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Executive Summary

Environmental Assessment - Sustainable Cards Europe

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The Jegrelius Institute conducted a comprehensive, three-part assessment of the environmental performance of Sustainable Cards Europe's wooden multi-functional cards compared to the market-dominating cards made of plastic such as Polyvinyl chloride (PVC), Polystyrene and Polyethylene Terephthalate Glycol (PETG). The research included an ISO-norm life cycle assessment (LCA), sustainability analysis and chemical assessment. In summary, the overall assessment showed that the wooden cards have a lower total environmental impact and are closer to a sustainable society than plastic cards.

Key Highlights from the Environmental Assessment of Sustainable Cards

- Raw materials come from a renewable resource rather than fossil sources
- Raw materials come from certified sustainably managed forests in Scandinavia
- Wood cards produced with 30 percent less energy than plastic cards
- Approximately 30 % of energy used comes from renewable resources
- Sustainable Cards generate 50% less carbon emissions than plastic cards
- Wood cards are manufactured with no hazardous chemicals or additives

Description of Sustainable Cards Studied

The cards function as hotel key cards, gift cards, and loyalty and membership cards. The cards core is made from Finnish birch veneer with a layer of paper backer glued on both sides of the veneer. The card core can be printed on or applied with a magnetic strip or bar codes and/or sealed with a layer of lacquer or a plastic overlay.

Sustainable Cards produce two card types: the *Scandic Card* with two types of overlay to give it durability and PVC-like performance capabilities and the *Northern Light Card* , a card with a thicker veneer and a layer of lacquer. The Scandic Card is available with two different types of overlay, a plant-based overlay (PLA) and a petroleum-based overlay (PETG).

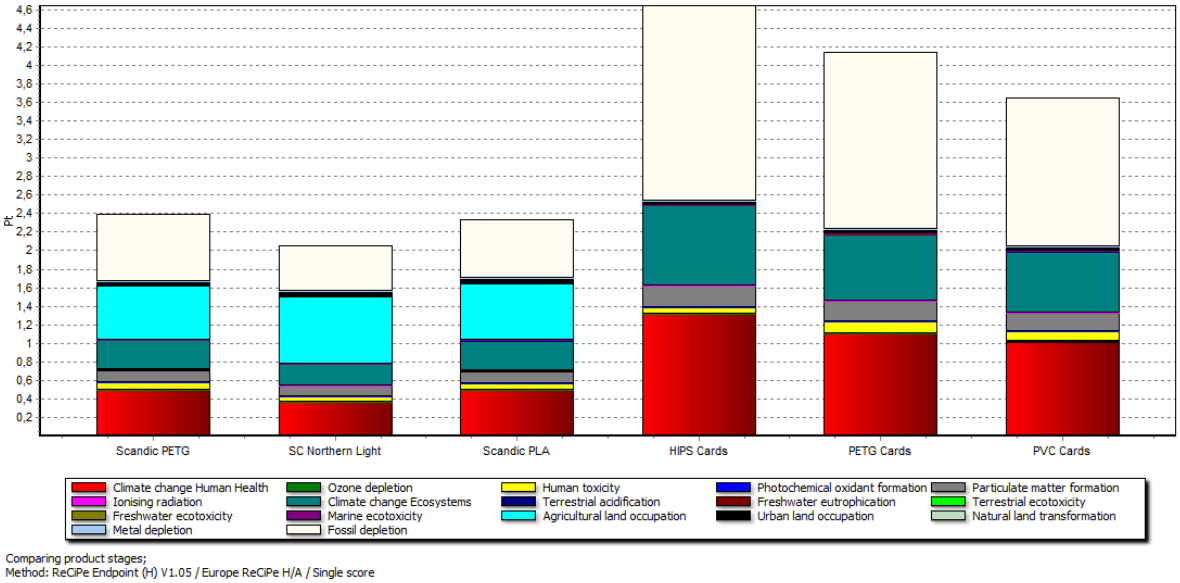

Figure 1: An overall comparison of the environmental impact presented as ReCiPe Endpoints during the life cycle of wooden and plastic cards.

The Cradle-to-Grave LCA found that in all phases the total environmental impact was lower for the wooden cards when compared to plastic cards made from PVC, Polystyrene and PETG.

The LCA, using ISO 14040 standards, was performed on three wood and three plastic card types, assessing raw materials, manufacturing, usage and disposal. Quantitative environmental impact parameters, such as energy consumption, greenhouse gases and resource depletion, were weighted against each other according to the ReCiPe Endpoints method, and the total environmental impact was then presented as ReCiPe Endpoints. (Figure 1)

For the two first life cycle phases, *raw material* and *manufacturing,* the analysis showed that approximately 26 percent less energy was required for the wooden cards than for the plastic cards, and emissions of greenhouse gases such as carbon dioxide was around 50 percent less. That reduction is due to the fact that the raw material is wood harvested from sustainable forests and that a greater proportion of the used energy comes from renewable energy sources.

In the third phase, *usage*, the analysis examined the transport of cards to the end user, according to a scenario where approximately 26 percent of the cards are individually shipped by air around the world. The negative environmental impact of air shipping is offset by the weight of the cards (3.3g for wood cards compared to 5g for plastic cards). If the Scandic PETG card would have the same weight as the plastic cards, the environmental impact during the whole life cycle, would be approximately 12 percent higher.

n the fourth phase, *disposal*, the analysis points out a fundamental difference between the materials in the cards. The plastic cards, based on fossil sources, are generating fossil carbon dioxide when incinerated, which affects the climate; and the wooden cards are

mainly generating biogenic carbon dioxide. Again, greenhouse gases emitted from wood cards are significantly less than that of plastic cards.

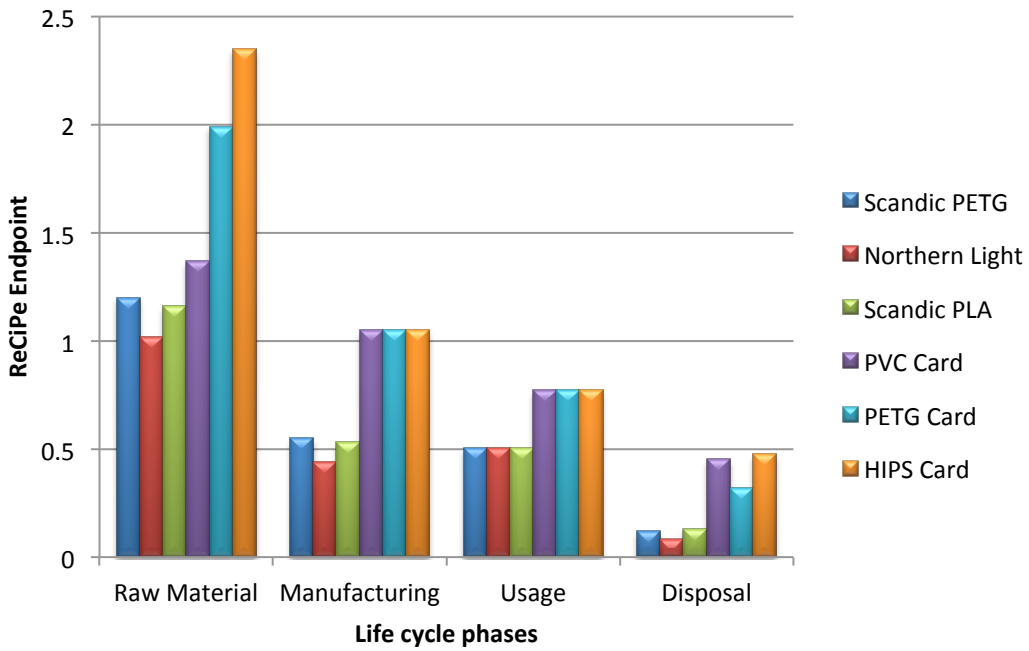

Figure 2: The environmental impact as ReCiPe Endpoints allocated on the different phases in the products life cycle.

The sustainability assessment clearly shows that the plastic materials have some great issues to deal with to fit into a sustainable society. PVC and Polystyrene are identified as materials not feasible in a sustainable society due to hazardous components and significant recycling issues. PVC is an environmental poison throughout its life cycle and vinyl chloride is a known human carcinogen. PVC can release dioxin and other organic pollutants during the manufacturing process and disposal, and cannot be readily recycled due to its chlorine and additive content. Furthermore, additives are not bound to the plastic and can be leached out.

The wooden cards manufactured by Sustainable Cards have several advantages because of the origin of raw materials being from renewable resources, but there are some critical challenges such as threats to biological diversity related to land use.

It should be noted that when the life cycle assessment considers the impact of land use, specific geographic differences are not taken into account. For example, in certain parts of the world, sustainable forest land could be used for agricultural production. In this case, Scandinavian sustainable forests are not competing for the cultivation of food. Deforestation is a critical issue in tropical forests, but not in boreal forest in the Nordic countries. The boreal forests have, on the other hand, problems with decreasing areas of old forest, key biotopes, monoculture and biodiversity. However, to ensure sound sustainable forest

management practices, the Jegrelius Institute highly recommends Sustainable Cards obtain some kind of third-party certification. The FSC-certification system is identified as the best system available.

The assessment of the chemicals did not identify any priority hazardous substances or any specific chemical risks connected to the wooden cards.

In the chemical assessment, chemicals used in the production of the wooden cards and substances ending up in the final product were identified and evaluated. No hazardous substances or chemical risks were identified.

Conclusion and Full Report
Our conclusion is that Sustainable Cards wooden cards are, from an environmental perspective, preferable to the studied plastic cards. The wooden cards have a lower total environmental impact and are closer to a sustainable society than the plastic cards. Within the group of wooden cards, the Northern Light and the Scandic PLA cards are the most preferable from a sustainability perspective due to the high degree of raw material from renewable resources.

The LCA also highlights the fundamental difference between the cards, the difference between fossil and biogenic origin of the raw material. The environmental impact in the form of climate change effects and fossil depletion are much more pronounced for the plastic cards compared to the wooden cards. This difference again is mainly due to the raw materials but also to the fact that the wood-based cards have a lower energy demand combined with a greater proportion of renewable energy sources.

The Jegrelius Institute has prepared a more comprehensive sustainability assessment which details the advantages and disadvantages of manufacturing and using Sustainable Cards and plastic cards. A copy of this report may be obtained directly from Sustainable Cards.

ABOUT JEGRELIUS INSTITUTE
Jegrelius - Institute of Applied Green Chemistry is a public non-profit organization that works with consumers, businesses and the public sector to stimulate demand and production of toxic-free products. The vision is to contribute to a safer environment in our everyday life. The Jegrelius Institute advises companies on chemical issues, runs projects and supports local governments in innovation procurement. The Jegrelius Institute is a part of the Regional Council of Jämtland in Sweden. For more information, visitwww.jegrelius.se/se

ABOUT SUSTAINABLE CARDS *Established in 2006, Sustainable Cards is the world's leading wooden card manufacturer, specializing in the most earth-friendly hotel key cards, gift cards and point-of-sale signage. Sustainable Cards is committed to reducing toxic plastic waste in the world and supporting efforts to preserve and protect a greener planet. Sustainable Cards is a member of 1% for the Planet, pledging one percent of all sales to the preservation and restoration of the natural environment. For more information, visit http://www.sustainablecards.com.*

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The Jegrelius Institute is a part of the Regional Council of Jämtland in Sweden