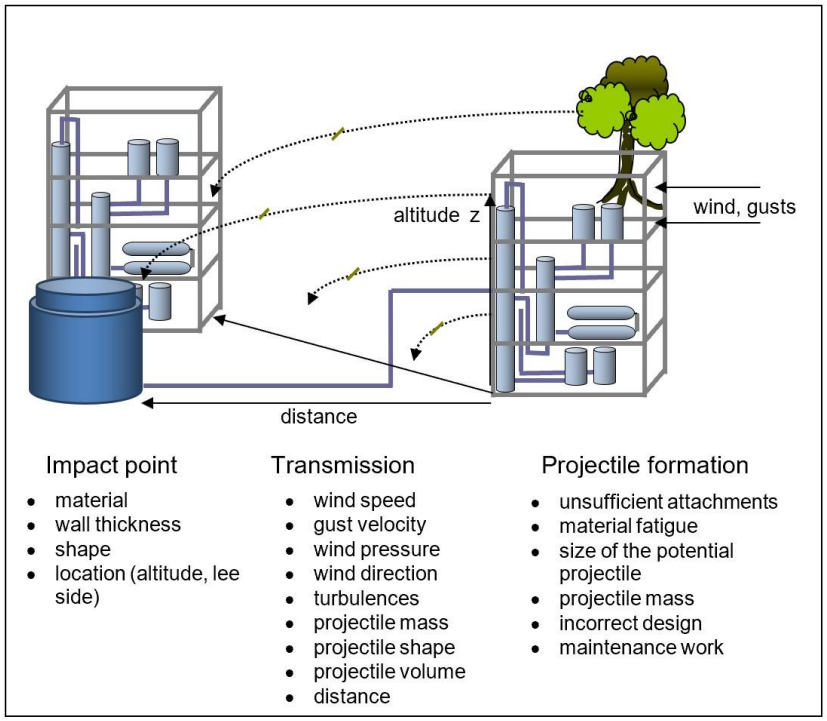
3.3 Modelling Risks due to Windborne Debris (Germany)

OECD GP Activity	UN SF Activity	UN SD Goals / Targets
3. Natural hazard analysis, Natech Risk Analysis	1. Understanding disaster risk	Non-specific targets relevant for Natech Risk Management (3.8, 6.3, 9.4, 11.5, 11.B, 12.4)

Classification according to OECD Guiding Principles, UN Sendai Framework Priorities/Activities, and UN SDGs and Targets

Figure 1: Hazards due to windborne debris



Source: Prof. Dr. Köppke & Krätzig & Partner Ingenieursgesellschaft mbH, 2016

Figure 2: Location of the distillation column with the adjacent tanks

Source: Prof. Dr. Köppke & Krätzig & Partner Ingenieursgesellschaft mbH, 2016

Short Facts:	Natural Hazard(s) Considered:
Governance approach: Risk analysis **Source:** Ing.-Büro Prof. Dr. Köppke GmbH **Entry into force:** **Targeted Stakeholders:** Operators, authorities, assessors/safety experts **Scope of applicability:** Enterprises, sites, installations	• Windborne debris **Climate change:** Can be included

Description

Extreme storms have a huge impact on structures and industrial installations, and may damage or even remove parts. The loss of safety-relevant equipment, in particular, may cause a loss of safety relevant functions. Furthermore, storms may carry away these parts as windborne debris which can in turn damage other safety-relevant equipment or equipment that contains hazardous substances.

The hazard posed by windborne debris was particularly investigated in the USA due to the high number of tornados and hurricanes. The goal in that instance was to develop requirements for the design of community safe rooms. Visual investigations of devastations after tornados have helped identify typical projectiles.

In contrast to tornados, no data or design objects exist for windborne debris generated by other storms or even horizontal air flows. K.-E. Köppke developed a method to generate the necessary data and to estimate the impact of windborne projectiles on tanks, for example. This approach enables an initial risk analysis. An Excel-based program was developed and tested for the refinery 'Heide', situated near the coast in the north of Germany.

The aim of the testing was to check the wall thickness of a tank on which a pipe (2 m length, diameter 5 cm) falls from 70 m (height of the distillation column). A gust velocity of 50.7 m/s was determined for the calculation. The diagram shows the calculated penetration depth of the projectile in a steel tank in comparison with the real wall thickness. In this case the wall and the roof were thick enough to withstand the impact of a steel missile with the given dimensions.

Link/Contact:

Prevention and preparedness due to hazards by wind, snow- and ice loads. UBA Report, 2016
http://www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Forschungsdatenbank/fkz_3711_68_331_vorkehrungen_gefahrenquellen_bf.pdf
Roland Fendler https://www.umweltbundesamt.de/en

Comments by the UN/OECD Natech-Steering Group:

The tool is a first approach to estimate the possible consequences of windborne debris, which is a very common natural hazard. Modelling the debris flight due to tornados requires other models.

Imprint

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