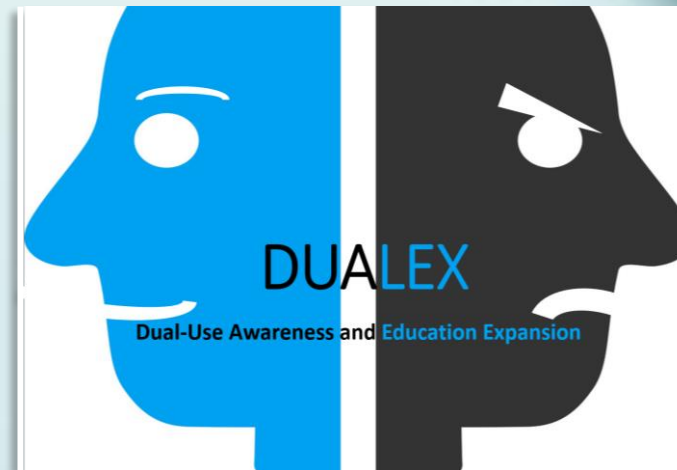


Biological Weapons in the Age of Synthetic Biology:

A Call for
Awareness Raising and
Education





Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG

Ongoing projects

CARL FRIEDRICH VON
WEIZSÄCKER CENTER
FOR SCIENCE AND
PEACE RESEARCH

CBWNet

Joint project of four German research institutions dedicated to the strengthening of the norms to ban chemical and biological weapons



VERIBIO

Joint project of UHH and TUHH dedicated to the qualification of PhD candidates in the field of biological arms control; Topic: The applied development of practicable concepts for preventive industry verification.

ELBE

Joint project on the enhancement of the communication in between authorities in the case of an unclear biological event. This project will be based on exercises with escalating complexity. Partners are German authorities from the local to the federal level.



Universität Hamburg

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Ongoing projects

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FOR SCIENCE AND
PEACE RESEARCH



BOKU

Institut für Sicherheits-
und Risikowissenschaften

SynBio-Weapons

Biosecurity assessment of the convergence of synthetic biology with new/innovative technologies

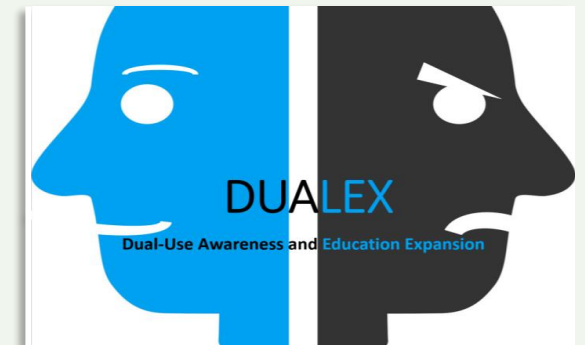


OTA-Report for the Deutsche Bundestag:

Biotechnology & AI – Risks of research for the security and proliferation of bioweapons

DUALEX

Dual-Use Awareness and Education expansion



Project partners



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FOR SCIENCE AND
PEACE RESEARCH



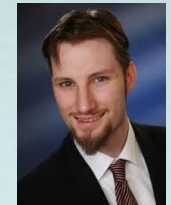
Dr. Gunnar Jeremias



Dr. Dunja M. Sabra



Dr. Bernd M. Giese



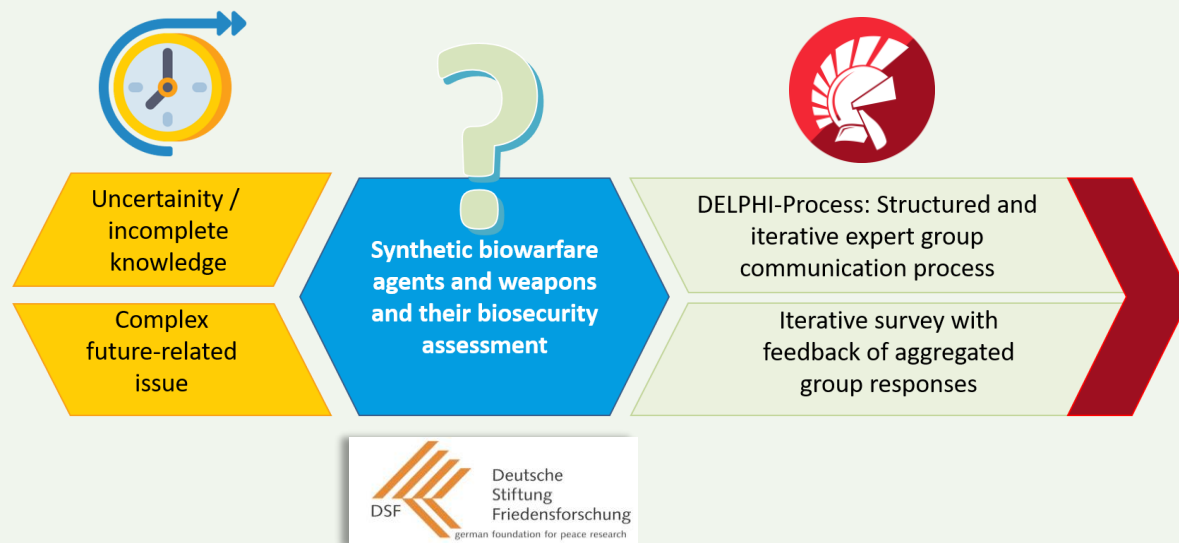
Dr. Johannes L. Frieß

Background and predecessor projects

Assessing novel biological threats due to dual-use technology

Synthetic bioweapons

Biosecurity assessment of the convergence of synthetic biology with new/innovative technologies



Biotechnology and artificial intelligence:

Risks of research for the security and proliferation of bioweapons

Biotechnologie und künstliche Intelligenz: Risiken der Forschung für die Sicherheit und Proliferation von Biowaffen

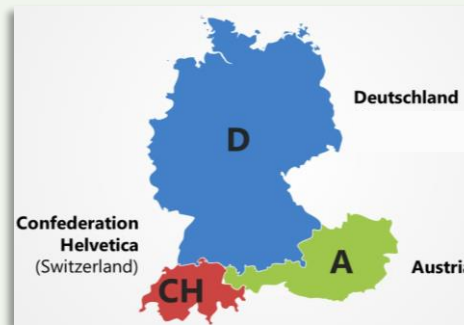
Gutachter/innen gesucht



The research question:

Are emerging technologies such as **SynBio** in context of other converging technologies such as **AI** relevant to **biosecurity** and **open to misuse**?

Delphi Process
Qualitative Data
Semi-quantitative Data



The empirical data demonstrate:

Students, researchers and academic staff are **unprepared** for the digital revolution's impact on science and technology.

There is a profound **need** for **structured training** in this area at academic institutions and universities.

Education, awareness and **sensitization** are key to **prevent misuse!**

1

2

3

Comprehensive data analysis from ongoing projects



Dual-Use Research of Concern (DURC)

Awareness must start early on!

→ Several German institutions, ministries and experts are quite unanimous



BMBF

**Federal Ministry of
Education and
Research**



DFG

**German Research
Foundation**



Leopoldina

**German National
Academy of
Sciences
Leopoldina**



Deutscher Ethikrat

**German Ethics
Council**

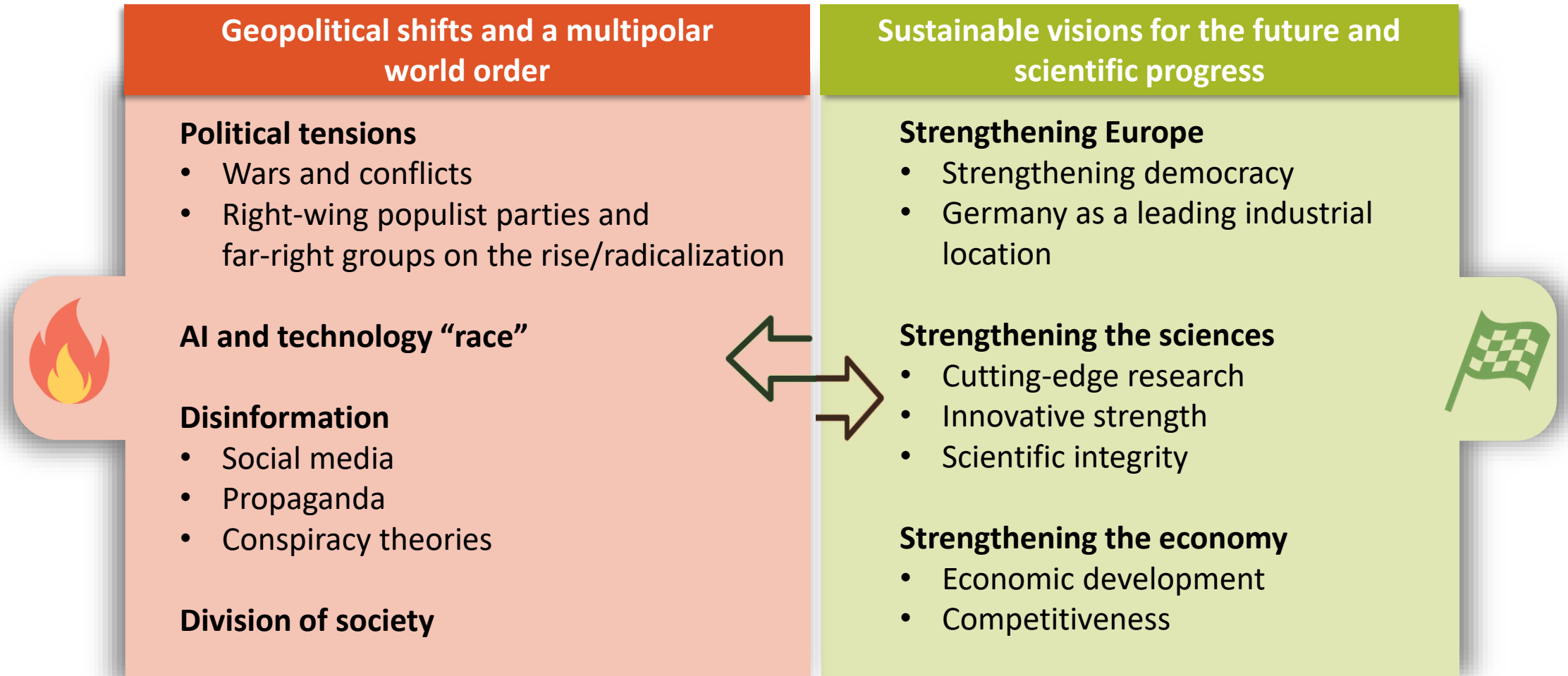


BAFA

**Federal Office of
Economics and
Export Control**



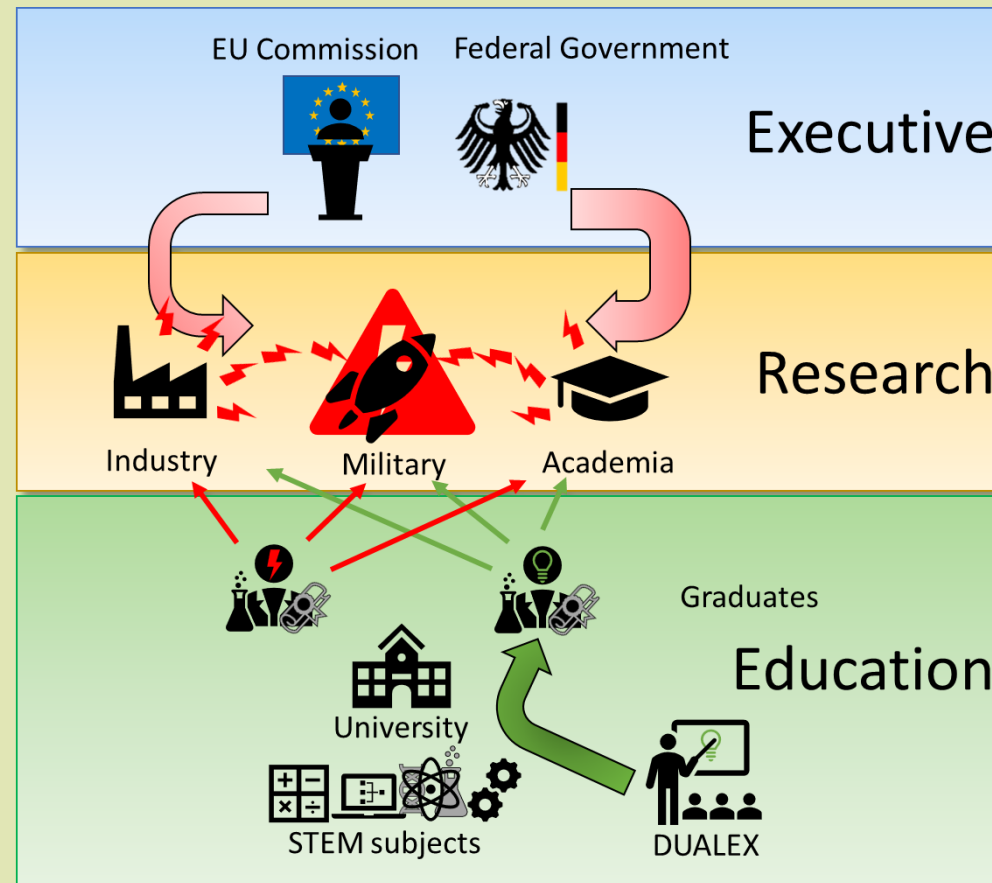
The political framework and the Civil Clause



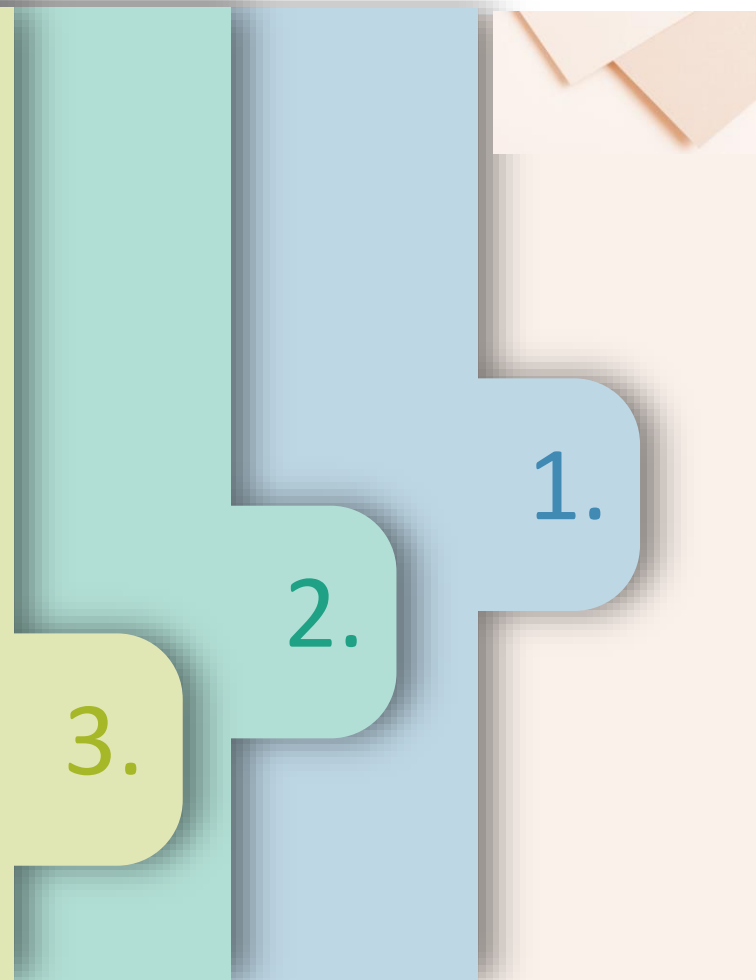
Political developments and Dual Use Research of Concern (DURC) issues

Dual-Use Awareness and Education expansion:

The idea in a nutshell



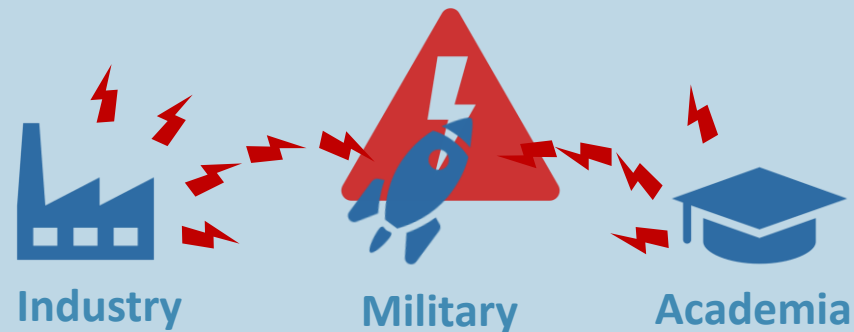
⚡ = Dual-Use Ignorance 💡 = Dual-Use Awareness



The idea in a nutshell

Development of (mandatory?) **course** on **DURC issues** at universities

- and establishment **at an early stage of studies**
- especially in the **STEM subjects**
- Raise students' awareness of **ethical and security policy risks**
- Tools for **dealing responsibly with DURC issues**



3.

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1.

The idea in a nutshell

The courses will cover the **entire academic education pathway** and **academic career**

- BSc
- MSc
- PhD



Universities



STEM-Subjects



DUALEX

3.

1.

2.

The idea in a nutshell

In the long term, a generation of scientists will emerge who can actively
→ **prevent the potential misuse of scientific findings**



Graduates



1.

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A- Introduction of awareness-raising courses

Course content should include the following topics:



Introduction to the dual-use topic:

- Definition of dual-use and DURC
- Historical examples of misused research results



Ethics and responsibility:

- Ethical dilemmas in research and reflection on the role of researchers in society



Legal framework:

- Overview of national and international regulations on dual-use research, e.g. the Biological Weapons Convention



Risk management in research:

- Strategies to minimize the potential for misuse and foster responsible research



Practice-oriented case studies:

- Analysis of real cases in which dual-use problems arose and development of solutions

B- Establishing a mentoring program

Mentoring program



- Mentoring program support for students and researchers
- Recognizing dual-use potential in research projects
- and minimize the potential for security-relevant misuse

Hands-on case studies



- Expertise of experienced scientists and security experts
- Analysis of relevant cases with junior researchers
- Development of ethically responsible solutions

Transdisciplinary cooperation



- Contribution to the structural redevelopment of university teaching
- Improving the balance between competition and cooperation
- Ensuring sustainability and future viability

C- Establishing forums and formats for discussion and exchange

Discussion forums:



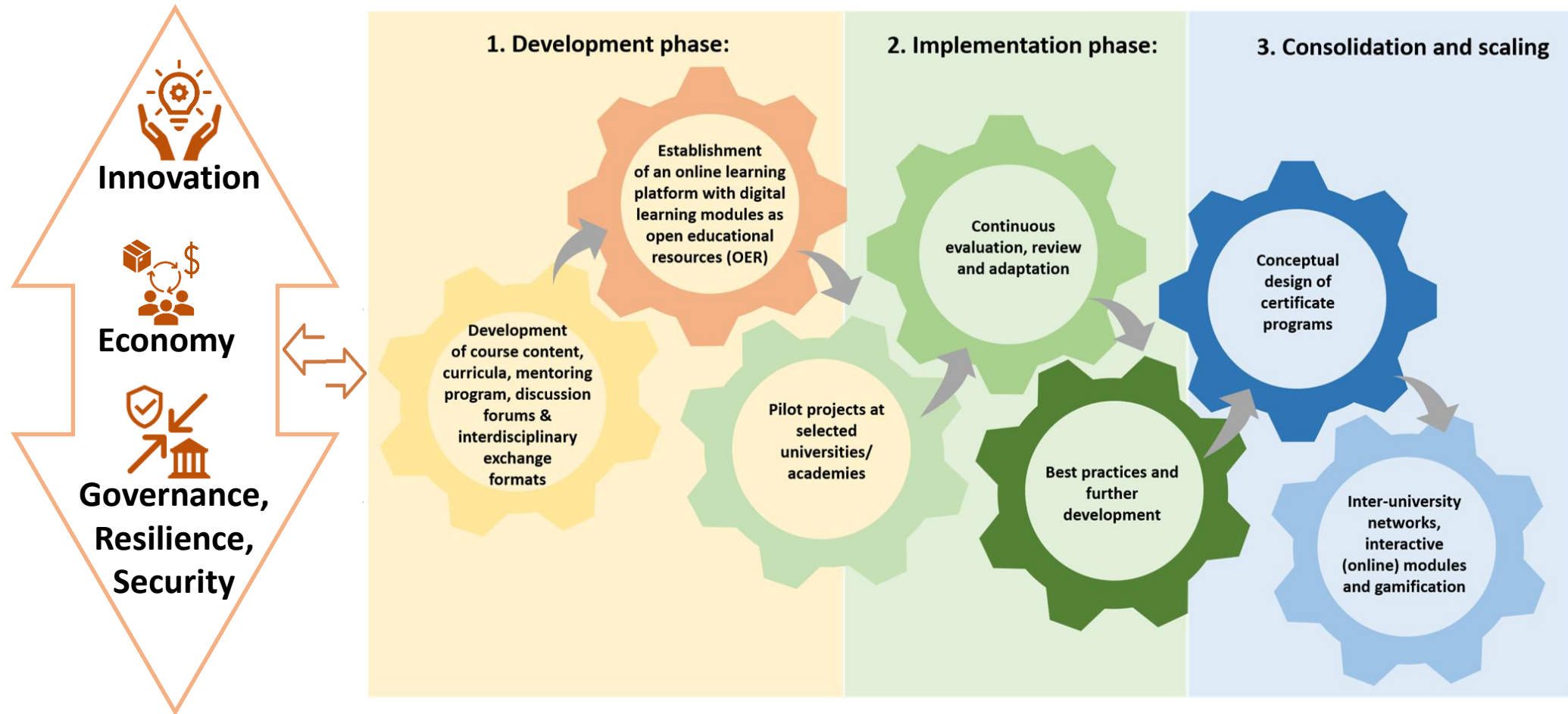
- Promoting dialog between different disciplines
- Enhancing the collaborative capacity of the scientific community
- Sustaining engagement with ethical challenges

Interdisciplinary exchange formats



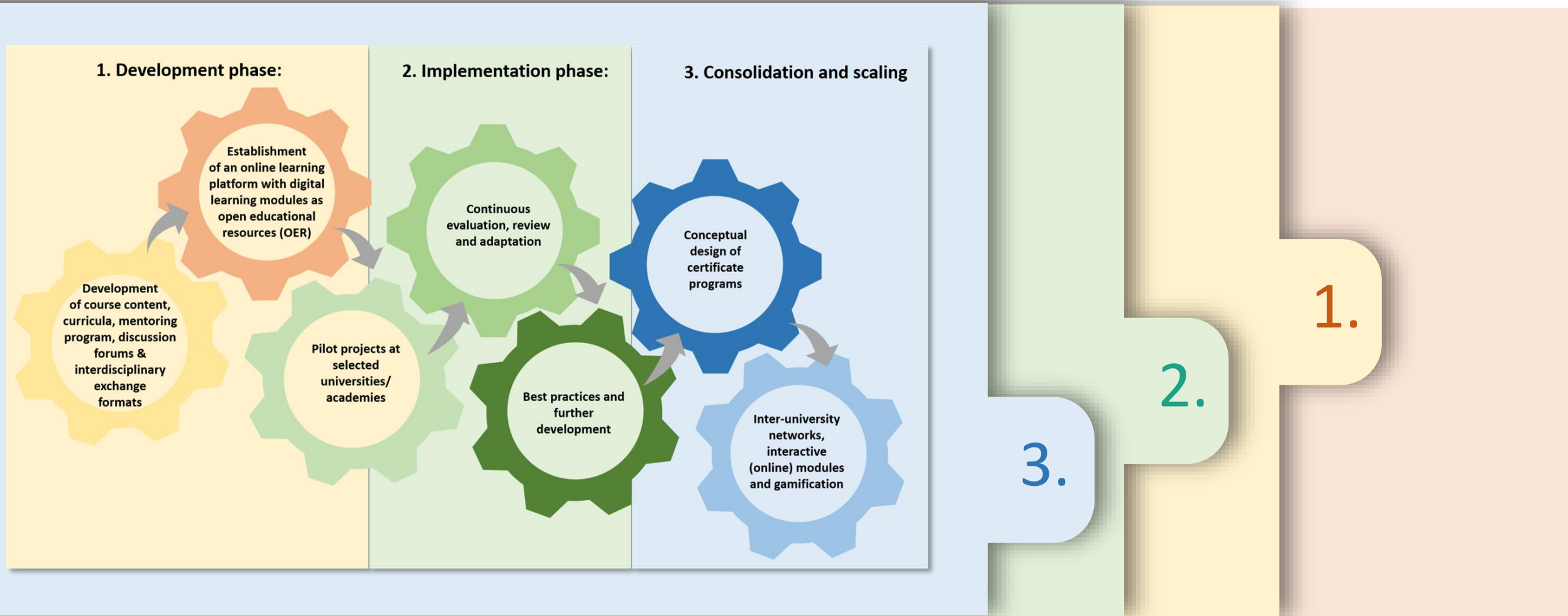
- Developing innovative approaches to minimize dual-use risks
- Developing joint solutions: Teachers, researchers and experts from different disciplines
- Exchanging best practices
- Increasing the resilience and adaptability of science and research

Structure and Implementation



UALEX - Dual-Use Awareness and Education Expansion: Structure and implementation

Structure and Implementation

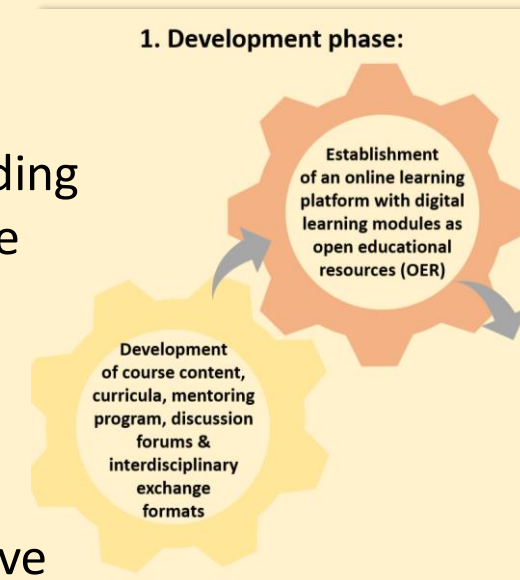


Structure and Implementation

1. Development phase:



- Development of modular course content and curricula by interdisciplinary and transdisciplinary teams from the fields (natural sciences, ethics and safety) and stakeholder involvement
- Digital learning modules on the dual-use topic including toolbox/construction kit models for the best possible freedom of design
- Online learning platforms and as open educational resources (OER) with feedback loop for continuous improvement and further development
- Structural embedding in teaching with comprehensive consideration of organizational psychological aspects
- Sustainable knowledge transfer to a broad target group



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2.

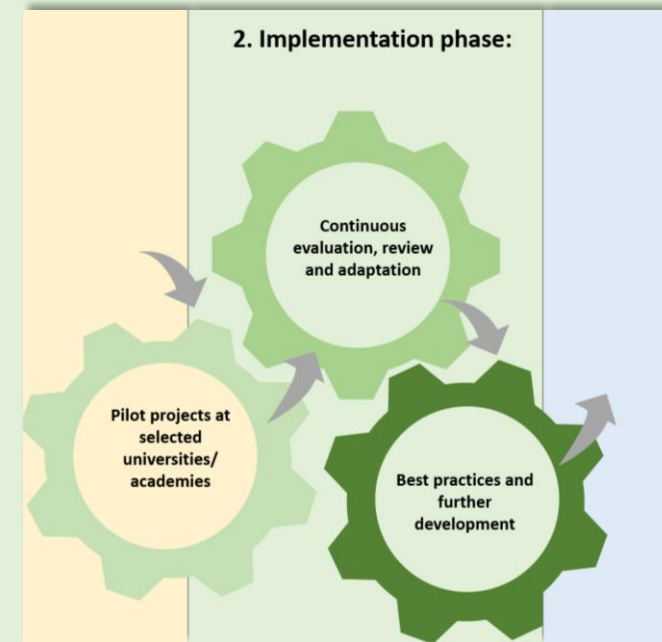
3.

Structure and Implementation

2. Implementation phase:



- Pilot projects at selected universities
- Continuous evaluation of the courses, also with regard to freedom of research and teaching
- Further development of the content
- Adaptation to current security policy developments
- Exchange of best practices
- Digital platforms for online learning modules on dual-use topics



3.

1.

2.

Structure and Implementation

3. Sustainability strategy for continuity and scaling

Comprehensive integration into STEM subjects at all German universities



Conception of certificate programs on ethical issues and responsibilities in research (\approx transfer certificate of the TU Berlin)

Incentives through a recognition system for committed students, teachers and researchers as well as educational institutions

Establishment of networks



Relevant players from industry, politics and civil society

Networking working groups coordinated by the German Rectors' Conference

Workshops and interactive (online) modules and gamification

3. Consolidation and scaling



3.

2.

1.

Structure and Implementation

3. Sustainability strategy for continuity and scaling (continued)

Cluster formation for financial support



Institutional sponsors (such as the BMBF)
Promotion of partnerships between public and private institutions

Public relations and information campaigns



Information campaigns at schools, universities and research institutions
Interdisciplinary events to promote awareness among the population

3. Consolidation and scaling



1.

2.

3.

Expansion to DACH region and EU

The combination of these measures

- enables successful implementation and dissemination
- → subsequent expansion to the **DACH region** or the **EU**



Thank you for your kind attention!

Questions and comments
are most welcome!

Mentimeter Survey



Contact details



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