

Ranking responsible source assessments for building materials

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Ranking Responsible Source assessments for building materials

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Abstract: An increasing amount of building materials is traded worldwide. The raw materials needed to construct buildings are often extracted in different places than where they are used. This creates social, economic and environmental impacts that are inflicted in other locations than where the building is constructed. To gain insight in these impacts and to be able to reduce them, certification schemes are developed. This research concentrates on the social impact of global construction material extraction and production, and can be used in multi-aspect sustainable building assessment tools.

In this paper, we propose a framework for the ranking of certificates to assess the social impact of global construction material extraction and production. With this framework, new assessment schemes can objectively be added to a tool. This framework is already being integrated in BREEAM-NL, but can also be used for other countries and other assessment methods than BREEAM.

Keywords: Responsible Source, building materials, certification schemes, sustainability

1. Introduction

Resource extraction and production of building materials have environmental and social impacts on both local and global scale [1, 2]. A significant amount of materials is traded worldwide, which results in a burden shift to other countries or regions than the location of the consumption of the materials [3]. For example, in the Netherlands, two-thirds of the minerals are imported and a significant amount of metals and metal ores is imported from Latin-America (figure 1 en 2) [4].

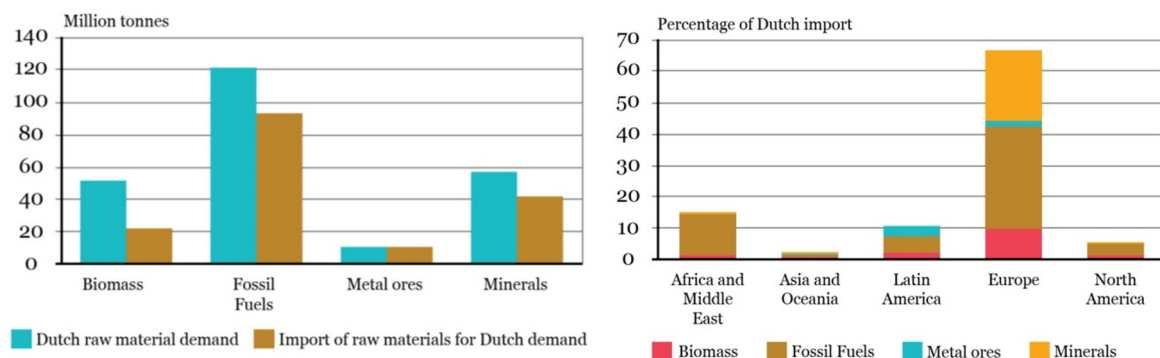


Figure 1 (left). The Dutch raw material demand and import in 2010 (excluding products that are re-exported)[4]
Figure 2 (right). The origin of imported raw materials (the Netherlands in 2010)[4].



The demand for raw materials increases rapidly, due to the growth of population and increasing standards of living [5]. This is accompanied with an increase of (shifted) impacts. Worldwide extraction of raw materials for the construction industry has increased with 41 percent (by mass) in the period from 1992 to 2005 [6].

The shifted impacts caused by building materials are not well known due to long, complex and non-transparent supply chains. To gain insight in these impacts, certification schemes have been developed which acknowledge responsible sourced materials. This enables “Responsible Sourcing” procurement [7], in which environmental and social considerations are embedded into procurement processes along with more traditional considerations like price, quality, product performance and availability of resources [8].

Of currently widely used assessment methods only the Leadership in Energy and Environmental Design, LEED (v4-2013) and the Building Research Establishment Assessment Method, BREEAM (-NL, 2011-v1) include a credit which assesses the social aspect of sourcing of the building materials.

LEED demands a defined amount of building materials to be bio-based, recycled, reused or certified by a certification scheme that is accepted by one of the main Corporate Sustainability Reports (CSR) frameworks (e.g. Global Reporting Initiative)[9]. BREEAM demands a defined volume of building materials to be certified by any of the certification schemes accepted by BREEAM. In addition, BREEAM ranks these certification schemes into four ranks (tierlevels) to determine the rating for the building [10].

LEED accepts any certification scheme that is accepted by a CSR framework and it does not determine the rigor of assessment done by the certification scheme. BREEAM on the other hand, selects and ranks the more effective certification schemes for Responsible Sourcing individually. Therefore this paper focuses on BREEAM.

Although BREEAM makes a selection of certificates based on their effectiveness, there is no framework for the ranking of these certificates. In fact, the certificates are ranked in the four tierlevels on the similarity with certificates that are already accepted by BREEAM.

In this article we present how Responsible Sourcing Assessment is analyzed and propose a framework which ranks certificates used in the assessment objectively.

2. Determining Responsible Source

“Responsible Sourcing is an ethos of supply chain management and product stewardship, encompassing and encouraging positive social, economic and environmental dimensions”, according to the Building Research Establishment (BRE) [11]. However, a framework how building materials can comply with this definition is in the Netherlands not available. Through interviews and surveys we found that users of BREEAM-NL can interpret Responsible Source in various ways. For example, some users interpret responsible as part of sustainability, while others interpret it as proven or justified. Based on literature, interviews and certification schemes regarding Responsible Sourcing and Responsible Source, the following definition for Responsible Source is proposed:

“Products and raw materials for buildings have a Responsible Source when the transport, extraction and production processes in the supply chain reduce their damage to the environment, treat people involved fairly and when this is substantiated in a transparent and verifiable manner”.

The definition is based on three Dimensions: Source, Responsibility and Accountability. Source defines the parties in the supply chain who are included in the assessment. Responsibility defines the acts of reducing environmental, social and societal impacts. Accountability is substantiating, describing and verifying the responsibility claims made throughout the supply chain.

These three elements are essential for the assessment of the Responsible Source of building materials and are further explained in the following paragraphs.

2.1 Source

Source describes the processes between the origin of the materials and the procurement before the construction. The processes involved are extraction, production and transportation (figure 3).

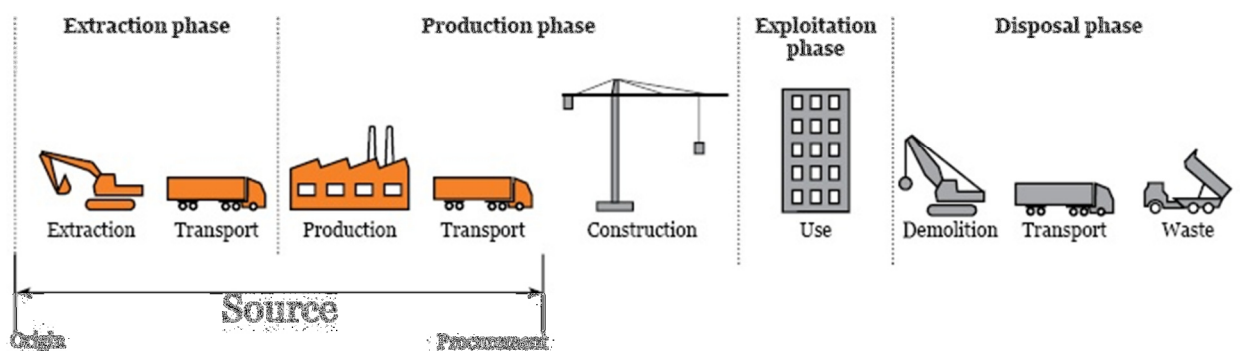


Figure 3. Phases and processes within the lifecycle of buildings. The defined processes of Source within the lifecycle of building materials are illustrated.

The origin is the starting point in the first process, which is the extraction of raw materials. In the case of recycled or reclaimed products their reclaiming or recycling process can be considered as their origin[12]. The scope of Source ends with the procurement before the construction, which includes the transportation onto the building site, but excludes the actual construction. This process does not create shifted impacts anymore, as it is on the actual

building site. After this point one could describe the following phases as responsible or sustainable construction, use and disposal.

Companies in the supply chain carry out the extraction, production and transportation. The requirements for the assessment of the Responsible Source differ per company depending on the their activity in these processes (figure 4).

Color scheme:	Company:	Requirements:
	Focal company	Full requirements
	Supply chain companies	Minimal requirements
	Companies producing non-constituent resources	No requirements (not assessed)

Figure 4. Different requirements depending on the company

If a building material is composed of multiple components, then they all should be assessed. The resources that do not end up in the final product (for example energy, water and catalysts) contribute to the impacts of a material, but do not have to be traceable to their origin(s) [12]. Tracing these resources back would lead to virtually endless supply chains. However, the amount of resources used during the process needs to be quantified.

Immediately demanding full requirements for all companies in the supply chain would make the assessment unviable. Therefore gradual increments in the assessment are necessary.

Being responsible is more important to the focal company (the company that is the center of attention) as a good reputation increases the value of the brand image, while environmental, social and societal violation can damage or even destroy the brand image [13, 14]. Supply chain companies (other companies within the supply chain) are often less known to the public and are therefore less subject to these effects. These companies follow up on the demands set by the focal company, which consequently come from the public or the assessment scheme. Therefore the requirements for Responsible Source for the focal company should be higher than the requirements for the supply chain companies.

The supply chain will be represented as shown in figure 5.

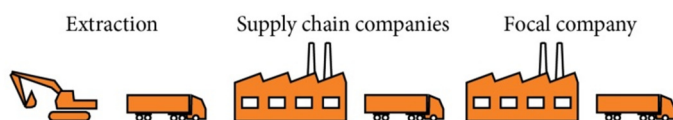


Figure 5. Icons for the supply chain

2.2 Responsibility

Responsibility describes the actions that the involved companies have to undertake, regarding the reduction of environmental, social and societal impacts.

Based on literature and widely accepted certification schemes, a set of ten principles regarding responsibility has been established (figure 6). This gives direction to the assessment regarding the dimensions of responsibility.

	Color:	Principle:	Description:
Environmental	1.1	Minimize pollution	Reduce emissions in air, water and land and reduce the production of wastes [2].
	1.2	Minimize depletion of raw materials and resources	Use of renewable sources within limits of the system and reduce use of non-renewable sources [2].
	1.3	Preserve and protect flora & fauna	Maintain long-term preservation of plant and animal species as well as plant and animal numbers [15].
Social	2.1	Respect the rights of all involved individuals	Respect the human rights of involved individuals and also the labor rights of employees [16].
	2.2	Reduce safety risks	Reduce safety risks for involved individuals and minimize trauma and loss of life [17].
	2.3	Minimize adverse health effects	Reduce physical and mental damage on involved individuals [16, 18].
Societal	3.1	Boost the local community	Be a positive stimulus and give opportunities for the local communities [12].
	3.2	Trade Fairly	Trade in an ethical, fair and open manner [19].
	3.3	Respect private and common property	Avoid conflicts with local communities and offer fair compensation for losses or damage [15].
	3.4	Oppose illegality by third parties	Prevent illegality of third parties that are connected to the company [15].

Figure 6. Principles of responsibility

The environmental principles aim to preserve the natural order and minimize degradation of and impacts on the environment. The social principles aim to protect all individuals that are involved in, or come in contact with the supply chain (e.g. employees, stakeholders and local residents). The societal principles aim to protect the society against unfair practices, and involve them in the production processes [20].

The ten principles are represented in a ring diagram, shown in figure 7.



Figure 7. Icon for the principles of responsibility

2.3 Accountability

Accountability describes the actions that need to be undertaken for each adopted principle of responsibility. Being accountable is substantiating for the processes and impacts, and indicates if and to what extent the adopted principles for responsibility are met. The purpose of substantiation is to achieve a more transparent supply chain and as a result gaining insight into the total impact per material. Based on the analyzed certification schemes, three main steps for accountability are defined (figure 8). Each main step has several sub-steps, which indicate the rigorousness of that particular step. However, one needs to comply with at least the first sub-step in each main step in order to be accountable for that particular principle.

Main step 1: Identify the current situation



- (1a) Identify the current situation/state of responsibility
- (1b) Identify the companies involved in the supply chain
- (1c) Identify the impacts per principle

Main step 2: Manage the processes



- (2a) Establish a policy of improvement
- (2b) Set goals or achieve the demanded requirements
- (2c) Conduct regular audits to reflect on the set goals
- (2d) Monitor the processes and possible impacts

Main step 3: Verify and report about the performances



- (3a) Get certified by an independent body
- (3b) Report the performances per principle to the stakeholders
- (3c) Report the impacts to the stakeholders
- (3d) Ensure company's transparency and accessible publications

Figure 8. Steps of accountability.

The environmental, social and societal impacts need to be identified before they can be addressed. In the first step the current situation (1a), the supply chain companies involved (1b) and impacts per principle (1c) need to be identified. Based on these outcomes, the goals and criteria for the assessment can be set. In the second step a policy for improvement of the current situation needs to be established (2a). By setting goals (2b) there can be more focus regarding the policy. To check if the policy functions properly and goals are being met, the company should conduct regular audits (2c) and monitor the process and impacts (2d). In the third step the data about the performances of the first and second steps need to be made transparent and available to parties involved with the product or process. Otherwise no comparison between companies or products can be made. This is done by getting certified by an independent body (3a), by reporting performances per principle (3b) and impacts (3c) and by ensuring transparency and available publications (3d).

3. Assessment of Responsible Source

The Responsible Source of building materials needs to be assessed in order to compare material choices as done in BREEAM. The Responsible Source depends on the companies in the supply chain that participates in the assessment, which principles of responsibility are applied, and the amount of substantiation that is provided. These three dimensions are visualized as three axes (figure 9).

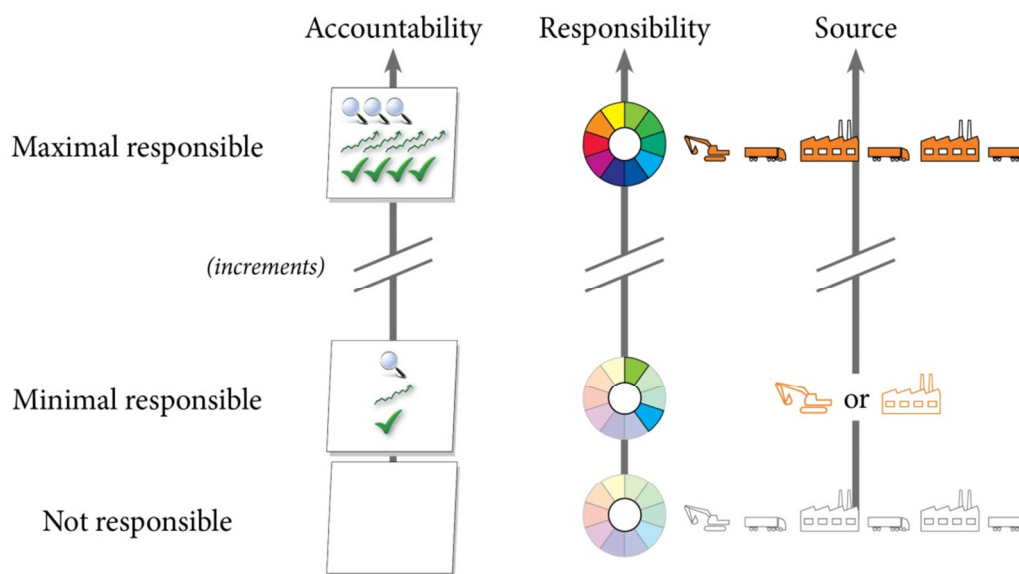


Figure 9. The axes of Responsible Source.

The axes range from not responsible to maximal responsible. Maximal responsible is complying with all the requirements mentioned in the paragraphs Accountability, Responsibility and Source. However, a material is already defined as responsible, when all three dimensions meet the minimum requirement. Minimal responsible requires for accountability the first sub-step in identifying, managing and reporting, for responsibility at least principle 1.1 and 2.1 (following the definition of Responsible Source: damage to the environment and treat people fairly) and for source at least one company in the supply chain.

Between minimal responsible and maximal responsible there is a scope of ranking. Although the three axes do not have a universal unit of measurement, each axis can have certain (albeit not equal) increments by itself.

Source can be divided in the parts of the supply chain that are included in the assessment. Including more suppliers and/or producers in the assessment improves the Responsible Source of a building material. The companies of the supply chain that contributes to the assessment and the rigor of the assessment of involved companies can differ. A material that has all constituent substances traceable back to their origin(s), showing the complete source, has the highest ranking.

In Responsibility the amount of principles that were assessed is counted. The more principles adopted, the more responsibility is taken. Parts of each principle are different actions, which have to be undertaken to achieve the highest ranking. This may differ per industry, company or location, as long as it continue to strive to do better than business as usual [12]. The requirements for the assessment usually vary for different companies in the supply chain and for different certification schemes.

Measuring Accountability should be based on the rigor of substantiating. The rigor of the identification, managing and reporting of the impacts proves the responsibility claims in an increasing manner.

4. Setting tierlevel requirements

The current state-of-the-art for the certification schemes is lower than maximal responsible. Therefore the assessment schemes used in BREEAM need to be analysed to determine a practical level of responsible source for the tierlevels. For the Dutch situation, these are the following:

BES6001	[12]
Cradle to Cradle	[21]
FSC	[15]
ISO14001	[22]
PEFC	[23, 24]
SFI	[25, 26]
TFT	[27, 28]

Figure 10. Certification schemes applied in BREEAM-NL

These certification schemes determine the requirements for Responsibility, Accountability and Source that can be met with the current state-of-the-art in the Netherlands. Based on the performance of FSC, PEFC and BES6001-Excellent (which are the certification schemes with the highest requirements), the requirement for the highest tierlevel (tierlevel 1) have been determined. For the entire supply chain minimal responsible is required and the focal

company needs to comply with 7 principles of responsibility and 3 steps of identifying, 3 steps in managing and 2 steps in reporting (figure 11).

Tierlevel 2, 3 and 4 are evenly distributed between tierlevel 1 and minimal responsible. This results in the requirement for each tierlevel, shown in figure 11. To fill the gap between tierlevel 1 and maximal responsible there is one increment placed above tierlevel 1 called 'exemplary performance'. This tierlevel is not maximal responsible but a next goal where certifying bodies should strive for when improving their assessment scheme. Therefore, in exemplary Performance the axis are still not fully filled in.

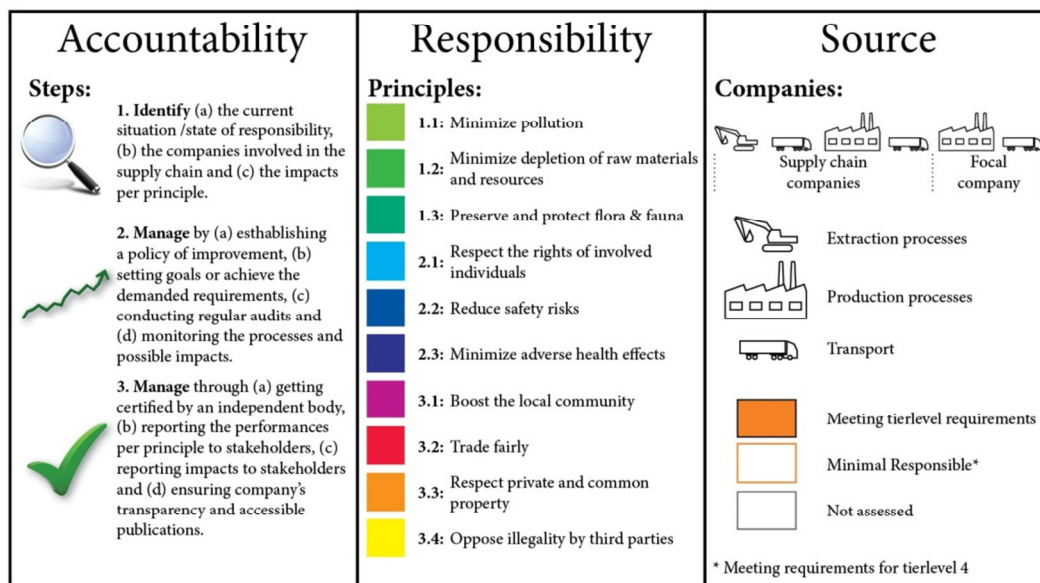
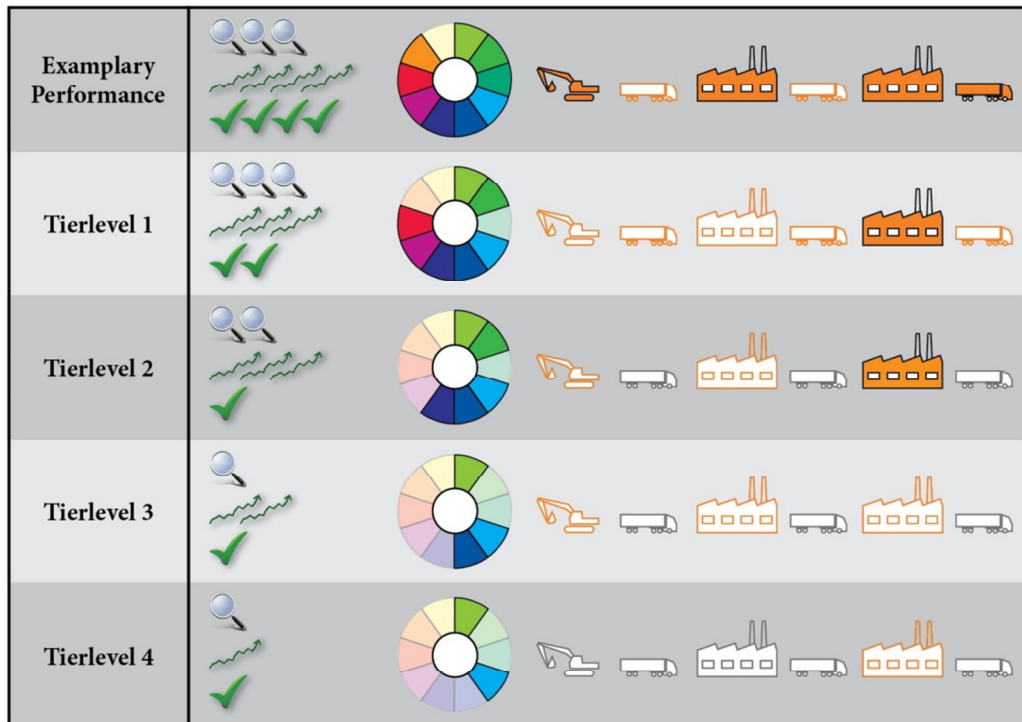


Figure 11. Framework of requirements for assessment schemes in BREEAM.



The framework shows the requirements of assessment schemes per tierlevel. New assessment schemes should be ranked by the administrator of BREEAM on these requirements before placing them in the desired tierlevel. Current assessment schemes in the tierlevel table of BREEAM should be redistributed to comply with this framework.

5. Conclusion

As many building materials and raw materials are traded worldwide, there is a shift of the impacts accompanied with the extraction, production and transport of these materials. It is therefore important to know the Responsible Source so that environmental and social considerations can be embedded into the procurement processes.

However many of the sustainable building assessment methods do not assess the Responsible Source of the used building materials. Only BREEAM and LEED assess Responsible Source, but is still underdeveloped. This is mainly because of ambiguity about the meaning of Responsible Source and the lack of an objective manner the rank certification schemes.

Responsible Source can be divided into three dimensions: Responsibility, Accountability and Source.

- Responsibility explains the actions by which the adverse impacts on people and the environment are reduced. In this research responsibility is divided into three themes: protection of the local environments, individuals and the society. Here ten principles of Responsibility are defined.
- Accountability is substantiating for the processes, impacts and principles, in order to prove that any claims about the responsible source are valid. Three steps of Accountability have been set up: Identify, Manage and Report.
- Source explains which companies in the supply chain need to be assessed. This includes all extraction, production and transport processes from the origin to the procurement for construction of all the constituent substances in a building material.

The three dimensions of Responsible Source each have a level minimum and maximum amount. Between the extremes, increments are defined based on the current certification schemes. The requirements of tierlevel 4 being minimal responsible and the requirements of tierlevel 1 based on the state-of-the-art of the current assessment schemes. The requirements of tierlevel 2 and 3 are evenly distributed between tierlevel 1 and 4. Above tierlevel 1 there is room for another increment called 'exemplary performance', which is used to stimulate improvement of the certification schemes in the future.

With this framework the administrators of BREEAM will be able to objectively rank certification schemes to their correct tierlevel and make it clear what new certification schemes need to comply with in order to reach a desired tierlevel.

This framework is already being integrated in the Dutch situation (BREEAM-NL) and negotiations for adding a few Dutch certification schemes are guided by this framework. And, although a new analysis of the state-of-the-art for other countries might be necessary, this framework can also be used for other countries and for other assessment methods than BREEAM.

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