VinylPlus® and the VinylPlus Product Label. Could the industry label be integrated into independent sustainability certification schemes?

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Abstract. In building & construction (B&C), polymeric materials are being used for roofing and waterproofing membranes, coated fabrics (“textile architecture”), window profiles, electrical installation, flooring, pipes, etc. The most widely used plastic for such long-life applications in B&C is Vinyl (PVC). VinylPlus is the value chain’s commitment for sustainable development. The voluntary commitment has a track record with publicly available progress reports, based on third party auditing and monitoring since 2001. More recently: After having substituted certain additives such as lead compounds, that had previously been used as stabilizers, and after abandoning mercury cell technology, VinylPlus is addressing further needs of the sustainability communities, e.g. by zooming in on additives and complementing standard LCA requirements. The VinylPlus voluntary commitment for sustainable development has been developing an additives sustainability footprint (ASF) and a set of criteria for its product label. The scope and the current status of those tools will be presented and examples be given in order to document the relevance of those efforts. The information given is intended to fuel the discussion on how can / to which extent should those value chain commitments be integrated into existing sustainability.

1. Sustainability principles and assessment methodologies

The contemporary concept of sustainable development evolved progressively from growing awareness of the interdependence of social and economic progress with the supporting environment. Development of the concept culminated in 1987 with the UN's report Our Common Future (World Commission on Environment and Development, 1987), also known as the ‘Brundtland Report’, which introduced the most widely recognised definition: “…development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.

New or amended definitions of sustainable development have continued to proliferate, and regulatory instruments and management tools have increasingly sought to integrate the concept into operational norms.

The UN's consensual 17 Sustainable Development Goals (SDGs², United Nations, 2016) make a welcome addition to considering the limitations in the sustainable development narrative. The SDGs succeed in re-focusing attention on a linked set of human needs aimed at “Meeting citizens' aspirations for peace, prosperity, and wellbeing, and to preserve our planet”. The SDGs have to be understood in a systemic context, addressing all goals as an inherently interconnected set. The SDGs also provide a framework for assessment of progress towards a more sustainable future. Such a framework avoids a
company, value chain or other institution to fall into the trap of selecting just a few goals in a given sector.

A comprehensive review of sustainability assessment schemes is obviously impossible within the limited size of the present paper. We will therefore briefly mention a few particularly relevant for the construction industry and/or the VinylPlus sustainability programme.

1.1. Sustainability assessment methodologies relevant for VinylPlus

In view of the wide use of vinyl products in construction applications, it is worthwhile mentioning the most widely used building rating systems in Europe such as the Leadership in Energy and Environmental Design (LEED) developed by the U.S. Green Building Council (USGBC), BREEAM (the Building Research Establishment Environmental Assessment Method) and the rating system developed by the German Sustainable Building Council (DGNB).

Those methodologies focus essentially on the sustainability of entire buildings—but not to the same extent on the sustainable production of individual building elements. Unless there are established sustainability labels, e.g. FSC for timber, on the elements and materials level the predominant schemes build on the ecological characterization of products.

The analysis of upcoming and/or commercially less relevant sustainability rating systems is not within the scope of this paper.

The Cradle to Cradle methodology (C2C) has its own set of aspirational principles and terminology, which is sometimes presented as an alternative model to sustainability and a foundation for the circular economy. Its essential reliance on chemical hazard of substances, embodied in its Banned List of Chemicals, does not however consider impacts during product use, nor the contribution of chemicals to product functionality.

Transitioning to a sustainable society is obviously a complex endeavour, requiring, e.g., extensive coordinated collaboration across disciplines and sectors. How can humanity hope to succeed with this without having a unifying and operational definition of sustainability, and a systematic approach to planning and acting for the fulfilment of it? In response to this problem, a consensus process aiming at developing such a definition and approach began in Sweden in the early 1990s and the result is now widely known as the Framework for Strategic Sustainable Development (FSSD). This scrutiny also involves a kind of modelling where scientists study contemporary sustainability issues and test whether they are all covered, and can be clustered under the different sustainability principles. Forecasting and backcasting represent two major approaches to support planning and decision making. Forecasting is often used in attempts to predict and solve problems but is not appropriate when planning for long term and novel goals in complex systems and when the dominating trends are themselves a main part of the problem. For such planning endeavours, backcasting is a more appropriate approach. Backcasting begins by defining the vision, and then asks: what shall we do today and subsequently to get there?

This was one of the main reasons why the European PVC industry called on the expertise of The Natural Step (TNS). TNS approach relies on the backcasting approach and is based on four basic rules defining success (sustainability principles). According to these principles, in a sustainability society, nature is not subject to systematically increasing concentrations of substances from the earth’s crust, concentrations of substances produced by society, and degradation of physical means. In that society, there are no structural obstacles to people’s health, influence, competence, impartiality and meaning.

2. VinylPlus’s approach to sustainable development

“The sustainable use of (sustainable) chemicals aims at providing socially necessary products while minimizing resource consumption, reducing substance losses and controlling exposures by corporate, design oriented, organizational and technical means and at the same time enhancing healthy workplaces and fair social conditions.”

Already in 2000 the entire European PVC industry value chain—resin manufacturers, converters and additive producers—launched the voluntary commitment Vinyl 2010. This 10-year programme marked a leap in the PVC industry’s journey towards sustainability. Despite a financial crisis and a much-
enlarged target area due to the addition of EU member states, all goals were met and in some instances even exceeded.

Building on the achievements of Vinyl 2010, the partners decided to launch a new 10-year voluntary commitment, VinylPlus, undersigned in June 2011. First, a fundamental assessment of the sustainability aspects of PVC was conducted and it became logical to involve The Natural Step since the NGO also has a clear vision of a sustainable society and a history of working with PVC-related issues. As a ‘critical friend’ of the industry, TNS became involved in laying out the basic principles. The VinylPlus programme builds on The Natural Step’s well-recognized science-based framework System Conditions for a Sustainable Society. For PVC, five challenges were identified that form the core of VinylPlus:

#1 Controlled loop management, with an ambitious target of recycling 800,000 tons of PVC waste per year by 2020.
#2 Organo-Chlorine Emissions, addressing concerns about the undesired release of chlorinated organic substances from the whole life cycle of PVC to avoid any systematic increase of any concentrations in nature.
#3 Sustainable Use of Additives: An essential component of PVC products, additives should also be used in sustainable way in order to secure alignment with the TNS sustainability principles.
#4 Sustainable Energy & Climate Stability, which entails minimising climate impacts through the reduction of energy and raw material consumption.
#5 Sustainability Awareness by which VinylPlus commits to building sustainability awareness across the value chain, including stakeholders inside and outside the industry. Its targets include, but are not limited to, developing a VinylPlus Product Label, and promoting VinylPlus’ sustainability principles to the audiences outside EU28.

In addition, the VinylPlus programme took over from the earlier Vinyl 2010 operational features ensuring transparency and accountability:

- An independent monitoring committee with representatives of the European Parliament and Commission, trade unions, retailers and consumer organisations oversees its progress.
- VinylPlus publishes every year a progress report which is independently audited and verified.

The VinylPlus programme plays a role in the overall progress towards sustainability by contributing to many of the 17 goals identified by the UN Sustainable Development Goals, in particular by minimizing impacts, while contributing to economic growth with suitable products for infrastructure and smarter cities (SDGs 7, 8, 9, 11, 12, 13, 17). It is also worth mentioning that VinylPlus has been a member of the Green Industry Platform since 2013, a global partnership led by the United Nations Industrial Development Organization (UNIDO) and the UN Environment Platform Programme (UNEP).

3. The VinylPlus Product Label

The development of a VinylPlus Product Label was one of the key targets of VinylPlus Challenge #5. The VinylPlus Product Label is a multi-criteria, third-party sustainability certification scheme. As other schemes, it has been created with the intent to shift the market preference towards the supply and demand of products with superior sustainability performance. Manufacturers of certified products can communicate these certifications to the downstream actors via a product label. For the buyers of such products, such label provides a simple way to convey information helping to select the products with best sustainability performance.

Voluntary certification schemes can be described and analysed using the tripartite standard regime framework developed by Busch. In this framework, a scheme is characterized in three dimensions by Governance, Standard and Certification.
Governance tells how the scheme is owned and managed, how the auditors are accredited, how the engagement with stakeholders is organized, and how the scheme’s activities and performance are communicated. All these elements drive the scheme’s legitimacy.

The VinylPlus Product Label scheme is owned by VinylPlus but is operated and developed together with the Building Research Establishment (BRE) and TNS. As both organizations are independent from the vinyl industry, the scheme can be considered as a multi-stakeholder initiative. As an important part of requirements are taken from the BES 6001 standard created by BRE, the third party audits have been run so far by BRE. With the recent recognition of the scheme by Accredia, the Italian accreditation body, and the expected recognition of the scheme by the 35 other members of the European cooperation for accreditation (EA), the audits will be run in a near future by properly trained auditors from ISO 17065 certification bodies specifically accredited for the scheme by government bodies. Auditors for many of the other environmental or sustainability schemes are certified by the scheme owner. Criteria revisions and developments of the VinylPlus label are open to all relevant stakeholders through a procedure available on the website of the scheme. All activities related to the scheme can be consulted at any time and any one on this website.

The second dimension of the framework is Standard, which describes the set of requirements and criteria that are set in the scheme. These elements directly impact the effectiveness of the scheme.

The VinylPlus Product Label scheme includes 18 requirements. 11 requirements are based on the VinylPlus challenges defined by TNS, based on a science-based definition of sustainability. They cover topics like recycling and building controlled loops, using the PVC resin and additives sustainably, committing to energy efficiency and internally and externally communicating to raise sustainability awareness. The other requirements are taken from BES 6001, the Framework Standard Responsible Sourcing developed by BRE.

Responsible sourcing of construction products offers a way to improve the implementation and traceability of sustainability objectives throughout the project supply-chain. BES 6001 scheme is more comprehensive than chains of custody schemes such as Forest Stewardship Council or managerial systems such as ISO 14001. BES 6001 includes a series of organisational management, supply chain management and environmental and social requirements; it covers legal compliance, management systems, traceability and more specific aspects such as waste management, transport impacts and life-cycle assessment. For each of the 18 requirements, a set of specific criteria is defined against which achievement can be scored; there is each time a threshold level of achievement which acts as a barrier to entry.

The third dimension of the framework is Certification, which describes the audit and certification processes and procedures. These elements impact the efficiency of the scheme.

By making use of the documents available on the website, any manufacturer of a PVC construction product can first determine if its product could be appropriate for certification. If this self-test reveals that threshold levels have been achieved for all requirements, the applying organisation sends its application online. VinylPlus then does a first conformity check and acknowledges reception of the application.

The audit is then prepared together with the auditor selected by the applicant among trained and accredited auditors. Once all the requested information has been gathered by the applicant, the auditor undertakes a pre-assessment. If this pre-assessment is positive, an on-site audit is performed by the auditor to collect additional pieces of evidence of conformity.

A detailed performance report is then prepared by the auditor. If required evidence is missing, the applicant has one year to fill any conformity gap. After all evidence has been gathered, the performance report is verified by BRE and additional inputs from the applicant may be requested. Once verified, the report is transmitted to VinylPlus. If the audit process is successful, VinylPlus grants a label certificate valid for 2 years. After this period, the certification needs to be renewed following the same process.

As of end of February 2019, 33 PVC window profiles manufactured in 11 manufacturing sites in 10 European countries have been certified. The scheme is now being open to all PVC building and constructions products as defined in the EU Construction Products Regulation.
Figure 1. The visual design of the VinylPlus Product Label is protected as an internationally registered trademark of VinylPlus®. The mark consists of the stylized blue word "VINYL" in the middle of a green outlined teardrop-shaped leaf design and the stylized white wording "VERIFIED" in the middle of a green banner design.

4. The Additives Sustainability Footprint
The VinylPlus Challenge #3 recognises the sustainable use of additives as a key challenge. Sustainable use should not only account for the intrinsic properties of additive substances but also considers the risks and positive benefits within the full societal life cycle context of the PVC articles into which they are incorporated, based on the TNS science-based definition of sustainability.

Existing schemes for assessment of chemical sustainability differ significantly in definitions of objective, interpretation and scope. Many such schemes concentrate on intrinsic chemical properties and particularly potential hazard27. Regulatory mechanisms and management tools such as the REACH Regulation predominantly focus on hazard reduction or elimination. Risk assessment integrates hazard with potential exposure28.

Both approaches—hazard and risk—fail to account for wider sustainability issues related to sourcing, production and application of chemicals, their interaction with products within which they may be used and their fate at or beyond end-of-life. Life Cycle Assessment (LCA) measures some of these aspects, using well-established environmental impact categories such as global warming potential, eutrophication, different aspects of ecotoxicity and ozone-forming potential29. Yet, models used to assess life cycle impact differ from each other in basic principles, scope and outcomes, potentially omitting impacts of chemical emissions and making different approaches hard to reconcile30. Lack of social considerations in conventional LCA has been acknowledged as a deficiency, and the SETAC/UNEP Social Life Cycle Assessment model is working to include social impacts as a more useful tool in progress towards sustainable development31.

The European Commission is developing a Product Environmental Footprint (PEF) methodology for potential application to all products on the European market32. It remains unclear when or if this methodology will be used or be applied to any important PVC construction products (e.g. window profiles).

The Additive Sustainability Footprint (ASF) tool has been developed by VinylPlus since none of the REACH, LCAs, and PEFs initiatives, taken alone, can account for the roles and behaviours of the additives as functional constituents of complex products. None of these initiatives accounts for the wider context of sustainability as articulated by the TNS System Conditions. None accounts for positive benefits arising from the functional contributions of additives, enabling articles to address the meeting of human needs on a potentially sustainable basis.

The ASF uses the Sustainability Life Cycle Assessment (SLCA) approach developed by TNS (Lundholm et al., 200833 and 201134). This life cycle assessment methodology implements the TNS FSSD within the ISO 1404X-compliant LCA methods35. SLCA addresses strategic pathways towards full sustainability based on the FSSD, rather than focusing on specific known problems36. SLCA has been applied in various operational contexts, including for example to paints37.

The ASF development follows the ten-step SLCA approach consistent with established LCA protocols:

1. **Setting goal and scope** establishes vision and meaning about the sustainable use of additives.
   The agreed vision statement wording based on TNS criteria was:
   - Additives are sustainably produced using materials that are responsibly sourced.
   - Additives support the sustainable management of PVC products (e.g. safe and recyclable).
   - The functional benefits of additives enable PVC products to support sustainable development (e.g. meeting the UN Sustainable Goals)
2. **Creating a shared definition of the sustainable product system** entails agreement on success criteria for sustainable use of additives across each of the life cycle stages based on TNS sustainability principles;

3. **Setting system boundaries** establishes de minimis additive concentrations and other aspects of the life cycle such as aligning with assumptions in the published EPD and other protocols used by the industry, as well as agreement on guiding principles;

4. **Inventory analysis** collects information relevant to addressing the social and environmental criteria covered by questions in Step 6;

5. **Sustainability assessment** uses TNS System Conditions to assess sustainability strengths and weaknesses;

6. **Identify key impact areas** entails answering sustainability-relevant questions for each combination of TNS System Condition and life cycle stage;

7. **Brainstorm possible solutions** considers options to address ‘sustainability hotspots’ highlighted in Step 6;

8. **Prioritise solutions** prioritises optimal solutions to address ‘sustainability hotspots’;

9. **Create an innovation roadmap** entails taking innovations through to measurable actions; and

10. **Measure and report progress** includes as a useful output a summary ‘Snapshot report’ comprising a description that an ASF has been performed, an explanation of the process of the study, a link to further contact and other information, verification by those behind the study, and the insights and recommendations that arose from the process.

A pilot implementation of the method to the additives of a generic PVC window profile has demonstrated that the ASF method is workable, robustly founded on science-based sustainability principles, makes use of pre-existing assessments in addition to novel social and environmental criteria comprising a broader picture of necessary conditions of sustainability, and takes account of multiple dimensions associated with the sustainable use of additives throughout the full societal life cycle of the articles into which they are incorporated.

Development is ongoing to develop an online version of the ASF tool now the basic protocols are tested, with auto-filling of generic information for some implementations of ASF, making assessment easier, quicker and cheaper. The online tool can also serve as a vehicle for publishing outcomes whilst protecting commercially sensitive inputs.

5. **Conclusion, outlook and vision**

The unique value chain approach of VinylPlus, its wide range of targets to enhance the sustainability of PVC, and the concrete tools it has developed, such as its product label and additives sustainability footprint, are mentioned by policy makers as a kind of role model. For example, an EU Commission director stated that “VinylPlus can be considered as a frontrunner for the circular economy”38. It is particularly this toolbox, that positions VinylPlus as a valuable partner for stakeholders developing and implementing policies aiming at a more sustainable European industry, especially the construction industry.

In a nutshell, the VinylPlus Product Label is a document of responsible sourcing of feedstock—e.g. no mercury cell technology used; it is a proof of the absence/substitution of certain additives—such as lead compounds that had previously been used as stabilizers; and last but not least the Vinyl Plus Product Label stands for controlled loop and traceability—in order to guarantee the highest possible recycling level after decades of a product’s useful service life.

The instruments of product label and additives sustainability footprint AFS allow for an easy discrimination between material grades and consequently of product sustainability levels. The label should thus be considered for direct integration into existing and future building sustainability schemes.

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