

Happiness as capability and sustainable consumption elevator?

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Abstract

Until recently, happiness research, the capability approach, and sustainable consumption have been seen as distinct and separated fields of research. Our paper looks into the question whether increasing individual happiness will also support the enhancement of capabilities and allow for more sustainable consumption. In order to tackle these questions we used a number of methods to get answers to sub-questions. We analyze recommended activities and orientations that have been found to increase happiness and find, that a number of factors that contribute to long-term improvements in individual happiness are as well functional in enhancing capabilities. Using Frederic Vester's paper computer we analyzed the interdependencies of these recommended activities and orientations and can show what are the active and passive elements within this system and what factors are critical respectively are like a buffer. Within a Japanese program on sustainable consumption research that focused on reducing climate change we asked: If people strive for maximizing utility and if ultimate utility can be approximated by happiness, how can happiness be maximized at minimal CO₂ emissions. Realizing that happiness and capability enhancing programs may cause major changes in consumption patterns we developed an empirical method to analyze changes in consumption patterns. Using available panel data for young Japanese women and their households we were able to detect over time how consumption pattern change. Using methods developed within the field of industrial ecology and life cycle assessment we were also able to model changes on CO₂-emissions on a household level. The results indicate that although the method is feasible and was applied on few case studies related to durable goods and major life events the inter-individual differences will make it challenging to use the empirical approach in a straight-forward way when designing and evaluating more sustainable products and services. However, on a conceptual basis it became clear that such design processes need and can consider insights from happiness and capability research. A checklist for designers should support them to make their products and services not only less polluting but also more satisfying on a longer term. This will support sustainable development in a relevant and major way, offering an escape from treadmill effects in the developed and leapfrogging in the quality of life labyrinth in the developing world.

1. Introduction

Increasing quality of live and transforming societies into patterns of sustainable living are key challenges in a fast developing world that are also goals of international UN agreements. Our paper has to be located in this arena where we look into tools that help to enhance happiness in order to enhance capabilities and sustainable consumption. Both, capabilities and sustainable consumption are again prerequisites for sustainable living.

Technological advances that focus on increasing energy efficiency of services have often failed to reduce fossil fuel consumption and therefore also failed to enhance sustainable consumption. There are two mechanism that have to be considered to understand this fact: First, existing products or

services are not just replaced by the new and more efficient alternative and second, consumers have no intrinsic motivation to reduce energy consumption but to maximize ultimate utility. Therefore, ways to predict changes in consumption patterns and ultimate utility are needed in order to estimate CO₂ emission changes due to the introduction of new technologies or products (our indicator for sustainable consumption).

We suggest that the better a consumption activity fulfils basic needs and maximizes utility the lower the propensity to get into a tread mill. In a consumption tread mill consumption does not really satisfy and triggers more consumption.

Based on the review in Hofstetter & Madjar (2003) we concluded that “happiness” might be a good indicator for ultimate utility. In Madjar & Hofstetter (2004b) we analyzed happiness enhancing factors from different sources and realized that a majority of these factors are not based on pleasure aspects but are based on social aspects, relationships and personal growth. So we concluded that happiness could be a useful driver towards a value and virtue based life. In the next section we discuss in more detail the relationship between happiness, capabilities and basic needs. Section 3 will introduce two methods for a design and an assessment tool. Section 4 provides preliminary results from these tools and a final discussion will conclude on major insights.

2. The connection of happiness, capabilities and basic needs

Short introductions into happiness enhancing factors and the basic needs approach will be followed by an attempt to link those concepts with the capability approach. Rather than focusing on the (sometimes subtle) differences in these concepts we strive for identifying the commonalities.

2.1 Happiness enhancing activities

As stated before we assume that only happy people will feel less pressure to consume more with the idea that this would make them happier. Although this assumption needs more evidence, we are convinced that offering an activity, product or service (APS) that increases happiness provides the needed basis for sustainable development. Table 2-1 lists happiness enhancing activities that have been collected from psychologists, psychiatrist, anthropologists and other scientists (see, e.g., Fordyce (1993), Seligman (2002), Myers (2004), Wiesemann (2003), Varughese (2004), and Monthier (2004)).

	Happiness enhancers	weight
A	keep busy and active	1
B	become an outgoing social personality creating networks	1.5
C	meaningful work that engages your skills	1.5
D	lower expectations & aspirations	1
E	positive, optimistic thinking for present and future	1
F	become present oriented	1
G	healthy personality (food, sleep, movements)	1.5
H	skill engaging leisure activities	1.5
I	be yourself	1
J	prioritize close relationships	1
K	nurture spiritual (religious) self	1.5
L	focus beyond self	1
M	don't equate happiness with money	1
N	Take control of your life, get organized	1
O	Enhance self-esteem	1.5
P	act extraverted	1.5
Q	have sex with a person you love	2
R	prioritize happiness, act happily	2.5
S	be grateful	1
T	give love a high value in life	1
U	set achievable important non-materialistic goals	2.5
V	be open for new experiences / changes in believes	1

Table 2-1: List of happiness enhancers and a preliminary relative weighting of importance (Hofstetter & Madjar 2005)

This unique list that builds on Hofstetter & Madjar (2003) and Madjar & Hofstetter (2004b) has been analyzed using elements of Vester's (2000) paper computer to identify those factors that are likely to play a very active role in stimulating or buffering other factors (Hofstetter & Madjar 2005). Therefore, the influence from each factor on all other factors have been assessed in a matrix and sorted into active, reactive, critical and buffering elements by using Vester's (2000) calculation.

In Figures 2-1 and 2-2 the most active/reactive respectively most critical/

buffering factors are highlighted. It is no surprise that these highlighted factors are not the easiest personal changes one can make.

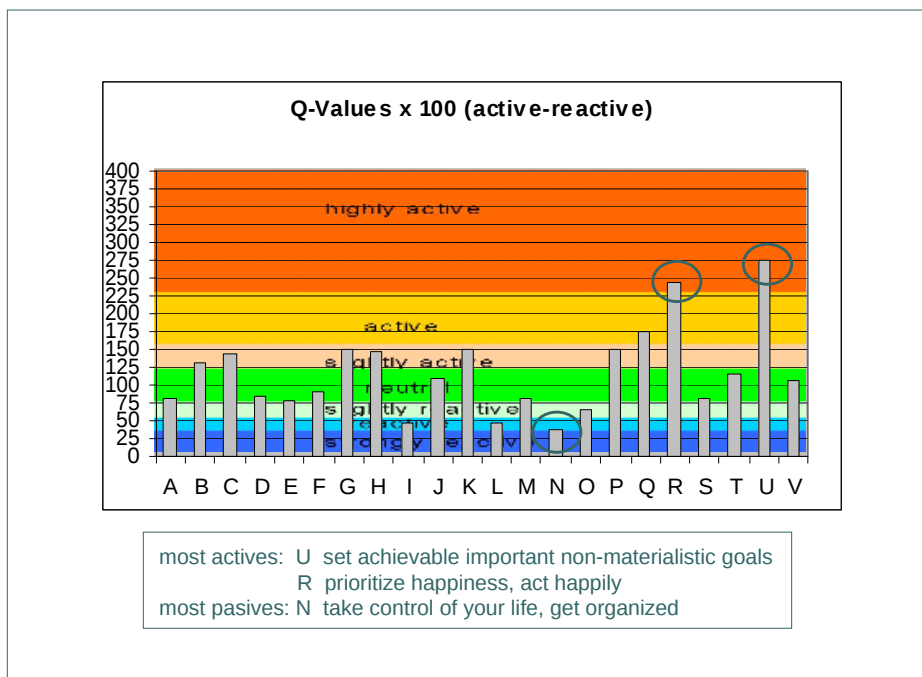


Figure 2-1: Classification of Q-values (active-reactive) following Vester (2000)

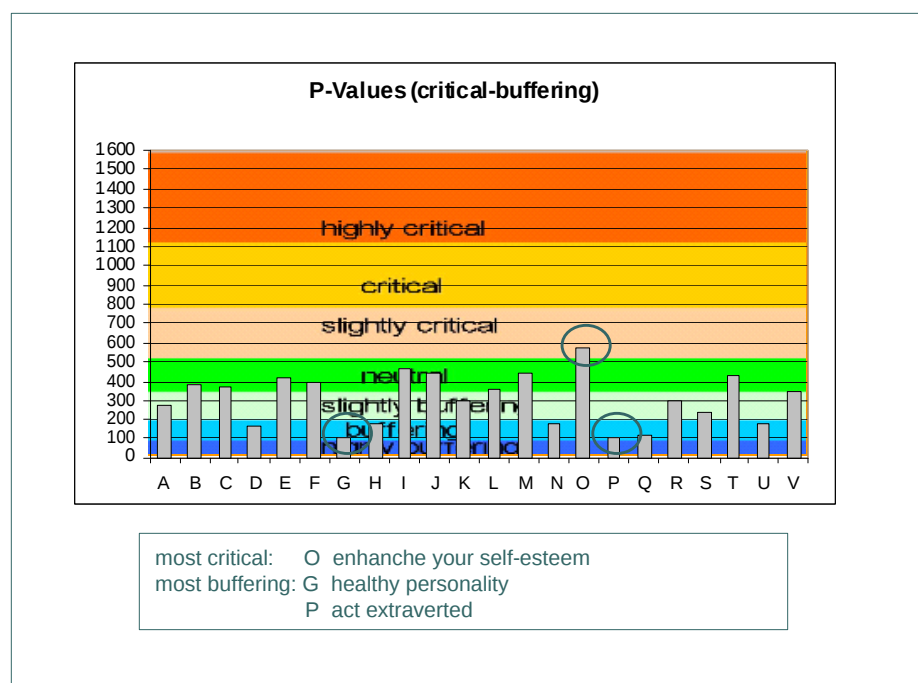


Figure 2-2: P-values (critical-buffering) following Vester (2000)

Out of the p-values and q-values we introduced a subjective weighting for the different happiness enhancing factors (weight of 2.5 for highly active/highly critical, weight of 2 for active/ critical, weight of 1.5 for slightly active/slightly critical and all other with normal weight). Results of this weighting are shown in Table 2-1.

2.2 Basic needs

We suggest that sustainable consumption should have a clear concept of basic needs that seek satisfaction. Max-Neef (1991) suggested that there are nine universal basic needs (subsistence, protection, affection, understanding, participation, leisure/idleness, creation, identity, freedom) plus

transcendence, which is not yet universal. He also gives a total of 129 satisfiers, i.e., factors that support the satisfaction of these needs when we look at the existential categories of “being” and “doing” (see Table 2-2).

Table 2-2: A categorization of need satisfiers according to Max-Neef (1991/2). Along the rows, ten basic needs are listed. Along the columns, four existential categories are ordered. The cells indicate a variety of need satisfiers.

	Being	Having	Doing	Interacting
Subsistence	Physical health, mental health, equilibrium, sense of humor, adaptability	Food, shelter, work	Feed, procreate, rest, work	Living environment, social setting
Protection	Care, adaptability, autonomy, equilibrium, solidarity	Insurance systems, savings, social security, health systems, rights, family, work	Co-operate, prevent, plan, take care of, cure, help	Living space, social environment, dwelling
Affection	Self-esteem, solidarity, respect, tolerance, generosity, receptiveness, passion, determination, sensuality, sense of humor	Friendships, family, partnerships, relationships with nature	Make love, caress, express emotions, share, take care of, cultivate, appreciate	Privacy, intimacy, home, spaces of togetherness
Understanding	Critical conscience, receptiveness, curiosity, astonishment, discipline, intuition, rationality	Literature, teachers, method, educational policies, communication policies	Investigate, study, experiment, educate, analyze, meditate	Settings of formative interaction, schools, universities, academies, groups, communities, family
Participation	Adaptability, receptiveness, solidarity, willingness, determination, dedication, respect, passion, sense of humor	Rights, responsibilities, duties, privileges, work	Become affiliated, co-operate, propose, share, dissent, obey, interact, agree on, express opinions	Settings of participative interactions, parties, associations, churches, communities, neighborhoods, family
Leisure/Idleness	Curiosity, receptiveness, imagination, recklessness, sense of humor, tranquillity, sensuality	Games, spectacles, clubs, parties, peace of mind	Day-dream, brood, dream, recall old times, give way to fantasies, remember, relax, have fun, play	Privacy, intimacy, spaces of closeness, free-time, surroundings, landscapes
Creation	Passion, determination, intuition, imagination, boldness, rationality, autonomy, inventiveness, curiosity	Abilities, skills, method, work	Work, invent, build, design, compose, interpret	Productive and feedback settings, workshops, cultural groups, audiences, spaces for expression, temporal freedom
Identity	Sense of belonging, consistency, differentiation, self-esteem, assertiveness	Symbols, language, religions, habits, customs, reference groups, sexuality, values, norms, historical memory, work	Commit oneself, integrate oneself, confront, decide on, get to know oneself, recognize oneself, actualize oneself, grow	Social rhythms, everyday settings, settings which one belongs to, maturation stages
Freedom	Autonomy, self-esteem, determination, passion, assertiveness, open-mindedness, boldness, rebelliousness, tolerance	Equal rights	Dissent, choose, be different from, run risks, develop awareness, commit oneself, disobey	Temporal/spatial plasticity
Transcendence				

Although “subsistence” is considered to be the most basic need neither Max-Neef nor we did apply a hierarchy to these needs. We also assumed that all satisfiers are equally important. Therefore, an

activity, product or service (APS) that covers several satisfiers and needs would be preferable over APS that focus on one need only. The assumption is that the better basic needs are satisfied through APS, the less individuals would be prone to consume more.

2.2 Linking happiness and basic needs to the capability approach

Sen (1992) defined capability as “a set of vectors of functioning’s (beings and doings) reflecting the person’s freedom to lead to one type of life or another”. Regarding freedoms Sen (1999) distinguishes between constitutive and instrumental freedoms. While constitutive freedoms are related to aspects like to avoid hunger, undernourishment, curable diseases etc. instrumental freedoms are related to political freedoms, economic facilities, social opportunities, transparency guarantees and protective security (Sen 1999). Our approach is based on the personal influence under the assumption that people’s possibility to fulfill basic needs is given and that people have the possibility to have their freedom to enjoy valuable beings and doings (constitutive freedoms as well as instrumental freedoms are basically given). But having the freedom to enjoy valuable beings and doings does not automatically mean that people are effectively using this freedom. People have many possibilities to choose what they want to do and many of these activities are not strengthening personal growth, civic commitment, relationship development or intrinsic motivations. E.g., freedom can be choosing to have fun and to consume whatever is suggested to fulfil one’s personal needs. Our focus lies on the question how these (value) aspects could be strengthened respectively how people can be motivated to focus and use their capabilities. Our hypothesis is that people can be motivated to develop their capabilities by raising the awareness that it makes them happy.

Table 2-3: Linking happiness enhancers with the concept of capability (classification from Nussbaum (2003) with general value aspects in brackets) and basic needs

Happiness enhancers	Capabilities	Basic needs
meaningful work that engages your skills	Senses, imagination and thought (civic commitment)	Creation
skill engaging leisure activities	Senses, imagination and thought & play (personal growth)	Leisure/creation
positive, optimistic thinking for present and future	Senses, imagination and thought (personal growth)	Affection
be yourself	Senses, imagination and thought	Identity
healthy personality (food, sleep, movements)	Bodily health	Subsistence
prioritize close relationships	Emotions (relationship)	Affection/protection
Enhance self-esteem	Emotions (personal growth)	Identity/affection
give love a high value in life	Emotions, affiliation, other species (relationship/civic commitment)	Affection
have sex with a person you love	Emotions (relationship)	Affection
prioritize happiness, act happily	Emotions	Affection
be grateful	Affiliation (personal growth)	Affection
become an outgoing social personality creating networks	Affiliation (relationship)	Participation/Leisure
nurture spiritual (religious) self	Affiliation (personal growth)	Transcendence
focus beyond self	Affiliation (personal growth, civic commitment)	Participation/protection
Take control of your life, get organized	Control over one's environment	Participation
set achievable important non-materialistic goals	Practical reasons (intrinsic motivations)	Creation
lower expectations & aspirations		Affection
become present oriented		Affection
act extraverted		Affection
don't equate happiness with money		Understanding
keep busy and active		Participation
be open for new experiences / changes in beliefs		Freedom/Creation

So far, our work focuses on highly industrialized countries. Therefore, our approach can not be used to provide human development in an environment where basic needs are not fulfilled at all, be it for political, economic, or social reasons.

To link our happiness enhancers with the capability approach we use the list of capabilities from Nussbaum (2003) because Nussbaum as opposed to Sen has defined a specific list of capabilities. In Table 2-3 the capabilities mentioned in Nussbaum's list are assigned to the happiness enhancers. The four value aspects mentioned above are added in brackets to the capability aspects.

Table 2-3 illustrates that many happiness enhancing factors are related to capability aspects as well as to basic needs. Therefore, we assume that enhancing happiness will also lead to higher fulfillment of basic needs and to strength people's capabilities.

3. Methods for two new tools

We propose two new tools for the sustainable consumption toolbox: First a checklist approach to support design for sustainable consumption¹ and second, a method to quantitatively assess behavioral aspects of consumption and its consequences on CO₂-emissions and happiness. The checklist-approach serves for the early design stages for sustainable activities, products, services (APS) when not all parameters are known and support is needed to come up with more sustainable alternatives. The quantitative assessment method is only applicable for APS that are at least partly introduced in the market for at least a year. It may serve to screen a large number of established APS and rank them according to the newly developed CHap index.

3.1 Design for sustainable consumption: The checklist approach

The semi-quantitative checklist approach combines four so far separated fields of importance to sustainable consumption:

- i) The work on basic needs and satisfiers by Max-Neef (1991) is re-interpreted and operationalized (see Table 2-2).
- ii) Happiness-enhancers from Table 2-1 are used.
- iii) Six limiting factors that have been proposed to cause rebound effects are combined to a rebound factor (Hofstetter & Madjar 2003, Binswanger 2001, Greening et al. 2000).
- iv) A streamlined life cycle assessment is used to quantify potential environmental life cycle impacts of APS².

The following 10-step checklist to design for sustainable consumption builds on these elements:

1. Brainstorm on activities, products and services (APS) based on needs, satisfiers, and happiness enhancers.
2. Identify for each APS the covered needs and satisfiers (Table 2-2). Add the number of covered satisfiers and multiply this number by the number of basic needs that are (partly) covered by these satisfiers.
3. Apply the list of happiness enhancers (Table 2-1) to the potentially new APS and make a list of factors that are completely satisfied (3 points), good contribution (2 points), and weak contribution (1 point).
4. Multiply the number of evaluation points from step 2 and 3 with each other. Rank the APS according to the total points and select the top scorers for next steps.

¹ Whenever we claim throughout this paper to develop tools for sustainable consumption we focus on the environmental and sometimes CO₂-dimension only.

² Life Cycle assessment is an established and standardized method of industrial ecology and assesses impacts along the life cycle of products and services, i.e., resource extraction, production, use phase, and disposal.

5. Identify for each new APS one to three most similar established APS that might be substituted by APS for sustainable consumption. This should not just be based on intuition but by looking at the basic needs that are most directly satisfied.
6. Adjust the number and repetitions of activities, products, or services to approximately match the size, amount or extent of the new APS described in step 1.
7. Repeat steps 2 and 3 to the identified established APS.
8. Guesstimate for each selected potentially new and existing APS the life cycle costs, hours completely absorbed by APS, dwelling space, and other resources. Further, the share of people without sufficient skills and information should be estimated.
9. Perform a streamlined LCA to get a first estimate on environmental life cycle impacts of all APS under consideration.
10. Use Table 4-1 to evaluate the new APS according to its potential for sustainable consumption and its competitiveness against established APS.

A similar checklist was also developed for improving existing APS and more details are available in Hofstetter & Madjar (2005). This semi-quantitative scoring and ranking approach is a structured way to integrate findings and information from very different fields of investigation.

3.2 CHap: An index to assess and rank sustainable consumption activities, products, and services

The methodology includes three modules (Figure 3-1):

- Module CP calculates the change in consumption patterns when a new good has been purchased and supposedly put in service. Ozawa & Hofstetter (2004 c,d) provide the relevant data derived from young Japanese women.
- The data for module H has been derived together with the analysis for module CP and reports the change in happiness when the a new good is purchased and used (together with all the other occurring changes in consumption pattern and lifestyle).
- Changing consumption patterns lead to changes in CO₂ emissions during the production and use phase of goods. These changes have been assessed in module C using a hybrid approach.

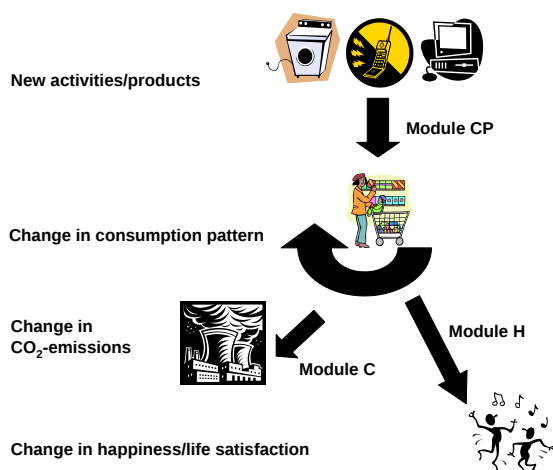


Figure 3-1: Overview on calculation procedure for CHap

The three modules indicated by arrows can be combined to the index *CHap* that quantifies how much an activity contributes – when considering all simultaneous changes and rebound effects - to an increase in happiness and at what expense in terms of changes in CO₂-emission. To demonstrate the method we selected the purchase and use of an automatic cloth dryer, a mobile phone and a personal computer as activities (see Section 4.2).

This assessment process can be applied to a large set of activities that are suggested to contribute to a more sustainable development. The result could then be a list that ranks those activities either according to their contribution to increase happiness, or according to their changes in CO₂-emission or as a combination of both. This combination of both is the new index introduced here and called *CHap*:

$$CHap_i = W * \frac{\Delta Happiness_i}{Happiness_{ref}} - \frac{\Delta CO_{2,i}}{CO_{2,ref}} \quad [-] \quad (1)$$

Where happiness is measured on a scale from 1 to 5 and CO₂ emissions in kg. This formula allows that increased happiness and reduced CO₂-emissions contribute to higher scores of *CHap*. For *Happiness_{ref}* we use here the value “2” because people that feel “average happy” get a score of “3” which makes that *Happiness* will usually be smaller than 2. For CO_{2,ref} again a person’s equivalent in highly industrialized countries per year has been chosen here (10’000 kg CO₂ per year and person). Further, the weighting factor *W* makes sure that an explicit weight must be given. A weight of *W*=1 would mean in our case that an increase in happiness by two units (lifting a person from “average happy” to “very happy”) is weighted as equal to a decrease of CO₂-emissions by 10’000 kg/a.

Formula (1) allows, once *W* is set, that all activities can be ordered from the highest *CHap* to the lowest. Where the top activities have the highest potential to contribute to sustainable consumption and the activities with the lowest scores are likely to have either high CO₂-emissions or a low or negative impact on happiness (or both).

Consumption elasticities are one of the new elements of this method. The term elasticities is borrowed from economics where elasticity is used to describe the change in demand (or supply) due to changes in prices. Here we are interested in change of demand due to changes in activities/product acquisition. The idea to calculate elasticities using panel data was inspired by Gershuny (2002) who used a similar approach to tackle with changes in time consumption.

The elasticity coefficients have been calculated as follows:

$$\begin{aligned} e &= \frac{\text{Change of variable for adopters (NY)} - \text{Change of variable for non - adopters (NN)}}{\text{Change of variable for non - adopters (NN)}} \\ &= \frac{NY - NN}{NN} \end{aligned} \quad (2)$$

In order to calculate the resulting CO₂-emissions from changes in induced consumption we use the following general formula:

$$CO_2\text{-emissions} = e * NN * I = (NY - NN) * I \quad (3)$$

Where *I* is the CO₂-intensity of the variable at stake. The data on CO₂-intensities is derived from input-output analysis using an extended input-output table for the Japanese economy. Process analysis and literature data was used for the three examples mobile phone, personal computer, and cloth dryer. The data on the change in consumption is taken from Ozawa & Hofstetter (2004c,d). For change in happiness we looked at the difference in change between the non-adopter group (NN) and the adopter group (NY). For a more detailed description of the method and assumptions we refer to Hofstetter & Ozawa (2005) and Ozawa & Hofstetter (2004c,d).

4. Results

4.1 Illustration example “gardening” for the checklist-approach

An old Chinese saying suggests that gardening may make people happy all life. Therefore, this looks like a perfect activity to illustrate the checklist for sustainable consumption. Here we show only the resulting evaluation Table 4-1. In Hofstetter & Madjar (2005) we assumed that having a dog, using a weekend house for maintenance work and walking, or starting yoga classes may be competing alternatives to gardening. We used desktop assumptions to fill in the table and would like to highlight only few issues here:

- In terms of need satisfaction and enhancing happiness the activities gardening, having a dog and starting yoga classes score rather similar. Only the weekend house scores much lower.

- The tendency to cause rebound effects has two sides to the coin. High costs, time and space demand etc. are good to avoid or reduce additional consumption. However, it also may make an activity, product or service less likely to be picked up by consumers. Also, the suggested evaluation procedure leaves much room for interpretation. Therefore, full transparency needs to be kept at the design and evaluation stage.
- We approximate in this example environmental impacts by primary energy demand guessed based on the assumed yearly costs. For the gardening we assumed a berry, fruit, salad and vegetable garden that would substitute for some of the household demand to be produced, stored, and transported elsewhere. Therefore, a net negative impact results.

Table 4-1: Evaluation table for sustainable consumption checklist, example “gardening” (Hofstetter & Madjar 2005)

Activities, products, services		Gardeni ng	Dog	Weekend House	Yoga	Remarks
Number of covered satisfiers	S	79	64	44	54	
Number of covered needs	N	8	9	8	10	
Score	S*N	632	567	352	540	
Score from happiness enhancers	H	22.5	23.5	10	24	
Total score	H*S*N	14'220	13'536	3'520	12'960	higher means better potential for SC
Life Cycle Costs	Euro/a	200	2000	15000	600	
Ratio competing alternatives to gardening	C	1	10	75	3	Ratio >1 is better for avoiding rebound effects and worse for acceptability
Hours 100% absorbed	h	150	600	160	125	
Ratio competing alternatives to gardening	T	1	4	1.07	0.83	Ratio >1 is better for avoiding rebound effects
Occupied dwelling space	m ²	200	5	1	2	
Ratio competing alternatives to gardening	D	1	0.025	0.005	0.01	Ratio >1 is better for avoiding rebound effects
Other scarce resources		0	0	0	0	
Ratio competing alternatives to gardening	R	1	1	1	1	Ratio >1 is better for avoiding rebound effects and potentially worse for LCA
Share of people without required skills	%	10	20	10	30	
Ratio competing alternatives to gardening	L	1	2	1	3	Ratio >1 is better for avoiding rebound effects and worse for market potential
Share of people without required information	%	50	75	50	30	
Ratio competing alternatives to gardening	I	1	1.5	1	0.6	Ratio >1 is better for avoiding rebound effects and worse for market potential
Score for rebound effect	C*T*D* R*L*I	1	3	0.4	0.04	Ratio >1 means better for avoiding rebound effects
Environmental impacts analyzed by streamlined LCA	Primary energy kWh/a	-200	2000	15000	300	
Rank order happiness and satisfaction score	H*S*N	1	1	4	1	Highest score gives rank no.1 (only difference > 20% justifies different rank)
Rank order rebound effect		2	1	3	4	Highest ratio gives rank no. 1 (only difference > 20% justifies different rank)
Rank order impacts		2	6	8	4	Lowest Eco-Points gives rank no.1 (double weight rank order points, only difference > 20% justifies different rank)
Total rank order points		5	8	15	9	Just sum the three previous rows, lowest sum is best.

Weighting environmental impacts twice results in the final ranking in a comfortable “victory” of gardening followed by having a dog and taking yoga classes. In a real life application the designer could now select the most promising alternatives, make a business plan, and then make the final choice for the activity, product, or service to be offered.

4.2 CHap for cloth dryer, personal computer and mobile phones

In order to apply equations (1) and (3), we rely on the impressive Japanese Panel Survey of Consumers (JPSC) provided by the Institute for Research on Household Economics (IRHE) of Japan. Co-author Toshiyuki Ozawa is approved user of the data and performed the statistical

analysis using the three most recent years 1998-2000 for households of almost 1500 young women. Although the initial number of households seems large and even after combining the two samples from 1998-1999 and 1999-2000 we still were faced with very few remaining cases for adopters after excluding cases with major life events that affect our analysis. Therefore, the explanation power of the used data and analysis remains limited. Table 4-2 illustrates how a selection of 10 major events affects happiness and the purchase of durable goods. Only getting married did positively impact happiness in a statistically significant manner. However, there are many life events that correlate well with buying the three example products.

Table 4-2: Events that affect happiness and the possession of three technologies (Ozawa & Hofstetter 2004d) (Significant different at $p < 0.05$ between NN and NY (+: increase; -: decrease))

	Got married	Gave birth to a child	Husband moved out for business reason	Started a new hobby	Took responsibility as a chairperson of an organization	Entrance exam and enrollment	Working	Have a full-time position	Living in a detached single family house	Living in an own condominium or house
Happiness	+									
Cloths Dryer				-					+	
Personal Computer	+			+	+			+		
Mobile Phone	+	-				+				+

Among the multiple results in Ozawa & Hofstetter (2004a-d) and Hofstetter & Ozawa (2005) we will present here a very small selection only. Table 4-3 gives an impression how a ranking list of sustainable activities, products and services could look like. We give here CHap values using a number of assumptions:

1. The calculated CO₂-emissions include statistically significant and non-significant changes in the whole consumption pattern within one year of adopting the new APS.
2. The results combine the two samples 1998-99 and 1999-00 and they also adjust for changes in family size by correcting with a per capita emissions value.
3. All changes in this year are attributed to the listed APS only.
4. The CHap for cloth dryers, personal computers, and mobile phones are the values after excluding all households that did show other life events that affect happiness in a major way.

Assessed activity	CHap	Rank
Using a personal computer	0.126	1
Having a baby	0.098	2
Using a cloth dryer	0.065	3
Using a mobile phone	0.059	4
Starting new lesson or learning	0.012	5
Taking leadership of a committee	0.009	6
Started living in a house	-0.014	7
Getting married	-0.143	8

Table 4-3: Comparing CHap with adjustment for change in family size for three durable goods and five life events.

The high ranking of having a baby is not the consequence of a happier family. On the contrary, the happiness actually decreases according to our analysis. However, the CO₂-correction for the additional person in the family results in a large negative change in emissions. In the case of getting

married happiness increases but CO₂ emissions increase as well, especially if all the added durable goods and other expenditures are counted in one year only (while the happiness increase supposedly sustains).

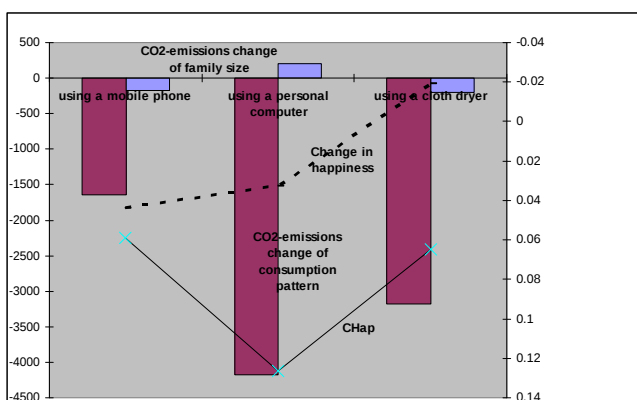


Figure 4-1: CHap and its constituting factors for three durable goods, correcting for major life events. (left y-axis: CO₂-Emissions in kg per household per year; right y-axis: change in happiness and CHap [-])

The very good ranks for the three durable goods need some further insights. Figure 4-1 provides the happiness which is positive for mobile phones and personal computers but negative for cloth dryer (all not statistically

significant). The darker bars indicate changes in CO₂ emissions per household considering all changes in adopter households from those in non-adopter households. We can see that these bars are all heavily negative and this would not change if the CO₂-emissions due to changes in family size (light bars) would be considered. We should keep in mind that production and use of one year of a mobile phone, personal computer, and cloth dryer cause 18, 420, and 270 kg CO₂ respectively. This is 10% or less of what Figure 4-1 shows and *positive* not *negative*! This would imply a negative rebound effect of a factor of 10 or higher. The shown results are completely dominated by dramatic reductions in expenditure for transportation. This reduction can not be explained by avoiding trips by smart use of mobile phone and computer. We rather suspect that there are three biases at work:

- i) After eliminating all cases with major affecting life events we end up with a very small number of adopters and sometimes non-adopters which makes the results arbitrary.
- ii) Our method automatically assumes that the adoption is the cause for a change in consumption pattern. However, due to the nature of the analyzed APS, it is more likely that other changes in lifestyle are responsible for the observed change in impacts.
- iii) The expenditure data for transportation -this is the data that proves to dominate the results- accounts for an average person in our sample in 2000 only 57'000 yen (570 USD) per year or 3.2% of income per capita. This amount does not account for car loans. Even if this would be included the total amount looks low. This means that the available data may not be sufficient to properly calculate CO₂-changes that account for all lifestyle and consumption changes.

5. Discussion and conclusions

Much has been achieved in bringing together so far isolated fields relevant to sustainable consumption. The two new tools, one for design, the other for assessment, include both an assessment of environmental impacts. However, they also provide two different proposals on how to consider (the propensity for) rebound effects and (the potential for) utility maximization. The latter being a measure to predict the likelihood that the sustainable consumption activity indeed brings the expected satisfaction and may reduce the demand for additional (material) consumption. It is exactly this last purpose that remains so far a hypothesis awaiting further empirical evidence.

Checklist approach

The developed checklists for designing new or improving existing activities, products, or services allow to estimate need satisfaction, potential for happiness enhancement, propensity for rebound effects, and environmental impacts at reasonable costs and offer a proposal on how to condensate the information to indicators on different aggregation levels. This offers maximum transparency and may stimulate further improvements towards more sustainable consumption.

The whole checklist approach has the quality and purpose of a streamlined evaluation before all design, production and marketing parameters are fixed or even known. In addition to the major untested assumption already mentioned, there are a number of caveat that apply to the operationalization by the checklists. We do not know what limiting factors have the largest quantitative impact on the environmental impacts of consumption patterns. We do know they are relevant and we made further progress in quantifying all rebound effects together (Hofstetter & Ozawa 2005) but we have no factor analysis that indicates the relative importance of the single factors. We have accepted that all satisfiers listed by Max-Neef (1991) are equally important and that although subsistence is the most basic of all needs it should get equal weight to each others. The checklists did also assume a weighting of the factors that enhance happiness. The most critical and active factors from the happiness enhancing programs have been identified and deserve most attention when activities, products, and services are designed for sustainable consumption. However, the relative weighting remains a first subjective guess and we do not empirically know what

happiness enhancing factors contribute most (and under what conditions for whom). Further, we accepted that all six limiting factors have a multiplicative effect on rebound effects without having empirical data to support this assumption.

As a next step, applications and experiences will be needed to refine the tool. First real life examples should then also be checked against Table 2-3 in order to discuss the role of capabilities and the common direction of happiness enhancers. Such insights may even help to prioritize activities, products, and services that should undergo a re-design procedure for more sustainable consumption.

CHap

Some of the caveat have been mentioned before. However, a major caveat seems to apply to the question of causality. Although we did use panel data and did not just rely on correlation analysis as most other empirical analyses, this may not be good enough for activities that are hardly the true cause for major changes in consumption patterns. The survey is filled in only once a year and for the month of September only. This may not be frequently enough to detect immediate and short term impacts on consumption in a causal way. However, this also means that mid and long term impacts may remain undetectable because there is just happening to many other relevant things during a full year.

Realizing how fast the large sample of more than 1000 households of young women melts if unaffected sub-groups are needed, the method may need to become more sophisticated by correcting for other independent factors rather than just excluding households that show other major changes. Although the chosen approach is rather transparent, it would require a much larger sample to take account of all relevant factors while still securing a sub-sample size that allows to detect statistically significant signals.

The obtained results for the three examples are also questionable because we found a reduction in household expenditure for all three examples. Especially the reduction in expenses in food and transportation looks suspicious. Sure, one can easily save on eating out expenses in order to compensate for a luxury cloth dryer. But how is it possible that such substantial savings in transportation could be made? Or to say it bluntly: Would the purchase of a mobile phone causally lead to the reduction of 2.5 tons CO₂ per household as suggested in Figure 5, then NGOs and governments may consider to give away mobile phones for free being a very cost-efficient way to reduce traffic. The rebound factor of more than -10 would indeed be very promising for any sustainable consumption APS. In addition to the reasons mentioned, the CO₂-calculations relied on a small share of the household income that was spent on the available expenditure categories. Shifts in housing and other loan-related consumption (e.g., cars) has not been included. Therefore, our results would only apply if all these shifts had cancelled within the sub-samples.

Unfortunately, we did have household data for consumption but data on happiness only for one household member, the young women. Also, not all decisions are taken by the same person in a household. Therefore, what we see in the change on happiness in one person and the observed change in consumption of a complete household with typically four persons may be only weakly correlated (because the husband gets the full happiness from the personal computer).

These observations make it obvious that the used panel data is insufficient:

- 1) for analyzing more promising examples of sustainable consumption, and
- 2) for allowing a reliable quantification that withstands careful review with respect to causality and statistical significance.

In order to justify the additional efforts needed for more reliable data to calculate CHap we need to clarify, whether there is empirical evidence, that

- 3) at least some people that got happier in the course of several years indeed were able to do so without increased material consumption or CO₂-emissions, and
- 4) at least some people that followed a number of recommended sustainable consumption activities managed to get both, more happy and less carbon-intensive.

There is promising work on these questions (e.g., Diener & Oishi 2000, Diener & Seligman 2004, Kasser 2002, Frey & Stutzer 2002) that needs verified along these more concrete questions.

We suggest that enhancing happiness (not pleasure) will also improve some capabilities and has large potential to achieve both, to (i) truly maximize utility and avoid that people are trapped in a consumption tread mill and (ii) provide additional carrots to achieve major changes in consumption patterns that otherwise show a high inertia. Thus, happiness has the potential work like an elevator for both capabilities and sustainable consumption.

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