
# INNOVATION CAMPUS BONN:
## Sustainability and Global Change

UNIVERSITÄT BONN

UNITED NATIONS UNIVERSITY
UNU-EHS
Institute for Environment and Human Security

zef
Zentrum für Entwicklungsforschung Universität Bonn

bicc Bonn
International Center for Conversion

d·i·e
Deutsches Institut für Entwicklungspolitik

Hochschule Bonn-Rhein-Sieg
University of Applied Sciences

# A Welcome by the Mayor of the City of Bonn

Bonn stands for sustainability: The success of the 23rd United Nations Climate Change Conference which was held in Bonn's Rheinauen park in November 2017 once again impressively confirmed this. Around twenty United Nations secretariats and programs based in Bonn, together with numerous international organizations, federal ministries and authorities and NGOs, create a setting on the subject of "Sustainable development and fair global solutions" that cannot be found anywhere else in Germany. With their profiles geared towards sustainability topics, Bonn's scientific institutions contribute to this feature of the federal city in a special way. For instance, a specialized knowledge network has been established between the universities and research institutions located in the region, which conducts top international research on sustainability topics. In 2017, the Bonn Alliance for Sustainability Research made this network visible to the outside world.

Against this background, the creation of an Innovation Campus Bonn "Sustainability and Global Change", as presented in this brochure, offers an exceptional opportunity: The Innovation Campus can help to further refine the existing unique selling point and make Bonn a true global player in sustainability research – a place of globally unparalleled production of knowledge for sustainable development. The fact that the Innovation Campus Bonn provides strategic interfaces for advising on political, societal and economic matters ranging from local to global level makes it an extraordinary project that is highly relevant to the global sustainability debate, the implementation of which I strongly support.

Yours sincerely,

Ashok Sridharan

**Ashok Sridharan**
Mayor of the City of Bonn

# The Most Important Facts at a Glance

## INNOVATION CAMPUS BONN: SUSTAINABILITY AND GLOBAL CHANGE



The Innovation Campus Bonn "Sustainability and Global Change" (ICB) outlined in this publication aims to combine Bonn's top scientific expertise in the field of sustainability research and to develop it with new components into a one-of-a-kind global science center. Existing potentials are multiplied in interaction with the UN location Bonn. At the same time, the Innovation Campus establishes strategic interfaces for direct exchange, dialog and concrete advice for policymakers, society and industry. The research here is also always concerned with the concrete implementation of innovations in cooperation with industry and civil society organizations.

The ICB is establishing a research infrastructure that links a corona of university and non-university institutions even more closely: the University of Bonn with its faculties and the Center for Development Research (ZEF), the German Development Institute (DIE), the United Nations University (UNU-EHS), the Bonn International Center for Conversion (BICC) and the Hochschule Bonn-Rhein-Sieg/University of Applied Sciences. These institutions are the network partners of the Innovation Campus and at the same time form the framework within which the new institute is embedded. Essential parts of the planned infrastructure are: a Center for Advanced Studies, a Bonn Advanced School of Innovation and Sustainable Development (BASIS, PhD program), BA and MA programs and transfer projects.

In its research, training and transfer services, the ICB concentrates on key orientation points of the 2030 Agenda. At the same time, it takes into account that the transformation to sustainability takes place in an extremely turbulent environment, and that the implementation of the 2030 Agenda can therefore only succeed if central drivers of global change that influence all sustainability processes are also considered. Research on sustainability, taking into account central changes in many of our societies in the course of the 21st century, will thus represent a significant unique selling point of the ICB (cf. on the other unique selling points pp. 6-7). The focus is on three main topics that take into account and exponentiate the strengths of Bonn's existing sustainability and development institutes:

1. Digitization and Artificial Intelligence
2. Mobility and Migration
3. Bioeconomics

# Unique Selling Points

## INNOVATION CAMPUS BONN:
## SUSTAINABILITY AND GLOBAL CHANGE

1. **THE UN LOCATION BONN**, with its focus on climate policy and 2030 Agenda, offers the ICB-sponsoring organizations direct access to the UN system. The combination of "UN City for Sustainable Development" and "Science Location Bonn for Interdisciplinary Sustainability Research" is unique and will make it possible to create global visibility for the ICB and its network partners.

2. **THE PLANNED CONNECTION TO LOCAL (DAX) COMPANIES** ensures that the latest technological developments in ICB programs are reflected and joint learning processes between research and the private sector are driven forward. Cooperations between the UN location, science and the globally committed private sector in the common field of sustainability strengthen the profile of the city of Bonn as a globally radiating innovation location for sustainability.

3. **THE THEMATIC COMPETENCE SPECTRUM OF ICB-SPONSORING ORGANIZATIONS** significantly exceeds that of comparable institutions in Germany and Europe (IASS and PIK in Potsdam, Wuppertal-Institute, IDDRI in Paris, Institute for Development Studies in Sussex, Stockholm Environmental Institute). In particular, the ICB is uniquely able to bring together topics of environmental and development research, cutting-edge technology and governance.

4. **THE REGIONAL, NATIONAL AND INTERNATIONAL NETWORKS** of the ICB-sponsoring organizations as a whole are unparalleled. The partner institutes work in close-knit, global, interdisciplinary networks and are often decisive network nodes. The UNU-EHS is part of the association of United Nations Universities. The ZEF's doctoral program is at the heart of a worldwide research and training network.
The Global Governance Academy of the DIE brings together more than 60 research and consulting institutes from the pivotal newly industrialized countries on issues of global sustainability. All of Bonn's partner institutes cooperate with top international research institutes and are actively involved in prominent positions in the context of Think20 (T20), an association of 150 research institutions advising the G20. There is no other place in Germany with a comparable global network for sustainability innovations.

5. **THE SUPPORT OF THE UN'S 2030 AGENDA** (sustainability goals) is an important goal of the ICB, which can be advanced particularly in interaction with the UN location Bonn and the worldwide networks of the ICB's network partners. At the same time, the ICB will take up and work on topics that are not yet sufficiently or not at all addressed in the 2030 Agenda (e.g. artificial intelligence, virtual networks, digitization and sustainability, new political orders). This way, the ICB develops visions for the future prospects of sustainability in the 21st century.

6. **THE ICB WILL NOT JUST BE A GLOBAL RESEARCH CENTER.** Rather, excellent research, advice for society and its actors as well as policymakers, excellent education and training for local, national and international partners are carried out at the ICB. This specific profile of the ICB is based on the corresponding competitive advantages of its network partners.

# Unique Selling Points

**With regard to the three priority topics these are:**

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## Digitization and Artificial Intelligence

Until now, the research communities "Digitization" and "Sustainability Research" have only been interlinked in a few places around the world (e.g. MIT, SPRU/Sussex). Even at the few locations where these interdisciplinary networks are being established, cooperation is still in its infancy. At the same time, digitization will fundamentally shape and transform all dimensions of the implementation of 2030 Agenda and the Paris Climate Agreement. The Scientific Advisory Council on Global Change to the German government (WBGU), which cooperates closely with the DIE, is currently preparing the first comprehensive study on this topic. Work on many aspects of digitization and sustainability is being undertaken at the University of Bonn. At this interface, the ICB can do pioneering work at a very early stage and shape global scientific search processes that would be strengthened even further by interaction with two global players in the digital economy (Deutsche Telekom and DHL).

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## Mobility and Migration

The ICB partner institutions are already working on migration issues from a wide variety of perspectives in their research programs: Mobility and migration in Africa and Asia as well as refugee movements in Africa (ZEF), conflicts (BICC), policy and governance (DIE) and environment and climate change (UNU-EHS). The ICB priority topic allows a comprehensive view of these different facets. In particular, however, the connection to the other two priority topics of digitization and bioeconomics with sustainable use of resources, means that opportunities and risks in connection with the future development of the labor markets are also considered. The ICB, together with other partners in Bonn, particularly the IZA Institute of Labor Economics, is ideally positioned for researching the influence of this development on future migration scenarios and can thus make a groundbreaking contribution to the issue of combating the causes of people fleeing their homelands.

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## Bioeconomics

The future of humanity will depend to a large extent on reliable and secure access to food and the sustainable use of energy, water and raw materials. Bioeconomics at the University of Bonn is looking for solutions to these challenges and conflicting goals. Man and nature must be reconciled. Bioeconomics is a core concept of transformation. With its National Research Strategy Bioeconomics, Germany took on a leading role in bioeconomics policy worldwide in 2010.

In the recommendations of the German government's HighTech Forum 2017, bioeconomics is placed among the six most important topics of the future. The research programs at the Faculty of Agriculture, the Faculty of Mathematics and Natural Sciences at the University of Bonn, the Center for Development Research and the Jülich Research Center, which focuses on bioeconomics, provide Bonn and its surroundings with a unique selling point.

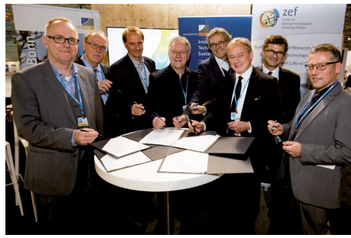
# Network Partners of the Innovation Campus: The Bonn Alliance for Sustainability Research

The international science location Bonn offers the essential prerequisites for assuming the role of a global player in the future sustainability debate. The basis for this is the unique academic and non-academic scientific landscape for sustainability research as well as the strong presence of international organizations that are working on this issue, in particular the United Nations. The Berlin/Bonn Act laid the foundation for this with the expansion of Bonn into a center of development policy and research:

Particularly the settlement of the United Nations University with its Institute for Environment and Human Security (UNU-EHS) as a globally operating scientific institution should be mentioned here, as well as non-university institutes, especially the German Development Institute (DIE) and the Bonn International Center for Conversion (BICC) that work in an interdisciplinary context on different dimensions of sustainability and global change from the perspective of development research as well as peace and conflict research and organize their research in high-performance global networks. Furthermore, in addition to its sustainability research with a disciplinary orientation, with the Center for Development Research (ZEF) the University of Bonn has an interdisciplinary research institution that conducts international research on central sustainability topics. The political relevance of the Bonn institutes is emphasized by the fact that DIE, BICC and ZEF have been listed among the most influential global think tanks for years – more than at any other location in Germany. The overall picture is completed by the Hochschule Bonn-Rhein-Sieg/University of Applied Sciences, which focuses in particular on the transfer of science into a sustainable economy.

To further expand the cooperation between the University of Bonn with its faculties and the ZEF, the DIE, BICC, the UNU-EHS and the Hochschule Bonn-Rhein-Sieg/University of Applied Sciences, on 15 November 2017 these institutions founded the **Bonn Alliance for Sustainability Research** in Bonn in the context of the UN Climate Change Conference. The regional research network aims to further strengthen research in the field of sustainable development and global change and to support and expand the existing competence in this field in Bonn. Against this background, the alliance is intended to facilitate optimal cooperation between the partners and thus forms a central precursor to the establishment of the Innovation Campus Bonn.

Both a cooperation in the field of teaching (expansion of the range of courses on sustainability, cooperation in the field of young scientists) and an intensive cooperation in joint research projects and symposia have been agreed within the framework of the Alliance. In addition to the institutions mentioned, actors from civil society and industry will also be successively integrated into the alliance as additional partners from 2018 onwards.



signing of the Agreement to establish the Alliance for Sustainability Research. From left to right
**Prof. Dr. Christian Borgemeister | ZEF**
**Prof. Dr. Joachim von Braun | ZEF**
**Prof. Dr. Dirk Messner | DIE**
**Prof. Dr. Dr. h.c. Michael Hoch | University of Bonn**
**Prof. Dr. Jakob Rhyner | UNU-EHS**
**Prof. Dr. Hartmut Ihne | Hochschule Bonn-Rhein-Sieg/ University of Applied Sciences**
**Prof. Dr. Conrad Schetter | BICC**
**Michael Dedek | BICC**

# Conceptualization

# INNOVATION CAMPUS BONN:
# SUSTAINABILITY AND GLOBAL CHANGE



New York, Geneva, Paris or Rome – each of these cities represents a global challenge. The presence of the United Nations (UN) means that these locations are gaining international appeal for the production of knowledge to meet global challenges. Bonn wants to join this group of global strategy centers focusing on the future topic of sustainability research. The Innovation Campus Bonn (ICB) described in this publication aims to pool the top scientific competences available in Bonn on the topic of sustainability research and to develop them together with new components into a unique and innovative global research center, multiplying existing potentials in interaction with the UN location Bonn. The concept also provides for the establishment of strategic interfaces of direct exchange, dialog and concrete advice to policymakers, society and industry from the local to the global level. The research here is also concerned with the concrete implementation of innovations in cooperation (implementation research) with industry and civil society organizations.

**ICB**
Innovation Campus Bonn

seats of the United Nations
**New York | Geneva**
**Paris | Rome**

**SDGs**
Sustainable Development Goals

**The topic of sustainability** is of fundamental importance for the future viability of mankind and the environment. The central question is how humanity can handle the resources provided by the earth system, both locally and globally, in such a way that future generations not only do not suffer any disadvantages, but so that new development opportunities are opened up to them, even in ways in which the entire world population can participate. Climate change, refugee crises, increasing inequalities within and between societies and authoritarian-nationalist movements in the West and other parts of the world indicate that such a transformation towards sustainability entails enormous challenges. The 2030 Agenda, adopted in 2015 by the United Nations and its member states, represents a development narrative consisting of 17 Sustainable Development Goals (SDGs) with the overriding motto "Leaving no one behind". However, the achievement of each of these goals faces many challenges. On the one hand, as a result of global negotiations, the SDGs are fragmentary and with their comprehensive claim not only represent many synergies but also numerous conflicts of objectives that must be considered in research on future development options – but a research agenda is not included in the SDGs.

**On the other hand** every development agenda is set in the context of massive global (but regionally very different) drivers of change. The most important include radical technical transformations, changing orders, but also changing social models, all of which are not independent of each other. At the heart of our research agenda is therefore the question of the tension, opportunities and risks between these global drivers and the goal of sustainable development, i.e. development that is globally inclusive and respects planetary boundaries. The SDGs with the 2030 Agenda provide an important framework. However, sustainability research must go far beyond 2030 and must not understand the Agenda as a dogma. In the future, a sustainable and inclusive future of the globally networked world society is to be scientifically pioneered in Bonn, whilst local organizational and technological sustainability solutions that are also relevant for Germany and Europe must be developed at the same time.

seat of the United Nations in Bonn

# Target Dimensions

The 17 SDGs of 2030 Agenda represent a complex, interdependent target system. At the Innovation Campus Bonn (ICB), the goals and associated implementation strategies are examined in their interaction in order to better understand potential trade-offs and co-benefits. Only in this way can robust and diverse implementation perspectives for and with society, industry and policymakers be developed. Despite all its complexity, the 2030 Agenda bundles four central points of orientation for local and global development that have emerged in the international community over the past decades:

**Participation and Opportunities:** People are at the center, no matter where they live. Poverty reduction and the fight against economic, social, political and cultural inequalities should be significantly advanced by 2030. The United Nations have summarized this in their demand “Leaving no one behind”.

**Planetary and Local Boundaries:** Social and economic development must take place within the boundaries of the Earth system in order to prevent a change in the Earth system that could overwhelm present and future generation(s), and to overcome local environmental problems.

**Governance and Politics:** The implementation of the 2030 Agenda can only succeed on the basis of effective local, national and global governance structures. A new quality of global and regional cooperation will be necessary to meet the Agenda’s ambitious goals.

**Uncertainty and Risk Management:** Societies must advance transformation processes in the context of diverse uncertainties. These arise on the one hand from the complexities of social, economic, technological and ecological change in a globally networked world, which can intensify in shocks and volatile dynamics (natural disasters, financial crises, political turbulence, crises and wars, refugee movements). On the other hand, however, transformation processes towards sustainability entail uncertainties and risks on their part. Intelligent handling of these and the development of resilient structures are therefore points of orientation for the implementation of a sustainability strategy with organizational and technological innovations.

# Drivers of Global Change

**unique selling point of the ICB**

In its research, training and transfer activities, the ICB will concentrate precisely on these 2030 Agenda benchmarks and target systems, taking into account and enhancing the strengths of Bonn's existing sustainability and development institutes. At the same time, the ICB emphasizes that the transformation to sustainability is taking place in an extremely turbulent environment. The implementation of the 2030 Agenda can only succeed if at the same time central drivers of global change are considered, which influence all processes of sustainability by changing, accelerating, slowing down or even completely realigning them. This interaction of research on sustainability transformation, taking into account central, sometimes radical changes in many of our societies in the course of the 21st century, will be the unique selling point of the ICB. The ICB focuses on three major, interacting drivers of global change whose effects on the implementation of 2030 Agenda are currently difficult to assess. The drivers provide the three basic research priorities for the ICB.

## 1 Technological Changes

Digitization, artificial intelligence (AI), big data, the creation of virtual spaces and infrastructures, the merging of AI and neurobiology are changing labor markets, the international division of labor, social systems, societies and scientific systems as fundamentally as the technological breakthroughs at the beginning of the industrial revolution in the late 18th/early 19th century. The discussion around Industry 4.0 is merely a prelude to understanding these far-reaching dynamics adequately in order to be able to shape them. These innovative impulses affect all dimensions of the 2030 Agenda in a very fundamental sense, but are hardly addressed by the Agenda itself and have so far been examined only marginally or not at all by established sustainability research. Research at the ICB can play a truly pioneering role here. The central theme will be "Digitization and Artificial Intelligence", which the ICB not only observes in research but also actively shapes with innovations, e.g. in bioeconomics.



## 2 Changing Orders

Communication – networks – mobility. Globally networked communication, transnational networks, new constellations of actors and tectonic shifts of power are gaining increasing significance. The relationship between transnationally mobile actors (including investors and companies, international NGOs, refugees) and stationary actors (such as governments, vulnerable population groups) is in motion – not least due to new communication technologies that allow many and very different actors to network and act transnationally. How transformation alliances and strategies for the implementation of 2030 Agenda should and could be designed, i.e. what precisely could constitute the "transformative governance" that is often mentioned in the context of the 2030 Agenda, are by no means trivial questions. New, highly dynamic relationships are emerging that stand in the way of maintaining manifest and previously established boundaries and require new types of solutions, governance structures and – processes. The changing orders and networks are reflected in a field of tension between the persistence, dissolution and renegotiation of borders, authorities, sovereignties and responsibilities. In this area, we want to focus our research on the importance of "mobility and migration" and thus put human action in the foreground.

## 3 Guiding Principles in Transition

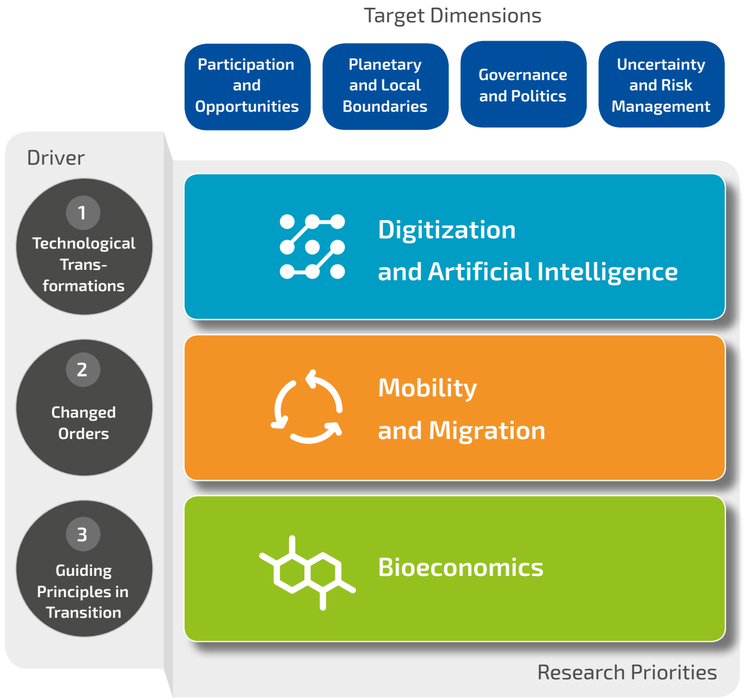
Not only technologies and governance structures are in transition, but also social models and development concepts. The 2030 Agenda is one example. In this context, a central and controversially discussed question is how the SDGs' sustainability narrative can be reconciled with economic growth and increased prosperity for as many people as possible. In this complex we want to focus on the focal topic of "bioeconomics" with the goal of (re-)gaining an increased harmony of society and nature in a world of 9 to 10 billion people. Central elements here are the conversion from an economy that exploits fossil raw materials and resources to a circular economy based on renewable resources, sustainably used ecosystems with care for biodiversity and biological innovations.

# Research Priorities

Against the background of these three drivers (and their interactions) that will strongly influence the implementation and achievement of SDGs, we envisage a research design for the ICB based on a matrix structure. On the one hand, we are setting three concrete research priorities (digitization and artificial intelligence, mobility and migration, bioeconomics) as the focal points of our research, which represent the interaction of the drivers. These three fields are at the very beginning of our research agenda and can be complemented by additional future topics. We are examining the relevance of the three priority topics for the four 2030 Agenda target systems mentioned above.

**This results in the following research matrix for our research on sustainability:**






**According to our research matrix, each of these research priorities presents central challenges both for Germany and Europe as well as globally.**

# Digitization and Artificial Intelligence

**Digitization and artificial intelligence (AI)** will fundamentally change the world economy and international division of labor as well as society, politics, orders, people's thinking and their working world in the coming decades. All SDGs and the ICB's core target dimensions (inclusion, planetary boundaries, governance, risk management) are affected by these dynamics, which will also require a whole new generation of development goals that take into account the realities of the digital age. The SDGs of the 2030 Agenda have not anticipated the dynamics and the profound processes of change resulting from digitization and AI, but only sometimes mention the opportunities of "information and communication technologies" and digital inequality. The connections between digitization, AI and sustainability are characterized above all by considerable uncertainties, high rates of change, large knowledge deficits and manifold design challenges. The diffusion of digitization and AI is identified by three essential characteristics.



First, enormous work and resource efficiency potentials (through big data, networking, virtualization) can be released, which at the same time entail high demands e.g. on the labor and training market, trade and development policies (SDGs 4, 17) as well as various challenges to data security and the protection of human privacy. New paradigms of production, such as 3D printer systems and intelligent automation, could lead to the relocation of industries to OECD countries, but at the same time undermine the competitive advantages of many developing countries – or potentially increase these? Such correlations have attracted little research so far. Digitization and AI could therefore advance social inclusion and circulation-oriented economic activity within the boundaries of the Earth system, but at the same time hold enormous potential for exclusion and inequality (within and between societies) and have effects on the planet's resource budget (SDGs 1, 5, 10, 13, 14, 15) that are currently virtually inestimable. This first dimension already opens up a central field of research: Implementation of the 2030 Agenda in the context of economic structural change in the digital age. However, the implications of this technological change go even further, opening up completely new horizons of knowledge for future sustainability research.

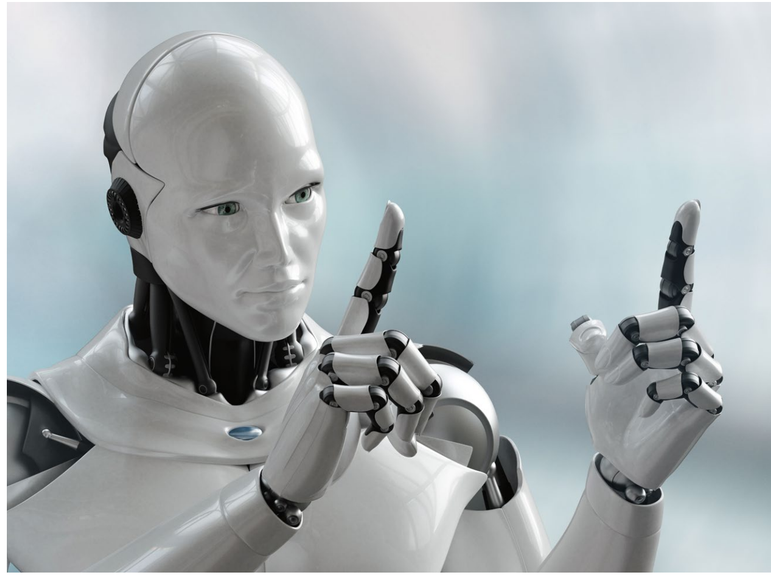
**interface between humans and technical systems**

The characteristic of digitization and AI (in combination with other innovation dynamics, e.g. in neurobiology) is that humans, after starting to transform the entire Earth system in the course of industrial development over the past two centuries, are now in a position to fundamentally transform themselves (human enhancement). In research as well as in application areas, work is being done to consolidate the interfaces between humans and technical systems. This includes the control of autonomous systems and extends to direct interventions in the human brain in order to combat diseases such as epilepsy or Parkinson's disease, to optimize people's cognitive abilities or also to "shape" their emotional world (combating depression; "switching off" fear, emotions, pain).


"Enhancement of humans" has the potential to serve the needs of people (e.g. by combating illness), to cognitively "upgrade" people, to enable transnational encounters of people through virtual worlds and thus possibly to create the conditions for the emergence of "world awareness", but also to "create" individuals who are particularly well-adapted to war ("eliminating" pain, fear, emotional inhibitions of violence). This raises very fundamental questions: Who decides on and controls the use of these technical interventions? What understanding of a "good life", of "well-being", of "welfare" should, could, or will be the yardstick for these transformation processes? Can the 2030 Agenda be a point of reference for shaping such processes? Sustainability research that focuses on humans, their rights and their opportunities for development, must understand the dynamics that lead to an era in which people begin to fundamentally transform themselves. This type of question is new territory for sustainability research. It requires interdisciplinary networking of research on sustainability, digitization and AI at the ICB.



Third, in the digital age, a new quality of technical systems is emerging whose effects on sustainability have so far hardly been taken into account. Digitization and AI increasingly allow activities once considered to be a unique selling point of human processing to be transferred to technical systems. Technical systems learn to create cultural innovations (music, literature), they produce news texts, control financial systems, will make decisions in many complex contexts in the future, because some of their analytical abilities will exceed those of humans many times over. We need to look at how these technological developments can be developed and used for the benefit of humanity. It can no longer be denied that these cognitive technical systems will have a massive influence on our daily lives. Critics may ask the question up to what point people are able to use their algorithms to maintain control over networked, "intelligent", learning technical systems. These changes will not only have enormous implications for the labor market, but will also fundamentally change our entire social fabric. Sustainability research, which focuses on people and the common good, must understand and shape these fundamental potentials for change and innovation, but at the same time reflect on normative guidelines in the digital age: What limits should there be for technical systems? How can transparency be established as to whether and in which situations decisions are (or should be) made by humans or machines? How is the well-being of people defined in the digital age? At the same time, research must be conducted on how these change processes are catching on in different regions of the world and thus transform the international system.



**pioneering work with international partners**

The ICB will conduct pioneering work with international partners on these topics and in this context think about a next generation of development goals for the digital age.

# Mobility and Migration

Contemporary society is characterized by increasing mobility. This has not only geographical, but above all also social dimensions with various influencing factors. In geographical migration and mobility the classic factors should first be mentioned, such as conflicts, economic crises and changes, disasters and in the future presumably climate-induced environmental changes (SDGs 16, 13). Many of these factors are currently leading to massive transnational migration (incl. people fleeing their homeland and labor migration). However, these migratory flows have recently been strongly influenced by access to low-cost or even free means of communication and systems (although they still vary from region to region), both favorably and unfavorably.

The second important dimension of mobility is social mobility, not only in vertical terms (social advancement), but also in lateral terms, as an ordinary professional life becomes more and more diverse. The increase in mobility in this dimension is closely interwoven with geographic mobility. In particular, however, it is in many ways due to, but also limited by, the scientific and technical advances described in the previous section, which fundamentally change the social orders and offer humankind radically new possibilities with regard to its geographical and social mobility but will also present it with decisive new challenges. These diverse interactions between different dimensions of mobility, but also with scientific and technological developments, have so far been the subject of too little or no sustainability research. Social and spatial mobility are important prerequisites for the creation of sustainability in direct correspondence with almost all SDG objectives. Similar to the considerations in the previous chapter on digitization, however, the connections described force us to completely reconsider the question of what is sustainable and what is not.



The following key challenges should be mentioned in detail (without claiming to be complete): The topic of inclusion is at the root of all questions of mobility. Socio-economic, political and cultural inequalities (SDGs 10 and 16) are centrally shaped by social and spatial mobility and equally determine these. At the same time, social mobility and spatial migration processes repeatedly challenge the cohesion of society. Local communities in particular often feel insecure and threatened by changes in social and spatial mobility. Integration – at all levels of society – is therefore always looking for a balance between the maintenance of collective identities and individual life plans.

Newly added is the likelihood that climate-induced environmental changes (linked to "planetary boundaries") will increase the pressure in many places and lead to additional migration in the future. This will further increase the dynamics of these processes and represent a fundamental challenge for political control processes. The refugee crisis in the summer of 2015 already revealed that national and supranational (e.g. EU) institutions lack important capacities here. However, the sustainability debate would be incomplete if politics, for instance, concentrated only on the management of migration flows. Rather, the question is how politics must be shaped worldwide in order to make socio-economic and social participation possible. In the light of the scientific and technological dimension of global change described in the previous chapter, the concept of addressing the causes of displacement must be rethought.

**control processes within planetary boundaries**

Analogous to the development of communication technology, which has given developing countries access to communication to an extent that would have been barely conceivable with earlier (cable-based) technology, Industry 4.0 may enable industrialization progress in developing countries that would have been difficult to imagine or would at least have taken a very long time under previous approaches. The ICB will pursue research into such "corridors". The risk aspect is central to such issues.

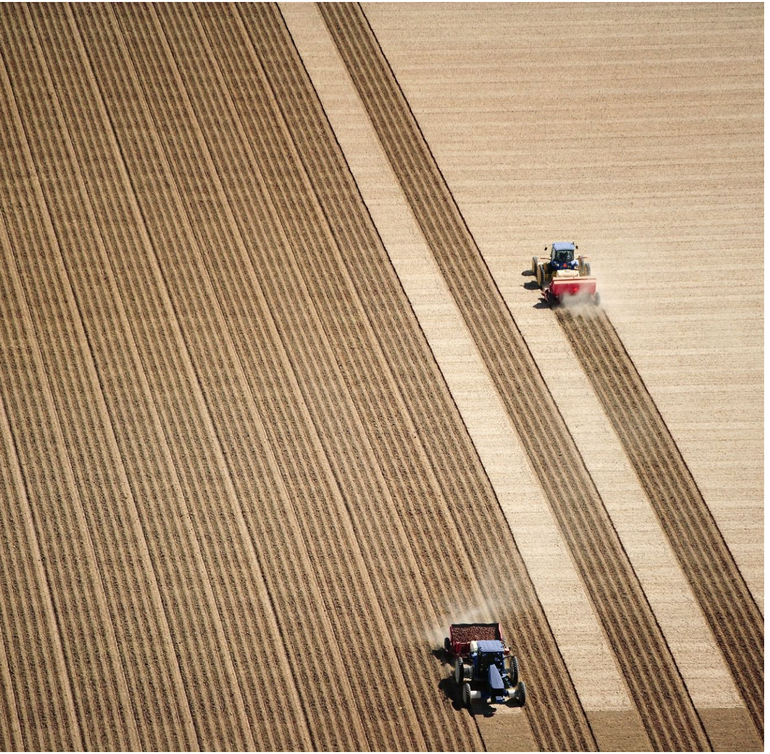
Precisely because of their dynamic and diversely networked character, social mobility and migration always entail the hard-to-quantify unforeseeable events and factors, including external influences such as environmental disasters and (climate-)ecological changes. Political and economic instabilities also come into play. The question arises as to how such risks, which have an adverse effect on sustainable development, can be anticipated and mitigated by preventive action.



# Bioeconomics

**The future of humankind** will depend to a large extent on reliable and secure access to food and the sustainable use of energy, water and raw materials. In view of climate change and dwindling resources, renewable sources and their basis play a central role. The 2030 Agenda and the Paris Climate Agreement to reduce greenhouse gas emissions will only be achievable by overcoming the current use of resources. Population growth, increasing food requirements and environmental pollution are leading to central conflicts of objectives for sustainable development with regard to higher living standards, limited arable land with increasing soil degradation, shrinking water supplies and the loss of biodiversity. Bioeconomics is searching for solutions to these challenges and conflicting goals. Humans and nature must be reconciled.

Bioeconomics is a core concept of transformation. With its National Research Strategy Bioeconomics, Germany took on a global leadership role in bioeconomics policy in 2010. In the recommendations of the German government's HighTech Forum 2017, bioeconomics is placed among the six most important topics of the future. The concept of bioeconomics has gained political momentum and importance worldwide over the past ten years. More than 50 countries have anchored bioeconomics in their policies since 2005.



Bioeconomics is based on the paradigm of biology and organisms that can grow, reproduce, repair and develop intelligently. Bioeconomics is therefore the sustainable production and use of biological resources, processes and principles to provide products and services in all economic sectors within the framework of a sustainable economic system. Bioeconomics refers not only to the use of renewable raw materials, but also to the use of biological processes and findings, for example in biomedicine and environmental technology. Ideally, bioeconomics should deliver better and more sustainable products and processes. Bioeconomics strives to decouple economic growth from resource consumption through efficient methods and innovations. This is research-intensive and places bioeconomics at the very center of a sustainable industrial strategy. Bioeconomics, understood as the "biologization of the economy", includes producers and consumers alike and is linked to the digitization of the economy. Bioeconomics requires innovations for sustainable solutions that are made possible by constant progress in the life sciences and related areas. This is pursued at the ICB, in particular with research to link new biological processes and findings with developments in agricultural science and in information, medical or production technology.



The nexus between water, land use and energy must be given a special focus in bioeconomics in order to reduce negative effects on the environment and society. Technological developments could, for example, provide biobased "supermaterials" such as biologically produced spider silk, nano-celluloses or biobased carbon fibers. Their use in the lightweight construction of vehicles and buildings can contribute to further energy and material savings. In the field of environmental technologies, water can be purified using biotechnology and biobased filters. Precision agriculture uses modern information and communication technologies as well as biological knowledge to offer resource-efficient solutions. In the field of bioenergy, hopes are pinned on the new generation of biofuels, which use plants and residues that are not in competition with food. With the help of biotechnological processes, carbon dioxide, for example from industrial emissions, can be used as a starting material for the production of fuels, chemicals or polymers.

However, the transition to a bio-sensitive society also requires adjustments for consumers. Resource footprints of products and services must be better understood and taken into account when making purchasing decisions. Social innovations such as "sharing" and "up-cycling" promote more sustainable lifestyles. Bioeconomics, which is oriented towards the material cycles of the natural world, fits such approaches and offers opportunities for innovations in the urban environment. Urban gardening, local use of biogenic waste such as food scraps, and the development of new nutrition concepts are also examples from everyday life in Germany. "Organic" in itself does not guarantee sustainability. The careful measurement of resource footprints and the monitoring of positive and negative effects of a growing bioeconomy are essential here. The development of a bioeconomy requires an open dialog between politics, industry, science and citizens on opportunities and risks, their evaluation and assessment. The establishment of international platforms that ensure a continuous and open dialog between scientists, politicians, companies and citizens could provide support. The ICB will provide such a platform.

**measurement of the resource footprint**

# The Campus

**unique concentration of expertise**

The ICB creates a research infrastructure that builds on the unique concentration of expertise in Bonn and develops the city into a global center of sustainability research. The ICB is surrounded by a corona of closely networked universities and non-university institutions (University of Bonn with its faculties and the ZEF, DIE, UNU-EHS, BICC and the Hochschule Bonn-Rhein-Sieg/University of Applied Sciences). These institutions are the network partners of the ICB and at the same time form the framework within which the new institute is embedded. The ICB comprises the following specific levels:

## Research:

Scientific priorities are set in order to close existing gaps and to create synergies between existing institutes. The ICB forms a research center for sustainable development and global change with a focus on "digitization and artificial intelligence", "mobility and migration" and "bioeconomics". The collective competitive advantages of the resulting research cluster will be significantly greater than the sum of the individual strengths of the participating institutes and institutions. Based on the research matrix developed above, each of these three research priorities will receive targeted support in accordance with the three perspectives with three fully funded senior professor chairs. In its Center for Advanced Study, the best scientists can be brought to Bonn as fellows to work together on the research topics.



## Education:

The aim of the ICB is to establish a specific international BA/MA/PhD program on the subject of sustainability research, whilst at the same time developing globally visible courses for (future) decision-makers. It can be seen, for example, that the topic of sustainability is gaining increasing importance for managers in a more and more international labor market. Sustainability plays an increasingly central role not only at the UN and national and international NGOs, but also in industry (in particular services). The current supply does not meet the demand. Interdisciplinary Bachelor and Master programs that combine technical and institutional innovations with political and social issues are lacking in Germany (compared to the Anglo-American region and also to France and the Netherlands).

On the level of Bachelor and Master degree programs, the University of Bonn could play a unique role in Germany through a new and independent Bonn Advanced School of Innovation and Sustainable Development (BASIS) that is coordinated across faculties and could also be very attractive for international students. The Bonn Advanced School should focus on areas such as 1) institutional innovation and politics, industry and organizations, 2) innovation for sustainable management and use of natural resources, and 3) technological innovation and digitization. Such a Bachelor and Master program would provide the established international doctoral programs in Bonn (e.g. at ZEF) with a strong "foundation".

This would give Bonn a new unique selling point in Germany.

## Transfer:

The ICB sees itself as a catalyst in relation to sustainability research. The scientific results are to be disseminated in the form of exchange, dialog, advice, co-production of knowledge, conferences and workshops both in industry (e.g. Startup Platform Bonn, but also DHL and Telekom) as well as in politics (federal government, state government, but also various ministries, such as the Federal Ministry for Economic Cooperation and Development (BMZ) and the Federal Ministry for the Evironment, Nature Conservation and Nuclear Safety (BMU), scientific organizations (German Research Foundation (DFG), Alexander von Humboldt Foundation, DAAD), political foundations (e.g. KAS, FES), NGOs, in the region (e.g. city of Bonn) and in practice. A central partner in this area is the UN. The UN in Bonn sees itself as the UN's "sustainability hub". Cooperation with the ICB will be fruitful for both partners. While the city of Bonn known for its outstanding research and the UNU already cooperate in a variety of ways, both in research and in training, further cooperations are to be established with other UN organizations based in Bonn, where the UNU can act as a pacemaker.



# INNOVATION CAMPUS BONN:
## Sustainability and Global Change

Geneva | Paris | BONN | Rome | New York

**Advisory Board**
(Quality control)

### Network Partners

**University of Bonn (eg. ZEF, Geography, Agricultural Factory), H-BRS, UNU, DIE, BICC**

### Research

**Research priorities**

ICB-Professorships

Center for Advanced Study

### Education

Bonn Advanced School of Innovation and Sustainable Development (BASIS)

BA and MA programs

### Transfer

Transfer to industry as well as to politics, civil society, scientific organizations, political foundations, NGOs and into practice

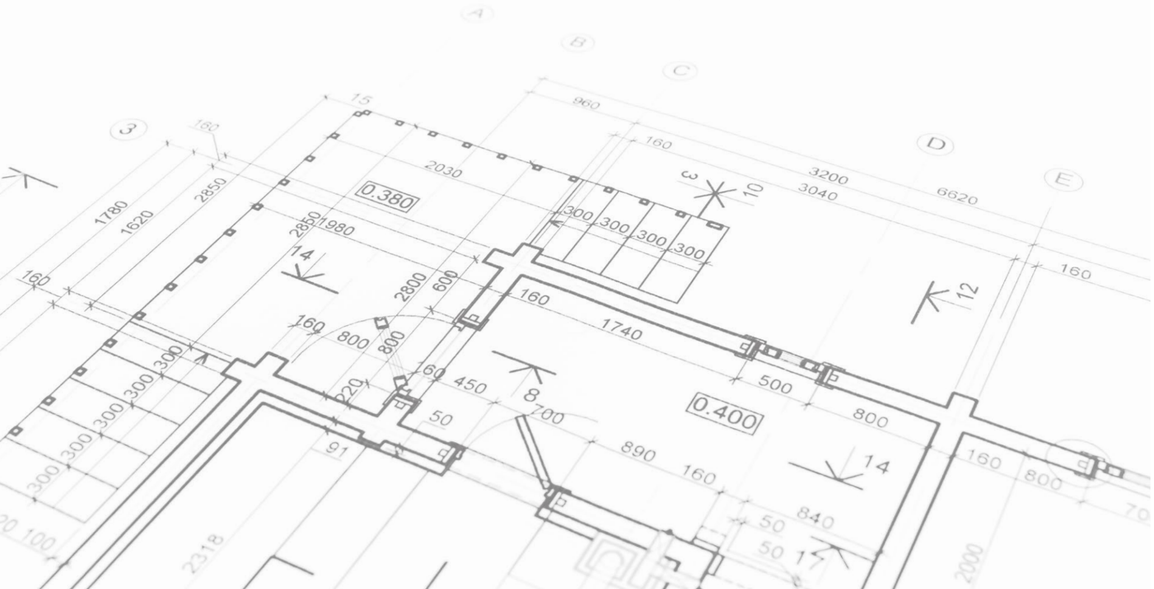
### Associate Partners

City of Bonn, scientific organizations (DFG, AvH, DAAD, EADI), political institutions (Federal Ministry for Economic Cooperation and Development (BMZ), Federal Ministry of Education and Research (BMBF), BIZ, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) , Federal Ministry for Economic Affairs and Energy (BMWi), Federal Ministry of Food and Agriculture (BMELV)), political foundations (e.g. KAS, FES), companies in the region, NGOs, GIZ, other UN institutions, Deutsche Welle and others.

# Financial Framework

**400 to 600 scientists**

Ideal is a campus where the existing research institutions (DIE, ZEF, UNU-EHS, BICC) and the new ICB are combined in a single location and share a joint infrastructure. It should provide 400 to 600 scientists with the necessary space. We anticipate that the Campus will cost approx. €40 million, plus maintenance costs. In addition to further material costs, we estimate personnel costs of approximately €12 million per year. Additionally, the sponsors of the ICB (University of Bonn, Hochschule Bonn-Rhein-Sieg/University of Applied Sciences, DIE, UNU-EHS, BICC) would need financial support to provide the foundation for the campus and to get started on the joint activities.






# Final Prospects

Due to its federal structure, Germany has top-level research at various locations, which is advantageous in many respects. However, for science to move beyond research and influence social changes on different scales and with various actors, central bundling and coordination of scientific competences is necessary.

**In the future key issue of "sustainability research", on which research is being conducted at many individual locations throughout the world, Bonn's unique scientific positioning provides the city with the opportunity to become a global player in shaping the global sustainability debate.**

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# INNOVATION CAMPUS BONN:
## Sustainability and Global Change

UNIVERSITÄT BONN

UNITED NATIONS UNIVERSITY
UNU-EHS
Institute for Environment and Human Security

zef
Zentrum für Entwicklungsforschung Universität Bonn

bicc Bonn
International Center for Conversion

d·i·e
Deutsches Institut für Entwicklungspolitik

Hochschule Bonn-Rhein-Sieg
University of Applied Sciences