

Wiping the Habit

An interdisciplinary research on the alteration of the environmentally harmful human activities revolving around the use of toilet paper



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Table of Contents

| | |
|---|----|
| 1. Introduction | 4 |
| 2. The Increasing Use of Toilet Paper on a Global Scale; An Environmental Policies Perspective | 7 |
| 2.1 Introduction | 7 |
| 2.2 The Causal Model: Causes of the Growing Use of Toilet Paper | 7 |
| 2.2.1 Relations of power between the West and developing countries – an end-user perspective | 8 |
| 2.2.2 Influence of commercial actors on the distribution of western sanitation habits; a supplier’s perspective | 8 |
| 2.3 The Causal Model: Consequences of the Growing Use of Toilet Paper | 9 |
| 2.3.1 Paper use | 9 |
| 2.3.2 Chemicals and POPs | 9 |
| 2.3.3 The impact of toilet paper on waste water | 10 |
| 2.3.4 The causal model | 10 |
| 2.3 The final model; potential measures for regulation | 11 |
| 2.3.1 Policies concerning production | 12 |
| 2.3.1.1 International standards by intergovernmental organizations | 12 |
| 2.3.1.2 National policies | 12 |
| 2.3.1.3 Non-governmental market intervention | 13 |
| 2.3.2 Policies concerning end-users | 13 |
| 2.3.3 Conclusion and recommendations | 13 |
| 3. Changing the social practice of toilet paper use | 16 |
| 3.1 Introduction | 16 |
| 3.2 Achieving More Sustainable Consumption by Policy Interventions | 16 |
| 3.3 Social Practice Theory | 17 |
| 3.4 Emergence and Disappearance of Practices | 18 |
| 3.5 Changing the practice of toilet paper | 20 |
| 3.6 Discussion & Conclusion | 22 |
| 4. Achieving Non-Forced Compliance to Reduce the Use of Toilet Paper. | 23 |
| 4.1 Introduction | 23 |
| 4.2 Toilet paper use as part of human behaviour | 23 |
| 4.3 Influencing behavioural decision making | 24 |
| 4.3.1 Nudging | 24 |
| 4.3.2 Importance of changing behaviour and legislation | 27 |
| 4.4 Disgust based interventions: harnessing disgust to influence behaviour | 27 |
| 4.4.1. Disgust | 27 |

| | |
|---|----|
| 4.4.2. Harnessing disgust to influence behaviour | 28 |
| 4.5 Conclusion | 29 |
| 5. Common Ground | 30 |
| 5.1 Introduction | 30 |
| 5.2 Identifying Differences and Creating Common Ground | 30 |
| 5.2.1 Harmful Human Activity | 31 |
| 5.2.2 The Alteration of Behaviour | 32 |
| 5.2.3 Harmful Human Activity: The Technique of Extension | 33 |
| 5.2.4 The Alteration of Behaviour and the Technique of Organization | 35 |
| 6. More Comprehensive Understanding | 37 |
| 6.1 Joint Perspective and Integration | 37 |
| 6.2 Applications | 38 |
| 7. Conclusion | 40 |
| 8. Discussion | 41 |
| References | 42 |

1. Introduction

When considering everyday habits and practices with a harmful environmental impact, toilet paper use would not be the first activity to come to mind. The use of toilet paper in Western countries is a very common habit and in most sanitation environments the only option of cleaning after using the toilet. It is thought that people started using alternative methods of cleansing in Northern parts of Europe and the US due to the cold winters. Toilet facilities were mostly placed outside of the house, and often ice-cold water was used for perianal cleansing, resulting in an uncomfortable toilet experience. Changing from water based cleansing methods to the use of rags, leaves or old newspapers meant an increase in comfort, which is thought to be the reason why toilet paper eventually became popular in Europe and North-America (Garg & Singh, 2016). Western commercially available toilet paper got introduced in 1857 and became widely available in the late 1920s (Wallechinsky & Wallace, 1976).

As often happens with the introduction of a new innovation, the harmful environmental consequences of the use of toilet paper were not taken into consideration when this method of cleansing was adopted. Given the ongoing wide scale consumption of this product, one might suggest this is still the case. Toilet paper is a product with a very short one-time-use lifespan and every day an equivalent of 27.000 trees is flushed down the toilet worldwide (Robbins, 2010). Harmful chemicals like dioxin or phosphorus are some of the by-products from the production process (Canadian EPA, 1991; Melin, 2008). For recycled toilet paper, less virgin wood fibres are needed (Thomas, 2008), but research shows that recycled paper products are associated with 10-100 times higher concentrations of toxic chemical such as BPA (Pivnenko, 2016, Liao et al 2012). Also, the need for new fibres will always exist, as fibres can only be recycled four to six times (Villanueva & Wenzel 2007). Consequently, toilet paper use has negative environmental implications for soil depletion, water contamination and human health.

The negative environmental impacts associated with toilet paper seem to be increasing as a growing number of people are starting to use toilet paper instead of cleansing methods based on water. Improved access to sanitation in developing countries appears to be the reason for a rise of the global consumption of toilet paper (Robbins, 2010), which is driven by countries like China, India and Brazil (Euromonitor, 2013). This increasing amount of users and the lack of attention in the media and politics, implies there are no indications that the harmful impact caused by toilet paper use will be reduced any time soon. Therefore, this research will aim to provide solutions on how to tackle this ever increasing problem, leading to the following research question: *“How can the negative environmental impact of the use of toilet paper be reduced?”*. The focus of this research will be what Repko (2012, pp. 86) describes as problem-based research, which focuses on providing useful, efficient and practical results. Such a research seems fit to finding solutions to the unresolved societal issue of the environmental harmful impact of toilet paper

In order to provide a more comprehensive answer to the main research question than any single discipline would be able to provide, the three disciplines of Environmental Social Sciences and Environmental Policy, Cognitive Neurobiological Psychology and Innovation Sciences will research different aspects of this complex problem. The first disciplinary chapter of the thesis will cover the problem from the perspective of Environmental Social Sciences and Environmental Policy, which will evaluate the causal relations between the globally increasing use of toilet paper, and the negative environmental consequences of this growing consumption. Consequently, it will assess the current status of policies concerning the

regulation of toilet paper production, consumption and disposal, and the role that different government bodies, or other non-governmental organizations can have within such regulatory policies. Finally, a model is presented with a recommendation of three potentially effective policies to reduce the harmful environmental effects associated with the use of toilet paper. The sub-question of this chapter is: *'How can governmental interventions reduce the negative environmental impact of the globally increasing use of toilet paper?'*. Innovation Sciences will try and provide a perspective on how to alter the practice of toilet paper use in order to prevent the harmful environmental effects. Toilet paper use is something that is embedded in social culture in many countries. Approaching the problem from this perspective provides information on what is theoretically needed to disembed the practice of toilet paper in a society. The sub-question of this chapter is: *'How can social practice theory be used to decrease the use of toilet paper?'*. The third chapter provides insights from the perspective of Cognitive and Neurobiological Psychology and discusses methods to influence behaviour like *nudging* and disgust based interventions and how they could play a role in directing people to change their behaviour to make more desirable decisions in sanitation. Directing people to choose for an alternative can eventually lead to a potential reduction of toilet paper usage. The sub-question of this chapter is: *'How can nudging and harnessing the emotion of disgust potentially help to decrease the use of toilet paper?'* .

Due to the diverse nature of the disciplinary approaches, the problem will be evaluated from three different angles. The use of toilet paper and its negative environmental consequences entail a set of complex problems that occur at the intersections of different scientific disciplines such as policy making, behavioural analysis, psychology, geology and even chemistry. Dissecting the subject further would inevitably lead to the inclusion of numerous other disciplines that could provide useful insights and additions on the matter. Because this research focusses on achieving behavioural change to reduce negative environmental impacts associated with toilet paper use, it is important to understand how this change is achieved. Each of the disciplines provides insights on how to do this. Apart from providing a scientific basis of the specific environmental impacts, the discipline of Environmental and Social Sciences and Environmental Policy discusses the possibilities for policy interventions. This is important because in order to change the behaviour of large groups of people at the same time over a short period of time, governmental interventions can be highly effective to direct or stimulate people into a certain direction. However, to change a practice that is so embedded in societal culture, it is important to understand the dynamics of such cultural behaviour. The discipline of Innovation Sciences provides useful insights on the practice of toilet paper use as a part of societal culture. These insights can be used in policy making and therefore the reduction of the harmful environmental impacts associated with the practice. The discipline of Cognitive and Neurobiological Psychology studies behaviour and how to influence individual decision making by implementing architectural and contextual alterations. Problems caused by toilet paper use are in essence a result of individuals behaving in a way that has a negative impact on the environment, and by understanding this behaviour, solutions can be offered for policy making on how to change individual behaviour. The new insights on cultural and individual behaviour can help to create policies that have a more structural effect. However, knowledge on the existing policy framework provided by Environmental and Social Sciences and Environmental Policy remains important in considering the applicability of such solutions. Only then, a plausible solution can be offered.

There is consensus among the disciplines that certain environmentally harmful activities need to be altered in order to reduce the negative environmental impact associated

with toilet paper. However, the perspectives on how to do this accordingly, differ. Common ground will be created by extending the concept of harmful human behaviour and organizing the theories on the alteration of behaviour, according to the techniques of extension and organization as proposed by Repko (2012). Applying these techniques enables collaborative communication between the different disciplinary insights. Using the insights from the three disciplinary chapters, and integrating them into a more comprehensive understanding, should make it possible to answer the main research question in an interdisciplinary fashion.

2. The Increasing Use of Toilet Paper on a Global Scale; An Environmental Policies Perspective

2.1 Introduction

This part of the thesis reflects on the increasing use of toilet paper on a global scale from a perspective of Environmental Social Sciences and Environmental Policy by providing an answer to the question *'How can governmental interventions reduce the negative environmental impact of the globally increasing use of toilet paper?'*. Environmental Social Sciences and Environmental Policy handles a broad, transdisciplinary approach to study the interrelations between humans and the natural environment, which entails research on how human activities impact our environment, but also how this impact can be reduced by altering human behaviour, putting limitations to human behaviour or implementing technical innovations.

In order to answer the question proposed, it is important to understand why regulation is necessary. Over the last years, the consumption of toilet paper is growing on a global scale (Euromonitor, 2013), and consequently the negative environmental impacts that are associated with this activity increase as well. The causal model presented in the first part of this chapter reveals the details of this relation and their implications. Potential reasons for the globally increased use of toilet paper (and therefore potential continuous growth) and the consequent negative environmental impacts will be explained. The findings displayed in the model provide insight to the status quo and give reasoning why it is important to regulate the use of toilet paper.

Building on the causal model, the situation will be evaluated from a perspective of Environmental Policy. Environmental Policy focuses on problems arising from human impact on the environment, and proposes a course of action or principle to reduce these problems. The possibilities for regulations will be assessed from two different angles, which are policies that target manufacturers and policies that target end-users. The production side is evaluated at three levels, namely the international, national and non-governmental level. Strategies to influence end-users are relatively new in the field of Environmental Policy, but an introduction will be made. Finally, three suggestions for intervention will be incorporated into the causal model. The aim is to propose a variety of different policies that intervene at different stages within the causal model that could be effective in the reduction of the negative environmental impacts associated with the growing use of toilet paper on a global scale.

2.2 The Causal Model: Causes of the Growing Use of Toilet Paper

There are organizations that correlate the use of toilet paper with access to improved sanitation in developing countries (Robbins, 2010A). The worldwide adaptation of flush-toilets as a replacement for squatting toilets is driving the demand for toilet paper and even in countries that prefer wet sanitation (i.e. cleaning with water) over dry sanitation (i.e. cleaning with paper) like Indonesia and India, the exposure to AFH (i.e. away from home) flush-toilets and toilet paper has led to an increased popularity of the product (Euromonitor, 2013). Population growth adds to the 2.4 billion people currently estimated to be in need of improved sanitation (WHO/Unicef, 2015), so it appears that the global demand for toilet paper will only continue to rise. There is no proof that dry sanitation is actually cleaner or results in fewer deaths from poor sanitation than wet sanitation (Robbins, 2010A), which means there must be different factors that contribute to the globally increasing use of toilet paper. The following section will identify two factors that explain this phenomenon.

2.2.1 Relations of power between the West and developing countries – an end-user perspective

Since the start of globalisation, Western traditions and customs have been adopted all over the world in a process known as Westernisation. Explanations for this globally occurring conversion to Western habits, and therefore the global adaptation of toilet paper, can be found in social theories on relations of power and social identity. Especially 'group identity' is an important concept in relations of power between the West and developing countries. Social identity of individuals is linked to the awareness of their membership of certain social groups, and to the emotional and evaluative significance of that membership. The characteristics of the group -like in this case status, richness or poverty, white or non-white - acquire significance only in relation to the perceived difference from other groups and the evaluation of these differences. Due to these differences, the relations between the groups remain asymmetrical and as a consequence differences in power will be reflected in the relations (Tajfel, 1972). The relations between the West and the rest of the world are built upon these principles as well, as the West was able to secure a dominant position in the world order due to the asymmetrical relation that was shaped by historical events and as of today, is still able to hold this position due to the current differences between the West and developing countries.

Linking the idea that toilet paper is an 'adequate' or 'the best' sanitation option to the dominant position of the West is not a new phenomenon of this kind. Aiming for the reproduction of the characteristics of the dominant group is a logical consequence to escape from the oppression that is experienced from the asymmetrical relations by the non-dominant group, and has occurred before. Examples of such include the global dominance and adaptation of western beauty standards (Calogero et al. 2007), or the conversion to western diets in Asia (Pingali, 2007). Therefore, it can be assumed that social identity and relations of power between the West and developing countries are factors of influence for the increasing demand of toilet paper in developing countries, and therefore contribute to the rise of the use of toilet paper on a global scale.

2.2.2 Influence of commercial actors on the distribution of western sanitation habits; a supplier's perspective

Another potential causal factor for the globally increasing use of toilet paper is the influence of commercial actors on the distribution of western sanitation habits. Toilet paper manufacturers from all over the globe are seeking to expand tissue markets by linking toilet paper use to a 'civilised', healthy way of life (Robbins, 2010B), which builds upon the previously mentioned relations of power between the West and developing countries. Commercial giants compete with steadily emerging local brands to target developing countries and to take advantage of the potential within the toilet paper market (Euromonitor, 2013). One example of such is the increasing commercial prominence of the Chinese Yuan Xiang Paper Products Factory, who state that China is headed for a 'golden period' in the tissue paper industry, and correlate the consumption of toilet paper with economic development and improvement of the quality of life in China. Manufacturer Fine Dubai sees huge potential in Iran, where the population of 67 million still mostly uses water for sanitation; their production plant is solely dedicated to ship tissue across the Persian Gulf (Robbins, 2010B). Market-dominating giant Kimberly-Clark (Tefris Team, Forbes, 2015) has seen a decline of sales due to the efforts of these local companies, but market expansion and growth are nevertheless ongoing (Euromonitor, 2013). Therefore, it can be concluded that the continuous efforts of commercial

actors to expand the global toilet paper market by promoting toilet paper as part of a civilised way of life, have led to a global increase in the use of toilet paper.

2.3 The Causal Model: Consequences of the Growing Use of Toilet Paper

The following section will identify some of the major negative consequences of the use of toilet paper on a global scale.

2.3.1 Paper use

Some would say that the globally increasing use of toilet paper isn't necessarily an environmental problem, as long as people are willing to use recycled-fiber content toilet paper. Producing recycled paper involves between 28 to 70 percent less energy consumption than making virgin paper, and for every tonne of paper used for recycling, the savings are at least 30.000 litres of water, 3000 to 4000 kWh electricity (sufficient for an average three-bedroom house for one year) and up to 95 percent of air pollutants (Thomas, 2008). However, toilet paper cannot be recycled indefinitely. After a maximum of four to seven cycles, the fibers become too short and weak, and eventually virgin pulp must be introduced into the process to ensure the quality and functionality of the product (Villanueva & Wenzel, 2007). This means that even for recycled toilet paper, new trees have to be cut.

Even though recycled toilet paper is a more environmentally friendly option than toilet paper made of virgin pulp, people still appear to prefer the latter. According to K-C's 2007 sustainability report, North America ranks the lowest for purchases of recycled-fiber content toilet paper with 20% of the total market, compared to 36% of the European market and 67% in Latin America (Robbins, 2010B). These numbers lay even lower for the 'at-home'-markets: only 2% of American households buy recycled-fiber toilet paper, compared to 20% in Europe (Kaufman, 2009).

The lack of demand for recycled toilet paper pointed toilet paper manufacturers into a different direction. Large eucalyptus monoculture plantations are being cultivated in Asia, South America and the Southern parts of Africa to supply the ever-growing demand of paper products. The construction of such monoculture plantations can directly cause deforestation and loss of biodiversity (Vijay et al. 2016), since natural (rain) forests and habitats often are cleared for these purposes. Eucalyptus is an invasive, high yield species, which due to its fast growing takes up large quantities of water and minerals at a high rate. This eventually leads to soil degradation in respect of nitrogen and organic carbon, and depletion of groundwater (Hu et al. 2017). Similar scenarios have played out in China, where the cultivation of eucalyptus plantations in semi-desert areas has depleted the already scarce water supplies (Robbins, 2010A). Despite these negative side effects, fibre richness and the strength of this tree make it the preferable source of raw material for toilet paper.

2.3.2 Chemicals and POPs

Before becoming the end product of toilet paper, virgin fibres undergo multiple processes like pulping, bleaching and strengthening, most of which are chemical processes that have environmental implications. For example, commercial giant Kimberly-Clark and many other non-explicit environmentally friendly brands use chlorine to bleach their products for aesthetic purposes and to remove the lignin (glue) from the wood (Melin, 2008). A consequence of bleaching with chlorine is the byproduct dioxin, which is a highly toxic chemical. Dioxin can cause reproductive and developmental problems, damage to the immune system, interference with hormones and also cancer. Besides that, dioxine is a POP (persistent organic pollutant),

which means it has a high chemical stability (a half life of 7-11 years once absorbed by fat tissue) and thus accumulates in the body or the environment (WHO, 2016A).

Production processes like pulping and strengthening the paper can form environmental hazards as well. Wastewater of a pulp and paper mill discharges materials such as nitrogen and phosphorus, which can cause or exacerbate the depletion of oxygen in water bodies, also known as eutrophication (Canadian EPA, 1991). The pulp and paper industry is also associated with emissions of heavy metals. In Canada for example, this industry is the third source of lead emissions to water (Environment and Climate Change Canada, 2016).

Choosing for recycled paper does not clear the dangers of toxic chemicals and POPs. Research shows that there can be 10 to 100 times more toxic metal residues in recycled toilet paper than toilet paper made from virgin pulp, which is caused by the ink on recycled paper that cannot be completely removed during the process of de-inking (Thomas, 2008). An important chemical in ink is BPA, bisphenol A, which is linked to increased rates of metabolic disorders (Vom Saal & Myers, 2008) and cancer (Jenkins et al. 2011). BPA can be found in high concentrations in recycled paper products (Pivnenko, 2016, Liao et al. 2012) and thus also in recycled toilet paper. On top of that, BPA is another persistent organic pollutant (WHO, 2016B).

2.3.3 The impact of toilet paper on waste water

As of now, limited research has been performed to understand the degradation mechanisms of toilet paper in sewage systems and wastewater treatment plans (Ruiken, 2012). Before wastewater reaches a treatment plant, toilet paper is already dissolved. This has to do with the fact that toilet paper is typically plant cellulose based, and when the paper becomes saturated with water, the water molecules weaken the cellulose bonds until the paper dissolves. However, due to increased chemical treatment to ensure a soft, absorbent and strong end product, more chemicals end up in the wastewater with it. Microbes consume the dissolved paper, which turns it into sludge. The breakdown of the sludge creates biogas (MH₄ and CO₂), but there are no exact numbers of these quantities. The remaining sludge will be filtered out and is usually sent to a landfill or recycled. Part of the chemicals that were in the toilet paper will remain in the sludge and contaminate the soil if stored/buried in a landfill. Also, more methane, a greenhouse gas with 23 times the heat trapping capacity of carbon dioxide, will be released during the breakdown of toilet paper in the landfill (Green Press Initiative, 2007). After the removal of the sludge, the wastewater undergoes more chemical treatment to remove dissolved metals and other built up toxins. POPs will remain in the water (WHO, 2016B).

2.3.4 The causal model

The findings above are combined and displayed in the following causal model. The model provides an insight to the current situation and expresses a need for the regulation of this practice. The following paragraph will use the model to identify possible interventions in order to to reduce the negative impacts associated with the globally increased use of toilet paper.

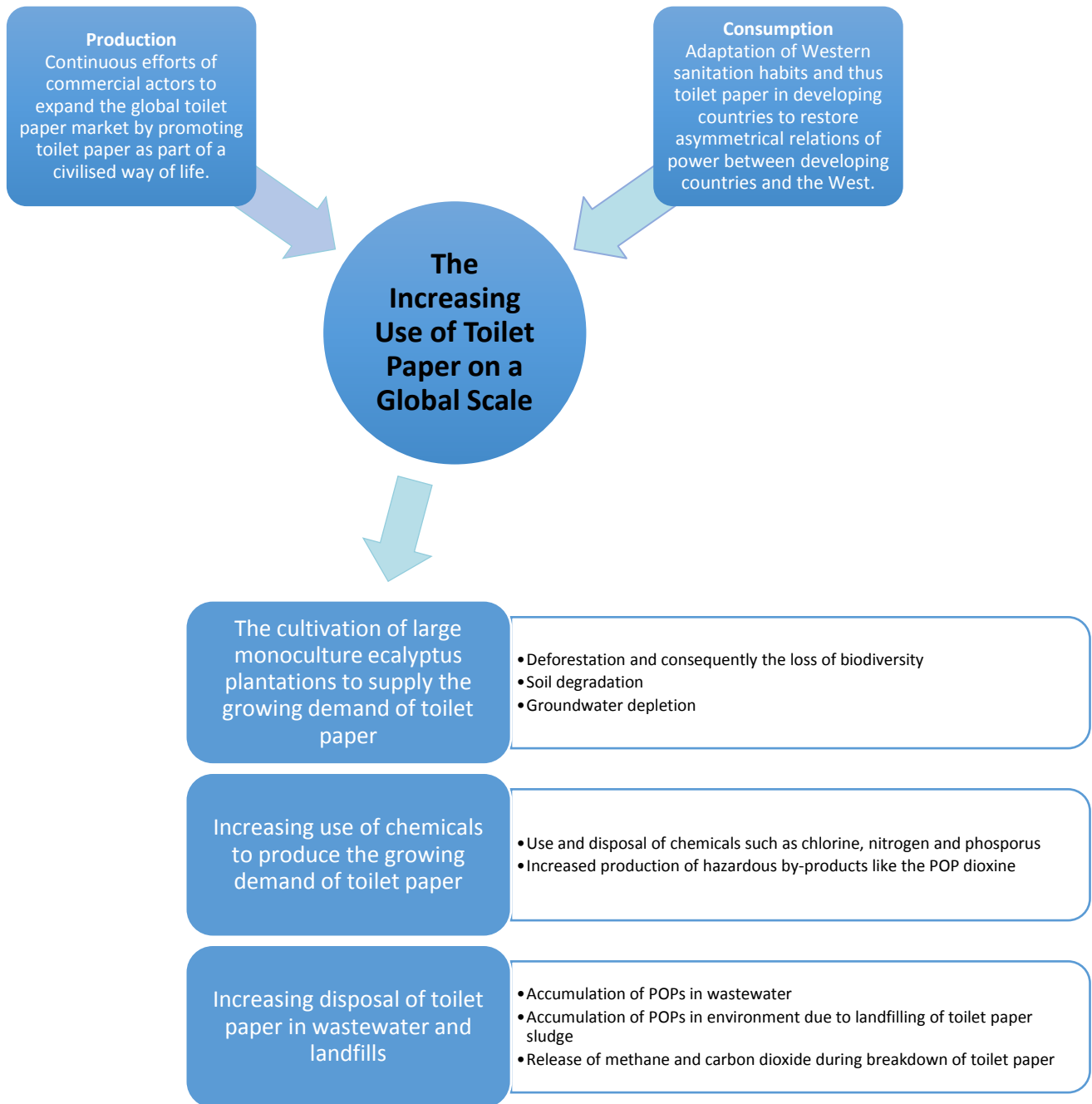


Figure 1: The causal model

2.3 The final model; potential measures for regulation

Currently, there are limited policies in place to regulate the production, use and disposal of toilet paper specifically. In this section, the possibilities of intervention and their effectiveness will be explored. The interventions can be aimed at the manufacturers, but also at end-users. Finally, three suggestions will be incorporated into the causal model.

2.3.1 Policies concerning production

This section will evaluate and argue the existing policies of international, national and non-governmental bodies that aim to reduce the negative environmental impact associated with toilet paper use by targeting manufacturers.

2.3.1.1 International standards by intergovernmental organizations

Negative impacts due to the increasing use of toilet paper can be experienced all over the world and are not restricted to country boundaries. For example, forests often transcend national boundaries, which leaves multiple governments in charge of its management. Also, deforestation, loss of biodiversity and the release of emissions can have an impact on a global scale.

Global international environmental law is very limited and in many cases reduced to 'soft' law only. So far, several laws such as 'the right to undisturbed family life' and 'the right to live' of the European Convention on Human Rights have compensated for the lack of concrete environmental law (Uylenburg & Visser, 2013). An example of soft environmental law concerning paper production is the promotion of SFM-practices (sustainable forest management) by the United Nations, which aim at keeping a balance between three pillars of ecological, economic and socio-cultural development. However, questions arise how compatible these three pillars are. For example, the Forest Stewardship Council is one of the most famous international initiatives to ensure sustainable forestry, but certified monoculture eucalyptus plantations in the Brazilian rainforest in 2008, and thus failed to take into consideration what environmental implications these monoculture plantations hold. A transnational set of regulations focussed on the protection of natural forests would therefore be useful to reduce the negative environmental impacts associated with the production of toilet paper.

The European Union is considered to have the most extensive set of environmental policies of any intergovernmental organization. However, most policies are functioning as a framework, which leaves it to individual countries to draw up specific policies. Drawing up policies within the framework of the EU is incredibly complex, as the decision-making process is densely populated with actors that have veto. Conflicting interests and the aim to ensure a strong international economic position make it very hard to reach consensus on environmental topics. Same difficulties will be encountered on a higher level such as the UN, since even more actors are in the playing field.

The illegitimacy of unsustainable forestry would be of significant influence on the regulation of paper production, since manufacturers would have to comply with certain standards of production. Stricter rules on the production process could eventually lead to a less profitable market and/or a more expensive product, and contribute to the reduction of the production and use of toilet paper. However, the likelihood of these policies coming into practice is another topic of discussion.

2.3.1.2 National policies

As the section above touched upon the issue of sustainable forestry, this section will explore the possible policies on national level to reduce the negative environmental impact of the production of toilet paper, from the point at which the virgin wood or recyclable product reaches the factory.

In these cases, the policy will have to deal with point-source pollution (pollution from a fixed place), but negative impacts such as from emissions, can be experienced away from this

fixed point as well. Consequently, national environmental policies have to be put in place to prevent pollution at the point source, to ensure a clean living space within its own domestic borders, and to prevent possible transboundary pollution in surrounding countries.

The two dominant environmental regulatory approaches are 'command and control' and the 'market-based regulatory approach'. Command and control entail punitive policies that, for example, hold companies responsible when they exceed the legally set limits of pollution. Around two decades ago, a shift was seen from command and control towards an incentive-based regulatory approach, by providing market-based inducements to encourage polluting entities to reduce pollution. It was believed that incentive-based regulations would obtain better results, because financial incentives would stimulate companies to reduce their environmental impact beyond the set limits. Research has shown that it is best to find a middle way between these two approaches, as circumstances under which pollution occurs may vary and different environmental issues ask for different approaches (Sinclair, 1997).

An example of such a combinational policy to tackle the negative environmental aspects of the production of toilet paper could be the requirement of closed loop recycling. This means that a factory cannot dispose waste, but has to use it for other processes of production. One step beyond closed loop recycling, brings us to the principle of 'cradle to cradle'. This approach not only demands a closed loop, but also to redesign the industrial processes altogether. This means that toxic materials and processes should be eliminated entirely to make sure that the product can be produced, recycled and reused safely (Ho, 2011). This approach sets standards, but leaves it to the companies to find ways to achieve these standards. A policy based on the principles of cradle to cradle therefore stimulates innovation (McDonough & Braungart, 2010) and could direct toilet paper manufacturers, in collaboration with scientific parties, towards more sustainable production of toilet paper.

2.3.1.3 Non-governmental market intervention

For the last decade, a new trend of certification of the social and environmental aspects of a product's production process has emerged as a significant trans-national, non-governmental market-based approach to environmental regulation and development. Examples include the certifications of the Forest Stewardship Council, which is supported by organizations like WWF, NWF and Greenpeace, and the Programme for the Endorsement of Forest Certification. This approach aims to improve the environmental and social circumstances under which forests are managed. However, the big retailers remain the most powerful players in the commodity network, and their demands for high volumes and low prices dominate, which resulted in an incapacity of the forest managers to cover the costs of certification and the required forest management improvements (Klooster, 2006). This means, from an environmentally regulatory perspective, certifications do not adequately stimulate environmentally friendly forestry. The failure of the certification system calls for new approaches, as once again ecological, economic and socio-cultural development seem incompatible as a foundation for policy.

2.3.2 Policies concerning end-users

Instead of taking reactive actions, policies could aim at preventing the use of toilet paper as well. Preventing environmental harm is cheaper, easier and less environmentally dangerous than reacting to environmental harm that is/has already taken place. This set of assumptions also known as the prevention principle. The prevention principle was an important element of the EC's Third Environmental Action Programme, which was adopted in 1983. An expression of the prevention principle in existing environmental policies is for example found in the

Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989) from the Basel Convention, which sought to minimize the overall production of hazardous waste. By preventing the growing use of toilet paper, the negative environmental impacts will be significantly less than when an increased use of toilet paper continues to take place, of which the negative consequences need to be mitigated.

A way of preventing the use of toilet paper is by targeting the end-users instead of the manufacturers. Besides command and control and market-based incentives, nudging, as a newcomer in the field of environmental policy, could be effective in doing so. A nudge is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives (Thaler & Sunstein, 2008). Nudging could be used as an instrument to alter a person's initial decision to use toilet paper. For example, promoting wet-sanitation on pamphlets in public restrooms in developing countries as the 'proper' way of cleaning (Lindahl & Stikvoort, 2015) could stimulate people to clean with water instead of toilet paper. Another very effective type of nudging is changing the standard choice -in this case toilet paper- for another option; this is called preset nudging (Marteau et al. 2011). An example of preset nudging would be installing water hoses for cleaning and not supplying any toilet paper in public restrooms.

An empirical study (Lindahl & Stikvoort, 2015) of 32 nudge case studies proves nudging effective in 28 of those cases. However, the same study states that nudging is highly context dependent, which means that to effectively use nudging as a strategy to reduce the growing use of toilet paper, more small-scale research is needed. Also, however nudging in itself does not require any policy or law making, in order to implement it as a strategy there must be some kind of framework or regulation in place. Nudging is currently not used in any form of governmental policy, so this would require more research as well.

2.3.3 Conclusion and recommendations

After evaluating various existing policies that could reduce the negative environmental impacts associated with toilet paper, it appears that there are some limitations to the current system. As was seen with both international forest protection programs and the certification scheme, the three pillars of ecological, social-cultural and economic development did not provide an adequate basis for efficient policy. The evaluation of these limitation has led to the identification of three potentially effective interventions that intervene at different stages within the process.

The first option would be to implement a set of binding international rules to protect natural (rain) forests and to prohibit unsustainable forestry, which would solve problems of shared responsibility. Even though it can be very complex to form such policies, if all actors are willing it can be very effective. A second option would be to create a national policy based on the principles of both command and control and the incentive-based regulatory approach. As was argued, the demand for cradle to cradle processes could be of way to do this. Finally, since prevention is always more effective than reactive policy, an option would be to target end-users with the technique of nudging to reduce the use of toilet paper in general.

Lastly, the recommendations are integrated in the causal model, which leads to the final model.

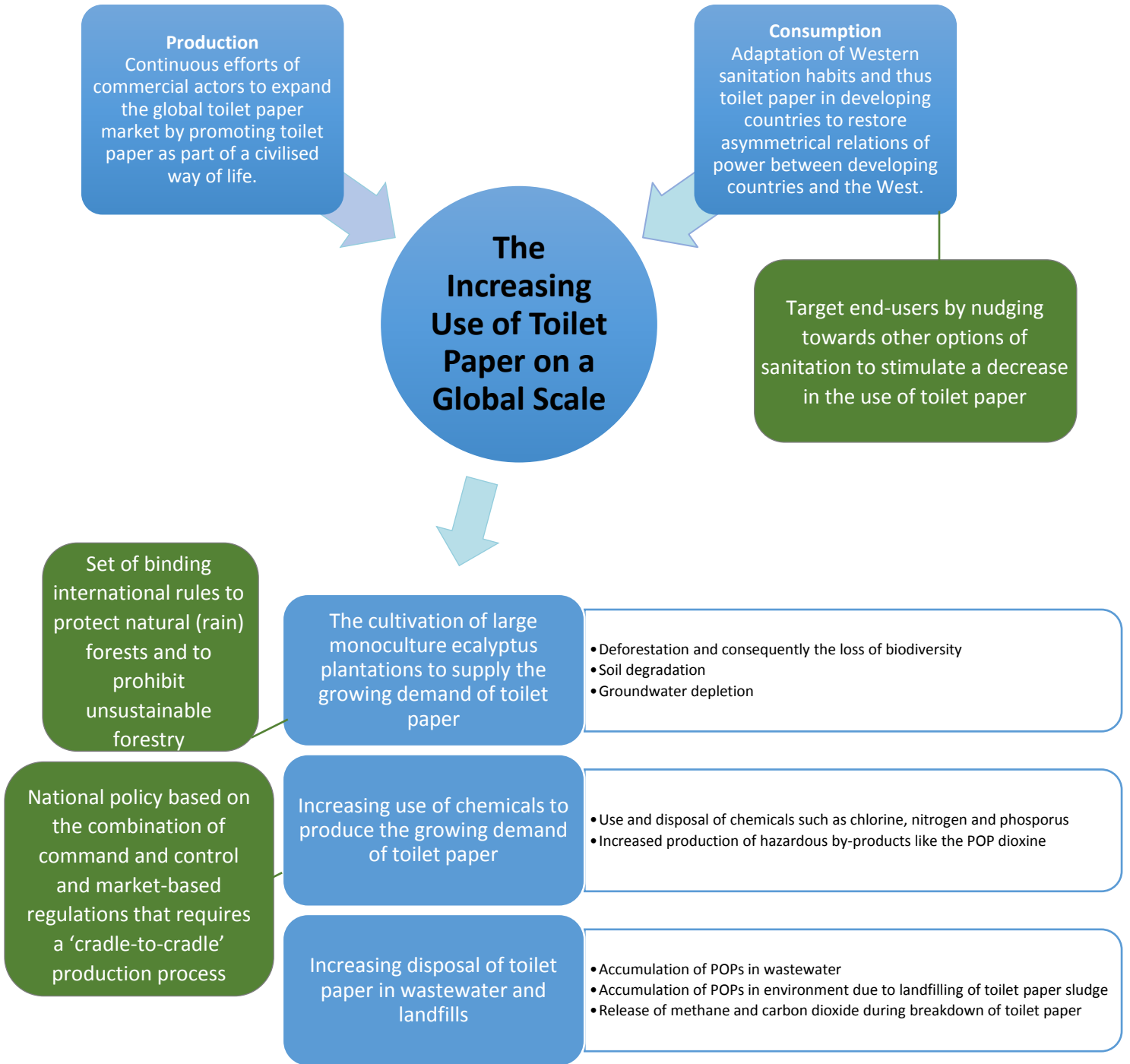


Figure 2: The final causal model

3. Changing the Social Practice of Toilet Paper Use

3.1 Introduction

This part of the thesis will look at the problem of toilet paper from the perspective of innovation sciences. Innovation Sciences revolve around the application of better solutions that meet new requirements, unarticulated needs or existing market needs. An example of such requirements or needs could be to achieve more sustainable consumption. Therefore, this chapter will focus on finding a better solution to the unsustainable consumption of toilet paper. An example of a solution that would meet more sustainable consumption patterns would be the use of a bidet, or bidet sprayer instead of toilet paper. This chapter will look at how the implementation of such alternative cleaning methods could be achieved in western countries.

Changing the use of toilet paper, would mean to change a practice that is embedded in everyday life. Achieving more sustainable consumption patterns by changing individual behaviour concerning such everyday practices, has proven difficult (Bellotti & Mora, 2016). Behavioural change theories such as the theory of planned behaviour or nudging, have proven successful in achieving more sustainable consumption. These changes however, are incremental and often temporary. Fundamental changes, affecting the lifestyles of individuals, are rarely achieved. The reason for this is thought to be that behaviour is heavily influenced by social and cultural factors (Hargreaves et al. 2013). Therefore, this chapter will aim to provide an understanding of how behavioural change could be achieved, from the perspective of societal culture.

Social practice theory revolves around how social and cultural factors influence everyday practices such as using toilet paper (Reckwitz, 2002). By focussing on these practices the theory moves away from using rational choice as the driving force of human behaviour. By doing this the framework has received increased attention over the past 20 years to replace, or enhance more conventional based behaviour change theories (Strengers et al. 2015). By emphasizing the practices in everyday life, the possibilities to use more sustainable and cleaner ways of perianal cleansing will be discussed. This leads to the following research question: *'How can social practice theory be used to decrease the use of toilet paper?'*

The first section will provide an overview of the current status of policy interventions revolving around achieving more sustainable consumption patterns. This is followed by an explanation of what social practice theory entails. Next, the possibilities on how to change social practices will be discussed. The final paragraph will propose potential methods on how to change the practice of toilet paper use, into a cleansing method based on water.

3.2 Achieving More Sustainable Consumption by Policy Interventions

The social sciences have been involved with behavioural change, concerning sustainable consumption since the early 90's (Shove, 2010). Much of current literature, revolving around behaviour change of consuming, has focused on the so called ABC framework. The 'A' stands for attitude, 'B' for behaviour and 'C' for choice. Within this framework, it is believed that behaviour change can be achieved by changing values and attitudes, which influence certain kinds of behaviour that individuals choose to adopt. The basic principles of the ABC framework are based on a believe that if societies want to make steps towards becoming sustainable, individuals and their behavioural choices can make the difference (Shove, 2010; Walker, 2015).

The attention in literature made the ABC framework popular as a basis for policy interventions aiming to achieve more sustainable consumption patterns. Concepts such as persuasion, pricing and advising, targeting the cognition of people, have been widely adopted in such interventions. It is thought that by working on the cognition of individuals their attitudes can be changed. Supposedly, once attitudes have been changed, they will regardless of context stay that way and influence the lifestyle of individuals (Hargreaves, 2011). This context however, has turned out to be more important than previously thought. For example, existing social norms, social networks or infrastructures are all determinants of behaviour change. In order to account for many of such factors, behaviour change programs are becoming increasingly complex, without much signs of improvement (Hargreaves, 2011). Reports like the International review of behaviour change initiatives have made reasons to believe that interventions based on individual change do not work as intended, or at least do not have the environmental impacts as hoped for (Southerton et al. 2011). It thus seems, that the focus on the ABC framework, has not resulted as intended when trying to achieve more sustainable consumption patterns.

This seems to be the reason why there has been increased attention for social practice theory, to successfully implement sustainable ways of living (Bellotti & Mora, 2014). The theory is based on the principle that changing behaviour is by nature part of a very complex cultural, material and technical system. By looking at these complex systems in terms of more simple social practices, behaviour change could be more easy to understand and ultimately achieved. How this could be achieved, is still a point of discussion. Some think that it would be best to use social practice theory in order to improve current behaviour change methods (Hargreaves, 2011; Strengers et al. 2015). Others argue that it can be used stand alone and see ABC based and social practice based interventions as impossible to incorporate together (Shove, 2010; Shove et al. 2012; Spurling & Mckeen, 2015). The intervention possibilities presented in this paper, will look at the latter. The focus will be on showing how social practice theory could be used to influence toilet paper use. However, the exact means of executing such policy interventions will not be discussed. This will be discussed in the integration chapter, where insights regarding policy interventions can be integrated with social practice theory.

3. 3 Social Practice Theory

Rather than individuals, societies or social groups, social practice theory uses practices as an explanatory process for everyday behaviour. Giddens (1984) was one of the first to examine behaviour from such a viewpoint. His work revolved around the structuration theory, explaining that there is interaction between structure and agency. Meaning that behaviour is influenced by social structures, which provide rules and meaning in a society. On the other hand these social structures are influenced and reproduced by human behaviour (Giddens, 1984). So, human behaviour is neither the outcome of conscious decisions, nor a necessary outcome provided by social structures. According to Giddens, structure and agency come together or form a duality by performing social practices. Social structures have an important role in determining social practices and thus human behaviour. However, social practices changing over time, can only be explained by the interplay between both structure and agency. Following, examining social practices makes it possible to understand outcomes of the social world from the perspectives of both structure and agency.

Reckwitz (2002) has been important for the current form of social practice theory in most literature. He unified differences among variations of the social practice theory by

pointing out the shared focus on everyday life and shared knowledge. But more important, he provided the currently most adopted definition of a social practice:

“A ‘practice’ (Praktik) is a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.” (Reckwitz, 2002, pp. 249).

A social practice according to this definition forms a ‘block’ necessarily depending on the existence of these elements and how they are connected. The interplay between these elements determines the dynamics of a social practice. Shove et al. (2012) elaborate on social practices as dependent on these links but simplify it by addressing three elements.

-Materials, consisting of objects, infrastructures, tools, hardware and the human body.

-Competences, the skills or practical knowledgeability of a practice.

-Meanings, which include, symbolic meanings, ideas and aspirations.

Using these three elements allows to examine social practices more accessible, but still provides a comprehensive approach. The interplay between these elements, can be seen with for example the practice of showering: it combines the meanings of cleanliness and freshness; the skills of how to use soap and washing; and the materials water, soap and the shower cubicle (Hargreaves et al. 2013).

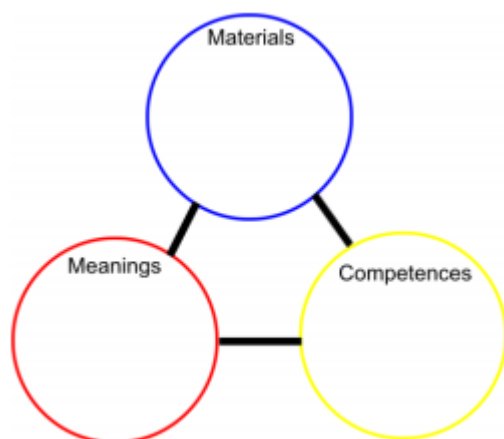


Figure 3: Elements of a social practice

When a practice is being performed this is an individual combining certain materials, his or her use of competences and the meaning her or she attaches to the practice. Rather than individuals being the subject of analysis, they are the carriers of a practice (Reckwitz, 2002). It is the sum total of many individuals performing an activity in a certain way, that determines what a practice involves. So what basically happens when a practice emerges is that a certain amount of individuals, forming a social group start executing an activity in a certain way. This practice is shaped by the elements, competences and meanings interconnected with each other.

3.4 Emergence and Disappearance of Practices

In their conceptual framework Shove et al. (2012) explain how single practices emerge, exist and disappear. Most important for this is the link between the elements. According to them, a new practice can emerge when a link between at least two elements is made, a practice will

exist as long as the links stay the same and a practice will disappear if a link is broken. That means there are three possible states or scenarios for a practice, as shown in figure 4. The first is the Proto practice state in which the links are not made yet. The second is the practice state, in which the links are being made. The third is the ex-practice state in which links are no longer being made (Shove et al. 2012). The emergence of a practice means going from the proto practice to the practice state, and the disappearance of a practice means going from the practice to the ex-practice state. In order for such a change between different states to happen, active integrations or disintegrations of materials, competences and meanings is needed (Shove et al. 2012).

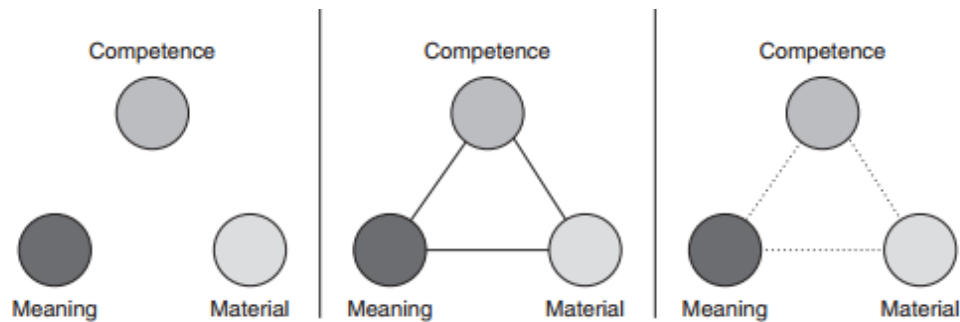


Figure 4: Three scenarios of practice

There are various ways in which the changing of states of a practice can occur. These revolve around the interaction of elements within a certain practice or the interaction of elements between practices. Change of a practice is often influenced by external impulses, such as an innovation, leading to the improvement or existence of a material element (Hargreaves et al. 2013). An external impulse can result in one of the elements becoming susceptible to change. When this happens, other elements can be changed as well, mutually shaping each other (Pantzar & Shove, 2010). Rather than the formation of social practices happening from one day to another due to changes in preferences of the carriers, it follows a slow process in which changes in the elements influence one another.

One good example of how elements within a practice can influence each other is provided by Shove et al. (2012) and concerns the practice of driving. When cars were first used in the early 1900's, the practice of driving was different from the current one. Driving was only for wealthy men and was considered non-practical since cars would frequently break down. The car, as a material element caused that the competences of mechanical skills were needed to operate a car. This meant that the meaning of driving included adventure and risk. Many did not foresee a future for automobiles in everyday transportation, for such unreliable means of transportation. But, as cars became more reliable, the skills (competences) needed to operate a car decreased rapidly. This led to an increase of car use and with that the meaning of driving. Instead of being adventurous, it became associated with everyday life and a main transport method. In this situation, a change in material led to a change in competences. This on its turn led to a change in the meaning of driving (Shove et al. 2012). This shows how innovations in the car industry led to a changing material element, which on its turn led to a change in the skill needed and the meaning that of the practice. Next to technological innovations, cultures, social expectations, knowledge, etc. change between time and place. All these factors can lead to the emergence of new practices, stabilize existing ones or bring old ones to a halt (Bellotti & Mora, 2014).

Another mechanism important for the emergence or disappearance of practices, are the relations and links between practices. First it is important to realise that the elements, while susceptible to change within certain practices, are themselves relatively autonomous (Pantzar & Shove, 2010). This means that the same element can circulate between practices, but also be part of multiple practices at once. For example, the practices of showering and doing laundry have such a link. Both practices seem to be very different, when looking at the competences, one needs the skill of operating a washing machine and the other of putting on soap, washing etc. Also the main materials used, a washing machine and a shower differ. But despite this clear distinctions they have elements that overlap with each other. In the practices of doing laundry or taking a shower the material elements soap and water, provides the meaning of cleanliness (Shove, 2003). So the practices themselves are different in many of the elements, however, in some aspects they form links and are much alike.

In literature these relations between practices are referred to as bundles or systems of practices. These practices depend on each other and can not be seen separately. In the example of cleanliness with doing laundry and taking a shower this can be seen. When a person takes a shower before going to work, doing laundry is not part of the routine. A person will probably not think of one while doing the other, making them seem autonomous. They, however, revolve around the same meaning: cleanliness. Shove (2003) describe how the meaning of cleanliness has evolved over time. Even one generation ago it was normal to take a bath only ones a week in the UK, nowadays it is normal to take one or two showers a day. The same increase can be seen for doing laundry. This co-evolution is important for the idea of cleanliness. If a person would put on dirty clothes after taking a shower every day, the meaning of cleanliness dissolves. The two practices thus, are related to each other due to the meaning of cleanliness.

This means, aiming to achieve a transition from toilet paper to water based cleansing methods, several mechanisms can be used. It can be tried to make use of external stimuli to create a change in one of the elements, leading to a change in the practice as a whole. Another option would be to explore the possibilities, by how the connection of elements of toilet paper, or water based cleansing methods can benefit such a transition. The next section will explore the possibilities on how these mechanisms can be used when aiming to achieve such a transition.

3.5 Changing the practice of toilet paper

Introducing an intervention based on social practice theory, will mean that policy makers have to make a transition from focussing on individuals to focussing on practices. One problem that social practice theory has is that, policy makers are part of the patterns, systems and social arrangements. Current policy interventions are often aimed at change within the boundaries of a current social practice. So in order for a policy intervention using social practice to work, policy makers have to be able to look past these boundaries (Shove et al. 2012).

If such boundaries can be overcome, there are several ways in which policy interventions could influence the practice of toilet paper use. This could be in the form trying to break links between the element of the unwanted practice of toilet paper use. It could also be by positively promoting elements of the wanted practices, using a bidet or bidet sprayer. The first option to achieve this is by influencing the elements directly. By, for example, making infrastructural changes aimed at influencing the material elements. Second, knowledge on relations between practices can be used. If a connection between the elements of practices

can be established, one could be used to influence the other. Or if potential links between practices exist, recognizing these could also be valuable.

For the case of toilet paper, there are first some things which need to be considered. In some countries the practice of going to the toilet has included toilet paper for over 100 years (Garg & Singh, 2016). This means that the material element of toilet paper and its connection with other elements is deeply embedded in social culture. In other countries, where (some) people begun using toilet paper more recently, the elements included in the old practice are still likely to endure in social culture (Shove et al, 2012). It is therefore likely that in such countries the reintroduction of water based solutions instead of toilet paper, could be relatively simple. This, because the use of the practice is already a quite normal thing to do. In countries where toilet paper is established for over 100 years, changing the practice is likely to be extremely difficult.

There are several options when replacing toilet paper, by water based cleaning methods. The more luxurious option, that corresponds with western prosperous lifestyle would be a bidet or bidet sprayer. Using a bidet is fairly simple since it consists of pressing a button and water will come out of a pre-installed tap in the toilet. The other option would be using a bidet sprayer, which means a hose attached to the toilet has to be aimed by the individual. Both options would have advantages considering certain elements. The bidet, which is more easy to operate, has an advantage considering the competences. The sprayer however, appears to have an advantage considering the material element. Since the sprayer can be installed on a toilet without replacing the toilet all together, the installment is less cost and time intensive. They both however seem to be viable options.

When trying to achieve a change in a practice, it is important to realize that a practice only exists when people are performing it. This is what makes it common and part of societal culture. When this is the case it means that the practice has meaning, competences and material elements involved in the practice. In order to start the practice of cleaning with water, links between the elements need to be formed. So, in order for cleaning with water to become a social practice, people need to perform the practice and there needs to be a material element, the competences to use this and a certain meaning attached to it. The first step to make the transition to cleaning with water, would be to provide the material element. In this case it will be the provision of water based cleaning methods in sanitational area's. Only if this material element is present, it will become possible to perform the practice. Only having the material element present, however, does not mean that links between the meaning and competences of the practice are made, which in this case are links to cleanliness and more environmentally friendly methods.

In the current form, individuals performing the practice have the meaning of cleanliness when using toilet paper, due to it having the least contact with feces (Othman & Buys, 2016). By using more advanced methods as the bidet or bidet sprayer, this contact with feces can be avoided in total. This would mean that water based methods would be the most clean option. As stated before however, such information targeting the conscious mind, does not make it likely that individuals change their behaviour. An option to achieve such change would be to use relations between practices. There are other practices, that, like toilet paper are associated with cleaning. Such practices are for example doing laundry, showering, washing hands, doing dishes and other cleaning methods based on water. These cleaning methods are associated by the meaning of cleanliness and the material element of water. It is this connection with water that could be of use when implementing a change in sanitational

cleaning. By making the comparison of cleaning with water, people could have the meaning of cleanliness they have with taking a shower or going to the toilet.

Next to new connections between elements that have to be made, also old connections have to be broken. In many social practices, such as the example with driving as a social practice, the old links broke due to the new links forming slowly over time. In policy interventions however, the transition will be less natural and breaking links could be a determinant for success. Breaking the links can be done by for example using the link between the material element toilet paper and the meaning people have when using it. A meaning currently held, is most likely one of convenience and a sense of cleanliness. If somehow these links can be broken, other options can seem more viable. A way of achieving this can be by addressing the negative sides of using toilet paper. By addressing that the use of paper, is not a very effective cleaning method, this link can be broken. This can for example be done by showing that rubbing just a paper on dirty spots, does not only clean the spots, but also leaves traces and spreads the dirt. So, by focussing on these points the meaning of comfort and cleanliness people have with using the material element of toilet paper could be decreased.

3.6 Discussion & Conclusion

This paper has aimed to find a way to change our daily toilet paper use. An explanation of social practice theory has been used in order to provide such a way. By using social practice theory, several propositions have been done in order to change the toilet paper habit into more sustainable options as the bidet or bidet sprayer. The first is to create the opportunity for a new material element, by placing other perianal cleansing options. The second was to use a connection with other elements. By emphasizing that using water would mean the same sense of cleanliness as with practices such as showering or doing laundry, a connection between cleanliness and using a bidet or water hose could be established. In addition, a focus on breaking elements between comfort and cleanliness people have with the material element of toilet paper, could be used to break the elements between the practice of using toilet paper.

The propositions as discussed in this paper are far from a ready to use policy framework. This is one of the current matters still undeveloped in social practice theory. It was however, not the main focus of this chapter to provide a ready to use method. The main focus was to show potential ways, in which social practice could alter the embedded use of toilet paper. The practical applicability can be improved by integrating them with the insights from the other disciplines. Also, the insights on how to change the practice could have a more empirical nature. By performing interviews, or tests, aiming at understanding what people endure when using toilet paper versus a bidet or bidet sprayer can be used to develop a more comprehensive method.

4. Achieving Non-Forced Compliance to Reduce the Use of Toilet Paper.

4.1 Introduction

This part of the thesis will discuss how the use of toilet paper can possibly be reduced from the perspective Cognitive and Neurobiological Psychology. This discipline revolves around the study of mental processes such as attention, language, memory, perception, problem solving, creativity, and thinking. Focussing on mental processes involving the use of toilet paper and studying it from a behavioural perspective could provide insight in how to influence the behavioural practice in order to potentially reduce the use of toilet paper and direct people in using an alternative when provided. It will also provide an addition to the previous chapter, which proposed that breaking and forming links between material elements, competences and meaning in social practice could lead to an alteration of the social practice itself.

In this chapter the end-user and it's hygienical behaviour and decision making will be targeted in order to potentially reduce the use of toilet paper. First the use of toilet paper will be discussed as part of hygienical human behaviour. Indirect suggestions can influence decision making and incentives, potentially leading towards the making of more desirable and environmentally friendly decisions by individuals. This is a concept known as nudging or nudge theory, which will secondly be discussed along with how it's use can potentially lead to a reduction of toilet paper usage and directing people to use an alternative. This chapter will also discuss the role of the emotion of disgust in hygienical behaviour and how it can be harnessed for disgust based interventions to potentially influence people's behaviour.

The aim of this chapter is to provide an answer to the following question: *How can nudging and disgust based interventions potentially help to decrease the use of toilet paper?*

4.2 Toilet paper use as part of human behaviour

For most people in western countries, using toilet paper is a highly normalised practice which is often performed without being full consciously aware of the practice itself or the consequences of using it. Cleaning after the use of sanitation, which includes using toilet paper for a lot of people, is a phenomenon of human behaviour which is often associated with hygiene. Hygienic behaviour is often motivated by the desire to avoid or remove things that are found to be disgusting (Curtis & Biran, 2001). There is much variety in what is considered acceptable, disgusting or appropriate among different societies. For example, in some societies it is considered disgusting to eat insects, whereas in countries like India it is fairly normal to eat fried grasshoppers. Despite these differences there is also a sign of consistency between societies in what is considered to be disgusting or hygienic (Curtis & Biran, 2001). Feces, for example, is considered as disgusting by most societies in the world (Curtis & Biran, 2001). The consistency of hygienic behaviour in human beings is believed to be related to the emotion of disgust, an emotion which is evolved to protect the organism from risk of disease (Curtis et al. 2004). Cleaning yourself after using sanitation seems to be a part of common human behaviour. The problem is that some cleaning practices, like using toilet paper, have more harmful environmental consequences than other forms of cleaning, like using a bidet or a waterbrush. If more people alter their behaviour and choose to use alternatives for toilet

paper, like water (as proposed in the previous chapter), and these alternatives are provided, this can potentially have a positive effect on the environmentally harmful consequences surrounding the use of toilet paper.

Westernised countries often hold a very high standard in hygiene which can be explained culturally (prevention of disease spreading) but also economically (most people can afford hygienic measures). The use of toilet paper is, however, often not found to be the most hygienic solution of cleansing compared to other alternatives like the use of a bidet. Toilet paper can leave fecal traces on the body of the user, including the hands due to almost direct contact while wiping. Feces and fecal traces are the source of over 20 known bacterial, viral and protozoan causes of intestinal tract infection, including the infectious bacteria *E. Coli* (Curtis & Biran, 2001). There is already a simple solution to this problem: washing the hands after the use of a toilet. However, a meta-analysis in hygiene based on observed and self-reported information found that rarely more than 50% of the people wash their hands after the use of a toilet (Porzig-Drummond et al. 2009). A UK-wide study to hygiene published by the BBC found that 32% of british men washed their hands and 64% of the women (Winterman, 2012). Estimates based on a meta-analysis concluded that improved hygiene could reduce the rate of gastrointestinal illness by 31% and respiratory illness by 21% (Aiello et al. 2008). This suggests that a more hygienic alternative for toilet paper may also potentially improve overall health, using a bidet for example, removes the part of the toileting sequence where the user has almost direct physical contact between his/her hands and the feces he/she tries to remove.

Some countries, like Japan, already have their sanitational area's equipped with alternative methods of cleaning due to their more hygienic properties. Many Japanese toilets provide the option to clean with water and dry with air instead of using toilet paper. Toilet paper, as mentioned in chapter one, has a lot of environmental harmful consequences from the production to the use and disposal of the product. Concerning the environmental and hygienic implications of the use of toilet paper, providing alternatives to toilet paper in western sanitation like in Japan can potentially cause a reduction in the use of toilet paper. The previous chapter discussed how social practices can theoretically be altered by the breakage and forming of links between material, meaning and competences. Nudging and disgust based interventions can serve as potential tools in breaking and forming these links, eventually linking water based cleaning methods in sanitation to the more environmentally friendly and hygienical choice. Assuming these water based alternatives are or will be provided in western countries, this part of the thesis will focus on directing people to make the more environmentally friendly and hygienic choice once provided.

4.3 Influencing behavioural decision making

4.3.1 Nudging

Most people value their health and the environment and yet persist in behaving in ways that undermine it. This can reflect a conscious and intentional act by individuals at different moments in time in which other things in life are valued higher (explicit, controlled), but it can also be non-conscious and unintentional (implicit) (Marteau et al. 2011). In psychology this is called the *dual process model*. The explicit act is often a reflective and goal oriented system

driven by an individual's values and intentions, which require thinking space or cognitive capacity. These explicit acts include conscious decision making. The implicit act is an automatic and affective system that is being driven by immediate feelings and triggered by cues in our environment. This requires little to no cognitive engagement. The sequence that people perform in using sanitation, like using toilet paper, flushing, washing hands, etc., most of the time falls under these implicit acts (Stevenson et al. 2009). Nudging is a form of positive reinforcement to influence behaviour and mainly operates through the automatic and affective system, suggesting that it can be an effective tool in directing people in using less toilet paper and switching to alternatives when these are provided by governmental and non-governmental institutions.

Nudge theory is a concept in behavioural sciences, political theory and economics. The term “nudge” was first developed by Dr. James Wilk in 1995 but rose to global prominence with the release of the book *Nudge: Improving Decisions About Health, Wealth, and Happiness* in 2008 by Richard Thaler and Cass R. Sunstein (Marteau et al. 2011). The term is described as “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives” (Thaler & Sunstein, 2008). The aim of implementing nudges is to promote decisions that have a positive effect on individuals or the common good. Nudging includes a wide variety of approaches involving the alteration of social and/or physical environments with the aim of making certain behaviours more likely (Marteau et al. 2011). These approaches can include providing information about what other people are doing, also known as “social norm feedback”, which aims to correct misperceptions by exposing actual norms that will benefit society as well as individuals, for example: providing students with information about alcohol and how much most people in society drink, decreasing the misperception that the actual norm of drinking frequency is the one of the students around them, which is often a lot higher. These approaches can also include altering the layout of a building by, for example, making stairs more prominent than elevators to promote physical activity or by altering the design of objects, for example: the sticker of a fly in toilets to make the user aim more accurately in the toilet and not over or around it. Nudging builds on the theory that environments constrain and shape human behaviour. Nudging does not include direct instructions, legislation, regulation, enforcement and interventions that alter economic incentives (Marteau et al. 2011).

Shaping environments to cue certain behaviours seems to be very effective and is already widely used in social environments. Nudging can, for example, be used to change behaviour and improve healthy food options. Putting a yellow ribbon on shopping trolleys with a request of putting fruits and vegetables in that spot of the trolley improved the amount of fruit bought by American school children by 70% during lunchtime (Just, 2009).

In *Informing Versus Nudging in Environmental Policy*, Ölander and Thøgersen (2014) describe a wide array of examples where the effectiveness of informing and nudging is compared in changing behaviours of individuals to be more environmentally friendly. Informing seemed to be effective for choices that are made not very often: one time decisions with long-term consequences, for example, changing to green energy. This, however, had a very short effect on changing the behaviour of individuals. Informing people about the environmental impact of using plastic wraps or driving a car did not make them alter their

behaviour in buying lesser plastic wrapped products or make them take the bike from time to time. Shaping environments in stimulating environmentally friendly decision making seemed to be more effective in changing everyday behaviour than informing (Ölander & Thøgersen, 2014).

Nudging has a lot of varieties and no precise or operational definition. It more or less reflects a reality in which it draws attention to the role of social and physical environments and the way it shapes our behaviour. The goal of nudging is not to inform a scientific taxonomy of behaviour change interventions (Marteau et al. 2011). However, few nudging interventions have to date been evaluated for their effectiveness and its ability to achieve sustained change. Nudging can offer relatively cheap solutions, like putting green paint on the floor at a place where you would like people to form their cue when waiting for the ferry, but big environmental changes like altering the lay-out of a train station can also be very expensive. The example below, a paper dispenser by the WWF which attempts to reduce the use of paper by making people conscious about its link to deforestation, is an example of a fairly cheap nudge to implement.



Figure 5: Paper dispenser by the WWF.

Nudges can offer potentially effective tools to reduce the use of toilet paper. Simple nudges, like the example above, could also be implemented in sanitation environments in order to achieve a reduction in the use of toilet paper. The implementation of nudges can, however, also play a role in the theory of the previous chapter in which the social practice of the use of toilet paper itself get altered and replaced by water cleansing. Water based cleansing methods can get a prominent place in the lay-out of the sanitation environment and can be presented as the more environmentally friendly choice. In order to give people a decision in whether to use toilet paper or a water based alternative, these alternatives have to be available in sanitary environments first. Providing people the option to choose for an alternative will probably require some big environmental changes in sanitary environments, making these propositions momentarily very hypothetical.

4.3.2 Importance of changing behaviour and legislation

Although most people value their environment, they often do behave in ways that undermine these values. A large and still growing number of acts relating to private consumption have a serious direct and indirect environmental impact. Considering this, there is also a large and increasing focus on the actions and responsibilities of consumers in terms of contributing to solve climate change and other environmental problems. In industrialised countries these responsibilities are increasingly being accepted by individuals in terms of contributing to solving environmental problems (Ölander & Thøgersen, 2014). However, people respond much more reluctantly when it comes to actually changing their behaviour in ways that reduce their ecological footprint (Wackernagel & Rees, 1996). Although people seem to care about their environment and personal health and hygiene, changing the habit of using toilet paper will probably not come with easy compliance.

Nudging in itself excludes legislation, but often to implement effective nudging, enabling legislations and policy environments are required. This is required to either implement the nudge or to prevent damaging or unhealthy “nudges” coming from the industries that are trying to stimulate these practices with harmful consequences. One of the most known examples of these governmental interventions is banning advertisements and changing the package of cigarettes and other tobacco products. Governments can provide people with the tools to make choices like, for example, placing trash cans on the sidewalk where garbage like plastic and paper can get disposed separately. These people are not forced to separate their trash but now have the option to do so. This desirable behaviour can be stimulated by making the separation aspect of the trash can very prominent and shaping the context in a way that people are more likely to separate their trash.

Governments can intervene to promote an alteration in the practice of toilet paper use. Nudges can be implemented aiming to potentially reduce paper use itself, like the WWF example, but can also be used to link water cleansing to a more environmentally friendly form of cleaning and thereby influencing people in using an alternative. It can also be used to link water cleansing to a more hygienical choice, making it appear as something clean like hand washing and linking the practice to cleanliness. The use of disgust based interventions can also be another potentially effective tool in influencing hygienical behaviour.

4.4 Disgust based interventions: harnessing disgust to influence behaviour

4.4.1. Disgust

Hygienic behaviour is often motivated by the emotion of disgust. Disgust is a powerful emotion believed to be evolved as a response to protect the organism from harm invoked by potential disease holders (Curtis & Biran, 2001). This perspective on disgust as a disease avoidance mechanism is based upon several observations, most notably those where there seems to be a consistency in the stimuli that evoke disgust and the cross-culturally and universally connotation of the stimuli in the presence of pathogens (Curtis & Biran, 2001). Disgust may function as a protective mechanism by generating intense negative affection towards sources that potentially bear diseases, leading to a reduction of the risk of infection (Stevenson et al. 2009). A sense of contamination may also accompany other emotions as fear, which can invoke particular kinds of behaviour like, for example, avoidance or hand washing

(Rachman, 2004). This insists that it is potentially possible to influence someone's behaviour by exposing them to elicitors of disgust.

Potential disease holders like feces and spoiled foods are prime objects of disgust (Curtis & Biran, 2001). Feeling disgusted due to being exposed to potential disease holders often triggers a motoric response in the form of a certain facial expression. According to cognitive account, the processing of this facial expression, occurring in the visual cortical areas, leads to a propositional representation of the inferred state of disgust (Wicker et al. 2003). This representation determines our decision to avoid the elicitor of disgust. Facial expressions and self-reported feelings of disgust, by being exposed to elicitors of disgust, is found to be correlated with activity in the insula and to a lesser extent in the Anterior Cingulate Cortex (Wicker et al. 2003). Activity in the insula is also found in participants who are exposed to disgusted facial expressions of others and during the experience of the emotion of disgust evoked by unpleasant odours (Wicker et al. 2003). The insular activity due to the observation of disgusted faces is caused by the mirror-neuron system, causing disgusted facial expressions to trigger the neural activity typical of our own experience of the same emotion and helping us to empathize with others. This social aspect of the disgust emotion suggests that the soon to be discussed disgust based interventions could have a significant effect in altering social practices. Insular activity can be studied with fMRI to analyse the intensity of the activity caused by disgust elicitors. Also facial expressions as a reaction to disgust elicitors can be studied, suggesting that the effect on the disgust centre of an elicitor in a disgust based intervention can be studied in laboratory environments, which can be useful in testing the effectiveness of propositional disgust elicitors in an attempt to harness disgust in influencing behaviour.

Stevenson et al. (2009) conducted a survey with 616 adults, obtaining illness frequency and recency data, disgust and contamination sensitivity, and a variety of control measures. They found that multiple exposures to disgust elicitors can lead to a reduction in self-reported disgust towards the stimuli, an effect that has also been observed in several other studies. People who worked with sick people or in sewage cleaning, for example, were less disgusted by other related potential disease holders. This also raised their overall frequency rate of illness. They also observed that there was a strong correlation between scores on a questionnaire designed to assess participants' exposure history to disgust cues and their responses on the Disgust Sensitivity Scale. Greater reported exposure equated less reported disgust. Cleaning feces from your table or bathroom floor by simply wiping it with a piece of paper is most likely to be experienced as disgusting by most societies. In some countries like India, cleaning with water is the conventional standard and wiping with paper is often considered as not-clean. Everyday use of toilet paper possibly led to an almost non-existent disgust reaction towards the practice in westernised countries. It also suggests that disgust reactions towards water cleansing by people who are used to toilet paper can decrease over time when performing the alternative practice.

4.4.2. Harnessing disgust to influence behaviour

Disgust is identified as a relevant consumption-related emotion. Manipulation of emotional states and contexts are found to be having an influence on people's behaviour (Shimp & Stuart, 2013). Contexts and advertisements perceived as being disgusting influence the

experience of the perceiver. Participants in an experiment conducted by Shimp & Stuart (2013) mostly preferred neutral contexts and advertisements above those perceived as being disgusting. The context can also influence the experience of the individual. Food that was presented in a disgusting context was experienced as more unpleasant than the same food presented in a neutral context. A sense of disgust can also reduce the perceived value of an object compared to neutral objects (Shimp & Stuart, 2013). A good example of using disgust to influence consumption is the placement of pictures perceived as disgusting on packs of cigarettes and tobacco products.

Two studies conducted in Sydney Australia explored whether inducing disgust can be a useful addition in promoting hand-hygiene interventions. In one experiment to study the efficiency of these disgust induced interventions a series of washing rooms were covertly monitored. Some of these washrooms contained informal information in the form of educational posters about hygiene, exhorting participants to wash their hands. Other washrooms received disgust/education-based posters. Examples of disgust elicitors most closely linked to sanitation are feces, mucus, soiled looking item and certain animals like cockroaches (Stevenson et al. 2009). There was also a control condition containing no information about hygiene. In the disgust condition, 83,3% of the men and 71,4% of the women washed their hands at least once. In the education condition 50% of the men and 50% of the women washed their hands and in the control condition 23% of the men and 66,6% of the women washed their hands. They suggested that in the control condition gender difference was the principal source of the interaction effect. Disgust-based interventions were significantly better at promoting hand hygiene in the conducted experiment and suggest that disgust based interventions may be useful in promoting hygienic behaviour.

These studies suggest that disgust based interventions can potentially be used to direct people in using alternatives for toilet paper. The previous chapter suggested that a social practice can get altered by breaking and forming new links between material, meaning and competences. When the link is created between water cleansing and cleanliness, disgust based interventions, like the ones used to promote handwashing, could be used to promote the alternative practice of water cleansing. It can also potentially be used to link the use of toilet paper to a less hygienic way of cleansing. This reasoning is of course hypothetical and water cleansing could also potentially elicit a disgust emotion when someone is used to toilet paper.

4.5 Conclusion

Nudging and disgust based interventions can have a significant effect on the alteration of behaviour and can therefore be a potential tool to achieve a reduction in the use of toilet paper. Simple nudges can be implemented to influence the use of toilet paper. When aiming to hypothetically change the practice of toilet paper use to a water based alternative, nudges could be implemented by making these alternative practices more prominent and linking them to the more environmentally friendly decision. Disgust based interventions could be used to motivate people and promote links between the water based alternative and cleanliness but also between the use of toilet paper and the less hygienic choice.

5. Common Ground

5.1 Introduction

Previous chapters studied the possibilities to reduce the negative environmental impacts associated with toilet paper use from different disciplinary angles. Although the three disciplines all answered a question on how the problem could be solved from their disciplinary perspectives, the main question “*How can the negative environmental impact of the use of toilet paper be reduced?*” still remains to be answered in a fashion that respects the findings from all previous chapters. All three disciplines contain different concepts and theories which can not simply be glued together. In order to incorporate the findings of the disciplines, and gain a more comprehensive understanding, common ground between conflicting insights has to be created. The first step of the integration process is to identify differences between concepts and/or theories mentioned in the disciplinary chapters. The next step is to create common ground by modifying the concepts and/or theories directly or via their underlying assumptions. When common ground is created, it provides a basis for collaborative communication between each discipline. This way, the insights in which the assumptions are embedded and the disciplinary authors that produced these insights can “talk to each other” (Repko, 2012, pp. 321).

To reduce the negative environmental impacts associated with the increasing use of toilet paper on a global scale, the harmful human activities that cause these negative impacts need to be altered. Due to the different disciplinary perspectives, each discipline has different views on *what* such harmful human activities are, and *how* these should be altered. The first paragraph explains the origin of these different assumptions and creates common ground between the three disciplines by means of the technique of extension and the technique of organization. After the application of these techniques, consensus is reached about the earlier conflicting concept ‘harmful human activity’ and theories on ‘the alteration of behaviour’, and their underlying assumptions. The redefinitions consequently provide a basis for further integration to achieve a more comprehensive understanding on the complex subject of reducing the harmful environmental effects of toilet paper use.

5.2 Identifying Differences and Creating Common Ground

In order to create common ground, it is important to first identify the different disciplinary insights and perspectives. A short summary for each discipline will be provided. This way, contradictions and discrepancies between the disciplines will come forward.

- Due to the practical nature of this discipline, the discipline of Environmental Social Sciences and Environmental Policy mainly studies the alteration on environmentally harmful behaviour by using existing concepts rather than theories. The insights gained from this discipline revolved around the question: *How can governmental interventions reduce the negative environmental impact of the globally increasing use of toilet paper?* In order to change environmentally harmful behaviour, governmental interventions address large groups of people at the same time to achieve a change in a short span of time. This can be done by punishment (restrictive policy) or reward (stimulating policy). The policies are focused on regulating the practice instead of prohibiting the practice, which makes them mostly reactive.
- The Discipline of Innovation Sciences studies the subject in a more theoretical manner by approaching the use of toilet paper as a social practice. The insights gained from this discipline revolved around the question: *How can social practice theory be used to*

decrease the use of toilet paper? The discipline provides a theory on how social practices can be changed due to the breaking and forming of links between meanings, materials and competences. The discipline targets social groups and focusses on the behavioural practice of the end-user. The embedded use of toilet paper as a social practice is treated as the harmful human activity, which has to get altered in order to reduce its negative environmental impact. To reduce the impact of toilet paper use, it proposes that the harmful impact can be reduced by replacing toilet paper with alternative cleansing methods based on water.

- The discipline of Cognitive and Neurobiological Psychology studies toilet paper use as part of human hygienical behaviour and mainly focusses on the individual. The use of toilet paper as part of hygienic behaviour, which is most of the time unconsciously performed, is seen as part of the environmental harmful human activity. As a resulting answer followed by the question: *How can nudging and harnessing the emotion of disgust potentially help to decrease use of toilet paper?* It proposes theoretical tools and psychological methods to influence and alter human behaviour revolving around the reduction of toilet paper use, and directing people in using alternatives like water based cleansing methods as proposed by the discipline of Innovation Sciences. These methods include alterations of the environment in order to make a certain behaviour more likely. These theories on the alteration of behaviour exclude legislation and do not take away choices of the individual.

Evaluating these summaries, there can be two main differences identified between the disciplinary perspectives and assumptions. The next sections will explain how these differences originated, starting with the concept 'harmful human activity'. Harmful human activity connotes the understanding of which kind of activities exactly lead to the negative impacts of toilet paper use according to each of the disciplinary chapters. Next, the origin of the different theories on 'the alteration of behaviour' is explained. These disciplinary theories revolve around how harmful human activities can be influenced and altered in order to reduce the negative impacts associated with toilet paper use. Following, different techniques for creation of common ground will be applied to both concepts, serving the purpose of gaining a more comprehensive understanding.

5.2.1 Harmful Human Activity

Evaluating the disciplinary chapters, it can be concluded that the disciplines handle a different scope in identifying the problem that needs to be tackled. An explanation for these different perspectives can be found in the applicability of each of the three disciplines. Environmental Social Sciences and Environmental Policy is a highly practical discipline which implements governmental interventions in order to influence environmentally harmful activities. In the case of toilet paper use and its negative environmental implications, these interventions mainly aim to ensure a more sustainable production, use and disposal of toilet paper, such as sustainable forestry, sustainable fibre processing and water safety. This means that the practice is regulated, but not prohibited. Thus, Environmental Social Sciences and Environmental Policy sees the production, use and disposal of toilet paper as the harmful human activity, and consequently only addresses these activities in order to reduce possible negative environmental impacts.

Where Environmental Sciences takes a very practical approach, the other two disciplines remain more theoretical leading to a different definition of the concept harmful human activity. For example, Innovation Sciences approaches toilet paper use as something which is culturally embedded in a social practice. The practice of toilet paper use, and thus the negative environmental impact associated with it, sustains itself through the performance of the practice by societal members. Therefore, in order to reduce the negative environmental impacts of toilet paper, the practice itself needs to be altered. The same can be seen with the discipline of Cognitive and Neurobiological Psychology, which approaches toilet paper use as a behavioural habit. In order to reduce the negative environmental impact associated with toilet paper use, architectural and contextual alterations can be applied in order to influence behaviour. By analysing behaviour in the context of social culture and individual decision making, the disciplines of Innovation Sciences and Cognitive and Neurobiological Psychology approach the problem in a more theoretical way.

As opposed to Environmental and Social Sciences and Environmental Policy, the other two disciplines have to take less applicability into account as well. Environmental policies are often formed reactively when damages are detected. In the case of the negative environmental impacts associated with toilet paper use this would be, for example, water contamination or unsustainable forestry. Consequently governmental bodies have to come up with practical and possible solutions for that specific problem. Eventually, there might be some rules in place that regulate parts of the process, but the whole practice of toilet paper remains unregulated. The other two disciplines are not restricted to an existing framework and consequently have more freedom to explore the problem in a more theoretical or ideal way. These distinctions have led to different definitions of the concept harmful human activity between the three disciplines. Following, it can be concluded that Environmental Social Sciences and Environmental Policy sees 'the unsustainable production, use and disposal of toilet paper' as the harmful human activity, whereas Innovation Sciences addresses the 'embedded use of toilet paper in a social practice' as a harmful human activity and Cognitive and Neurobiological Psychology addresses the 'behavioural habit of using toilet paper' as harmful human activity.

5.2.2 The Alteration of Behaviour

Each disciplinary chapter contains its own insights and assumptions in how to alter behaviour. These different disciplinary theories on the alteration of behaviour revolve around how the harmful human activities can be influenced and altered in order to reduce the negative impacts of toilet paper use. The different insights on how alteration of behaviour is achieved according to each discipline are summarized below.

- Environmental Social Sciences and Environmental Policy aims at altering human behaviour by the implementation of external stimuli such as prohibitions (subject will receive punishment if he/she will not comply to the rules) or incentives (subject will receive a reward if he/she complies to non-binding rules). Policies can be aimed at individuals, specific groups or society as a whole and can be implemented on the international, national and/or local level. This usually means that one set of rules applies to a variety of subjects. For now, environmental policies are mostly aimed at manufacturers, but research to target end-users is slowly becoming more substantial.
- The discipline of Innovation Sciences approaches human behaviour from the perspective of societal culture. The basic viewpoint is that individual behaviour is determined by the performance of social practices. The interplay between materials,

competences and meanings of a social practice determine what behaviour looks like. If links between the elements of a practice are broken, it means that a practice disappears. If links are forged, this means a practice emerges. Therefore, changing human behaviour can be achieved by breaking and forging these links.

- The chapter of Cognitive and Neurobiological Psychology explains that the alteration of behaviour can be accomplished by targeting the individual's conscious and/or unconscious internal motivation. Changing external aspects of choice architecture and manipulation of external stimuli can alter behaviour without forbidding any options or significantly change economic incentives.

According all three disciplines, behavioural changes are fundamental in achieving a reduction of the negative environmental impact associated with toilet paper use. However, the theories and underlying assumptions on how it is achieved vary in respect of the approaches, scale, targets and perspectives.

Environmental Social Sciences and Environmental Policy applies a practical, top-down approach by means of legislations and policies. The aim to provide instant applicable solutions, has led to behavioural change methods of punishing and rewarding. On the other hand, the discipline of Innovation Sciences proposes how a social practice can get altered in theory but it does not provide concrete measures to actually achieve the alteration. This resulted in a theoretical framework on *what* needs to happen in order to achieve the alteration of behaviour, instead of concrete information about *how* it is achieved. Finally, the discipline of Cognitive and Neurobiological Psychology proposes more applicable theories like nudging and disgust based interventions. The discipline mainly targets individual behaviour, using non-legislative methods, influencing internal behavioural motivation to achieve non-forced compliance.

An evaluation between the theories from Innovation Sciences and Cognitive and Neurobiological Psychology reveals a similarity in approaches which are more focused on the individual and cultural level, in which the individual is the active actor that makes decisions based on social structures, motivation, habits, emotions, culture and preferences. By targeting the individual or societal behaviour, an alteration of behaviour can be achieved. Environmental Social Sciences and Environmental Policy has less attention for these aspects and usually aims to reach compliance by means of force or rewards. These assumptions are not necessarily conflicting since they could all potentially lead to an alteration in behaviour. However, they do not form an integrated whole yet.

5.2.3 Harmful Human Activity: The Technique of Extension

In this part, the technique of extension will be applied to the concept 'harmful human activity'. This technique, according to Repko, refers to 'increasing the scope of "something" we are talking about' (Repko, 2012, pp.340). The technique of extension involves addressing differences or oppositions in disciplinary concepts and/or assumptions by extending their meaning beyond the domain of the discipline that originated them into the domains of the other relevant disciplines (Repko, 2012, pp.340). The technique will be used in order to create common ground on the concept of 'harmful human activity', which is perceived as 'the unsustainable production, use and disposal of toilet paper' by Environmental Social Sciences and Environmental Policy, 'the embedded use of toilet paper in the in social practice of cleansing' by Innovation Sciences and 'the embedded use of toilet paper in a behavioural habit' by Cognitive and Neurobiological Psychology.

A consequence of these differences is that the disciplines come up with different solutions to the problem. As Environmental Social Sciences and Environmental Policy proposes, the most applicable solution is to target the producer, making the assumption that if the production process can be improved, regardless of the use, the environmental impact will be reduced. Solutions targeting the end-users, as proposed by Innovation Sciences and Cognitive Neurobiological Psychology, imply that the normalised habit of the practice of toilet paper use should be altered. By extending the definition beyond the original disciplinary boundaries by incorporating other disciplinary definitions and their underlying assumptions, this division can be overcome. According to Szostak (2015) it is best to extend the theory or assumption that is already the most comprehensive. The discipline of Environmental Social Sciences and Environmental Policy has elaborate knowledge on what is environmentally harmful and which policies are effective to reduce environmentally harmful behaviour. The concept as defined by this discipline can consequently be extended by incorporating the concept of 'harmful human activity' as proposed by Cognitive and Neurobiological Psychology and Innovation Sciences. Therefore, to overcome the conflict between the disciplines regarding the end-user or producer side, this technique seems most fit.

Even though Innovation Sciences and Cognitive Neurobiological Psychology have brought forward different theories, assumptions and concepts on behavioural change and individual decision making, they both target the practice of toilet paper use as a whole. For example, people could be provided with a nudge to have them use less toilet paper (Cognitive and Neurobiological Psychology) or breaking the link between the material element of toilet paper and the meaning of cleanliness (Innovation Sciences) can result in people using less toilet paper. Eventually, the end goal remains the same, which is trying to alter people's behaviour in order for them to use less toilet paper. That is why it can be concluded that both Cognitive and Neurobiological Psychology and Innovation Sciences address 'toilet paper use' as the harmful human activity.

Following, the concept as proposed by Environmental Social Sciences and Environmental Policy can be extended with the redefined concept provided by Cognitive and Neurobiological Psychology and Innovation Sciences. This means that now not only the unsustainable production, use and disposal of toilet paper are addressed as the harmful human activity, but the use of toilet paper as a whole as well, which implies that policies should not only be targeting the negative environmental consequences of the use of toilet paper, but also the practice of toilet paper use itself.

This extension offers new perspectives on possible governmental interventions and their reach. First, the insight offered by Cognitive and Neurobiological Psychology and Innovation Sciences are of great addition to the highly undeveloped field of environmental policies that target end-users. Once more developed, they can be applied on the international, national and local level. Besides that, adopting the regulation of the use of toilet paper as a whole can also lead to either stimulating or restrictive policies aimed at the production side. Examples of such, include an incentive for companies to transition to the production of a different product or a toilet-paper tax. This way, the extension helps to eradicate the separation in the producer - end-user conflict, which means that there is no division between the possibilities of application of the insights of the three disciplines anymore.

5.2.4 The Alteration of Behaviour and the Technique of Organization

To create common ground between the different insights on how the alteration of behaviour can be achieved, the technique of organization will be applied. According to Repko (2012, pp.346), organization identifies the hidden (or “latent”) commonality in the meaning of different concepts or assumptions and redefines them accordingly. This is followed by organizing, arranging or mapping the redefined theories and assumptions to bring out a relationship between them. Common ground can be created by clarifying how these relations interact between disciplines and by creating an overview of the causal relations. The technique of organization can be applied to the theories on the alteration of behaviour and their underlying assumptions, because the insights gained by each discipline on this matter do not necessarily oppose each other and can be arranged in a way that exposes the relations between them.

As explained in 5.2.2, the disciplinary chapters have provided distinct theories on how to alter behaviour. The means by which the disciplines aim at altering behaviour, show that the disciplines have different assumptions on how to do this. The discipline of Environmental Social Sciences and Environmental Policy approaches the alteration of behaviour as something that can be achieved by means of policies that punish people for undesirable behaviour or reward people for desirable behaviour. Innovation Sciences tries to alter behaviour by breaking links between unwanted practices and forming links between wanted practices. Cognitive and Neurobiological Psychology, tries to influence behaviour by targeting unconscious habits through the automatic and affective system by implementing architectural and contextual alterations. Despite the disciplines all approaching the alteration of behaviour from a different perspective, they do have a latent commonality in achieving an alteration of behaviour through external influences.

Applying the Technique of Organization to the disciplinary perspectives and assumptions mentioned above reveals the latent commonalities as links in the following map (see figure 6).

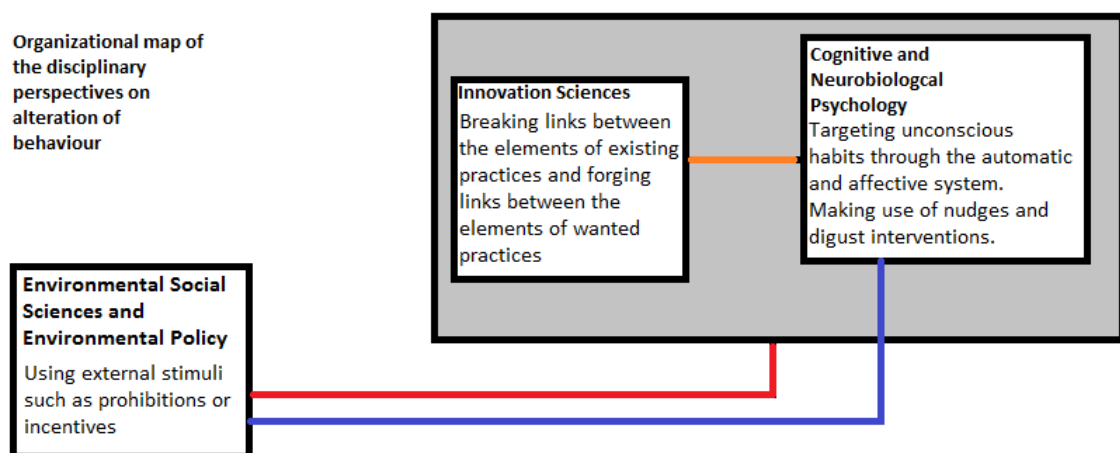


Figure 6: Organizational map

This map reveals three primary complementary links between theories on achieving an alteration of behaviour. The first complementary link is created between the discipline of Innovation Sciences and Cognitive and Neurobiological Psychology. Innovation Sciences

provides a purely theoretical explanation, therefore it does not provide ready to use information on how links between materials, meanings and competences can potentially be broken and formed. Cognitive and Neurobiological Psychology provides more ready to use theories which can be used to alter behaviour, and thereby complements the theory of Innovation Sciences on how to change social practices by suggesting practical tools to break and form new links through nudges and disgust based interventions. Both disciplines focus on altering the behavioural practice by targeting the practice itself. These similarities in focus and complementation between theories and assumptions result in a cluster (see map) between the disciplines which targets the behavioural practice of toilet paper use itself.

The second complementary link is between this cluster and the discipline of Environmental Social Sciences and Environmental Policy. Environmental Social Sciences and Environmental Policy offers a comprehensive set of concepts and theories, explaining practical top-down measures which can be used to reduce the impact of toilet paper use on different scales, using a variety of intervention methods. These top-down measures can be both restrictive (incentive based regulation) or rewarding (command and control). Potential regulation methods regarding the negative environmental impact of toilet paper use are found in prohibitions and incentives on international, national or local level. The other two disciplines do not discuss these aspects of the problem, instead, they target the behavioural habit itself as something which can be influenced and altered. The discipline of Environmental Social Sciences and Environmental Policy, on the other hand, does not provide the information and theories on how to change the behavioural practice of toilet paper use as a whole. This way the assumptions on the the concept of alteration of behaviour complement each other, covering multiple angles concerning the main question.

The third complementary link is located between the discipline of Environmental Social Sciences and Environmental Policy and the discipline of Cognitive and Neurobiological Psychology. Both theories make use of external stimuli in order to achieve an alteration in behaviour. This link also represents the relation of the practical applicability between the theories on the alteration of behaviour. Environmental Social Sciences and Environmental Policy mainly implements ready to use practical top-down measures, whereas Cognitive and Neurobiological Psychology proposes practical measures which could potentially stimulate the alteration of behaviour without active governmental interventions and legislation. Legislation could however be required to implement these measures. The assumptions on the alteration of behaviour from the perspective of Innovation Sciences are mainly theoretical and provide almost no practical “ready to use” measures.

Due to the practical aspects of the theory provided by Cognitive and Neurobiological Psychology, which complements the provided theory of Innovation Sciences and shares the virtue of having practical implications with Environmental Social Sciences and Environmental Policy, these insights can function as a bridge between these two disciplines. It provides practical applicability to the theory of Innovation Sciences, tightening the complementary gap between the disciplines of Innovation Sciences and Environmental Social Sciences and Environmental Policy. It also makes the theoretical framework on how to change the social practice more applicable and more suitable for eventual policies. This exposes the latent commonality between the disciplines in which the application of external stimuli can lead to an alteration of behaviour. Policies can be applied, individual behaviour can be influenced and structural practices in society can be altered in order to achieve an alteration of behaviour.

6. More Comprehensive Understanding

Now that the creation of common ground has eradicated any discrepancies or contradictions between the three disciplines, the disciplinary perspectives can be integrated into a new and more nuanced whole, called 'the more comprehensive understanding'. According to Repko (2012, pp.383), the more comprehensive understanding should provide a more complete and detailed explanation of the problem than any of the separate disciplinary parts could provide on their own. This more comprehensive understanding is based on the different insights from each of the three disciplines, and the relations between them. These new insights can challenge the previous methods, assumptions and concepts. The next section will explain how the outcomes of the redefinition of these concepts can be applied to the problem.

6.1 Joint Perspective and Integration

By creating common ground on the concept of harmful human activity and the theory of the alteration of behaviour, a deeper understanding of which harmful human activities should be addressed to reduce the negative environmental impacts associated with toilet paper and the various techniques to alter these activities was established. As was seen, the disciplinary insights focussed on different aspects of the problem, but were not contradictory in doing so. In such cases, Repko (Repko, 2012 pp. 389) proposes the use of the technique of horizontal causal integration. The challenge when performing this integration technique is to find the relationships among the different causal explanations to construct the more comprehensive theory.

Within Environmental Social Sciences and Environmental Policy, a consensus is established that preventive measures are more effective than reactive measures. Thus far, this assumption was not reflected in the existing set of regulations concerning the negative environmental effects associated with toilet paper use. Current policies mainly focus on targeting the negative consequences from the use of toilet paper, instead of addressing the root cause of the negative environmental impact, namely toilet paper use itself. The new concept of harmful human activity, which entails the unsustainable production, use and disposal of toilet paper, but also toilet paper use in general, implies that the practice of using toilet paper can be targeted as well. Extending the concept of harmful human activity to one which also implies the use of toilet paper in general results in a more preventive policy regarding the reduction of the impact of toilet paper.

In order to form a successful environmental policy, the effectiveness of the measure is very important. Thus far, techniques such as command and control and market-based incentives have been used to have people comply to certain standards, or to stimulate them to achieve certain desirable goals. These solutions can have a significant effect on the reduction of the impact of toilet paper but are unlikely to create structural change. For example, prohibitions on cutting certain area's of forest will keep people from exploiting the area but do not alter the demand of toilet paper itself. Manufacturers can also return to the area whenever the prohibitions are lifted or seek another area to exploit which has less strict regulations. By addressing behaviour in a broader context of culture and individual decision-making, insights on the durability of behavioural change can be provided. For example, by offering a perspective on how to change the behaviour of individuals in a social culture, the discipline of Innovation Sciences provides solutions of a more structural nature because it revolves around changing the meaning of a certain practice. This could be changing the meaning of a 'bad' practice so that it becomes undesired, or changing the meaning of a 'good'

practice, so it becomes desired. Cognitive and Neurobiological Psychology offers tools which could potentially lead to more desirable behaviour on an individual level. Environments can get shaped in such a way that the more desirable behaviour or decision becomes more appealing. These insights could be used to target the use of toilet paper as a whole, but can also be applied in policies that target production processes to make them structurally more sustainable. Thus, by not only seeing punishment and reward as tools to alter behaviour but also look at behaviour in a socio-cultural and individual level, more durable policies to alter unsustainable behaviour can be formed.

The adaptations of the new concept of 'harmful human activity' and the theory of 'the alteration of behaviour' offers a broader perspective for the construction of policies that aim to reduce the negative environmental impacts associated with toilet paper use. In light of these new insights, external stimuli can be used to achieve structural change of human behaviour, concerning every aspect of the harmful human activity. This means that the use of external stimuli in policy interventions such as prohibitions or incentives, supported by theoretical foundations on how to alter behaviour, can be used to structurally reduce the harmful impact of toilet paper use.

6.2 Applications

Now that the links between the different disciplinary insights, assumptions and perspectives are formed, the main research question "*How can the negative environmental impact of the use of toilet paper be reduced?*" can be answered. This will be done by proposing what a policy intervention that aims to reduce the negative impact of toilet paper, could potentially look like. The different perspectives from which each discipline has approached the problem have shown that there is a variety of solutions, from targeting the end-users and the practice of toilet paper use, as well as targeting manufacturers and the processes. The most important insight that can be used, is that the integrated assumptions and perspectives can help to form policy interventions that create a more structural change. The extended concept of harmful human activity makes these policy interventions aim at achieving structural change in both preventive and reactive measures.

This means that the possibilities for policy interventions have opened up. Apart from the existing methods of command and control and market-based incentives, the insights from social practice theory in combination with the application of nudging and disgust based interventions can be used to achieve a more structural change, which will function as a more preventive measure to target end-users and manufacturers. One way of doing so, could be by means of a policy intervention aimed at changing the practice of toilet paper as a whole to a cleansing method based on water (preventive, targeting end-users). The first step would be to evaluate how a certain change could be achieved by using insights from the social practice theory. According to the social practice theory, this could be achieved by breaking the current links between the material element of toilet paper and the meaning of cleanliness, followed by forging links between the use of a bidet or bidet-sprayer and the meaning of cleanliness. Such a change could be achieved by using the current links that people have with water and cleanliness in the practices of showering and doing laundry. The next step would be to use the insights on nudging and disgust based interventions to actually break and form links. Water based methods could get a more prominent place in the sanitation environment, making use of it by individuals more likely. These methods can be presented in such a way that its use is linked to cleanliness and/or as the more environmentally friendly option. Disgust based interventions can be applied to motivate the individual to use the water based methods by

presenting water based methods in a cleaner context than the use of toilet paper. An example of a cleaner context could be one that appears as more white, shiny or “splashy” when comparing it to the context in which the toilet paper is presented. The toilet paper could also be presented a context with pictures of disgust elicitors. Following, the options for the implementation of an environmental policy that uses these techniques should be explored. The discipline of Environmental Social Sciences and Environmental Policy has a wide range of intervention methods, which can be used to design a certain policy. For example, large corporations could be stimulated to place bidets in their companies, or companies that sell water based sanitation solutions should enjoy some kind of benefit (market-based incentive). Another option would be to implement a toilet paper consumption max (command and control). These examples are still very conspicuous, though they depict how the disciplinary insights could come together in a policy.

Besides such a preventive measure, policies could aim at achieving structural change by means of reactive policies aimed at manufacturers as well. This can be achieved by applying behavioural change methods based on theories of social practice and nudging and/or disgust based interventions to the processes that make the use harmful, such as the production or disposal. Following, these policies can be applied to the companies responsible for these processes. Companies can be seen as social groups with their own culture, which makes social practice theory applicable to companies as well (Hargreaves, 2011). By addressing the processes that are harmful in companies responsible for production or disposal of toilet paper, and by trying to structurally change these processes, the harmful impact can be reduced. If it becomes possible to break the links between the elements of the practices within these processes, and to form new links between the elements of a wanted process, the production or disposal process becomes less environmentally harmful. Because the old process will be seen as abnormal and the new process will be seen as normal, these interventions can have a structural nature. However, the implementation of these theories on these actors is still highly theoretical, which has certain consequences for the applicability. For example, nudging is highly context dependent, so a specific type of nudge or emotion-based intervention has to be designed in order to break the contextual undesirable behaviour. Then, to form a general policy to implement this as a strategy, would be even more complex.

7. Conclusion

This interdisciplinary research has provided an answer to the question “*How can the negative environmental impact of the use of toilet paper be reduced?*”. By creating common ground on the disciplinary perspectives, collaborative communication between the different insights was achieved. Redefining the concept harmful human activity has extended the scope of what is considered environmentally harmful behaviour. By extending the meaning from ‘the unsustainable production, use and disposal of toilet paper’ to inclusion of ‘the use of toilet paper’, governmental bodies can reorientate for potential targets of their policies. The organization of the disciplinary insights on the alteration of behaviour has led to a complementary map that provides various strategies to achieve behavioural change. These included top-down measures using strategies of punishment and rewarding, but measures on how the embedded use of toilet paper as a practice could be targeted and altered by shaping environments.

The creation of common ground was followed by an integration of the new concept of harmful human activity and the theory on the alteration of behaviour, which offered a broader perspective for the construction of policies that aim to reduce the negative environmental impacts associated with toilet paper use. By applying the technique of horizontal integration, it was revealed that the integrated assumptions and perspectives can help to form policy interventions that create a more structural change. The extended concept of harmful human activity makes these policy interventions aim at achieving this structural change with both preventive and reactive measures.

8. Discussion

Even though this study has provided some interesting new insights on durable preventive and reactive policy making, there are some limitations to the results. One of these was the applicability of the insights from the perspectives of Cognitive Neurobiological Psychology and Innovation Sciences on the alteration of behaviour into the existing framework that Environmental Policy handles to regulate environmentally harmful activities. As was presented in 6.2, social practice theory could provide a basis for policy. However, the current theoretical nature of this suggestion make it very difficult to come up with practical solutions. A way to work around this problem would have been to execute an extension instead of an organization to the concept of 'the alteration of behaviour'. The tools suggested by Environmental Policy to regulate manufacturers would have been extended to the domain of end-user policy which would be integrated with the insights on nudging, social practice and emotion based interventions, to result in an innovative policy regarding end users and the practice of toilet paper as a whole. However, the focus of this research was to provide a comprehensive overview of the possibilities. Extension of 'the alteration of behaviour' would completely disregard the lack of structural policy interventions, targeting manufacturers. The chosen method has targeted all of the harmful human activities responsible for the harmful impact of toilet paper use. By targeting the whole spectrum of harmful human activities, the solutions offer a holistic view on the problem. However, it has resulted in less ready to use solutions to the problem, which is why it is suggested that the solutions proposed will be examined in further research. Such research could entail the possibilities of structural changes on the production side, but also how policy interventions can be used to efficiently change the embedded use of harmful practices.

Other limitations can be found in the disciplines that examined the problem. The involvement of other disciplines could have potentially made the results more comprehensive. For example, there is a large amount of money accompanied with the product of toilet paper. Changing the use of the product as a whole, or altering production processes will mean losses for companies involved. When governmental policies are being executed, knowledge on such numbers are needed to take the total impact of the interventions into consideration. Therefore, an addition of an economic discipline would be needed if the proposed solutions are further examined. Also, cultural factors seem to have an important role for the harmful impact of toilet paper use. The globally increasing use of toilet paper and the differences in preference for either water or paper based cleansing methods, show that cultural aspects are an important part of the problem. Therefore disciplines such as sociology and cultural anthropology, could provide better insights on how toilet paper use is embedded in different societies.

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