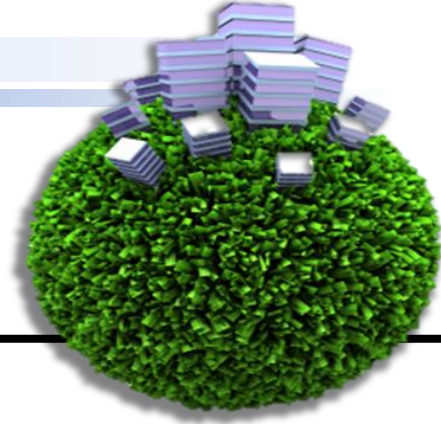


Life Cycle Assessment for Clickshare Button Product



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Project Description

- **Project Objectives**

USI Green Product Lifecycle Assessment and Counseling – Clickshare Button
Product Study

- **Project Implementation Framework**

The Green Product Lifecycle Assessment and Counseling Project is planned for one year, with the goal of promoting the establishment of product LCA, and at the same time, through counseling and training, strengthening the ability to implement product LCA, to fulfill the corporate social responsibility, to give full play to the influence of the semiconductor industry, and to improve the performance of international sustainability questionnaires (e.g., DJSI, CDP, etc.).

- **Anticipated Benefits**

- 1) Perform life cycle assessment on the target product to assist the investment control subsidiary to more comprehensively identify the environmental impacts associated with the product production process, as well as to identify improvement hotspots in the production process, and to fulfill its corporate social responsibility.
- 2) Through this year's project work program, not only can we achieve further exchanges between the industry and the academia, but we can also combine academic theories to meet the needs of the commissioning unit.

Clickshare Button Environmental impact implementation process

Research Target

Target Product	Clickshare Button
Functional unit	The production of one Clickshare Button product
System Boundary	B2B (Raw materials, manufacturing, waste)
Software	SimaPro 9.4.0.1
Inventory Data	USI provides data on energy inputs, and the data collection period is one year.
Carbon Footprint	IPCC 2021 GWP100a
Environmental Impact	ReCiPe (H) Midpoint 、Endpoint

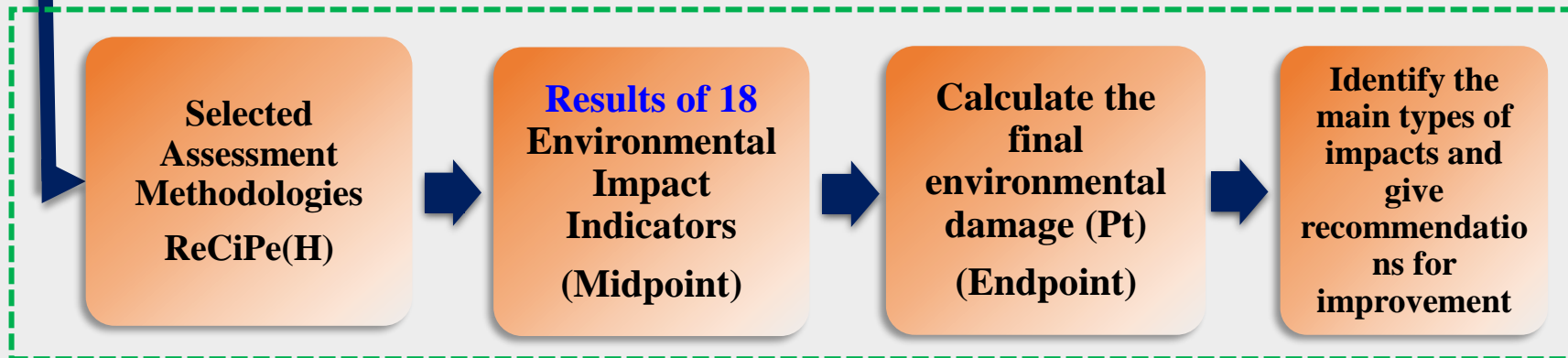
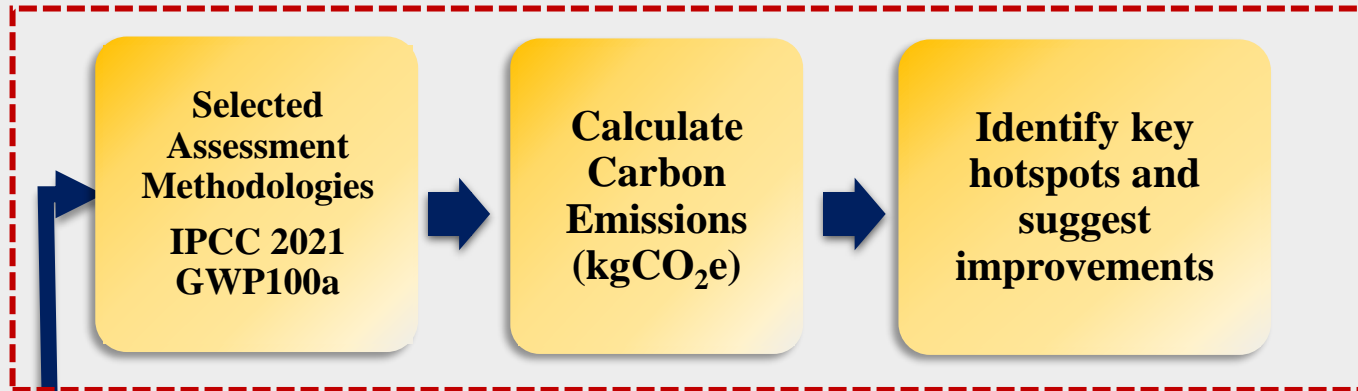
Carbon Footprint & Environmental Impact

Carbon Footprint

- ✓ Inventory data collection and compilation
- ✓ Database Coefficient Update



Importing data into SimaPro software



Environmental Impact

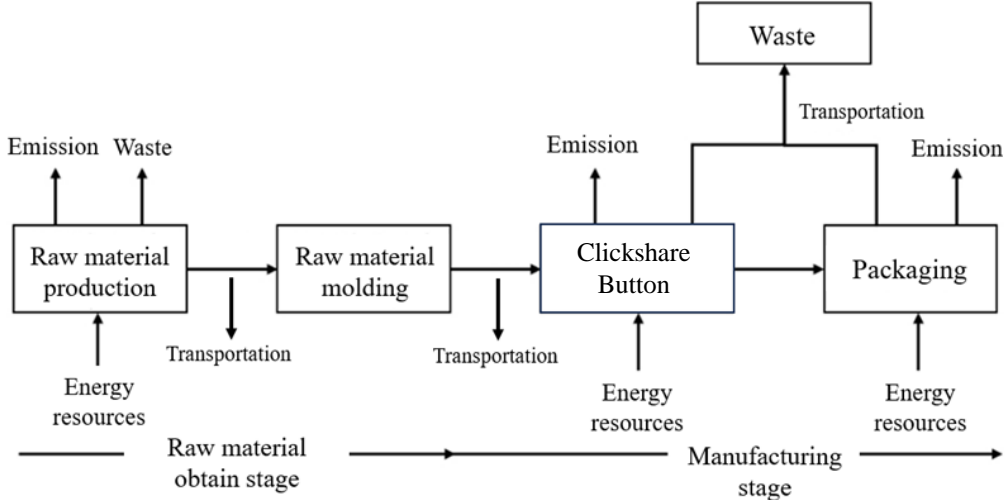
Clickshare Button Environmental Impact Implementation Process

System Boundary

- Includes wastes from the raw material stage, the manufacturing stage, and the production stage.

Inventory Data

- 2022/01/01~2022/12/31

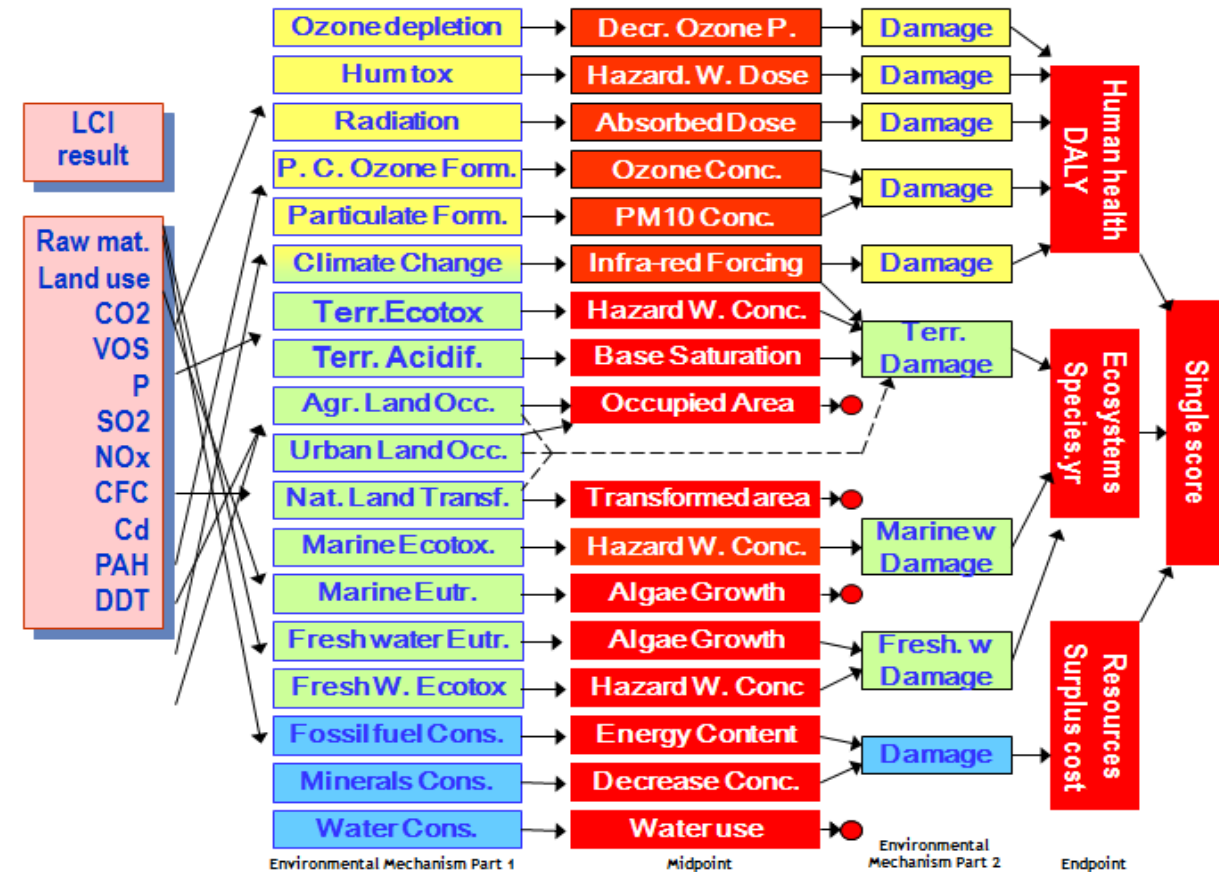


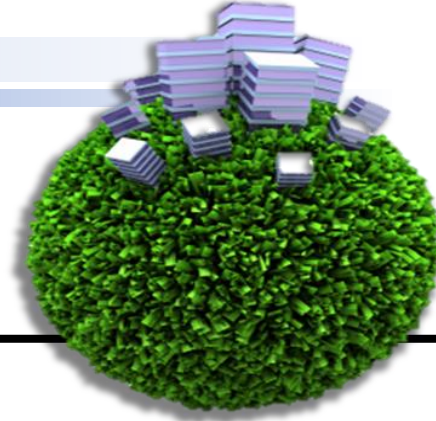
Stages	Use of Information	資料來源	分配方式
Raw material stage	Raw Material Activity Data	SAP、OA、Replacement of Records	Clickshare Button Number of production/all products in production
	Transportation Distance, Vehicle Type	Supplier Information、Google Map、ELCD、ICAO	
Manufacturing stage	Resources	Electricity Bills, Greenhouse Gas Inventory Data, Meter Reading Records	SMT equipment man-hour allocation + SMT floor revenue allocation + Assembly and testing floor revenue allocation
Waste Stage	Waste	Statistical Tables, Weigh Bills, Coupons	Floor area of production line/floor area of the whole factory*product quantity distribution
	Transportation Distance, Vehicle Type	Supplier Information、Google Map	

Clickshare Button Selection of Environmental Impact Methods

ReCiPe methodologies

- ReCiPe is a methodology developed based on two existing methods, CML 2001 and Eco-indicator 99, making it one of the relatively newer environmental impact assessment methods (Goedkoop et al., 2013). ReCiPe encompasses the most extensive range of environmental impact categories among current existing methods (Heinonen et al., 2016) and can be used for comparative analyses of various environmental impact and damage categories (Korol et al., 2016).
- A significant feature of the ReCiPe methodology is that the normalization factors between midpoint and endpoint methods are consistent. Therefore, when evaluating damage results, the ReCiPe life cycle impact assessment method is recommended for use (Dong and Ng, 2014).

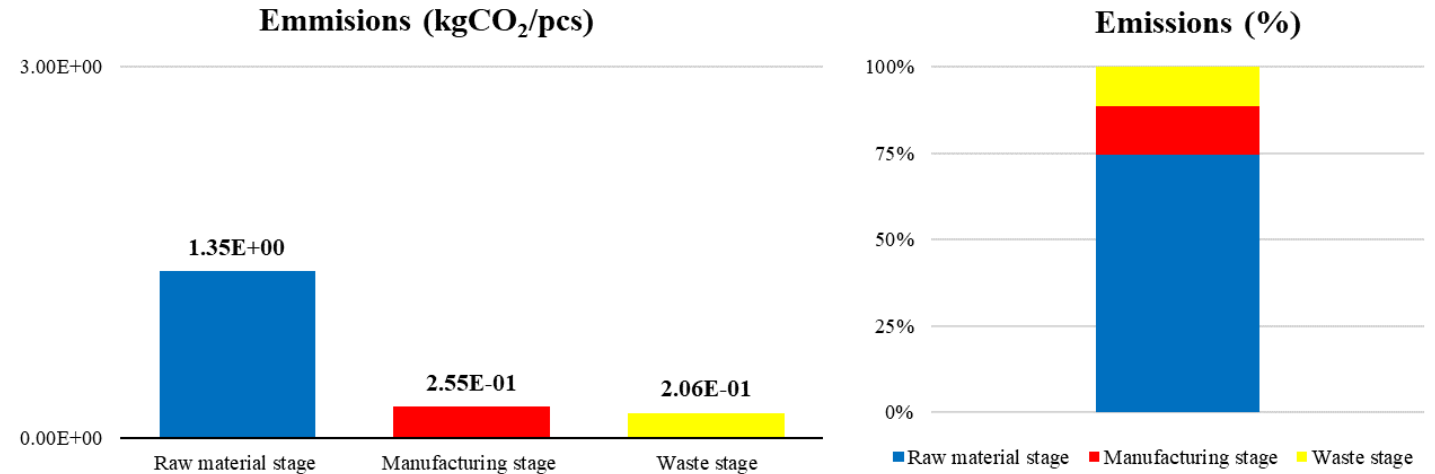




Clickshare Button Carbon Footprint Assessment Results

Carbon Footprint Assessment Results

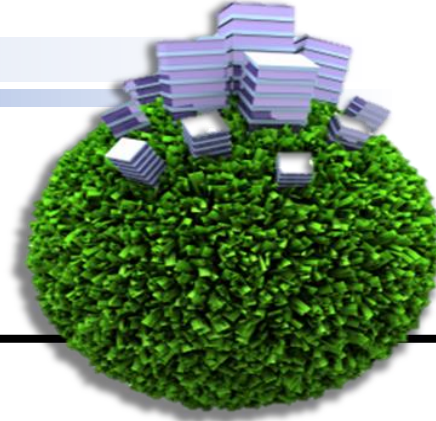
- ✓ Using the life cycle assessment software SimaPro and the IPCC 2021 GWP100a methodology, we examined the carbon emissions of Clickshare Button products and found that the total carbon emissions were **1.81 kgCO₂e/pcs**.
- ✓ The raw material stage (1.35 kgCO₂e/pcs) has a higher carbon footprint than the manufacturing stage (0.255 kgCO₂e/pcs).



Critical Material

- ✓ Electricity used in manufacturing processes is a major hotspot for carbon emissions.

Number	Categorization	Name	Carbon footprint (kgCO ₂ e/pcs)	Percentage
	Manufacturing stage	Electricity	2.55E-01	14.05%
M1	Raw materials	PCB	3.03E-01	16.72%
M77	Raw materials	USB	3.17E-01	17.48%
M43	Raw materials	IC PROCESSOR	6.62E-02	3.65%
M50	Raw materials	IC VOLTAGE MONITORS	6.61E-02	3.65%



Clickshare Button

Environmental Impact & Critical Material Sequencing

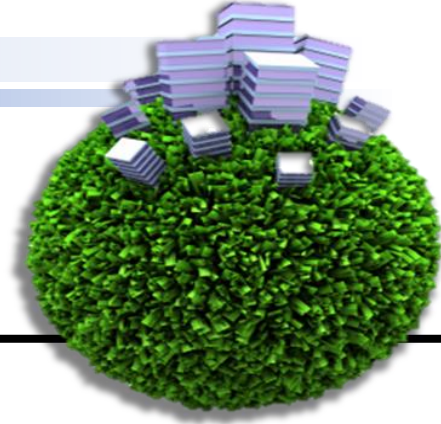
Environmental Impact

Critical Material

ReCiPe(H)- Lifecycle Assessment Results	
Environmental Impact (Percentage of damage)	Priority
	Clickshare Button
Fine particulate matter formation	1 2.80E-01 Pt (50.06%)
Global warming, Human health	2 1.63E-01 Pt (29.12%)
Human non-carcinogenic toxicity	3 6.08E-02 Pt (10.87%)

Number	Categorization	Name	Damage	Percentage
M1	Raw material	PCB FR4 8L 9P	1.34E-03	16.72%
M77	Raw material	USB Cable ASSY	1.28E-03	17.48%
Process	Process input	Electricity	3.60E-01	14.05%

- ✓ In Clickshare Button's environmental impact assessment, the key materials at the raw material stage are PCB and USB Cable, which come from M1 and M77.
- ✓ The critical material at the manufacturing stage is electricity.



Conclusion and Recommendation

- ✓ From the results of Clickshare Button's Carbon Footprint and Environmental Impact Critical Raw Materials, power input in the manufacturing process is one of the hotspots, with a share of 14.05% and 20.11% respectively.
- ✓ →It is recommended to reduce the proportion of traditional electricity input and increase the use of electricity (purchased green energy) in the manufacturing process to improve the damaging effects.
- ✓ In the ranking of critical raw materials (except for the process stage), PCB, USB Cable ASSY, and IC PROCESSOR used in the raw material stage are the hotspots that affect carbon emissions.
- ✓ →It is recommended to optimize the ratio of inputs of these critical raw materials to strengthen raw material management and avoid unnecessary consumption, thus improving the environmental impact.

*Thank you
for your attention*

