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RELATING TO THE INDIVIDUAL'S LEVEL OF CONSUMPTION - AN INDICATOR OF ECOLOGICAL FOOTPRINT

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ABSTRACT
Today's talk of sustainability is difficult to understand for the general public, designers and decision makers in industry and the public sector. CO_2 equivalence is one of the most important ways to measure climate change, yet people may be unsure what it means and find it difficult to relate to their personal consumption and the consequences for the environment. However, some efforts have been made to visualize the environmental impact that products have, to ease people's understanding of these multifaceted matters as they decide what to buy. This paper discusses how visualization can contribute to increasing the general understanding of the environmental consequences of consumption and, furthermore, how it can help consumers to choose the option with the least impact on the environment. The discussion is oriented toward the following research question: How can an indicator of resource measurement enable end users to make a choice based on the ecological footprint of the available products or services?

Keywords: Ecological indicators, graphic design, communication design, ecological footprint.

1 GLOBAL ENVIRONMENTAL CHANGES: AN OVERVIEW

Since the Industrial Revolution of the 19th century, countries around the world have experienced economic growth, a reduction in poverty and improved welfare. However, these developments have been made at the expense of the ability of the planet's ecosystem to sustain life [1][1]. The world's population has more than quadrupled over the past century, which has pushed global resource consumption to a point where humanity now consumes resources at a faster rate than the Earth is able to regenerate them [1]. In a business-as-usual scenario, it is projected that just after 2030, humanity's demand for ecological assets will equal two Earths' worth of resources [1].
As a result, sustainability is a well-debated topic today. The Paris Agreement *(a 2016 pact among 133 countries to keep within a* 2 °C *increase in world average temperature by 2025)* is highly debated politically regarding how countries can manage to hold to their promise of emission reductions.

2 INTRODUCTION

The science of ecology and climate change is complex, involving large quantities of data and models to calculate and indicate resource consumption. Defining a sustainable level of consumption is a challenging proposition, as many factors need to be addressed. For this reason, most national publications on the subject are based on relative indicators, where quantitative data give an indication of how consumption levels have developed compared with earlier measurements.
These indications do however not describe which level of consumption that are sustainable.[2]
This is also the case in product development, where indicators are used to compare production techniques, distribution possibilities and so on. This method may help reduce the emissions associated with a given product, but it does not define how to develop a truly sustainable product or service [3].
In the case of terminology used by the food and commercial product industries, the information regarding sustainability presented to customers also tends to be relative. For example, Primus markets its EtaPack line as environmentally friendly. The reason for this claim is that this line of Primus stoves burns less fuel than comparable products. But the stove burners still burn propane gas, which, as a

fossil fuel, contributes to higher CO_2 levels in the atmosphere. The product is therefore not sustainable, it is less environmental damaging than comparable products.
Expanding on this insight, one can conclude that as of today, discussion of sustainability is for the most part relative.

3 METHODS

A literature review of publications addressing resource indicators and consumption trends in Norway was completed, followed by several qualitative interviews. Interviews were conducted with six master's degree students and one doctoral student in product design. The reason for this combination of methods was to see the scientific nature of the topic in the context of design education.

4 CONSUMER BEHAVIOUR

4.1 Consumption trends in Norway

The National Institute for Consumer Research (SIFO) is a consumer affairs research institute based in Oslo, Norway. SIFO published a report in 2015 which contains indicators of the consumption trends in Norway and maps the key environmental attitudes of Norwegian households through multiple surveys conducted between 1993 and 2014. [2] Each time, the informants were asked how much they agreed with the following statements:

1. New technology will solve climatic and environmental challenges without substantial change in the lifestyle ("technology optimism").
2. Individual consumers can themselves contribute to solving climatic and environmental challenges ("consumer responsibility").

These statements were used as indicators of people's intention and will to reduce their own consumption in multiple product categories (meat consumption, transportation, energy use). The SIFO report states that technology-optimistic consumers tend to have less intention to reduce their own consumption.
The report found that the share of the "technology optimism" viewpoint increased through the 20-year survey period, while the share of "consumer responsibility" declined proportionally. This change makes it harder to motivate Norwegian consumers to reduce their personal consumption.
The finding is surprising considering that the availability of information about climate change has increased over the same span of time, with more campaigns and a stronger consensus regarding climate change.

4.2 Psychological climate paradox

Psychologist per Espen Stoknes refers to this situation as the psychological climate paradox. Stoknes describes the most prominent psychological barriers to effective climate communication as follows:
Distance: The climate issue is construed as distant from the individual (in a number of ways).

3. Doom: Framing the issue in terms of disaster, cost and sacrifice backfires.
4. Dissonance: The lack of convenient climate-friendly behaviours weakens attitudes over time.
5. Denial: People seek refuge from fear, guilt and threats.
6. Identity: One may activate cultural filters so that one's identity overrides the facts.

Interestingly, Stoknes then flips these barriers over, identifying characteristics that can form the basis for new and more successful strategies in climate communication:

1. Feels personal, near and urgent.
2. Uses cognitive frameworks that do not backfire on the climate issue through negative affects.
3. Reduces dissonance by providing opportunities for visible, consistent action.
4. Avoids triggering the emotional need for denial.
5. Reduces cultural and political polarization on the issue.

These strategies suggest possible directions where design can influence communication on climate change and sustainable action. Most importantly, the research shows that the main problem with climate communication is not the availability of information. The key is approaching the public with a narrative that does not come into conflict with the fundamentals of the human psyche.[4]
All the strategies Stoknes defines can be implemented in a new product indicator for sustainability.

5 RESEARCH QUESTION

Based on the mostly relative terminology used in contemporary discussions of sustainability and the insufficiency of existing communication with consumers about the climate crisis, this is the question:
How can an indicator of resource measurement enable end users to make a choice based on the ecological footprint of the available products or services?

6 FUNDAMENTALS OF AN INDICATOR

6.1 CO_2 indicators

The technical basis of an indicator is the measurements the indicator relies on. The complex science of ecology uses multiple indicators based on multiple parameters. The most commonly used are CO_2 equivalents, which indicate the emissions of greenhouse gases. The problem with using greenhouse gases as an indicator is that they are invisible to the human eye, which renders them unavoidably distant from the consumer [5].
Established by the UK government, the private company The carbon trust has been working with several companies to develop and trial a publicly backed, standard measure of the carbon emissions associated with a product through its life-cycle, with the intention to help consumers in their decision-making towards lower carbon emissions.[5] A result from this effort, the carbon reduction label was introduced in 2007. The label indicates the carbon footprint of the product's lifecycle.
Tesco launched a pilot of this label in 2008.There are few published consumer perception studies regarding the labelling system. One of the quantitative studies available are a program of 6 focus groups run by Populus Ltd in Birmham.
Some of the study's findings was that -"even environmentally articulate consumers are generally baffled by the use of grams as a measure of carbon emissions, particularly in relation to the gram figure for the weight of the product." "Consumers found a comparative measure of carbon a little easier to comprehend than an absolute figure in grams. Comparisons are regarded as most relevant if they relate to very similar products (e.g. to other brands of chilled orange juice, rather than to different types of juice or other types of beverage)."

Figure 1. The carbon reduction label[6]

In general, the labelling system was perceived as complicated, and that it should be accompanied by a broader explanatory advertising campaign in order to be adopter more widely.[5]

6.2 Ecological footprint and biocapacity

The ecological footprint of a particular product or service indicates the natural resources used and the carbon generated in providing it [7]. This indicator becomes more interesting when it is combined with biocapacity, which indicates the ecosystem's ability to provide certain resources. Biocapacity measured at a global scale is expressed in global hectares of bioproductive land (gha). The Earth's total capacity can then be divided by the worldwide population to find the individual scale. With today's population and available land, the resulting number is 1.7 gha per person.

Together, these two indicators achieve a binary indication, where the consumption level for a given product or service is either greater than what the Earth can sustain or within Earth's biocapacity.

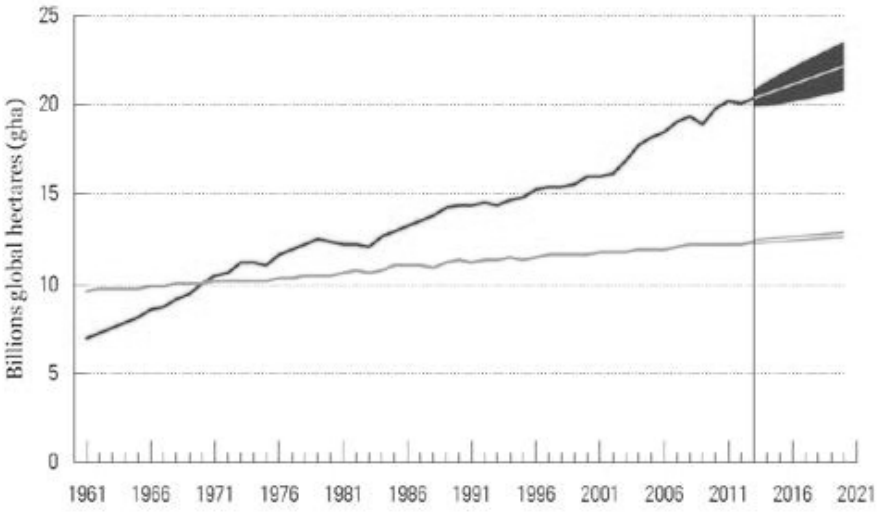

Figure 2. Green line represents the earth biocapacity, the red line represents resource consumption. The consumption exceeded the capacity in the early 1970s [7]

7 DEVELOPING A PROTOTYPE

This paper introduces a prototype sustainability indicator which is based on ecological footprint and biocapacity. The goal of the prototype is to test if it is possible to illustrate this information in a manageable way that the end user can relate to.

To create the prototype indicator, per-person biocapacity was divided into daily cycles. The chosen touch point is the product's interface with the consumer in the form of labelling. The percentage share shown on the label symbolises the product's resource consumption relative to one person's sustainable daily ecological footprint. The goal is to empower the consumer to choose among available products based on their environmental footprint.

Interviews were conducted at IPD HIOA campus to map the initial response to the terminology and the informational value of this touch point. The interviewer asked if the general discussion concerning sustainability is understandable. Of the seven students asked, three answered 'yes', two 'partly', and two 'no'.

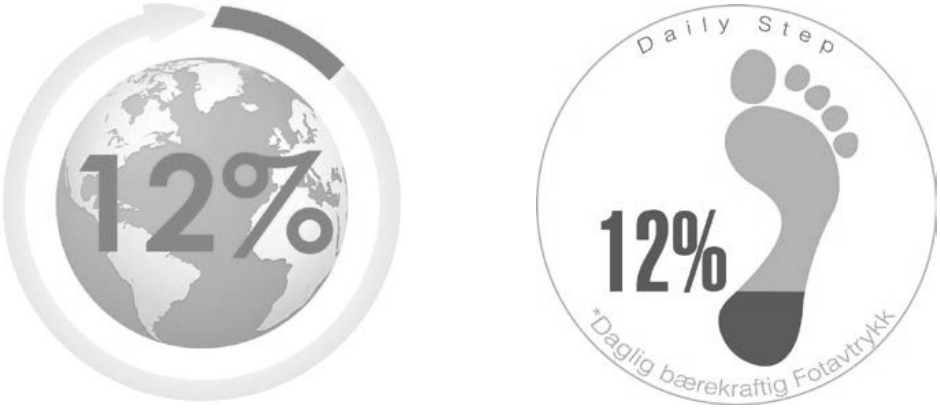

Figure 3. Two prototype label indicators for sustainability: A (left) and B (right)

Label A emphasizes the daily cycle. This graphic was interpreted as distantly related to the individual, and the orange colouring gave an impression of danger.

Label B was quickly recognized as using the terminology of sustainability. The reaction was more positive compared with A, because the footprint icon appears more green—a colour closely associated with sustainability -when resource consumption is lower. The foot graphic was also interpreted as signifying a more personal value.

Figure 4. Placing prototype labels in a shopping context shows how the indicator can help the consumer to make a choice based on each product's ecological footprint. Less is more!

Based on the reactions on the interviewers, it is apparent that the average consumer would not be able to interpret what the percentage signifies. If such a labelling system were adopted, a large-scale educational campaign might be required to teach people about biocapacity and daily footprint. In such a campaign, this phrase *Less is more!* could play a valuable role as a catchphrase.

The interviews did not answer whether this system of labelling can change consumers' habits, a question which is not within the scope of this paper. The intention was to visualise one communication solution in the form of the indicator.

8 CONCLUSION

The complex science of sustainability has come a long way, and climate information is now abundantly available. The challenge is that most communication on the subject is based on scientific discourse, which is difficult for the layperson to interpret.

Because the situation has changed little in several years, the will of consumers to try to understand and take action is becoming weaker. This is a challenge facing future resource indicators, as they risk falling into the same category as today's indicators: indicators that is difficult for consumers to relate to their own lives and choices.

The prototype footprint label presented in this paper is not considered as a valid proposition on how the public can be informed of their personal consumption. It is regarded as a proposal for a research subject that can be modelled further. To encourage progression, the tangible indicator must have personal value for the consumer. A shift in communication is essential, and multiple disciplines must

collaborate. Methods in design will be valuable in this collaboration. This challenge has the possibility to stimulate design education, as it can stretch the discipline ability to practise perception studies, for then to materialise the findings in an iterative design process.
Within design education, this paper contributes to the field of communication via ecological indicators.

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