space sector in North Rhine-Westphalia is not small, but one of the leading research sectors on the topic.

The German Aerospace Center in particular plays a central role in the field by coordinating projects and its own research. Alongside seven of its own projects, there are others, funded with DLR's project management agency. In addition, DLR cooperates with the Space Command of the Bundeswehr, thereby supporting a key national institution related to security research. The Space Command monitors and categorizes near-Earth objects in space and aims to provide protection for German space-based civilian systems as well as the military systems of the Bundeswehr against disruptions. Its individual tasks include recording and assessing the space situation in inter-departmental cooperation, advising decision-makers, preparing and providing forecasts on the entry of

objects into the Earth's atmosphere and their potential for possible damage, in addition to analyzing and assessing information on missile launches and armament activities in the area of ballistic missiles and space weapons. Thus, the German Space Command also serves as a prime example for dealing with today's threat situations, in which a separation of military and non-military threats can hardly be made in a meaningful way and joint processing creates synergies and yields efficiency gains.

In North Rhine-Westphalia, a composition of actors can also be identified in the cost-intensive field of space security. In addition to the state-funded Fraunhofer Institutes, a branch and the knowledge portal of the United Nations Office for Outer Space Affairs (UNOOSA) is located in Bonn. On the topic of space technologies in the field of disaster management, there is also research at universities in Dortmund and Aachen. Societal actors could not be identified yet. It can be assumed that the high costs in security research on space and the high scientific specialization in this field are the reasons for this.





#### 4. Interview with Dr. Dirk Zimmer

*Dr. Dirk Zimmer is the Program Coordinator for Security Research at the German Aerospace Center (DLR) and Founding Director of the DLR Competence Center for Rapid Reaction Satellite Deployment.*



**Sicherheitsforschung.NRW:** *Dear Dr. Zimmer, thank you very much for taking the time to talk about the Sicherheitsforschung.NRW project. In your opinion, what makes security research a topical issue?*

**Dr. Zimmer:** From my point of view, security research has always been a topic and always will be, because security is a basic need of every human being. The areas of internal and external security are necessary so that we can live in peace, prosperity and freedom in accordance with our values. And security research, regardless of the understanding of the term, makes an essential contribution to security provision today and tomorrow. In this respect, it is an ongoing topic for me. Moreover, I think that security, or the degree of perceived security, also depends very much on personal perception. The role of security research is not dependent on whether individuals feel more or less secure. The more dynamic the security situation, the greater the need for security. If everyone already feels safe overall, security is readily taken for granted. This is by no means the case.

**Sicherheitsforschung.NRW:** *In your view, to what extent is the topic of space important in the context of security research?*

**Dr. Zimmer:** What is exciting here are the applications in space, i.e. satellites or space-based capabilities. If we look at all the applications in this area, we find out relatively quickly that – speaking from the perspective of security research – we are more dependent than ever on space-based systems. My favorite example is navigation: without GPS or Galileo, navigation is hardly conceivable nowadays. The same applies to satellite-based communication. When we look at major disasters, such as an earthquake, it becomes clear that without satellite-based reconnaissance, support operations would be inconceivable nowadays because we get essential information from it. In this respect, space-based capabilities are an absolutely cross-cutting issue: space and security are interconnected. Of course, there are some applications that work without space-based technologies. But there are an increasing number of applications that only work optimally together with space services.

**Sicherheitsforschung.NRW: Which current debates and topics within the space and security nexus do you see as particularly relevant?**

**Dr. Zimper:** One point that is of a general nature, but to me is particularly true in the context of the combination of space and security, is the issue of agility and innovation. Innovation is not having an idea. Innovation is bringing a technology to market and having it adopted, then leading to a certain capability or being able to use it. Only then it really is an innovation. Today, we have incredibly high invention cycles: new technologies are always being developed that make new things possible, and these technologies are to be brought into use as quickly as possible. Of course, this is also true in the space-based context, including with small satellites. In my opinion, the idea of New Space is incredibly important in order to open up new areas of application for security as well.

In addition, resilience is another important aspect. I believe that it is clear that today's modern life is no longer conceivable without space-based application. Consequently, we need to accept this dependency and think about how to increase the discussion on resilience. An exaggerated example would be that in the event of a disruption, e.g. by a prominence of the sun, important satellite services can be lost, so that parts of life on Earth come to a standstill. Therefore, it is essential that we think about how we can counteract such disruptions in order to have a robust, resilient system. This aspect of resilience, especially in the combination of space and security, is very significant in my opinion and needs to be discussed more. There are some research topics and technologies that we can bring into use to increase robustness and thus also increase resilience.

**Sicherheitsforschung.NRW: In your view, to what extent are citizens affected by any dangers or challenges in the area of space?**

**Dr. Zimper:** Contemporary life, as we know it, is no longer imaginable without space-based services. It starts with simple navigation by Google Maps and goes all the way to time signals, for example. Many people are not aware of the dependence of time measurement and time synchronization on Earth on space-based capabilities. This includes, but is not limited to, time synchronization of the power grid or trading on the stock exchange, because the information needed to do this comes from space, from our space-based systems. The importance of these services is extremely high for many sectors. In this respect, ensuring the functionality of these systems in space is essential for our life on Earth, especially in a technical context. Another example is scientific reconnaissance, such as the detection of climate change, based on the melting of the ice caps. The observation of climate change would not even be possible without space-based services. It is only on the basis of this information that we have options for specific action.

**Sicherheitsforschung.NRW: This clearly shows the cross-sectional character of the space sector that you mentioned.**

**Dr. Zimper:** : Yes, absolutely! In many ways, space is an 'enabler' for an incredible number of facets, such as the area of security, among others, but also beyond that.

***Sicherheitsforschung.NRW: What is the focus of your personal research?***

**Dr. Zimmer:** I am personally responsible for the entire DLR research program on security. If we stay with the topic of space security, DLR is concerned, for example, with the evaluation of data, in particular Earth observation data. Cameras or sensors in space send data, so the processing of this data is quite essential. The topic of Big Data is already a terrestrial problem and in the context of orbital platforms it is an even greater challenge, because we not only have to receive the data in great volumes, but also need to store and process them. Let me outline this with the example of an earthquake. There is data before and after the earthquake. Clever algorithms are needed to analyze it – and this concerns the field of AI – to understand what happened. This data can tell whether a building with four, five or six floors was there, so that the emergency services on the ground know how deep to dig, if necessary, so that it can be assessed where people might actually still have survived. This information is essential in the first hours after such a disaster. The same scenarios can be outlined for many cases in the field of security. In this respect, the use of technology for the emergency services on the ground is one of our main areas of work. In a nutshell, this means data processing and preparation, the provision and fusion of information for the best possible situation picture. A sensor can be many things: a space-based camera or even social media where people chat and discuss with each other. By the way, do you know what the fastest way to detect earthquakes is these days? Not with seismographs, but with social media – also in compliance with the EU General Data Protection Regulation.

***Sicherheitsforschung.NRW: So it matters where the satellite-based cameras are looking at?***

**Dr. Zimmer:** Exactly! Satellites are on their orbit and are always positioned over a certain spot on earth at a certain time, depending on which orbit they are on. Except if they are geostationary, then they are always in a particular area. Alignment with the area of particular interest is, of course, quite important. For satellite-based images, it is also true that data must be prioritized. Modern cameras or sensors on board generate a large amount of data that cannot be sent directly down to earth, but must be prioritized because the bandwidth is simply limited.

And then, of course, it is important to download the images that are needed – remember the example of the earthquake – from the area where the security-relevant event just took place and not to see cows standing in the pasture due to a wrong selection. Nowadays, a human being can no longer evaluate this information; it can only be done with the help of the clever networking of algorithms. This is where digitization comes into the picture, the evaluation of algorithms, data fusion, evaluation against the background of safety aspects – very complex issues and therefore also a very important topic for us.

The same applies to the maritime situation picture, by the way. Unfortunately, it is still unimaginable how little we sometimes know about the exact position of ships on our oceans.

***Sicherheitsforschung.NRW: : So trans- and interdisciplinary is essential for security research on the topic of space?***

**Dr. Zimmer:** Absolutely! We are structured at DLR in such a way that we have research institutes, which in turn are experts in their respective fields. For example, there is an institute for optical sensor systems or an institute for critical infrastructure protection. So experts are based there in the respective field, but we always have to look at this specialist expertise for specific cases in a cross-sectional manner and bring it together with others in order to enable sound applications. In this respect, communication among each other is essential! In addition, the user must also be involved, which is basically the supreme discipline. Ultimately, it is the user who decides whether the application is useful to him and not the academic.

***Sicherheitsforschung.NRW: To what extent do you cooperate with other institutions outside DLR on security-related topics or on security-related research in North Rhine-Westphalia?***

**Dr. Zimmer:** We cooperate to a considerable extent with universities and with other research institutions, such as the Fraunhofer Institutes. This can certainly also be called benign ‘coopetition’, because in some areas we cooperate, and in other areas it is more like a competition. In this respect, it is important that we have to be honest with ourselves and admit that we cannot always do everything perfectly and that other institutions simply have more knowledge in some aspects. My task as director is to open our eyes to the left and to the right. The best thing is when we can show the benefits of a technology afterwards, which means it is in usage. However, we can’t fulfil this task on our own. Mainly because we are a research institution and cannot produce products – which is not

our task, but that of the respective industry. That’s why exchange between research and industry is important, so that successful projects can be implemented together. On the other hand, it is also an important goal to find and promote highly qualified young researchers. That is why cooperation with universities is so important, for example, through joint considerations on study program profiles or via supervision offers for a final thesis. The same applies to the use of synergies through cooperation with institutions such as the Fraunhofer Society. As a rule, it will only ever be possible to generate real added value through cooperation. This applies to products that are subsequently used by authorities and organizations for security tasks, but also to those for industry. For example, we work together with the ‘Alliance for Security in Industry’, where companies from North Rhine-Westphalia such as Henkel or Deutsche Post are represented.

***Sicherheitsforschung.NRW: How do you rate the networking among the security research actors within North Rhine-Westphalia?***

**Dr. Zimmer:** Undoubtedly good, but there is still room for improvement. However, this does not only apply to North Rhine-Westphalia, but to the whole of Germany. Cooperation is incredibly exhausting because it requires an exchange with various experts, who must harmonize with each other and be prepared to make compromises because otherwise there is no progress. This takes time and energy but ultimately serves a common goal. And if, for example, we can contribute to the field of security research on internal and external security and make progress together, that is something wonderful.

**Sicherheitsforschung.NRW: How do you rate the quality and quantity of academic research work in North Rhine-Westphalia compared to other federal states? And in which areas do you think North Rhine-Westphalia is strong as a research location?**

**Dr. Zimmer:** North Rhine-Westphalia as a whole is strong in research. One sign of this is the DLR, the universities, the Fraunhofer institutes and other really good research institutions that do very good work.

**Sicherheitsforschung.NRW: Are there areas where you see a need for improvement or would like to see changes? For example, approaches where you say that the state government or scientific institutions could invest money, because that would make sense at this or that point in order to use or create synergies?**

**Dr. Zimmer:** In general, risk aversion is always an important topic for me. I believe that every state and also North Rhine-Westphalia can make a positive contribution to this. In reality, there is a lack of courage to conduct risky research because calls for proposals necessarily contain milestones and targets, and thus it is no longer risky research. Risky research means that research is open-ended, that despite the best methods, sometimes something doesn't work out and research can also go wrong or 'fail'. These supposed failures must also be seen as successes and must be allowed to happen, otherwise you can't really try new things out. We do far too little of that in Germany! We need a different culture of failures! I say this from the point of view of someone who gives money to institutions and sets up metrics to make 'success' measurable – which of course should always be positive. This means, we automatically gravitate towards those technologies where we see the highest application potential, for example, so that nothing can go wrong. This is a risk minimization strategy at the planning level where we forget that we have to accept risk – in order to develop something really new. I think it would also be good for the state of North Rhine-Westphalia to set such funding accents – for everyone: for industry, which can then take risks

in research in cooperation with the universities. Usually, one learns more from mistakes than from successes. And especially from DLR's practice-oriented research experience, it can be said that on the ground, on paper, everything always looks very simple. But when the things fly, at the latest, it's a whole different story. That's why my motto is: Test, build, fly! We will only gain relevant experience when we fly. Of course, this looks different depending on the technology and research in other areas. What is important is that the courage to take risks and thus an openness to possible failure should be given greater consideration in research funding.

**Sicherheitsforschung.NRW: What security challenges do you see for the future of the research field of space and security?**

**Dr. Zimmer:** On the one hand, I see the challenge of making the high complexity of the field of space, technology and security politically and socially tangible. The understanding of the issues of resilience, dependency and complexity must be strengthened in order to strengthen the implementation in concrete political action to overcome these challenges. In my opinion, currently a political vision is missing in this regard: What do we actually want? Representatives of academic and non-academic research or industry can provide input for this, but politics has and encompasses the role of leadership. Politicians must make it clear what we want to achieve with regard to space, with regard to the security issues there. In which direction should it go? Then this ambition should be adopted. At the moment, there is no concrete formulation or strategy on how to proceed in the area of space security. In my view, however, this is incredibly important in order to have planning and handling of security.

DLR, for example, is examining which strategies the federal ministries, among others, are drafting in order to align our research accordingly. For the important area of space security, these strategic policy guidelines are currently lacking.

***Sicherheitsforschung.NRW: Are there already initial thoughts on measures and approaches that you would consider relevant for investigation from the point of view of research for overcoming this challenge? In other words, how could recommendations be made from the field of science to policy-makers on strategically forward-looking trade?***

**Dr. Zimper:** There are different bodies in which politicians are advised. I think this is essential, because even the best decision-makers can only have limited expertise in every field. Of course, researchers cannot take decisions away from the people's representatives, but we can shape these decisions through expertise. Appropriate dialogue platforms are a very important element for this. These should be established with the goal in mind that what is discussed there will be used for implementation through concrete actions. Such discussions can also help experts to take a look behind the often one-sided media portrayals of successes in other countries. An example from the United States would be the enormous support Elon Musk received from the American state via NASA and the easy access to technologies originally developed there and the transfer of some of the best people to help Musk build SpaceX. This is also perfectly fine, but it is not in the public narrative.

However, this again shows the lack of a 'level of ambition' in Germany. The German government must clearly communicate its priorities and then show consistency in these goals – for example, with regard to New Space, micro launchers and micro satellites. Either one wants to be active there or not. But at a certain point, it is necessary to make a definitive decision and then implement it stringently, even if it carries a certain risk of failure. Ambiguity and maneuvering are anything but helpful in research funding.

It is clear that failure at one point does not mean that there is no longer a desire to pursue this action or application at another point. If, for example, we say that the ability to put small satellites into orbit is something we want in Germany – also with regard to our security provision – then this should be implemented with necessary consistency. It is in the nature of things that one or the other project will fail along the way. After all, we are talking about high technology here.

***Sicherheitsforschung.NRW: Dear Dr. Zimper, thank you very much for the interview!***

# Conclusion

The aim of the **Sicherheitsforschung.NRW** project is to identify, present and initiate networking among the actors conducting research on security policy issues in North Rhine-Westphalia. This is done in the form of a wiki in which, for the first time, a large amount of data on security research in North Rhine-Westphalia is collected and presented in a concise fashion. For this report on the research project, this data was processed briefly and clearly, presented on the basis of the five central research clusters cyber security, extremism, climate security, energy security and space security, and these important security policy focus areas were further illuminated through semi-structured expert interviews.

The result is clear: North Rhine-Westphalia is an extremely strong research state and is characterized by a heterogeneous and complex research community, also in the field of security research. Security research is conducted both in the field of social sciences and in the natural and technical sciences in diverse subject areas, whereby the actors can be assigned to the categories of science, state, society and economy and the state can boast outstanding expertise in the aforementioned five clusters in a national and European comparison.

Particularly in the field of cybersecurity, there has been a development of the research landscape in recent years involving the planning and expansion of new research institutions, which has been noticeable in European and global comparison. In the extremism cluster, many government initiatives can also be identified and strong approaches to further network existing research can be found, especially in the areas of right-wing extremism and Islamism. The two clusters on Climate Security and Energy Security, which are closely linked thematically, also clearly demonstrated

the inter- and transdisciplinarity of security research in North Rhine-Westphalia. Despite the comparatively smaller quantitative scope of the Space Security Cluster, it also became clear that this imminent topic is prominently represented in North Rhine-Westphalia with central important research institutions and is subject to multi-perspective research of relevant national and international organizations.

Overall, it is evident that security research in most cases has an interdisciplinary or transdisciplinary character. Moreover, through its work on information, analysis and education, as well as its contribution to public (security) policy discourse, security research makes an essential and non-negligible contribution to ensuring security and thus to the resilience of the state of North Rhine-Westphalia and the Federal Republic in the wake of the enormous increase in security challenges in an increasingly volatile, equally interconnected world. The necessity of purposefully integrating and appropriately promoting this research and its results for the benefit of the nation's people and the sustainable guarantee of a truly defensible democracy is consequently a worthwhile investment in a liberal-democratic, crisis-capable society.

In this sense, the project Sicherheitsforschung.NRW suggests that steadily closer networking between researchers within the clusters as well as between them is desirable for the future. This is also to enable a better connection between academia and application-oriented actors, so that the results of scientific research and development can be translated more directly, more straightforwardly and thus more quickly into practical and rule of law-compliant solutions for guaranteeing security for the citizens of the state, the republic and the Union.

As a federal state with a diverse and strong research community, North Rhine-Westphalia has the opportunity, in light of the scientific expertise gathered in the state, to further expand existing top-level research by, for example, transferring proven and successful forms of research network funding (e.g. CoRE-NRW or the Cyber Security Cluster in Bonn) to other clusters (such as climate or space security). At the same time, the state also has the opportunity to take the lead in further networking federal and European security research, for example, through the targeted funding of security research projects in a truly Euro-regional network. In both respects, the Wiki **Sicherheitsforschung.NRW** can be a useful and informative starting point for identifying promising collaborative partners from science, government, society and industry in North Rhine-Westphalia and strategically linking them through joint projects both within and outside the state.

# Partners

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