



DOCUMENTATION AND USER GUIDE

Description: The Holistic Sustainability Decision Support Tool documentation provides a comprehensive guide on how to use the tool for assessing the sustainability of products and processes.

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Introduction

Purpose and scope of the tool

The Holistic Sustainability Decision Support Tool for Products and Processes is designed to assist decision-making by providing users with a comprehensive assessment of the sustainability of their products and processes across their life cycle. The tool evaluates sustainability from a technological, economic, social, and environmental perspective, including also circular economy aspects, and is intended for use by individuals and organizations across various industries. The assessment includes a wide range of sustainability criteria, linked to the dimensions of sustainability, and can cover the entire life cycle of products and processes, from raw material extraction to disposal. The tool is user-friendly and accessible, with clear instructions and visualizations to help users understand the results of the assessment. By using the tool, users can make informed decisions about the sustainability of their products and processes, identify areas for improvement to reduce their environmental impact, improve social and economic outcomes, and enhance circular economy performance. The EURECOMP project, which aims to develop sustainable recycling processes for composite materials, served as the foundation for this tool. Below are the general aspects of the tool, along with guidelines for its use.

Overview of the tool's main features and functions

The Holistic Sustainability Decision Support Tool is an Excel-based software that evaluates the sustainability of products and processes. It allows users to input data about their products and processes, such as material inputs, energy use, transportation, and waste disposal. The tool utilizes a range of sustainability-related metrics to assess the environmental, social, economic, circular economy, and technological impacts of the process. The tool is user-friendly and accessible, with clear instructions and prompts to guide users through the assessment process. It can be used as a decision-making and improvement tool, enabling users to customize inputs and generate comparative analyses with industry benchmarks and best practices. It is a flexible resource for evaluating and enhancing the sustainability of production processes, making it a useful tool for individuals and organizations involved in production processes, sustainability professionals, researchers and academics, policymakers, and regulatory bodies. The tool requires Microsoft Excel 2010 or later to operate and is compatible with both Windows and Mac operating systems. The main features of a holistic sustainability assessment tool for products and processes may include:

- Customizable inputs: Users can input data about their product or process, including information on material inputs, energy use, transportation, waste disposal, and more. The inputs can be customized to fit the user's specific product or process.
- Comprehensive sustainability metrics: The tool uses a range of sustainability metrics to evaluate the environmental, social, and economic impacts of the product or process. These metrics may include energy use, greenhouse gas emissions, water use, waste generation, worker health and safety aspects, and economic viability.
- Comparative analysis: The tool allows users to compare the sustainability of their product or process to other products or processes, as well as to industry benchmarks and best practices. This comparative analysis can help users identify areas for improvement and set sustainability targets.



- Visualizations: The tool generates clear and informative visualizations, including charts and tables, to help users understand the results of their sustainability assessment. These visualizations can be customized and exported for use in reports and presentations.
- User-friendly interface: The tool is designed to be user-friendly and accessible, with clear instructions and prompts to guide users through the assessment process.

Intended users and audience

The tool is designed to be accessible to users with a range of backgrounds and levels of expertise in sustainability.

The intended users and audience for the Sustainability Assessment Tool are:

- Individuals and organizations in various industries who are involved in the production and/or evaluation of the sustainability of products and processes.
- Sustainability professionals who are responsible for assessing the sustainability of production processes.
- Researchers and academics who are interested in studying the sustainability of products and processes.
- Policymakers and regulatory bodies who are responsible for developing and enforcing sustainability standards for various industries.

Getting started

System requirements

The Holistic Sustainability Decision Support Tool is an Excel-based tool that operates on Microsoft Excel 2010 or later and is compatible with both Windows and Mac operating systems. For optimal performance, it is recommended to have at least 2GB of RAM.

Installation and setup instructions

To use the Holistic Sustainability Decision Support Tool, simply download the Excel file from the designated source and save it to a location on your computer. The tool does not require any additional installation steps. Please note that, depending on your system security settings, Microsoft Excel may initially restrict certain functionalities of the file. In such cases, users should right-click on the downloaded file, select Properties, and enable the option “Unblock” or “Allow” (if available), then click Apply before opening the file. Alternatively, if prompted within Excel, users should select “Enable Content” to allow full functionality of the tool.

How to access and use the tool

To access the Holistic Sustainability Decision Support Tool, open the Excel file and follow the user-friendly and self-explanatory instructions provided. If you require further assistance, refer to the present user manual.



Data inputs

Format and structure of the input data (e.g., tables, forms)

The tool provides a template for inputting data, which can be customized by users. The input data is organized into tables. The Holistic Sustainability Decision Support Tool requires users to input data on various aspects of the product or process being assessed. The tool is designed to be flexible, allowing users to customize inputs based on their specific needs and requirements. Input data is inserted as raw data in the relevant cells prompted by the Tool.

Data sources and references (if applicable)

Users are encouraged to reference relevant literature and data sources when inputting data into the tool to ensure transparency and credibility of the assessment results.

Instructions on how to input data into the tool

The tool provides clear prompts to guide users through the data input process. The tool is designed to be user-friendly, and technical support is available for users who need assistance.

Assessment criteria and methods

Explanation of the sustainability criteria used in the assessment

The Holistic Sustainability Decision Support Tool is grounded in a definition of sustainability proposed by its authors, which advocates five core and necessary pillars of holistic sustainability: environmental, social, economic, technological, and circular economy dimensions. These five pillars represent the conceptual framework of the tool and are considered essential for a comprehensive sustainability assessment.

While the sustainability pillars are predefined by the authors, the specific criteria and metrics used to evaluate each pillar are determined by the user. This allows users to select, define, and adapt indicators that are most relevant to the product or process under assessment. For example, environmental metrics may include carbon footprint, energy efficiency, water use, or pollution; social metrics may address human rights, labor practices, or community engagement; economic metrics may focus on cost-effectiveness, economic viability, or supply chain resilience; technological metrics may reflect innovation, mechanical performance, quality aspects, or technological maturity; and circular economy metrics may include material efficiency, recyclability, or waste reduction.

This user-defined selection of metrics ensures flexibility and contextual relevance, enabling the tool to be applied across different sectors, products, and processes while maintaining the authors' holistic sustainability framework based on the five core pillars.

Description of the assessment methods

The Holistic Sustainability Decision Support Tool utilizes a hybrid multi-criteria decision-making (MCDM) methodologies to evaluate the sustainability of a product or process. The MCDM models



incorporate a range of criteria, as previously mentioned. The AHP method is utilized in the Holistic Sustainability decision support Tool to allow users to assign weights and importance to the relevant criteria and metrics. This helps to prioritize and compare different aspects of sustainability for the product or process being assessed. After the criteria and metrics have been established, the tool uses a final evaluation and ranking process based on several MCDM techniques, including Weighted Sum Model (WSM), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), ELimination and Choice Expressing REality (ELECTRE), and VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR). This hybrid approach allows for a comprehensive evaluation of sustainability that considers multiple factors and enables decision-makers to identify areas for improvement.

Explanation of any assumptions and limitations of the assessment approach

The Holistic Sustainability Decision Support Tool provides a comprehensive approach to sustainability assessment. However, like any methodology, it has some assumptions and limitations that should be taken into account. One limitation is that the tool relies heavily on data inputs provided by the user. While the tool includes prompts and instructions for data entry, the accuracy and completeness of the data are still subject to the user's input. If the data is inaccurate or incomplete, the results of the assessment may not accurately reflect the true sustainability performance of the product or process. Another assumption of the tool is that it assumes a holistic view of sustainability. While the tool includes a broad range of criteria and metrics to evaluate sustainability, it may not capture all aspects of sustainability that are important for a specific product or process. The user may need to tailor and adjust the criteria and metrics to the specific context of their product or process. Furthermore, the tool relies on a hybrid multi-criteria decision-making (MCDM) approach, which may not be suitable for all users or situations. The use of AHP to assign weights and importance to the relevant criteria and metrics may require a certain level of expertise and may not be comprehensible to all users. The selection of the final MCDM method for evaluation and ranking, such as WSM, TOPSIS, ELECTRE, or VIKOR, may also have some limitations and assumptions that should be considered. Finally, the tool is designed to assess the sustainability of products and processes and does not provide guidance on how to improve sustainability performance. While the tool can identify areas of improvement and generate comparative analyses with industry benchmarks and best practices, it is up to the user to identify and implement appropriate sustainability measures. In summary, the Holistic Sustainability Decision Support Tool provides a comprehensive approach to sustainability assessment. However, users should be aware of its assumptions and limitations, such as the reliance on user-provided data, the need for tailoring to specific contexts, the expertise required for the MCDM approach, and the lack of guidance on sustainability improvement.

Outputs and results

Description of the output data generated by the tool

The Holistic Sustainability decision support Tool generates a range of outputs in the form of charts, tables, and graphs, allowing users to understand the results of their sustainability assessment. The outputs are generated based on the data input by the user and the weighting assigned to each criterion and sub-criterion. The tool provides a comprehensive overview of the sustainability of the product or



process under evaluation, including environmental, social, economic, technological, and circular economy factors.

Explanation of the results and how to interpret them

The results of the Holistic Sustainability decision support Tool can be interpreted in a variety of ways, depending on the user's goals and objectives. The tool provides an overall score for the sustainability of the product or process under evaluation, as well as individual scores for each criterion and sub-criterion. The scores are presented in a clear and intuitive way, allowing users to understand the sustainability performance of their product or process in relation to the criteria and sub-criteria evaluated. Users can also use the tool to generate comparative analyses with industry benchmarks and best practices, providing additional context for interpreting the results. The tool also generates a range of visualizations, including charts and tables, which help users to identify areas of strength and weakness in their sustainability performance.

Step-by-step user guide

To demonstrate the capabilities of the Holistic Sustainability Assessment Tool, a step-by-step user guide follows on how to use the Excel tool. This guide will illustrate how to compare potential products or processes in terms of sustainability. It will cover topics such as inputting data, interpreting the results, and customizing the inputs to generate comparative analyses against industry benchmarks and best practices.

The first sheet of the Excel-based tool is used to define the priorities of the criteria comprising sustainability using the Analytic Hierarchy Process (AHP) method. This method is a decision-making technique that helps users to systematically evaluate and compare different criteria based on their relative importance. To use this sheet, the user will need to input in the 'Pairwise comparisons' table the different criteria that they want to evaluate in the table provided. These criteria are linked to the different dimensions of sustainability that the user wants to consider, when comparing products or processes. The latter dimensions involve Performance, Environmental Impact, Costs, Circularity, and Social aspects. The user will then need to use the Saaty scale provided within this sheet to make pairwise comparisons between each dimension of sustainability/criterion to determine their relative importance.

To make a pairwise comparison, the user will need to consider two criteria at a time and ask themselves the question, "How much more important is criterion A compared to criterion B?" The Saaty scale provides a set of values ranging from 1 to 9 that can be used to indicate the degree of difference in importance between the two criteria. For example, if the user believes that the Performance criterion is "strongly preferred" over the Environmental Impact criterion, they would assign a value of 5. If the Costs criterion is "moderately less preferred" over the Circularity criterion, then they would assign a value of 1/3. Note in this case, that the reciprocal scale of the Saaty scale is consulted. Once the user has made all of the pairwise comparisons, the tool will automatically calculate the weightings for each criterion based on the AHP method. The resulting weights will be listed and visualized in the relevant pie chart.



It's important to note that the user only needs to edit the inputs in the green cells to adjust the weighting of each criterion. All other cells are automatically calculated by the tool and should not be modified by the user. Yet, If the user wishes to exclude a specific dimension of sustainability, such as the social dimension, they will need to remove the corresponding row and column from the input data. This will ensure that the excluded dimension is not considered in the analysis.

For all included pairwise comparisons, the consistency index (CI) is also calculated. The CI of the Analytic Hierarchy Process (AHP) is a measure of the level of consistency in the judgments made by the decision-maker. The CI is calculated based on the pairwise comparison matrix, which is a fundamental component of the AHP method. If the judgments made by the decision-maker are consistent, the CI value will be low (typically less than 0.1). However, if there are inconsistencies in the judgments, the CI value will be higher, indicating a lack of coherence in the decision-making process. In this case, the decision-maker may need to revise their judgments or conduct additional pairwise comparisons to improve the consistency of their judgments. The consistency index is an important measure in the AHP method because it ensures that the decision-making process is based on sound and consistent judgments.

In the subcriteria sheets (namely Performance, Environmental, etc), the user can define the weights for the subcriteria that fall under each of the main criteria defined in Sheet 1. The subcriteria can include more detailed aspects of the sustainability criteria that need to be assessed, such as specific environmental impacts or economic indicators. If the user believes that all of the subcriteria within a main criterion are equally important, they can assign equal weights to each subcriterion. If the user believes that certain subcriteria are more important than others, they can assign higher weights to those subcriteria, in the same way as in the first sheet of the Excel tool. If the user wishes to exclude a specific criterion, they will just need to remove the corresponding row and column from the input data.

Once the user has defined the weights for the subcriteria, they can proceed to the “Decision Matrix” sheet. In this sheet, the user can input the relevant data for each of the products or processes being assessed. The tool allows the user to add or remove products or processes from the analysis as needed. Moreover, in the decision matrix sheet, the user can see all of the criteria weights that were defined in Sheet 1, as well as the subcriteria weights that were defined in the subcriteria sheets.

Once the user has input all the required data into the decision matrix table, they can use the automated macro-based tabs to obtain the ranking of the considered processes. There are four alternative evaluation models that can be used for ranking the processes: WSM, VIKOR, TOPSIS, and ELECTRE. Each of these models uses a different approach for calculating the overall sustainability score for each process, based on the input data and the defined weights.

After choosing the evaluation model, the user is directed to the final sheet, where they can see the ranking of the alternative processes based on the chosen model. The user can then use this ranking to make a decision about which process is the most sustainable.

Troubleshooting and FAQs

Common issues and errors that may arise when using the tool



Despite being a user-friendly and self-explanatory tool, some issues or errors may occur during the use of the Holistic Sustainability Decision Support Tool. The most common issues that users may encounter include incorrect data input, missing data, and compatibility issues with older versions of Microsoft Excel.

Troubleshooting steps and solutions

If the user encounters any issues or errors when using the tool, there are a few troubleshooting steps that can be taken. First, make sure that the data input is correct and complete. Double-check the data sources and references if necessary. If the issue persists, try restarting the tool or Microsoft Excel. If the tool is not compatible with an older version of Microsoft Excel, consider upgrading to a newer version.

Frequently asked questions and their answers

Q: Is it possible to customize the criteria and metrics used in the tool?

A: Yes, the sub-criteria linked to the main criteria can be adjusted and tailored to specific products or processes.

Q: What are the system requirements for the tool?

A: The tool is an Excel-based tool and requires Microsoft Excel 2010 or later to operate. It is compatible with both Windows and Mac operating systems. It is recommended to have at least 2GB of RAM to run the tool efficiently.

Q: What MCDM methods are used in the tool for final evaluation and ranking?

A: The final evaluation and ranking are made using a hybrid MCDM model, combining AHP with either WSM, TOPSIS, ELECTRE, or VIKOR.

Conclusion

Summary of the tool's main benefits and limitations

In summary, the Holistic Sustainability Decision Support Tool is a user-friendly tool for assessing the sustainability of products or processes. Its benefits include its ability to consider a wide range of criteria and sub-criteria, its compatibility with both Windows and Mac operating systems, and its ease of use. However, the tool is not without its limitations. Some of the limitations include the reliance on user-provided data, the need for tailoring to specific contexts, the expertise required for the MCDM approach, and the lack of guidance on sustainability improvement. Despite these limitations, the tool provides a useful starting point for sustainability assessments and can assist decision-makers in making more informed and sustainable choices.



Suggestions for future improvements or updates

To improve the tool's functionality and address some of its limitations, several potential updates and improvements could be made. For example, the tool could be expanded to include more specific and localized criteria and metrics, such as those related to cultural or geographic factors. Another potential improvement could be the inclusion of real-time data analysis and visualization features, such as the ability to generate dynamic charts or graphs. Additionally, the tool could be expanded to include predictive capabilities, allowing users to evaluate the potential impact of proposed changes or interventions.

Contact information for support or feedback

We welcome any feedback or suggestions for improving the Holistic Sustainability Decision Support Tool. If you encounter any issues or have any questions or concerns, please do not hesitate to contact us at the following email address: [dmark@upatras.gr]. Our team is committed to providing timely and effective support to all users, and we appreciate your input as we work to improve and refine the tool.

Related Literature

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