sustAId

AI-powered sustainable material selection

user guide

table of contents

about

Welcome to sustAId!

sustAId is an AI-based, design-driven sustainable material selection tool developd with the aim to optimize this process and make it more accessible, and understandable to fashion designers.

how

The tool, composed of a searchable database to compare materials and an AI-powered assistant, was developed combining material science and data analysis artificial intelligence, with design-oriented thinking in the design process.

why

sustAId's was developed to bridge the still-present gap between sustainable development goals and fashion design practices by supporting fashion designers navigating the complexity of sustainable materials with accessible and transparent insights.

windows

System Requirements

Windows 10 or later (64-bit)
Minimum 4 GB RAM (8 GB recommended)
100 MB disk space

macOS

System Requirements:

macOS 10.15 (Catalina) or later
Apple Silicon (M1, M2, M3, M4)
Minimum 4 GB RAM (8 GB recommended)
100 MB disk space

windows

download and save

Download sustaid_windows.exe from the sust*AI*d website and save it in a folder of your choice (e.g., Desktop or C:\Program Files\sustAId\)

launch the app

Double-click sustaid_windows.exe to launch the application. No installation required - it's portable!

⊙ *windows security warning*

The first time you launch the app, Windows Defender may display a warning because the app is not digitally signed (this is normal for beta versions).

To proceed:
Click "More info"
Then click "Run anyway"

macOs

download and save
Download sustaid_mac.zip from the sust*AI*d website and double-click it in your Downloads folder. The folder will authmatically unzip and sustAId.app will appear.

⚠ *macOS security warning - unlock required*
If you try to open the app now, macOS will show a "damaged file" error. This is normal. Follow these steps:

Open Terminal

Press Cmd + Space on your keyboard

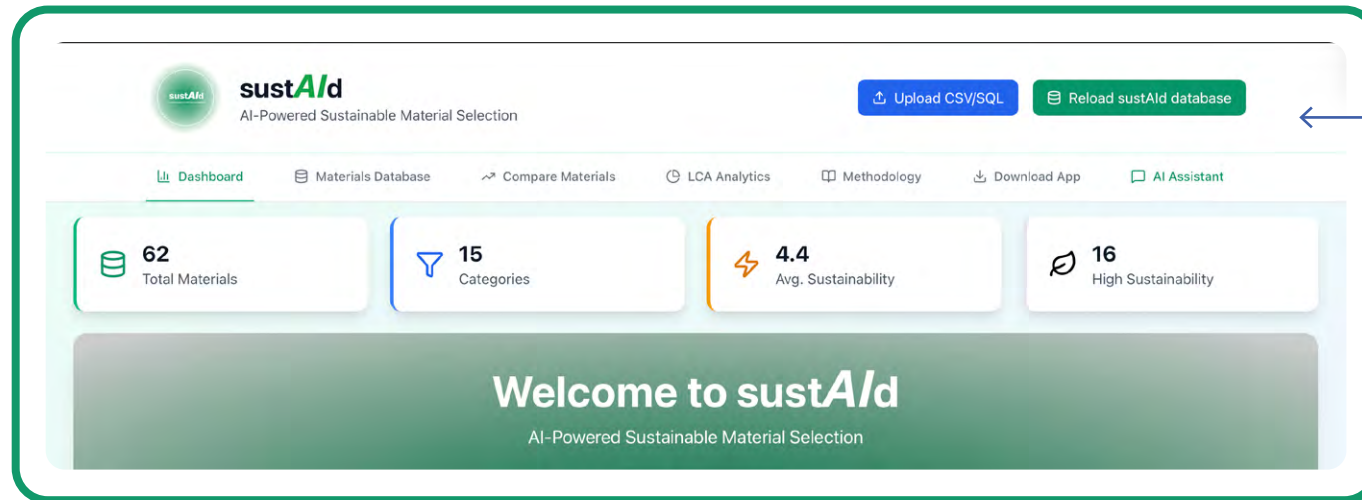Type: terminal

Press Enter

Run This Command

Copy and paste this command into Terminal, then press Enter:

```
xattr -cr ~/Downloads/sustAId.app
```

launch the app
Close Terminal, return to your Downloads folder, and double-click sustAId.app to launch!

choose your database

buttons to upload your own dataset in CSV/SQL format, or to reload sustAId database

sustAId database

sustAId provides its own material database to explore and use, which loads up automatically when opening the tool.

your own database

If you want you can upload your own material database for sustAId to read it and adapt its features to it.

⚠ **the database must be in CSV or SQL format.**

material database

buttons to download the data shown in the material database in CSV or JSON format

compare button to add the material to the comparison window

how to navigate

1. Use the **search bar** or **filters** to explore and sort materials.

2. After a first scan, you can choose which material to add to the comparison window by clicking on the **compare** button.

⚠ for information about the creation of the database, see the METHODOLOGY at the end of this document

8

material details

material details can be accessed clicking on the material name

buttons to download the data shown in the material details in CSV or JSON format + button to add fibre to comparison window + button to "copy and paste" data directly into an AI assisted chat for insights on that material

check the details

Each material entry includes a detailed description which can be accessed by clicking on the material name in the Material Database window.

compare materials
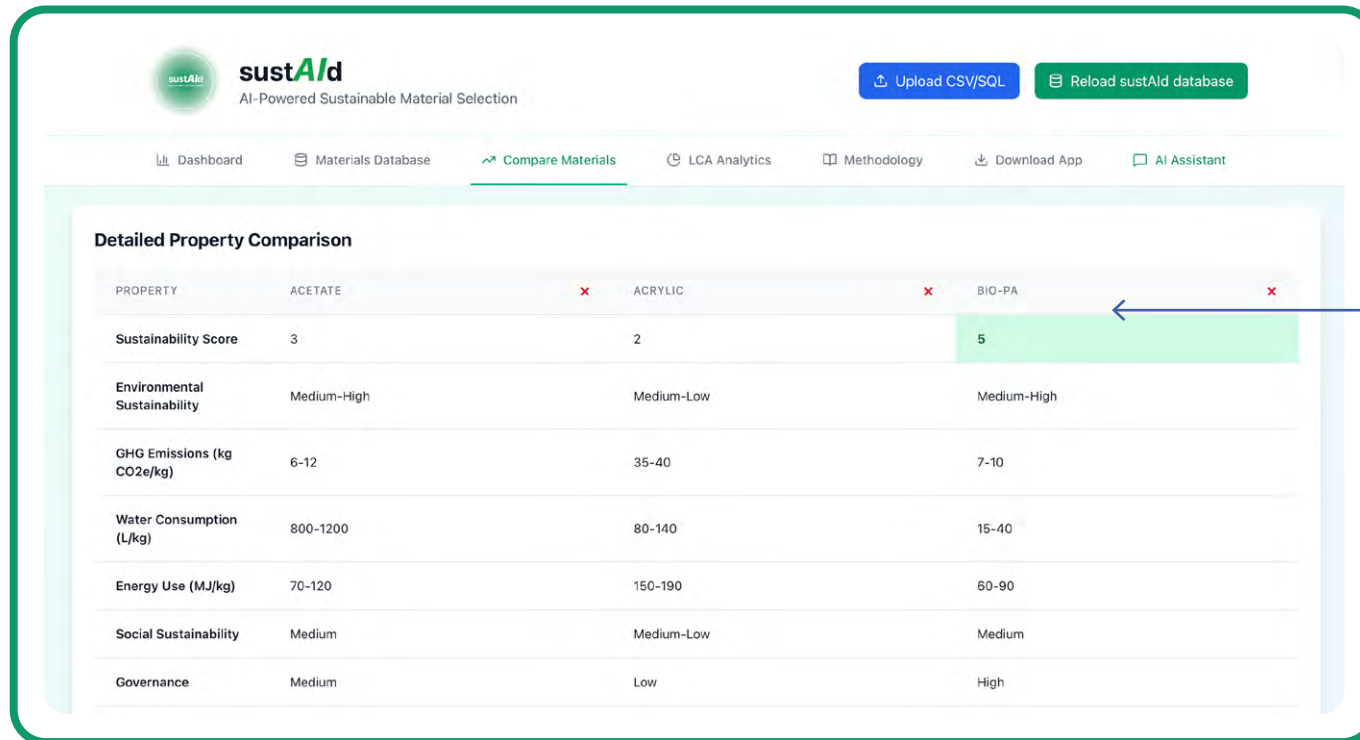
materials with the highest sustainability score are highlighted in green for visual clarity

how to navigate

1. Once selected which material to add to the comparison window, *compare your materials* using the table for written insights or the figures for visual comparisons.

2. Export the result of the comparison in CSV, JSON, PDF, or PNG.
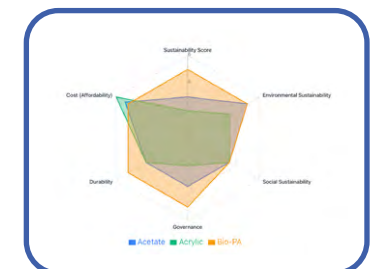
dynamic radar chart for visual comparison

compare materials

what is the compare materials window

The Compare Materials window allows you to compare and evaluate multiple materials to support more informed decision-making; this feature is handy for understanding trade-offs between material choices.

comparison table

In this window you will find a comparison table to evaluate and compare materials across the following characteristics:

- Sustainability score
- Environmental sustainability
- GHG emissions (kg $CO2_e$/kg)
- Water consumption (L/kg)
- Energy use (MJ/kg)
- Social sustainability

- Governance
- Durability
- Tensile strength (MPa)
- Chemical resistance
- Comfort level

multi-dimensional radar chart

In this window you will also find a multi-dimensional radar chart for a more visual comparison and better evaluation of material trade-offs.

for information about the creation of the database, see the METHODOLOGY at the end of this document

LCA analytics
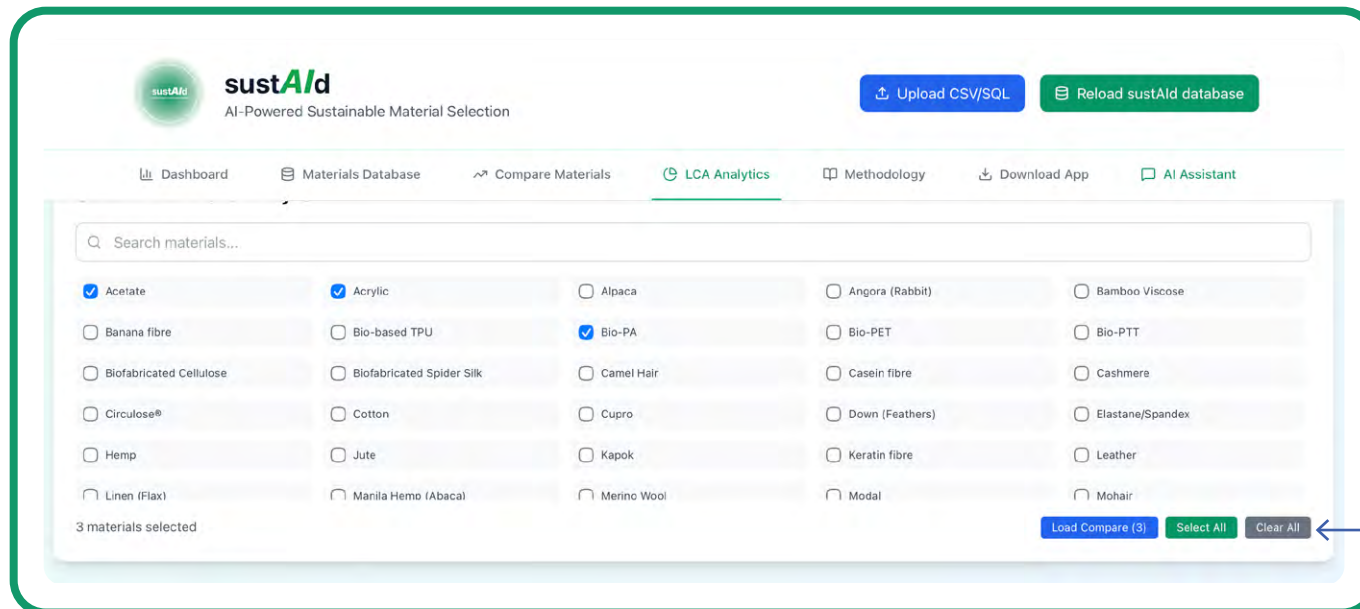
how to navigate

1. You can select which material to analyze using the *search bar*, or *load the materials you were comparing* in the previous window with the dedicated button.

2. Scan the figures and evaluate materials.

3. Export the result of the evaluation in PDF, or PNG if you need it.

LCA analytics
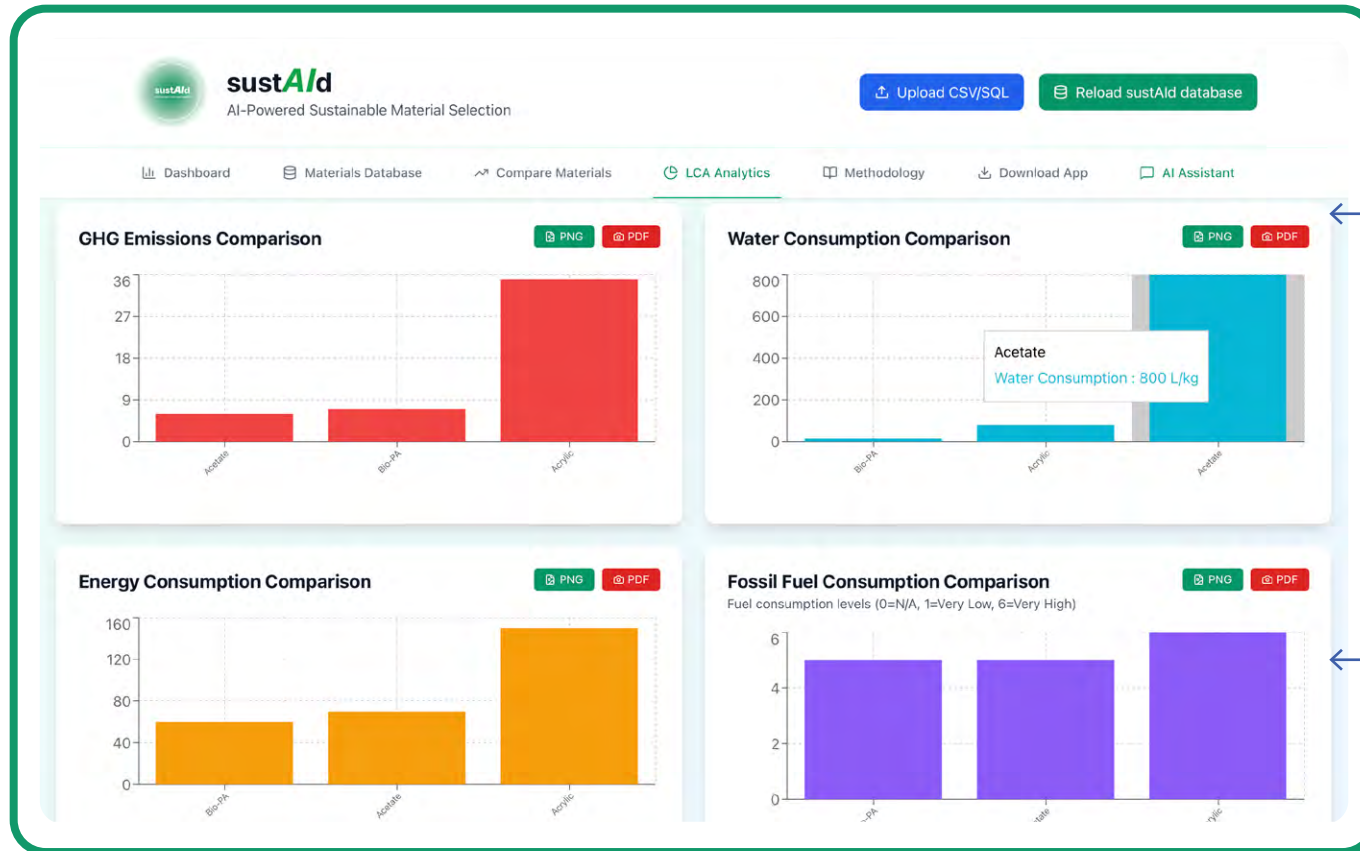
buttons to download the figures in PNG or PDF format when needed

example of dynamic figure (bar chart for fossil fuel consumption) for material evaluation across different LCA and environmental sustainability criteria

understand materials trade-offs

This window allows you to compare and evaluate multiple materials across environmental sustainability and LCA criteria.

LCA analytics

what is the LCA analytics window

The LCA Analytics window allows you to compare and evaluate multiple materials,mainly across environmental sustainability criteria typical of Life Cycle Assessment (LCA).
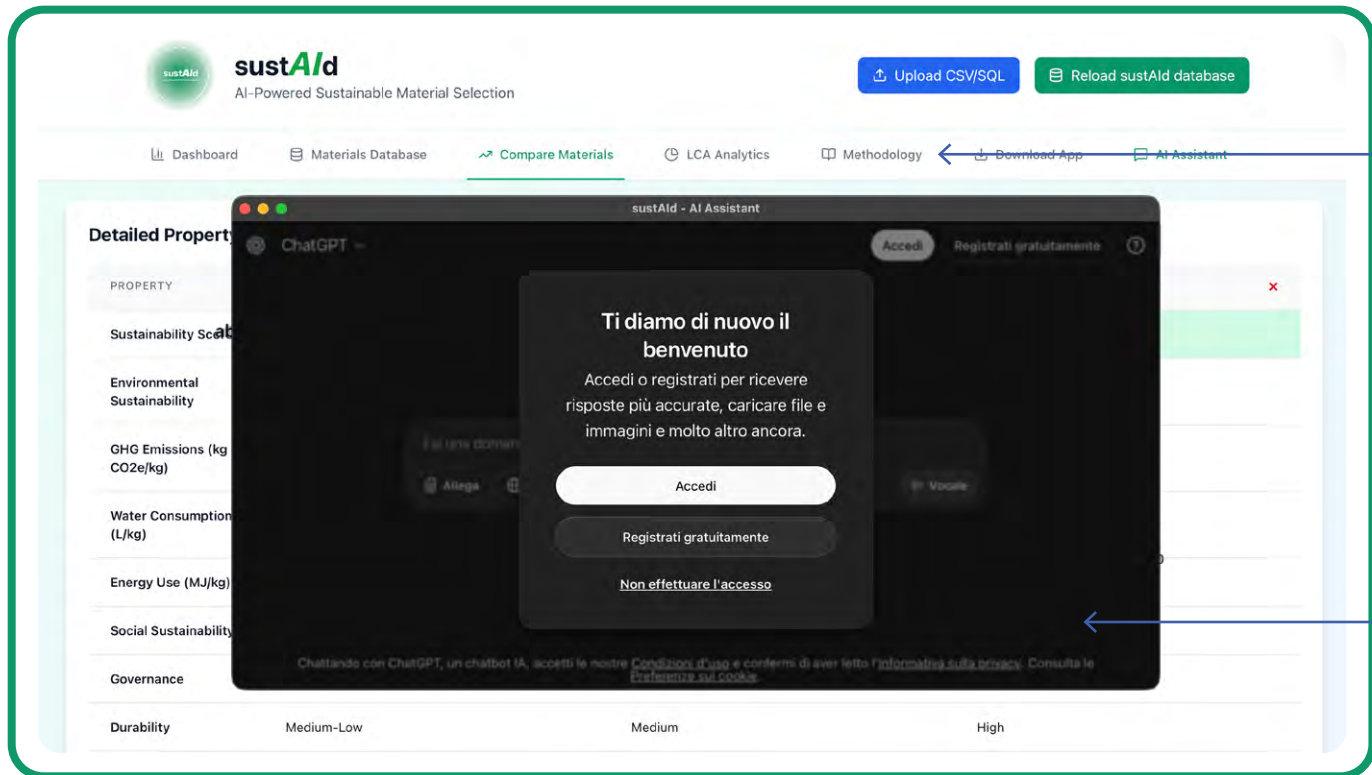
visual comparison

In this window you will find the following figures and charts for visual comparison and easier understanding of trade-offs and individual properties:

- Material distribution by category
- GHG emissions comparison
- Water consumption comparison
- Energy consumption comparison
- Fossil fuel consumption comparison

- Sustainability score evaluation
- Multi-criteria analysis: Durability vs Environment
- Cost vs Sustainability score correlation
- Single material environmental profile
- Multi-material environmental profile

for information about the creation of the database, see the METHODOLOGY at the end of this document

AI assistant

button to open the AI assistant window

AI assistant will open in a new window. *you must log in to your OpenAI account or create it if you don't have one*

how to navigate

1. Clicking on the **AI Assistant button**, your SustAId Assistant will open in a new window.

2. To start chatting, you will need to log in to your OpenAI account or create one if you don't have one.

AI assistant
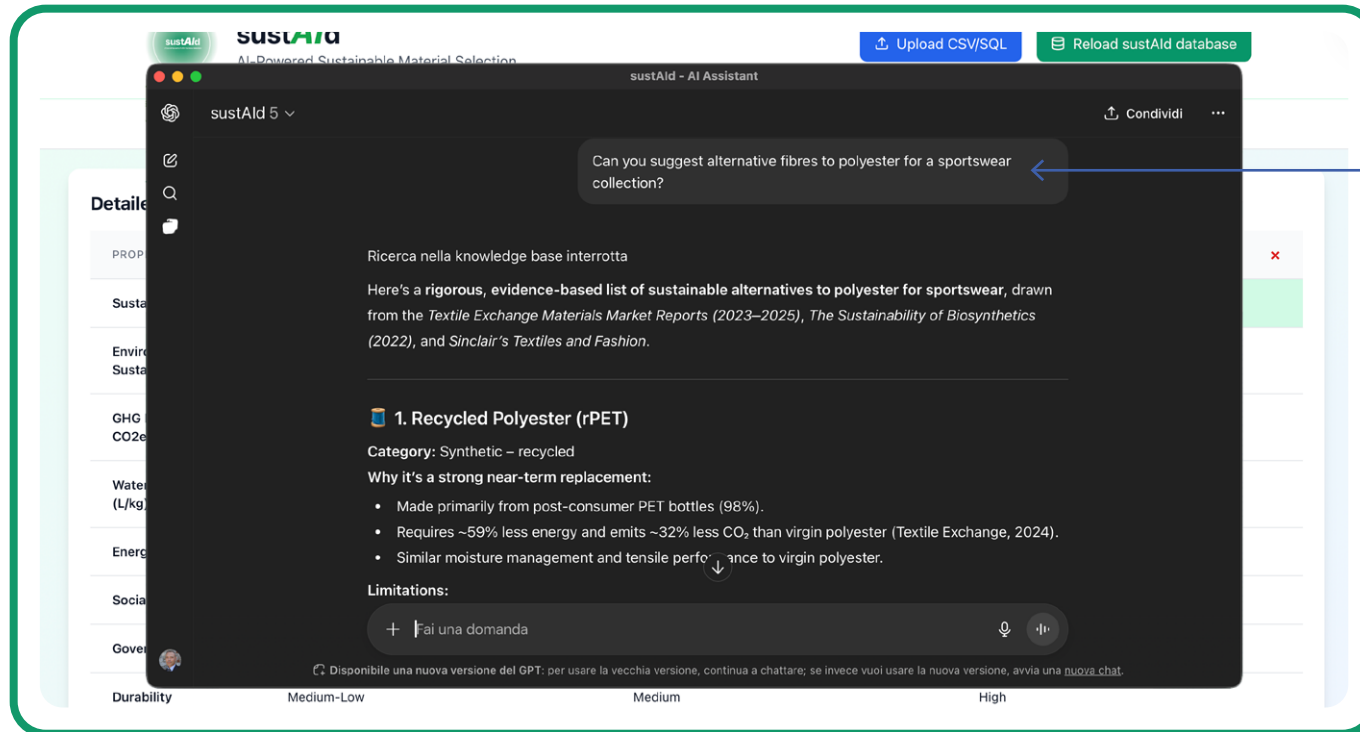
example question of the AI assistant

you can ask the AI Assistant to create tables or files for exportation if needed for your design process

how to navigate

3. Type your *question* or design brief – for example, "I need sustainable alternatives to polyester for lightweight outerwear".

4. The *AI will respond with suggestions* based on its knowledge base on sustainability, material properties, and use context. You can continue the conversation by asking follow-up questions.

privacy and data use

sust*AI*d does not collect or store your personal and design data. All interactions and feedback are used solely for research and improvement of the tool. For more information contact   **info@sustaid.net**

technical information

framework

React 19 + Tauri 2

charts

Recharts

database

Supabase (cloud)

artificial intelligence

OpenAI (GPT) + Anthropic Claude

support

thank you for using sustAId!

Thank you for using sust*AI*d and contributing to the research and development of AI integration into sustainable material selection for fashion design.

For more information about the tool and the data collection methodology you can see the *Methodology* **here.**

For other questions, or issues, please contact our development team at   **info@sustaid.net**

sust*AI*d

AI-powered sustainable material selection

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sustAId

AI-powered sustainable material selection

methodology

welcome to sustAId!

Welcome to sust*AI*d, an AI-based, design-driven tool with the aim to assist fashion designers in the process of sustainable material selection, combining artificial intelligence to provide informed, data-driven recommendations that support conscious material choices, with design-oriented thinking in the design process.

How it started

The tool, initially developed as part of a master's thesis at Politecnico di Milano, has been designed to make sustainable material selection more accessible, understandable, and actionable to fashion designers. Through its curated material database and AI assistant, sust*AI*d provides guidance, insights, and recommendations that help designers make informed decisions.

vision

"transforming the material selection process for fashion design into an interconnected and responsible ecosystem where design and sustainability coexist."

sust*AI*d envisions a **future** where designers – empowered by AI assistance and data-driven insights – can make conscious material choices that respect environmental and social sustainability, respect policies and regulations, promote material innovation, and **where design decisions become catalysts for advancing the sustainable transition of the fashion industry.**

"it is fundamental to know that sustAId does not aspire to substitute human designers but aspires to be at the same time, a creative partner and a knowledge ecosystem."

mission

"to bridge the still-present gap between sustainable development goals and fashion design practices by supporting fashion designers navigating the complexity of sustainable material selection through accessible, transparent, and grounded insights."

Rooted in a **design-driven methodology,** the tool translates complex sustainability data into actionable guidance, tailored for fashion designers' creative and functional needs.

Through this approach, **sustAId wants to**:

- Democratise access to credible and transparent sustainability data.
- Enhance the integration of sustainability criteria into the early design phases where material choices have the highest impact.
- Fostering dialogue between design, responsible materials, and technology.
- Promote the adoption of next-generation and preferred materials.
- Encouraging collaboration and interconnectivity between the different stakeholders of the sector.

sustAId database

The sustAId database was created to overcome the limitations of users, like students or emerging fashion designers, who may not have a material portfolio to upload on the platform, but wish to explore fibres and materials, gaining a complete overview of the textile landscape.

This directly integrated database has been developed with the support of the custom-trained sustAId GPT, collecting free open data from selected sources.
Using only open data, though, the work of the GPT was not always satisfactory: *manual intervention by the developer was necessary to standardise discrepancies,* correct errors, and clearly define each *row = material* and *column = property,* to help the AI in generating a complete, consistent, and readable database. All the retrieved data was source-verified by the developer and not fabricated; missing or incomplete records are signalled with N/A.

⊙ *database update*

The update of the database is a responsibility of the developer, who will periodically (approximately every 3 or 6 months) instruct the GPT to repeat the research to update some data or identify new materials missing in the current list and will check the results to prevent unwanted errors or discrepancies.

data sources

source type	examples	reliability criteria
a User-provided files	LCA_data_v2.csv, Textile Exchange reports, scientific literature	Direct, traceable, quantitative data
b Institutional reports	Materials Market Report 2024–2025, Ensuring Integrity in the Use of LCA Data (2025), etc.	Peer-reviewed, methodologically documented
c Pre-2024 general knowledge	ISO 14040–44 standards, GHG Protocol, academic references, valid theoretical background, etc.	Valid theoretical background
d Real-time web research	Textile Exchange, UNEP, ISO, FAO	Used for updates or verification

> ⓘ *sustAId GPT, when working, combines three different layers of knowledge: static knowledge, developer-provided documents, and web and real-time data.*

Because the information contained in these three layers of knowledge comes from different sources, sustAId follows a hierarchy of data sources, *ranked by reliability and temporal relevance in the table above,* when executing its workflow.

When sources conflict with each other, the GPT prioritises the most recent and methodologically robust, explicitly stating the motivation for doing so to the user.

textile materials and fibres info

families of fibres

Because data on fibres from individual manufacturers are generally difficult to obtain – particularly for free – and following Textile Exchange's Materials Market Reports approach, *the entries listed refer to the fibre family rather than a specific producer,* except for registered materials such as Circulose® .

For example, the entry *SUTAID_017*, listed as Cotton, does not refer to a specific cotton fibre from a particular manufacturer produced under specific conditions, but rather to the *generic family of cotton fibres sharing similar characteristics due to their common raw material origin*.

SUSTAID_017   Cotton

It is for this same reason that many properties were not assessed with just one number, but the result will be either a range or a qualitative evaluation.

textile materials and fibres info

- **Bio-constructed Material**
- **Biosynthetic Fibre**
- **Man-made Cellulosic Fibre**
- **Man-made Protein Fibre**
- **Natural Animal Fibre**
- **Natural Plant Fibre**
- **Natural Polymer**
- **Next-gen Recycled Fibre**

- **Non-fibre Material**
- **Recycled MMCF**
- **Recycled Natural Animal Fibre**
- **Recycled Natural Plant Fibre**
- **Recycled Synthetic Fibre**
- **Synthetic Fibre**
- **Synthetic polymer**

To provide homogeneous, consistent naming, the developer defined the **categories in which textile materials and fibres should be clustered.**

textile materials and fibres info

Presented below is the *list of materials* comprised in the database (in alphabetical order) – each of which is preceded by its *material ID*, for easier classification and readability of the database, and the *category* in which it belongs.

Material ID	Material name	Material Categories
SUSTAID_001	Acetate	Man-Made Cellulosic Fibre
SUSTAID_002	Acrylic	Synthetic Fibre
SUSTAID_003	Alpaca	Natural Animal Fibre
SUSTAID_004	Angora (Rabbit)	Natural Animal Fibre
SUSTAID_005	Bamboo Viscose	Man-Made Cellulosic Fibre
SUSTAID_006	Banana Fibre	Natural Plant Fibre
SUSTAID_007	Bio-based TPU	Biosynthetic Fibre
SUSTAID_008	Biofabricated Cellulose	Man-Made Cellulosic Fibre
SUSTAID_009	Biofabricated Spider Silk	Man-Made Protein Fibre
SUSTAID_010	Bio-PA	Biosynthetic Fibre
SUSTAID_011	Bio-PET	Biosynthetic Fibre
SUSTAID_012	Bio-PTT	Biosynthetic Fibre
SUSTAID_013	Camel Hair	Natural Animal Fibre
SUSTAID_014	Casein fibre	Man-Made Protein Fibre
SUSTAID_015	Cashmere	Natural Animal Fibre
SUSTAID_016	Circulose®	Man-Made Cellulosic Fibre
SUSTAID_017	Cotton	Natural Plant Fibre
SUSTAID_018	Cupro	Man-Made Cellulosic Fibre
SUSTAID_019	Down (Feathers)	Non-Fibre Material

textile materials and fibres info

Material ID	Material name	Material Categories
SUSTAID_020	Elastane/Spandex	Synthetic Fibre
SUSTAID_021	Hemp	Natural Plant Fibre
SUSTAID_022	Jute	Natural Plant Fibre
SUSTAID_023	Kapok	Natural Plant Fibre
SUSTAID_024	Keratin fibre	Man-Made Protein Fibre
SUSTAID_025	Leather	Non-Fibre Material
SUSTAID_026	Linen (Flax)	Natural Plant Fibre
SUSTAID_027	Manila Hemp (Abaca)	Natural Plant Fibre
SUSTAID_028	Merino Wool	Natural Animal Fibre
SUSTAID_029	Modal	Man-Made Cellulosic Fibre
SUSTAID_030	Mohair	Natural Animal Fibre
SUSTAID_031	Mulberry Silk	Natural Animal Fibre
SUSTAID_032	Mycelium	Bio-constructed Material
SUSTAID_033	Natural Rubber	Natural Polymer
SUSTAID_034	Nylon/Polyamide	Synthetic Fibre
SUSTAID_035	Orange Fibre	Man-Made Cellulosic Fibre
SUSTAID_036	Organic Cotton	Natural Plant Fibre
SUSTAID_037	PHA (Polyhydroxyalkanoates)	Biosynthetic Fibre
SUSTAID_038	Piña (Pineapple)	Natural Plant Fibre
SUSTAID_039	Polyester	Synthetic Fibre
SUSTAID_040	Polyester Microfiber	Synthetic Fibre
SUSTAID_041	Ramie	Natural Plant Fibre
SUSTAID_042	Rayon/Viscose	Man-Made Cellulosic Fibre

textile materials and fibres info

Material ID	Material name	Material Categories
SUSTAID_043	Recycled Cotton	Recycled Natural Plant Fibre
SUSTAID_044	Recycled Cotton (Chemical	Recycled Natural Plant Fibre
SUSTAID_045	Recycled Cotton (Mechanical)	Recycled Natural Plant Fibre
SUSTAID_046	Recycled Nylon	Recycled Synthetic Fibre
SUSTAID_047	Recycled Polyester	Recycled Synthetic Fibre
SUSTAID_048	Recycled wool	Recycled Natural Animal Fibre
SUSTAID_049	Refibra	Recycled MMCF
SUSTAID_050	Sisal	Natural Plant Fibre
SUSTAID_051	Synthetic rubber	Synthetic Polymer
SUSTAID_052	T2T (Textile-to-textile) recycled MMCF	Next-gen Recycled Fibre
SUSTAID_053	T2T (Textile-to-textile) recycled PA	Next-gen Recycled Fibre
SUSTAID_054	T2T (Textile-to-textile) recycled PET	Next-gen Recycled Fibre
SUSTAID_055	Tencel Lyocell	Man-Made Cellulosic Fibre
SUSTAID_056	Tencel Modal	Man-Made Cellulosic Fibre
SUSTAID_057	TPU	Synthetic Fibre
SUSTAID_058	Vicuña	Natural Animal Fibre
SUSTAID_059	Vinyl	Synthetic Fibre
SUSTAID_060	Viscose	Man-Made Cellulosic Fibre
SUSTAID_061	Wild Silk (Tussah)	Natural Animal Fibre
SUSTAID_062	Wool	Natural Animal Fibre

assessment framework explanation

To overcome the discrepancy errors in how the GPT searched for data on each material's properties and information, the developer defined the *list of required information to be included, along with an explanation.* For some properties that needed to be updated to ensure alignment with a design-oriented thinking and methodology, a "new" definition was provided.

Since it is more difficult to access open quantitative data for some families of fibres and because it is an easier language for designers, *qualitative evaluation has been preferred over quantitative in assessing some of the following categories.* Qualitative evaluation, as one can read in the list of characteristics, is assessed with a score from 1 to 6 (corresponding to the scale low, medium-low, medium, medium-high, high, and very high).

In the following page, is the complete list of properties and how they were assessed.

assessment framework explanation

sustainability rating	Qualitative assessment of how sustainable the material is comprehensively across multiple sustainability and performance categories. The qualitative evaluation is, in this case, obtained with the average between the evaluation of environmental sustainability, social sustainability, governance, and durability. Materials should be rated low, medium-low, medium, medium-high, high, and very high based on the results.
sustainability score	Quantitative assessment corresponding to the sustainability score. Materials should be rated from 1 to 6, with low corresponding to 1/6, medium-low to 2/6, medium to 3/6, medium-high to 4/6, high to 5/6, and very high to 6/6.
environmental sustainability	Qualitative evaluation representing the material's impact on the environment throughout its lifecycle. In this context, the evaluation is obtained with the average between the values of Ghg emissions, water consumption, energy use, chemical use, fossil fuel consumption, and toxicity. Since some of these values are quantitative and expressed with numbers, the AI assistant translates them to qualitative evaluations. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).
GHG emissions	Greenhouse gas emissions produced per kilogram of material. Quantitative data expressed in kg CO2e/Kg.
water consumption	Litres of water used to produce one kilogram of the material. Quantitative data expressed in L/Kg
energy use	Megajoules of energy required to produce one kilogram of material. Quantitative data expressed in MJ/Kg

assessment framework explanation

land use
Amount of land required to produce the material, usually expressed in Kg/ha, but in this context made qualitative in this context for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

chemical use level
The quantity or intensity of chemicals used in the production of the material. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

fossil fuel consumption
Amount of fuel required to produce and/or transport the material. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

toxicity
Potential of the material to cause harm to humans or ecosystems. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

biodegradability
The materials' ability (full, partial, none) to naturally decompose in the environment. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

social sustainability
Qualitative evaluation that refers to practices and policies that support human wellbeing, equity, and social cohesion for both current and future generations. At its core, it's about creating systems and communities where people can thrive together over the long term. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

assessment framework explanation

governance	Qualitative evaluation that in fashion materials ensures that sustainability commitments (like transparency and traceability or policy and regulations compliance) aren't just aspirational statements but are backed by concrete systems that create accountability and drive real change in how fibres are grown, processed, and used. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).
durability	Qualitative evaluation that refers to the material's resistance to wear, tear, or degradation with time. In the context of sustainable development, durability – that can be also emotional, but that unfortunately is unmeasurable – is fundamental because it reduces over consumption and extends the lifespan of garments. In this case is obtained with the average between the values of the properties that influence the performance of a fibre or material, when used to make a garment: abrasion resistance, chemical resistance, tensile strength, temperature resistance. Since some of these values are quantitative and expressed with numbers, the AI assistant translates them to qualitative evaluations. Materials should be rated low (1/6)
tensile strength	Maximum stress the material can withstand while being stretched. Quantitative data expressed in MPa.
abrasion resistance	The material's ability to resist surface wear from friction. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).
chemical resistance	How well the material withstands exposure to chemicals without degrading. Qualitative evaluation for easier data retrieving and understanding. Materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6).

assessment framework explanation

moisture absorption	The material capacity to absorb and retain moisture. Qualitative evaluation for easier data retrieving and understanding, materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6), along with quantitative assessment expressed in percentage.
temperature resistance	The range of temperatures the material can endure without damage. Quantitative data range expressed in °C.
elasticity	Ability of the material to return to its original shape after stretching or deformation. Qualitative evaluation for easier data retrieving and understanding, materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6), along with quantitative assessment expressed in percentage.
dyeability	Ease with which the material can be dyed or coloured. Qualitative evaluation for easier data retrieving and understanding, materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6), along with quantitative assessment expressed in percentage.
comfort level	Qualitative assessment of how comfortable the material feels to wear. Evaluation through little explicative sentences for easier understanding when asking the AI assistant suggestions.
cost range	Typical range price of the material per unit. Quantitative range data usually expressed in $/Kg.

assessment framework explanation

cost volatility

How much the material price fluctuates over time. Qualitative evaluation where materials should be rated low (1/6), medium-low (2/6), medium (3/6), medium-high (4/6), high (5/6), and very high (6/6), along with quantitative assessment expressed in percentage.

primary applications

Primary and more usual applications of a material in the fashion and textile industry. Evaluation through little explicative sentences for easier understanding when asking the AI assistant suggestions.

main challenges

Main sustainability challenges the materials undergoes. Evaluation through little explicative sentences for easier understanding when asking the AI assistant suggestions.

key opportunities

Main opportunities the material offers with its use. Evaluation through little explicative sentences for easier understanding when asking the AI assistant suggestions.

(!) For other questions, or issues, please contact our development team at **info@sustaid.net**

sust*AI*d

AI-powered sustainable material selection

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