Integrating ethics in risk governance of nanomaterials in tyres

Ineke Malsch,[a] Panagiotis Isigonis,[b] Evert Bouman,[c] Antreas Afantitis,[d] Georgia Melagraki,[d] Maria Dusinska[c]

[a]*Malsch TechnoValuation, PO Box 455, 3500AL Utrecht, The Netherlands – malschtechnovaluation@xs4all.nl*
[b]*UNIVE, Ca'Foscari University of Venice, Mestre-Venezia, Italy,* [c]*NILU-Norwegian Institute for Air Research, Kjeller, Norway,* [d]*Novamechanics, Nicosia*

Abstract & Background, Motivation and Objective

The nano risk governance framework and tools under development in the NMBP-13 project Gov4Nano, NanoRIGO and RiskGONE have been tested on a case study of the application of nanomaterials in tyres. In RiskGONE, online tools have been developed to guide users through an ethical impact assessment (EIA), as part of this broader risk governance framework. The EIA process is based on the CEN pre-standard on EIA (CEN CWA 17145-2:2017). In this poster, we show the possible added value of the EIA tools for risk governance of nanomaterials in tyres, based on limited open access information found on the internet.

Keywords: Risk Governance, Ethics, Nanomaterials, Tyres

Methodology

We used the online tools developed in RiskGONE [1], guiding us through the six-step Ethical Impact Assessment (EIA) procedure outlined below. The screening was guided by a checklist of nine categories of negative ethical impacts: health, privacy, liberties, equality, common good, environment, sustainability, military dual use, and misuse. The checklist allowed to determine the scope of the full-scale EIA, by selecting which ethical impacts were deemed relevant to the incorporation of nanomaterials in tyres, estimating the severity of each issue on a five-point scale. In this case, a small EIA was deemed appropriate. Thereafter, a plan for performing this EIA was drafted, including the required resources and appropriate methodologies. Given the aim to use the case only as demonstration of the EIA tools, one ethicist identified and evaluated ethical issues using desk research and drafted recommendations for remedial actions.

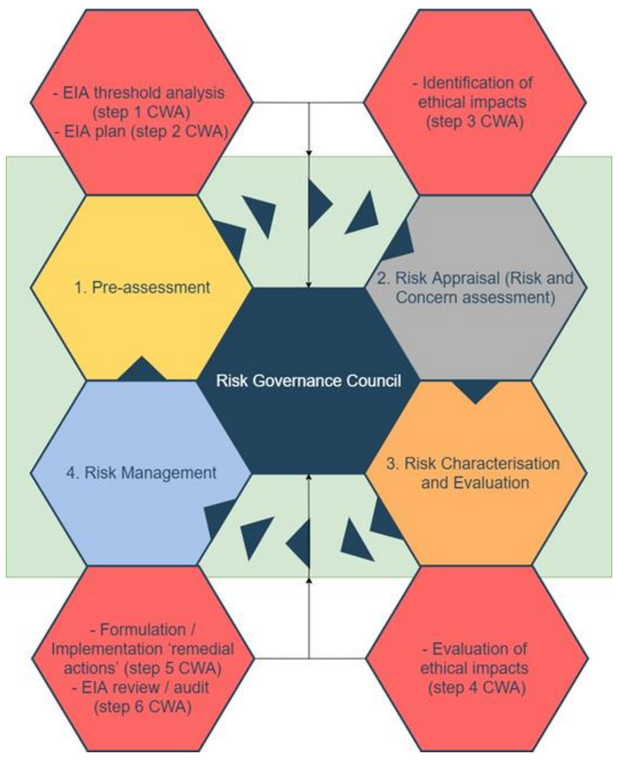

Figure 1: EIA procedure. Source: Malsch, I., Isigonis, P., Dusinska, M., Bouman E. A., Embedding Ethical Impact Assessment in Nanosafety Decision Support. Small 2020, 2002901, https://doi.org/10.1002/smll.202002901

The 6-step Ethical Impact Assessment procedure fits in the stages of the overall Risk Governance process:

1. **Threshold analysis** – self-assessment of foreseen ethical impacts by project leader to determine the need for and scope of the EIA
2. **EIA-planning** of resources, methodologies & stakeholder engagement
3. **Identify** ethical issues – desk research (optional stakeholder & expert engagement)
4. **Evaluate** ethical issues – desk research, engage stakeholder
5. **Remediate** ethical issues – draft recommendations, stakeholder consultation
6. **Review** the EIA – external ethicist

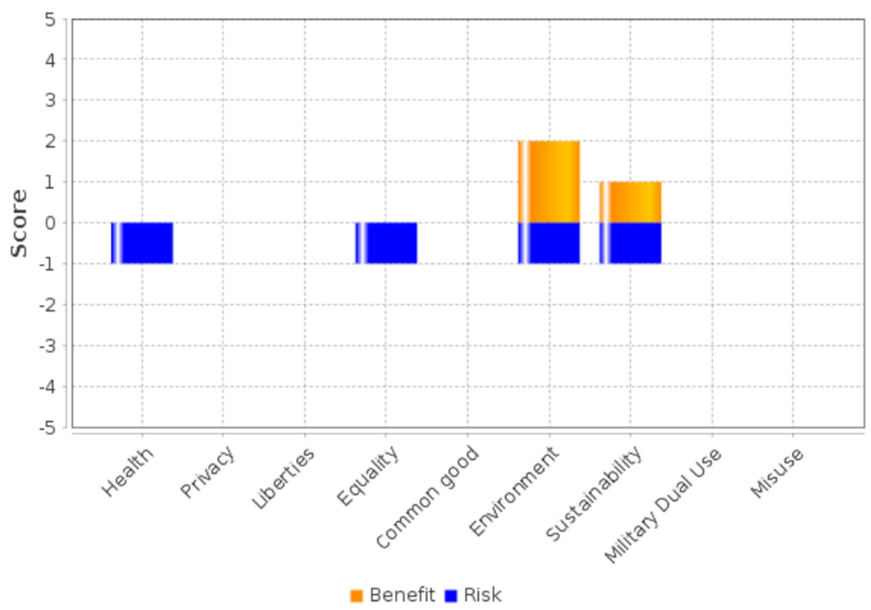

Figure 2: Self-assessment identified health, environment, sustainability and equality-related ethical risks and environmental and sustainability related benefits of incorporating nanomaterials in tyres. The threshold analysis suggests a small Ethical Impact Assessment.

Identification and evaluation of ethical issues and values

Issue	Description
Social justice: distribution of risks and hazards	While the tyre manufacturers and car drivers benefit from better quality tyres, road workers, citizens living near roads and others are exposed to tyre wear particles which may incorporate nanomaterials. Studies suggest a strong correlation between poverty and health risks caused by exposure to tyre wear particles (c.f. tyre collective 2018).
Social justice: future generations	If the nanoparticles in the wear are persistent and do not agglomerate, future generations may be exposed to health risks.
SDG 12 (sustainable consumption and production)	Recycling tyres is difficult. It is unclear whether nanomaterials worsen of improve recyclability. Reuse of tyres as granules in playgrounds are reported to cause health hazards of Polycyclic Aromatic Hydrocarbons (PAHs), leading to strengthened restrictions on the presence of PAHS in granules (EC 2021). PAHS could be adsorbed onto the surface of carbon black particles in tyres (SCCS 2015).
SDG 13 (climate change)	Carbon black released from tyres worsens climate change (TFTEI 2020).

Table 1: Analysis of identified ethical impacts of the use of nanomaterials in tyres found in literature, excluding EHS risks. All issues were deemed minor. The distribution of risks and hazards may be affected in the short term, while other impacts could emerge in the long term.

Ethical value & theory	Meaning in the case of nanomaterials in tyres
Distributive justice: mitigate environmental health inequalities	The WHO found large inequalities in exposure to PM2.5 (particulate air pollution smaller than 2.5 micron) between European regions and discovered that poorer citizens were on average more exposed to associated health hazards. Tyre wear particles including nanoparticles made up part of the traffic related PM2.5. (WHO 2019). Despite technical and policy measures aiming to reduce exposure to PM2.5, the inequalities persisted. The WHO recommended several measures targeting the reduction of health inequalities and exposure.
Intergenerational justice	TFTEI (2020) found that carbon black released from different sources including tyre wear strengthened climate change. One interpretation of intergenerational justice is the famous definition of sustainable development (Brundtland 1992): development that meets the needs of the present without compromising the ability of future generations to meet their own needs. However, no clear remedial actions follow from this general principle for the use of nanomaterials in tyres.
Sustainable chemicals management (SDG 12.4)	This SDG subgoal encompasses a variety of actions, including safer and sustainable by design nanomaterials and tyres, technical devices preventing release of tyre wear particles, improved road maintenance, and traffic regulations.
Circularity (SDG 12.5)	This SDG subgoal calls for technical solutions to improve the durability and recyclability of tyres with or without nanomaterials.

Table 2. Analysis of ethical principles or values in the case of nanomaterials in tyres.

Ethical risk	Principle or value	Ethical benefit
2	Distributive justice (environmental health inequalities)	0
1	Intergenerational justice (climate change)	1
1	Sustainable chemicals management	1
1	Circularity	1

Table 3: Balancing expected ethical risks and benefits. 0 = no, 1 = minor; 2 = moderate; 3 =medium; 4= high; 5=severe or very high.

Draft recommendations open for discussion

Besides well-documented environmental, health and safety issues, impacts on social justice (health inequalities, intergenerational justice) and sustainable consumption and production were identified and analysed. Recommendations for technical as well as societal and political measures were collected from the literature. Identified **technical recommendations** included capturing tyre wear particles at source (Tyre collective 2018) and recovering carbon black from end-of-life tyres (WBCSD 2021). **Societal measures** proposed by the WHO (2019) targeted health inequalities since poorer people in some regions were more exposed to air pollution than other European citizens.

References

Tyre collective (2018). https://www.thetyrecollective.com/
WBCSD TIP Sustainability Driven SDG Tire Sector Roadmap. WBCSD 2021.
WHO (2019) Environmental health inequalities in Europe. Second assessment report. Copenhagen: WHO Regional Office for Europe; 2019.
[1] http://www.enaloscloud.novamechanics.com/riskgone/

RiskGONE has 22 partners. The coordinator is NILU (Norwegian Institute for Air Research). More info: https://riskgone.eu/project-structure-partners/.
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