# INTEGRATING BIOTIC RESOURCES IN THE RESOURCES SCANNER

**Methodology and results**

CREM

WORKING ON SUSTAINABILITY

# *INTEGRATING BIOTIC RESOURCES IN THE RESOURCES SCANNER*

## Methodology and results

Commissioned by the Dutch Ministry of Agriculture, Nature and Food Quality

September 2019

CREM
Venetiëhof 123
1019 NC  Amsterdam
The Netherlands

T +31 (0)6 310 05 813

www.crem.nl

TNO
Van Mourik Broekmanweg 6
2628 XE  Delft
The Netherlands

T +31 (0)88 866 30 00

www.tno.nl

PRé Sustainability
Stationsplein 121
3818 LE Amersfoort
The Netherlands

+31 (0)33 455 50 22

www.pre-sustainability.com

WORKING ON SUSTAINABILITY

# CONTENTS


1 **Introduction** ..................................................... **1**

1.1 **Background** **1**

1.2 **The resources scanner** **2**

1.3 **Adding biotic resources to the resources scanner** **3**

1.4 **Reader** **4**

2 **Indicators for biotic resources included in the resources scanner** ..................................... **6**

2.1 **Introduction** **6**

2.2 **Indicators for 'Long term security of supply'** **6**

*2.2.1 The 'Reserve/Production indicator' 6*

*2.2.2 Companionality 9*

*2.2.3 Concentration of raw material reserves ($HHI_{res}$) in countries of origin 9*

2.3 **Indicators for 'Short term security of supply'** **9**

*2.3.1 Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin 9*

*2.3.2 Stability and quality of governance in the countries of origin (WGI) 11*

*2.3.3 Export restrictions (OECD-data) 14*

*2.3.4 End-of-life recycling rate 15*

*2.3.5 Regulation regarding conflict materials 15*

2.4 **Indicators for Operating profit** **16**

2.5 **Indicators for Corporate reputation** **17**

*2.5.1 Environmental impact and Impact on biodiversity 17*

*2.5.2 Performance of countries of origin regarding human development (HDI) 22*

3 **Action perspectives and Factsheets for biotic resources** .................................................. **25**

3.1 **Action perspectives** **25**

3.2 **Biodiversity factsheets** **26**

3.3 **A link to the ENCORE database** **27**

3.4 **A link to Bioscope** **27**

3.5 **The resources scanner and the Natural Capital Protocol** **28**

4 **Summary and recommendations** ........................................................................ **30**

4.1 **Summary** **30**

4.2 **Recommendations** **32**

# 1 INTRODUCTION

## 1.1 Background

In the last few years, the Ministry of Economic Affairs and Climate (EZK) has facilitated the disclosure of information regarding the use of (abiotic) resources in the Dutch economy. This has resulted in an increase in knowledge and a strengthened knowledge infrastructure with regard to raw materials use, criticality risks and the relation with circular economy. Moreover, a database has been created on the criticality of abiotic materials, as well as a 'Resources scanner' providing access to this database (www.grondstoffenscanner.nl).

The database and scanner offer users (researchers, businesses, purchasing departments and policy makers) new ways of managing risks and opportunities regarding the use of abiotic materials. The database and scanner provide insight in the (likely) presence of raw materials in end products (knowledge which is often lacking), in long term and short term security of supply, price volatility and risks regarding corporate reputation.

The current criticality analysis and resources scanner have an important limitation: they are limited to abiotic minerals and metals. By expanding the analysis and scanner with biotic materials and resources, a more complete picture can be provided of criticality risks for the Dutch economy. In 2017, the Ministry of Agriculture, Nature and Food Quality (LNV) commissioned a feasibility study to see if and how biotic materials could be integrated in the resources scanner. The study showed that an integration is possible and that the indicators and methodology used, to a large extent, can be similar to the indicators and methodology used for abiotic materials.

This report builds on the findings of the feasibility study and describes the approach of integrating biotic materials in the resources scanner. The resulting indicators and indicator scores are presented and briefly discussed. The draft results were discussed with a project group and a sounding board, involving the following organisations.

- Project group: Ministry of Agriculture, Nature and Food Quality, Ministry of Economic Affairs and Climate Policy, Netherlands Enterprise Agency (RVO)
- Sounding board: Ministry of Infrastructure and Water Management, MVO The Netherlands Oils and Fats Industry, FNLI, IUCN-NL, MVO Nederland

## 1.2 The resources scanner

The resources scanner can be found here: www.grondstoffenscanner.nl. This online tool now contains a total of 64 abiotic materials and currently uses the following indicators to provide an indication of the criticality of abiotic materials:

**Table 1: Risk indicators included in the resources scanner for abiotic materials**

| | Indicator |
|---|---|
| **Long term security of supply (>10j)** | Geo-economic: Reserve/Production (R/P) |
| | Geo-economic: Companionality (extent to which a raw material is a side product) |
| | Geo-political: Concentration of raw material reserves ($HHI_{res}$) in countries of origin |
| **Short term security of supply** | Geo-political: Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin |
| | Geo-political: stability and quality of governance in the countries of origin, expressed by WGI (World Governance Index) |
| | Geo-political: Export restrictions (OECD-data) |
| | End-of-life recycling rate |
| **Operating profit** | Price volatility of raw materials (MAPII) |
| **Corporate reputation** | Environmental impact of raw materials (Environmental Cost Indicator) |
| | Impact on biodiversity |
| | Performance of countries of origin regarding human development (Human Development Index: HDI) |
| | Regulation regarding conflict minerals |

To what extent these indicators remain the same for biotic resources is discussed in chapter 2.

***Macro level versus micro level***

The resources scanner is based on the research 'Materials in the Dutch economy'(TNO, 2015). The level of focus of this research is the Dutch economy, which means that the indicators are developed to indicate risks on a macro level. For instance, the 'concentration of the exploration of raw materials' indicates to what extent the Dutch economy depends on a limited number of countries of origin. A high concentration means a high risk. Some of the other indicators are also defined on a macro-level, like the indicators on environmental impact and biodiversity impact. The impact is calculated based on the Dutch import mix (the most important countries of origin for the Netherlands). A relatively high impact score for a resource is an indication that, looking at the total Dutch import, the reputational risk is relatively high. The resources scanner does not offer this information for each country of origin separately. It is up to the individual company to investigate further in case of high risk scores.

At the level of a company (micro-level) which knows where the company's resources originate from (on a country level or even more detailed) information on a country level would be more valuable than information based on the Dutch import mix. For one indicator, the Human Development Index (HDI), the information is already provided on a country level in the resources scanner (in the world map). For the other risk-indicators included in this world map, the World Governance Index (WGI) and Environmental Performance Index (EPI), data are available on a country level, but the scores are weighted according to relevance of production/imports. The interpretation of these scores is therefore not as straightforward on a company level.

In this project, the current approach for abiotic resources is followed. This means that the environmental impact and impact on biodiversity of biotic resources are calculated in same way as for abiotic resources, using the Dutch import mix. In future updates it could be considered to (also) tailor the information to individual companies.

## 1.3 Adding biotic resources to the resources scanner

The selection of biotic resources has been based on:

- The value to the Dutch economy: Import value and Export value, direct and indirect in other products.
- Practicability of inclusion in the resources scanner: Homogeneity resource, availability of environmental data.
- Methodological considerations. For example, live animals have been included to test whether the methodology would also provide value for such ‘resources’.
- Other reasons for prioritization: current discussion on supply risks, potential role in a biobased economy, perceived reputational risk, action perspective, spread across different sectors.

The resulting selection, presented in table 2, is of course still subjective and pragmatic. Other biotic resources will be added in the future.

**Table 2: biotic raw materials selected, including GN-code and description**

| | | |
|---|---|---|
| 102 | Live bovine animals | Live bovine animals, such as pure bred cattle, other cattle or buffalo |
| 103 | Live swine | Live swine, pure bred, either above or below 50kgram |
| 105 | Live poultry | Live poultry, that is to say, fowls of the species Gallus domesticus, ducks, geese, turkeys and guinea fowls, weighing above or below 185gram |
| 701 | Potatoes | Potatoes, fresh or chilled, from seed or other origin, from all variety |
| 803 | Bananas | Bananas, including plantains, fresh or dried, of all variety |
| 806 | Grapes, fresh or dried | Grapes, fresh or dried, of all colour and variety |
| 808 | Apples, pears | Apples, pear and quinces, fresh or dried, all varieties. Apples are discerned in "cider apples, in bulk, from 16 September to 15 December" and "all other apples" |
| 810 | Fresh strawberries | Strawberries, raspberries, cranberries and blueberries. |
| 901 | Coffee | Coffee, whether or not roasted or decaffeinated; coffee husks and skins; coffee substitutes containing coffee in any proportion |
| 1003 | Barley | Barley, all varieties, seed origin or others |
| 1005 | Maize or corn | Maize, all varieties, seed origin or others |
| 1006 | Rice | Rice in the husk (paddy or rough), Husked (brown) rice, Semi-milled or wholly milled rice, whether or not polished or glazed |

| | | |
|---|---|---|
| 1201 | Soya beans, broken or not | Soy beans, all varieties, seed origin or others |
| 1202 | Groundnuts | Groundnuts, not roasted or otherwise cooked, whether or not shelled or broken, seed origin or not |
| 1205 | Rape or colza seeds | Rape or colza seeds, whether or not broken, low erucic acid rape or colza seeds |
| 1212 | Sugar beet | Sugar beet and sugar cane, fresh, chilled, frozen or dried, whether or not ground of a kind used primarily for animal or human consumption |
| 1511 | Palm oil | Palm oil and its fractions, whether or not refined, but not chemically modified, crude oil or other |
| 1801 | Cocoa beans | Cocoa beans, whole or broken, raw or roasted, including shells, husks |
| 4001 | Natural rubber | Natural rubber, balata, gutta-percha, guayule, chicle and similar natural gums, in primary forms or in plates, sheets or strip |
| 5201 | Cotton | Cotton, not carded or combed |

***Definition of the resources***
The feasibility study has shown that biotic resources can be defined in the same way as the abiotic resources: on a 4-digit level of the international HS/CN classification (the 'Harmonized System/Combined Nomenclature'). This HS/CN classification is also used to develop the 'coupling matrix', the matrix linking resources to the products in which these resources are used. For more information on this matrix, see the publication on 'Materials in the Dutch economy', TNO, 2015; paragraph 4.1 and Annex A.

***Differentiation between different qualities of the resources***
Even more then with abiotic resources, the quality of biotic resources can be an important factor in the application. However, differentiation of different qualities is not possible in the resources scanner. The reason for this is the fact that the data used in the resources scanner to assess, among others, the concentration of exploration, price volatility and environmental impact, are not available for different qualities of the same resource. Differences in resource quality are therefore not covered in the resources scanner.

Biotic resources will be added to the scanner *in the same way as for the abiotic materials*, unless there is a need to change this.

## 1.4 Reader

In chapter 2, the indicators and methodology for biotic resources for 'long term security of supply' (2.2), 'short term security of supply' (2.3), 'Corporate profit' (2.4) and 'Corporate reputation' (2.5) are discussed.

In chapter 3, the action perspectives for biotic materials (3.1), the (biodiversity) factsheets for biotic materials (3.2) and linkages to ENCORE, Bioscope and the Natural Capital protocol (3.3, 3.4 and 3.5) are briefly discussed.

In chapter 4, a summary of the results is presented, as well as recommendations for future updates.

The changes in the action perspectives of the resources scanner and a practical guide for the integration of the data for biotic resources in the resources scanner/database are included in separate documents. The data for biotic resources, including the coupling matrix, are included in separate Excel files.

# 2 INDICATORS FOR BIOTIC RESOURCES INCLUDED IN THE RESOURCES SCANNER

## 2.1 Introduction

Most risk indicators remain the same for biotic resources compared to the indicators for abiotic materials. This is true for:

***Long term security of supply (see paragraph 2.2)***
- Geo-economic: Companionality (extent to which a raw material is a side product)

***Short term security of supply (see paragraph 2.3)***
- Geo-political: Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin
- Geo-political: stability and quality of governance in the countries of origin, expressed by WGI (World Governance Index)
- Geo-political: Export restrictions (OECD-data)
- End-of-life recycling rate

***Operating profit (see paragraph 2.4)***
- Price volatility of raw materials (MAPII)

***Corporate reputation (see paragraph 2.5)***
- Environmental impact of raw materials (Environmental Cost Indicator)
- Impact on biodiversity
- Performance of countries of origin regarding human development (Human Development Index: HDI)

The ‘Long term security of supply’ indicators based on the fixed reserves of abiotic materials cannot be used for biotic resources since these resources do not have a fixed reserve. Alternative indicators are discussed in paragraph 2.2. The ‘Short term security of supply’ indicator ‘Regulation regarding conflict minerals’ is not relevant for biotic materials.

The approach for each of the indicators for biotic resources is briefly discussed in the next few paragraphs.

## 2.2 Indicators for ‘Long term security of supply’

### 2.2.1 The ‘Reserve/Production indicator’

The ‘Reserve/Production indicator’ for abiotic resources is an indicator for scarcity. For abiotic materials this indicator shows how long the current production can take place (in years) before the reserve runs out. In other words, it is an indication of the risk that *the current level of production cannot be maintained in the long run*. Since biotic resources do not have a fixed reserve, this indicator needs to be replaced by another indicator that provides insight in this risk.

Based on an analysis of different options, the following indicator is proposed: ‘Production Capacity’. This indicator will be based on the FAO projections of the production of crops in 2050 in the ‘Business as usual’ scenario from ‘The future of food and agriculture; Alternative pathways to 2050’. The FAO projections for future production are based on modelling and expert input, covering a number of key production factors, including (for example) climate change, technical change, changing yields, cropping intensity, land availability, land suitability and irrigation potential. Projections for livestock and fish production are also provided.

This ‘Production Capacity’ indicator provides an indication of the ‘domestic production reserve’ which is present in the producing countries. Similar to the Reserve/Production indicator, it provides an indication of the risk that the current level of production cannot be maintained in the long run. The ‘Production Capacity’ indicator will be based on a comparison of the worldwide production level in 2020 and the projection for 2050. Both as reported by the FAO projections. The production in 2050 divided by the production in 2020 provides an indication of the extent to which production levels can be maintained taking into account the different production factors that will influence future production. In the ratio is below 1, worldwide production is expected to drop between 2020 and 2050. If the ratio is above 1, worldwide production level is expected grow. The data shows that the latter is still true for the 20 raw materials selected; see figure 1. However, this figure also shows that the growth potential varies.

An alternative approach would be to compare the projected production in 2050 to the most recent production statistics of the FAO (2017 at the time of this project). The advantage would be that sudden changes in production (e.g. an increase in production due to an increase in demand) are incorporated in the indicator. However, since the grouping of products differs between the two databases (production data and projections), this option is not selected.

The scope and definition of the product groups in the FAO projections is not always the same as the scope and definition of the 20 raw materials selected. The table below shows what FAO data are used for each of the 20 raw materials.

**Table 3: The 20 biotic raw materials selected and product classes in the FAO 2050 projections**

| Raw material selected | FAO commodity |
|---|---|
| Live bovine animals | Beef and veal |
| Live swine | Pig meat |
| Live poultry | Poultry meat |
| Potatoes | Potatoes |
| Bananas | Bananas |
| Grapes, fresh or dried | Other fruits |
| Apples, pears | Other fruits |
| Fresh strawberries | Other fruits |
| Coffee | Coffee, green |
| Barley | Barley |
| Maize or corn | Graine maize |
| Rice | Paddy rice |
| Soya beans, broken or not | Soybeans |
| Groundnuts | Groundnuts |
| Rape or colza seeds | Rapeseed and mustard seed |
| Sugar beet | Sugar beet |

| | |
|---|---|
| Palm oil | Palm fruit oil |
| Cocoa beans | Cocoa beans |
| Natural rubber | Natural rubber |
| Cotton | Cotton lint |

The fact that the product groups not always perfectly match stresses the fact that the Production Capacity indicator should be used as an indication of future production risk, not as a perfect number.

For the 20 biotic resources analysed, the picture is as follows:

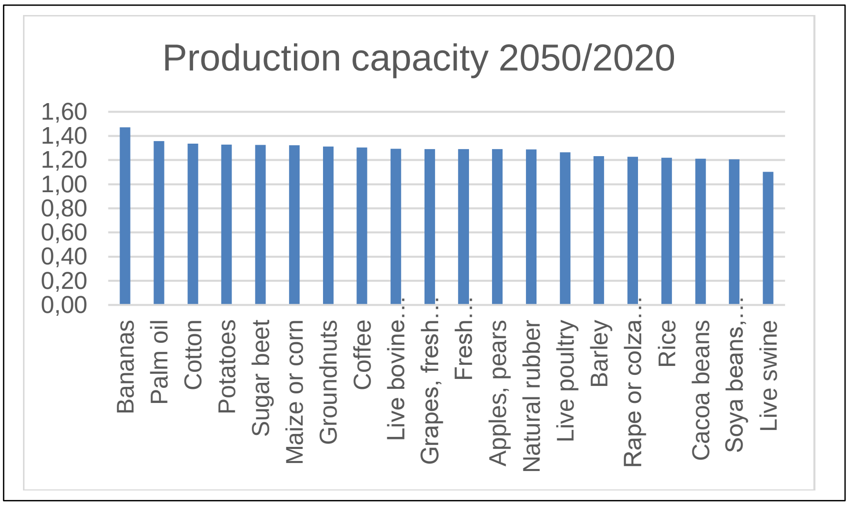


**Figure 1 Production capacity for the 20 selected biotic resources, based on the FAO projections for production in 2020 and 2050 in the 'Business as usual' scenario from 'The future of food and agriculture; Alternative pathways to 2050', FAO, 2018.**

The production of all 20 biotic resources is expected grow between 2020 and 2050, with bananas having the highest growth potential (+ 47%) and live swine the lowest (+ 10%). Please note that not for all 20 resources product specific data are available. For 'Grapes', 'Fresh strawberries' and 'Apples and pears' the data for 'other fruits' are used (which is why these scores are the same).

⇨ This indicator can be presented in the same way as the other indicators in the raw material scanner (see also figure 9) with a score between 0 and 1 (1 being the highest score of 1,47 for bananas). The turning point for criticality is then 0,68 (below 0,68 is high risk, above 1 is low risk).

***Alternative approaches to the Reserve/Production indicator***

An alternative to the use of FAO projections as an indicator for 'production capacity' is the use of indicators on separate key production factors, like water scarcity and quality, pollination and soil fertility (or soil degradation). However, an analysis of this approach has shown that the availability of crop specific data on these production factors is still quite limited and each separate factor only provides a piece of the 'production puzzle'. For this reason, the FAO projections of future production levels is preferred for the time being. This may change in the future when more data become available, e.g. on the dependency of different crops on pollination services and the status of these pollination services in the countries of production.

### 2.2.2 Companionality

Many mineral resources are only extracted as by-products ('companions') of other raw materials (the so-called 'hosts'). In such cases, the profitability of the mine will not depend on the extraction of the companion. Such a connection can lead to a lack of market elasticity: a sudden increase in demand (for example due to a technological innovation) will in the case of a by-product or 'companion' not lead to an increase in or the start of new mining activities. The production can only increase when the process efficiency of the companion extraction increases or when currently no full use is made of the quantity of producible companion material (source: 'Materials in the Dutch economy', TNO, 2015).

Compared to abiotic materials, companionality will be a less frequent issue with biotic resources. Most biotic resources are produced as 'host crops'. If companionality is an issue for a biotic resource, this indicator can of course also be used for biotic resources. In most cases, however, the level of companionality will be 0% and a score of 0% will be included in the resources scanner.

This is true for the 20 biotic resources selected: each of the resources has a score of 0%.

- ⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

### 2.2.3 Concentration of raw material reserves ($HHI_{res}$) in countries of origin

The indicator on the concentration of reserves of raw materials, used for abiotic materials, cannot be used for biotic resources since for most biotic resources there is no fixed reserve located in one or more countries of origin. There may be exceptions for some biotic resources, like specific species of fish, which can only be found in a specific area. Such a concentration of a biotic reserve will also show-up in the (short term)) indicator 'Concentration of the exploration/production of raw materials ($HHI_{prod}$) in countries of origin'. Based on its limited relevance and overlap with the concentration of production, it is proposed to leave the 'Concentration of raw material reserves in countries of origin' out for biotic resources.

## 2.3 Indicators for 'Short term security of supply'

### 2.3.1 Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin

The formation of monopolies undoubtedly leads to an increase in risks with regard to the security of raw material supply. Monopolies lead to greater market power and to the ensuing potential effects on price. Monopolies also lead to portfolio risk (all eggs in one basket). This is the case for abiotic materials as well as for biotic materials (for example, natural disasters will lead to greater supply risks if production is concentrated in only a few countries).

The degree of monopoly forming is expressed in most studies using the so-called **Herfindahl-Hirschman Index (HHI),** which is composed of the total sum of squares of the production concentrations per source country. This is an accepted standard for concentrations in a sector (in this case, source countries).The maximum value is therefore 10,000 (one country produces

100% of the total volume). A value greater than 2,500 is seen (by the US Federal Trade Commission at least[1]) as highly concentrated.

The HHI for the biotic raw materials studied here is given in figure 2.

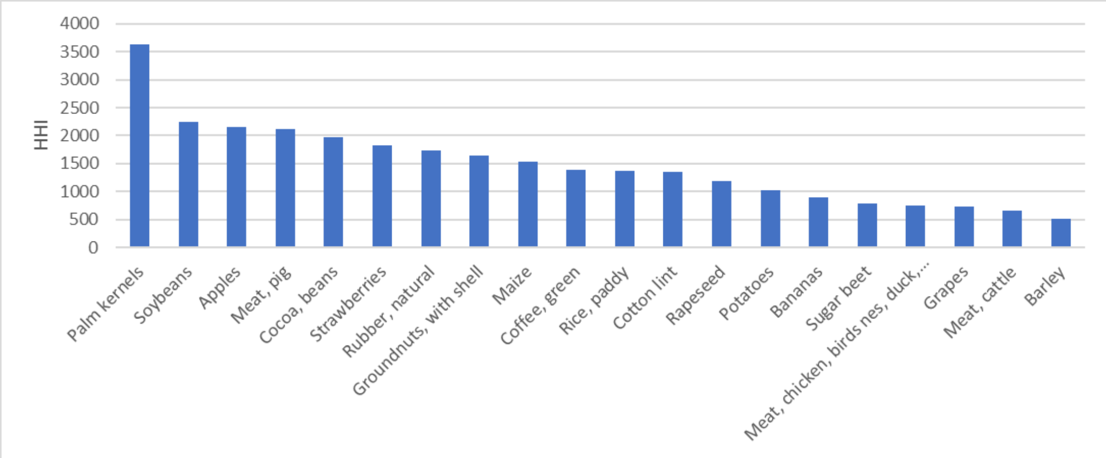


**Figure 2: HHI for the 20 selected biotic raw materials**

The production of palm kernel is the only one that can be considered in relatively high risk of monopoly formation. Most products are obviously in production in a wide range of countries.

In figure 3, the situation for biotic materials is compared with that of abiotic materials.

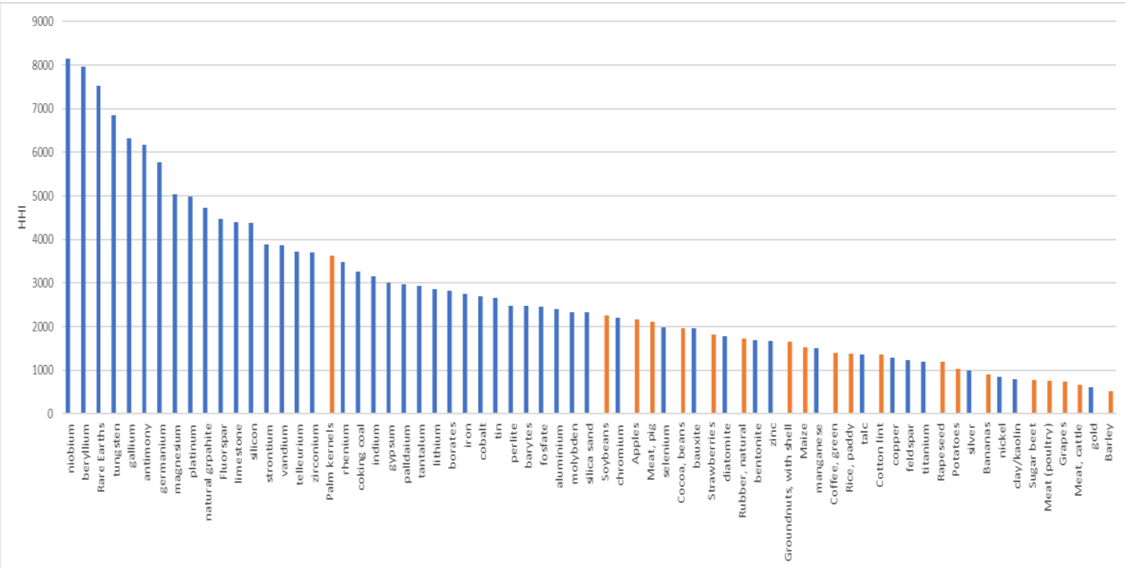


**Figure 3: HHI for the 20 selected biotic raw materials and the abiotic materials**

Obviously, the situation for the two types of materials differs strongly. The $HHI_{prod}$ is less than 2,500 for just 18 of the 64 abiotic materials considered here; all other materials are therefore to be regarded as a highly concentrated. For biotic materials -as said before- this is the case for

[1] www.justice.gov/atr/public/guidelines/hmg-2010.pdf.

only one out of 20 biotics. This difference can hardly be regarded as surprising, thereby also indicating that geopolitical pressure exerted through quasi-monopolies is highly unlikely for biotic raw materials.

Since we also analysed the import situation for The Netherlands, we can compare the global production concentration with the concentration of source countries for The Netherlands. For most raw materials, not surprisingly, we source materials from fewer countries than possible looking at the worldwide availability (see figure 4; below the red line the HHI of imports is lower than the HHI global). The most striking exception being palm kernel, for which Indonesia is the dominant source country on a global level (with an HHI of almost 4000), while The Netherlands source relatively much  from upcoming countries in Latin America (an HHI for import of below 2000).

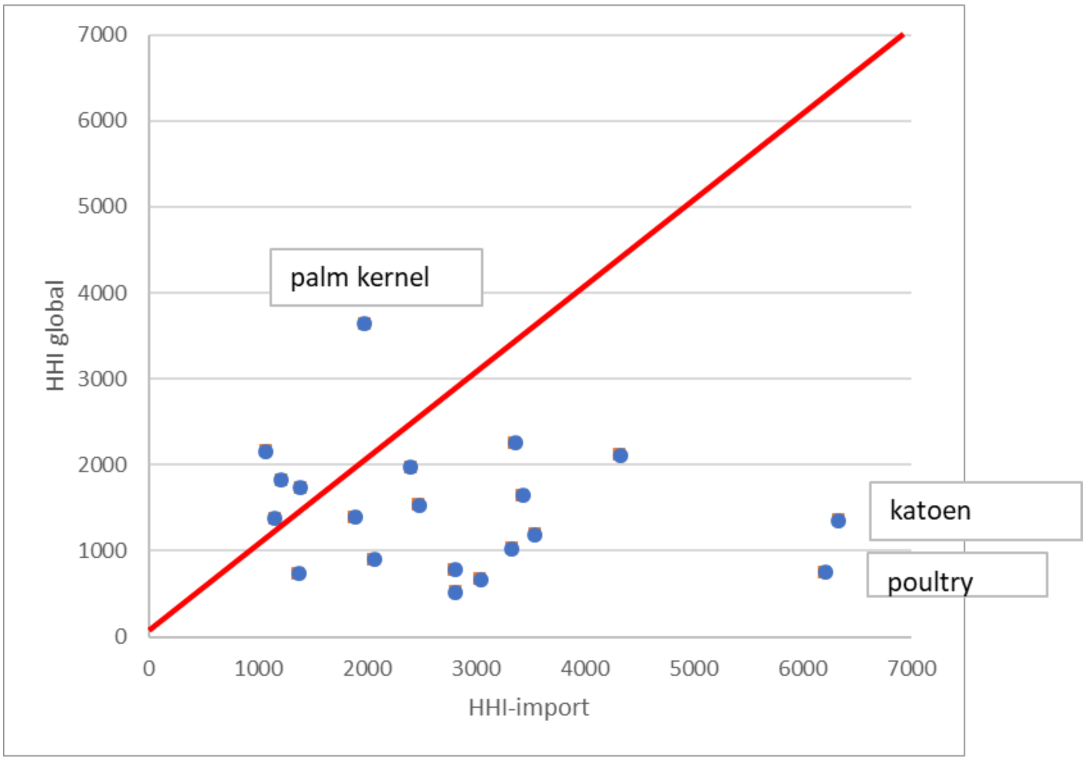


**Figure 4: Comparison of the global production concentration with the concentration of source countries for The Netherlands.**

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

### 2.3.2 Stability and quality of governance in the countries of origin (WGI)

The potential adverse effects of high raw material concentration are greater where the government of the source country is less reliable. A commonly used indicator for this is the World Governance Indicator of the country of origin (WGI, an indication of the form of governance in a country, based on World Bank data).

The World Governance Indicator is based on indicators for 215 economies between 1996 and 2012[2], in which six aspects of governance are measured:

- Voice and accountability;
- Political stability and absence of violence;
- Governmental effectiveness;
- Regulatory quality;
- Rule of law;
- Control of corruption.

In this study, the weighted WGI per raw material is calculated on the basis of the WGI score of a given country and the share of raw material production in that country.

To illustrate the significance of the WGI, the 10 source countries with the highest (i.e. most stable) WGI score and the 10 source countries with the lowest (<0) scores are shown in the table below.

**Table 3: Countries exhibiting best and worst WGI scores**

| WGI 10 best scores among raw material suppliers | WGI 10 worst scores among raw material suppliers |
|---|---|
| Denmark | Burma |
| Finland | Zimbabwe |
| Sweden | Iraq |
| Norway | Uzbekistan |
| Australia | Venezuela |
| Canada | Burundi |
| Austria | Guinea |
| Iceland | Iran |
| Republic of Ireland | Pakistan |
| Germany | Syria |

An important country for the sourcing of abiotic materials is China: China has a score of -0.59 and takes 21st place, on par with Kazakhstan.

*WGI for biotic resources*

On average the lowest WGI is found for cocoa beans, groundnuts, coffee, bananas (see figure 5). For cocoa beans this is based on the high percentage of harvest for Ivory Coast (37%). The high score for rapeseed is based on the high percentage of production from Canada (26%).

2 From http://info.worldbank.org/governance/wgi/index.aspx#home: "These aggregate indicators combine the views of a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. They are based on over 30 individual data sources produced by a variety of survey institutes, think tanks, non-governmental organisations, international organisations and private sector firms."

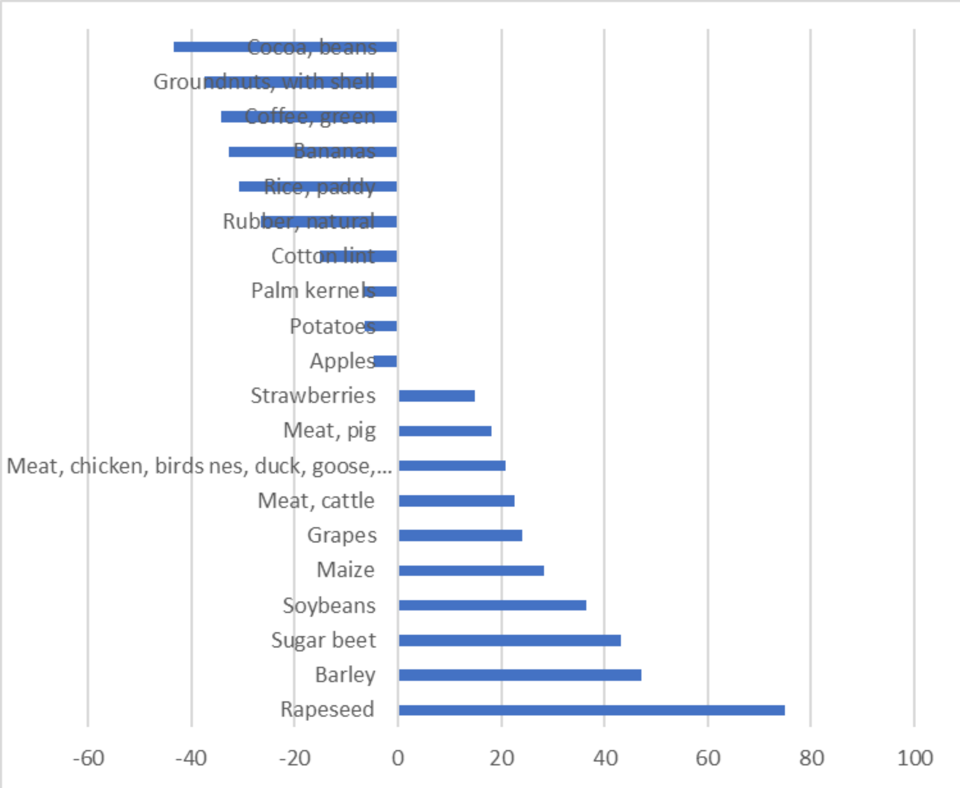


**Figure 5: World Governance Index (WGI) for the 20 biotic raw materials**

The degree of vulnerability depends in part on the source country concentration, and partly on the quality of governance in the source country, as measured by the WGI. It is therefore interesting to look at the relationship between the WGI-weighted value of the commodities imported into the Netherlands and WGI-weighted value of the global raw material production. In other words, does the Netherlands' direct import of raw materials come from countries with a better administrative environment than the global average?

This comparison is shown in Figure 6. In this figure, the average WGI score for the countries from which the Netherlands imports is plotted against the WGI scaled weighted score for the worldwide production (a *higher WGI* represents *a better score for governance).* Not surprising but remarkably consistent, is the picture that the weighted WGI score of Dutch imports is better (i.e. lower) than the global score. This means that the origin of Dutch imports comes, on average, from better governed countries. The clear exception here is the score for rapeseed: Dutch import seems to originate for a significant part from Ukraine and Romania (with a relatively lower WGI), whereas Canada (with a relatively higher WGI) is the world's most dominant player.

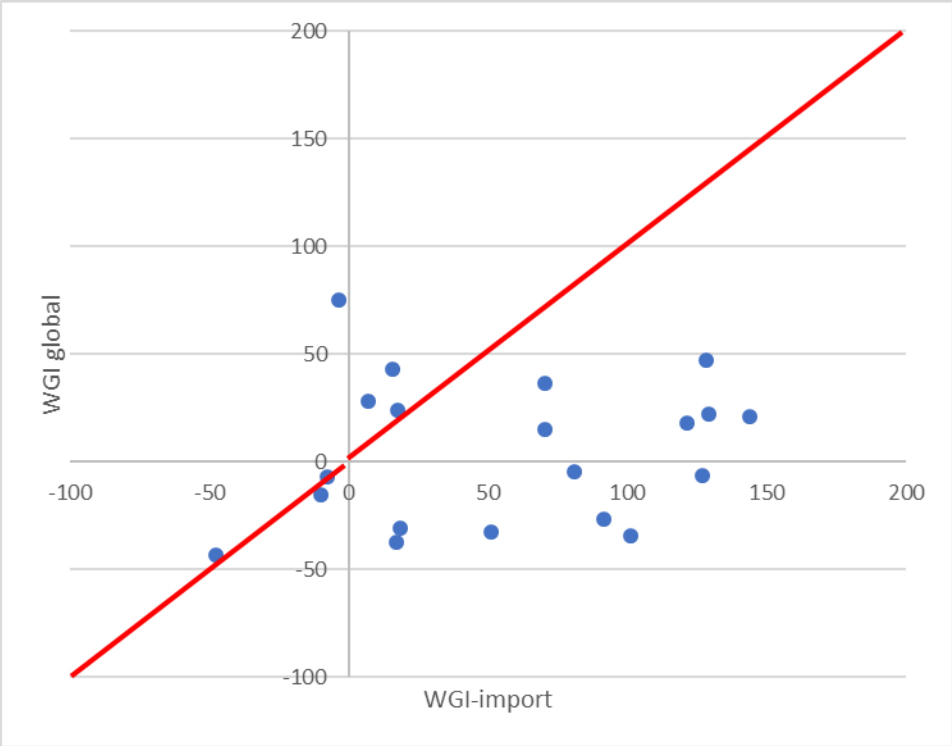


**Figure 6: Average WGI score for the countries from which the Netherlands imports compared to the WGI weighted score for worldwide production**

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

### 2.3.3 Export restrictions (OECD-data)

An interesting indicator for use in relation to a dominant position is the extent to which export restrictions are imposed by a source country. The data held by the OECD[3] covers 84 countries (the EU is considered as one region) for the period 2009-2012 and over 95% of the global production of agricultural products. The measures cover prohibitions on export and export restrictions, export duties, licensing requirements and obligations in relation to the local market.

Compared to industrial minerals, relevant trade barriers for agriculture are used less often. Barriers per commodity for metals or minerals are often imposed in hundreds of cases. For agricultural products, these number range between 0 and 6, with over half the products experiencing no barriers or restrictions. See figure 7.

[3] https://qdd.oecd.org/subject.aspx?Subject=ExportRestrictions_PrimaryAgriculture

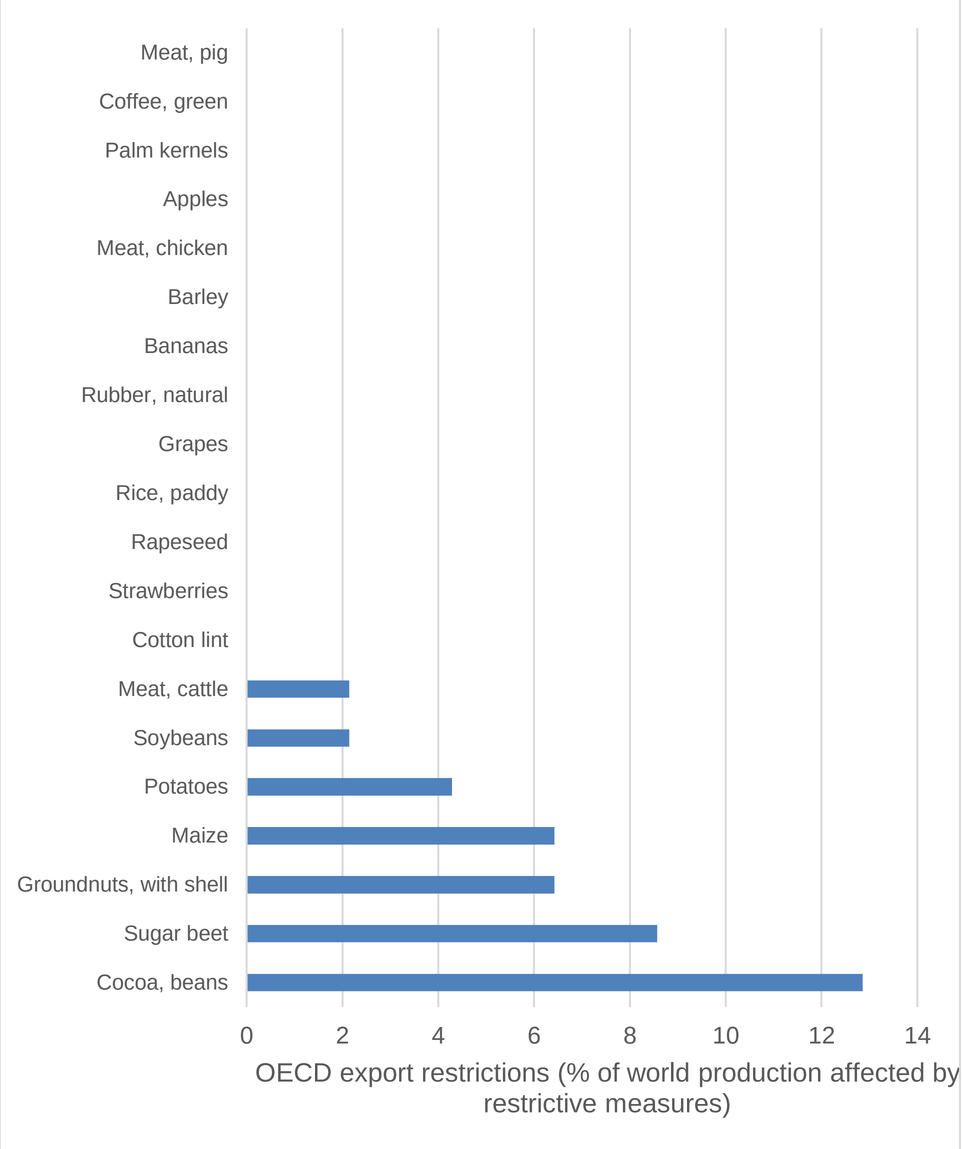


**Figure 7: OECD export restrictions for the 20 biotic raw materials, expressed as the % of world production affected**

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

### 2.3.4 End-of-life recycling rate

The relevance of this indicator is quite limited for biotic resources even though some resources, like wood, may be recycled. In practice this means that for most biotic resources the score on this indicator will be (close to) zero.

For the 20 biotic resources selected, the end-of-life-recycling rate score is 0.

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

### 2.3.5 Regulation regarding conflict materials

This indicator is not relevant for biotic resources.

## 2.4 Indicators for Operating profit

***Price volatility of raw materials (MAPII)***

To determine effects on operating profits it is sufficient to know the price volatility per raw material and an estimation of the quantities of a raw material that are used. Price volatility can be expressed in different ways, such as daily deviation of year average, or year average deviation of 10 year average etc. We suggest to use the MAPII, the Maximum Annual Price Increase Index, a measure of the maximum relative price increase that has occurred during the past 50 years. The MAPII represents the highest price increase per year in that period. A MAPII of 1.0 means that the maximum price increase was 100%, i.e. doubled, during a given year during this period. Using the MAPII, the impact of price volatility on a product or product group can be determined as follows:

$$\sum_{x=n}^{m}((MAPII_x \, . P2017_x) \times \, TS_x) \, \times \, \frac{W(import)}{V\,(import)}$$

In this formula, $MAPII_X$ is the maximum annual percentage increase in the price of a raw material (determined for the period 2000-2017), $P2017_x$ is the price level in 2017 of the raw material, $TS_x$ is the characteristic proportion of a raw material in a particular product group[4], W(import) is the weight of the volume of imports of all products within a product group and V(import)[5] is the value of imports of all products within that product group. The price developments are based on the Consumer Price index of FAOSTAT[6]. Notwithstanding the fact that seventeen year time-series may overlook significant price shocks in the 20th century, it is possible to generate a clear picture of the extent to which prices may fluctuate from year to year in the worst-case scenario.

An overview of the MAPII for the resources considered here is given in figure 8. In the resources scanner, the tipping point for no risk/risk is a tripling of the price in one year time

The impact of price increases is dependent upon the situation, the sector and the position of the company in the value chain. As such, the impact is greater as the proportion of the total product range increases, and when any price increases cannot be passed on to customers.

4 The $TS_x$ indicator for biotic materials is assumed to be 1 for all products groups describing the actual raw material ("cotton product group contains 100% cotton") and 0.1 for all other relations ("Strawberry marmalade contains 10% strawberries"). This is a simplification, yet the numerical value of 0.1 did not to prove to be very sensitive. Other values of 0.01 or 0.25 did not change the total MAPII score significantly.

5 https://opendata.cbs.nl/statline/#/CBS/nl/navigatieScherm/thema?themaNr=81287 for both W and V

6 http://www.fao.org/faostat/en/#data/CP

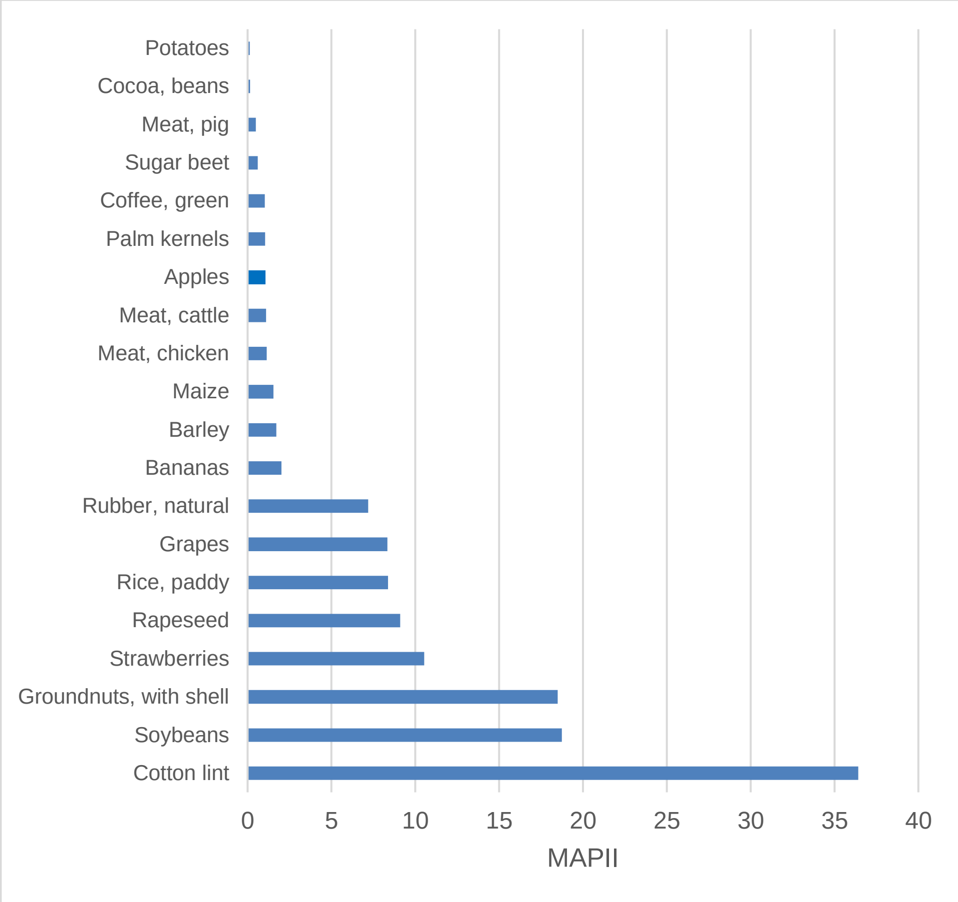


**Figure 8: MAPII for the 20 biotic raw materials**

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

## 2.5 Indicators for Corporate reputation

### 2.5.1 Environmental impact and Impact on biodiversity

Raw materials with a relatively high environmental impact could pose a risk to a company since external costs might be internalised in the years to come (leading to high production costs), an increase in environmental legislation may restrict exploration/production and the environmental impacts may harm the company's reputation and license to operate.

The resources scanner includes a score on overall environmental impact and a score on the impact on biodiversity.

The scores are based on a life cycle assessment (LCA) of the raw materials concerned. The basis for the calculations is the production of 1 kg of raw materials (functional unit). All steps from the production of the raw material to the production of the product as it is traded, are included in the calculations, as well as transport to the Netherlands. As with the abiotic materials, the use phase and end-of-life phase of the materials are not included in the calculation.

**Life Cycle Inventory Data**

In the Life Cycle Inventory step the environmental data (inputs and outputs) are collected for each raw material. For this study both the Agri-footprint 4.0 database, as well as the ecoinvent 3.4 database have been used. The allocation of environmental impacts is based on cut-off (ecoinvent) or economic allocation (Agri-footprint). In some cases data on the raw materials is available in both databases. In that case the Agri-footprint data were used, since these data were specifically developed for agricultural products. The only exceptions are rice and palm oil. For these two resources, the Agri-footprint database reports an ecotoxicity score which, in combination with the use of the environmental costs methodology, results in an inaccurate picture of the environmental damage. In these cases the ecoinvent dataset is used. An advantage of using the Agri-footprint database is the fact that the database includes the Dutch import and/or Dutch consumption mix and transport to the Netherlands. In ecoinvent, in most cases only the global production mix is available.

The only exception to the use of Afri-footprint data, when available, is the data used for rice and palm oil. For these resources, Agri-footprint mentions a toxicity score which, in combination with the environmental prices, shows a distorted picture of the environmental damage. In general, the impact scores for toxicity are the most uncertain factors in LCA results. For these two crops, almost 90% of the total environmental impact score is caused by 'terrestrial ecotoxicity' and is linked to a specific type of pesticide of which the use in rice and palm oil production is unclear. For this reason, ecoinvent data are used for rice and palm oil.

*Limitations*

It is difficult to take into account specific characteristics of different production chains in a tool for general use. First because there are many possibilities where it comes to production locations, but also because the background data available or often generic data. In most cases, the Agri-footprint datasets contain data based on the Dutch import mix. Since the resources scanner (at least for the moment) will mainly be used by Dutch companies, the Dutch import mix is a good proxy for the resources purchased by a Dutch company. This, together with the high data quality, is the most important reason to use the Agri-footprint dataset for the calculation of the environmental impact. However, for some resources the Dutch import mix is not available. In these cases use is made of country specific datasets. In the case of cocoa, for example, a dataset for the Ivory coast is used. About 85 percent of Dutch imports originates from Ghana, Ivory Coast, Cameroon and Nigeria. The areas where the cocoa is produced require specific climatic conditions and the countries use similar production techniques. For this reason, data from Ivory Coast are a good proxy to calculate the environmental impact of Dutch cocoa imports. In this way, for each resource the following data preferences have been used to select the data:

1. Import mix from Agri-footprint
2. Consumption mix NL from Agri-footprint
3. Global market mix from ecoinvent
4. Country specific data as a proxy for the Dutch import mix
5. Country specific data as a proxy for world production

Another limitation of the datasets used is the fact that not all impact drivers can be covered yet. This is true for the introduction of invasive species, a potentially important driver of biodiversity loss, and the risk of production in or close to areas with a high conservation value (High Conservation Value Areas, HCVAs). These drivers cannot yet be included in LCA calculations. Since these drivers can play an important role in the production of biotic resources, reference is made in the biodiversity factsheet to sources of information where a company can find more information (location specific or not) on both drivers.

*Transport*
Table 4 shows that for some resources transport distances have been added. The LCA-software SimaPro 8.5.2 was used to model the inventory data, the transport data and the impact assessment. In those cases where datasets already included an average transport distance, the assumption is made that this provides a good indication of transport to the Netherlands. Generally speaking, the role of transport in the total environmental impact is limited.

**Table 4: Overview of biotic raw materials and data sources**

| Resource | Dataset | Database | Geography | Transport | Note |
|---|---|---|---|---|---|
| Cacao beans | Cocoa bean {CI}\| cocoa bean production, sun-dried | Ecoinvent 3.4 - allocation, cut-off by classification | Ivoorkust | 6960 kgkm shipping added | 1 |
| Palm oil | Palm oil, refined {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | 2 |
| Soya beans | Soybean, consumption mix, at feed compound plant | Agri-footprint - economic allocation | NL consumption mix | Included in Agri-footprint dataset | |
| Live poultry | Chicken for slaughtering, live weight {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Grapes | Grape {GLO}\| market for | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Coffee | Coffee, green bean {GLO}\| market for coffee, green bean | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Maize or corn | Maize, market mix, at regional storage | Agri-footprint - economic allocation | NL importmix | Included in Agri-footprint dataset | |
| Fresh strawberries | Strawberry {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Rape or colza seeds | Rapeseed, market mix, at regional storage | Agri-footprint - economic allocation | NL importmix | Included in Agri-footprint dataset | |
| Groundnuts | Groundnuts, with shell, at farm/AR | Agri-footprint - economic allocation | Argentina | 11744 kgkm shipping added | 3 |
| Barley | Barley grain, consumption mix, at feed compound plant | Agri-footprint - economic allocation | NL consumption mix | Included in Agri-footprint dataset | |
| Live bovine animals | Beef cattle for slaughter, at beef farm/IE | Agri-footprint - economic allocation | Ireland | Included in Agri-footprint dataset | 4 |

| | | | | | |
|---|---|---|---|---|---|
| Potatoes | Potatoes, market mix, at regional storage | Agri-footprint - economic allocation | NL market mix | Included in Agri-footprint dataset | |
| Cotton | Cotton fibre {GLO}\| market for | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | 5 |
| Live swine | Swine for slaughtering, live weight {GLO}\| market for | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Bananas | Banana {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Apples, pears | Apple {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Natural rubber | Latex {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | |
| Rice | Rice {GLO} | Ecoinvent 3.4 - allocation, cut-off by classification | Global market mix | Global average included in dataset | 6 |
| Sugar beet | Sugar beet, market mix, at regional storage/NL | Agri-footprint - economic allocation | NL importmix | Included in Agri-footprint dataset | |

1. 85 % of cocoa beans are imported from Ghana, ivory Coast, Cameroon and Nigeria. (https://www.cbs.nl/en-gb/news/2016/51/dutch-chocolate-exports-spreading).
2. ecoinvent is used because the Agri-footprint dataset, in combination with the environmental prices methodology results in a unrealistically high impact (see previous remark in the text).
3. Proxy for world trade (50% of world production originates from Argentina).
4. Only Irish data are available in Agri-footprint. Other options are available in ecoinvent, but in these datasets meat is modelled as a by-product of dairy production.
5. There is no data for rubber available, but latex is the main base material for rubber.
6. ecoinvent is used because the Agri-footprint dataset, in combination with the environmental prices methodology results in a unrealistically high impact.

**Life Cycle Impact assessment**

To translate inputs and outputs from the *Life Cycle inventory* (LCI) data to an environmental impact score, LCA studies use impact assessment methodologies. To arrive at one environmental impact score for each raw material, for the abiotic materials the environmental prices are used from the ‘Handboek Schaduwprijzen: Waardering en weging van emissies en milieueffecten’ of CE Delft. However, this handbook has now been replaced by the ‘Environmental Prices Handbook 2017’ (‘Handboek Milieuprijzen 2017’). For this study, this more recent handbook has been used. The environmental prices in this handbook are based on the average emissions in The Netherlands in 2015 and the ‘old’ version of ReCiPe (2008).

Although the environmental impacts outside The Netherlands are included in the analysis, the calculation of environmental costs is based on *Dutch* environmental prices. This is true for both the abiotic resources and the biotic resources. Since environmental prices may differ in different countries (though many countries will not have environmental prices available), the result must be interpreted as a *risk indication* which particularly provides insight in the risk differences between different resources.

For the calculation of the impact on biodiversity, the updated endpoint methodology of ReCiPe 2016 (H/A) has been used. Note that the calculation of the biodiversity footprint of the *abiotic* resources is based on ReCiPe 2008. This can be updated in an update of the resources scanner.

Both methodologies, the Environmental Prices Handbook 2017 and ReCiPe 2016, use the same impact categories, like land use, climate change and ecotoxicity. The results are presented in table 5.

**Table 5: Environmental impact and impact on biodiversity for 20 biotic resources**

| Resource | Environmental Prices (EUR2015) | Normalized Environmental impact score | Biodiversity impact (species.yr) | Normalized Biodiversity impact score |
|---|---|---|---|---|
| Cacaobeans | € 4,24 | 0,8949 | 2,04E-07 | 0,9518 |
| Palm oil | € 2,04 | 0,7865 | 2,42E-08 | 0,5704 |
| Soya beans | € 1,46 | 0,7367 | 4,72E-08 | 0,6900 |
| Live poultry | € 1,69 | 0,7587 | 4,41E-08 | 0,6778 |
| Grapes | € 0,13 | 0,3775 | 5,70E-09 | 0,3117 |
| Coffee | € 5,40 | 0,9305 | 1,29E-07 | 0,8704 |
| Maize or corn | € 0,37 | 0,5321 | 1,69E-08 | 0,5065 |
| Fresh strawberries | € 3,14 | 0,8504 | 7,68E-09 | 0,3651 |
| Rape or colza seeds | € 0,86 | 0,6590 | 5,33E-08 | 0,7117 |
| Groundnuts | € 2,84 | 0,8354 | 5,20E-08 | 0,7072 |
| Barley | € 0,35 | 0,5239 | 1,35E-08 | 0,4663 |
| Live bovine animals | € 8,64 | 1,0000 | 2,67E-07 | 1,0000 |
| Potatoes | € 0,14 | 0,3873 | 3,26E-09 | 0,2117 |
| Cotton | € 3,27 | 0,8565 | 1,17E-07 | 0,8520 |
| Live swine | € 4,29 | 0,8965 | 9,93E-08 | 0,8232 |
| Bananas | € 0,18 | 0,4249 | 6,85E-09 | 0,3446 |
| Apples, pears | € 0,22 | 0,4575 | 9,23E-09 | 0,3979 |
| Natural rubber | € 0,73 | 0,6347 | 1,29E-08 | 0,4573 |
| Rice | € 0,51 | 0,5817 | 2,74E-08 | 0,5925 |
| Sugar beet | € 0,06 | 0,2752 | 1,63E-09 | 0,0872 |

**Scores in the resources scanner**

In the resources scanner, the environmental impact and biodiversity impact scores are presented on a scale between 0 and 1 (see figure 9). This is realised by multiplying the result with a factor high enough to have the lowest impact end up above ‘1’. The logarithm is taken of the result and all impacts are divided by the highest impact score. In this way, the highest impact score will be 1 and all other scores end up between 0 and 1. The result is included in table 5 under ‘*Normalized Environmental impact score’* en ‘*Normalized Biodiversity impact score’.*

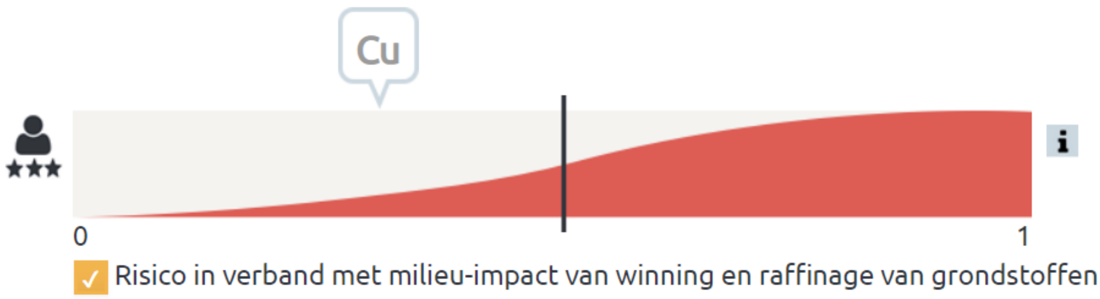


**Figure 9: Normalised environmental impact score for copper as presented in the resources scanner**

The following graph includes the scores from table 5. The graph shows that the environmental impact scores and biodiversity impact scores are more or less in line for the different resources, with the exception of strawberries and sugar beet.

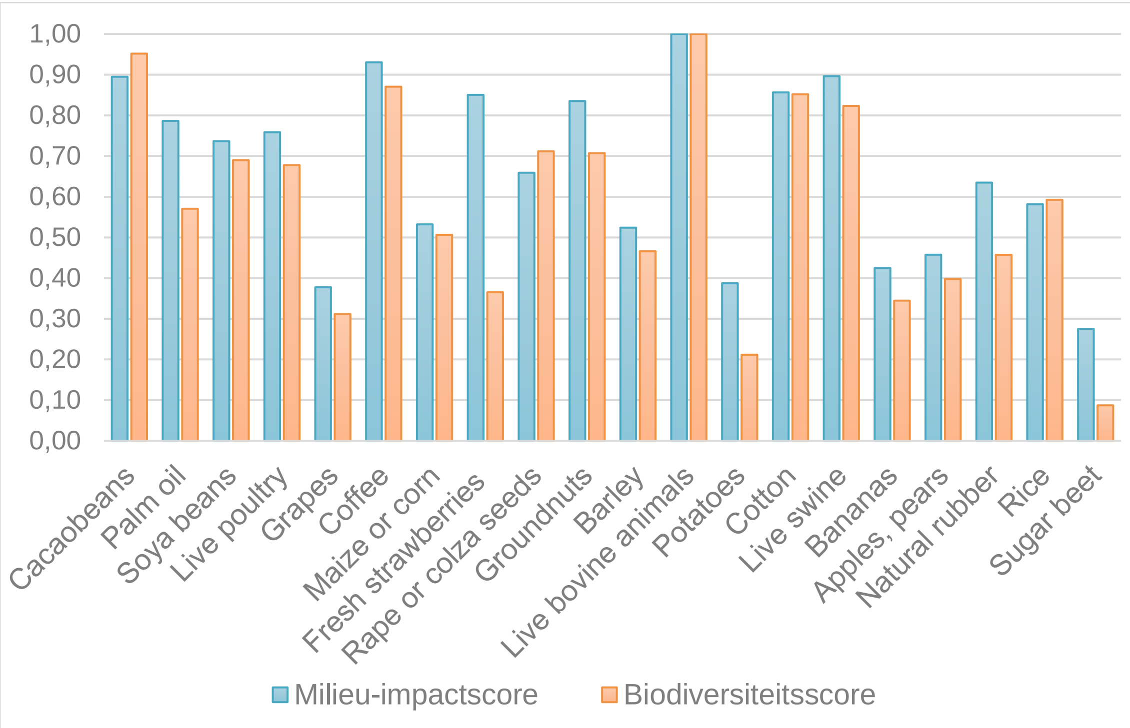


**Figure 10: Normalised environmental impact scores and biodiversity impact scores for the production of 1 kg of each biotic resource**

⇨ The presentation and explanation of both indicators in the resources scanner is the same as for abiotic materials.

### 2.5.2 Performance of countries of origin regarding human development (HDI)

Certain aspects of raw material production (for example the impact on the environment or on local working conditions) can have a negative impact on corporate reputation and on, for example, access to capital. Such external impacts of the extraction of raw materials may also determine the direction of the foreign policy of national governments.

The Human Development Index (HDI)[7] is an indicator roughly composed of: life expectancy, average years of schooling, expected years of schooling and gross national product per capita. Sourcing from countries exhibiting a low HDI may have a detrimental impact on corporate reputation. The HDI for the biotic raw materials studied here is shown in figure 11.

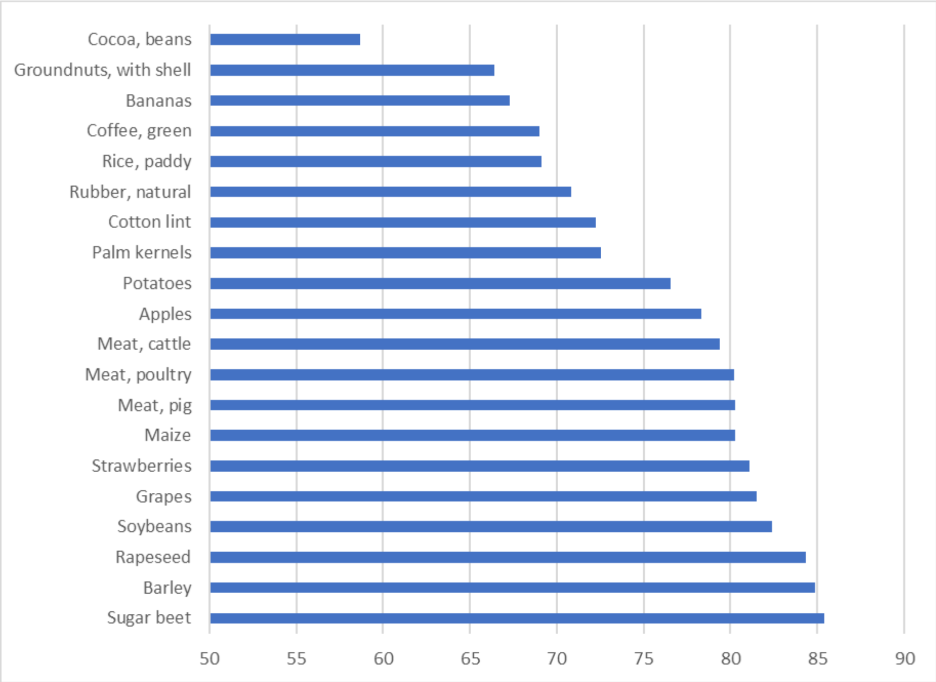


**Figure 11: Weighted HDI for the 20 biotic raw materials**

The picture of the weighted HDI is more or less similar to the picture of the weighted WGI. Again cocoa beans (due to significant imports from Ivory Coast) leads to a relatively low score for this resource.

As we showed earlier for the WGI, the weighted global HDI can be compared to the weighted HDI for import in The Netherlands. The results are shown in figure 12.
Again, for most materials the weighted HDI for our imports is higher than the global weighted HDI, showing that on average we trade goods with countries exhibiting a better developed human development.

[7] The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is compiled and reported by the UN Development Programme

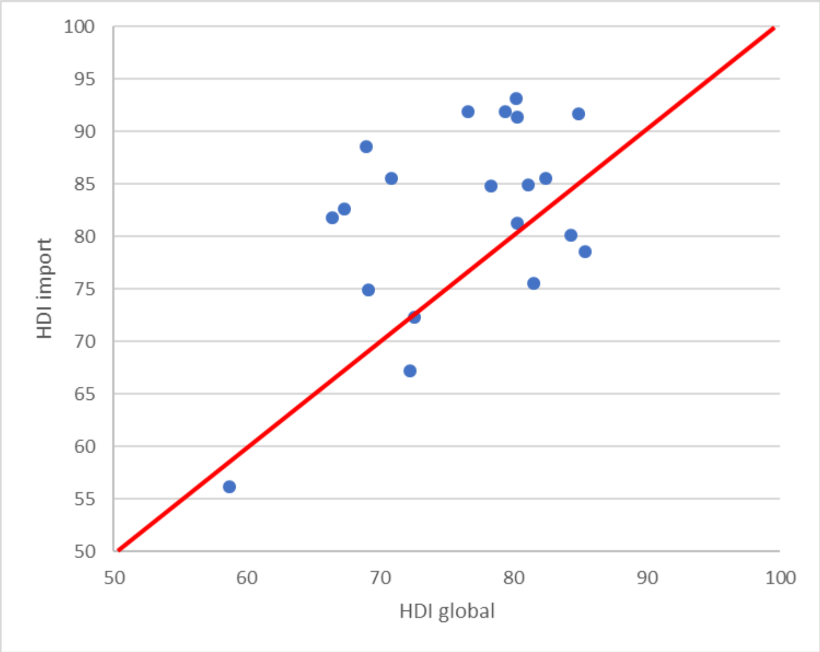


**Figure 12: Weighted global HDI compared to the weighted HDI for import in The Netherlands**

⇨ The presentation and explanation of this indicator in the resources scanner is the same as for abiotic materials.

# 3 ACTION PERSPECTIVES AND FACTSHEETS FOR BIOTIC RESOURCES

## 3.1 Action perspectives

For abiotic materials, only non-material specific action perspectives are included in the resources scanner. Companies can select (see www.grondstoffenscanner.nl):

- One or more of three ways to address the supply risk of raw materials: (1) different supply, (2) better supply and (3) reduction of use
- One or more of the risks the company wants to address: (1) Long term supply risk, (2) Short term supply risk, (3) Corporate reputation and (4) Operating profit.

For biotic materials, the option to also include material/resource specific action perspectives has been explored. The feasibility of providing resource specific action perspectives depends on the way the supply risk is addressed:

- <u>Action perspectives focusing on a 'Different supply'</u>**:** Use of other resources (substitutes) with a lower risk
  In this case, information is needed on resources which can be used as a substitute and with a better score on (one or more of) the risk indicators. However, substitutes will differ with different applications of the resource and may influence the characteristics and quality of the product in which the resource is applied. The identification of substitutes will therefore only be possible for a limited number of main applications of a resource and will result in a very technical discussion. Moreover, in the case of biotic resources for direct consumption, the use of substitutes will become a very different and challenging discussion, e.g. including nutritional value, taste, etc.
  Based on these challenges, it is recommended not to include any resource-specific action perspectives for biotic resources for 'Different supply'.

- <u>Action perspectives focusing on a 'Better supply':</u> Better management of the risks identified or the use of a more sustainable variant of the same resource
  Better management of the sourcing of resources (e.g. improving knowledge of the supply chain, analysis of the power of suppliers, etc.) will largely be similar for different abiotic and biotic resources and is already covered in the scanner. However, some of the action perspectives tailored to abiotic materials need to be rephrased to fit both abiotic and biotic resources. Suggestions for this are included in the separate document on action perspectives.

  The use of more sustainable variants of a biotic resource to reduce reputational risk can be specified, e.g. based on the availability of resource specific *sustainability standards* (e.g. RSPO for palm oil, RTRS for soy, etc.). It should be noted that this is also true for abiotic resources, but has not yet been included in the resources scanner. It should also be noted that the inclusion of information on sustainable sourcing will probably be revised in a next update of the resources scanner to better serve the 'Agreements on International Responsible Business Conduct'. This means that any choices made on this topic in this project may again be revised in the next update.

  The option to include resource specific sustainability standards was discussed with the project group and sounding board. It was concluded that, to prevent a discussion on the selection of sustainability standards, the resources scanner will not refer to specific sustainability standards, but will refer to the sector associations for more information on a sustainable choice. This action perspective can be covered by a general (non-material specific) action perspective. In this action perspective, reference will be made to the ‘Standards map’ of ITC. This Standards map provides resource- and country-specific information on a wide range of sustainability standards and certifications.

An alternative to this approach would be to include a selection of well-known, independent standards/certifications for each resource, without stating a preference. For the moment, however, this option is not selected, because: (1) the Standards map of ITC offers much more information, (2) including such a resource-specific action perspective requires the development of a new functionality in the resource scanner and (3) the information on sustainable action perspectives is likely to change in the next update when information supporting the International Responsible Business Agreements is considered.

- Action perspectives focusing on a ‘Reduction of use’**:** Reduction of use of the (virgin) resource
  Action perspectives with regard to resource efficiency will differ with each application/product or must be phrased in a general way. The first option will lead to similar challenges as with a ‘different supply’: the identification of options will only be possible for a limited number of main applications of a resource and will lead to technical discussions. It is therefore recommended not to include any resource specific action perspectives for ‘Reduction of use’.

  General action perspectives for resource efficiency are already covered in the scanner, but action perspectives may need to be phrased differently to fit both abiotic materials and biotic resources and a number of action perspectives for biotic resources can be added (e.g. on the reduction of food waste). Suggestions for this are included in the separate document on action perspectives.

## 3.2 Biodiversity factsheets

For abiotic materials, factsheets providing more information on the impact on biodiversity were developed: one general factsheet and material-specific biodiversity factsheets for 4 different materials (as a first step). The reason to add these factsheets to the scanner is to provide more information for companies to act on when they want to reduce their impact on biodiversity (biodiversity being a growing issue of concern).

For biotic resources, the same factsheets can be added. The general factsheet is the same for abiotic and biotic resources and has been slightly changed/updated. Factsheets for 2 biotic resources have been added in this project (separate documents).

Each resource specific biodiversity factsheet provides info on:
- The impact score for biodiversity and the drivers of this impact (what are the main causes of this impact?)
- An indication of the dependencies of (the production of) the resource on biodiversity and ecosystem services, including a reference to the ‘ENCORE database’. This database by the Natural Capital Finance Alliance (NCFA) and UNEP-WCMC provides insight in the dependencies of sectors on ecosystem services and the natural capital supporting these service. The database is still in development.
- A reference to sources for more information on the biotic resource and biodiversity.

## 3.3 A link to the ENCORE database

ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) enables users to visualise how the economy depends on nature and how environmental change creates risks for businesses (www.encore.naturalcapital.finance). Starting from a business sector, ecosystem service, or natural capital asset, ENCORE can be used to start exploring natural capital risks. The ENCORE database is developed by the Natural Capital Finance Alliance (NCFA) in partnership with UNEP-WCMC.

ENCORE offers the user a way to identify sector specific dependencies on ecosystem services, the natural capital assets supporting the provision of these services and environmental changes affecting these services. For each asset and environmental driver spatial data are provided to enable the exploration of location-specific risks. ENCORE does not provide an overview of the status of the ecosystem service itself (e.g. no pollination maps). For example, ENCORE shows:

- That the production of ‘agricultural products’ depends on a number of enabling ecosystem services, like ‘soil quality’, ‘water quality’ and ‘pollination’.
- That the ecosystem service ‘pollination’ depends on the natural capital assets ‘atmosphere’, ‘species’ and ‘water’, including a subdivision of these assets. For example, ‘atmosphere’ is divided in ‘Change in Precipitation Seasonality’, ‘Change in Temperature Seasonality’ and ‘Change in Wind Speed’.
- The drivers of environmental change potentially affecting the service, like ‘droughts’, ‘flooding’ and ‘habitat modification’.
- Spatial data (maps) on these natural capital assets and drivers.

Companies and financial institutions can use this information to identify natural capital related risks. However, looking at the type of information currently provided by the ENCORE database, this will require expert support. The database is still in development.

At this moment (July 2019), the ENCORE database does not provide enough detailed information (e.g. no separate agricultural products are covered) and is not yet user friendly enough to justify investing in a data-link with the resources scanner. A reference to ENCORE in the biodiversity factsheets is considered to be enough for the time being. However, if ENCORE is further developed, it is recommended to reconsider a possible datalink.

ENCORE: https://encore.naturalcapital.finance/en

## 3.4 A link to Bioscope

Bioscope is a free, online tool built  by a consortium composed of PRé Sustainability, Arcadis and Code. Bioscope can be used to calculate the biodiversity footprint of materials. The methodology behind Bioscope is similar to the methodology used to calculate the biodiversity impact in the resources scanner. A datalink between Bioscope and the resources scanner could therefore be an interesting step. Biodiversity-impact data could be generated for those materials that are covered in the resources scanner and in the database used by Bioscope (currently Exiobase, which has its limitations where it comes to raw materials covered). However, Bioscope is currently under construction which means that a potential datalink should be reconsidered when Bioscope is finished.

Bioscope: https://www.bioscope.info/

## 3.5 The resources scanner and the Natural Capital Protocol

The Natural Capital Protocol (NCP) focuses on the impact and dependencies on natural capital and the integration of natural capital in business operations and accounting. The resources scanner provides insight in a company's dependency on resources and (to a more limited extent) in the dependency of resource exploration/production on ecosystem services. This insight can be used to set priorities: what resources deserve (extra) attention? The relation between the resources scanner and the 4 steps from the NCP is summarised below.

**Step 1 NCP: Frame (why?)**
In this step, the resources scanner can be used to assess to what extent the dependency on natural capital (specific resources) poses a risk to a company. The resource scanner may not provide a conclusive answer, but offers direction to answer the 'why' question. The risk matrix in the resources scanner can be used to identify risks related to security of supply, while the biodiversity factsheets provide information on the dependency on ecosystem services and sources of information.

**Step 2 NCP: Scope (what?)**
In this step, the resources scanner offers information on the relative importance of different resources regarding security of supply risks, the impact on biodiversity and dependency on ecosystem services. Or, like the NCP states: "which impacts and/or dependencies are material?"

**Step 3 NCP: Measure and value (How?)**
In this step, the NCP focuses on the way impacts/dependencies, drivers and trends in natural capital can be measured. The biodiversity factsheets of the resources scanner will be of value here since they (1) provide in the drivers behind the impact on biodiversity (what should be measured?) and (2) refer to databases and tools, like maps on water scarcity (what is available to enable measurement?).

**Step 4 NCP: Apply (What next?)**
This step in the NCP covers the interpretation of results and translating these results into actions. The information on the drivers behind the impact on biodiversity is of value here since it shows what drivers the company could focus its actions on. Moreover, the action perspectives in the resources scanner regarding 'other supply', 'better supply' and 'reduction of use' can be used to address natural capital risks.

**Summary**
The link between the resources scanner and the Natural Capital Protocol is as follows:

| Step NCP | Information resources scanner | Where to find this information | What question does the scanner answer? |
|---|---|---|---|
| 1. Frame (why?) | • Information on the use of resources with a relatively high risk regarding security of supply, company result and company reputation | Product: the risk matrix<br><br>Resource: the resource-specific fact sheets | Why should I focus on certain resources and ecosystem services? |

| | | | |
|---|---|---|---|
| 2. Scope (what?) | • Information on relative risks: what resources run the highest risk regarding security of supply, company result and company reputation? | Product: the risk matrix<br><br>Resource: the resource-specific fact sheets | What resources and ecosystem services should be given priority? |
| 3. Measure and value (How?) | • Information on the drivers behind the impact on biodiversity: what to measure?<br>• Information on databases and tools to measure and monitor, like water scarcity maps, IBAT, etc. | Biodiversity-factsheets<br><br>Action perspectives | What 'natural capital assets', like water quantity, should I measure and what data and tools are available to enable measurement? |
| 4. Apply (What next?) | • Information on the reasons behind the risks: the points of action.<br>• Information on action perspectives. | Biodiversity-factsheets<br><br>Action perspectives: other supply, better supply, reduction of use | What can I do to minimise the risks? |

This overview or a hyperlink to this information could be included in the resources scanner.

# 4 SUMMARY AND RECOMMENDATIONS

## 4.1 Summary

Main findings regarding the integration of biotic resources in the resources scanner are:

***General***

- The main purpose of the resources scanner is to inform the user about the risks regarding resources used. The scanner offers risk indications, often based on data at the level of the Dutch economy. For example, the environmental impact and impact on biodiversity are calculated based on the Dutch import-mix. Whether this translates into a risk at the level of a single company depends on the specific resource situation of the company, like the countries the company sources from. The resources scanner shows what resources and risks the company should look into, but it is up to the company to take this extra step.

***Definitie***

- Biotic resources can be defined in a similar way as abiotic materials: at a 4-digit level of the international HS/CN classification (the 'Harmonized System/Combined Nomenclature': GN). This HS/CN classification can also be used to develop the matrix by which resources are linked to the products in which these resources occur.

- A distinction between resources of different quality is not possible since the data underlying the risk indicators are not available for different qualities of the same resource.

***Indicators***

- Most of the risk indicators for biotic resources are the same as those for abiotic materials. This is also true for 'live animals', like 'live bovine animals' and 'poultry'. An exception is the Reserve/Production indicator and the indicator for the 'Concentration of raw material reserves ($HHI_{res}$) in countries of origin'. The reason is that biotic resources do not have affixed reserve. The 'Production capacity' indicator can be used as an alternative to the Reserve/Production indicator. This indicator shows to what extent the production of biotic resources can be maintained in the long term. This indicator is based on the projections of future production by the FAO. A limitation to this indicator is the fact that these FAO projections are only available for a limited number of product groups and, in some cases, the limited level of specificity of these product groups.

  An alternative approach to assess future production capacity would be to zoom in on important production factors like soil fertility, pollination and the availability of water. Since each of these production factors only provide a piece of the 'production puzzle' and the availability of crop specific data for these production factors is still quite limited, this approach has not been selected.

  The indicator on the 'Concentration of raw material reserves ($HHI_{res}$) in countries of origin' is left out for biotic resources. The indicator 'Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin' is sufficient to cover the degree of monopoly forming for biotic resources.

This leads to the following indicators for biotic resources:

| | Indicator |
|---|---|
| **Long term security of supply (>10j)** | Geo-economic: Production capacity |
| | Geo-economic: Companionality (extent to which a raw material is a side product) |
| **Short term security of supply** | Geo-political: Concentration of the exploration of raw materials ($HHI_{prod}$) in countries of origin |
| | Geo-political: stability and quality of governance in the countries of origin, expressed by WGI (World Governance Index) |
| | Geo-political: Export restrictions (OECD-data) |
| | End-of-life recycling rate |
| **Operating profit** | Price volatility of raw materials (MAPII) |
| **Corporate reputation** | Environmental impact of raw materials (Environmental Cost Indicator) |
| | Impact on biodiversity |
| | Performance of countries of origin regarding human development (Human Development Index: HDI) |

***Action perspectives***

Additions will be made for biotic resources to the generic (non-resource specific) action perspectives now included in the resources scanner. Resource-specific action perspectives have not been added. The reason for this is that resource-specific action perspectives for 'other supply' and 'reduction of use' are closely linked to the application of the resources and the quality of the end product (including taste and nutritional value for food products). For the action strategy 'better supply' resource-specific sustainability standards and certifications could be added for each resource. However, since it is expected that information on a sustainable choice will probably change in very near future and the inclusion of resource-specific information will require a new functionality of the resources scanner, it is decided to refer to the 'Standards Map' of ITC. This online database offers extensive information on sustainability standards for different product groups and countries.

***Factsheets biodiversity***

The generic factsheet and resource specific factsheets on the impact on biodiversity can be included in the same way as for abiotic resources. The information in the factsheets can be used to gain more insight in the impacts on biodiversity and the opportunities to minimise this impact. Minor adjustments have been made based on recommendations from IUCN-NL and references to information on invasive species have been added. Biodiversity factsheets are now only available for 2 biotic resources and 3 abiotic materials. Whether these factsheets should be included for all resources needs to be decided in conjunction with decisions on other information behind the indicators that might be made available in future updates (see recommendations).

***Creating a link with Bioscope, ENCORE and the Natural Capital Protocol***

A (data) link with the online tool Bioscope and the ecosystem service / natural capital asset database of ENCORE is not recommended at this moment. Both initiatives are still in development and do not yet offer the right information to justify a link with the resources scanner. The resources scanner does offer valuable information for companies applying the

Natural Capital Protocol (NCP). The information on resource risks can be used to justify the use of the NCP (answering the 'Why' question) and to focus the actions of the company (what resources to focus on and, to a lesser extent, what ecosystem services). This relation with the NCP can be included in the introduction/explanatory text of the resources scanner.

***Integration of (data on) biotic resources in the resources scanner***
The integration of biotic resources in the resources scanner does not require any significant changes in the structure of the scanner. Both the indicator-data and action perspectives can be included in the database behind the resources scanner and visualisation of the results is largely similar to the visualisation for abiotic resources.  The new indicator on Production capacity needs to be added to the list of indicators. The difference between abiotic and biotic resources could be indicated with different colours (e.g. using blue and green colours), but this is not strictly necessary.

## 4.2 Recommendations

The analysis results in the following recommendations:

- For a number of indicators more recent data have been used than the data used for abiotic resources. It is recommended to use these more recent data for all resources (including the abiotic resources) in the next update of the resources scanner. This is true for (among others) data on imports, resource prices and environmental prices.

- The resources scanner is based on an analysis on a macro-economic level (The Netherlands) and not on the level of an individual company. Indicators which are currently based on the Dutch import mix could maybe also be based on separate countries of origin, provided such data are available. Information on different countries of origin can be more valuable to companies using the scanner. Examples are the indicators on environmental impact and impact on biodiversity. It is recommended to assess the value and feasibility of including country specific data in the next update.

- Most indicator scores are based on information which is not visible for the user of the resource scanner. For example, the environmental impact score does not show what the reason is of a relatively high impact score (e.g. what environmental topic(s) or environmental prices?). By making such data available in the resources scanner, action perspectives will become more clear (e.g. points of attention in the purchasing policy for a specific resource). In case of the impact on biodiversity, such information has been made available in the biodiversity factsheets (for a limited number of resources). It is recommended to assess the value and feasibility of making more information available in the next update.

- If it is decided to show more of the information behind the risk indicators, the question will need to be answered whether biodiversity factsheets should be included for all resources. The answer to this question will also depend on the way in which the extra information is presented: in factsheets (like the information on biodiversity), through pop-up screens or other.

- When country- and crop specific data on production factors like pollination and soil fertility become available, the integration of such production factors in the resources scanner can be considered, either or not in combination with the ‘Production capacity’ indicator. A future link with the ENCORE database might also be considered in this respect.

www.crem.nl