



**Barcelona
Supercomputing
Center**
Centro Nacional de Supercomputación



**EXCELENCIA
SEVERO
OCHOA**

Ethical and social implications of the digital transformation

Digital transformation for a sustainable Anthropocene

European Environment and Sustainable Development Advisory Councils Network (EEAC Network)

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“What are the main challenges to achieve a social an inclusive digital transformation? (with special attention to the ethical application of AI)”

Outline

- Leveraging digital technologies for sustainable development
- The digital nature of climate and sustainability science
- Technology and society
- The rise of AI ethics
- Doing the work that it takes to integrate socio-ecological and technical systems
- We matter more than we think



Leveraging digital technologies for
sustainable development

futurearth

WITH SUPPORT FROM

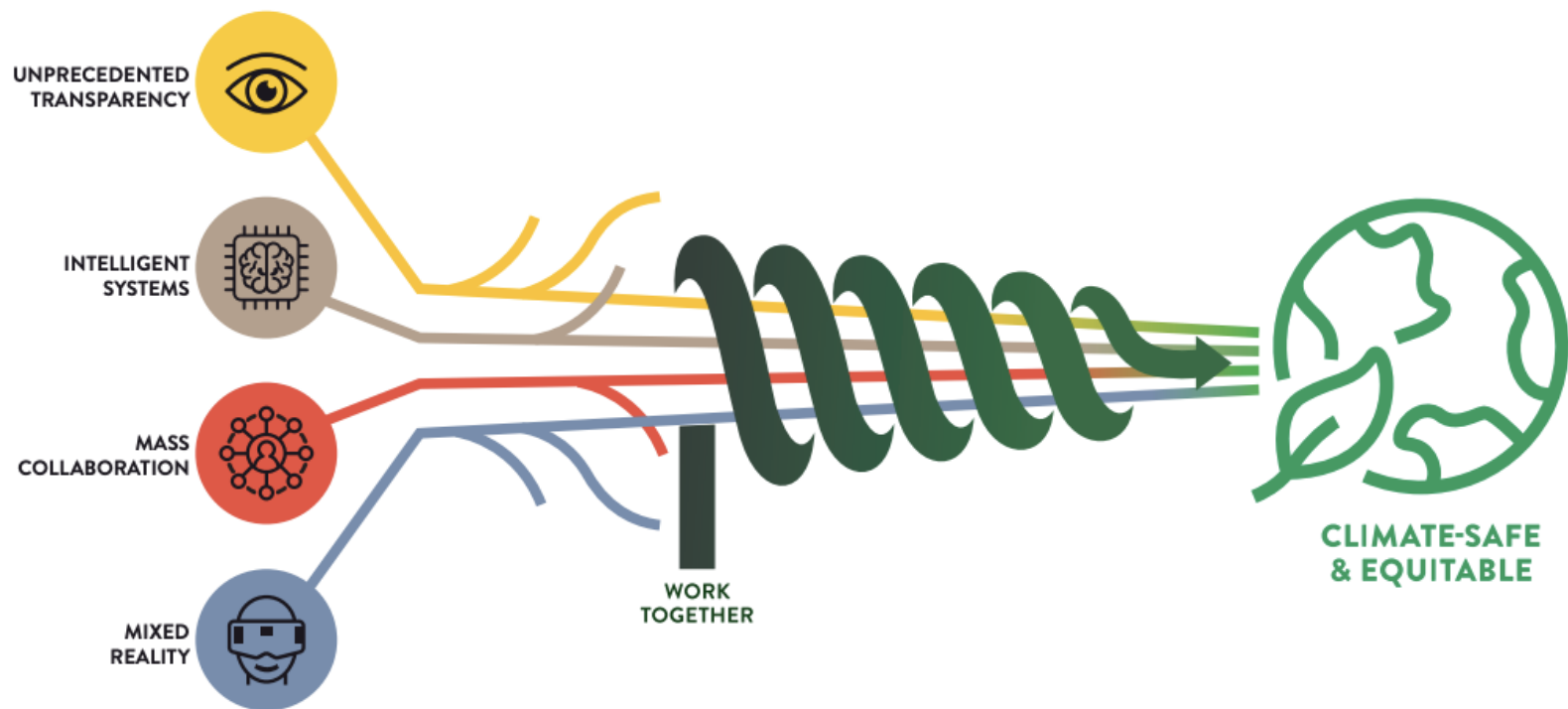


UK Research and Innovation



We cannot leverage digitalization to address sustainability challenges without putting social and human factors at the centre!

DIGITAL DISRUPTORS

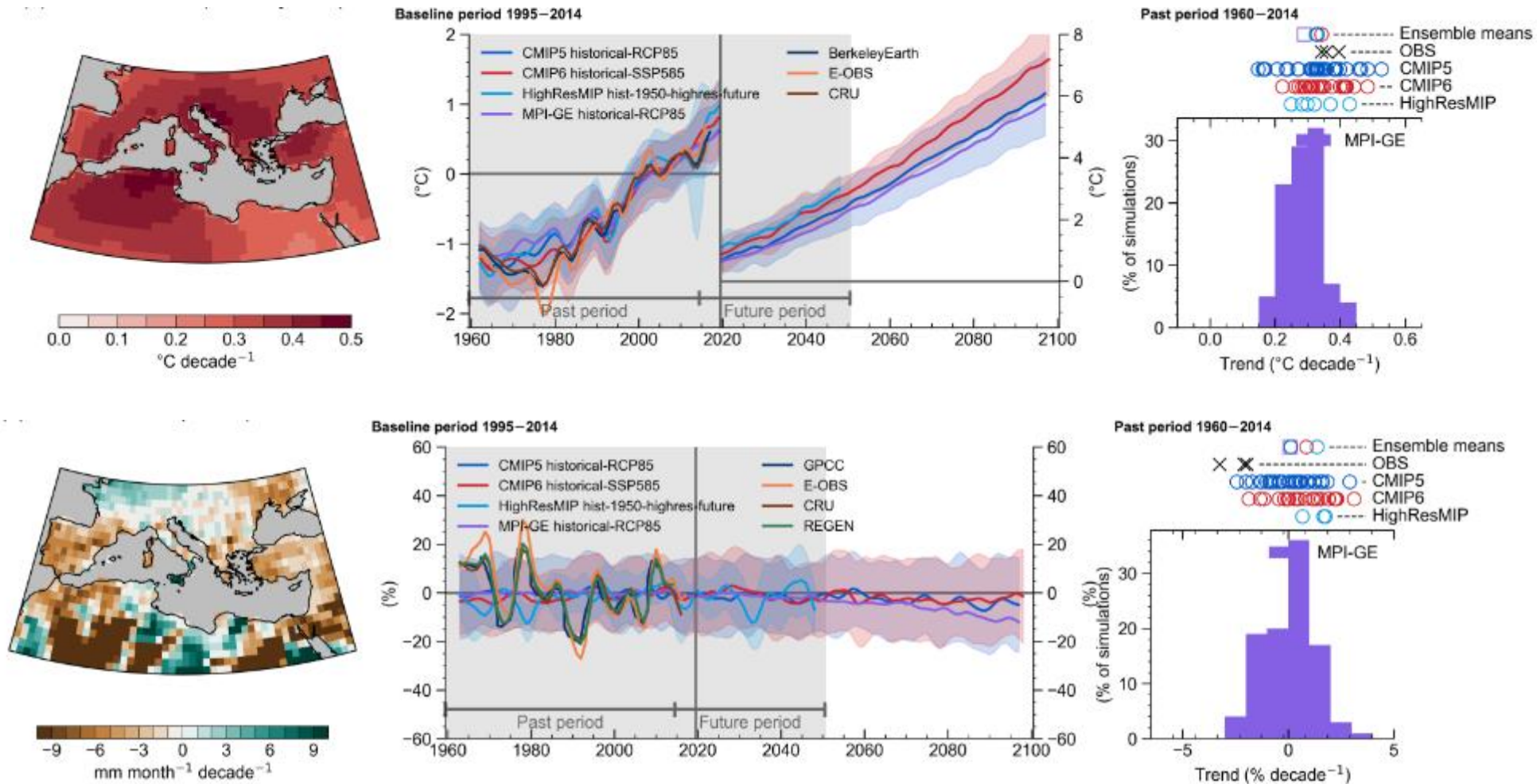


Source: [Sustainability in the Digital Age | A Future Earth Initiative \(sustainabilitydigitalage.org\)](https://sustainabilitydigitalage.org)



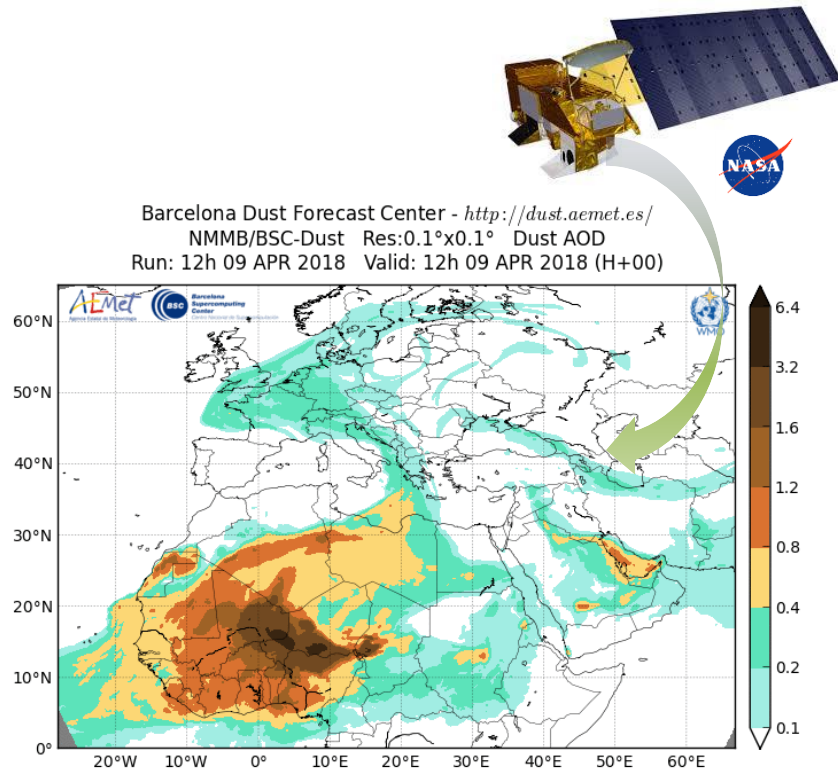
Digital nature of climate and sustainability science

Climate sciences & computational capabilities

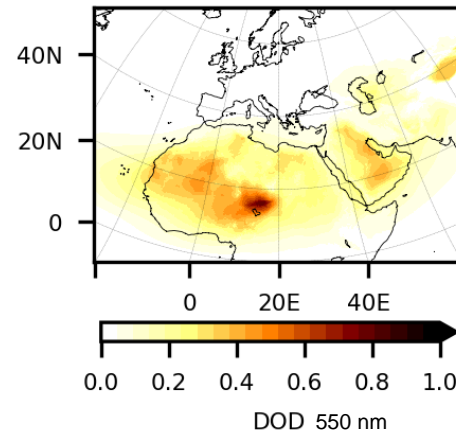


High-resolution regional reanalysis of desert dust aerosol

A complete and consistent, four-dimensional reconstruction of desert dust in a recent decade (2007-2016) by assimilating satellite observations in the BSC MONARCH model



- ✓ Unprecedented high resolution ($0.1^\circ \times 0.1^\circ$, 3h)
- ✓ Specific constraint from satellite dust observations
- ✓ Uncertainty estimates in the reanalysis output
- ✓ Link to specific air quality and climate services



Dust-related Climate Services

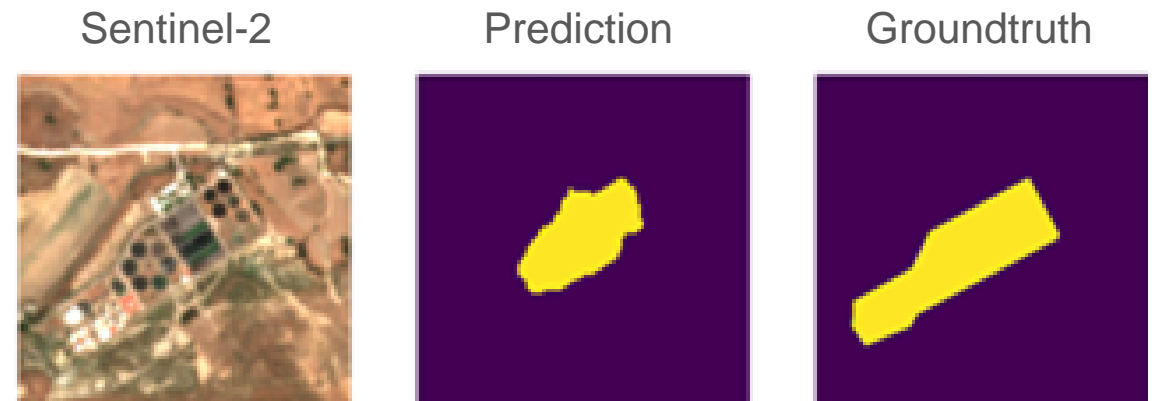
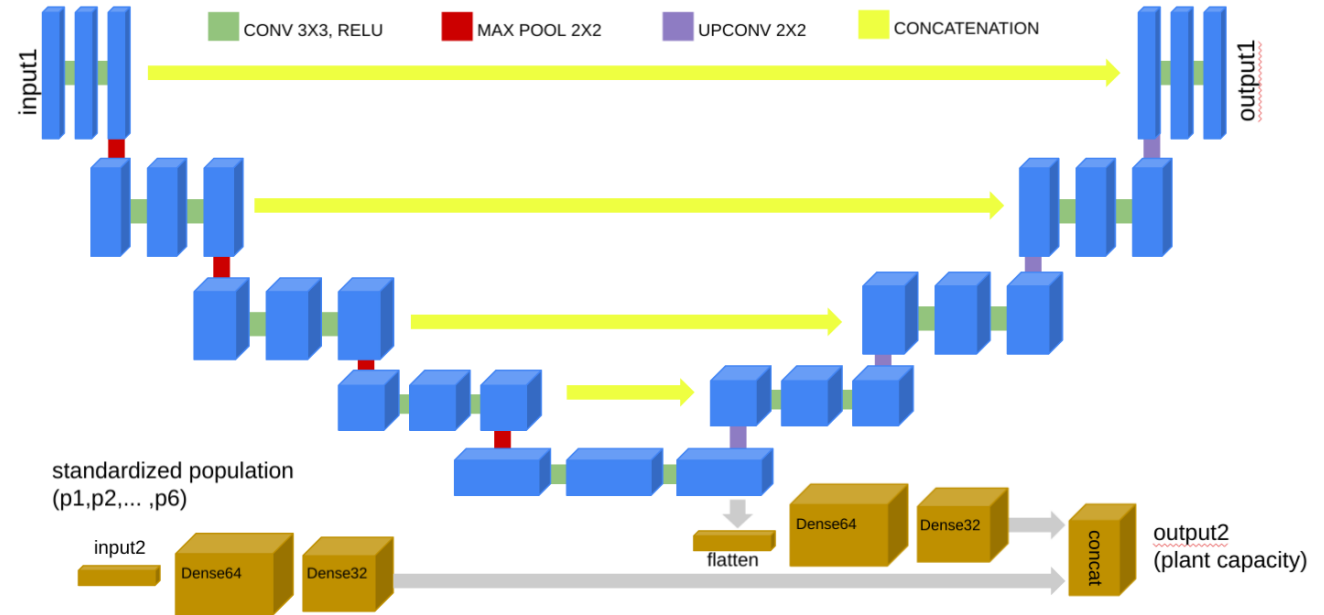


Dust Climatology

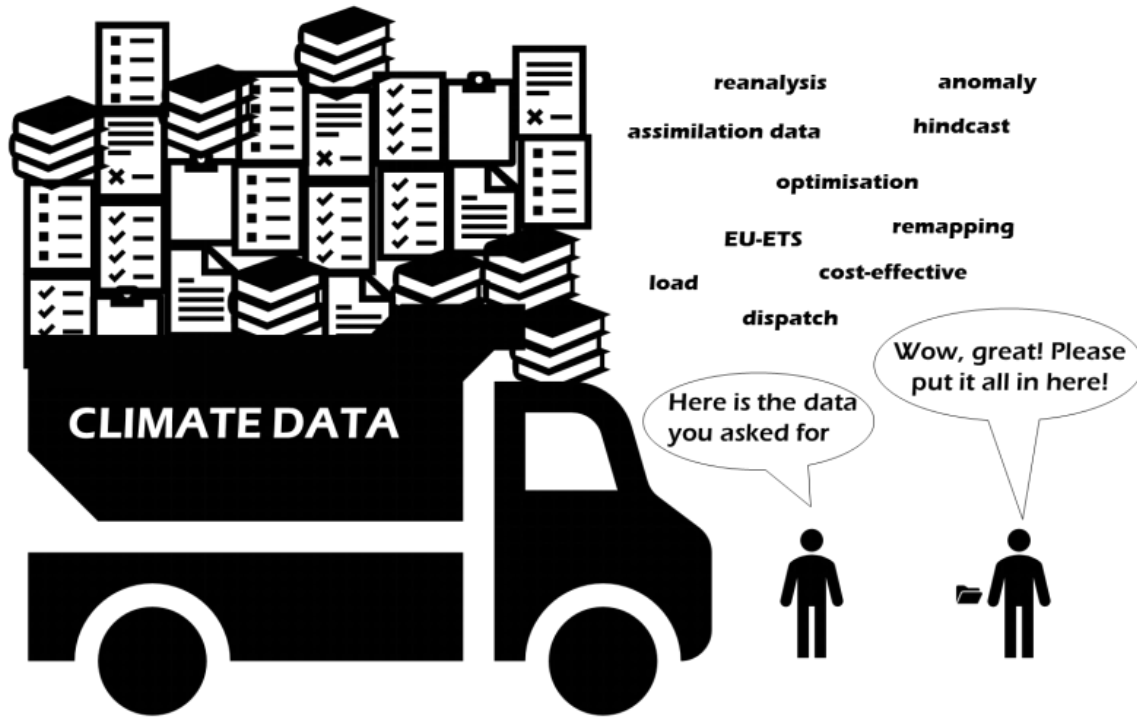
The reanalysis data set is freely and publicly available (Di Tomaso et al., ESSDD 2021)

Computer vision for improving emission models

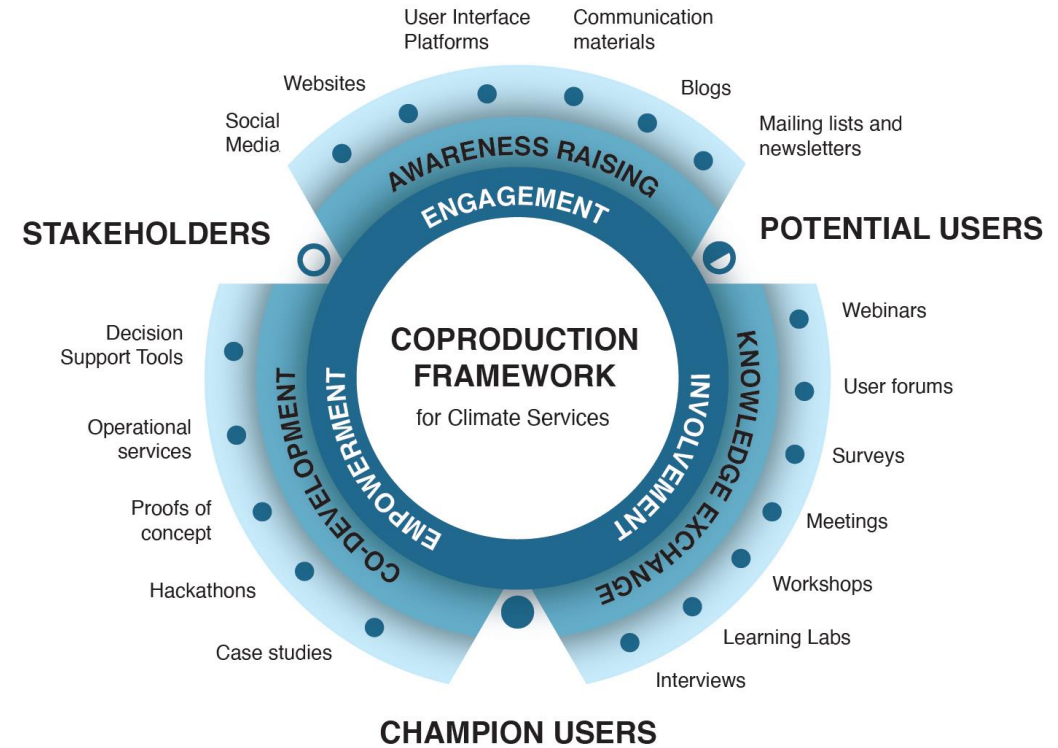
- Wastewater treatment plants (WWTPs) are a source responsible for ~20% of the CH₄ emissions
- We develop a methodology for the localization and characterization of WWTPs using a U-NET-based semantic segmentation algorithm
- The model is trained on Sentinel-2 10m images over the Iberian peninsula
- This methodology could help improving the spatial proxies for distributing CH₄ emissions in atmospheric emission models



Data ... too much data, whose data, data for what



reanalysis
 anomaly
 assimilation data
 hindcast
 optimisation
 EU-ETS
 remapping
 load
 cost-effective
 dispatch



Dragana Bojovic, Asuncion Lera St. Clair, Isadora Christel, Marta Terrado, Philipp Stanzel, Paula Gonzalez, Erika J. Palin, Engagement, involvement and empowerment: Three realms of a coproduction framework for climate services, *Global Environmental Change*, Volume 68, 2021, <https://doi.org/10.1016/j.gloenvcha.2021.102271>.

Technology and society

The image is a digital-themed background. It features a blue-toned globe of the Earth in the upper left. A bright light source on the right creates a lens flare and illuminates the scene. The foreground is dominated by a perspective view of a grid of binary code (0s and 1s) that recedes into the distance. Overlaid on this are several glowing, semi-transparent lines and planes that suggest data flow and digital connectivity.



We need to look at society's evolution and society's needs as an integral part of envisioning the technologies that may and should dominate 2030

TECHNOLOGY AND SOCIETY

Bi-directional
relation

Societal acceptance
& Licence to operate

Widely-shared
purpose

Perception technology
deepens inequalities &
unsustainable lifestyles

Source: [Technology Outlook 2030 - DNV](#)

The trilemma

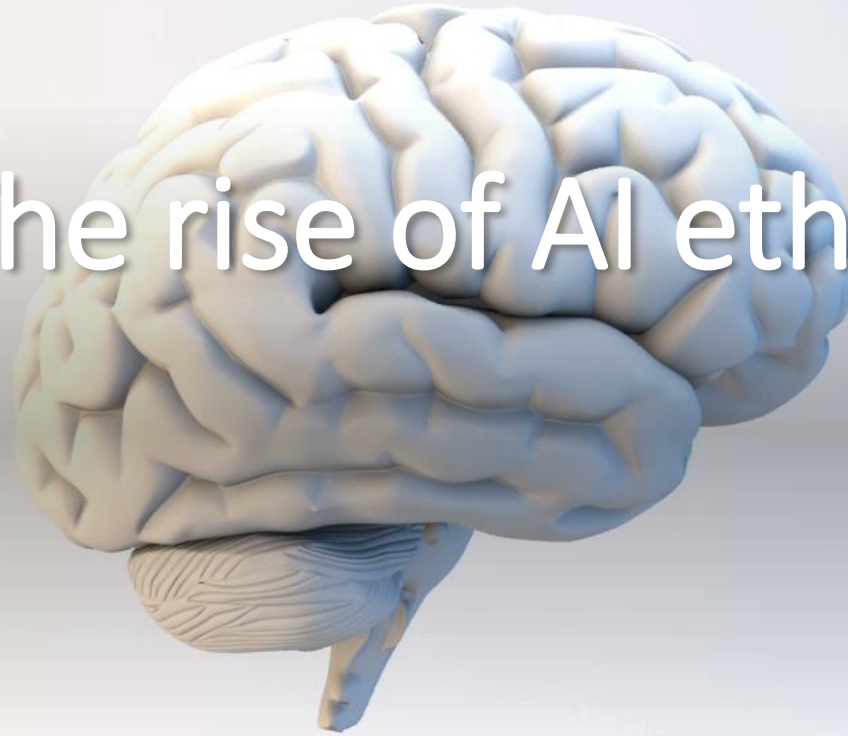
Economic potential

Social well being



Environmental sustainability

The rise of AI ethics



Trust and ethics



Trustworthy AI guidelines (+AIA)

ISO/IEC JTC 1
ISO/IEC JTC 1/SC 42
Artificial intelligence



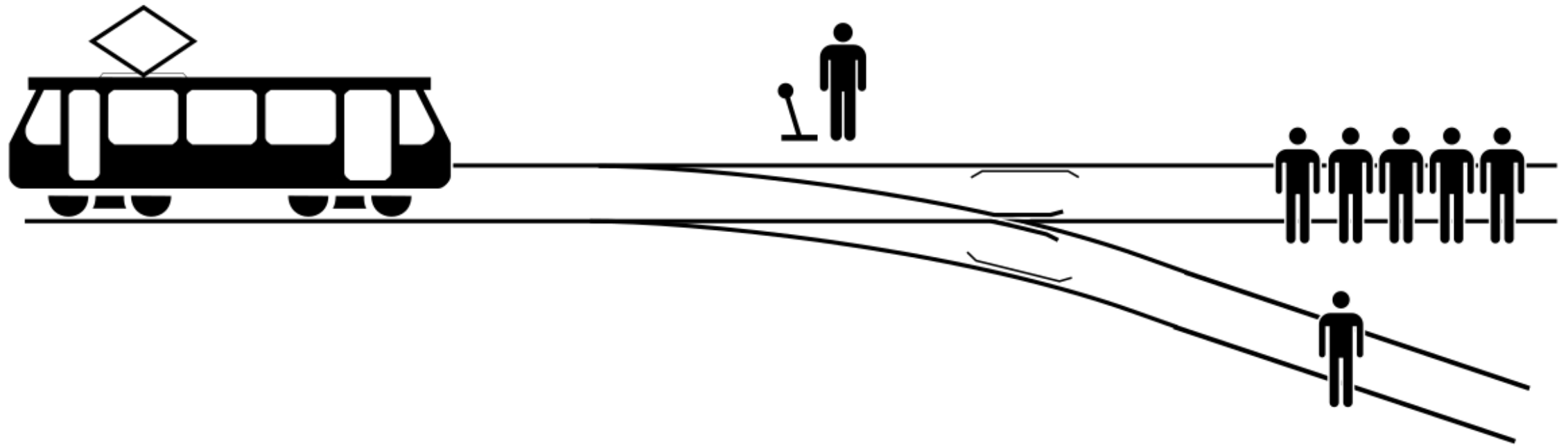
Multidimensional nature of trust

Sprawling AI Ethics Guidelines
#responsibleAI

Ethical issues often not related to technology

Major drive to regulate AI impacts on society

A misguided understanding of ethics ?



Ethics and trust cannot be an afterthought

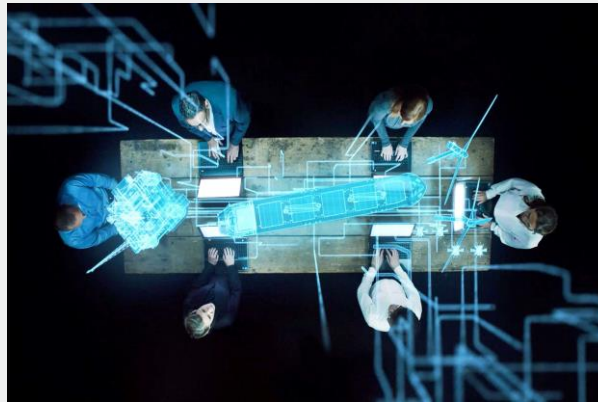
Ethics in design:

- Anticipating consequences



Ethics by design:

- Behaviour of AI systems



Ethics for Design(ers):

- Integrity of all actors in research and implementation processes



Source: Dignum, V. 2019. Responsible artificial intelligence: How to develop and use AI in a responsible way. Springer.

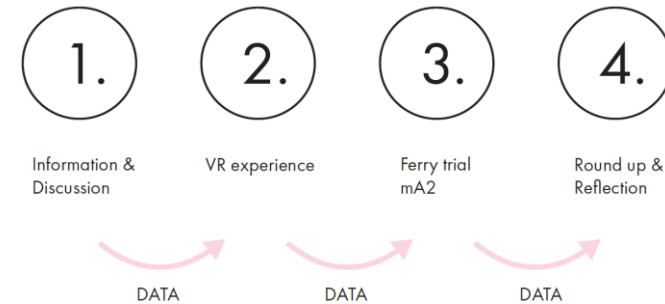
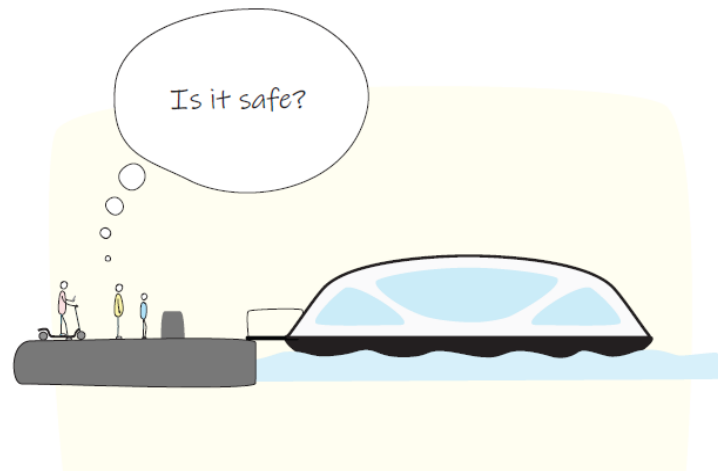
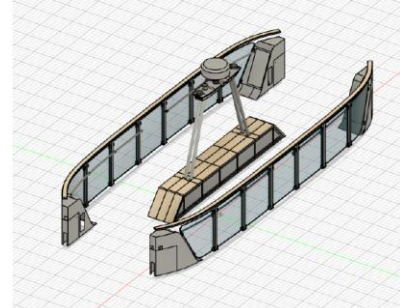
A blurred office desk scene. In the foreground, a pair of glasses rests on a stack of papers. To the left, a white coffee cup with a black lid is visible. The background shows a laptop screen and a window with a grid pattern, all out of focus. The text "Doing the work that it takes" is overlaid in the center in a white, sans-serif font.

Doing the work that it takes

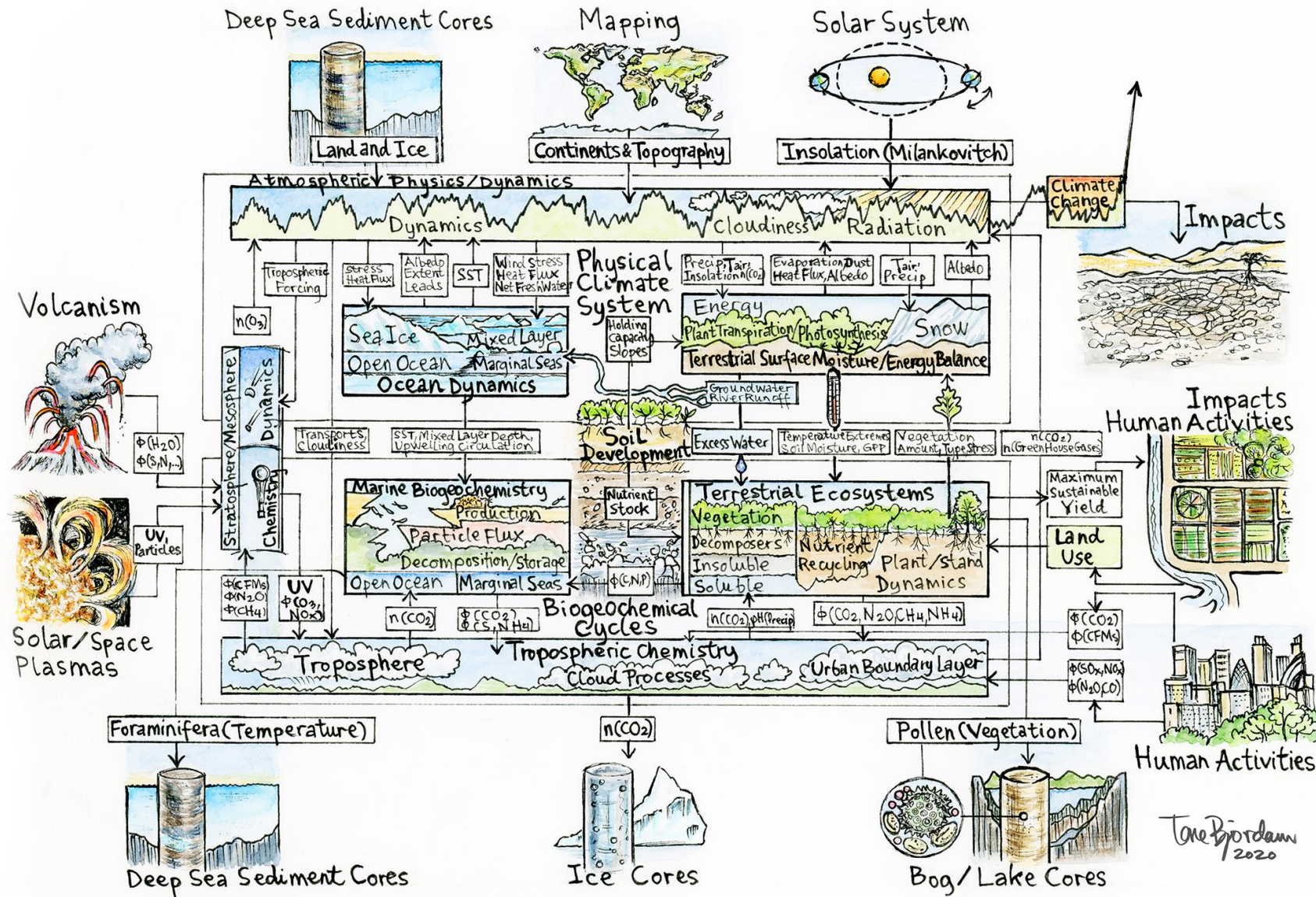
Assuring Trustworthy, Safe and Sustainable Transport for All - TRUSST



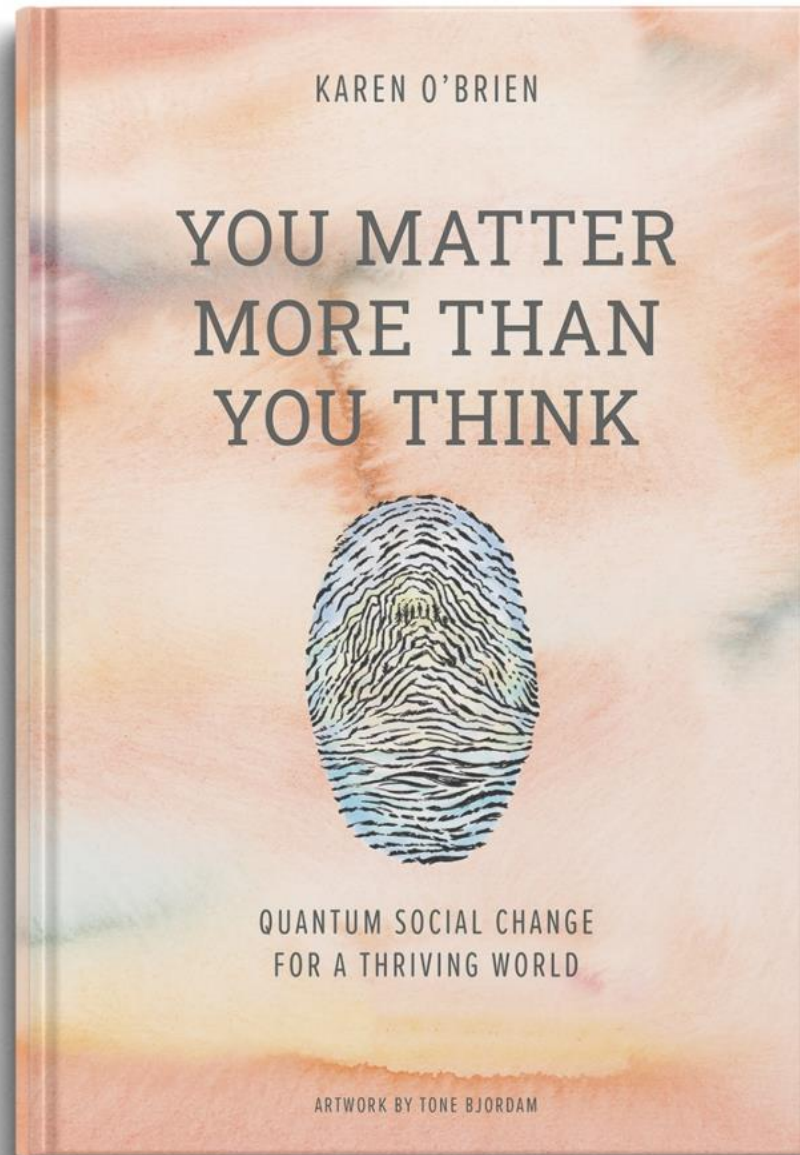
Investigate social dimensions of intelligent technologies



Building recommendations to be used in DNV's trustframework, design improvements and research.



Humans
outside
the
loop

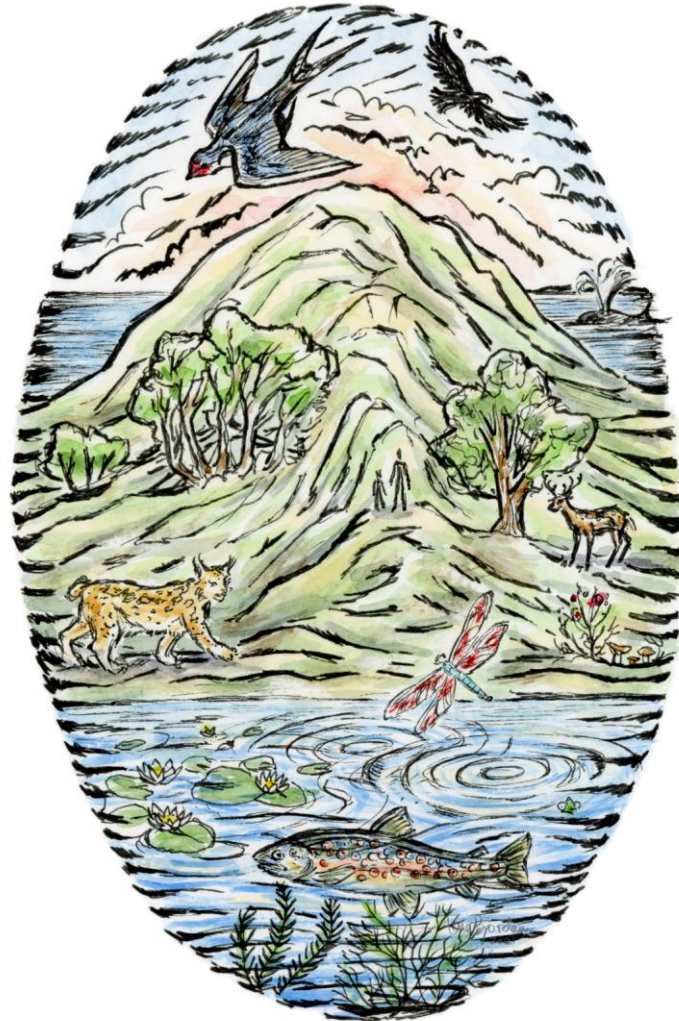


No technological advance will solve the failure to understand and value the social and human dimensions of technological innovation, of global environmental change, or of artificial intelligence

This failure leads to a pervasive misrepresentation of the role of human beings in creating and solving issues, in imagining and hoping

And in doing so create the quantum leaps we need

*The
footprint
of the
world on
us*



*Our
footprint
of the
world*

*Our
relations to
each other*

*Near by
and far
away*



*Today and
tomorrow*



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**EXCELENCIA
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Thank you

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