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Making Sustainability Activities a Key to Your Success From Compliance to Commitment

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Abstract: The demands on companies regarding environmental and social performance is increasing and numerous initiatives have been taken by the European Commission to decrease the environmental impact and improve the resource efficiency and social performance in Europe. In order to turn these demands into an opportunity to benefit from the sustainability work it is necessary to make it a central part of the business idea and allow it to penetrate every part of the organisation. Communication should be based on real achievements and greenwash avoided. Benefits may come from cost savings, increased product value, strengthened value chains both upstream and downstream, co-worker loyalty and improved public relations.

1 Introduction

The general view of what is normal and acceptable changes over time. Half a century ago it was considered normal for each country house to have its own dump in the backyard or in the adjacent forest. It was also considered environmentally friendly to bring stones aboard a leisure sailing boat to ensure that the plastic bags with household waste sunk properly and did not stay floating in the reed. Smoke from the factory stacks was a sign of progress and dilution was the solution.

After imposing laws on municipal garbage collection and a couple of decades with focus on emission control in production facilities the attitude has changed completely. The consumer behaviour could however still be summarised as “buy, wear and throw away” with huge city dumps as a result. A number of directives from the EU stating producer responsibility for recycling of electronic goods, vehicles and packaging paved the way for organized recycling and here also the attitudes have changed and people have learned to separate metals from paper and plastics before throwing it away.

With development of Life Cycle Assessment, LCA, the impact of a product on the environment during its entire life cycle from “cradle to grave” could be studied. A variety of methods were developed with the consequence that results from different studies could not be compared. In the standard ISO 14044 LCA methodology was standardized and a number of issues dealt with but the LCA practitioners still had freedom to make studies in different ways making them difficult to compare.

In 2004 the European Commission, EC, gave the European Standardisation Organisation, CEN, the mandate to develop a standard for environmental impacts from the production of building products. The main objective was to support the EU inner market and to create similar rules for building products throughout Europe. This was the start of the technical committee CEN/TC 350 "Sustainability of Construction Works" [1] and development of a set of standards for the building sector. The committee decided to extend the scope to work with all aspects of sustainability on the building level; environmental, social and economic. The first versions of these standards are now on the market. The scope has also been extended to include civil engineering works and this standard will probably be ready by 2018.

Some of the tools outlined in the standards will probably be necessary for companies to understand and use. This will be in order to comply with regulations or qualify for different kinds of ratings or public procurement schemes. It could also be done to position their products against less environmentally conscious alternatives or as an answer to market demands for information. This work will cost money.

In this plenary paper the question of how tomorrow's successful steel building companies can benefit from their sustainability work is discussed. It is full of references to standards and abbreviations so a look at the lists at the end of the paper might help the reader. It is also important to point out that the paper reflects my personal view of the development within EU and personal experiences from work within European Standardisation. This has affected my choice of examples and there are of course other views.

2 LCA as a Sustainability Tool in today's Standards

2.1 The life cycle

The life cycle of a building consists of several stages shown in fig. 1; production of building products, construction of the building, use of the building, and taking care of the building at the end of life. After the life cycle, benefits or loads that emanate from this life cycle but occur in another life cycle can be noted. An example may be a steel beam where the production is reported in module A for one building can be reused in another building. The principle used in the CEN/TC 350 work is that information from the different modules should be reported separately and not summarised to a total.

An assessment can be of different types depending on its use. For a building material it must include module A1-A3, "cradle to gate", but can as an example include ABC, "cradle to grave", or ABCD which does not have a name in the standard but might be called cradle to cradle.

When making an LCA for a building not yet produced the assessment is made based on scenarios. Examples of scenarios are recurring maintenance, replacement of windows and refurbishment of the entire building. The standard includes necessary rules for service life, functional unit that is assessed etc but the developer has a rather big freedom to develop scenarios and take different factors into account as will be discussed later.

Actual data for environmental impacts from the production process is preferred but database data can be used for upstream and downstream processes and a number of commercial databases exist.

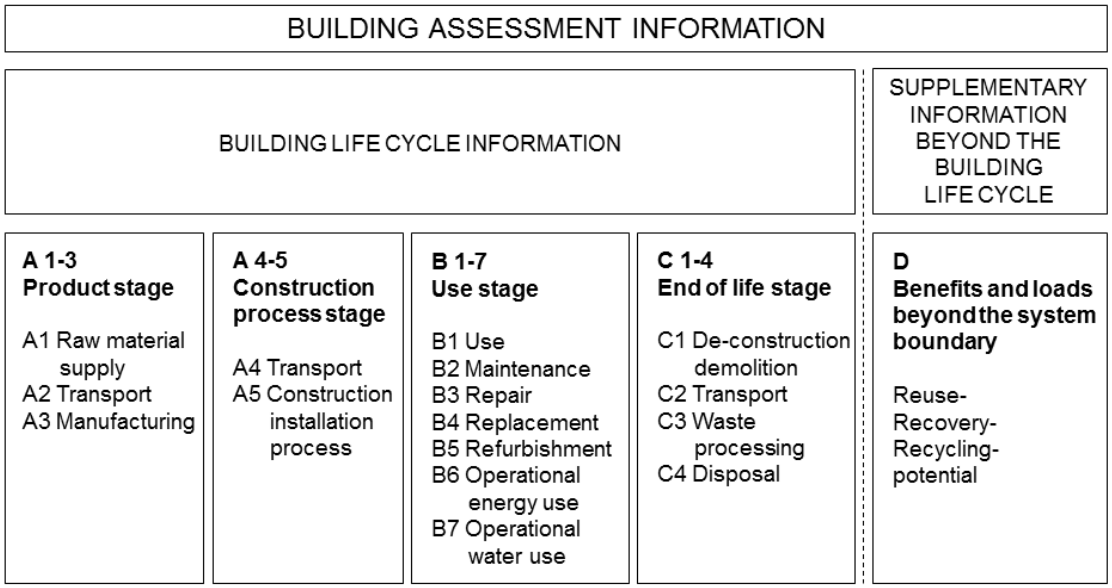

Fig. 1. Modularity for Building Assessment Information used by CEN/TC 350.

There is no limit of the number of environmental impacts that can be taken into account according to CEN/TC 350 standards. These are however mandatory:

- Global warming
- Ozone depletion
- Acidification for soil and water
- Eutrophication (over fertilization of aquatic systems)
- Photochemical ozone creation
- Depletion of abiotic resources-elements
- Depletion of abiotic resources-fossil fuels.

Furthermore, data on resource use should be given:

- Use of renewable and non-renewable primary energy used for raw material or energy
- Use of secondary material
- Use of renewable and non-renewable secondary fuels
- Net use of fresh water.

2.2 Environmental Product Declarations (EPDs) and Product Category Rules (PCRs)

Any company can make an LCA for their products according to ISO 14044. After having it reviewed by a third party for compliance with the standard according to ISO 14025 it can be used in market communication and called an Environmental Product Declaration, EPD. The freedom given by this standard has led to the practice of developing rules on how to apply ISO 14044 for different product categories in order to produce an EPD.

These rules, Product Category Rules or PCR, are administered by certification schemes like "The International EPD System" often called "Environdec" managed by IVL in Sweden, Das Institut Bauen und Umwelt, IBU, in Germany and many more. The different organisations are now working together in the Eco-Platform to make their PCRs coherent so that an EPD based on a PCR in one system is accepted in the other systems. [2]

The CEN/TC 350 standard EN 15804 could be seen as a "super PCR" for building materials that the certification schemes follow when developing their PCRs. The different building materials like concrete, timber and aluminium all have standards developed within the CEN system based on EN 15804 to serve as super PCRs for their respective material. In an initiative from the Nordic Council of Ministers a PCR for constructional steel has been developed but it has no official status.

2.3 The Battle of Materials

Steel, timber and concrete compete as materials for building frames. In standardisation work this becomes obvious as the three industries have completely different interests. Steel together with other metal industries emphasize the benefits of recyclability and as a consequence support the use of Module D and would prefer to have it mandatory. Industries like for example concrete and mineral wool, where the value of recycling is low, would rather be without module D.

Claiming the "polluters pay principle" concrete has advocated waste status for inputs like fly ash, wood chips or used tires. They have also claimed allocation principles for a co-product like blast furnace slag that are favourable for them. Another important issue for the concrete industry is carbonisation, the CO_2 uptake in concrete. By this way of counting it is possible to claim that concrete can be produced and used with very small emissions of Green House Gases, GHG. This will however, in the future, depend on how end of waste criteria are interpreted, on how the steel industry treats slag and on scientific results for carbonatisation.

The most important factor for the forest industry seems to have been the CO_2 storage. If module D is not taken into account the GHG-emissions from wood is negative which is reasonable if it is stored in eternity after its use. The normal recycling principle for wood is however incineration where the CO_2 is again emitted.

2.4. Social and Economic Factors

The standard for social methods today covers only the use stage and handles soft values like apprehension of safety, accessibility and indoor climate. The standard for economic methods covers the calculation of Life Cycle Cost, LCC.

Even if the CEN/TC 350 standards cover all three aspects of sustainability the standards are not totally coherent and we will have to wait until after the first revision of the standards before this can be achieved. In the standard for civil engineering under way the three are treated in the same standard which may facilitate a better integration.

3 Trends in Sustainability Demands and its Impact on Standards

3.1 Development Work in Standardization

The most important standard in environmental work is probably the ISO 14000-series for environmental management systems. In the imminent next revision of the standard the life cycle thinking is emphasized and we might see LCA as a tool for continuous improvement of a company's products [3]. This is probably a very good application for LCA but will increase the demands on LCA skills and awareness in the entire organisation.

The EC puts strong pressure on CEN/TC 350 to add a number of impact categories to the environmental standards. At present a technical report is being developed covering methods for:

- Human toxicity (cancer and non-cancer effects)
- Eco toxicity (terrestrial, freshwater and marine)
- Particulate matter formation, ionising radiation (human health and ecosystem health)
- Land use (occupation and transformation)
- Biodiversity
- Water scarcity

Criticism against introduction of these impact categories are for example that methods for toxicity lack assessed data for metals and that they are not suited for LCA since they are based on risk and not impact and for land use that it is local to its nature etc. What will happen in the field of additional indicators will be decided in the near future.

In order to make the standards coherent another technical report is under development investigating methods for social aspects on the modules A, C and D. The work is still in an early stage but responsible sourcing of raw materials, noise and disturbance of ordinary life might be topics that will be covered.

3.2 EC - PEF, Circular Economy and Construction Demolition Waste

As stated before the EC is very active in the sustainability field. The inner market and removal of environmentally motivated trade barriers is a major goal as well as is boosting the sustainability work as such. The number of initiatives is impressive. Sometimes it seems that the commission is moving a little too fast and needs to slow down. Not all initiatives succeed but the direction is stable and the signal sent to governments, companies and people in general is clear: we must decrease our environmental footprint.

The Product Environmental Footprint, PEF, aims at an EPD system for consumer products within the EU [4]. It is developed by the EU Joint Research Centre, JRC in Ispra and the industry participates in different pilot projects. The metals industries have for example contributed with the development of a PCR for metal sheet. A result that can be expected from PEF is that it becomes evident that LCA is a necessary tool for companies to use in order to show the environmental properties of their products in the future.

A recent initiative covering the cyclic economy is just starting up. Where it will end is too early to say but one might expect that renewable materials and material reuse and recycling with very small losses in mass and function will be important. The Construction Demolition Waste, CDW, work is more substantial [6]. So far, all member countries have reviewed amounts of CDW and the recovery rate and published these in a set of reports. It is reasonable to believe that this interest will strengthen the position of module D and eventually make it mandatory in all EPDs. Another initiative that will affect the industry is the “Efficient Buildings” study to develop a common EU framework of indicators to assess the environmental performance of buildings.[7]

3.3 Greenwash Awareness

A recent trend is the public awareness of unfounded claims of sustainability from companies. An example is “The Swedish Greenwash Price” funded by the Swedish government but awarded by an NGO. An example of an award is the Swedish-Finnish forestry company Stora

Enso that "won" the price in 2012 after publicity concerning child labour and threatening biodiversity by turning rain forests into Eucalyptus farms which contradicted claims of being a sustainable company. The Chief Executive Officer, CEO, now declares that the company will change and from now on intend to be a good example to others [8]. Similar examples exist from other industries.

Another example of claims that add ridicule to the issuer can be fetched from England. Rumours have it that there is an office building in London that was not possible to reach by bicycle but had bicycle racks since it gave "inexpensive" points in the rating system for sustainability that was used.

With increased knowledge about LCA and with EPDs as a common way to communicate, we might see a much more agile consumer market in the future. A market that scrutinizes the claims and questions assumptions in the search for greenwash in EPDs will lead to a more careful use by issuing companies.

3.4 Towards Sustainability Product Declarations, SPDs

A final observation is that social issues today are mentioned together with environmental impacts like in the Stora Enso case above. With standards that cover environmental impacts together with social and economic issues, it is not farfetched to assume that we in the future will have something called Sustainability Product Declaration, SPD, as an alternative to EPD.

4 Success in the Steel Building Business

4.1 Sustainability Work in a Steel Construction Company

Although we do not know how the interpretation of Life Cycle thinking in the revised standard for environmental management, ISO 14001, will be, we can assume that it will have much in common with the development of EPDs in most companies. One possibility is that the EPD forms a base line that can be compared with the actual values obtained in the LCA from the environmental management system.

Working with LCA methodology in continuous improvement will certainly take corporate sustainability work to a new level but also raise some questions. One which is important for steel construction is how to deal with variations in the ratio between steel from scrap and steel from ore since replacement of efficiently produced virgin steel with inefficiently produced steel from scrap would show a decrease in GHG emissions but would not represent an improvement in a wider sense.

Examples of areas for continuous improvement for a steel construction company are:

1. Sourcing of raw materials from a supply chain striving for best practice reported in module A1-A3.
2. Transport to building site reported in module A4
3. Yield in raw material use reported in module A5
4. Yield in raw material recycling from the construction site including the quality of material to recycling reported in module A5.

The first point requires data that to a large extent comes from steel producers which means that they need EPDs for their products. An interesting question is how different steel qualities

should be treated since they have different environmental impacts but are reported together in a common EPD. Examples are steels that are covered by the same EPD but differ in alloy content, working process or heat treatment resulting in different technical properties and different environmental impacts.

4.2 Steel Constructions Competing with Other Construction Types

Steel has a number of properties that makes it different from other materials and part of the success is to identify and communicate them with good arguments. The following three points are examples of claims that a steel construction company can make when steel competes with other materials.

- **Construction and deconstruction with steel is fast and silent.** The fact that steel is relatively light in weight means less transport which should be noted in module B4. Steel sections can be produced elsewhere and transported to the construction site. This means that construction and deconstruction can be done with a low noise level and with little disturbance to ordinary life which is an important social factor.
- **Steel constructions are inorganic and not hygroscopic.** This means that steel does not rot and takes little time to dry up which are important properties in case of water leakages and possible consequences of a more humid climate. In module B3 repair, B4 replacement and B5 refurbishment this information could be included in the LCA scenarios. It is also possible that it affects the service life time. These properties could also be reflected in the social impact "indoor climate" especially considering airtight houses.
- **Steel is 100% recyclable to the same quality or better.** This claim will probably meet more understanding in the future according to the trends outlined above. It should be noted in module D.

Making claims like this must be backed up by hard facts. It can be measurements made by the company or results from research on these issues where the companies take part. The ISO 14000-standards ask for improvements. Is it possible to make the building process smoother with less noise? Is it possible to further increase the buildings' robustness against water by changing accompanying materials, methods or design? And finally, is it possible to improve the recycling rate and decrease quality and material losses in steel recycling?

The three characteristics above have that in common that they are typical for steel and won't be mentioned by companies working with competing materials. It is therefore an important task to communicate the advantages in a way that customers or end users will start asking all suppliers on the market for the information.

4.3 Benefits and Success Factors

The benefits from successful work improving environmental and social performance may be manifold as is shown in the three examples below that result in improved revenues and/or reduced costs.

- **Strengthening steel as an attractive construction material by setting the agenda:** Some of the strong arguments for steel presented above are not really effective since they are not reported by other materials or requested by customers. An active role in sustainability development gives the opportunity to set the agenda and create a demand for information about for example disturbance, noise, robustness and recycling.

- **Strengthened relations with employees, suppliers and existing and potential customers:** A company that take leadership in sustainability development becomes a more attractive employer or business partner. The benefits come from the fact that it is easier to attract skilled people and keep them, and commercial contacts can start from existing relationships based on cooperation and trust which reduces communication problems.
- **Improved resource efficiency:** Improving yields in production, lean design etc may lead to decreased material use. This is perhaps the benefit that is easiest to measure.

It is possible to make a long list of factors that supports success and some examples are suggested below.

- **Credibility based on leadership:** Credibility is perhaps the most important asset in a change process where many people are involved. Commitment and leadership in creating supply chains and solutions with the lowest possible environmental impacts and good social performance forms the basis for credibility and trust.
- **Participation in-house, upstream and downstream:** The entire organisation must be involved and committed in the work together with all parts of the supply chain to the end user.
- **Efficiency in reporting systems:** Collecting data for LCA and EPD work is time consuming and costly. However, most of the data can be retrieved from internal systems
- **Continuous improvement:** Change takes time. Especially if many people are involved. A trick is to start simple and then improve and extend the scope and let the work mature slowly. The most important is to start as soon as possible to take the initiative.
- **Efficient communication channels:** Finally, internal and external communication channels must be developed to communicate sustainability information in a way that is possible to understand for all concerned.

5 Discussion

The days are gone when people saw earth as something that could be consumed. Today we are entering an era where companies are required to take responsibility for their products from raw material to recycled material. There are also signs that we are about to leave a period where companies can claim superiority in the field of sustainability by just applying immature metrics on what they already do. We have to assume a common mind set where people expect companies to have full knowledge of their supply chain and their environmental and social performance and to take measures to continuously improve the situation.

Sustainability work is time consuming and costly even for very big companies. For smaller companies it is probably only possible to take leadership if the work is developed within existing business processes. It must be handled in the same way as other management systems like quality and working environment/safety. Having a goal or vision is crucial, skills are necessary and starting a must. In my mind there is no success possible in sheer compliance. Commitment and leadership is necessary in order to benefit from your sustainability work.

Some information needed for module B, C and D discussed above must be investigated further and collected for use in LCA scenarios. This opens for joint research programs within the steel construction community and in the entire construction field.

This paper has referred to standards and they reflect in many ways the state of the art of application of methods and affect how these methods are used in the future. It is therefore important to understand the political dimension of standardisation. Standards are normally developed by scientists with strong influence from stakeholders who advocate interpretations of the scientific methods that in different ways are favourable to the stakeholders' interests. In a process where the aim is to simplify and to reduce the freedom in how you produce an LCA many opportunities to support such self-interest exist. The only long term remedy is to be present in the work and support solutions that are fair and can be accepted by all parties, and of course, to act from a position of trust and credibility.

6 Conclusions

This paper has concluded that a successful company working with steel construction is expected by its customers and end users to have full knowledge of their supply chain and their environmental and social performance and to take measures to continuously improve the situation. Furthermore it has been concluded that steel has many advantages that will not show in sustainability assessments unless this kind of information is asked for. This can only be achieved if steel construction companies have the credibility that let them affect or even set the agenda for sustainability discussions.

Standards mentioned in text

ISO 14001:2004	Environmental Management Systems
ISO 14044:2006	Environmental management -- Life cycle assessment -- Requirements and guidelines
ISO 14025:2006	Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures
EN 15804:2012	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
EN 15978:2011	Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method
EN 16309:2014	Sustainability of construction works - Assessment of social performance of buildings - Calculation methodology
EN 16627:2015	Sustainability of construction works. Assessment of economic performance of buildings - Calculation methods

Abbreviations used in text

CDW	Construction Demolition Waste
CEN	European Committee for Standardization
CEO	Chief Executive Officer
EPD	Environmental Product Declaration
GHG	Green House Gases
IBU	Institut Bauen und Umwelt e.V.
IVL	IVL Swedish Environmental Research Institute
LCA	Life Cycle Assessment
LCC	Life Cycle Cost
NGO	Non-Governmental Organisation
PCR	Product Category Rules
PEF	Product Environmental Footprint
SPD	Sustainability Product Declaration

References

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Svenska Dagbladet Näringsliv 2015-07-21 (In Swedish)