

ENGLISH EDITION:
Key sections from
the Dutch report

Structural Collective

Copper8

BUILDING WITHIN PLANETARY BOUNDARIES

Construction Materials and Risks to Nature

PUBLICATION: SEPTEMBER 2026

Research

Structural Collective
Harmen Heida
Job Papineau Salm
Lander De Visscher
Leen Felix

Copper8
Stefan Favrin
Sybren Bosch

Partners

Van Wijnen
Teun Verhagen

Synchroon
Maaike Perenboom

AM
Maarten Markus

PRICE
Monique van der Plas
Eva de Snoo

Dura Vermeer
Wendeline Besier
Lizzy Butink

Gemeente Amsterdam
Chandar van der Zande
Jeroen van der Waal

Provincie Zuid-Holland
Gert-Willem van Mourik

Design

Cassie Björck

Contents

Executive Summary 04

01 Introduction 06

02 Approach: assessing risks to nature 07

03 Concrete 13

04 Steel 17

05 Asphalt 21

06 Timber 25

07 Conclusions 29

08 Sector-wide courses of action 36

09 Final remarks 40

References 41

International translation

This study was initiated by Copper8 and Structural Collective, two Dutch consultancies at the forefront of the transition to a circular economy in the built environment. It was funded by a collective of public- and private-sector organisations in the Dutch construction sector.

The main findings and conclusions are presented here in English, making them accessible to an international audience. Further detail is available in the Dutch-language version of the report. Please note that, while the conclusions have broader international relevance, the analysis is based on material flows in the Dutch construction sector.



Read original report

Executive Summary

Worldwide, nature is under pressure. Seven of the nine planetary boundaries have already been crossed. In addition to climate and biodiversity, global changes in land use and freshwater availability are endangering the health and safety of human life. This requires the Dutch construction sector to look beyond 'nature-inclusive construction' at the construction site and also to address risks to nature throughout the supply chain.

This study provides an initial exploration of the risks to nature associated with the extraction of commonly used construction materials. It examines concrete, steel, asphalt and timber, based on the quantities used in the Netherlands in 2023. The study applies the Science-based Targets for Nature (SBTN) methodology. The risks to nature arise from the combination of environmental impacts at a specific location and the state of nature at that location.

Risks to nature vary considerably between the materials and extraction sites. The most important risks for each material are as follows:



For **concrete**, there are high risks to nature associated with the extraction of sand and gravel, for example in the Dutch province of Limburg and in Germany, due to water use and biochemical pollution at sites with existing water shortages and high concentrations of nitrogen.



For **asphalt**, the same risks arise from water use and biochemical pollution associated with the extraction of sand and crushed rock.



For **steel**, there are high risks involved in the extraction of iron ore and nickel, for example in Brazil and Indonesia, due to land use and high ecosystem integrity.



For **timber**, there are high risks associated with the harvest of tropical timber and timber from boreal (northern) forests. These forests have high ecosystem integrity and are at risk of land-use change. For tropical forests, the presence of large numbers of threatened species is an additional risk.

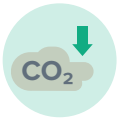
In many cases, the production of construction materials has a greater environmental impact than the extraction of raw materials. One important reason is the extraction and combustion of fossil fuels used in production processes. This results not only in carbon emissions, but often also in biochemical pollution, including nitrogen pollution.

The environmental impact and risks to nature associated with abiotic materials (concrete, steel, asphalt) differ from those of biotic materials (timber). Abiotic materials generally have a greater environmental impact than biobased materials. While abiotic raw materials impact the environment due to energy-intensive production processes, biotic raw materials require land in order to grow.



TRACK I: **Designing and building with less material is an important step in reducing risks to nature.** A decrease in the use of materials leads to less extraction of raw materials, fewer production processes, a lower impact on the environment, and therefore lower risks. In order to reduce the total amount of materials required for housing and construction, it is important to reassess the need for housing and buildings. Higher-value reuse and improved recycling can also make a major contribution.

Government policy instruments often lack explicit measures to reduce material use. For the Netherlands – the context of this study – the core instruments focus on environmental impact, although reducing material use is a stated objective of the Netherlands' national policy on the circular economy. New policy instruments are therefore needed to target the absolute quantity of primary (new) material used.



TRACK II: **In almost all cases, accelerated carbon reduction also reduces risks to nature.** A focus on carbon often leads to lower fossil-fuel use, thereby limiting risks associated with both extraction and combustion. Both climate change and risks to nature can be addressed through a transition to clean energy. However, this requires an investment case for increasing the sustainability of the production of construction materials. This can be realised in part through strong statutory requirements for the embodied carbon of buildings and through supply-chain measures to promote carbon-conscious construction.



TRACK III: **Responsible sourcing and supply chain transparency help to identify and reduce risks.** Because the net demand for materials exceeds the amount recovered from demolition, new materials will be required for the foreseeable future. Supply chain transparency makes it possible to promote responsible sourcing. In shorter supply chains (such as those for sand and gravel), sourcing can often be influenced directly. In longer, more complex supply chains (such as those for iron ore and timber), certification plays a central role. For timber in particular, increasing the share of certified timber in the Netherlands to 100% (currently 65-90%, depending on the type of wood) is an important step. These percentages differ per country.

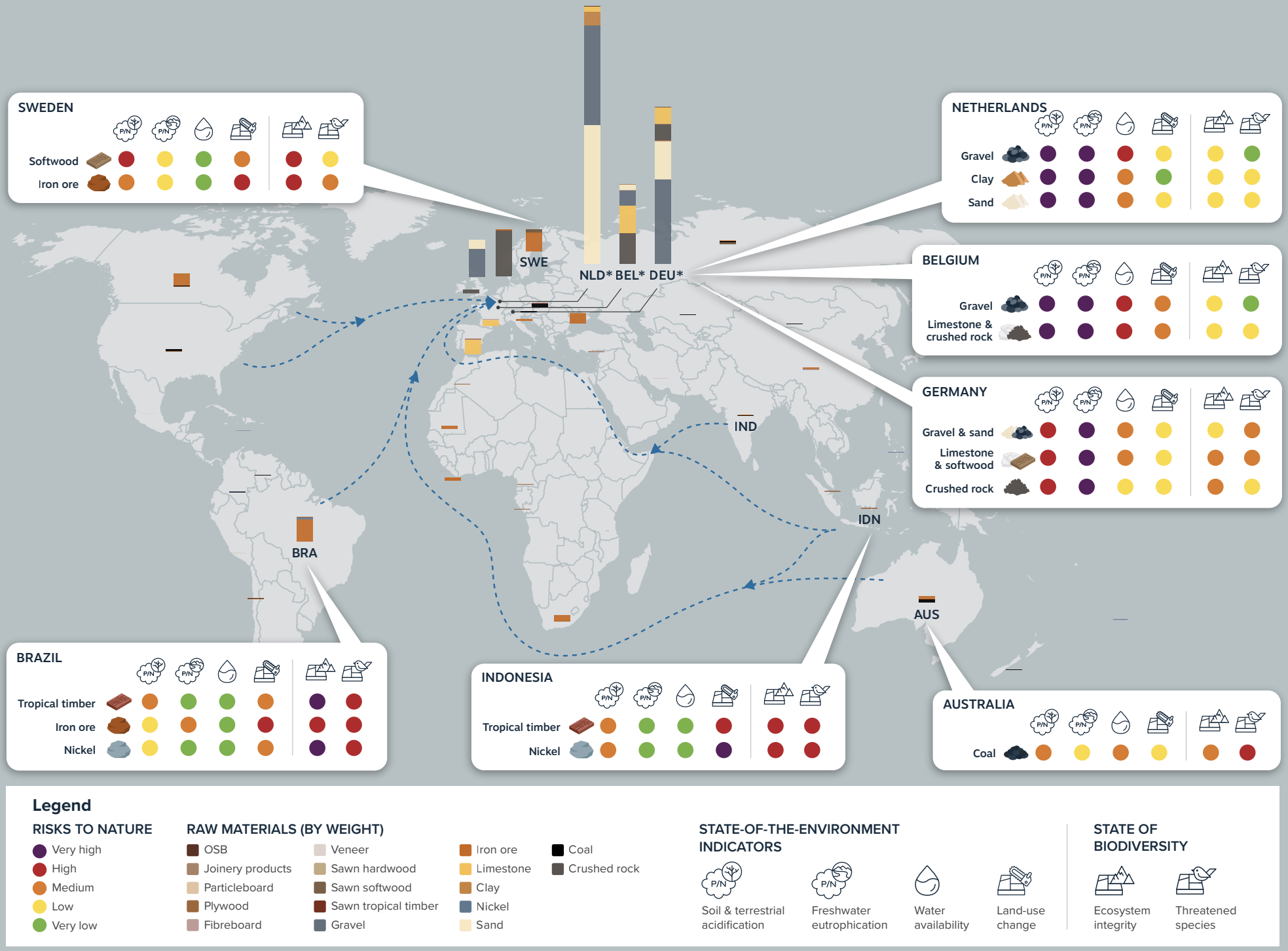


Figure: *Risks to nature at extraction sites for raw materials used in the Dutch construction sector*



01 Introduction

The world is facing a triple planetary crisis: climate change, biodiversity loss and pollution.[1] Seven of the nine 'planetary boundaries' have now been crossed. A healthy and safe future depends not only on limiting climate change, but also on preventing further loss of biodiversity.

At present, both globally and in the Netherlands, most attention is focused on limiting climate change by reducing carbon emissions. At the same time, combating loss of biodiversity and restoring nature require at least as much attention. After all, nature – and the biodiversity it depends on – forms the basis of human life on Earth. International agreements have therefore been made to halt damage to nature and restore ecosystems. These commitments are laid down in the *Kunming–Montreal Global Biodiversity Framework* (2022),[2] just as those on climate change are established in the Paris Agreement.

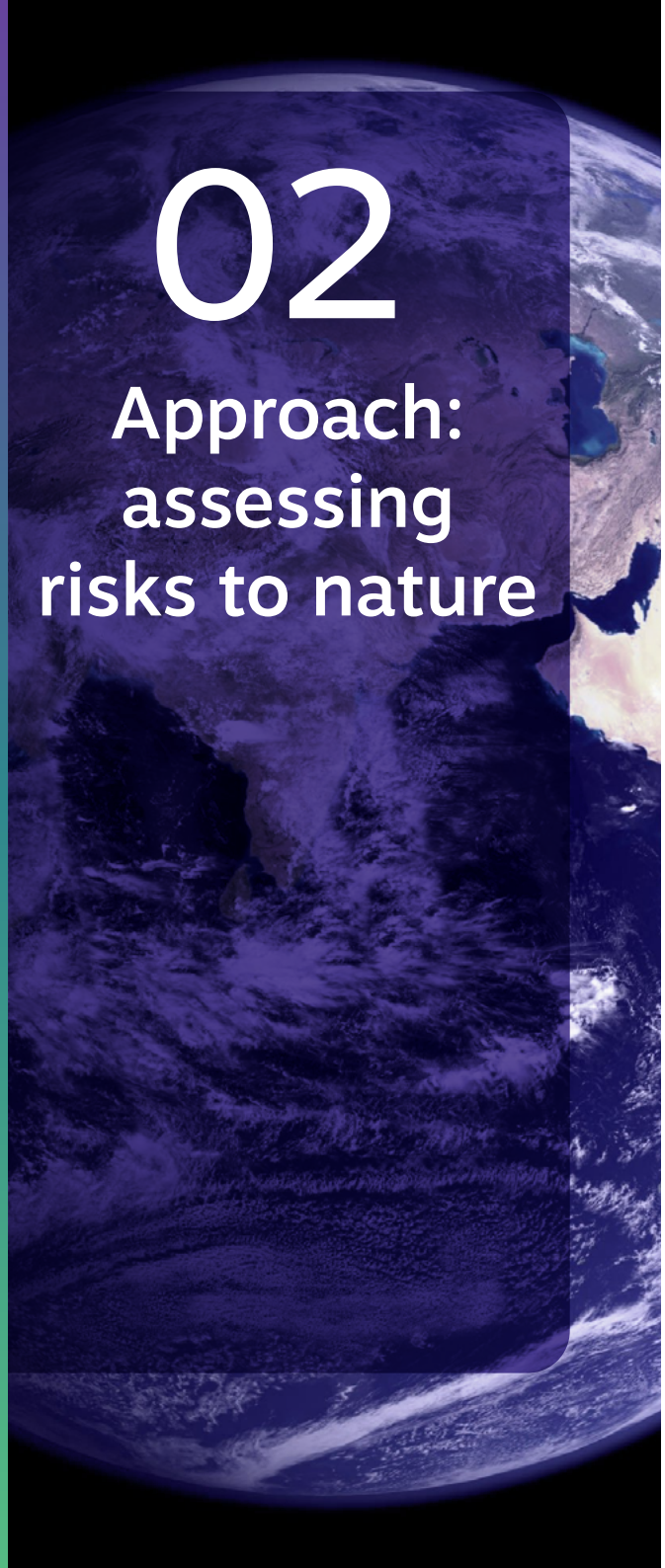
In the Netherlands, the construction sector still focuses largely on reducing carbon emissions, with far less attention paid to risks to nature, either in government policy or in the sustainability plans of construction companies. This narrow focus has consequences. Without a broader policy framework, there is a risk that construction activity will grind to a halt. The nitrogen crisis in the Netherlands, a country which emits far more nitrogen compounds than any other in the EU, has resulted in a major slowdown in construction activity. This could jeopardise both the delivery of the Dutch construction programme and the financial health of the sector.

The construction sector not only has an impact on nature, but also depends on it. Examples include the growth of timber and fibre crops, the supply of sand and clay and the availability of clean water.[3] As the state of nature deteriorates, so does the quality of the 'ecosystem services' that nature provides. Failure to give sufficient attention to nature conservation and restoration – both in the Netherlands and in international supply chains – could ultimately pose a financial risk to the construction sector.

With regard to nature conservation, the construction sector currently focuses mainly on 'nature-inclusive construction' at the construction site. In December 2025, 18 leading Dutch construction companies launched the *Net Nature Gain Manifesto* to support this approach.[4] Greater attention to nature-inclusive supply chains is a next step.

Because the construction sector accounts for around half of all raw material use in the Netherlands, the risks of damage to nature and loss of ecosystem services as a result of raw material extraction are substantial. However, many organisations in the construction sector have little or no insight into the impact of construction on nature in supply chains. This includes impacts associated with both the extraction and the production of construction materials.

This study shows how the extraction and production of construction materials can create risks to nature. These risks have been assessed for four major material flows: concrete, steel, asphalt and timber. A better understanding of these risks can help commissioning organisations and companies make better-informed decisions on improving the sustainability of material supply chains for construction. The approach used in this study also provides a step-by-step method that organisations can use to develop a better understanding of their own supply chains. Only by taking this broader perspective can we truly 'build within planetary boundaries'.



02

Approach: assessing risks to nature

This study assesses the risks to nature arising from the extraction and production of commonly used construction materials. The environmental impacts of construction materials are the starting point for this analysis. Based on these environmental impacts, we identify location-specific risks.

Environmental impact indicators (such as land use, CO_2 emissions or phosphate emissions), which are used for environmental impact calculations of construction materials, do not provide insight into the risks to nature or the resulting effects. For example, nature is sensitive to water use where water is scarce, but not where it is abundant. The effects on nature therefore depend on the location.

This study provides specific insights into risks to nature at locations where construction materials are extracted and produced. These insights can help organisations in the construction sector take more effective action to reduce their environmental impact, limit risks to nature and contribute to nature restoration. Planning, engineering and construction organisations can use these insights to reduce risks to nature through their choice of materials. For developers and construction companies, these insights can also help them meet the requirements of European legislation on reporting (CSRD) and due diligence (CSDDD).

Some measures needed to mitigate risks to nature differ from those directed at limiting climate change, partly because the local context determines the effects on biodiversity. Crossing the planetary boundaries for biogeochemical flows, freshwater use and land use has particularly strong regional impacts, whereas climate change has global effects.[5] This is explained further in Figure 1.

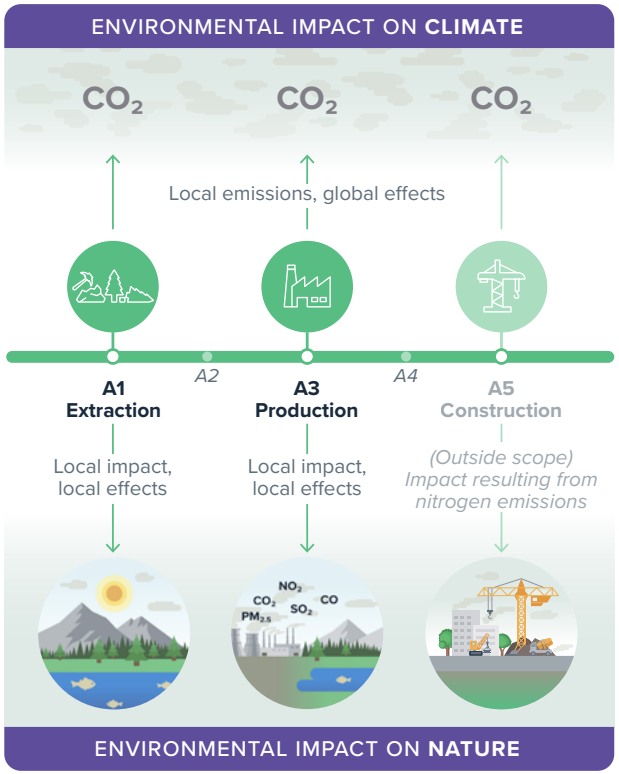


Figure 1: *Effects on planetary boundaries: global (climate) versus local (nature)*

For this study, we use the methodology developed by the Science Based Targets Network (SBTN). This approach helps companies set science-based targets to reduce their impact on nature and contribute to nature restoration. SBTN focuses on prioritising, defining and monitoring interventions, whereas other frameworks, such as the Global Reporting Initiative (GRI) and the Taskforce on Nature-related Financial Disclosures (TNFD), focus solely on reporting.[6] The approach used in this study also provides a step-by-step method that organisations can use to develop their own understanding of their supply chains.

Life cycle assessments show the scale of environmental impact, but not where this impact poses the greatest risks to nature. The SBTN methodology makes it possible to take account of the local context of production sites when assessing environmental impact. Insight into location-specific risks to nature enables the prioritisation of measures that reduce these risks or even restore nature.[6,7]

In this study, two analyses were carried out to provide insight into the risks to nature associated with construction materials:

I. **Analysis of environmental impact produced from extraction to production:** what environmental impact occurs at each stage of the supply chain?

II. **Analysis of risks to nature at raw material extraction sites:** what risks occur in areas affected by the environmental impact of raw material extraction (mining and forestry)?

The scope of this study is defined as follows:

- The study focuses on **widely used construction materials**: concrete, steel, asphalt and timber.[8]
- The study is based on an estimate of the **quantities used in the Netherlands in 2023**, drawing on research from 2025.[9] This includes use in both new construction and renovation, in residential construction, non-residential construction and civil engineering.
- The study examines the environmental impact of construction materials **from extraction to production** (LCA modules A1–A3).
- For **location-specific risks to nature**, the study looks exclusively at raw material extraction (LCA module A1).

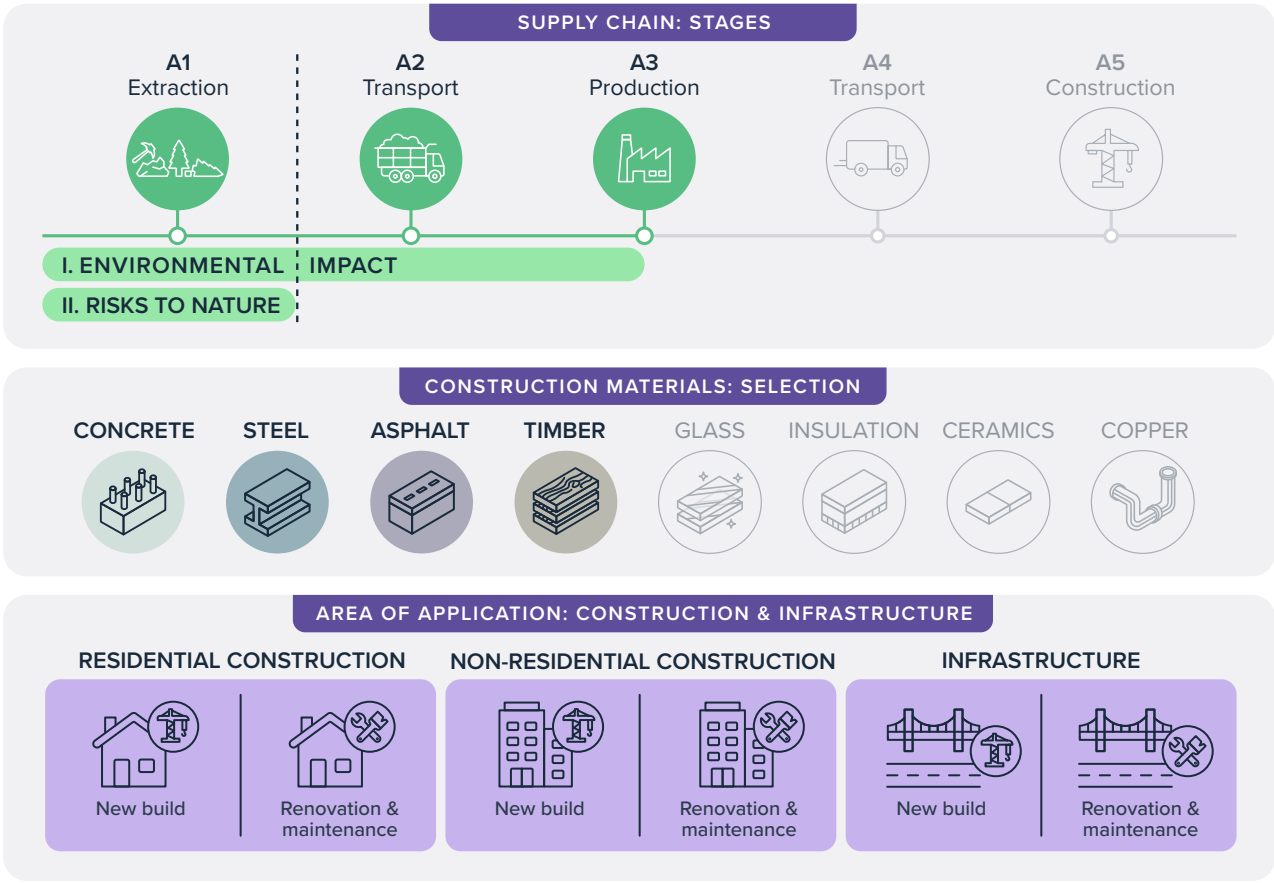


Figure 2: *Scope of the study*

Terminology: nature, biodiversity, risks to nature and environmental impact

This study maps the **risks to nature** associated with the extraction of raw materials for construction materials. **Nature** is defined here as an interconnected system of living and non-living elements. The non-living elements comprise structures and processes, such as soil conditions and climatic conditions. The living elements constitute **biodiversity**: the variability within **ecosystems**, **species** and **genes** that is essential to the resilience of nature.

To quantify these risks, the study analyses the **environmental impacts** of extraction and production that affect nature. Examples include water abstraction, terrestrial acidification and land use.

The state of nature is demonstrated through **state-of-nature indicators**, divided into the **state of the environment** (such as the degree of acidification or water shortage) and the **state of biodiversity** (the presence of threatened species and the degree of ecological integrity).

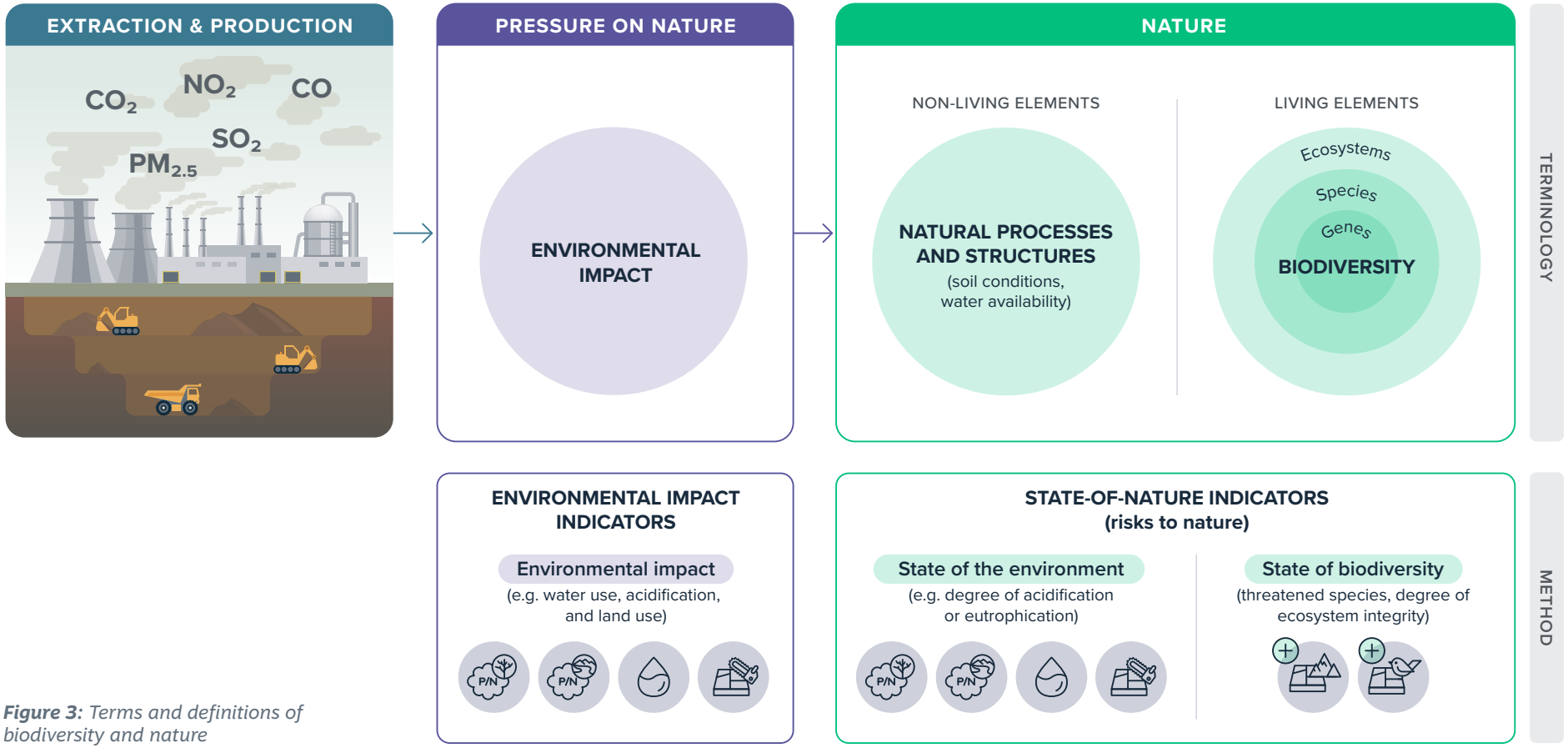


Figure 3: *Terms and definitions of biodiversity and nature*

Approach: environmental impact × state of nature

The aim of this study is to explore the risks to nature in areas where raw material extraction has an environmental impact. The approach consists of six steps in three phases. Further details on the method can be found in the original Dutch report, which is available from the authors on request.

DATA

An analysis of the construction materials used and the raw materials required for them (step 1), and of the extraction locations (step 2).

ANALYSIS

An analysis of the environmental impact of construction materials (step 3), the location-specific state of nature at extraction sites (step 4), and the prioritisation of environmental impact and risks to nature at those locations (step 5).

ACTION

An overview of possible measures (step 6).

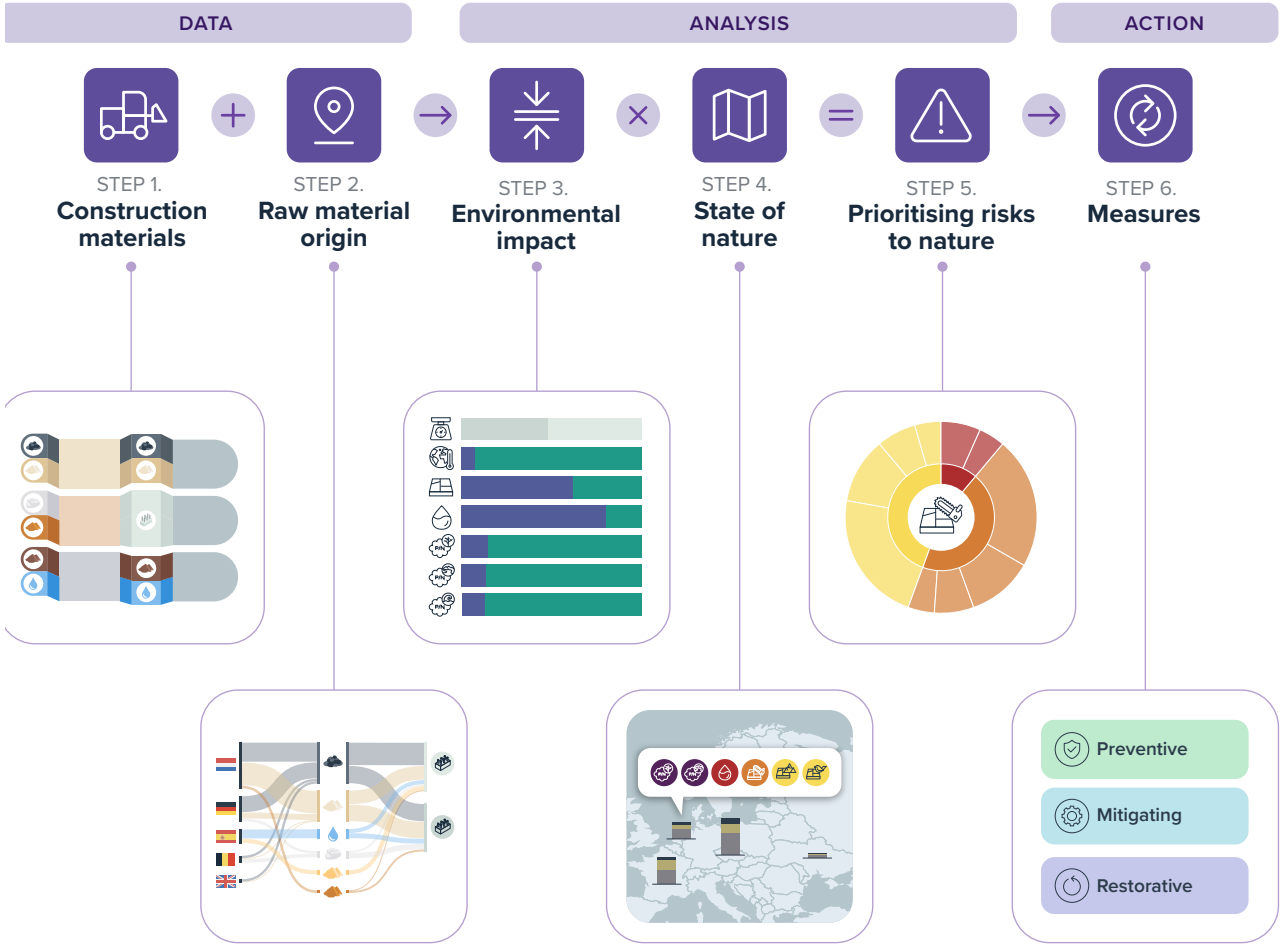


Figure 4: *Study approach: six steps*

STEP 1. Analysis of raw materials & construction materials

For the construction materials used in the Netherlands, this study draws on data from the report Material flows and environmental impact in construction and infrastructure (*Materiaalstromen en milieubelasting in de bouw en infra*).[9] This report models total material use in the Dutch construction and infrastructure sectors in 2023 by material group (concrete, steel, asphalt, timber). It also identifies the most widely used product groups within each material group. Steel, for example, is divided into reinforcing steel, pipes, cold-rolled sheet and structural steel. For each product group, the study examines which raw materials are needed to manufacture the products used in construction in the Netherlands.

STEP 2. Analysis of raw material origin

To determine where environmental impact occurs, the extraction sites for all raw materials were identified. For steel, for example, one of the extraction locations for iron ore is Brazil. These extraction sites were identified using trade data, production data and maps. For each site, the volume was estimated of raw materials extracted for use in the Dutch construction sector.

STEP 3. Analysis of environmental impact across the production chain

To determine the environmental impact of raw material extraction (mining and forestry) and production processes (factories, including transport), life cycle assessments (LCAs) were used.[10] In line with the SBTN methodology, the analyses focuses on land use, water use, soil and terrestrial acidification and water eutrophication. For reinforcing steel, for example, the analysis uses the LCA dataset *reinforcing steel* production.[11]

Please note

Environmental impact (based on LCAs) provides only limited insight into actual 'damage to nature'. This is because the relationship between impact and damage varies by location and depends on the local state of nature (step 4). Two examples:

- The area of land used for forestry provides only limited insight into the damage to nature. Sustainable forestry requires a larger land area but causes much less damage to nature per square metre. Intensive forestry uses less land, but the damage per square metre is often greater. The current approach uses only LCAs for sustainable forestry.
- The environmental impact of steel production can vary from one factory to another, depending on the specific production process used. The LCAs in this study are averages, as no factory-specific LCAs are available. The actual impact of a particular factory may be higher or lower than the average.

STEP 4. Analysis of the state of nature

To determine which environmental impacts are significant at specific extraction sites, the sites (step 2) were plotted on maps showing local state-of-nature indicators.[7,10,12] Two types of maps were used to assess the state of nature:

- **Environmental maps** describe the state of the environment around the extraction site (state-of-the-environment indicators). They can be used, for example, to determine the extent of water scarcity or soil acidification at a particular location.
- **Biodiversity maps** assess ecosystem integrity and the presence of threatened species (state-of-biodiversity indicators).

To indicate the risks to nature, five risk classes were established, ranging from 'very low' to 'very high'. Their interpretation varies by indicator: for state-of-the-environment indicators, a 'very high risk' means that safe threshold values are greatly exceeded. For biodiversity, by contrast, a 'very high risk' indicates a highly intact ecosystem or the presence of many threatened species.

Please note

Risks to nature are not the same as damage to nature. The approach provides insight into risks to nature, but does not provide evidence of actual effects on or damage to nature. A high risk therefore means that the likelihood of damage to nature is greater, not necessarily that the extraction activity is the cause of that damage. A next step for companies is to collect site-specific data from their supply chains.

STEP 5. Assessing the key risks to nature

For each combination of raw material (step 1) and extraction site (step 2), a risk profile was determined for each specific indicator, based on the environmental impact (step 3) and the local 'state of nature' (step 4). For example, the environmental impact for 'water use' (from the LCA, step 3) was combined with the state of nature for 'water availability' (environmental maps, step 4). Combining these data provides a picture of the environmental impact occurring at locations where there are risks to nature as a result of existing environmental pressures.[7]

The extent to which risks to nature warrant attention is visualised in two figures:

- **Environmental impact from raw material extraction**, combined with the risks to nature associated with the specific environmental effect at the extraction site. *Example:* Water use in iron ore extraction in South Africa is associated with a high risk due to low water availability (drought).
- **State of biodiversity at extraction sites**, showing the number of threatened species and the degree of ecosystem integrity. *Example:* Harvesting tropical hardwood in rainforest poses a 'very high' risk to nature because many threatened species are present, whereas harvesting coniferous timber in boreal forests poses a 'low' risk because few threatened species are present.

STEP 6. Description of promising measures

To help translate the findings into action, possible measures were explored to reduce the identified risks to nature. A distinction was made between preventive, mitigating and restorative measures. Measures were identified on the basis of existing scientific literature and advisory reports (including reports by TNO, CE Delft and the IEA). For example, producing steel in an electric arc furnace powered by renewable electricity avoids the need for coal, thereby reducing the water pollution associated with coal extraction.



03 Concrete

Summary

Concrete is the most widely used material in the Dutch construction sector. It currently forms the basis of almost all buildings and civil infrastructure. Even with the rapid growth of timber construction, concrete will remain necessary for the foreseeable future, if only because many current construction plans are still based on its use. In the longer term too, concrete will remain essential in applications where it is difficult to replace, such as foundations, abutments and the load-bearing structures of taller buildings.

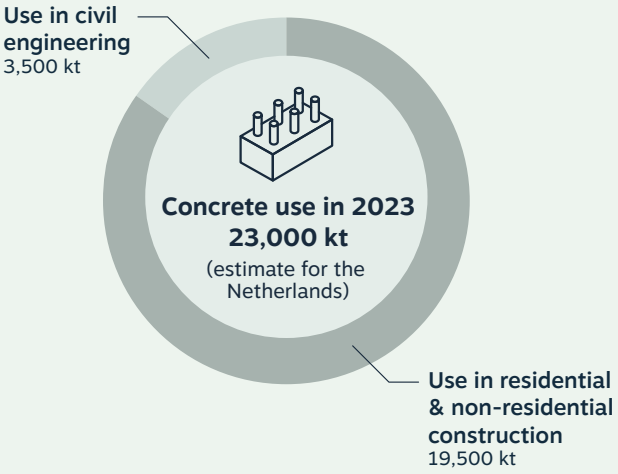
The current environmental impact of concrete is substantial. The extraction and production of concrete result in around 1.8 Mt of CO_2 emissions annually, mainly as a result of cement production. Concrete production is also responsible for substantial nitrogen and phosphorus emissions.

Raw materials for concrete come largely from the Netherlands (48%) and other countries in Northwestern Europe (37%). This is because concrete production requires large volumes of sand and gravel. Most sand and gravel is still extracted in the Netherlands. Cement, and the limestone needed to produce it, comes mainly from Belgium and Germany.

Sand and gravel extraction often takes place in areas with relatively few threatened species and low ecosystem integrity. Nevertheless, extraction can cause damage to nature in these areas because of its high impact on the soil. Nature restoration at former extraction sites is possible to some extent, but a full return to the original ecosystem is not feasible.

The greatest risks to nature are associated with water use in sand and gravel extraction. Around 13 million m³ of water is used for this each year in regions with medium to high risks due to water scarcity. By way of illustration, in the Dutch province of Limburg, where water availability is already limited, sand and gravel extraction uses around 6.1 million m³ of water annually – comparable to the annual drinking water consumption of 130,000 people in the Netherlands. This water use increases the local pressure on water availability.

To reduce risks to nature, priority should be given to reducing demand for virgin raw materials and reducing cement use. Key measures include the large-scale recovery of clean raw materials from demolition concrete and the use of alternative binders to replace Portland cement. Nature restoration measures at former extraction sites can also make a contribution.



Environmental impact across the production chain

This figure shows:

- The **mass distribution** of the types of concrete, as a reference for the impact
- The **ratio** between the environmental impact resulting from extraction and the impact from transport + production

Results

- **Raw material extraction** accounts for the largest share of the environmental impact for land use (62%) and water use (80%)
- **Transport and production** cause a greater environmental impact through emissions of CO_2 (93%), nitrogen (87%) and phosphorus (87%).

Further interpretation of the results is available in the Dutch version of the report.

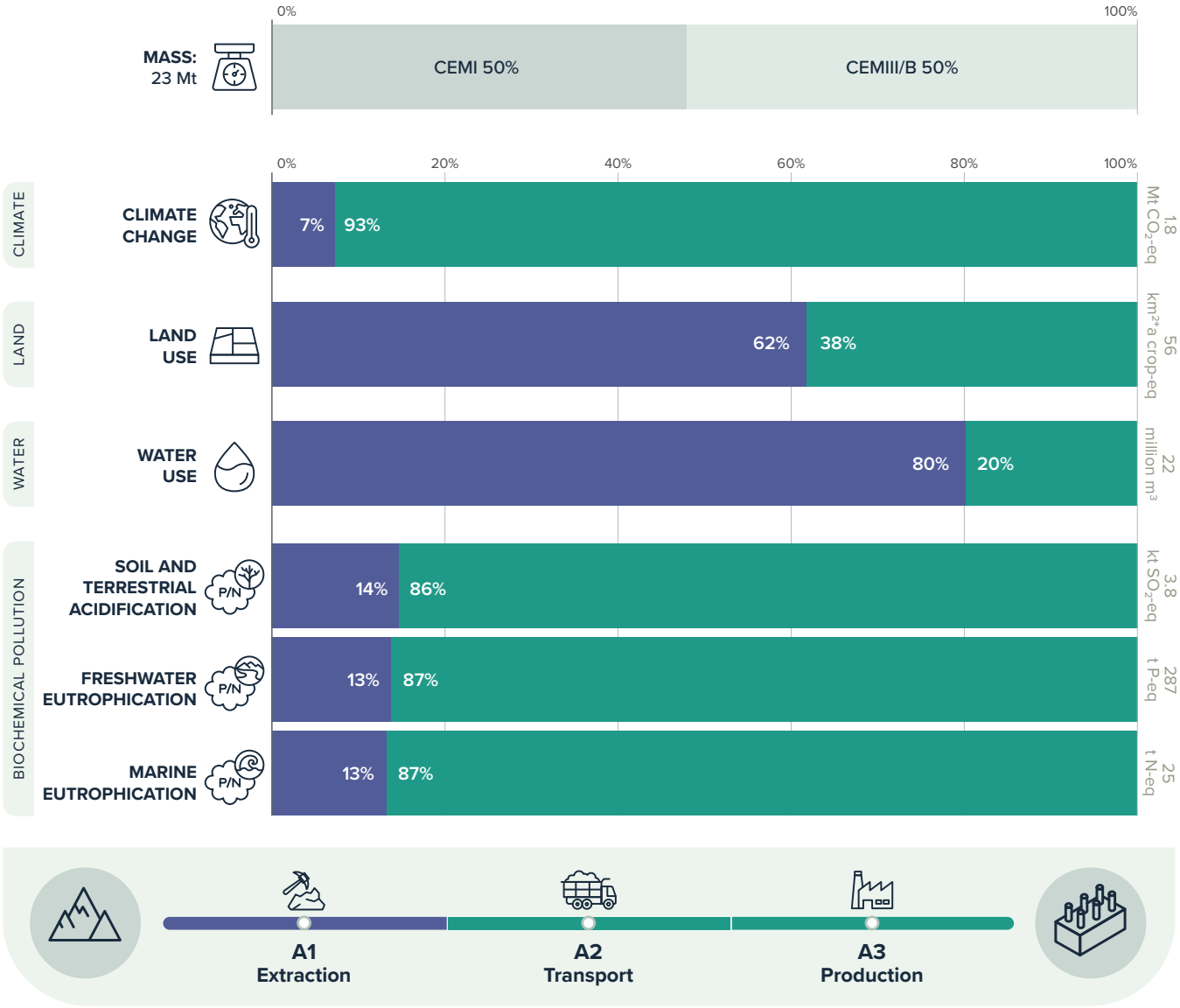


Figure 5: *Share of environmental impact from extraction, transport and production of concrete for the Dutch construction sector (2023)*

Key risks to nature associated with extraction

The bar chart shows:

- The share of the **environmental impact** from extraction relative to the entire supply chain
- The **state of nature** at the extraction site, with a classification of the risk of further damage to nature
- The **risks to nature** due to water availability at extraction sites, broken down by risk class and, within each class, by country.

The pie chart shows:

- The **risks to nature** due to water use as a result of (limited) water availability at extraction sites
- Breakdown by **risk class** and, within each class, by country.

Results

- 33% of the **water use for concrete production** takes place at extraction sites with a high risk due to low **water availability**, and 26% at sites with a medium risk
- 51% of the **land use for concrete production** takes place at extraction sites with a low risk due to historical **land-use change**.

Further interpretation of the results is available in the Dutch version of the report.

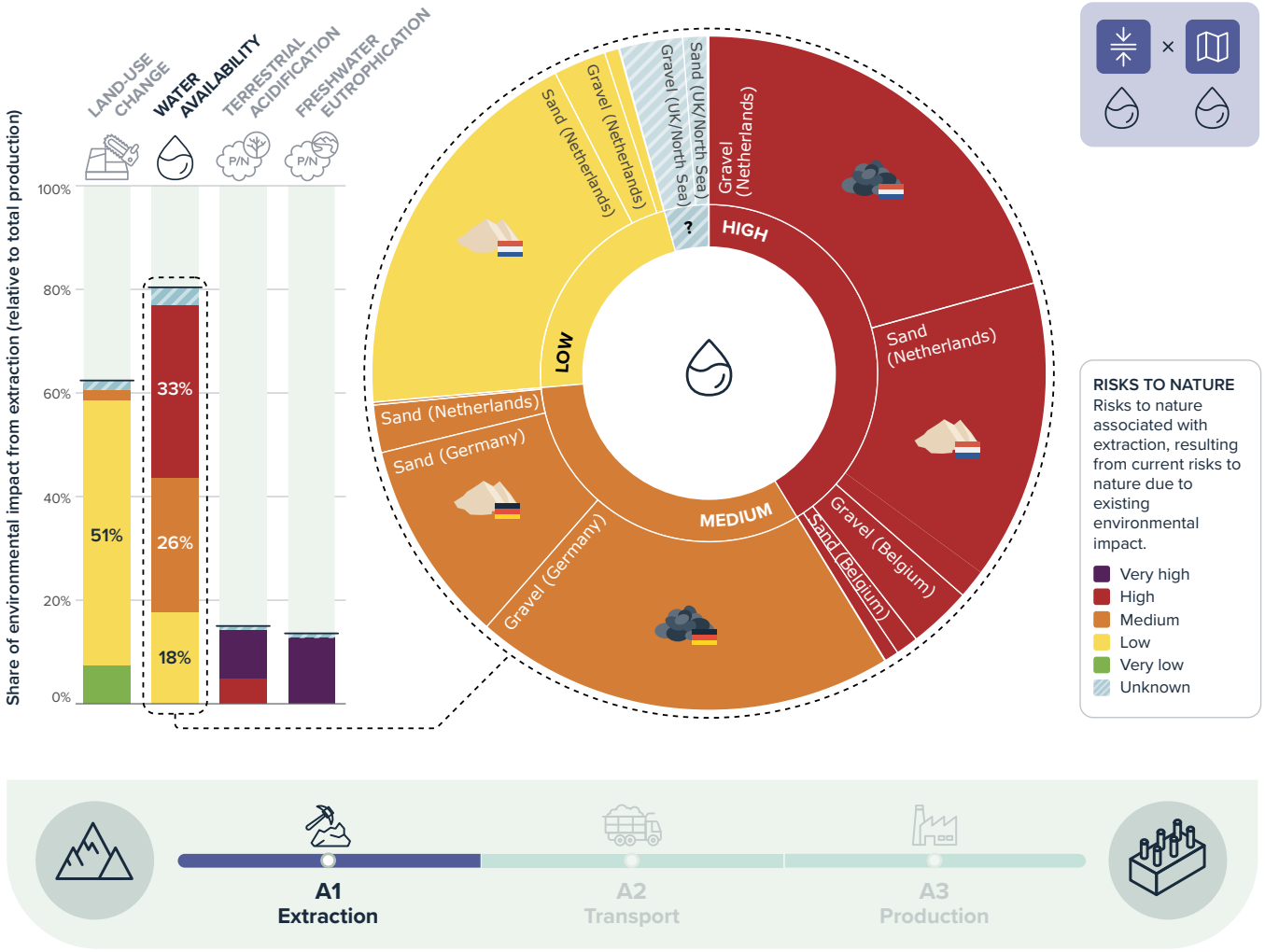


Figure 6: *Environmental impact and risks to nature associated with raw material extraction for concrete*

Key risks to nature associated with extraction

How to read this figure

This figure shows the following for land use from raw material extraction

- The proportion of the global population of a threatened species that lives in an area
- The extent to which an area is ecologically intact, meaning that the composition and functioning of the ecosystem have not been affected by human activity.

Results

- 22% of the **land use for raw material extraction** for concrete takes place at extraction sites in Germany with a medium risk due to **threatened species**
- 94% of the **land use for raw material extraction** for concrete takes place at extraction sites with low **ecosystem integrity**.

Further interpretation of the results is available in the Dutch version of the report.

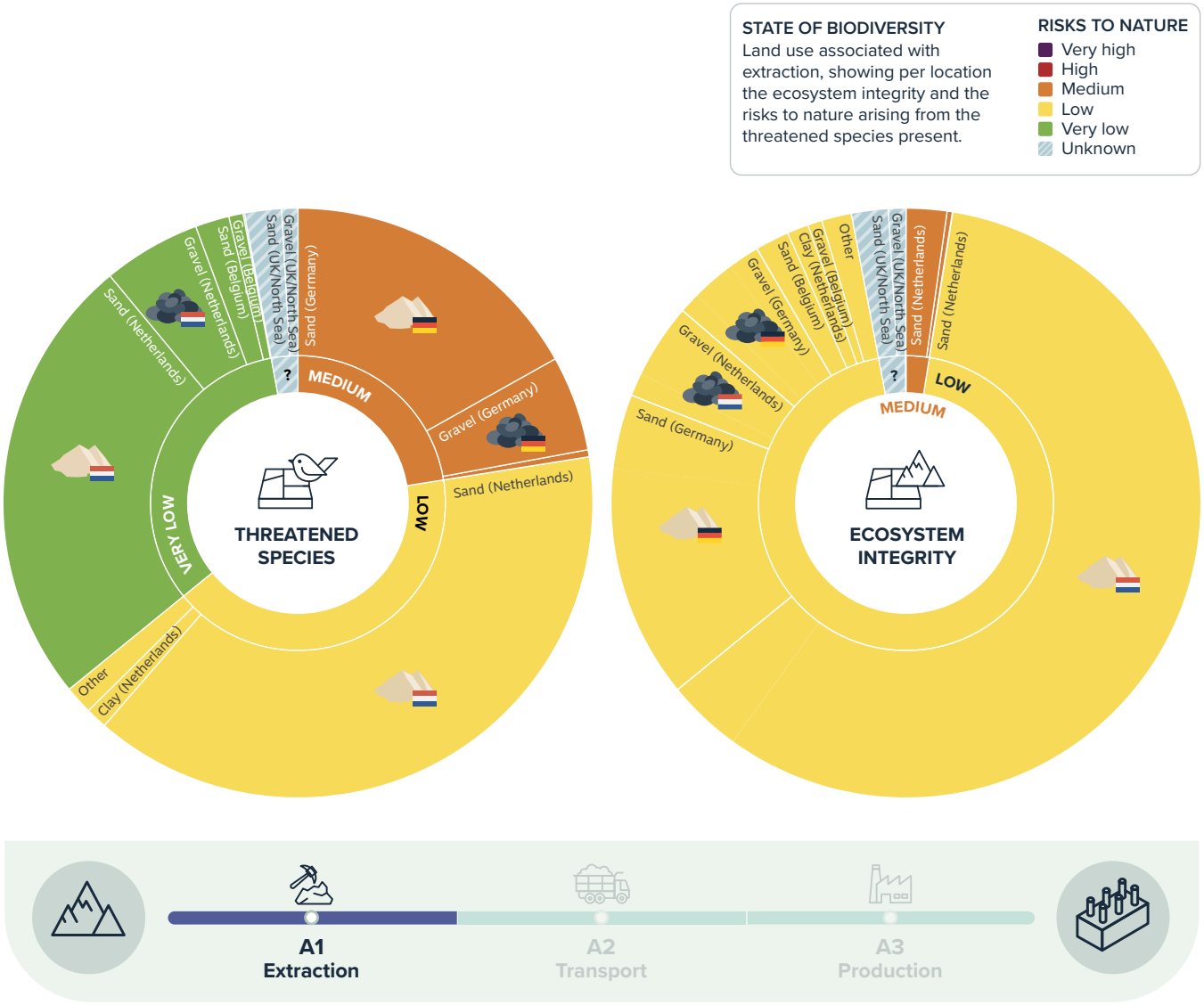
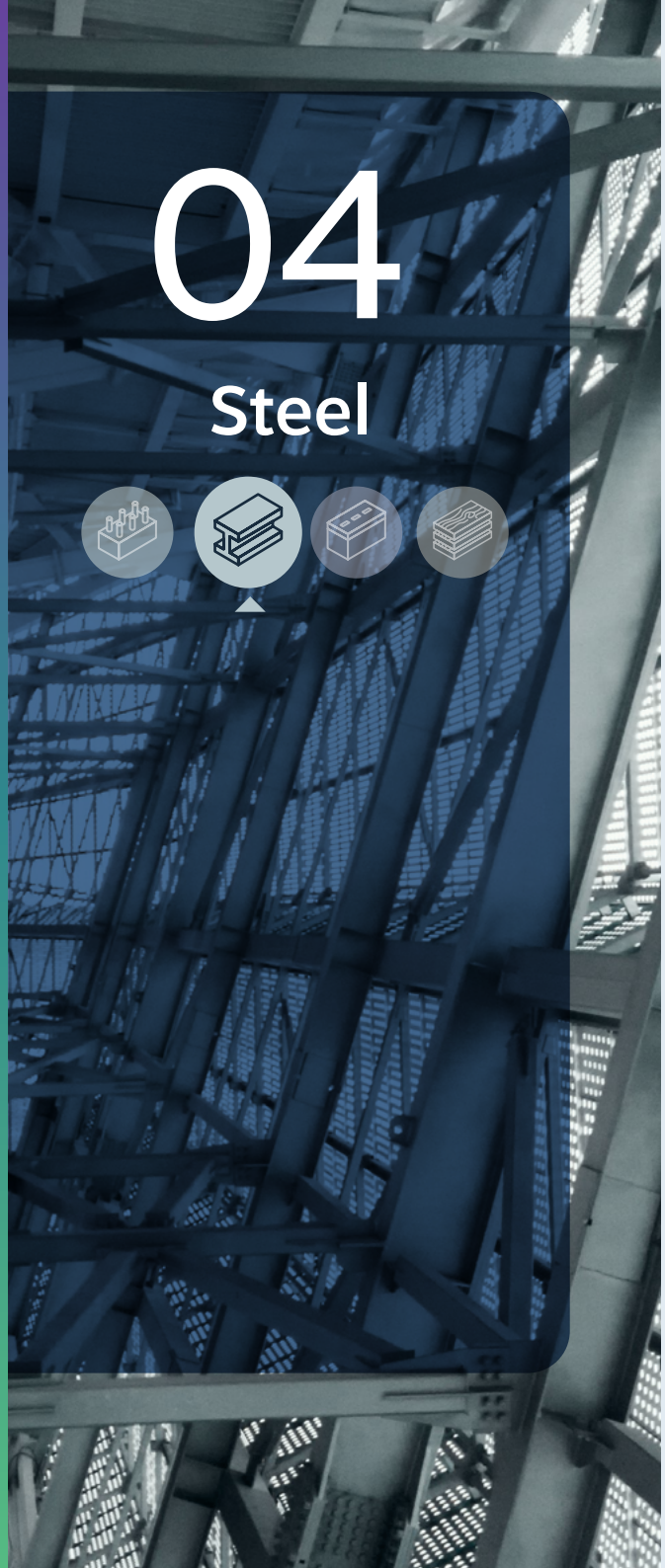


Figure 7: Biodiversity indicators at extraction sites for concrete



04 Steel

Summary

Steel is an essential construction material for both buildings and infrastructure. It is widely used for reinforcing concrete, as structural steel, and in sheet and tubular products. Around 24% of the steel products used in the Netherlands are imported from outside the EU; the remainder are produced in Europe.

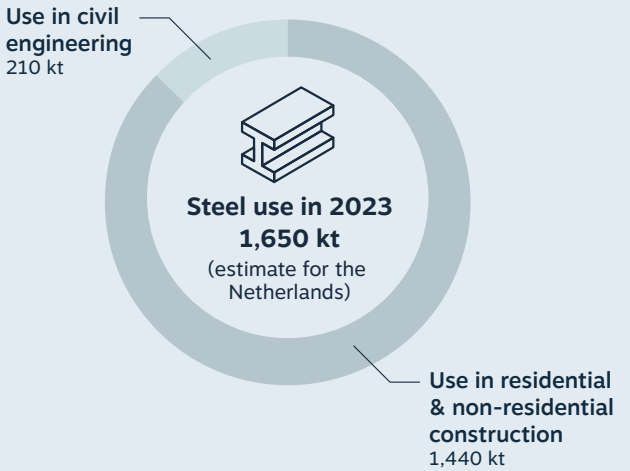
The environmental impact of steel is substantial. Production is the dominant source of impact compared with raw material extraction, accounting for 96% of carbon emissions and 95% of water use in the steel supply chain. In addition to CO_2, steel production also emits particulate matter, nitrogen dioxide and sulfur dioxide, which acidify the soil and contribute to water eutrophication.

The environmental impact of steel depends strongly on the production method. The blast furnace–basic oxygen furnace (BF-BOF) route uses coal and requires more primary raw materials. An electric arc furnace (EAF) uses electricity and a high proportion of scrap. As a result, its environmental impact is much lower.

Raw materials for steel production come from several different continents. One of the most important raw materials, iron ore, is extracted in countries that include Brazil, Sweden and Canada. Limestone comes mainly from Germany and Belgium. Coal is imported mainly from Poland, Australia and the United States. Scrap comes mainly from the EU.

Nickel extraction in particular takes place in locations with high risks to nature. At these extraction sites, ecosystem integrity is high and many threatened species are present. Nickel extraction in Brazil and Colombia leads to land-use change in these areas, posing risks to nature. Coal extraction also takes place in areas with high ecosystem integrity.

Switching to electric arc furnaces is an essential step for steel production. This reduces reliance on coal and allows a higher proportion of scrap to be used, thus reducing carbon emissions, biochemical pollution and the amount of primary raw materials required. Direct reuse of steel can also make an important contribution, as it eliminates the need for recycling and production processes.



Environmental impact across the production chain

This figure shows:

- The **mass distribution** of the types of steel, as a reference for the impact
- The **ratio** between the environmental impact resulting from extraction and the impact from transport + production.

Results

- **Production** is dominant in all environmental impact categories. For climate impact, this is over 95%
- The impact of **raw material extraction** is relatively small for steel. It is greatest for land use: around 26% of the total land use in the steel supply chain.

Further interpretation of the results is available in the Dutch version of the report.

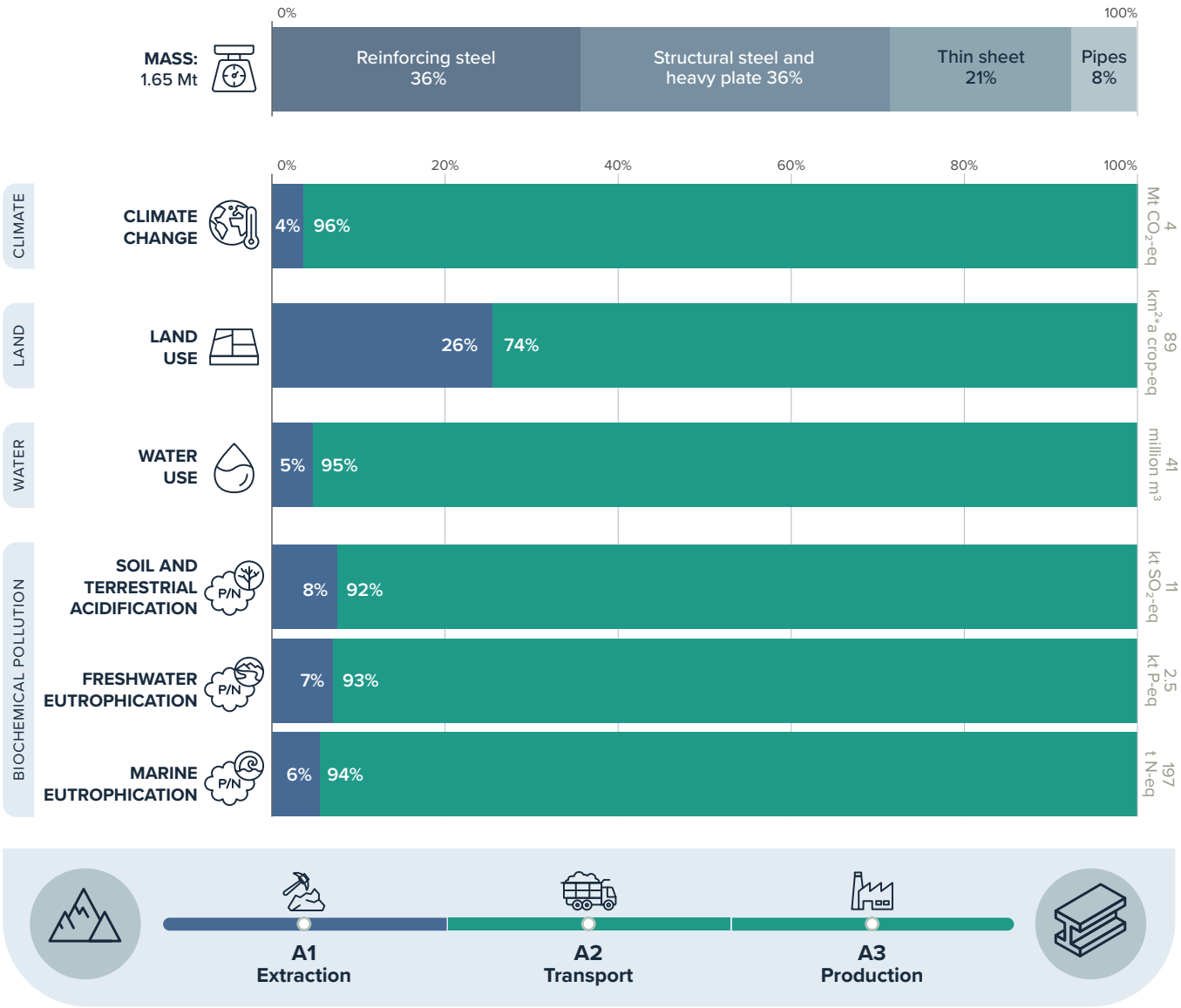


Figure 8: *Share of environmental impact from extraction, transport and production of steel for the Dutch construction sector (2023)*

Key risks to nature associated with extraction

The bar chart shows:

- The share of the **environmental impact** from extraction relative to the entire supply chain
- The **risks to nature** associated with the specific environmental effect at the extraction site.

The pie chart shows:

- The **risks to nature** due to land-use change at mining sites
- Breakdown by **risk class** and, within each class, by country.

Results

- 2% of the **land use for steel production** takes place at extraction sites with a high risk due to historical **land-use change**, and 10% at sites with a medium risk
- 5% of the **land use for raw material extraction** for steel takes place at nickel extraction sites in the Dominican Republic with a high risk due to historical **land-use change**, and 42% at nickel extraction sites in Brazil with a medium risk.

Further interpretation of the results is available in the Dutch version of the report.

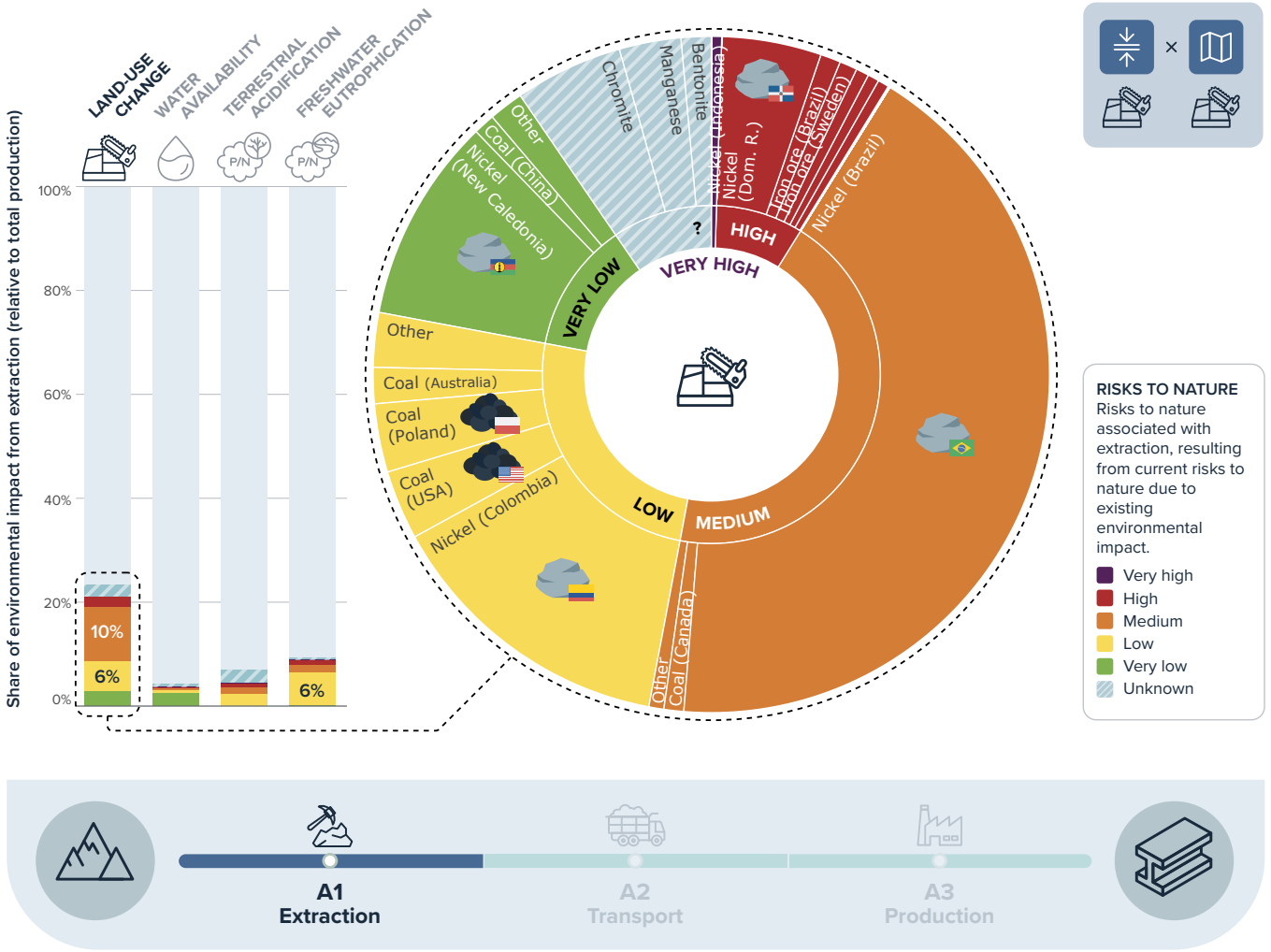


Figure 9: *Environmental impact and risks to nature associated with raw material extraction for steel*

Key risks to nature associated with extraction

How to read this figure

This figure shows the following for land use from raw material extraction

- The proportion of the global population of a threatened species that lives in an area
- The extent to which an area is ecologically intact, meaning that the composition and functioning of the ecosystem have not been affected by human activity.

Results

- 29% of the **land use for raw material extraction** for steel takes place at extraction sites with a very high risk due to **threatened species**, and 50% at sites with a high risk
- 43% of the **land use for raw material extraction** for steel takes place at extraction sites with very high **ecosystem integrity**.

Further interpretation of the results is available in the Dutch version of the report.

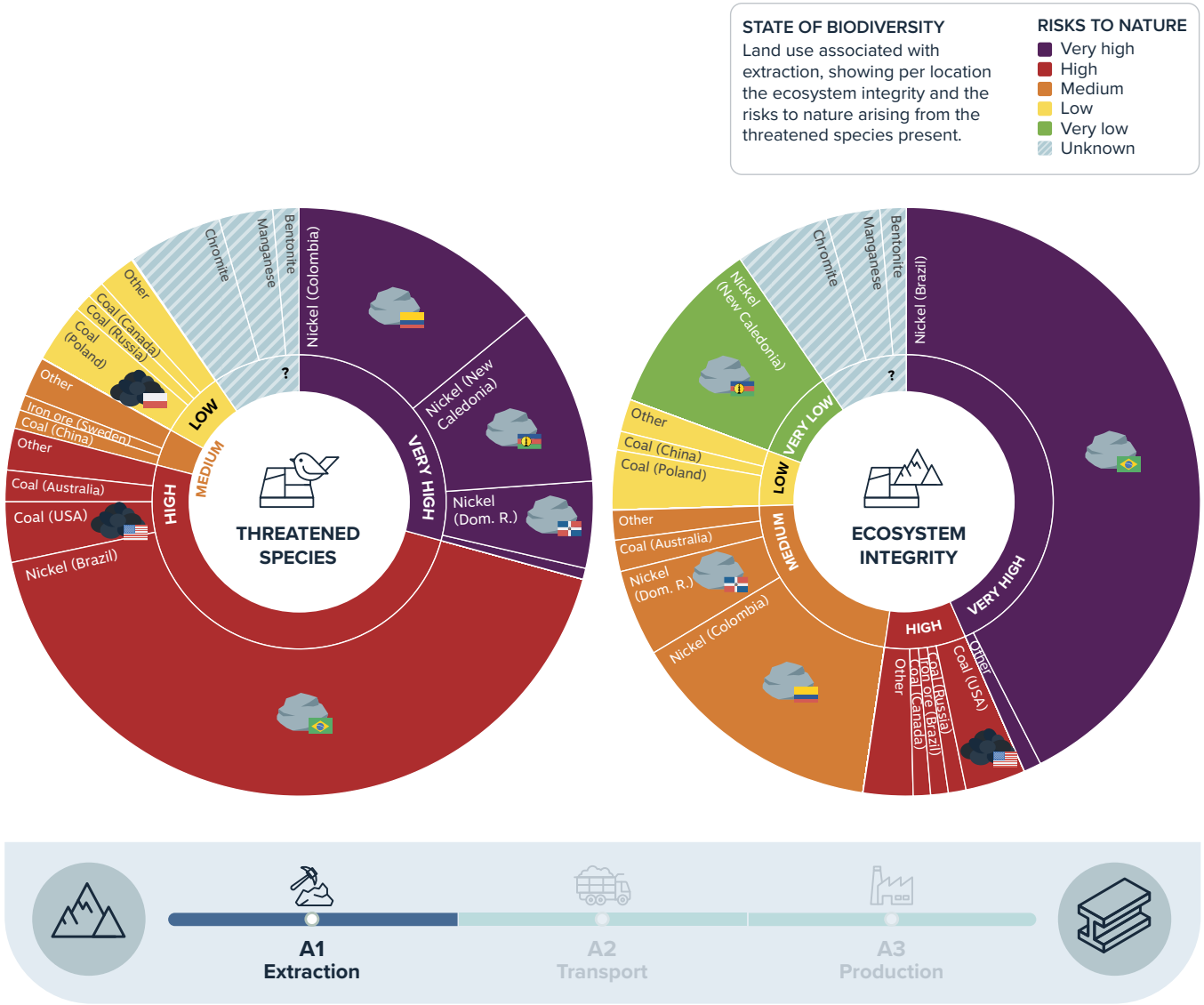


Figure 10: *Biodiversity indicators at extraction sites for steel*

05 Asphalt

Summary

Asphalt forms the basis of the Dutch road network. Central government, provincial government and municipalities are all major purchasers. An estimated 8.7 million tonnes of asphalt are produced in the Netherlands each year at around 20 local asphalt plants. Municipal roads also use concrete or clay pavers in addition to asphalt.

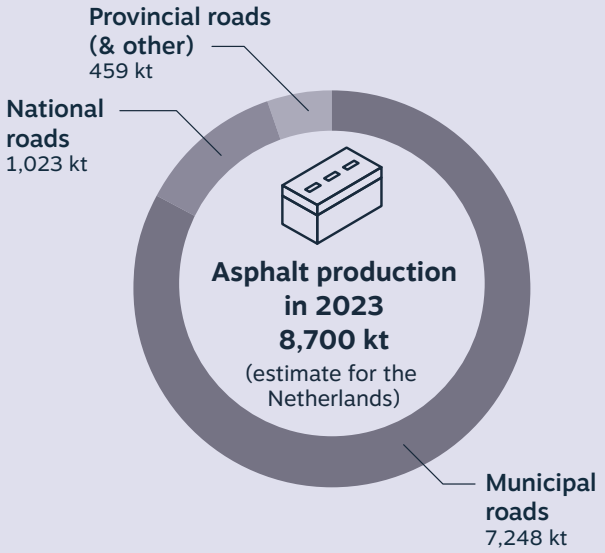
For asphalt, production accounts for most of the environmental impact. Asphalt production generates around 590 kt of CO_2 emissions and 2.3 kt SO_2-eq of acidifying substances each year. This is mainly due to the combustion of fossil fuels, particularly natural gas. The environmental impact of raw material extraction (crushed rock, sand and limestone) is relatively limited, with the exception of the large volume of water used.

Raw materials for asphalt come mainly from Northwestern Europe. Sand is extracted mainly in the Netherlands. Crushed rock is quarried in Belgium, Norway, Germany and Scotland. Limestone is quarried in Germany and Belgium.

Raw material extraction for asphalt often takes place in areas with relatively few threatened species and low to medium-high ecosystem integrity. Nevertheless, extraction can cause damage to nature in these areas because it has a significant impact on the soil. There are medium risks associated with crushed rock extraction in Norway and Germany and with sand extraction in the Dutch province of Drenthe. In addition, sand extraction in Germany poses medium risks due to the presence of threatened species.

As with concrete, the greatest risks to nature arise from water use in sand and gravel extraction. Around 3 million litres of water are required for extraction each year. Some of this water use occurs in areas with high risks to nature due to existing water scarcity (crushed rock extraction in Belgium and sand extraction in the Dutch province of Limburg).

To reduce risks to nature, priority should be given to life extension, greater use of reclaimed asphalt and more sustainable asphalt production. Life extension reduces both raw material use and environmental and climate impacts. A greater proportion of reclaimed asphalt in the lower asphalt layers reduces demand for virgin raw materials. The use of warm mix asphalt reduces both climate impact and nitrogen and sulfur emissions.



Environmental impact across the production chain

This figure shows:

- The **mass distribution** of the types of asphalt, as a reference for the impact
- The **ratio** between the environmental impact resulting from extraction and the impact from transport + production.

Results

- Production causes the largest environmental impact on freshwater quality (85%), terrestrial acidification (84%) and land use (63%)
- Extraction causes the largest environmental impact on water availability (76%) and marine biochemical pollution (65%).

Further interpretation of the results is available in the Dutch version of the report.

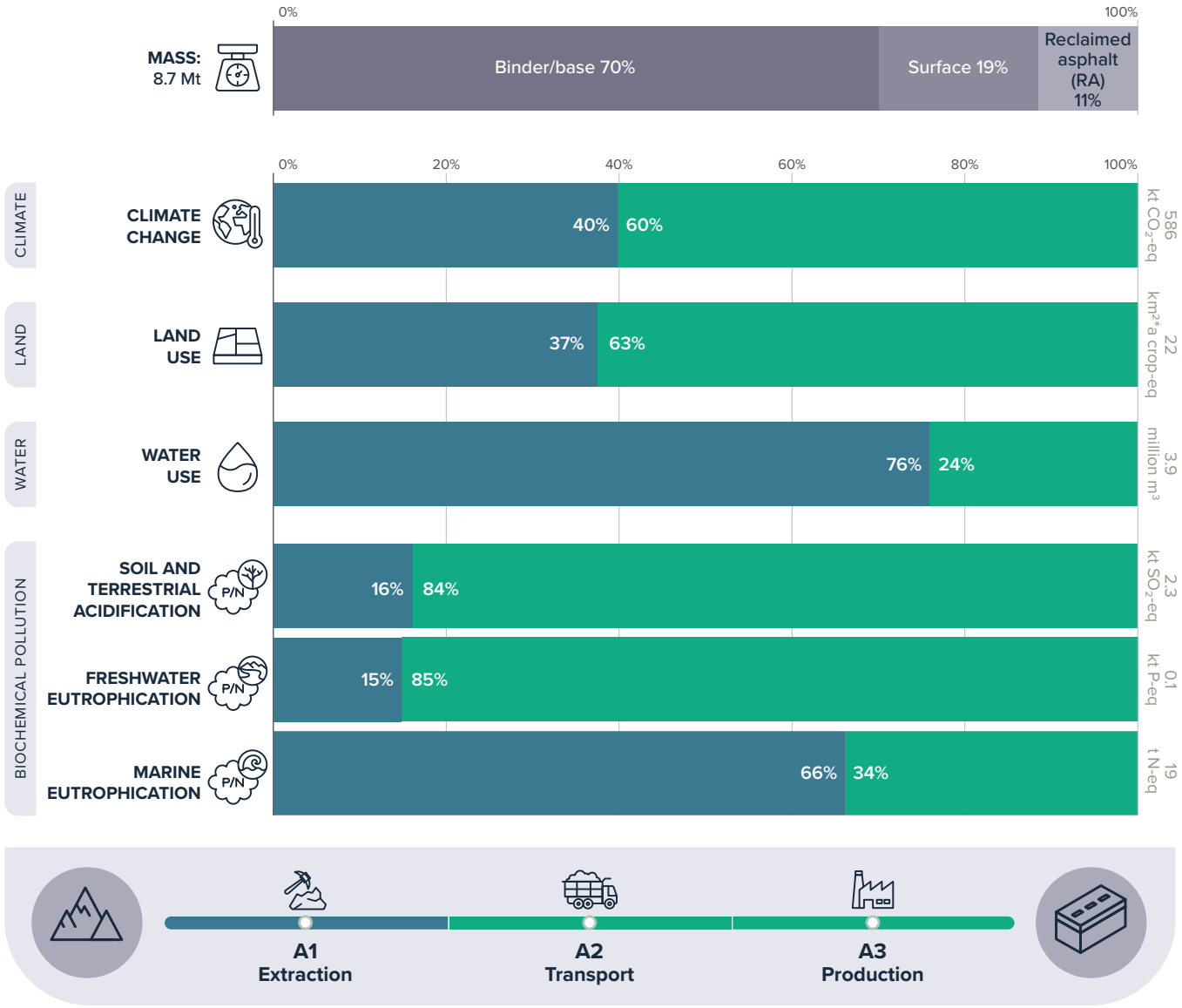


Figure 11: *Share of environmental impact from extraction, transport and production of asphalt for the Dutch construction sector (2023)*

Key risks to nature associated with extraction

The bar chart shows:

- The share of the **environmental impact** from extraction relative to the entire supply chain
- The **risks to nature** associated with the specific environmental effect at the extraction site (example: nitrogen emissions in relation to existing terrestrial acidification).

The pie chart shows:

- The **risks to nature** due to water use as a result of (limited) water availability at extraction sites
- Breakdown by **risk class** and, within each class, by country.

Results

- 25% of the **water use for asphalt production** takes place at extraction sites with a high risk due to low **water availability**, and 9% at sites with a medium risk
- 7% of the **freshwater eutrophication from asphalt production** takes place at extraction sites with a very high risk due to **freshwater eutrophication**, and 4% at sites with a medium risk.

Further interpretation of the results is available in the Dutch version of the report.

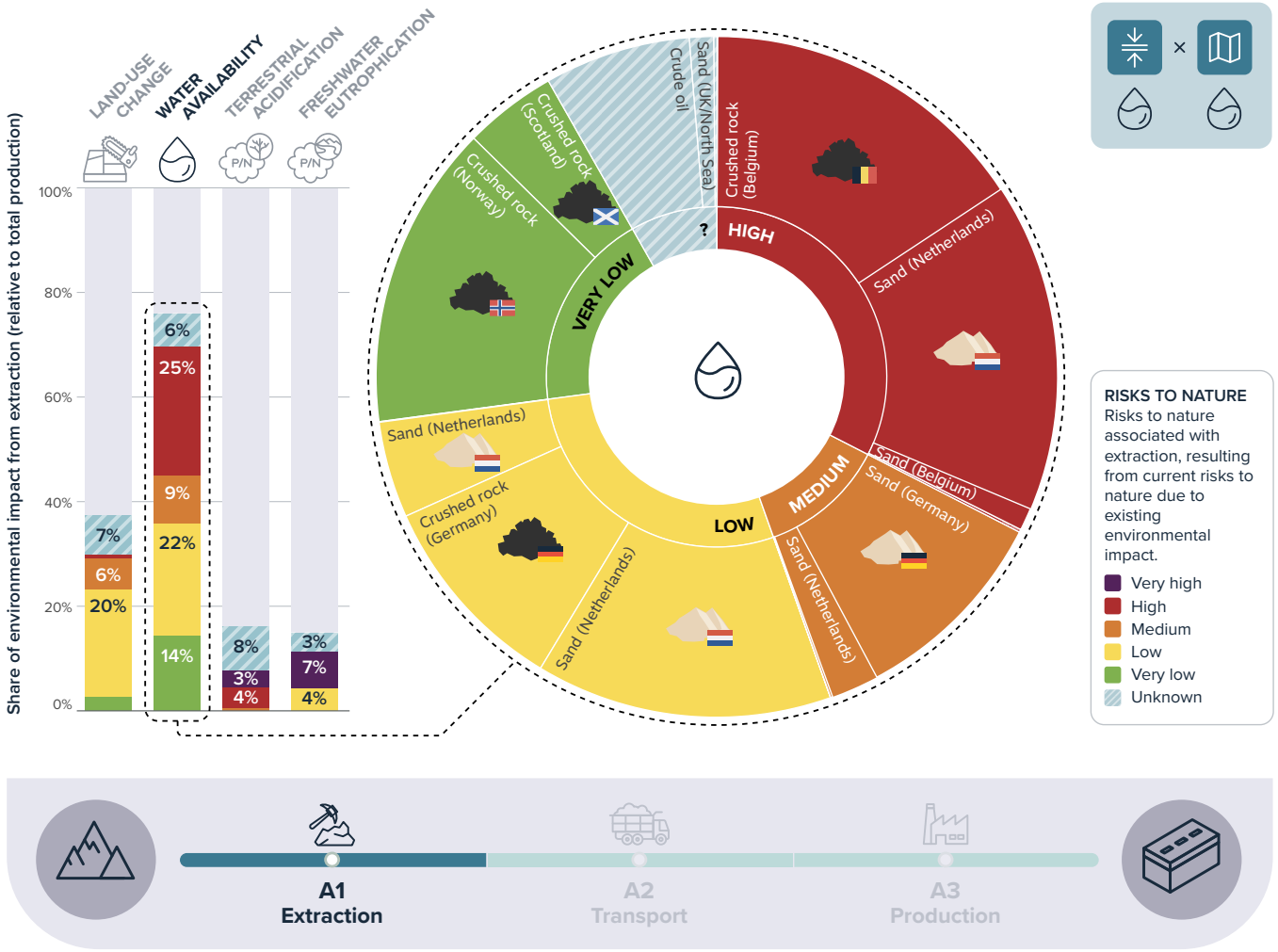


Figure 12: *Environmental impact and risks to nature associated with raw material extraction for asphalt*

Key risks to nature associated with extraction

How to read this figure

This figure shows the following for land use from raw material extraction

- The proportion of the global population of a threatened species that lives in an area
- The extent to which an area is ecologically intact, meaning that the composition and functioning of the ecosystem have not been affected by human activity.

Results

- 12% of the **land use for raw material extraction** for asphalt takes place at extraction sites in Germany with a medium risk due to **threatened species**
- 65% of the **land use for raw material extraction** for asphalt takes place at extraction sites with low **ecosystem integrity**.

Further interpretation of the results is available in the Dutch version of the report.

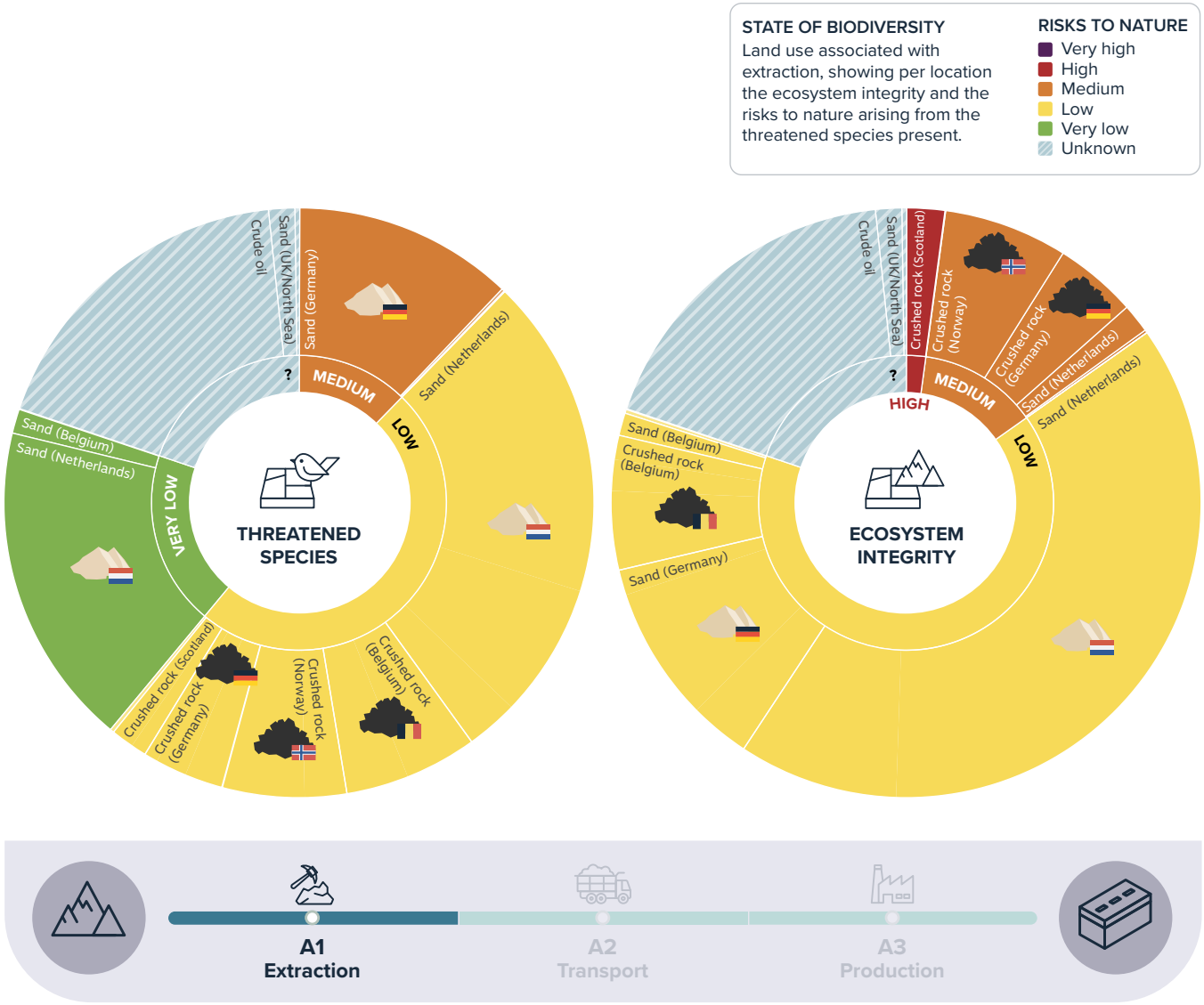
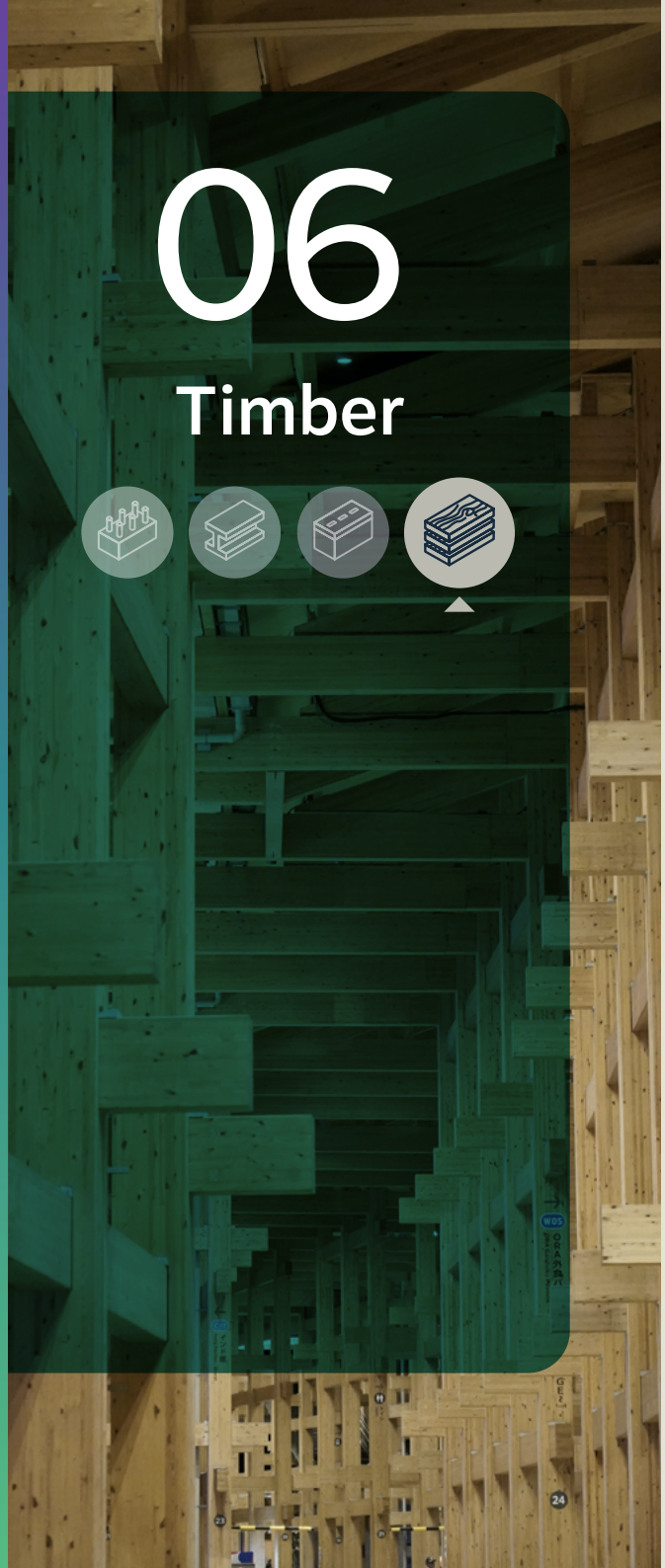


Figure 13: *Biodiversity indicators at extraction sites for asphalt*



06 Timber

Summary

Timber is increasingly being used as a construction material. This report uses data from 2023, when an estimated 509 kt of timber was used in the Netherlands for residential and non-residential construction (93%) and civil engineering (7%). More than half (57%) consisted of sawn softwood. Other products used included fibreboard, particleboard, joinery products and tropical hardwood.

Compared with concrete, steel and asphalt, timber has a relatively low environmental impact and low carbon emissions. However, timber production requires a large area of land. Its low environmental impact on other indicators is due to the relatively small amount of energy required for timber production. As a result, fewer fossil fuels are burned, limiting emissions of substances including nitrogen.

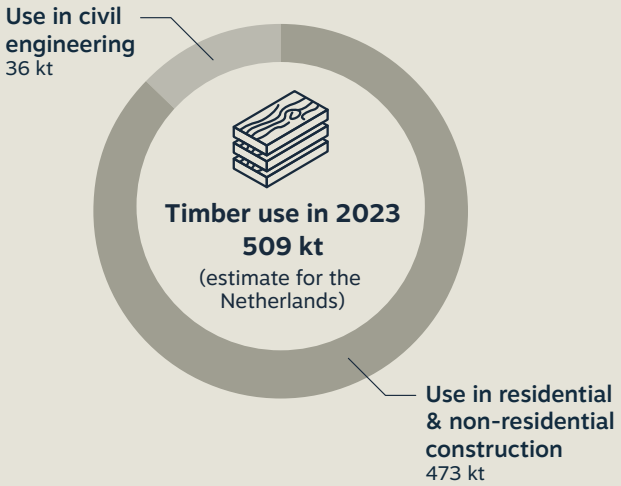
Most of the timber used in the Dutch construction sector comes from Europe (82%). Much of this timber comes from Germany, Sweden and Belgium. A small proportion comes from the Netherlands (7%), mainly for use in oriented strand board (OSB).

More than half of the land used for timber production is in areas with high to very high ecosystem integrity. More than a third of this land use is in areas classified as high to very high risk due to the number of threatened species. However, most timber used in the Netherlands is certified, indicating that it was harvested responsibly. This applies to 84–91% of the softwood used and 66–70% of the hardwood used.

The greatest risks to nature associated with timber harvesting occur in boreal softwood forests and tropical forests. Forestry for tropical hardwood takes place in areas with a very high risk to nature (9%) and a high risk (14%) due to the presence of threatened species. In the European boreal (northern) forests of Sweden and Finland, ecosystems are also under pressure.

The risks to nature associated with engineered timber products from Central European forests, such as cross-laminated timber (CLT) and glued laminated timber (glulam), appear to be limited. In German forests, risks to nature associated with threatened species are moderate, and ecosystem integrity is also moderate. Europe also has relatively strict regulations governing timber harvesting, which helps to limit risks to nature.

As timber construction scales up, it is essential to continue prioritising the use of certified timber. Despite the high proportion of certified timber, some of the timber used in the Netherlands is still uncertified: this ranges from 9% for wood-based panels to 15% for softwood, 30% for tropical hardwood and 36% for temperate hardwood. After its initial use, timber should be reused in a cascade, with each subsequent application retaining as much value as possible.



Environmental impact across the production chain

This figure shows:

- The **mass distribution** of the types of timber, as a reference for the impact
- The **ratio** between the environmental impact resulting from extraction (A1) and the impact from transport (A2) + production (A3)

Results

- The **production stage** accounts for the largest environmental impact on climate change (87%), water use (98%), terrestrial acidification (92%) and water eutrophication (97%).
- **Extraction** (forestry) accounts for almost all of the land use (99%), because forests need space to grow.

Further interpretation of the results is available in the Dutch version of the report.

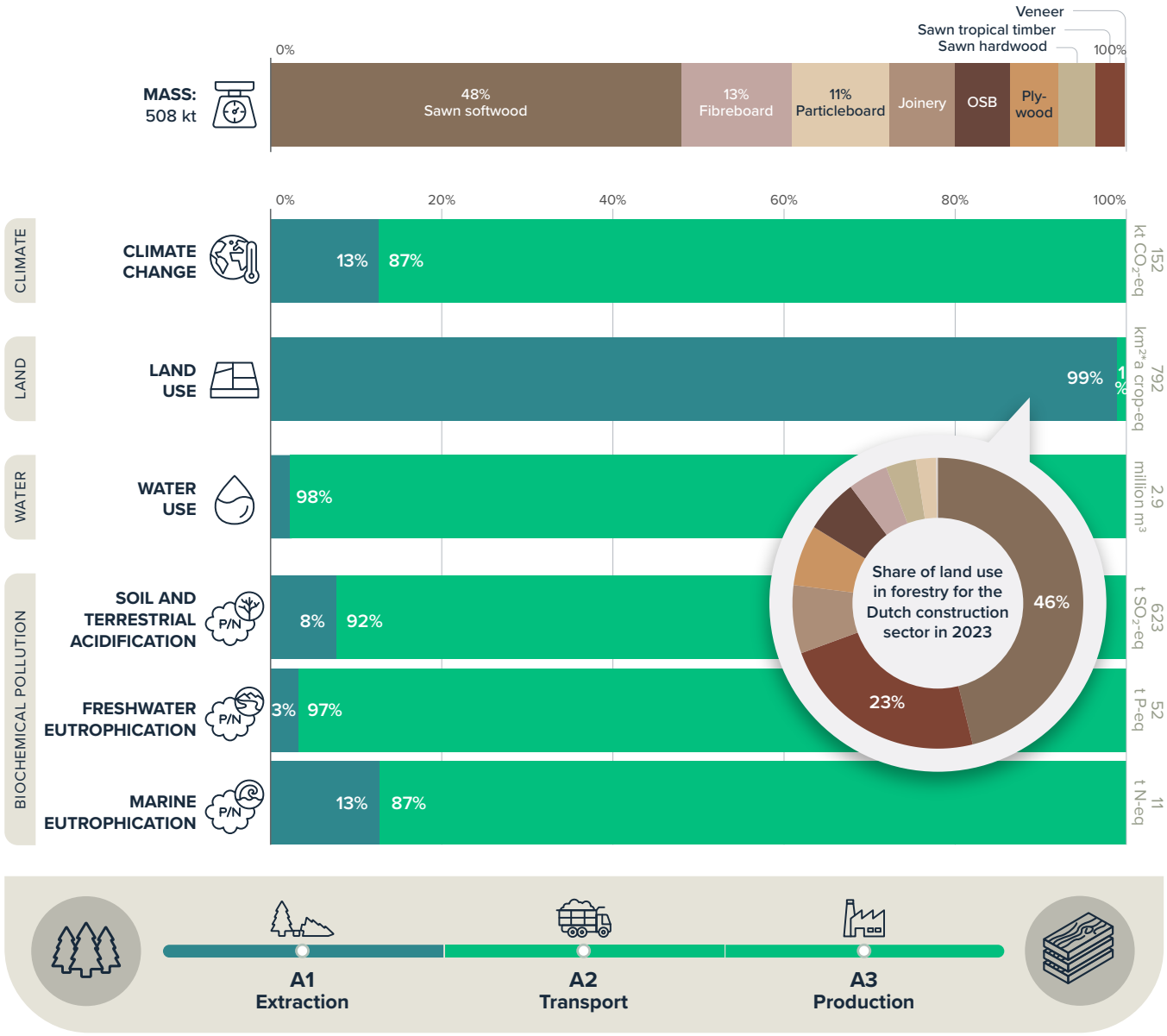


Figure 14: *Share of environmental impact from extraction, transport and production of timber for the Dutch construction sector (2023)*

Key risks to nature associated with extraction

The bar chart shows:

- The share of the **environmental impact** from extraction relative to the entire supply chain
- The **risks to nature** associated with the specific environmental effect at the forestry sites

The pie chart shows:

- The **risks to nature** due to land-use change at forestry sites
- Breakdown by **risk class** and, within each class, by country

Results

- 12% of the **land use for timber production** takes place at forestry sites with a high risk due to historical land-use change. This is mainly tropical hardwood.
- 39% of the **land use for timber production** takes place at sites with a low risk.

Further interpretation of the results is available in the Dutch version of the report.

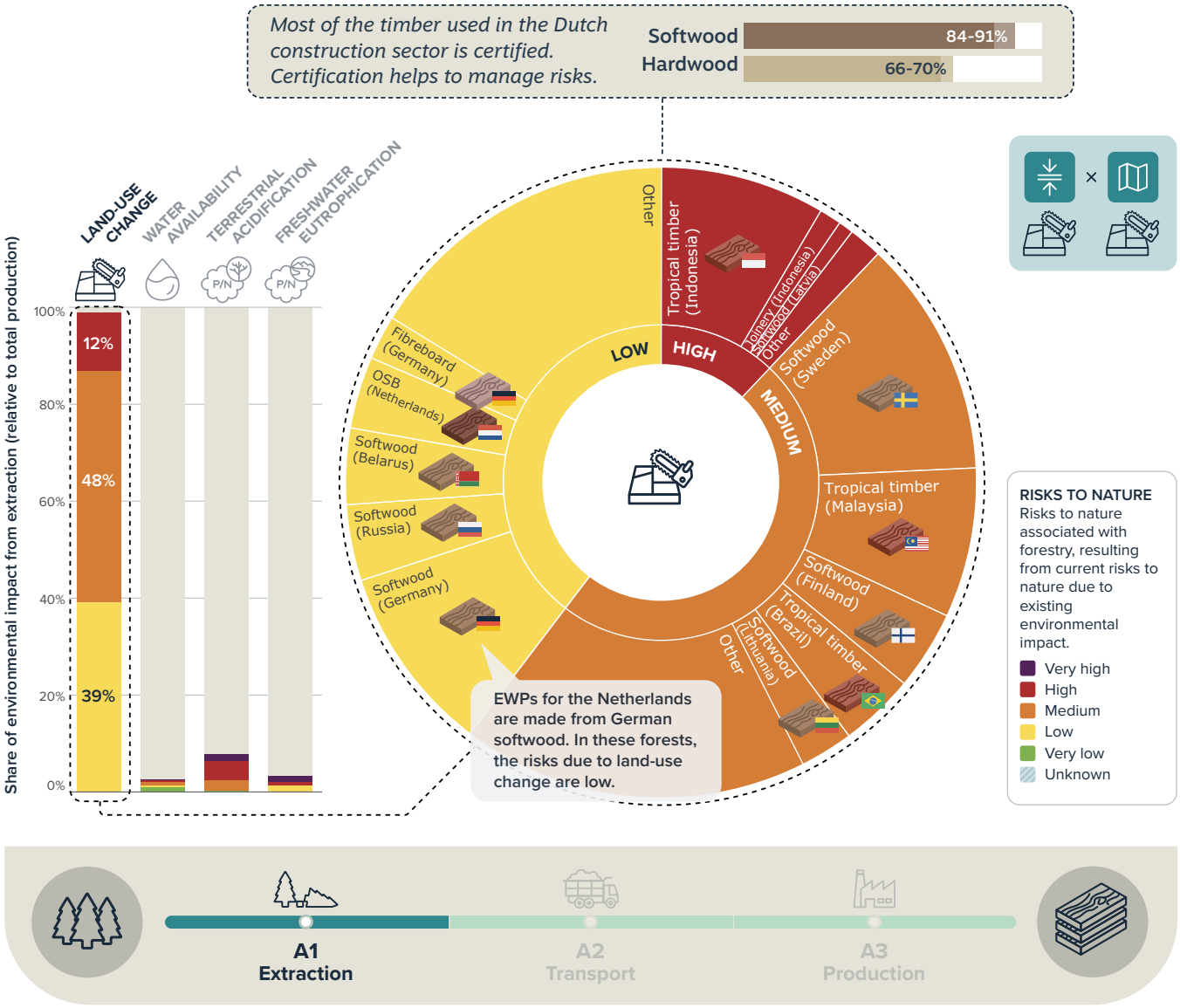


Figure 15: *Environmental impact and risks to nature associated with forestry*

Key risks to nature associated with extraction

How to read this figure

This figure shows the following for land use from forestry

- The proportion of the global population of a threatened species that lives in an area.
- The extent to which an area is **ecologically intact**, meaning that the composition and functioning of the ecosystem have not been affected by human activity

Results

- 11% of the **land use for forestry** is at sites with a very high risk due to **threatened species**, and 22% at sites with a high risk.
- 14% of the **land use for forestry** takes place at forestry sites with very high **ecosystem integrity**, and 43% at sites with high ecosystem integrity.

Further interpretation of the results is available in the Dutch version of the report.

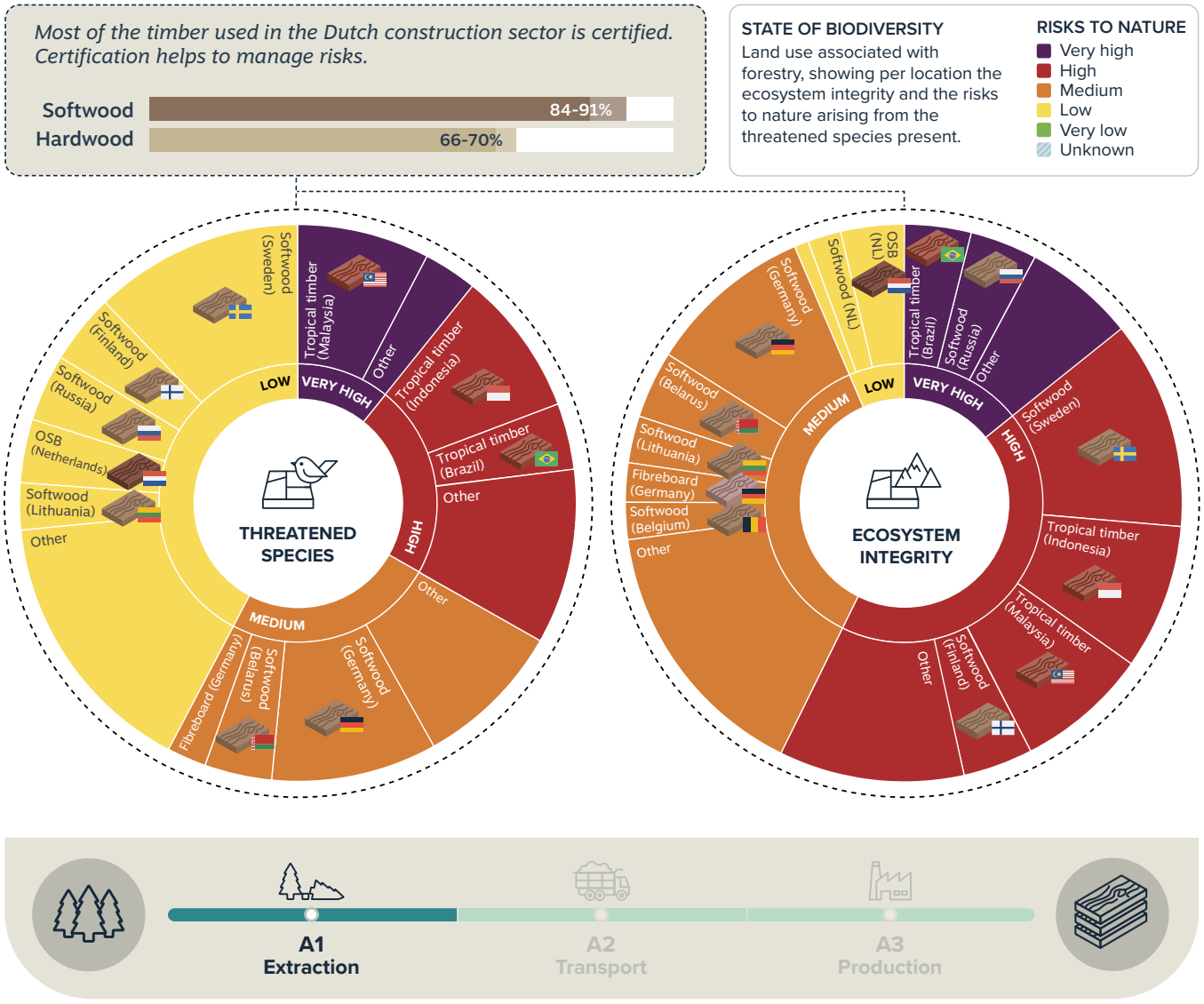
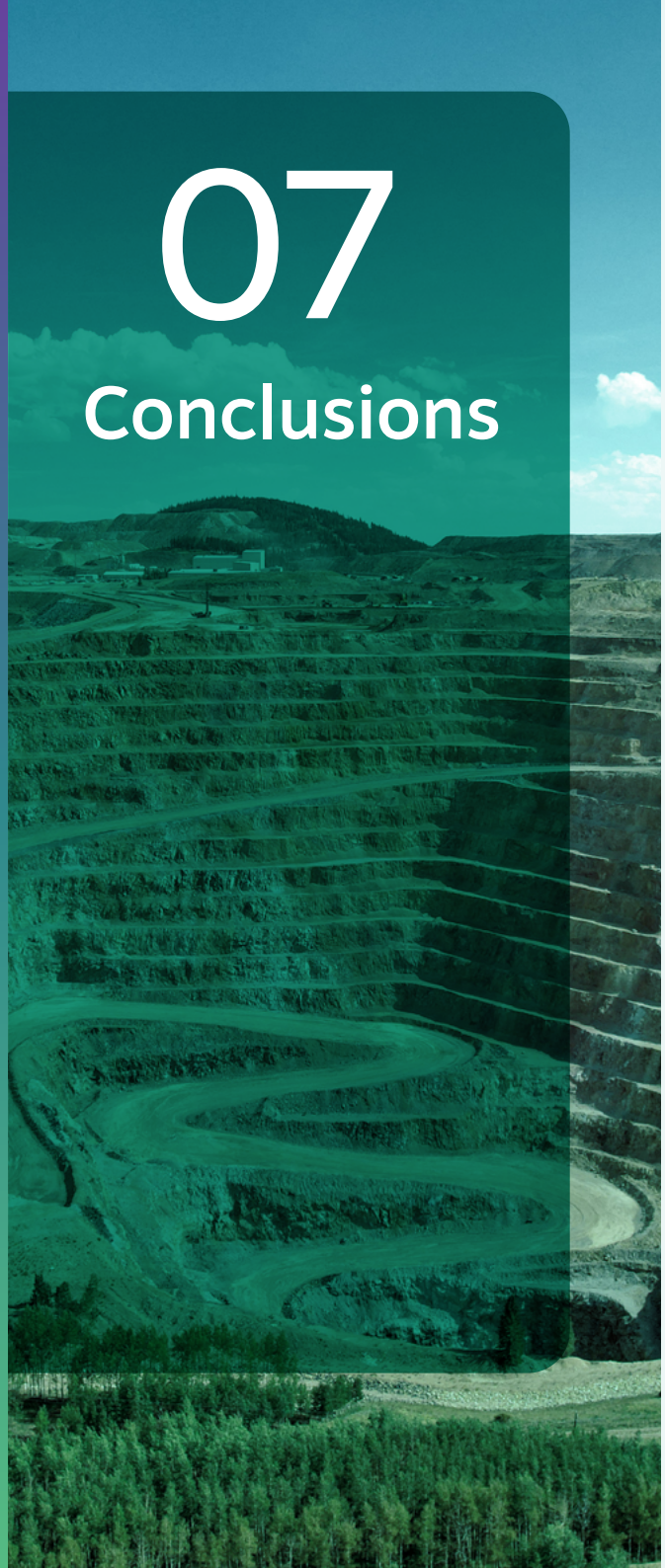


Figure 16: *Biodiversity indicators at forestry sites*

07 Conclusions



The extraction and production of construction materials have environmental impacts and pose risks to nature. The scale of these risks depends on factors including the raw material, the extraction location and the state of nature at that location. This section presents the conclusions drawn from the analysis of concrete, steel, asphalt and timber.

The extraction and production of construction materials always have an environmental impact and always pose risks to nature. However, the impacts vary considerably depending on the construction material, the constituent raw material and the location.

Six conclusions can be drawn from the analyses of concrete, steel, asphalt and timber:

1. The greatest environmental impact of construction materials occurs during the production stage
2. The extraction and combustion of fossil fuels account for the greatest environmental impact
3. Insight into supply chains and material origins is necessary to assess risks to nature.
4. Abiotic raw materials have a different environmental profile from biotic raw materials
5. Abiotic raw materials require different measures from biotic raw materials
6. Designing and building with less material is the most important step

These conclusions enable the construction value chain to adopt a broader perspective in its strategic decision-making regarding the use of construction materials. Section 8 sets out the sector-wide action needed to reduce environmental impact and the associated risks to nature.

> **These conclusions enable organisations within the construction value chain to adopt a broader perspective in its strategic decision-making regarding the use of construction materials.**

1

The greatest environmental impact of construction materials occurs during the production stage

The production of construction materials has a greater environmental impact than the extraction of raw materials. For many materials and environmental effects, production accounts for more than 80% of the total impact of extraction and production combined. Figure 17 shows the total environmental impact of the production chains for concrete, steel, asphalt and timber used in the Dutch construction sector in 2023.

The substantial impact of the production stage appears to be mainly due to the use of fossil fuels (see conclusion 2). The contribution of the transport stage (A2) is very limited for almost all materials; for simplicity in the analysis, it has been included as part of the production stage (A3).

Although the production stage generally has a greater environmental impact, there are two areas in which raw material extraction also has a relatively large impact:

1. **Land use:** timber has a substantial impact simply because forestry requires large areas of land. However, this does not necessarily translate into environmental impact if harvesting is carried out responsibly.
2. **Water use:** the extraction of sand and gravel for concrete and asphalt has a particularly large impact.

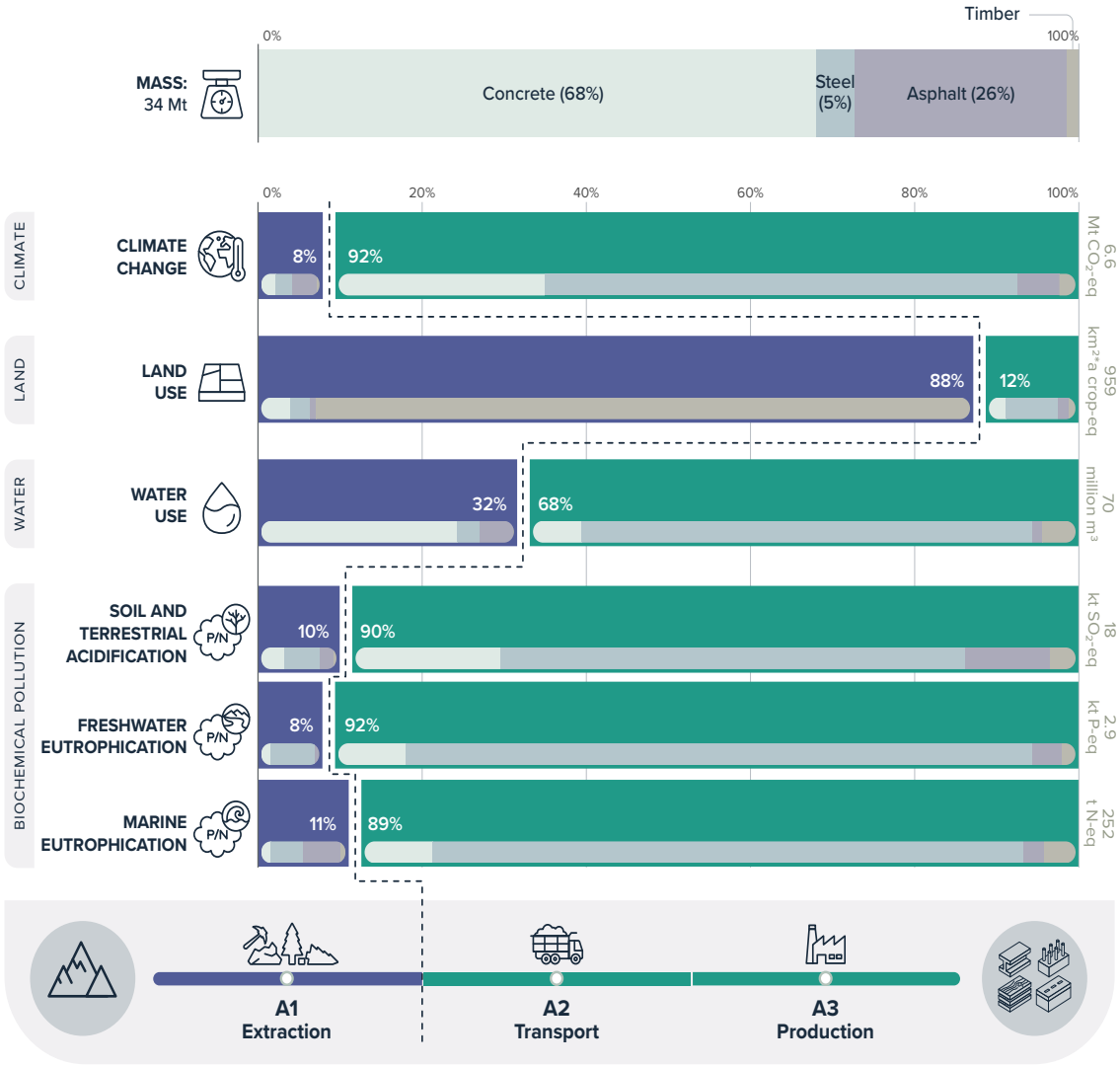


Figure 17: Total environmental impact resulting from the extraction and production of concrete, steel, asphalt and timber for the Dutch construction sector (2023)

2

The extraction and combustion of fossil fuels account for the greatest environmental impact

A significant share of the total environmental impact of material production results from the energy used in production. At present, this energy is generated mainly through the combustion of fossil fuels. This not only contributes to climate change through carbon emissions, but also leads to effects such as soil and water acidification due to sulfur dioxide emissions. In addition, fossil fuel extraction often contributes substantially to eutrophication and involves significant land and water use. The locations of fossil fuel extraction and combustion were outside the scope of this study.

A transition from fossil fuels to renewable energy generation has a positive effect on most environmental impacts. Figure 18 shows the relative contribution of each energy source to the various environmental impacts associated with generating 1 kWh of electricity.[13] Coal-fired electricity generation – and, to a lesser extent, natural gas – makes the largest contribution to almost all environmental impacts. A rapid transition to low-carbon electricity generation will therefore help to bring about a structural reduction in pressure on nature and ecosystems.

At the same time, renewable energy technologies also have environmental impacts that can pose risks to nature. For example, solar PV panels have a relatively high impact on land use and water use per kWh generated. For ground-mounted solar, land use is high because of the space required for the panels. Solar panel production also requires relatively large amounts of water. Other environmental impacts are largely due to the energy-intensive production of silicon for the panels and of aluminium and steel for the frames, processes that still rely heavily on fossil fuels.[14]

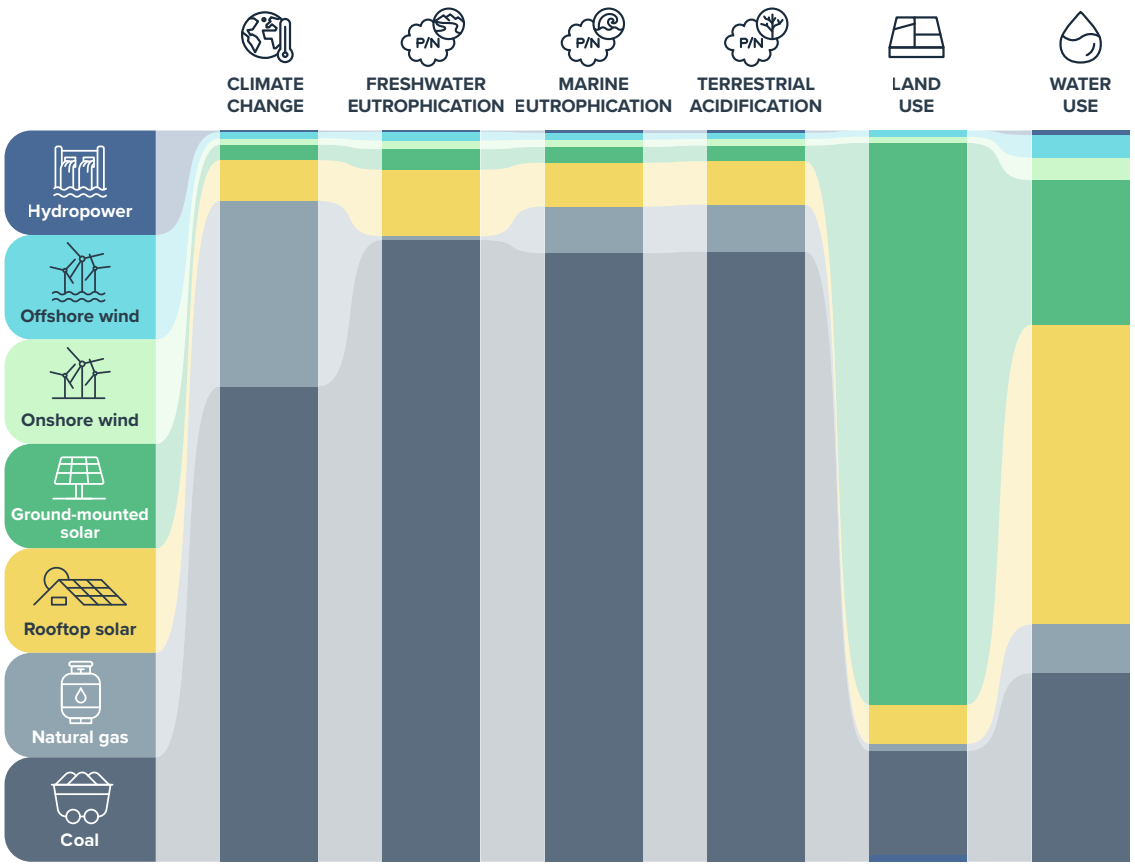


Figure 18: *Relative environmental impact of different energy sources in the production of 1 kWh of electricity*

3

Insight into supply chains and material origins is necessary to assess risks to nature

Raw materials for construction products are extracted worldwide. The factors underlying the risks to nature posed by extraction differs widely by location. In the Netherlands, high risks to nature arise from biochemical pollution such as nitrogen, while in tropical forests they arise from the presence of a rich diversity of plant and animal species.

Although some materials have global supply chains, a large proportion of the raw materials used in the Dutch construction sector – measured by mass – are extracted in the Netherlands and neighbouring countries. At the same time, some materials are also sourced from outside Europe, including iron ore and timber. Assessing the risks to nature therefore requires insight into supply chains and material origins.

In **North-West Europe**, raw materials are extracted mainly for concrete, asphalt and timber products. The main risks to nature here result from biochemical pollution, such as nitrogen and phosphorus. Because safe limit values have already been exceeded, any additional nitrogen emissions directly pose risks to nature. There are also high risks associated with water use in sand and gravel extraction, particularly in the Netherlands, Belgium and Germany.

In **South America** and **Asia**, raw materials are extracted mainly for steel (iron ore and nickel) and timber products (tropical hardwood). Here, the main risks to nature arise from the large numbers of threatened species and the high degree of ecosystem integrity.

Legend

STATE-OF-THE-ENVIRONMENT
Risk to nature from existing environmental pressure

- Soil & terrestrial acidification
- Freshwater eutrophication
- Water availability
- Land-use change

STATE OF BIODIVERSITY
Risk to nature from current levels of biodiversity

- Ecosystem integrity
- Threatened species

RISKS TO NATURE

- Very high
- High
- Medium
- Low
- Very low

MATERIALS

- Gravel
- Nickel
- Limestone
- Iron ore
- Sawn softwood
- Sawn hardwood
- Sawn tropical timber
- Sand

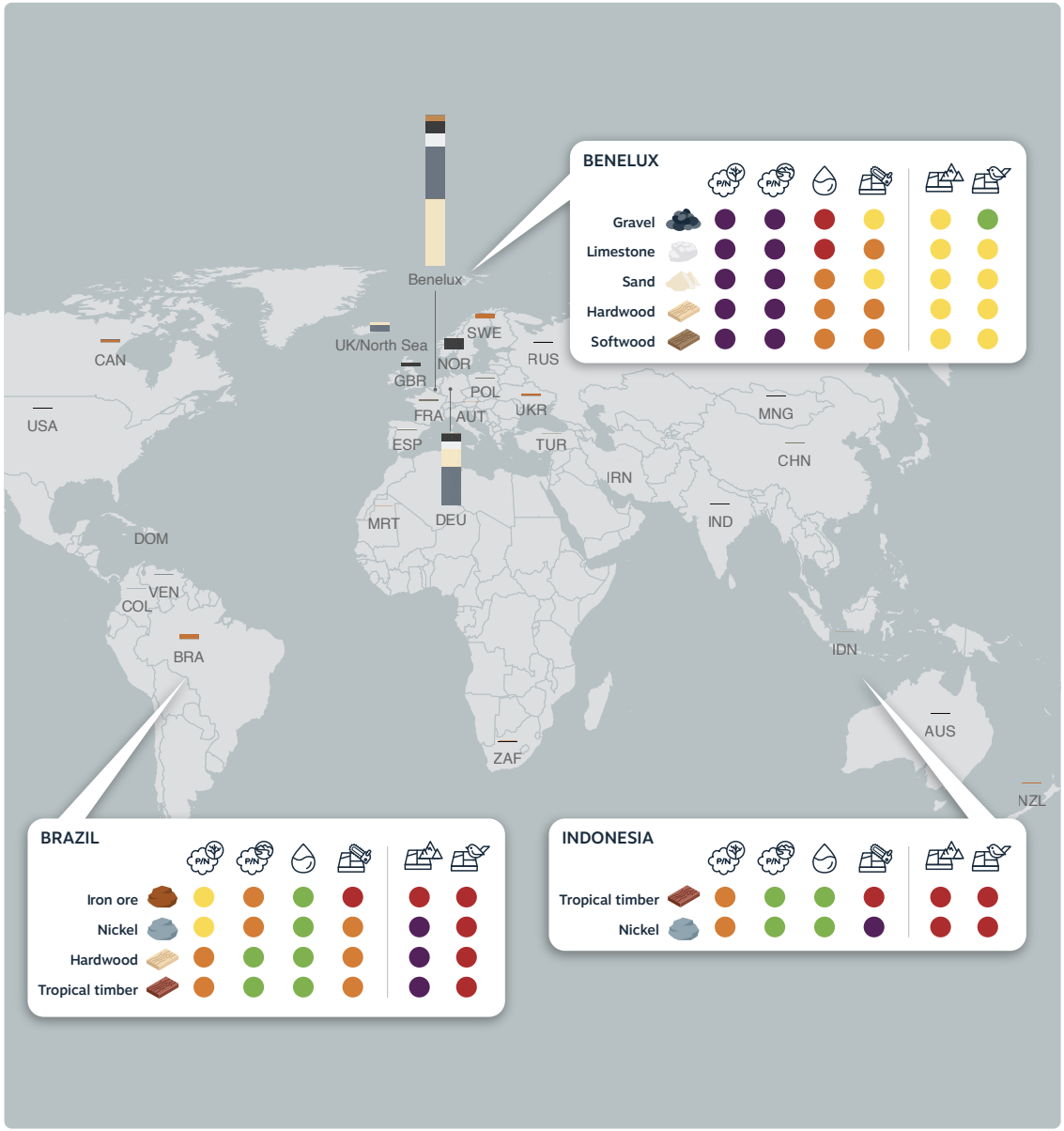


Figure 19: *Examples of risks to nature associated with raw material extraction for the Dutch construction sector*

4

Abiotic raw materials have a different environmental profile from biotic raw materials

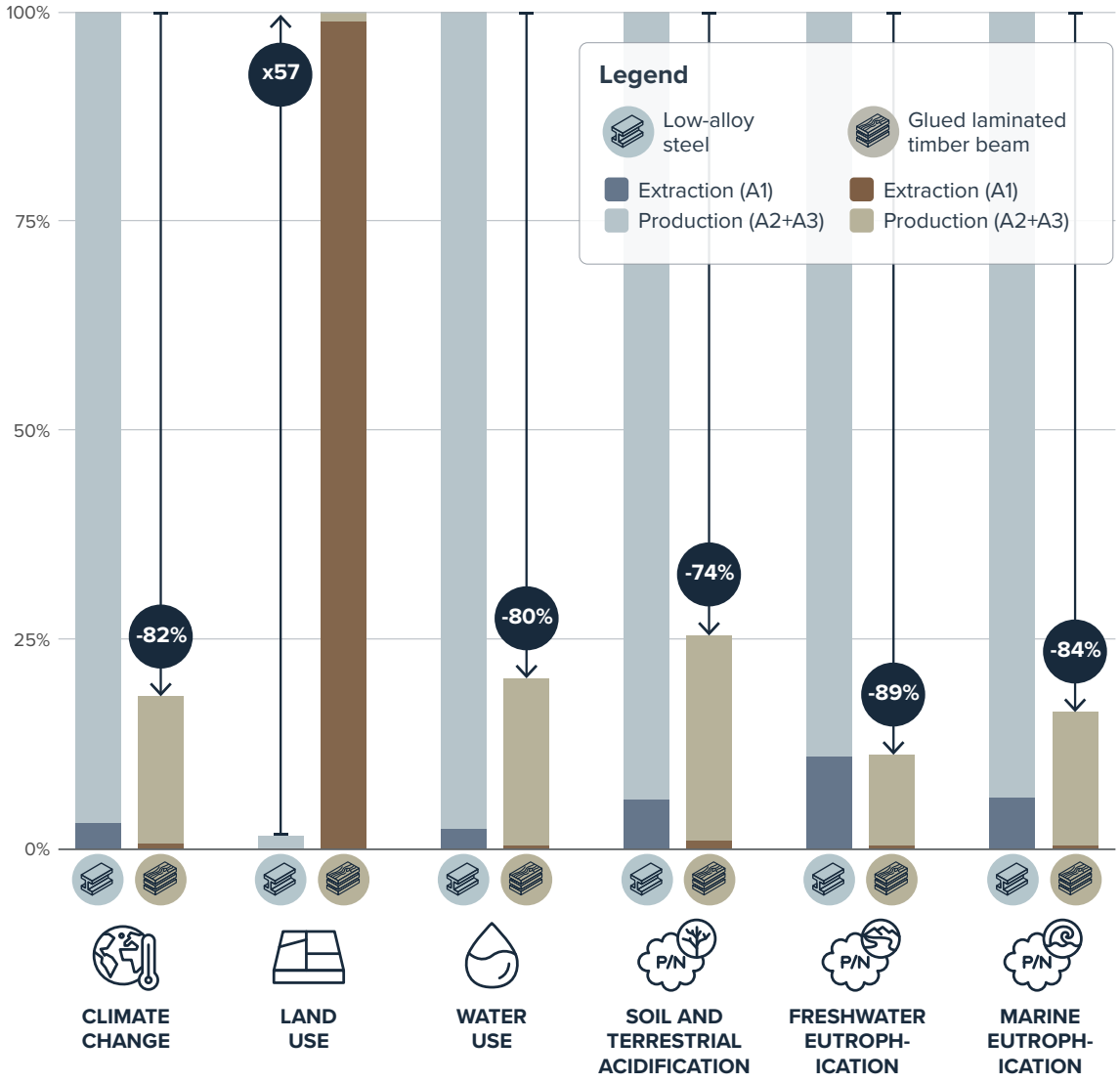
Every choice of construction material involves weighing up a range of environmental considerations. Lower impacts on climate change or biochemical pollution can come at the cost of greater impacts on water or land use. Insight into these specific risks is therefore important to prevent improvements in one area from leading to undesirable impacts in another.

To illustrate this, a steel beam (abiotic) was compared with a glued laminated timber beam (biotic): see the example illustrated on the right (Figure 20). The glued laminated timber beam (glulam) performs 75–90% better than steel on virtually all environmental indicators. However, growing the timber for this beam requires more land (forest).

For the production of a steel beam, coal and nickel are essential. The extraction of both raw materials poses high risks to nature. Coal extraction in countries such as Poland, for example, poses a high risk to freshwater quality and ecosystem integrity due to biochemical pollution. In absolute terms, the environmental impact of the production and transport stages is also by far greatest for steel.

The glued laminated timber beam is made from softwood. Most of this timber is likely to come from Central European forests. Although the total environmental impact of timber is much lower, forestry also poses risks to nature: a low risk associated with a change in historical land-use and a high risk of terrestrial acidification.

A focus on environmental impact provides a sound basis for decision-making. However, where extraction poses high risks to nature, an additional consideration of responsible sourcing is also necessary.



Glued laminated timber beam (116.6 kg) vs low-alloy steel (99 kg) for a load-bearing structure, based on the average import mix of materials

Figure 20: *Environmental impact: glued laminated timber beam versus steel beam*

5

Abiotic raw materials require different measures from biotic raw materials

The environmental impacts differ considerably between abiotic raw materials (concrete, steel and asphalt) and biotic raw materials (timber). While abiotic raw materials often require energy-intensive production processes, biotic raw materials require large areas of land in which to grow.

For abiotic raw materials, the environmental impact of production is often greater than that of raw material extraction (see conclusion 1). As a result, pressure on nature is often greater at production sites than at extraction sites. An emphasis on limiting environmental impact across the production chain is therefore effective, also with regard to reducing risks to nature.

Production processes generate CO_2 emissions through the local combustion of coal or gas. The same combustion processes that generate CO_2 also produce particulate matter, nitrogen and phosphorus emissions. For these materials, a focus on reducing carbon emissions therefore often also leads to reductions in other environmental impacts. This in turn reduces risks to nature.

For biotic products, which have a much lower environmental impact during production, the main priority is to limit risks to nature during extraction. Limiting these risks is also important for the raw materials used in other material categories, but for those materials there is greater scope to reduce impacts during production.

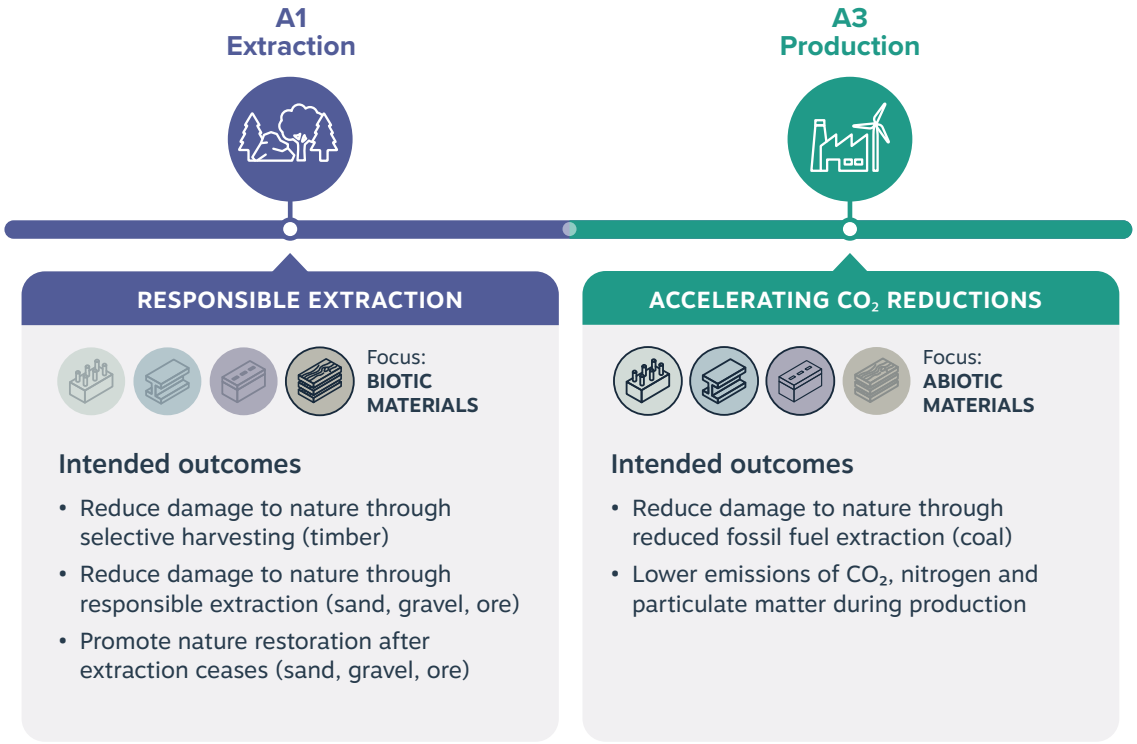


Figure 21: *Main priorities for abiotic and biotic materials*

6

Designing and building with less material is the most important step

The most effective strategy for reducing risks to nature is to reduce the use of primary (new) materials. A reduction in material use by definition leads to less raw material extraction, fewer production processes and less environmental impact, and thus a reduction in risks to nature. Lower environmental impact reduces pressure on nature, helping to preserve ecosystem services and allowing ecosystems to recover over time.

For construction projects, designing and building with less material is therefore the most important step. Only once decisions have been made on how to minimise material use at building-stock and project level do choices at product and material level become relevant.[15] This requires coordinated action by municipalities, developers and construction companies.[16]

Designing and building with less material requires a fundamentally different approach to construction.

- **Building-stock strategies** start by making better use of the existing built environment.[17] Construction decisions are then made on the basis of the necessary building stock rather than on short-term market demand.[18]
- **Development strategies** can guide choices such as vertical extension or life extension. For example, a building can be repurposed for a different use rather than demolished and rebuilt.
- **Design strategies** can then help reduce risks to nature, for example by designing with less material or opting for reuse.
- **Material strategies** can lead to different choices of products and materials, for example by selecting options with a lower environmental impact or avoiding additives that cause pollution. Responsible sourcing can also be prioritised through measures such as timber certification.



Figure 22: *Strategies for designing and building with fewer new materials*



08 Sector-wide courses of action

For every construction material, there are opportunities to reduce environmental impact and risks to nature. All organisations in the construction sector have their own role and responsibility in achieving these reductions. This involves three tracks: using less primary material, accelerating carbon reductions, and ensuring responsible sourcing through greater supply chain transparency.

The choices made by designers, developers and construction companies are primarily determined by legislation and the requirements set by commissioning organisations. To make the management of risks to nature an integral part of the construction process, sector-wide coordination is essential.

The conclusions show that for concrete, asphalt and steel, the greatest environmental impact occurs during the production stage. A large proportion of this impact is caused by the combustion of fossil fuels, mainly coal and gas. The environmental impact associated with timber use is much lower, although forestry requires large areas of land.

The environmental impact of raw material extraction is associated with location-specific risks to nature. These risks vary by location, depending on the local state of nature and the environmental impact caused by extraction.

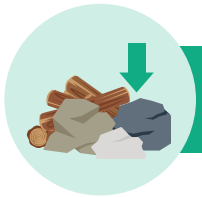
To make effective progress in reducing risks to nature, a sector-wide approach is needed across three tracks:

I. **Using less primary material**, from planning through to construction

II. **Accelerating carbon reductions** in concrete, steel and asphalt production

III. **Ensuring responsible sourcing** of raw materials, including sand, gravel, ores and timber

The Dutch construction sector uses a range of instruments to drive improvements in sustainability performance. However, the current instruments are often not adequately suited to addressing risks to nature. Nor do they show which local interventions are necessary and feasible.



TRACK I
Using less primary material

Using less primary (new) material reduces demand for raw materials and therefore the extraction of new raw materials. This in turn reduces environmental impact, resulting in less pressure on nature and lower risks to nature. For example, using less concrete and asphalt reduces the need for sand and gravel extraction and therefore reduces the environmental impact at locations where risks to nature are currently high.

None of the current instruments focuses on the absolute quantity of material used in a building. At the same time, Dutch national policies on circular economy aim to reduce absolute material use.[19] EU circular economy policy also places the emphasis on material efficiency.

However, these policy objectives have not yet been translated into policy instruments at project or building level. Achieving this reduction in material use will require it to become an explicit focus of decision-making. This calls for new policy instruments at every stage of the design process.

Possible approaches

The main approach is to place greater emphasis on avoiding the use of primary materials. Examples include:



A different approach to housing and building needs

Municipalities often play a central role in meeting the need for housing and other buildings. For housing, they coordinate development; for public and community buildings, they may act as either the commissioning organisation or the permitting authority. Both areas offer considerable potential for reducing primary material use.

- In housing, there is considerable potential for both vertical extension and subdivision. Vertical extension involves adding one or two storeys to existing apartment buildings, potentially creating up to 260,000 additional homes within the existing built environment in the Netherlands.[20]
- For public and community buildings, there are opportunities to avoid demolition and repurpose existing buildings while retaining their foundations and structural frame. Schools in particular are often demolished and replaced with new buildings rather than renovated or converted.[21]



Integrating material use into urban planning decisions

When drawing up urban plans, municipalities determine the spatial structure of an area or neighbourhood. Their choices have a major influence on the amount of material required, as well as on carbon emissions.[22,23] Considerations include the types and sizes of homes needed for an optimal housing stock,[24] alongside the balance between building footprint, building height and public space.[16] In addition, a high degree of adaptive capacity can help create a housing stock that is prepared for future changes in needs.



Design considerations

In the design process, **urban planners** (for neighbourhoods), **architects** and **engineers** (for projects) play a leading role. Every design process offers opportunities to minimise the amount of material used in buildings and infrastructure. For buildings, this includes optimising the ratio of facade area to floor area and using efficient building design to limit the amount of building services required.[25] For infrastructure, it includes minimising the amount of hard surfacing in public space and designing civil engineering structures to be as functional as possible.[26]

TRACK II

Accelerating carbon reductions

A large proportion of the environmental impact of construction material production can be traced back to the extraction and use of fossil fuels. For the three major material flows – concrete, steel and asphalt – focusing on carbon reduction also reduces risks to nature when it results in less extraction and combustion of fossil fuels. If only emissions from combustion are reduced – as with Carbon Capture and Storage (CCS) – the risks to nature associated with coal extraction remain. CCS addresses emissions at the point of combustion without reducing the underlying demand for coal.

The need to make industry more sustainable is now firmly on the European political agenda. Nevertheless, actual investment remains slow to materialise.[27] Several major steel manufacturers, for example, have recently postponed planned investments in sustainability.

The current instruments used in the built environment also still place insufficient emphasis on carbon emissions from the production of construction materials (embodied carbon). The new European Whole Life Cycle Global Warming Potential (WLC-GWP) requirement for residential and non-residential buildings will focus on carbon emissions over the entire life cycle. However, to address risks to nature – and climate change – effectively, greater emphasis needs to be placed on carbon emissions in the short term: the production stage. Various organisations in the Dutch construction sector, including DGBC, are therefore calling for a strong short-term focus in the national implementation of WLC-GWP.[28]

Possible approaches

Accelerating carbon reductions requires action on several fronts. These include:

An investment case for more sustainable construction material production

The **European Commission** and **national governments** have the primary responsibility for creating a viable investment case for industry. Government action needs to include both financial support for sustainability measures and clarity on minimum environmental performance requirements. The aim of these investments is to further electrify production and make energy use more sustainable, thereby reducing the environmental impact and risks to nature associated with the extraction and combustion of fossil fuels. Initial steps towards strengthening this investment case are already being taken, including the European Industrial Accelerator Act[29] and national requirements governing the environmental impact of concrete and asphalt.[30]

Precondition: infrastructure

The electrification of industry requires adequate infrastructure. Electricity infrastructure is particularly important: electrifying production requires sufficient grid capacity. The development of hydrogen networks is also essential for production processes where electricity alone is insufficient, such as green steel production. Without these public investments in infrastructure, producers remain locked into conventional, carbon-intensive production processes.

Statutory regulation of embodied carbon

National governments are responsible for effective statutory regulation of carbon emissions. This is necessary to meet the climate targets for 2030, 2040 and 2050. When implementing WLC-GWP in EU member states, central governments can make choices regarding its scope and calculation methodology. It can therefore choose to place greater emphasis on upfront embodied carbon when implementing WLC-GWP.[31] This would reduce the environmental impact and risks to nature associated primarily with abiotic materials (concrete, steel and asphalt) as a result of the extraction and combustion of fossil fuels.

Supply-chain measures for carbon-conscious construction

Contractors are responsible for minimising carbon emissions during construction. This means selecting **suppliers** and construction products on the basis of environmental performance and using construction methods that reduce carbon emissions. Concrete, for example, is required in almost all projects and offers many opportunities for improvement. For cast in-situ concrete, simple measures include allowing a longer curing time or using heated tunnel curing. For precast concrete elements, **suppliers** are available that provide concrete with lower carbon emissions.



TRACK III

Ensuring responsible sourcing and supply chain transparency

The extraction of virtually any raw material poses risks to nature. Where these risks are high, there may be a reason to source raw materials from locations with lower risks to nature or to take active measures to mitigate them. Because many supply chains are international and involve a large number of different actors, it is hard for commissioning organisations and contractors to directly influence where the raw materials used in their construction materials are sourced.

Possible approaches

Supply chain transparency is a prerequisite for responsible sourcing. With this in place, responsible sourcing can be strengthened through measures such as:

Ensuring fully certified sourcing for timber

A large proportion of the timber used in the Netherlands is certified: around 84–91% of softwood and wood-based panels carry sustainability certification. (Please note that these figures differ per country.) However, this also means that 9–16% of the timber used remains uncertified.[32] It is not known in which sector this uncertified timber is used. **Contractors** have the option to make certified timber a requirement in their procurement. Most contractors already do so, but further reductions in risks to nature will require all parties to make these risks an explicit focus of their decision-making.

Achieving responsible sourcing in practice requires greater supply chain transparency and material traceability. Because materials are often transported in bulk and then undergo several processing stages, it is often impossible to determine exactly where the raw materials in an individual construction product originate. Raw material certification can provide a solution. Timber is an example of a raw material for which such a certification system is already well established, through two major global certification schemes: FSC and PEFC.

Current instruments used in the construction sector focus mainly on environmental impact, based on life cycle assessments of construction products included in databases. Life cycle assessments do not take account of whether raw materials have been responsibly extracted, so this is also absent from the resulting environmental profiles. As a result, there is currently no instrument that makes responsible sourcing a decision-making criterion.

Ensuring responsible sourcing in short supply chains

A number of raw materials, including sand and gravel, have relatively short supply chains. **Concrete and asphalt producers** often purchase these materials directly. This gives them influence over where their raw materials come from, and consequently over the risks to nature associated with extraction. An important step for all organisations is to make responsible sourcing an explicit consideration in these short supply chains, including requirements for nature restoration once extraction has ended.

Developing certification for responsible sourcing in complex supply chains

Raw materials that are produced and traded internationally often have longer, more complex supply chains. Examples include iron ore and nickel, which are important raw materials for steel. Because **contractors** often do not purchase steel products directly from the steel producer, they have limited influence over the responsible sourcing of these raw materials. Improving supply chain transparency, for example through a certification system for responsible raw material extraction, could be a next step. Timber certification provides a model for such a system.

Legislation on supply chain responsibility

Alongside voluntary certification, the European Union is developing the EU Deforestation Regulation (EUDR). This legislation is intended to prevent products that contribute to deforestation from entering the European market. Although its full entry into force has currently been postponed, its objective remains unchanged: companies are to be made legally responsible for their supply chains. Importantly, certification can support risk assessment, but can never fully replace a company's own due diligence obligations.



09 Final remarks

Building within planetary boundaries requires a broader view of the impact of the construction sector. These boundaries concern not only climate change, but also biodiversity loss, land-use change, and pollution. This applies both in the Netherlands and across international supply chains, both now and in the future.

A growing number of construction companies are embracing nature-inclusive construction. This is a positive development, because it means we are taking account of nature at the construction site. However, it is crucial that we also take nature into consideration throughout the supply chains for our raw materials.

We need to broaden the focus from nature-inclusive construction to nature-inclusive value chains. This broader approach requires a combination of strategies. Carbon reduction, already a focus for many construction companies, can make an important contribution. In addition, consciously choosing to use less new material is an important step. Where the use of new material is unavoidable, responsible sourcing and low-carbon production are essential.

Progress will require action from all parties across the construction value chain. Municipalities can help meet housing and building needs in different ways, reducing the need for new buildings. Developers and contractors can make different design and material choices to reduce material use and carbon emissions. Construction material producers can, wherever possible, prioritise responsible sourcing. Public authorities can create the conditions to make production more sustainable. All these parties depend on one another: none can transform the supply chain alone.

Current efforts centre on limiting climate change. Yet healthy and resilient ecosystems are equally a prerequisite for the health and safety of human life on Earth. Protecting nature and preventing further damage is therefore vital – not only at construction sites, but also where raw materials are extracted. We can only make this shift by working together.

References

1. **UNEP** (2024). Navigating new horizons: a global foresight report on planetary health and human wellbeing

2. **UN Environment Programme** (2022). Kunming-Montreal Global Biodiversity Framework

3. **PBL** (2016). Natuurlijk kapitaal: naar waarde geschat

4. **IUCN et al.** (2025). Manifest Netto Natuurwinst

5. **Rockström et al.** (2024). Planetary Boundaries guide humanity's future on Earth

6. **Aligned Incentives** (2024). Understanding TNFD and SBTN: Corporate nature and biodiversity frameworks

7. **SBTN** (2026). Why biodiversity matters and how SBTN helps

8. **TNO** (2025). Houtbouw in Nederland; de stand van zaken

9. **EIB & Structural Collective** (2026). Materiaalstromen en milieubelasting in de bouw en infra

10. **SBTN** (2026). Step 1b - Value chain assessment | webpagina

11. **EcoQuery v.3.11** (2024). Reinforcing steel production

12. **SBTN** (2026). Step Up For Nature | webpagina

13. **EcoInvent v3.11,** (2024). Electricity production for natural gas, hard coal, photovoltaic roof, photovoltaic open ground, wind onshore, wind offshore, hydro.

14. **Buyer Group Duurzame Zonnepanelen,** (2024). Gids 3: Duurzaamheidsaspecten en marktscan duurzamere zonnepanelen

15. **Copper8 & Metabolic** (2024). CO_2-impact van de Nederlandse bouw

16. **CityFörster, PosadMaxwan & Gemeente Rotterdam** (2026). Carbon-based urbanism

17. **Platform31** (2021). Beter benutten bestaande woningbouw

18. **DGBC, Platform Woonopgave & Platform31** (2025). Eerlijk wonen

19. **Rijksoverheid** (2025). Nationaal Programma Circulaire Economie 2025

20. **STEC** (2023). De potentie van splitsen en optoppen

21. **Fred Feddes** (2026). Beter dan sloop: een blijvende toekomst met duurzame bebouwing

22. **RIi** (2025). Bouwen met toekomst: werken aan woningen van duurzame materialen

23. **Urban Climate Architects, BURA & LEVS** (2026). Low-carbon Urbanism

24. **Platform Woonopgave** (2025). Actie-agenda Platform Woonopgave

25. **SBRCURnet** (2015). Praktijkboek Passiefbouwen

26. **Witteveen+Bos** (2018). Circulair ontwerpen in het MIRT-proces

27. **Nationale Klimaatraad** (2026). Kiezen of verliezen: naar een industrie die past in een toekomstbestendig Nederland

28. **DGBC** (2025). Position paper Whole Life Carbon

29. **Europese Commissie** (2026). Industrial Accelerator Act

30. **Ministerie van I&W** (2024). Kamerbrief Toelichting Circulair Klimaatbeleid

31. **NEPROM** (2024). Quick Carbon Indicator: methoded-ocument

32. **Probos** (2023). Marktmeting duurzaam geproduceerd hout op de Nederlandse markt 2023



Structural Collective

Copper(8)