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Viewpoint: Give Europe a readiness scale for dual-use research

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Researchers, institutions and funders still lack a common definition for dual use. A Dual-Use Readiness Level could help bridge that gap

By Jakub Szlachetko, Agnieszka Słowikowska, Adam Kola and Waldemar Dubaniowski



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Dual use has moved high up on the research and innovation policy agenda, but scientists, universities and research organisations are still struggling to define the boundaries between civilian research, security applications and defence technologies.

We think Europe should follow an alternative approach.

Many researchers are willing to contribute to societal resilience and security but do not necessarily want to help develop offensive applications. Universities and research organisations founded on open science and civilian research principles increasingly have to ask whether certain collaborations require additional ethical reviews, export-control assessments, restrictions on data sharing or enhanced research-security procedures.

For research funders too, it's increasingly difficult to describe what kind of dual-use projects they are willing to support. There is an enormous difference between funding fundamental research that one day may be applied in security or defence, and funding projects that are specifically aimed at developing technologies that will be deployed in a military environment.

The dual-use label tells us little about what researchers are actually doing and, without a more precise vocabulary, these very different activities risk being placed in a category that is too broad.

For example, a radio telescope and a synchrotron are both civilian research infrastructures. However, if scientists combine the capabilities of the two, they could better understand how to protect civilian infrastructure against global positioning system jamming and spoofing.

This type of research has obvious security relevance, but describing it simply as dual-use risks creating the impression that these institutions have suddenly entered weapons development.

Some technologies are developed from the beginning with both civilian and security applications in mind. These are dual use by design. Other technologies emerge from civilian research and only later prove to be useful for security or military use. Technologies in the former category are dual-use by design, while those in the former category could generate a dual-use benefit.

Both categories matter, but they are not the same, and researchers, institutions and funding agencies need a way to distinguish between them.

TRLs for dual use

In the 1970s, NASA wanted to assess the technological maturity of research projects, and it developed Technology Readiness Levels (TRLs), a nine-step scale that provides a common language for classifying different types of research, from basic principles at TRL 1 to a technology proven in an operational environment at TRL 9.

We believe that Europe should develop, based on the TRL model, a scale that would assess the dual-use implications of specific research projects and technologies, including whether security implications have been identified, whether its potential applications have been considered, whether appropriate governance is in place or whether the technology can be shared and developed responsibly.

Related readiness scales have recently also appeared in the US, such as MIT's Dual-Use Readiness Levels, which helps start-ups balance commercial and defence markets, and Ontario's Dual-Use Readiness Assessment, which rates universities' institutional governance. But neither describes the dual-use posture and governance maturity of individual research projects and research infrastructures across Europe's fragmented national and EU frameworks.

If TRLs measure whether a particular technology is ready to be deployed, a Dual-Use Readiness Level (DURL) would assess if the dual-use implications of a project are understood and whether the technology can be developed, shared and used responsibly.

DURL should not be a scale measuring how "military" a technology is. Nor should a high DURL automatically mean that a technology is more dangerous or more desirable. Instead, it should describe the maturity with which its dual-use dimension has been recognised, assessed and governed.

At the earliest stages of research, this could mean little more than acknowledging that a future dual-use application may exist.

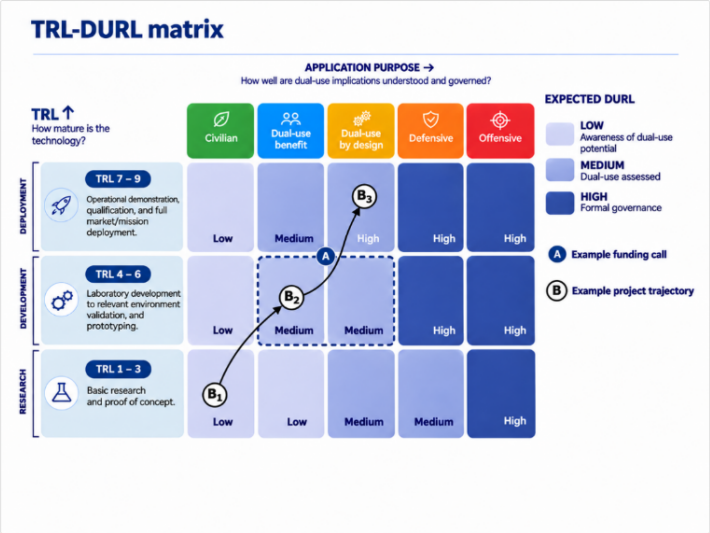
As the technology matures, the assessment would become more structured. Researchers and institutions might consider potential civilian and security applications, ethical implications, export-control requirements, partner selection, data-access rules, intellectual-property issues and appropriate institutional oversight.

At higher levels, governance could include formal risk-management plans, compliance procedures, monitoring and clear rules governing dissemination and long-term responsibility.

For every TRL stage, a project could be described using two additional pieces of information: its application posture, for example, civilian, dual-use benefit, dual-use by design, defensive or offensive, together with the maturity of its governance.

Why funders should care

This is not simply an academic classification exercise. European and national funding programmes increasingly operate across the boundaries between research, innovation, resilience and security. The European Defence Fund already supports activities ranging from generating knowledge to design, prototyping, testing and qualification. NATO's Science for Peace and Security Programme similarly supports research in areas that can have both civilian and security relevance. The discussion surrounding the next EU Framework Programme makes the need for a more precise vocabulary even more important.



Funding agencies need to be able to say not merely which technological field they want to support and which TRL they expect, but also what kind of dual-use application and governance maturity they are prepared to fund.

We do not suggest that the scientific community should adopt a finished DURL standard tomorrow. Quite the opposite. The framework should be developed openly and tested by researchers, universities, research infrastructures, funding agencies, ethics experts, industry and security institutions. Different communities will inevitably see the problem differently. That debate is necessary. But Europe should start testing it now.

Research organisations could pilot DURL-like assessments in selected projects and infrastructure access procedures. National ministries could test the concept alongside existing research-security and export-control guidance. The European Commission could examine whether such a framework could complement TRL in future research and infrastructure programmes, including the preparations for the next Horizon Europe.

The objective should not be to classify more science as military. It should be precisely the opposite: to create enough granularity to distinguish clearly between fundamental civilian research, research generating security benefits, technologies deliberately designed for dual application and projects moving towards explicitly defensive or offensive use. That distinction could help preserve openness where openness is appropriate while introducing stronger governance where it is genuinely needed.

Jakub Szlachetko is director of the National Synchrotron Radiation Centre Solaris and a professor at Jagiellonian University. Agnieszka Słowikowska is director of the Joint Institute for VLBI ERIC and a professor at Nicolaus Copernicus University in Toruń. Adam Kola is vice-rector for research at Nicolaus Copernicus University in Toruń. Waldemar Dubaniowski is director of the Brussels office of Poland's National Centre for Research and Development.

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