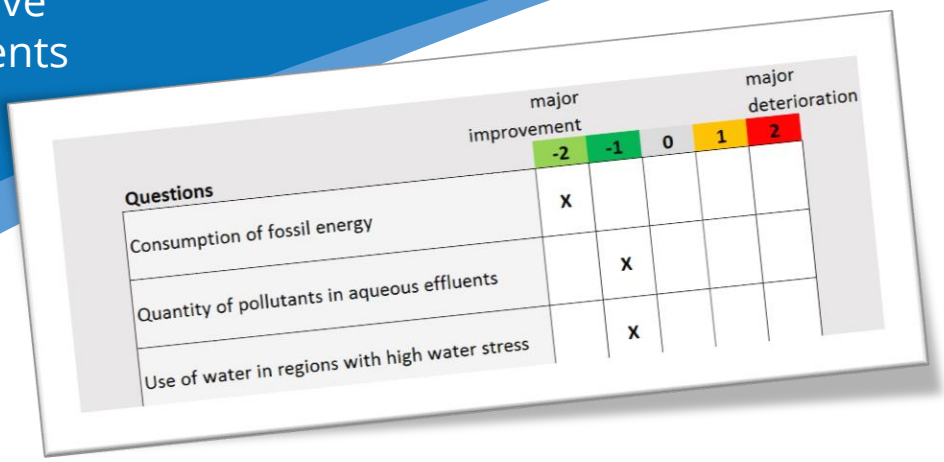
Simple, but not Simplistic

Challenges for qualitative sustainability assessments



Questions	major improvement -2	-1	0	1	major deterioration 2
Consumption of fossil energy	X				
Quantity of pollutants in aqueous effluents		X			
Use of water in regions with high water stress		X			

At the early stage of projects, process industry organisations, such as Solvay and Tata Steel, have found value in using *simple* qualitative screening tools to identify sustainability implications of their development options.

The qualitative approach, defined for the *STYLE scenario**, addresses the need to bring sustainability into early stage process development, when there is more "design freedom" and the opportunity to have a more significant impact on the final process. These tools can also stimulate project members to think about sustainability in ways they may not have considered before (*e.g. Instead of selling this product, can we lease it to customers? Can we avoid manufacturing routes which produce intermediates that are classified as harmful to human health?*).

Issues

- It can be difficult to balance keeping the tool 'simple', whilst still providing sufficient coverage of the three pillars of sustainability.
- Questionnaires tend to be specific to a sector or align with a company's own priorities, so are harder to transfer to different process sectors.
- Answering specific sustainability questions can be harder than listing materials used in a product – ie energy/mass balances can be straight-forward data collection exercises, whereas answering a qualitative question often requires a degree of subjectivity and thus prior knowledge of the subject. It is also not straightforward to write a question that everyone in a project team will interpret in the same way.

Recommendations

- A general cross-sector tool could be developed, but sustainability experts should set up the tool for different organisations (either internal or sector-specific setup).
- Documentation should explain the concepts and methodologies used in the tools, to help non-experts understand why some questions are important, leading to better-considered design choices. Training of up to half a day is a reasonable prerequisite for using such tools.
- Questions should be specific and use clearly-defined concepts, focusing on technological aspects rather than sustainability terminology, e.g. "*Will this reduce emissions of organic material to water?*", rather than asking about "*impact on freshwater eutrophication potential*"

For more information see www.spire2030.eu/style

***STYLE Scenario**: A project team is evaluating options for a resource or energy improvement for their process or product and they need a pragmatic tool to check the broader sustainability implications of each technological solution*

European Commission

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STYLE

SUSTAINABILITY TOOLKIT FOR EASY LIFE-CYCLE EVALUATION

SPIRE PROJECT

Working with Industrial Realities

Providing day-to-day value for industry project teams

Context

The *STYLE scenario** focuses on engaging process industry project teams. These can consist of scientists and engineers from research, development and manufacturing areas, facilitated by a project manager with input from other business areas. These are crucial people to engage in sustainability thinking, as they are in a position to influence sustainability with their development decisions. However, sustainability is often not their top priority, with issues such as short-term manufacturing troubleshooting taking precedent. If an organisation has sustainability specialists, they are rarely present in every project team, and many smaller organisations will not have someone dedicated to sustainability at all. The challenge is to find sustainability evaluation tools that project teams find value in using on a day-to-day basis.

Issues

- Many sustainability tools use terminology and concepts which are difficult to interpret by non-specialists.
- Tools can be very time consuming to use, so are seen as an unnecessary extra burden on a project team.
- Lack of calculations transparency in some tools limit teams being able to identify where improvements in the process can be made.
- Data availability is often low in early-stage process development.

Recommendations

- Qualitative, questionnaire based evaluation tools can be used in early-stage process development, limiting requirements for data and keeping the evaluations to a manageable duration.
- Tools for non-specialists require supporting documentation and fast-track training to explain the sustainability topics involved.
- Questionnaire based tools can be used in project team meetings to bring together those from different disciplines, and can help shape a collective 'success criteria' for the project, e.g. input from Purchasing staff may highlight the need to avoid use of a scarce resource.

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SUSTAINABILITY TOOLKIT FOR EASY LIFE-CYCLE EVALUATION

SPIRE PROJECT

Transparency

Acknowledging limitations to move forward

3.1 CO_2 upstream and own operations

Calculated by multiplying the tonnes of absolute gross CO_2 emissions by USD 29 (CHF 28). This figure was derived using the assumptions below.

The amount of CO_2 considered corresponds to our absolute gross emissions (Scope 1, 2 and 3) over a full calendar year. The total tonnes (t) of CO_2 are multiplied by its societal value, which we assumed to be 29 USD/tonne in 2015.

We acknowledge that there are a large range of estimates of the CO_2 societal value. We based our figure on a combination of reports, including the Stern report (assuming 25 USD/t in 2007), analysis made by the Environmental Protection Agency (29 USD/t with a discount rate of 3% and inflation), combined with prevalent assumptions used by governments that internalize the cost of CO_2.

Extract from LafargeHolcim Profit & Loss Statement 2015

Context

It is good practice to make it clear which methodologies are being used in sustainability evaluation tools, such as those relevant to the *STYLE scenario**. This is often done more rigorously in commercially available tools than in in-house industry tools. Transparency enables users to see the assumptions and limitations of their calculations, and aids consistency between organisations and sectors, even if they are not directly sharing sensitive data.

Issues

A barrier to some organisations choosing to run sustainability evaluations, or to include the more tricky social factors, can be the lack of 'perfect' methodology for every indicator and the fear that results will be 'incorrect' or easy to criticise.

Good practice example

LafargeHolcim use an in-house tool to calculate a monetised sustainability evaluation for their projects, providing input to their Integrated Profit and Loss account. Although the tool is used in-house, they have published all their methodologies and assumptions, inviting stakeholders to engage to suggest alternatives and improvements.

Recommendations

- Commercial tools should, as standard, publish transparent links to the methodologies used.
- Industry in-house tools should consider publishing their methodologies used online, allowing more opportunities to get stakeholder input and engagement.
- Industry acknowledgement that they are having to use the best currently available or 'least worst' methodology for certain indicators can be a driver for the Life Cycle Management community to develop improved methodologies.

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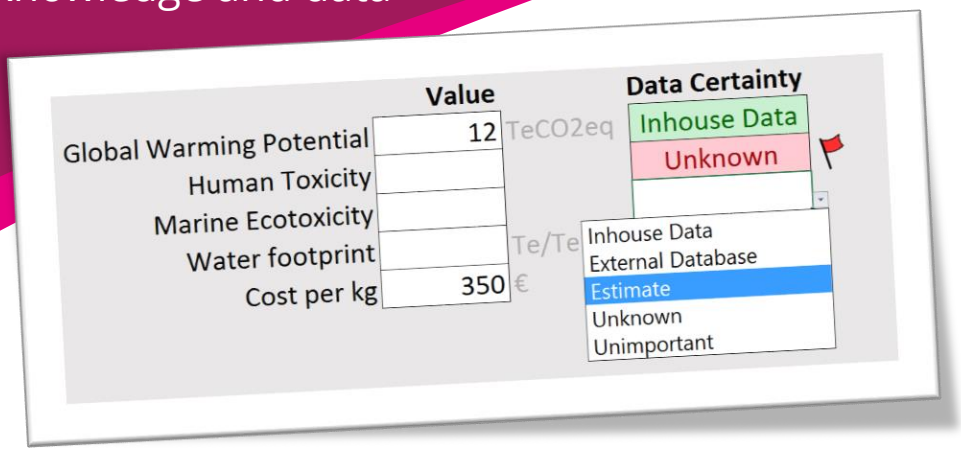
SPIRE PROJECT

An Uncertain World

Being certain of your knowledge and data uncertainties



Context and Issues

All process design has to be done against a backdrop of data uncertainty; real world plant operations rarely live up precisely to the theory or lab scale approximations. The data involved in sustainability evaluations can often be even more uncertain or not available at all. As well as requiring material and energy flows, tens of indicator properties can be needed for each component and geographical variances can become significant (e.g. if the embedded water in the manufacture of a resource was from a water scarce region). Uncertainty in *input* data can be amplified through a tool calculations, resulting in an *output* with even greater levels of uncertainty. Consequently, a challenge exists to make sustainability evaluation tools relevant to the *STYLE scenario** useable and useful when quality input data is lacking.

Recommendations

- At a basic level, it is useful if tools allow *meta data* to be input alongside data values. This can allow the user to record whether the data is high quality measured data, from an external database, an estimate, unknown or unimportant. Some databases have a simple high, medium, low quality rating system.
- Enhanced tools can use methods to score these quality attributes, resulting in an overall confidence rating for the calculation (e.g. *Britest's Process Complexity and Understanding Methodology*).
- Learning could be taken from the nanotechnology sector, where some tools use a *worst case* value if data is missing. The user then only needs to source more data if the worst case is not good enough for the project to proceed.
- Tools could be improved by allowing range input values, whereby the user may have higher confidence in specifying a minimum and maximum, rather than an absolute value (e.g. *RDC Environment's RangeLCA tool*).
- Sensitivity analysis techniques can be used in tools to inform the user of the impact of uncertainty.
- An increase of quality, open access databases are essential to improve data uncertainty. There is a particular lack of good social and economic impact factors data available, which could be compiled at a sector level.

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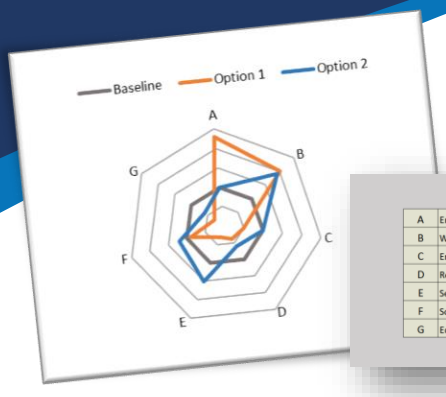
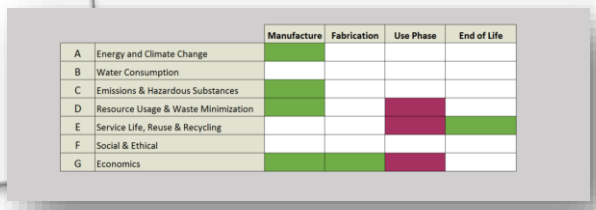
Aiding Decision Making

Integrating sustainability through Stage-Gates





		Manufacture	Fabrication	Use Phase	End of Life
A	Energy and Climate Change				
B	Water Consumption				
C	Emissions & Hazardous Substances				
D	Resource Usage & Waste Minimization				
E	Service Life, Reuse & Recycling				
F	Social & Ethical				
G	Economics				

Context

Sustainability evaluations can sometimes be seen as an after-thought; something that is done once process improvement plans are well developed. Technical feasibility and economics frequently take centre stage in early stage decision making, with sustainability being a 'check' at the end, if at all.

A growing number of process sector organisations are, however, now seeing the value in integrating sustainability into their project 'stage-gate' systems, as per the *STYLE scenario**. At the early-stage, qualitative assessments, such as those used by Tata Steel and Solvay, allow project teams to consider more radical process and product options, whilst there is still high "design freedom". In later stages, organisations such as LafargeHolcim have monetised the outputs of their sustainability assessments to allow sustainability to be integrated into financial decisions at the top of the company.

Issues

- Too much data about lots of different sustainability indicators can actually hinder good decision making; it becomes hard to see what are the most important factors.
- Tools that *over*-simplify sustainability evaluations into a single "best option" score stop decision makers from being able to see the compromises available and influencing factors.

Recommendations

- Sustainability tools should be chosen to fit with how and when industry make decisions.
- Organisations can integrate sustainability into their 'stage-gate' style project management systems, using output from sustainability evaluations at 'gates' to inform decisions on which options to pursue in the next 'stage'. Qualitative tools can be used at early stages, building to more quantitative tools for later stages.
- Clear visualisations (e.g. star diagrams) should be used to help decision makers see the compromises and options available to them.
- Aggregation can be used for some groups of indicators to help simplify the output of tools, but the methods involved in the aggregation should be robust and transparent so that decision makers can trace back the key influencing factors and drive further process improvement.

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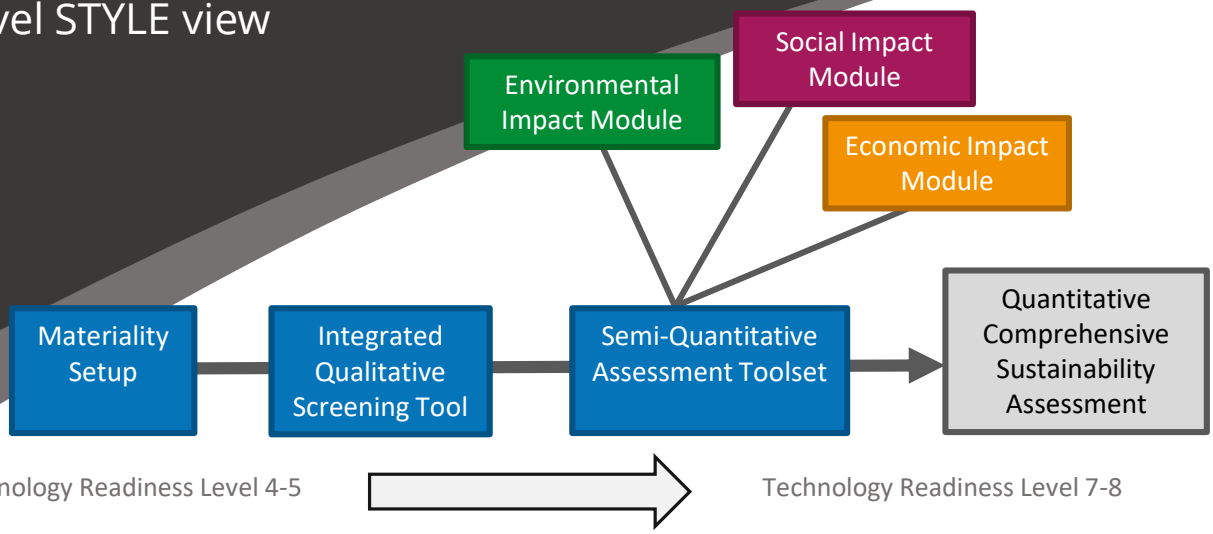
An Ideal Toolkit Framework

A high-level STYLE view



Context

Project STYLE set out with a remit to look for an ideal collection of tools to meet the needs of the *STYLE scenario**. Although promising *features* were found in existing open access tools, the most suitable tools found were developed in-house by industry and lacked availability and transferability to be used across the SPIRE process industries. Consequently, STYLE has worked with project partners and stakeholders to develop a high-level structure for an 'Ideal Toolkit', taking useful features from existing tools and feedback from tool users.

Materiality Setup

This upfront stage allows an in-house or sector level *sustainability expert* to set-up the toolkit, customising the next stages to make the evaluation more relevant and efficient. Preliminary modules and questionnaires can be selected and options filtered based on sector, geography, product vs process change, study boundary and corporate priorities.

Integrated Qualitative Screening Tool

This stage takes a project team through a series of qualitative questions, getting them to score the technological solution relative to a defined benchmark (e.g. -2 to +2). The questions cover a range of issues and opportunities across environmental, economic and social pillars. Given that questions are subjective, it is important that they are individually specific to the sector, as comprehensive as possible, and with space to allow justification and comments to be captured alongside the answers. Grouped and/or proxy indicators are necessary to keep the amount of questions at a relevant and manageable level, although transparency on this aggregation and weightings should be provided to aid acceptance of the tool and to enable potential process improvements to be identified. The output of the screening tool should be of a simple visual format to summarise whether technological options are likely to be better or worse in different sustainability areas.

Semi-Quantitative Assessment Toolset

Once the project reaches pilot scale, more data allows semi-quantitative assessments to be carried out, with modules selected based on screening tool areas of interest or concern. Some of the data input will be mass balance style formats, which then requires links to generic and in-house databases. Given that data uncertainty may still be high, an ideal tool would allow users to include absolute values, order-of-magnitude comparisons, or data ranges. Outputs from such tools should clearly show where likely hotspots are in the process and allow easy export of data. If the project warrants progression to a fully quantitative comprehensive assessment, data input would then not have to start from scratch again.

Through all stages and sustainability pillars, a Life Cycle Thinking approach should be taken and the toolkit should be able to highlight sustainability beneficial aspects, not just negative impacts.

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