

Land-based Regulations & Standards Gap Assessment for hydrogen bunkering installations in the Netherlands

RH2INE Sub-study 1b, SuAc A1&A2

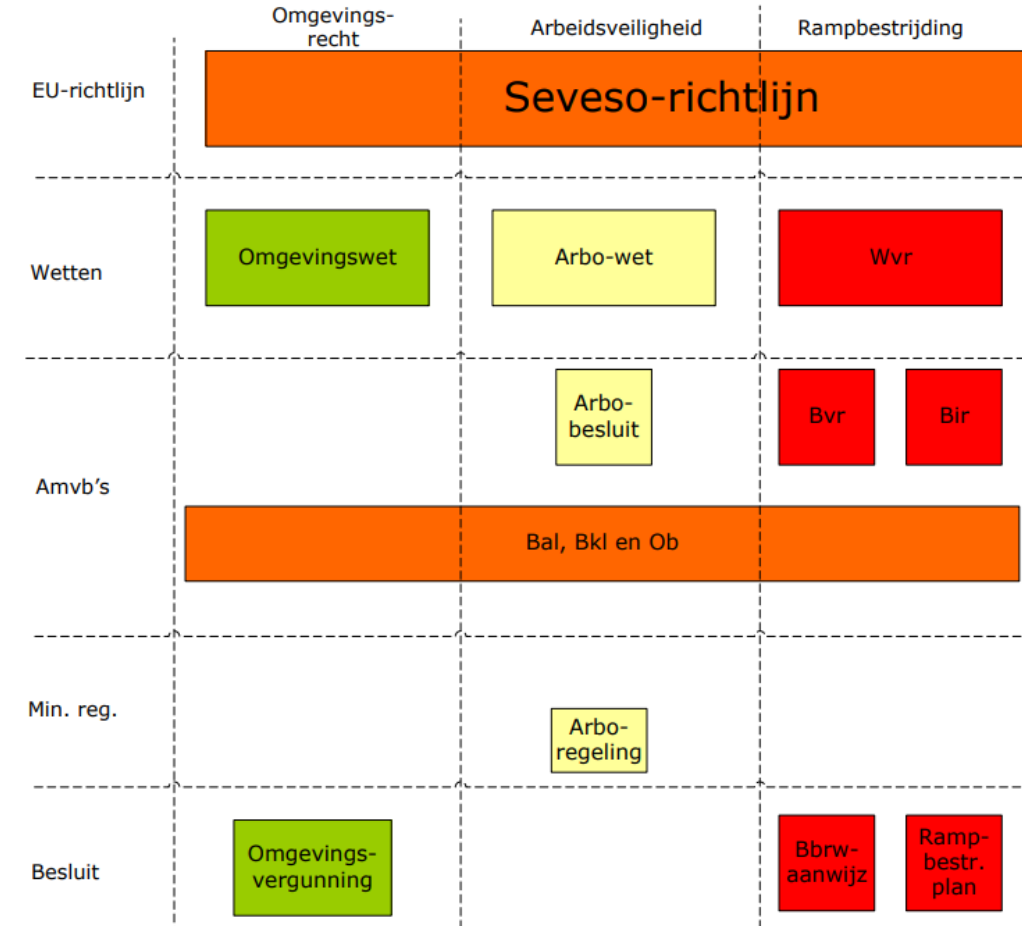
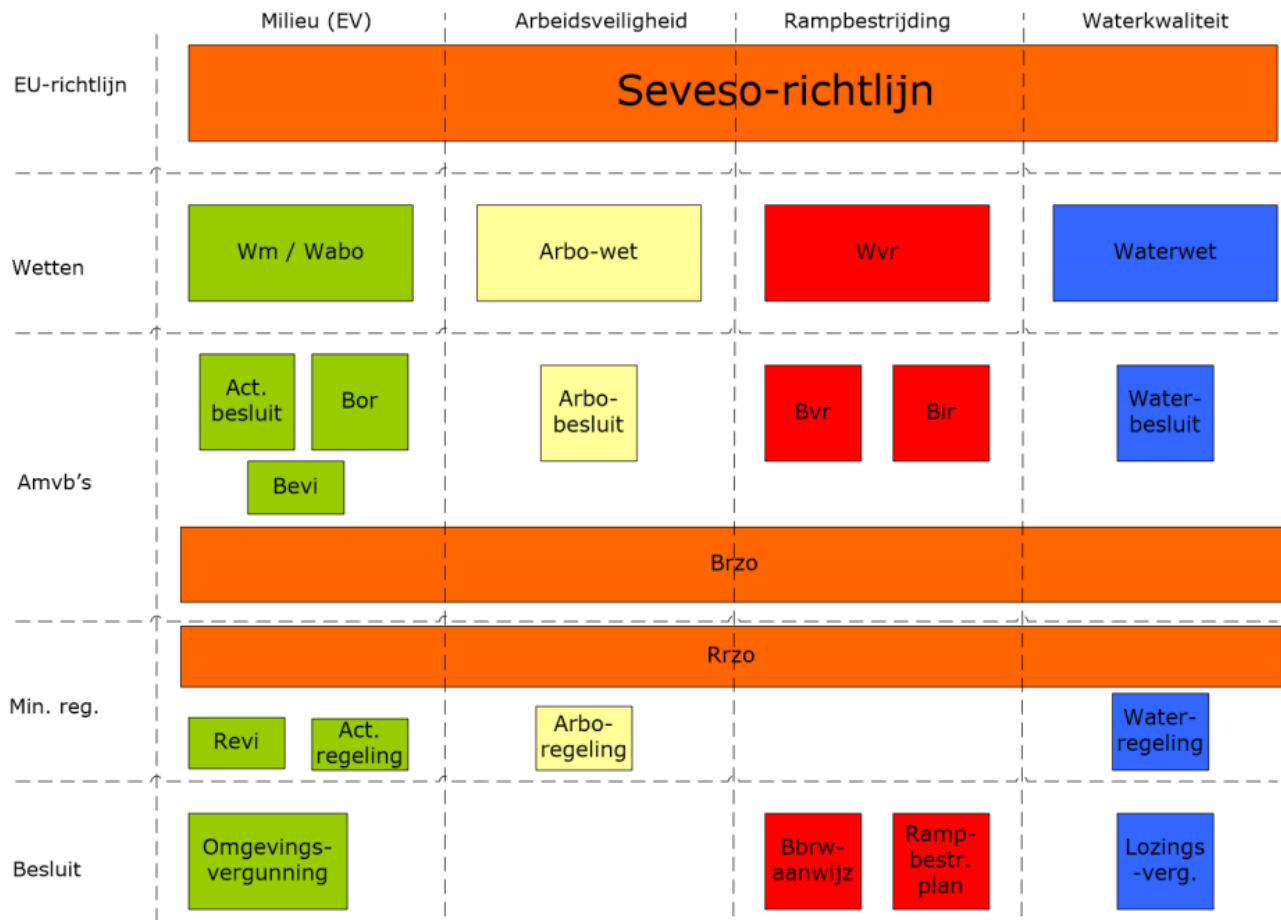
Dutch Legal Framework (1/3)

- Current legal Framework relevant for land-based hydrogen establishments & activities is shown in this figure →
- Note: a new Environmental law is expected to come into force on 1st of January 2022, existing laws will be replaced and some will cease to exist (more on the next slide).

	Environmental (External safety)	Labour safety	Emergency (disaster) management	Water quality
EU-Directive	Seveso III directive (2012/18/EU)			
Laws	Wm / Wabo	Abro law	Wvr	Water law
Amvb's	Activities decree Bor Bevi	Abro decree	Bvr Bir	Water decree
Min. Reg.	Rzo			
	Revi Act. Reg.	Abro Reg.		Water Reg.

Dutch Legal Framework (2/3)

- Current legal framework (left) and new legal framework (right) that will come into force in 2022.



Dutch Legal Framework (3/3)

- New laws and decrees are not described in detail, but are taken into account in the gap analysis.
- Identified gaps in the existing laws are verified to check whether the same gaps are also present in the new legislation.
- Focus of the study is to identify gaps in relevant environmental laws related primarily to external safety of land-based establishments & activities with hydrogen.
- Labour & water quality laws are therefore not considered.
- Laws related to emergency management are generic and therefore not further discussed.

Laws (1/2)

- Law on the general provisions for environment (wet algemene bepalingen omgevingsrecht, Wabo), which is implemented in 2010. This law integrated about 25 permits, exemptions and notifications into one environment permit. Environmental permit requirements are not specifically regulated in this law, but in the law on environmental management (Wm)
- Law on environmental management (wet milieubeheer, Wm). Implemented in 1993.
- The law is aimed at the prevention of nuisance and protection of the environment Companies with a hydrogen land-based installation (e.g. onshore storage, HRS, bunker station) and related operation have to comply with this law and require a permit.
- Regulations apply to, for instance, noise and vibration energy, waste materials, odour, air emissions, discharging liquids, transport management, soil protection and hazardous substances.
- The decree on general rules for environmental management of facilities, activities decree (Besluit algemene regels voor inrichtingen milieubeheer, activiteitenbesluit) forms the basis for environmental regulations (see more on next slide)

Laws (2/2)

- Depending on the activities of a facility, it will be classified in one of three categories pursuant to the activities decree:
 - Type A does not require an environmental management notification or an environmental permit;
 - Type B requires an environmental management notification;
 - Type C requires an environmental permit.
- Hydrogen onshore storage, HRS and bunker stations etc. are classified as Type C.
- For facilities that contain hazardous substances the activities decree refers to the so-called PGS (Publicatierieks Gevaarlijke Stoffen) guidelines, which provide requirements & provisions for the safe design and operation of an installation.
- PGS guidelines are considered to represent Best Available Techniques (BAT).

Regulatory Technical Guidelines (PGS) (1/2)

- PGS guidelines are used by the authorities and industry to prove conformity to the regulation by complying with the requirements of PGS.
- Relevant guidelines in relation to hydrogen are:
 - PGS 35 is a guideline for hydrogen delivery installations for road vehicles (HRS). **GAP 1**
 - **A guideline for the design and operation of a hydrogen bunker station to ship is currently not (yet) under development.** However, the equivalent PGS guideline for LNG bunker stations (PGS 33-2) has been published in 2014. Depending on the market developments and the need for regulations for bunker stations, it is expected that a similar guideline will eventually be developed for hydrogen bunker stations ('PGS 35-2').
 - PGS 26 is a guideline for safe stalling, maintenance and repairing CNG and LNG road vehicles. Although the guideline is written for road vehicles, the new environmental legislation in 2022 (Bal) specifies that PGS 26 is also applicable for the maintenance and repair of fuel engines of e.g. maritime & inland vessels. **The PGS program council is currently considering to include hydrogen in PGS 26**

GAP 2

Regulatory Technical Guidelines (PGS) (2/2)

- PGS 15 is a guideline for the storage of packed dangerous goods.
- Chapter 10 specifies provisions for the storage of (tank)containers at e.g. container terminals and inland terminals in particular, which are relevant when hydrogen (tube)containers will be hoisted on board hydrogen fuelled vessels at inland container terminals.
- This guideline does not contain substance specific requirements for e.g. hydrogen, but this is also not needed, because the requirements related to storage of (tank)containers with hazardous goods in the stack is primarily based on the ADR classification, which covers flammable gasses such as hydrogen.

Decrees (1/3)

- Decree on risk of major accidents (Besluit risico zware ongevallen, Brzo) is a transposition of the Seveso III directive (2012/18/EU).
- Brzo integrates legislation on occupational safety, external safety and disaster relief in one legal framework.
- In accordance with Seveso III, all onshore establishments which hold more than 5 tonnes of hydrogen fall under the scope of Brzo and need to establish a major accident prevention policy.
- In addition, operators of high tier establishments holding more than 50 tonnes of hydrogen need to establish a safety report before construction is commenced.
- The safety report must include identification of major hazards, a quantitative risk assessment (QRA) and necessary measures to prevent such accidents, a safety management system and an emergency plan.

Decrees (2/3)

- The decree on external safety of facilities (Bevi) sets safety requirements to companies that pose a threat to people outside of the premises of that company.
- The decree contains risk acceptance criteria for location-specific risk and societal risk, which should be evaluated in a QRA.
- The criterion for location-specific risk is 10^{-6} /year and is applicable to vulnerable objects such as residential areas, hospitals etc.
- The distance to the 10^{-6} /year contour is the external safety distance.
- Note: the new 2022 legislation, Bkl, also contains a new concept: focus areas (“aandachtsgebieden”) that need to be calculated. These areas will determine where additional measures are required to protect occupants indoors against harmful effects.

Decrees (3/3)

- The Bevi decree is applicable to all activities that fall under the previously mentioned Brzo, e.g. for onshore establishments that hold more than 5 tonnes of hydrogen.
- Bevi specifies that a QRA must be developed for e.g. Brzo establishments based on the Reference Manual Risk Assessments Bevi (current version is 4.3, 1st of January 2021) developed by the RIVM and making use of DNV's software program Safeti-NL 8 (current version 8.3).
- Next to Brzo establishments, Bevi also defines categorial (Bevi) establishments, such as an LPG refuelling station for road vehicles (Article 2.1.e) or container terminals with hazardous good (Article 2.1.b), for which specific safety requirements exist.
- For container terminals, a specific QRA calculation methodology must be applied.
- Small-scale establishments with hydrogen (HRS, bunker station etc.) are not defined as categorial Bevi establishments, therefore no specific requirements exist. **GAP 3**
- However, fixed external safety distances (and focus areas) for HRS are given in the new 2022 legislation Bkl.

QRA calculation guidelines (1/2)

- The Reference Manual Risk Assessments Bevi is not specifically written for hydrogen, it has generic applicability.
- For instance, the manual does not specify hydrogen-specific failure frequencies for e.g. storage in tube-containers but rather specifies generic failure frequencies for pressurized onshore storage or pressurized vessels on trailers.
- The RIVM has developed calculation guidelines for specific installations, e.g. container terminals, LNG refuelling stations and LNG bunker stations. These guidelines also contain case studies.
Similar guidelines for hydrogen installations (e.g. bunker stations) do not exist. GAP 4
- However, the RIVM has written a memo on risk and effect distances for HRS in 2017. These results are used to define the fixed distances in Bkl (see previous slide).
- There is still a need to develop a QRA calculation guideline for hydrogen bunker stations (or installations) supplying hydrogen as a fuel to (inland) vessels, because the way of calculating the risk of hydrogen releases differs compared to other substances (e.g. related to ignition probability & outflow modelling)

QRA calculation guidelines (2/2)

- The QRA calculation guideline for container terminals is included in the Reference Manual module C, chapter 5.
- This guideline does not specify failure scenarios for hoisting & storage of compressed hydrogen tube-containers nor containers with cylinders. **GAP 5**
- The scenarios are related to hoisting and storage of tank-containers, either with gas or liquid.
- The assumptions related to gas tank-containers are actually based on liquified gas and do not seem to be applicable for e.g. pressurized hydrogen gas in e.g. tube-containers.
- In addition, the design and strength (e.g. wall thickness of the tube/cylinder) of such containers is very different to a liquefied gas tank-container and therefore the failure scenarios & frequencies may not be appropriate.

Gaps and Recommendations

GAP	Description	Type	Recommendation
1	A PGS guideline for the safe design and operation of a hydrogen bunker station is missing.	L, K	Depending on market developments, the Dutch national standardisation body NEN should consider developing PGS 35-2: hydrogen bunker stations.
2	Guidelines for maintenance and repairing hydrogen fuel engines / fuel cell systems on inland vessels are missing in PGS 26.	L, K	Consider including specific requirements for maintenance and repairing hydrogen fuel engines / fuel cell systems on inland vessels in PGS 26. Note: The PGS program council is currently considering to include hydrogen in PGS 26.
3	Small-scale hydrogen bunker stations (less than 5 ton storage, Brzo lower-tier threshold) & truck-to-ship bunkering is currently not regulated by Bevi / Bkl as they are not defined as categorial establishments / activities.	L, H	Consider one of the following: • Include fixed external safety distances in Revi / Bkl • Recommend to authorities to always ask for a QRA and regard these installations as part of Bevi • Develop an EU harmonized approach for risk assessment
4	A specific QRA calculation guideline for hydrogen bunker stations is missing.	L, H	It is recommended that the RIVM develops a QRA calculation guideline for hydrogen bunker stations (also include truck-to-ship bunkering) supplying hydrogen as a fuel to (inland) vessels
5	The QRA calculation guideline for container terminals does not seem to specify failure scenarios for compressed hydrogen tube-containers nor containers with cylinders.	L, H	Update the QRA calculation guideline for container terminals to include specific scenarios related to hoisting and storage of tube-containers (or containers with pressurized gas in general).

Types: H = Harmonization; L = Legal; K = Knowledge

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