THE ABILITY OF A CITY TO SUCCESSFULLY HOST SUSTAINABILITY EXPERIMENTS

What regional context factors affect the success of a sustainability experiment?

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SUMMARY

There is an increasing need for successful sustainability experiments, in order to support the current societal sustainability transition. However, it is shown that there is a geographically uneven distribution of cities in their ability to host successful sustainability experiments. This paper aims to systematically explain the geographical uneven distribution of successful sustainability experiments. In order to decrease inequality and build a useable framework for governments to increase their ability to host successful sustainability experiments. Current literature from the Transition field and the Evolutionary Economical Geography field show a gap in explaining the regional influences on societal transitions. Based on this knowledge gap the following research question is formulated: *'In what way can the difference between cities in their ability to host successful sustainability experiments be explained by their regional characteristics?'*.

In order to answer the research question, a data-driven quantitative research is performed, with Nature-Based Solution (NBS) initiatives as sustainability experiments. NBS initiatives are defined as nature-based initiatives helping to decrease the influence of climate change upon urban areas. NBS initiatives are a heterogeneous set of sustainability experiments. Furthermore, NBS initiatives within 99 European cities are mapped within a public dataset (Almassy et al., 2018). This research combines the data for 35 regional context factors within these 99 European cities to test their influence on the transferability of different NBS groups. The regional context factors are grouped within *Culture, Regional network, Learning culture, Demographic information* or *General context factors.* Expanding current literature on favourable experimental habitats for different types of sustainability experiments (Van den Heiligenberg et al., 2017).

Results show the possibility of grouping sustainability experiments on their experiment characteristics and forming contrasting sets of favourable regional context factors for each experiment type. This in combination with the result of a generic set of favourable regional context factors influencing the transferability of all experiment types. Stating the importance of regional diversity with explaining the geographical uneven distribution of successful sustainability experiments. This thesis adds critical insights and systematic results to the existing qualitative built habitat framework. Adding a systematic performed quantitative research and the influence of a generic set of favourable regional context factors. However, it is stated that future research is necessary with a larger sample, different sustainability experiments and different demographic areas.

Keywords: Nature-Based Solutions, sustainability experiments, sustainability transition, economical geography, transferability of experiments, regional context factors

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1. INTRODUCTION

Sustainable development is seen as the answer to multiple occurring societal challenges (Lang et al., 2012), such as urbanisation and scarcity (Kabisch et al., 2016). Although the aim for sustainable development is global, it should be executed from the lower level of regions and cities (Geels, 2002). Cities are the centre of development and innovation, substantiated by theory on the spiky world phenomena (Mithas & Whitaker, 2007). The economic wealth, population and knowledge are transferring more and more to urban areas, increasing opportunities within cities (European Commission, 2015). Therefore, it is stated by the European Commission that cities should be the forefront of sustainable development (European Commission, 2015).

Sustainability experiments are involved with the sustainable societal transition, offering a bridge for sustainable development towards changing the societal system (Sengers, Wieczorek, & Raven, 2016). Sustainability experiments are experiments involved with the sustainable societal transition, specifically defined as: *"planned initiatives that embody a highly novel socio-technical configuration and that are likely to lead to substantial (environmental) sustainability gains"* (Berkhout et al., 2010, p. 262). Transition literature includes the identification of success factors for sustainability experiments (Van den Heiligenberg, Heimeriks, Hekkert & Van Oort, 2017). However, TM misses the geographical component and explanation for the uneven distribution of successful sustainability experiments. TM does not include differences in geographical location and possible system boundaries.

Every city act and react differently upon the implementation of sustainability experiments, large differences in the success of sustainability experiments can therefore be seen within Europe (Bai, Roberts, & Chen, 2010; Broto & Bulkeley, 2013a). A sustainability experiment is stated to be successful when it either achieves short-term targets or is scaled up to change current regimes (Bai, Roberts, & Chen, 2010; Geels, 2002; Van den Heiligenberg et al., 2017). In which short-term success leads to scaling up, long-term success and the transferability of the experiment (Broto & Bulkeley, 2013b). Long-term success can be defined by upscaling the sustainability experiment through transferring the experiment to other cities (Kabisch et al., 2016). Bai, Roberts & Chen (2010) address the difficulty of transferring innovative practices to other environments or regions due to differences in regional context factors.

A city is a rather geographical cluster of context factors, which could be an explanation for the geographical uneven distribution of cities to host successful sustainability experiment (Hansen & Coenen, 2015). Hodson & Marvin (2010) state that cities differ in their set of socio-technical regimes, defining the socio-spatial environment of the city. Exploring what type of context factors influence the success of a sustainability experiment, will increase the sustainable development of cities. Previous research defined and conceptualised sustainability experiments in terms of what they are and how and why to execute them, but the geographical influence on the success and therefore the differences between cities have not yet been included in previous research (Kabisch et al., 2016).

This study connects theory on the regional context of a city with available transition theory and knowledge on the success of sustainability experiments. Van den Heiligenberg et al. (2017) introduce the concept of four different regional experimentation habitats. Stating that habitat experiments are affected and influenced by regional context factors (Van den Heiligenberg et al., 2017; Van den Heiligenberg, Heimeriks, Hekkert, Raven, & Sol, 2018).

Habitats show a difference in, for example, the type of knowledge necessary for the experiment type either being technological or social (Van den Heiligenberg et al., 2017). The different habitats are used in previous research as a base for qualitative case studies. However, a systematic research about contrasting sets of favourable regional context factors explaining the geographical uneven distribution of successful sustainability experiments is missing. Therefore, this research focusses on explaining differences between cities by exploring regional context factors influencing the success of sustainability experiments.

Based on this knowledge gap the following research question is formulated: ***'In what way can the difference between cities in their ability to host successful sustainability experiments be explained by their regional characteristics?'***. This main research question touches upon the theoretical and methodological discussions that are applicable to this research due to the new combination of theories and methodological approach. Three sub-questions are formulated in order to answer the main research question:

1) *'Is the habitat concept useful when explaining differences in the success of sustainability experiments?'*
2) *'What regional context factors are available to explain the differences between cities in hosting successful sustainability experiments?'*
3) *'Is there a relation between the experimental habitats and the success of a sustainability experiment?'*

To answer these research questions a data-driven quantitative research is performed with a focus on Nature-Based Solution initiatives as sustainability experiments. Nature-Based Solution initiatives are defined as nature-based initiatives helping to decrease the influence of climate change upon urban areas. Therefore Nature-Based Solution initiatives are a heterogeneous set of sustainability experiments. Furthermore, Nature-Based Solution initiatives within 100 European cities are mapped within a large dataset, making it possible to analyse them in this thesis (Almassy et al., 2018).

This research has two scientific contributions, firstly, by adding a quantitative study a systematic analysis is executed to explain geographical differences between cities in hosting successful sustainability experiments. Herein a connection is made of the difference a city's ability to host successful sustainability experiments and the difference in regional context factors of cities. Secondly, the existing theoretical habitat framework is expanded with Economical Geography literature to explain the geographical aspect of the success of sustainability experiments. In addition to these scientific contributions this thesis provides a societal contribution, when it becomes clear which regional context factors increase the success of sustainability experiments, governments can be offered advice on their possible 'frontrunner' position. Indicating which regional context factors are favourable for the type of sustainability experiment used and what type of sustainability experiment fits with the city's regional context. Making it possible for regional governance to support a predictive and successful sustainability experiment, implement this and fasten the societal change towards a more sustainable society.

The research paper continues with the theoretical framework, discussing literature and presenting the guided expectations of this research. The theoretical framework builds up to the conceptual framework. Hereafter, the method of the research is presented, operationalizing the presented conceptual framework. Followed by the results and analysis forthcoming from the research. Ending with a concluding and discussion chapter to evaluate the research, results and its conclusions.

2. THEORY

This research is built on previous literature mainly focused on literature that considers the habitat concept (Van den Heiligenberg et al., 2017), which is developed as a combination from the Transition Management field and Evolutionary Economic Geography field. Van den Heiligenberg et al. (2017) published the first attempt to address the geographical uneven distribution of successful sustainability experiments. This thesis will be built on the habitat concept and expand it with a combination of theories, with the aim to build a systematic framework. A broad heterogeneity of theories will be discussed to provide possible explanations for the observed differences between cities. Due to the lack of a homogeneous theory this thesis executes explorative and expands on existing literature. This chapter is used to define concepts and introduce researchable relationships. Starting with the theory on habitats and how this is expanded and adapted towards the used conceptual framework. Followed by introducing and defining the transferability of sustainability experiments as the dependent variable. Concluding with the conceptual framework used for this thesis.

2.1. TRANSITION THEORIES

Modern society is transforming into a society based on networks, trying to solve emerging societal problems with traditional approaches and instruments (Loorbach, 2007). The existing and emerging societal problems are however complex, deeply embedded and in need for new interrelated approaches and instruments (Rotmans & Loorbach, 2009). Societal problems show negative and concrete impacts at a local level (Loorbach, 2007), increasing the willingness of inhabitants to change. The need for change activates the need of research about transitions and the management of transitions. In the field of transition studies a variety of system thinking theories have been introduced, such as socio-technical systems, complex adaptive systems, and innovation systems. These system thinking perspectives include a non-linear adaptive surrounding to analyse complete systems, with the aim of changing the system structure into one gradual process (Loorbach, 2007; Rotmans et al., 2001). This gradual process includes a complex process of structural change from one system towards another. The goal of Transition Management (TM), as a subfield within transition studies is to enable, facilitate and guide system transitions (Kemp & Loorbach, 2006). Kemp and Loorbach (2006) introduce the usage of transition management instead of short-term goals, shown in Figure 1.

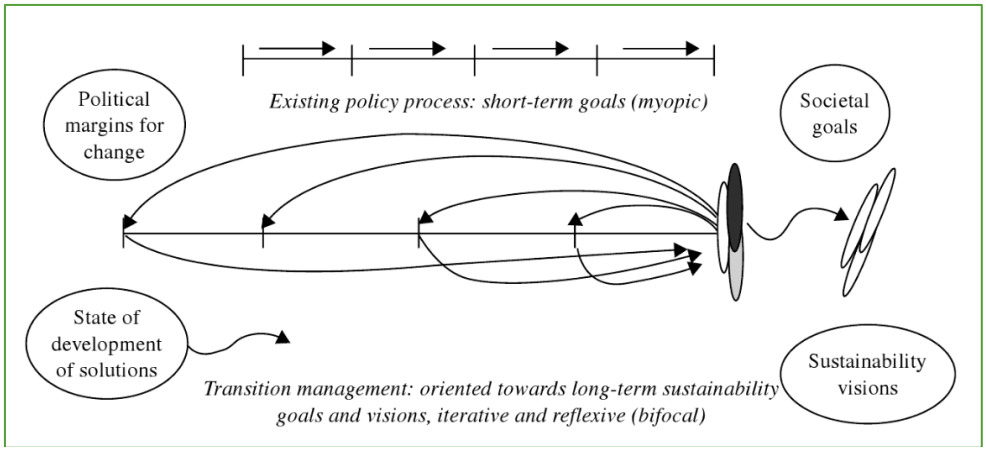

FIGURE 1: DIFFERENCE BETWEEN ORIGINAL PROCESS AND TRANSITION MANAGEMENT (KEMP & LOORBACH, 2006)

Geels (2002) incorporates the dynamics of transition studies with the complexity of societal transitions as a multi-level perspective (MLP), shown in Figure 2. The MLP defines three levels of society the socio-technical landscape, socio-technical regimes and technological niches. The socio-technical landscape operates on the macro-level, which is hard to change and inflexible. The socio-technical regimes operate on the meso-level, which is a set of semi-coherent rules within a multi-actor network. The technological niches operate on the micro-level, novel to the system and generally generating radical innovations. The MLP shows an interactive and dynamic possibility of change. In order to have a societal transition all three levels of the MLP need to change. (Geels, 2002)

Societal change is easiest to come from the niche level, providing the seeds for change. The niche level is considered to be a space where experimentation will take place (Van den Heiligenberg et al., 2017). Through experimentation at the niche level learning processes and reconfigurations of the system can be made. The experimentation phase offers the possibility to fail or adjust before continuing. When an experiment is successful the innovation is accepted by the regime level, adapting current regimes and eventually adapting the societal landscape (Geels, 2002). Sustainability experiments are experiments involved with the sustainable societal transition, specifically defined as: *"planned initiatives that embody a highly novel socio-technical configuration and that are likely to lead to substantial (environmental) sustainability gains"* (Berkhout et al., 2010, p. 262). Kemp, Schot & Hoogma (1998) give a list of seven success factors for sustainability experiments: Technological, Governance, Cultural, Demand, Production, Infrastructure and Societal. The space in which experimentation takes place is not defined by TM research. Leaving a gap in explaining the influence of regional differences on the success factors for sustainability experiments. Making it interesting to research if success factors can be geographical positioned by regional context factors.

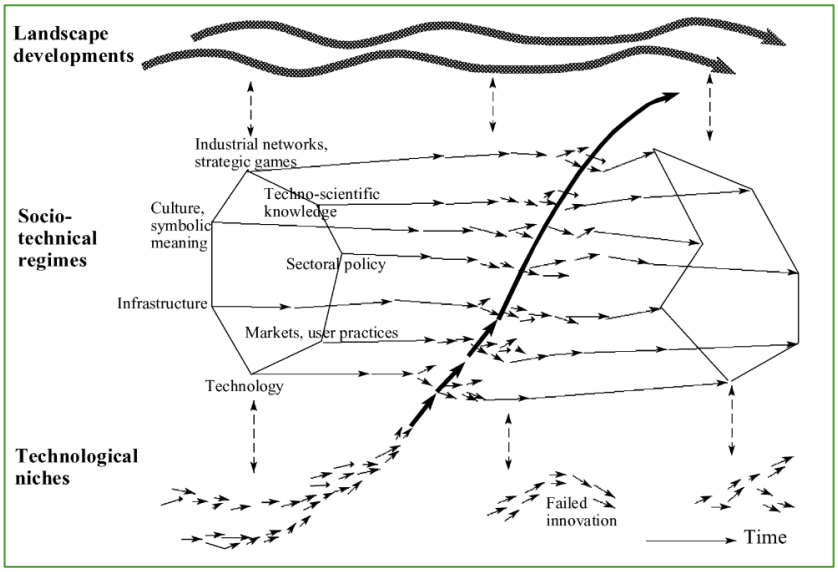

FIGURE 2: MULTI-LEVEL PERSPECTIVE ON TRANSITIONS (GEELS, 2002)

The field of TM includes theoretical information about the societal transition from successful experimentation (Geels, 2002). Displaying society as an MLP, important influences of experiments and niches in societal transition are acknowledged. TM includes the identification of success factors for sustainability experiments (Van den Heiligenberg et al.,

2017). However, TM misses the geographical component and explanation for the uneven distribution of successful sustainability experiments. TM does not include differences in geographical location and possible system boundaries. The system thinking theories within the field of transition studies do sometimes include geographical boundaries but do not include possible geographical influences to explain the uneven distribution in successful sustainability experiments. An understanding of geography-specific influence on sustainable societal transition is missing but necessary and urgent for explaining the current uneven distribution (Coenen, Benneworth, & Truffer, 2012).

2.2. Evolutionary Geography

The field of Evolutionary Economic Geography (EEG), tries to explain the spatial evolution of firms, industries, networks, cities and regions (Boschma & Frenken, 2011). EEG introduces the influence of a regional context on the actions of a firm, industry, network, city or region. The regional context of a city is built on regional context factors determining the social, economic and cultural configuration of a city (Fornahl, 2003). These regional context factors can be influenced by the inhabitants or governance of the city, making the set of context factors broad and transmutable (Scott, 2006). EEG is built on path dependency through regional context factors as an answer to the uneven distribution within the world (Boschma & Frenken, 2011). Stating that previous events affect the future and the probability of future events (Boschma & Frenken, 2006). The current uneven distribution of successful sustainability experiments may therefore origin from previous events. EEG claims that besides regional context factors and path dependency, human decision-making influence current events (Boschma & Frenken, 2006). The human decision-making is executed by the agent of change initiating the sustainability experiment (Moulaert & Farid, 2003). The human-decision making process of an agent of change is strongly dependent on the information received from their surrounding (Fornahl, 2003; Rutten & Boekema, 2012).

The regional context factors of a city are therefore influencing the human-decision making process (Bettencourt & West, 2010), which is also path-dependent due to the stickiness of agents to their regional surrounding and relationships (Rutten & Boekema, 2012). Making regional context factors influencing on their own, through path dependency and the human-decision making process (overview shown in Figure 3). Due to the multiple influencing paths of the regional context factors these will be further researched in the thesis, leaving the path dependency and human-decision making process out of this thesis as researchable influencing factors. Identifying regional context factors which distinguish differences in cities will provide more insights into the uneven distribution between cities with respect to their ability to exploit successful sustainability experiments. EEG includes an explicit dynamic perspective of analysis on the influence of regional context factors towards change (Boschma, Coenen, Frenken, & Truffer, 2017; Frenken & Boschma, 2007). However, the EEG field does not include possible geographical influences on societal transitions and the necessary societal development for this. The field of EEG lacks a theoretical base for this.

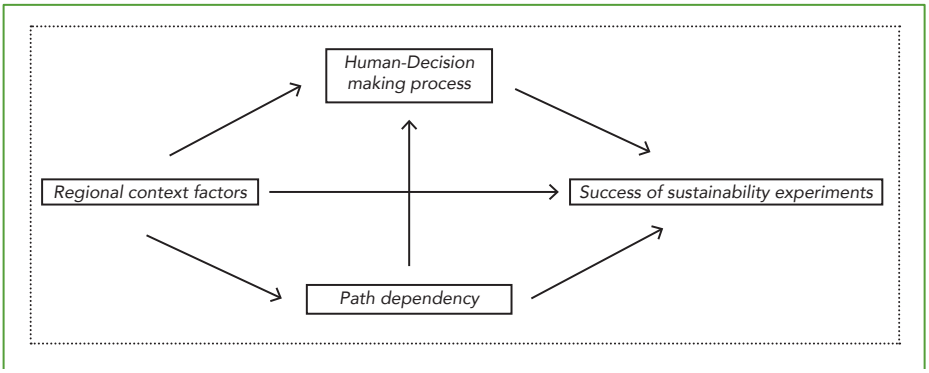

FIGURE 3: INFLUENCE OF REGIONAL CONTEXT FACTORS

2.3. HABITATS

Sustainable societal change is in need for successful sustainability experiments, as stated within the TM field. Which are influenced mostly by regional context factors, as described by EEG literature. However, both theories show a literature gap in their ability to explain the geographical uneven distribution of successful sustainability experiments in order to accomplish a societal transition. Numerous scientific researchers currently address this gap and are trying to combine scientific fields to fill the gap. For example Coenen, Benneworth and Truffer (2012) and Van den Heiligenberg et al (2017). By addressing the importance of regional or local specific context factors influencing experimentation. And therefore adding a regional/local influence in the success of sustainability experiments within current societal sustainable development.

Following this reasoning it is interesting to look at the habitat theory. Van den Heiligenberg et al. (2017) describes the idea of four different habitats, as configurations of contextual factors for experimentation on a local and regional scale. The proposed habitat framework combines TM with Regional Innovation System (RIS) based on the fact that different types of sustainability experimentation have different preconditions for success (Van den Heiligenberg et al., 2017). The framework addresses four different habitats favourable for different types of sustainability experiments. The four habitats are the valley habitat (visionary science region), the middleground habitat (visionary creative region), the makerspace habitat (cooperative science region), and the do-it-ourselves habitat (cooperative creative region), see Figure 4. Habitat names changed through the development process of the framework. Providing a typology for sustainability experiments within their favourable habitats. The mentioned context factors create clusters of certain hubs supportive of sustainability experiments. The used axes of the framework do not define opposites but are used as analytical distinct dimensions (Van den Heiligenberg et al., 2017).

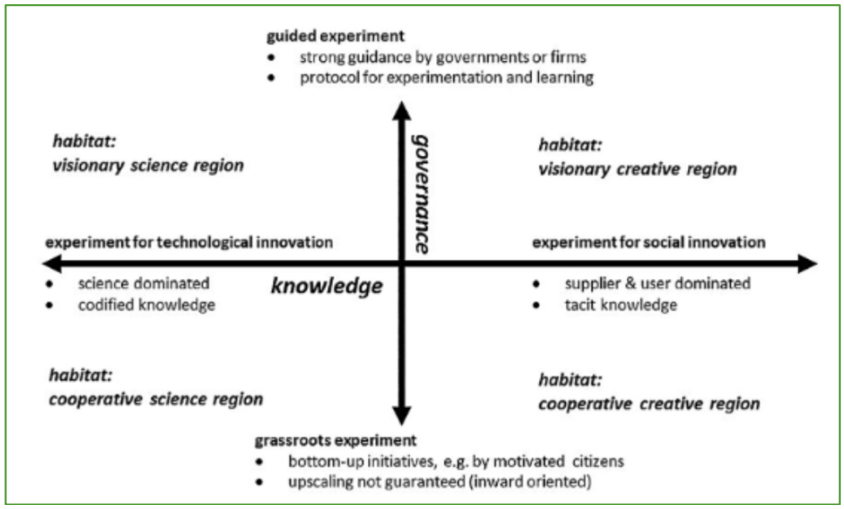

FIGURE 4: HABITATS (VAN DEN HEILIGENBERG ET AL., 2017)

The habitat quadrant is constructed by a horizontal (knowledge) and a vertical (governance) axis. The horizontal axis differentiates between the type of knowledge necessary for the experiment, either technological or social (Van den Heiligenberg et al., 2017). Technological experiments are expected to have a more science dominated base and prefer codified knowledge. Codified knowledge is information that can be described or explained without a personal interaction (Zack, 1999). This does not mean that codified knowledge is systematically transferred (Ancori, Bureth, & Cohendet, 2000). Universities are known to be an important factor in exploring codified knowledge and making it available for public consumption (Franken, Branson, & Penney, 2018). On the other side of the knowledge axis is social knowledge or social innovations, which are stated to be supplier and user dominated and in preference of tacit knowledge (Van den Heiligenberg et al., 2017). Tacit knowledge is information which can only be transferred through personal interaction. This knowledge is mostly subconsciously understood and developed by personal expertise and interaction with others (Adler, 1995; Zack, 1999). It is stated that tacit knowledge can be codified to a certain level (Ancori, Bureth, & Cohendet, 2000). Due to the difference in knowledge transfer it is expected that Technological sustainability experiments are more often successful than Social sustainability experiments.

The vertical axis differentiates between the type of governance the experiment asks for, either being a guided experiment or being a grassroots experiment (Van den Heiligenberg et al., 2017). For this study this differentiation is defined as either governmental lead or non-governmental lead. This axis accentuates the type of initiating organisation for the experiment. Governmental experiments have a clear protocol for the experimentation, facilitation from the government and possible learning possibilities. Where Non-governmental experiments are more inward-oriented and focussed on bottom-up solutions for local sustainable problems using their own facilitation and resources (Seyfang & Smith, 2007). Due to the difference in facilitation for the sustainability experiment it is expected that Governmental sustainability experiments are more often successful than Non-governmental sustainability experiments.

When looking at the habitat framework it is stated that experiments can be grouped over the horizontal and vertical axes (Van den Heiligenberg et al., 2017). Which can be used as a first step into a conceptual framework explaining geographical differences between cities in their ability to host successful sustainability experiments (see Figure 5). First, the valley

habitat experiments are expected in a technologically-oriented science-based culture. Secondly, the makerspace experiments are expected in a technologically-oriented bottom-up fabrication culture. Thirdly, the middleground experiments are expected in a socially-oriented creative culture. Lastly, the do-it-ourselves experiments are expected in a socially-oriented alternative culture. The habitat framework can be used to group regional context factors that enable a specific type of sustainability experiment. The first guided expectation is therefore: ***Habitats offer a different configuration of regional context factors enabling the specific type of sustainability experiment to be successful***. With this the first guided expectation the first layer of the conceptual model can be built (see Figure 5).

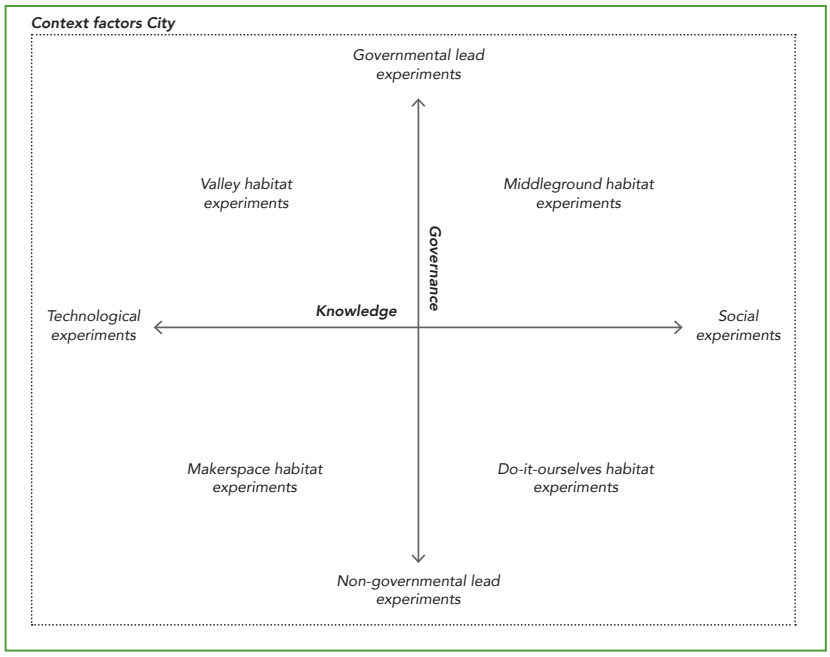

FIGURE 5: CONCEPTUAL MODEL STEP 1

The habitat concept is formed around the two axes forming 4 possible types of sustainability experiments, however, hybrid forms are not yet taken into account. Sustainability experiments are known for their heterogeneity in execution on governance as well as on knowledge level (Pesch, Spekkink, & Quist, 2019), as also stated in the TM field (Geels, 2002). This shows a gap in the habitat framework. It is expected that there are sustainability experiments which are defined to have either a hybrid form of leadership or a hybrid form of knowledge or even both. These hybrid experiments do not fit within the current habitat framework. Introducing the idea of having a possible overlap between habitats and their configuration of regional context factors with offering hybrid experiments. As a second building step for the conceptual framework and as an addition to the habitat framework there is the possibility of having experiments that do not fit with one of the habitats (see Figure 6). Each type of experiment diversification is shown as a coloured ellipse, where the overlap between two ellipses describes habitat experiments. Hybrid experiments are positioned within an ellipse but outside of the habitat overlay. Combining the axes ellipses within the first building step. This only includes the possibility to have a hybrid form for either governance or knowledge. This choice is made to limit the number of sustainable experiment types because this is a first try to add and conceptualise hybrid forms in the habitat framework.

Therefore, the second guided expectation reads: ***There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.***

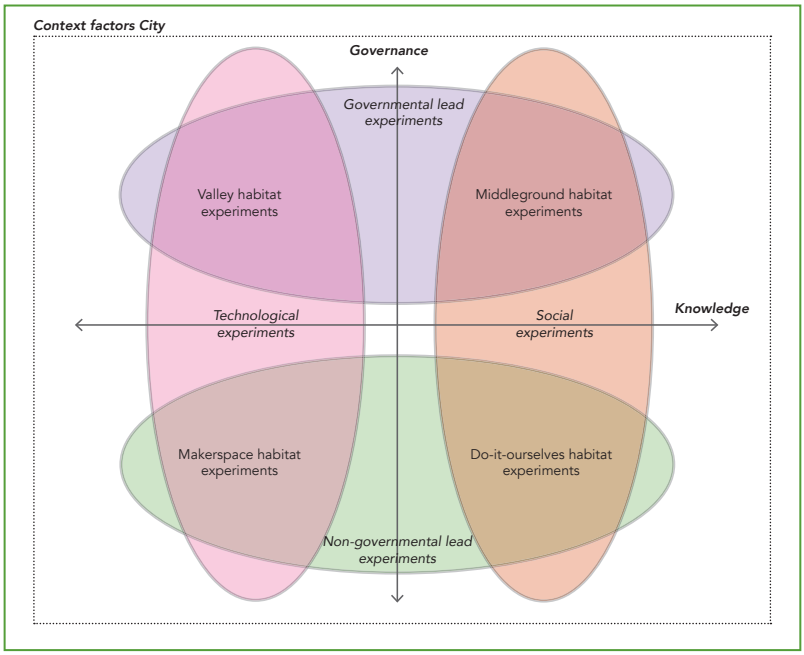

FIGURE 6: CONCEPTUAL MODEL STEP 2

2.3.1. REGIONAL CONTEXT FACTORS

Each habitat is defined as having a set of favourable regional context factors for the sustainability experiment type. This thesis groups regional context factors within four dimensions: ***Culture, Regional network, Learning culture and Demographic information***. These groups are a combination of the stated influential context factors within the EEG field (Fornahl, 2003) and the success factors within the TM field (Kemp, Schot, & Hoogma, 1998) (overview given in Table 1). The groups show an overlap between the TM and EEG used factors. The Technological and Governance success factors of Kemp, Schot & Hoogma (1998) are used for the experiment information within the habitat framework. All context factors have a connection to the location of the habitat type. The four groups are further described and a complete overview of expected regional context factors is given in Table 2. With this description of the different groups it is also shown that there is an overlap of factors within the four groups.

TABLE 1: CONTEXT FACTOR GROUPS

Regional context factor groups of this research	**Context factor groups EEG field (Fornahl, 2003)**	**Success factors TM field (Kemp, Schot, & Hoogma, 1998)**
Culture	Cultural	Cultural
		Societal
Regional network	Economic	Demand
		Production
Learning culture	Social	
Demographic information		Infrastructure

The first regional context factors group is ***Culture***, indicating possible sub-cultures and types of innovative environments. Van den Heiligenberg et al. (2017) already state the

diversification of innovative cultures over the different habitats. With either having a more scientific background or more creative background. The informal institutions of a city are describing the innovative culture of the city. Morgan (2004) states the importance of acknowledging the emergence of regional institutions above having national institutions, because of the direct influence upon the city's development. Therefore, it is expected that the different types of habitats have different innovative cultures. Secondly, this study includes the ***Regional network*** as a regional innovation advantage. Whereas the importance lay in the type of employment, a specific type of employment is expected to be important for each of the habitats (Durantan & Puga, 2004). Either respond to the more science-based influences or the creative force influences. Thirdly, the ***Learning culture*** of a city provides information about the available knowledge (Morgan, 2004). The diversification within the habitat quadrants is made between publication learning or patent learning, respectively science-based or R&D-based. This can again be associated with the horizontal axis. It is expected that learning in theoretical ways is more important in the valley and makerspace habitats due to the codified knowledge needed for valley and makerspace experiments. The more creative middleground and do-it-ourselves habitats will show learning in the development of new products. It should be noted that both types of knowledge exchange are important for a successful learning region (Asheim & Coenen, 2006). Therefore, results with influences of both types of learning are possible. The last group of regional context factors is based on ***Demographic information***. Focussing on type of knowledge production and extra possible contextual influences. For the valley habitat it is expected that the strong science-based culture will also continue into a life-long learning culture, supported by the government. The other habitats will show again an R&D based community.

TABLE 2: EXPECTED CONTEXT FACTORS

	Valley habitat	**Makerspace habitat**	**Middleground habitat**	**Do-it-ourselves habitat**
Culture	Science-based	Sharing culture	Creative class	Alternative lifestyles
		Alternative lifestyles		
Regional network	Globally oriented	Globally oriented	Regional oriented	Regional oriented
	High-tech firms	Diverse employment	Creative employment	Creative employment
Learning culture	Publications	Publications	Patents	Patents
Demographic information	Knowledge production	Knowledge production	R&D	R&D
	Long-life learning	R&D		

2.3.2. GENERAL REGIONAL CONTEXT FACTORS

Besides specific regional context factors as addressed above, it is also expected that the success of hosting a sustainability experiment by a city is influenced by ***general regional context factors*** of the city. The infrastructure of the city is the prime enabler of sustainable development (Ramaswami, Russell, Culligan, Rahul Sharma, & Kumar, 2016). Therefore, it is interesting to look at a range of context factors, which define the exploiting possibilities of a city for sustainability experiments (Van den Heiligenberg et al., 2018). With researching the possibility of a generic set of regional context factors explaining the geographical uneven distribution the applicable of the habitat framework can be questioned. The basic assumption of the habitat framework about different favourable regional context factors for different experiment types will be criticised when a generic set can be derived.

Being sustainably active, or a focus on green exploration is an interesting factor expected to influence the success of a sustainability experiment within a city (Berkhout et al., 2010). It is expected that cities which are highly sustainably active have more sustainability experiments than cities which are not sustainably active. With having more experiments the chance of having successful experiments also increases. Showing a broader distribution of knowledge, increasing the learning processes and eventually having a faster sustainability transition. Physical and non-physical ways to distribute knowledge of successful sustainability experiments (Bai, Roberts, & Chen, 2010) are also seen as an interesting point of research when looking at a general set of influencing regional context factors. Universities will provide for instance a clear distribution of knowledge as the gatekeepers of a city's knowledge. The habitat theory does not include the idea of a general set of influencing context factors, therefore this is added to the conceptual model. It is stated with the third guided expectation that: *A set of general regional context factors without making a distinction in* experiment type, influences the success of sustainability experiments, which explains an uneven geographical distribution.

2.4. TRANSFERABILITY OF EXPERIMENTS

A sustainability experiment is stated to be successful when it either achieves short-term targets or is scaled up to change current regimes (Bai, Roberts, & Chen, 2010; Geels, 2002; Van den Heiligenberg et al., 2017). Both definitions of success can lead to societal change (Van den Heiligenberg et al., 2017).

For short-term success Van den Heiligenberg et al. (2017) presents three success factors; the articulation of expectations and visions, the building of social networks, and the learning processes at various dimensions. It is expected that sustainability experiments are more often able to proceed with success when the experiment characteristics fit the habitat, defined as short-term success. However, since short-term success influence long-term success, this research focusses on the long-term success of sustainability experiments.

Long-term success can be defined by up-scaling the sustainability experiment by transferring the experiment to other cities (Kabisch et al., 2016). A successful sustainability experiment has been upscaled to a higher level within society leading to system change (Bai, Roberts, & Chen, 2010; Geels, 2002). The successful endpoint of a sustainability experiment will be conquering the societal challenge and concluding the urban sustainability transition (Hodson & Marvin, 2010). However, defining this point and what leads to this point is speculation, and impossible with currently available data. Bai, Roberts & Chen (2010) address the difficulty of transferring innovative practices to other environments or regions. According to this paper local modifications are necessary before transferring to other contexts is possible. Therefore, the dependent variable of this research will be defined as the transferability of sustainability experiments.

2.5. CONCEPTUAL FRAMEWORK

Throughout this theoretical framework it is stated that the transfer of sustainability experiments is influenced by regional context factors, which are either habitat-specific or general. All regional context factors are local or regionally bounded adding a geographical component to the existing statically Transition Management field. The conceptual framework expands the habitat framework of Van den Heiligenberg et al., 2017 with the possibility of

having hybrid forms of experiments and with the guided expectation that a generic set of regional context factors influence the transferability of sustainability experiments. As a conclusion of this theoretical framework the conceptual framework is presented in Figure 7. The used regional context factors are within the groups ***Culture, Regional network, Learning culture*** and ***Demographic information***. Throughout the theoretical framework three guided expectations are formed for each layer of the conceptual framework. A habitat specific guided expectation, followed by a broader ellipse specific guided expectation and as last a framework broad guided expectation. The following guided expectations are made throughout this theoretical framework:

1. Habitats offer a contrasting configuration of regional context factors enabling the specific type of sustainability experiment to be successful.
2. There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.
3. A generic set of regional context factors without making a distinction in experiment type, influences the success of sustainability experiments explaining an uneven geographical distribution.

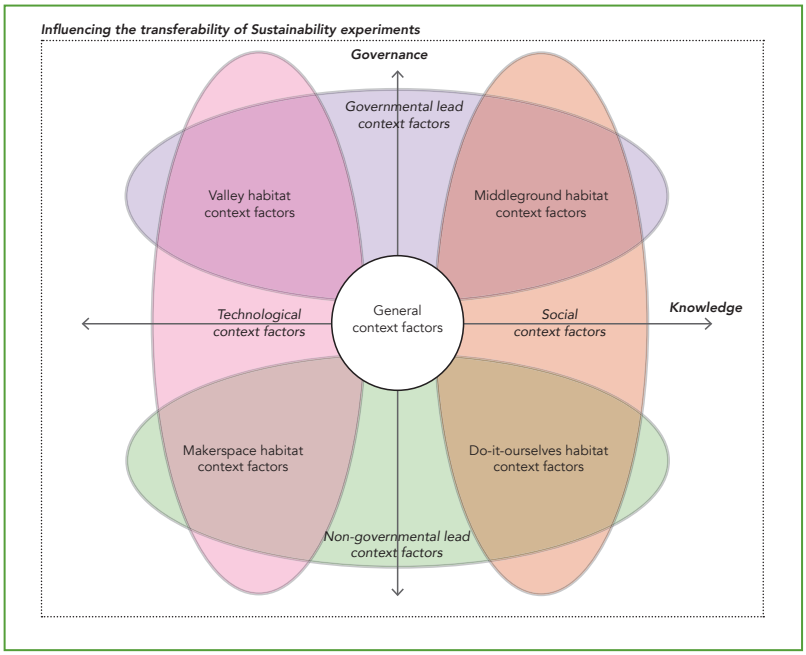

FIGURE 7: CONCEPTUAL FRAMEWORK

With the introduction of the habitat concept a first step is taken towards the explanation of differences in the ability of cities to host successful sustainability experiments. However, a habitat is not geographically bounded by a region or city (Van den Heiligenberg et al., 2017), which implies the possibility of having multiple habitats within a region or city. Regional context factors are geographically bounded up to a local or regional level and used to explain the success of different types of experiments. The transmutable appearance of a city in combination with the complexity of modern cities (Scott, 2006) introduces the expectation that multiple habitats are necessary to explain the success of sustainability experiments within one city. Which will result in either a broad generic set of favourable regional context factors or with a great overlap between experiment type specific sets of regional context factors. It will be difficult to determine if this occurs and which possible

explanation is occurring. Opening up the question about the analytical fit of the habitat framework to explain the geographical uneven distribution of cities and their ability to host successful sustainability experiments.

3. CASE SELECTION: NBS INITIATIVES

A Nature-Based Solution (NBS) is a type of sustainability experiment applied in an urban surrounding, fundamentally using nature for initiatives (European Commission, 2015). An NBS is defined as a nature initiative helping to decrease the influence of climate change upon urban areas (Kabisch et al., 2016). In Horizon 2020 the European Commission defined NBS as: *"Living solutions inspired by, continuously supported by and using nature, which are designed to address various societal challenges in a resource-efficient and adaptable manner and to provide simultaneously economic, social, and environmental benefits"* (European Commission, 2015, p. 15). The concept of NBS may be recently introduced within the scientific and political world, but this type of initiatives has been implemented for a long time (Eggermont et al., 2015). Therefore, it is important to consider that the use of NBS as a concept may not have been introduced but the way of framing it has been used.

NBS is a comprehensive concept, including technological, social and creative innovations. For instance, increasing green and blue areas in the city (Kabisch et al., 2016). NBS show to be an interesting type of sustainability experiment for this research due to the heterogeneity of possible initiatives. Offering governmental lead, non-governmental lead, technological and social initiatives, which makes it possible to group the set of initiatives over the different habitats. Giving a broad and complete view of the framework, while making it possible to compare experiment types. It is stated that there is currently a window of opportunity to develop and use NBS initiatives in an experimental way to increase sustainable development (European Commission, 2015). NBS show to be innovative in their transfer of knowledge to new surroundings and not by introducing new technologies. This limits the resemblance between NBS initiatives and socio-technical experiments. Socio-technical experiments are defined as technological experiments originating in niche situations with the possibility to influence society through regime changing paths (Brown, Vergragt, Green, & Berchicci, 2003; Geels, 2004). For the scope of this research, an NBS is analysed and researched as being a socio-technical experiment. Due to the fact that specific differences between NBS and socio-technical experiments are not yet analysed in their connection to societal transitions.

Due to this recent focus on NBS initiatives Naturvation[1] published a database with 976 NBS within 100 cities in Europe (Almassy et al., 2018). Introducing the possibility to generate a substantial dataset for quantitative research on regional context factors. NBS initiatives were selected with the aim of diversity in terms of the urban setting, sustainability challenges, and governance arrangements (Almassy et al., 2018). The urban setting was identified straightforward from the goal of the NBS, however, NBS can often belong to more than one urban setting or subdomain.

The transferability rate per city of NBS initiatives is shown as a percentage in Figure 8. For 471 experiments within the 99 cities the transferability was given, through the Naturvation database. The cities are defined as a NUTS 2 level. This indicates the uneven distribution of transferred NBS initiatives. Substantiating the idea of uneven distribution of successful sustainability experiments between cities.

1 Naturvation is a group of 14 institutions across Europe researching urban development through the usability of NBS (Almassy, et al., 2018).

Due to the heterogeneity of NBS initiatives, the available database of experiments and the uneven distribution NBS show to be an applicable case for sustainability experiments.

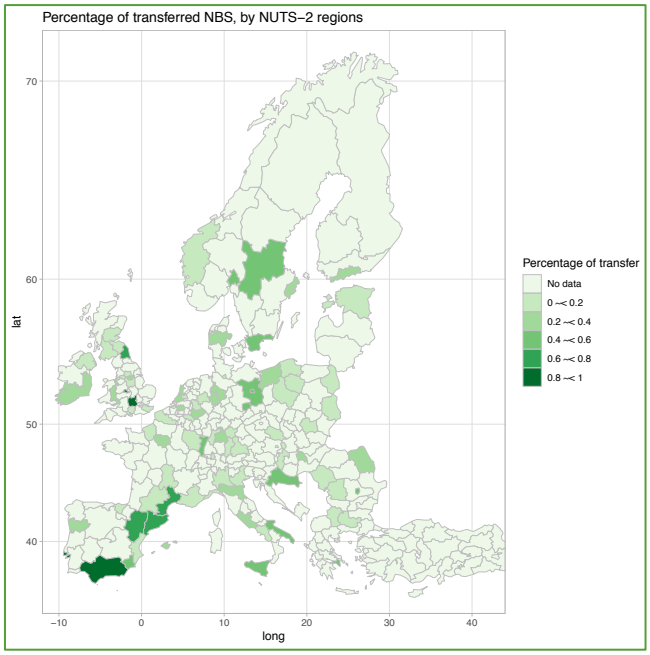

FIGURE 8: TRANSFERABILITY RATE OF NBS

4. METHOD

This chapter elaborates on the methodological approach taken within this research. Describing the chosen research design, used data, measurement of regional context factors and chosen data analysis. All methodological steps follow the built conceptual framework and presented guided expectations (chapter 2.5).

4.1. RESEARCH DESIGN

This thesis uses an explorative data-driven quantitative approach to research the stated guided expectations and the conceptual framework (presented in 2.5). The explorative approach is chosen because of the theory-building nature of this research. Due to the testing of provided guided expectations and research type for this subject the explorative research design fits. The research focuses on the bridge between deductive and inductive research, taking a theoretical approach as a starting step and build further on it. Herewith, possible new theoretical routes are explored. This choice also offers the opportunity to answer both the theoretical as the methodological overarching questions of the currently discussed habitat framework:

- Theoretical: Does the habitat framework help to explain the currently occurring geographical uneven distribution between cities in their ability to host successful sustainability experiments?
- Methodological: Is it possible to systematically test the influence of regional context factors on the success of sustainability experiments with existing data?

In addition to the guided expectations testing this research also is explorative in finding unexpected trends or mechanism indications in the data. Due to the explorative research design, this research focusses on indicating possible relations and mechanisms without stating causal relations. This research can be seen as a first quantitative step in systematically analysing and conceptualising the currently unexplained difference between cities in successfully transferring NBS initiatives. In order to do so, this research is based on a cross-sectional research design.

The cross-sectional design offers the opportunity to search for patterns of association between variables but does not say anything about the influence over time (Brymann, 2012). With the cross-sectional design it is important to gather the data for variables more or less simultaneously, because in essence this design is used to compare cases without acknowledging the influence of time (Brymann, 2012). With the collection of public data it is tried to take data from one moment in time. However, the diversity in used public sources does not make this possible. With not explaining or stating influence over time but just using the data statically this problem is forestalled.

4.2. USED DATA

4.2.1. DEPENDENT VARIABLE

This research uses the database of Naturvation (Almassy et al., 2018). Naturvation collected the NBS experiments by setting out a questionnaire, first tested in the partner cities of Naturvation. The Naturvation partner cities are: Barcelona (Spain), Győr (Hungary), Leipzig (Germany), Newcastle (United Kingdom), Malmö (Sweden) and Utrecht (the Netherlands). NBS was selected by the researchers with the aim of having then NBS interventions per city

with diversity in the selected interventions. However, achieving ten NBS was not always possible, due to lack of information. Within all 100 cities between the five and ten NBS were identified and added to the dataset (see Table 3 for the distribution). Making a total of 976 NBS initiatives within 100 cities.

TABLE 3: DISTRIBUTION OF NBS EXPERIMENTS OVER CITIES

Number of NBS experiments	Frequency of occurrence in cities	Percentage	Cumulative percentage
5	1	1.0 %	1.0 %
6	0	0.0 %	1.0 %
7	1	1.0 %	2.0 %
8	3	3.0 %	5.0 %
9	20	20.0 %	25.0 %
10	75	75.0 %	100.0 %
Total	100	100.0 %	

Information about the NBS initiatives is gathered through secondary sources, project reports, websites, or news articles. Intentionally with search terms such as: nature-based solutions, green or blue infrastructure (Almassy et al., 2018). Collected data of the NBS initiatives contains general information, objectives, key characteristics, governance and financing, innovation, evaluation, and sources (Almassy et al., 2018). The Naturvation data is verified in two stages (Almassy et al., 2018). Firstly, parallel to the data collection several questions, with low respondence, were subject to further corrections. Secondly, a quality check after completeness of the dataset. Besides the verification of the data, Naturvation acknowledges possible limitation in the data due to the accuracy of the reported data.

For this research one city, Sintra (Portugal), and the corresponding NBS data, 5 NBS initiatives, are removed from the dataset because of the lack of context data. Resulting in case selection of 99 cities with 971 NBS initiatives (list of cities is shown in

Appendix 2: List of researched cities). For 471 NBS initiatives data on transferability is available, limiting the finishing dataset on 471 NBS initiatives within 99 cities (see Figure 9).

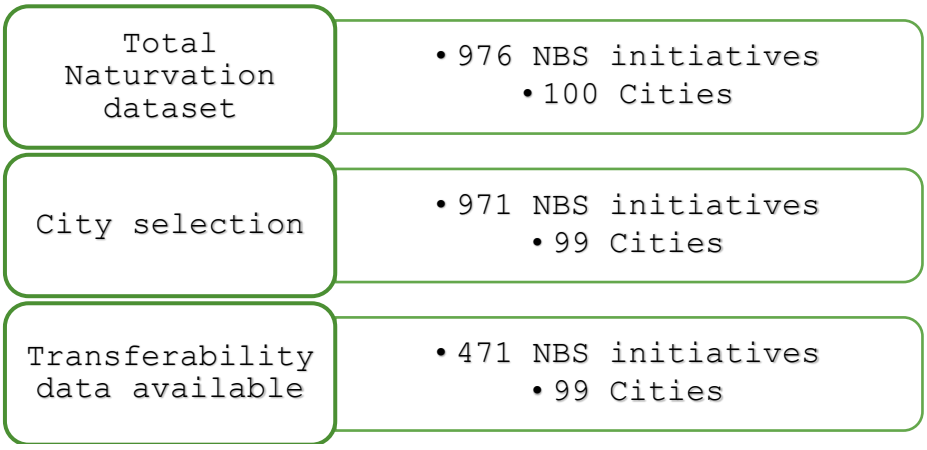

FIGURE 9: NATURVATION DATA SELECTION

4.2.2. INDEPENDENT VARIABLE

The chosen 99 cities represent a variation in urban environmental conditions across Europe with a broad geographical distribution (Almassy et al., 2018). This is done through applied indicators such as; demographics, city size, unemployment, the proportion of green space, access to green areas in Europe's cities, climate risk and vulnerability (Almassy et al., 2018). Naturvation chose to only include cities with more than 200.000 inhabitants (inhabitant distribution is shown in Figure 10). The cities are defined as a NUTS 2 level, cities and their close surrounding with the application of regional policies (Eurostat, 2018)[2]. Not all indicators can be tested upon NUTS 2 level, these will be tested on a NUTS 1 or NUTS 3 level. Including these indicators increases the value of the results more than it decreases the validity of the research. It also indicates the direct regional influence on the transferability of NBS experiments. All data is gathered through public data sources, increasing the replicability of the research.

Data were gathered from the year 2000 up to 2018. Because of the use of multiple databases and indicators it is not possible to take all data from the same year. Regional indicators do not influence actions on a direct basis, it will always take some time until the niches with sustainability experiments appear. Data is gathered from the following data sources: Naturvation, Eurostat, Espon, Martin Prosperity, Movehub, European Regional Competitiveness Index, Leiden Ranking, World Higher Education Database, Cultural and Creative Cities Monitor, Eurobarometer, Arcadis, Ecobase Global ecovillage network, and ICCA.

[2] NUTS level is defined as: *"A hierarchical system for dividing up the economic territory of the EU for the purpose of: 1) The collection, development and harmonization of European regional statistics, 2) Socio-economic analyses of the regions and 3) Framing of EU regional policies"* (Eurostat, 2018)

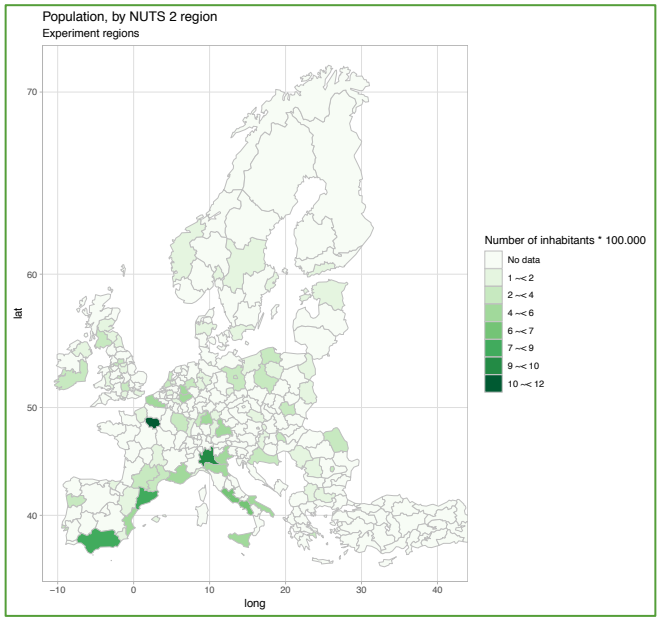

FIGURE 10: POPULATION OF NATURVATION CITIES

4.3. MEASUREMENTS

This thesis includes 38 indicators from 13 different data sources. This subchapter will elaborate on the proxy indicators and how they are gathered. A summary of all variables and indicators is presented in Table 4. The operationalisation table is given in Appendix 3: Operationalisation table, description of the different indicators is given in 8.3.1. The complete data set can be requested with the author of this thesis[3].

TABLE 4: INDICATORS

	Concept	**Indicator number**	**Indicator**
Dependent variable	Long-term success		Transferability of the experiment
Independent variables	A: Experiment information	A1	Experiment type
		A2	Type of innovation
	B: Culture	B1	Open-source and sharing culture
		B2	Counterculture of young people who are open to innovation
		B3	Counterculture of alternative lifestyles, with a role for creatives
		B4	Creative class index
		B5	Hipster index
	C: Regional network	C1	Cooperative culture
		C2	Innovative cooperation
		C3	Technological specialization
		C4	Employment in technology and knowledge-intensive sectors
		C5	Foreign controlled firms
		C6	Employment dispersion
		C7	Creative jobs
	D: Learning culture	D1	Scientific pipelines
		D3	Patents
		D4	Knowledge exchange among actors
		D5	Co-publications
		D6	Co-authored patents

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	E: Demographic information	E1	Impact of knowledge production to cross-regional mobility
		E2	Adult learning
		E3	Citations of patents
		E4	R&D expenditure
		E5	Median age
	G: General context factors	G2	Internet access
		G3	University appearance
		G4	University ranking
		G5	Foreign index
		G6	Cultural openness
		G7	Index regional green economic performance
		G8	Sustainable Cities Index
		G9	Intentional Communities
		G10	International meetings
		G11	Personal trust
Control variables		X1	Population
		Y1	Economic wealth
		Z1	Surface of the city

Because of the explorative basis of this research used indicators may not fit completely with the theoretical description. A flaw to this fit is the lack of complete proxy data when quantitatively describing and explaining the current situation. Increasing possible missing data and decreasing the sample. Missing data does have implications for the statistical tests performed during the research (shown in Table 5). All indicators will be used during the descriptive statistics and correlation tests. With the correlation tests it is necessary to keep in mind that with a smaller N the correlation coefficient will be easier significant. On average 18,1% of the cases are missing. An overview of the descriptive results of the indicators, showing sample size, minimum, maximum, mean and standard deviation is presented in

Appendix 4: Descriptive results.

TABLE 5: MISSING DATA

Indicator number	Description	N missing	Percentage missing	Valid N
Transfer	Transferability of NBS	496	51.3%	471
A1	Leading type	0	0%	967
A2	Type of innovation	43	4,5%	923
B1	Open-source and sharing culture	457	47,3%	509
B2	Counterculture of young people who are open to innovation	116	12,0%	850
B3	Counterculture of alternative lifestyles, with a role for creatives	116	12,0%	850
B4	Creative class index	126	13,0%	840
B5	Hipster index	346	35,8%	620
C1	Cooperative culture	135	14,0%	831
C2	Innovative cooperation	48	5,0%	918
C3	Technological specialization	48	5,0%	918
C4	Employment in technology and knowledge-intensive sectors	38	3,9%	928
C5	Foreign controlled firms	19	2,0%	947
C6	Employment dispersion	9	0,9%	957
C7	Creative jobs	136	14,1%	830
D1	Scientific pipelines	38	3,9%	928
D3	Patents	162	16,8%	804
D4	Knowledge exchange among actors	116	12,0%	850
D5	Co-publications	342	35,4%	624
D6	Co-authored patents	174	18,0%	792
E1	Impact of knowledge production to cross-regional mobility	211	21,8%	755
E2	Adult learning	141	14,6%	825
E3	Citations of patents	192	19,9%	774
E4	R&D expenditure	29	3,0%	937
E5	Median age	145	15,0%	821
G2	Internet access	164	17,0%	802
G3	University appearance	19	2,0%	947
G4	University ranking	427	44,2%	539
G5	Foreign index	803	83,1%	163
G6	Cultural openness	66	6,8%	900
G7	Index regional green economic performance	28	2,9%	938
G8	Sustainable Cities Index	305	31,6%	661
G9	Intentional Communities	9	0,9%	957
G10	International meetings	368	38,1%	598
G11	Personal trust	558	57,8%	408
X1	Population	76	7,9%	890
Y1	Economic wealth	29	3,0%	937
Z1	Surface of the city	89	9,2%	877

4.3.1. DEPENDENT VARIABLE

The success of the NBS is measured by the transferability rate of the NBS (as stated in 2.4). A total of 471 NBS is tested with data on transferability. Which is, 49% of the total number of NBS in the database. When looking at city-data a transferability rate is taken, by the number of NBS transferred as a percentage of all NBS with information on the transfer. For each city the number of NBS, with information on the transfer, varies between one and eight, when looking at the transferability indicator. This shows dispersion in the number of test cases per city. Due to the small sample per city, the transferability rate does not promise a normally distributed scale. Data for the transferability is taken from the Urban Nature Atlas, Naturvation, from the year 2017.

4.3.2. INDEPENDENT VARIABLE

The set of indicators used for the independent variables is developed in an iterative way. Indicators were added, adjusted or deleted over time within this study, which provided a set of indicators as inclusive as possible with public data at the time of research. Some

regional context factors are overlapping to check for differences and possible methodological flaws. The choice for this set of regional context factors is defined by the following criteria, an indicator should be:

1. A context factor of the city, defining partly either the *Culture*, *Regional network*, *Learning culture*, *Demographic information* or *General context* of the city.
2. Regional or local oriented, offering the possibility to be different for surrounding cities. Preferably defined on a Nuts 2 or Nuts 3 level.
3. Influenceable by either the inhabitants or the governance of the city.

The *Habitat type (A3)* of an NBS initiative is conducted through the information on the *Governance type (A1)* and *Knowledge type (A2)* of the NBS initiative (See for the distribution Table 6).

TABLE 6: HABITAT DISTRIBUTION

Habitat type	Governance type	Knowledge type
Valley habitat	Governmental	Technological
Makerspace habitat	Non-governmental	Technological
Middleground habitat	Governmental	Social
Do-it-ourselves habitat	Non-governmental	Social

4.3.3. CONTROL VARIABLES

This research includes three control variables: Population, Economic wealth and City size. The control variables are not habitat specific. The population size is growing, especially in cities (Ahern, 2011). It is expected that with a higher number of inhabitants transferring knowledge between one and another becomes easier. This will influence the transferability of NBS. However, this research does not include the population size as a context factor of the city because it is a factor which hardly can be affected by stimuli to influence the transferability.

The relation between the level of economic development and environmental sustainability has been excessively researched (Dasgupta, Laplante, Wang, & Wheeler, 2002). Since the aim of this paper is to look beyond these economic explanations for sustainability performance, therefore, the level of economic wealth per capita is included as a control variable.

Larger cities, in surface, will have more space and opportunity to experiment with NBS (Daley, Sharp, & Bae, 2013; Maes & Jacobs, 2017). Therefore, it is expected that larger cities will have a higher number of NBS and with a higher number of NBS the likelihood of successful sustainability change increases in a city. The aim of this paper is to look beyond the expected opportunity of having successful sustainability experiments and to explain it by other geographical factors. Therefore, the size of the city is included as a control variable for this research.

4.4. DATA ANALYSIS

The level of analysis throughout this research is on the NBS initiative level. Taking the data from the 471 NBS initiatives and expand it with the data on regional context factors. The NBS initiatives are classified by the *Governance type (A1)*, *Knowledge type (A2)* and the *Habitat type (A3)*. This research contains three analysation steps to describe and analyse the data, providing answers to the research questions. Answering the research questions is done through testing the guided expectations stated in chapter two, building towards the conceptual model. An overview of the steps is given in Figure 11. For the research, a

combination of computer programmes is used, such as: RStudio, SPSS and Excel. The complete analysis code can be requested with the author of this thesis[4].

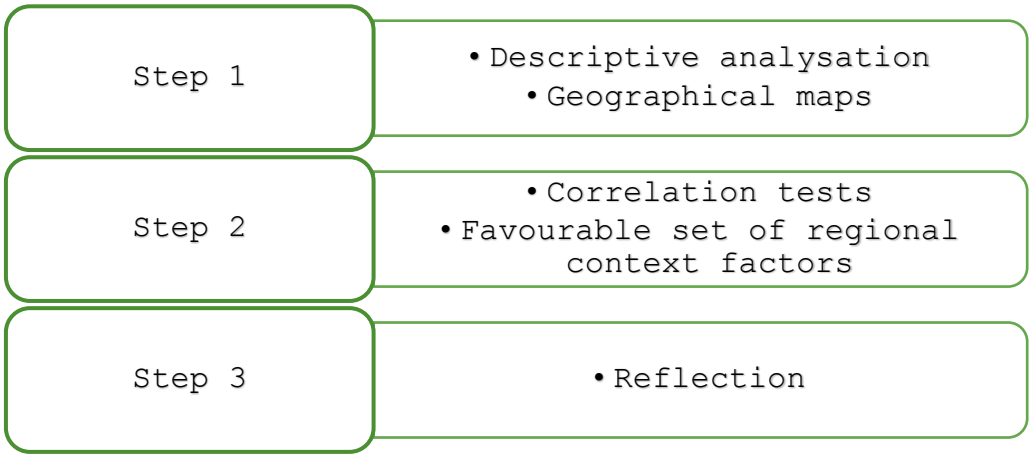

FIGURE 11: DATA ANALYSATION

The data analysation starts with analysing the descriptive statistics of the indicators and producing maps of the data to generate a graphical overview. This will provide a first idea on possible correlations and relationships. The produced maps will give insights in possible geographical explanations for dispersion of results. First ideas will be formed on the type of data for the following steps of the research.

Hereafter possible relations are researched with the Pearson R correlation test between indicators and the dependent variable. The Pearson R correlation test is chosen due to the dichotomous scale of transferability of the NBS. This is done by means of the three guided expectations.

1. Testing habitat specific differences in grouping NBS initiatives over the habitats and forming possible habitat specific sets of favourable regional context factors in order to test the first guided expectation: ***Habitats offer a contrasting configuration of regional context factors enabling the specific type of sustainability experiment to be successful.***
2. Testing the analytical differences on the axis level between sets of favourable regional context factors in order to test the second guided expectation: ***There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.***
3. Testing the influence of a generic set of favourable regional context factors in order to test the third guided expectation: ***A generic set of regional context factors without making a distinction in*** **experiment type, influences the success of sustainability experiments explaining an uneven geographical distribution.**

At last a reflective step will take place. The used proxy indicators will be reflected in combination with the results.

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5. RESULTS

This chapter elaborates on the results of the presented guided expectations, conceptual framework (chapter 2.5) and research method (chapter 4). Starting with an overview of descriptive results from the dependent and independent variables. Followed by results to the different guided expectations, with the analysation of possible relationships and defining habitats.

5.1. OVERVIEW OF DATA

This sub chapter provides an overview of results found with the first descriptive analysis step. Discussing only geographical relevant descriptive results[5]. The discussed regional context factors will be discussed on geographical distribution, successful and unsuccessful cities and applicability.

TRANSFERABILITY RATE

The geographical distribution of the transferability rate[6] per city of NBS initiatives is shown in Figure 12 (also described in chapter 3). For 471 experiments within the 99 cities the transferability was given, through the Naturvation database. The figure shows a clear geographical uneven distribution of the transferability rate. It can be stated that the geographical location of a city is not the only factor influencing the ability to host successful sustainability experiments (NBS).

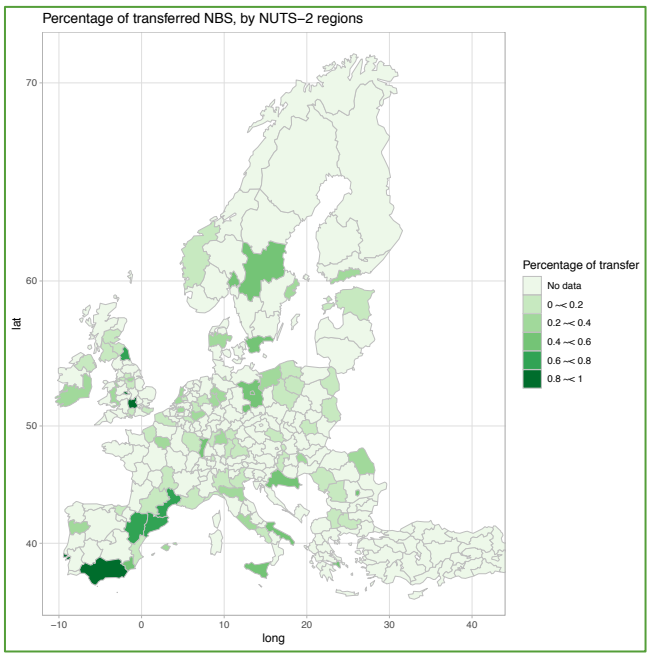

FIGURE 12: TRANSFERABILITY RATE OF NBS

The transferability rate of cities ranges between 0% and 100% stating the usage of the complete scale, with an average of 28% transferability. Best performing cities on the

[5] Transferability rate, experiment information, counterculture, Creative class index, cooperation type, employment type, adult learning, median age, university influence and green economic performance

[6] Transferability rate: ((number of transferred NBS initiatives) / (number of NBS initiatives)) * 100%

transferability rate are: Lisboa (*Portugal*) with 100%, Cordoba (*Spain*) with 100%, Coventry (*United Kingdom*) with 100%, Reading (*United Kingdom*) with 83% and Zaragoza (*Spain*) with 80%. However, it should be noted that Cordoba (*Spain*), Coventry (*United Kingdom*) and Lisboa (*Portugal*) have respectively 1, 2 and 3 experiments with data on the transferability, which makes it easier to have a 100% transferability. Therefore, the value of this transferability rate could be questioned. To overcome this an alternative list is produced only including cities with data for 5 or more NBS, including 58 cities. This results in the following best performing cities list: Reading (United Kingdom) with 83%, Zaragoza (Spain) with 80%, Sevilla (Spain) with 60% and Bucuresti (Romania) with 60%.

There are 35 cities with a transferability rate of 0%. Remarkable cities, because of the number of tested NBS in combination with their transferability rate, to notice are shown in Table 7. When looking at the alternative list of cities, with 5 experiments or more examined, only 15 cities have a transferability rate of 0%.

TABLE 7: OVERVIEW OF CITIES WITH 0% TRANSFERABILITY RATE

Cities with 0% transferability rate	Amount of tested NBS initiatives
Brno (Czech Republic)	7
Ljubljana (Slovenia)	7
Belfast (United Kingdom)	6
Bremen (Germany)	6
Glasgow (United Kingdom)	6
Nancy (France)	6
Plovdiv (Bulgaria)	6

The results do acknowledge the difficulty of using a transferability rate per city. Therefore, it is difficult to extrapolate the results to the city level. Focussing on NBS initiative level makes the used data researchable.

A1[7] & A2[8]: EXPERIMENT INFORMATION

Looking at the ***Governance type (A1)*** of the NBS it is shown that the most common preferred[9] governance type is a hybrid type, a combination between governmental and non-governmental leadership. The preference for hybrid governance is present in 54 cities. The hybrid type does not explicitly indicate a clear habitat preference. The distribution of governance types is shown in Figure 13, showing an equal distribution over Europe. It does not show an area with preference for one or another governance type.

[7] Governance type
[8] Knowledge type
[9] Highest percentage of NBS initiatives in the city with this governance type.

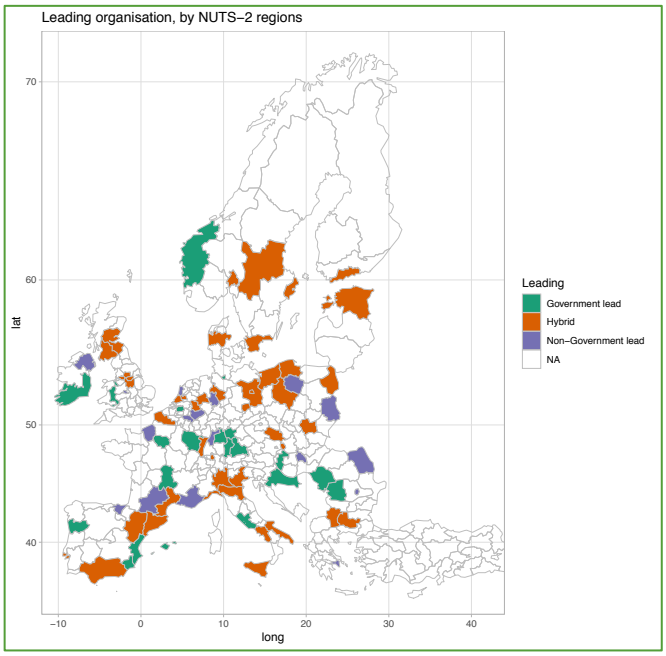

FIGURE 13: GOVERNANCE TYPE

Looking at the ***Knowledge type (A2)*** of NBS, the most preferred[10] knowledge type is with technological initiatives. The preference per city is shown in Figure 14. With 48 cities preferring technological innovation over 34 preferring social and 17 preferring a combination of the two. The distribution of innovation type shows an equal distribution over Europe. It does not show an area with preference for one or another knowledge type.

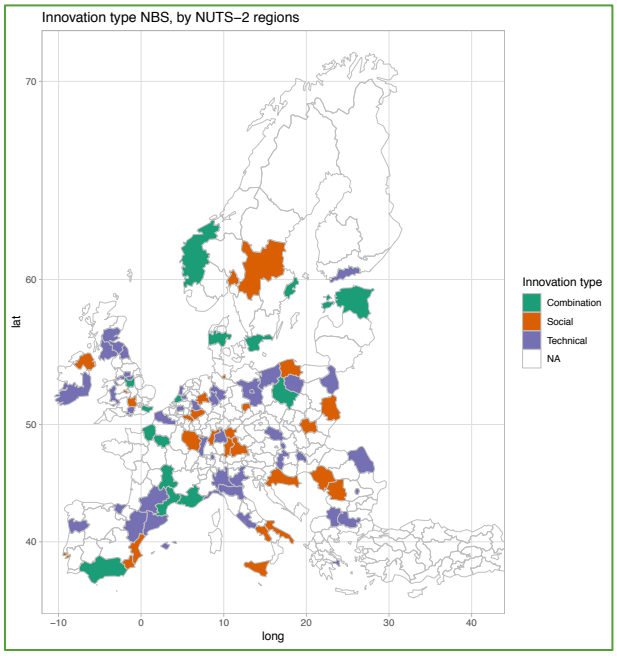

FIGURE 14: KNOWLEDGE TYPE

[10] Highest percentage of NBS initiatives in the city with this knowledge type.

Governance type (A1) and *Knowledge type (A2)* both show an equal distribution over Europe. Indicating that the influence of the NBS initiative experiment type is not enough to explain the geographical uneven distribution of transferred NBS initiatives.

B2[11] & B3[12]: COUNTERCULTURE

The counterculture is discussed by means of the contradicting *Counterculture for young people who are open to innovation (B2*) and *Counterculture of alternative lifestyles, with a role for creatives (B3)* regional context factors. Indicating possible analytical contradiction on the knowledge axis of the conceptual framework. To substantiate the idea of contradicting habitats defined by favourable sets of regional context factors it is expected that a city will have one of the two countercultures.

Looking at the distribution of both countercultures (shown in Figure 15) a geographical uneven distribution can be seen. Indicating the *Counterculture for young people who are open to innovation (B2)* more centered in the central Europe and the *Counterculture of alternative lifestyles, with a role for creatives (B3)* a bit more located on the outer sides of Europe and being more spread out. This indicates the possibility of grouping cities at the knowledge axis. However, this conclusion does show a contradiction with the equally distributed knowledge type preference, weakening the influence.

Data of both indicators are shown in Figure 15, herein, one can see that there is moreover a shift from the one counterculture to the other counterculture, "other"[13] defines that the counterculture is not present in the city. When getting an "other" with the one counterculture it is defined with the other counterculture, and the other way around. There are 11 cities which are not defined as either a *Counterculture of young people who are open to innovation (B2)* or a *Counterculture of alternative lifestyles, with a role for creatives (B3)*. This is explained missing data on the counterculture for these cities. This geographical result indicates the presence of the analytical contradiction on the knowledge axis.

[11] B2: Counterculture of young people who are open to innovation
[12] B3: Counterculture of alternative lifestyles, with a role for creatives
[13] Shown with the orange cities

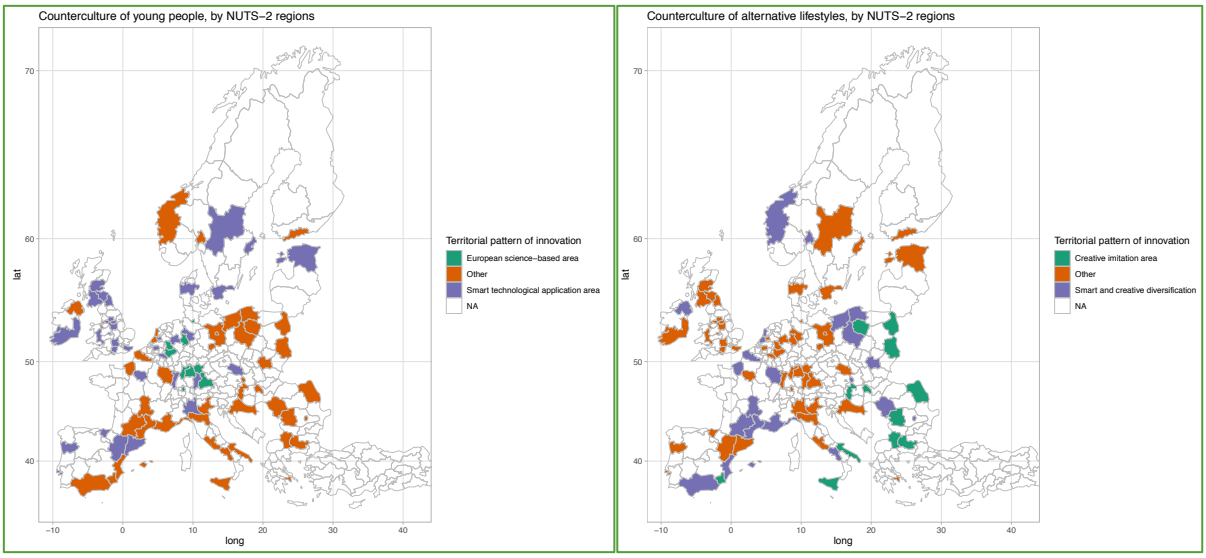

FIGURE 15: COUNTERCULTURE B2 & COUNTERCULTURE B3

B4: CREATIVE CLASS INDEX

The ***Creative class index (B4)*** is used as a measure for the role of creatives within society. Expected to be a favourable regional context factor for social knowledge NBS types. With the ***Creative class index (B4)*** data (shown in Figure 16) it is seen that north-western Europe is better performing than south-eastern Europe, showing a geographical uneven distribution over Europe.

With Utrecht (the Netherlands), Amsterdam (*the Netherlands*), The Hague (*the Netherlands*) and Zurich (*Switzerland*) as best performing. Bucuresti (*Romania*), Iasi (*Romania*), Timisoara (*Romania*) and Craiova (*Romania*) as weakest performing cities. A clear connection between the better performing cities and cities with preference of social knowledge NBS types cannot be made directly.

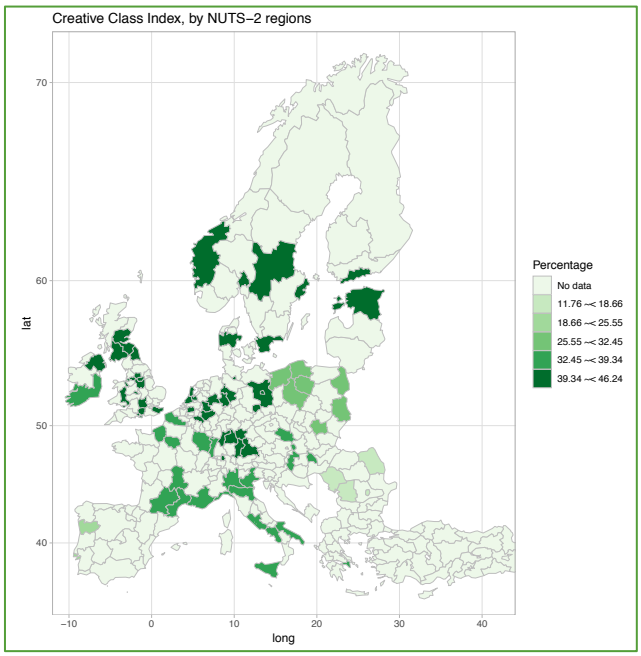

FIGURE 16: CREATIVE CLASS INDEX

C1[14] & C2[15]: COOPERATION TYPE

When researching the data for the ***Cooperative culture (C1)*** and ***Innovative cooperation (C2***) it can be noticed that there is a shift between scores for the two indicators (shown in Figure 17). Whereas ***Cooperative culture (C1)*** is mainly shown in southern Europe, such as Spain, France and Italy, ***Innovative cooperation (C2)*** is mostly shown in northern Europe, such as Hungary, Finland and Slovenia. From theory, cooperation type was not yet defined as a contrasting regional context factor for habitats but was included to define the global or regional orientation of a city, showing possible contrast between the two indicators.

This implies that different types of cooperation occurs within cities and that this could influence the transferability of NBS in these cities. It is expected that the ***Cooperation culture (C1)*** is present and influencing in the left side (Technological innovations) and that ***Innovative cooperation (C2)*** is present and influencing on the right side (Social innovations) of the habitat quadrant. Due to the fact that the ***Cooperation culture (C1***) shows a more global focus in its data collection. Whereas the ***Innovative cooperation (C2)*** includes the regional cooperation type. Combining the statements these results indicate that southern Europe is more globally focussed and northern Europe is more regionally focussed.

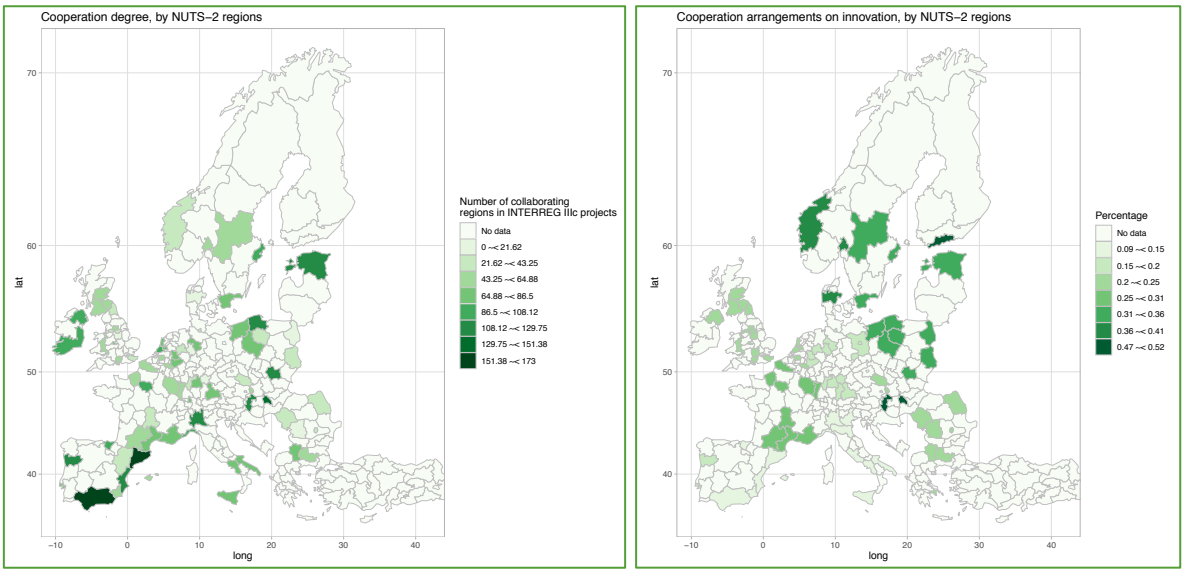

FIGURE 17: COOPERATION CULTURE & INNOVATIVE COOPERATION

C3[16] & C6[17]: EMPLOYMENT TYPE

Technology and creativity are two opposite sides of the habitat quadrant, which raises the expectation that either the one or the other will have a high score on employment. When looking at the figures of ***Technological specialization (C3)*** and ***Creative jobs (C6)*** (Figure 18) this expectation is not fully met. With the number of ***Creative jobs (C6)***, it appears that some regions exceed from the overall mean without an equal geographical distribution, a small centre in western Europe could be spotted. With Saint-Etienne (680,97 creative jobs per

[14] C1: Cooperative culture
[15] C2: Innovative cooperation
[16] C3: Technological specialization
[17] C6: Creative jobs

100.000 inhabitants, *France*) and thereafter Milano (399,88 creative jobs per 100.000 inhabitants, *Italy)* having the highest scores.

The epicentre of the ***Technological specialization (C3)*** labour force can be seen in north-western Europe. Although, the scores seem to be equally distributed over Europe. The highest score for ***Technological specialization (C3)*** is in Reading (67,80% of all labour force, *United Kingdom*) and thereafter Portsmouth (62,30% of all labour force, *United Kingdom*).

Saint-Etienne (France) is fourth in highest technological labour force, with 57,45% of all labour force while also scoring highest on ***Creative jobs (C6)***. Which introduces the idea that technological and creative labour force can be occur highly in one region. An explanation for this can be with the makerspace habitat where technology and creativity are in connection (Van den Heiligenberg et al., 2017). These results do limit the analytical contrast between technology and creativity as proposed by the conceptual framework.

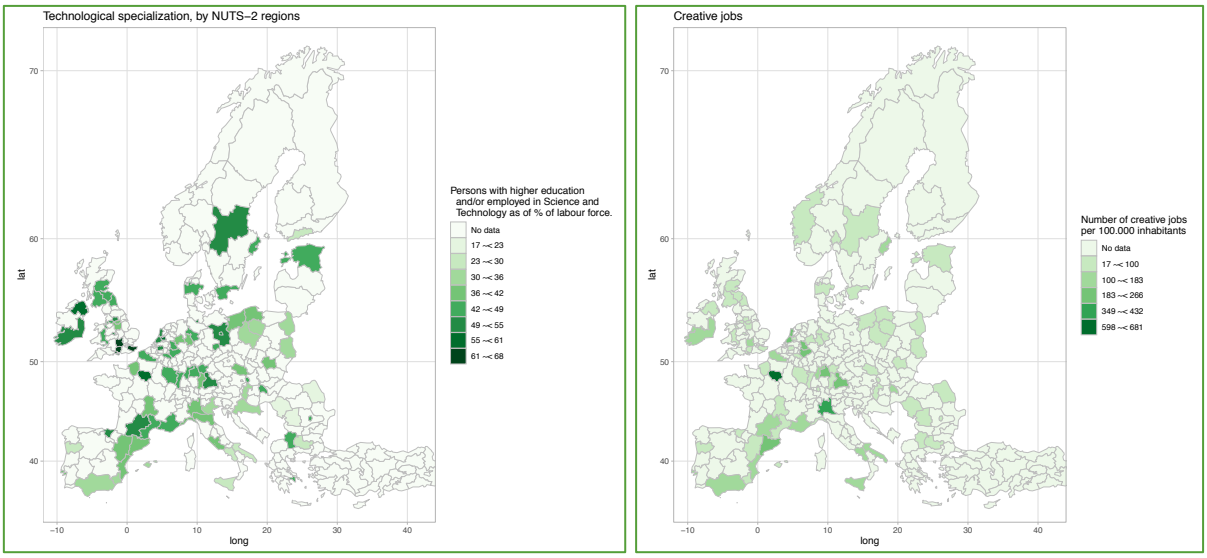

FIGURE 18: TECHNOLOGICAL SPECIALIZATION & CREATIVE JOBS

E2[18] & E5[19]: REGIONAL YOUTH

Adult learning (E2) is expected to be favourable for especially the valley habitat. Due to the fact that technological knowledge and governmental lead experiments are both in favour of knowledge transfer through codified knowledge. The data on ***Adult learning (E2)*** shows a large peak at the Scandinavian regions (shown in Figure 19), with Malmö (31,60%, *Sweden*), Stockholm (31,60%, *Sweden*), Helsinki (30,40%, *Finland*), Götenborg (27,80%, *Sweden*), Ärhus (26,10%, *Denmark*), and Oslo (22,50%, *Norway*) in the top ten. The list is led by Zurich (35,50%, *Switzerland*) and closed by Utrecht (21,80%, *the Netherlands*), Amsterdam (20,40%, *the Netherlands*) and The Hague (19,80%, *the Netherlands*). Showing a geographical difference and uneven distribution over Europe.

[18] E2: Adult learning
[19] E5: Median age

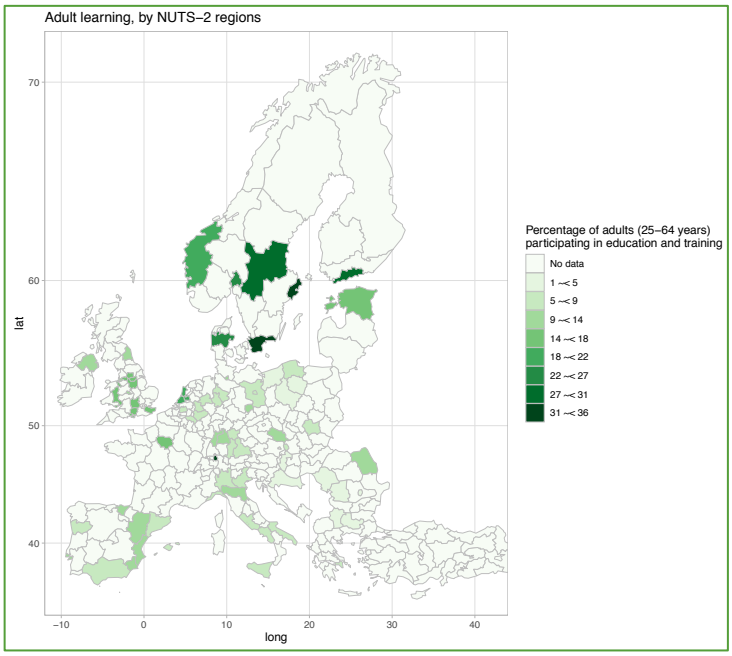

FIGURE 19: ADULT LEARNING

A lower ***Median age (E5)*** is expected in cities that have a higher ***Adult learning (E2)*** score. Building a relationship between both regional context factors. However, this relationship is not proved with the used data. Whereas ***Adult Learning (E2)*** shows a high concentration in the Scandinavian region, which is not applicable to the ***Median age (E5***) distribution. ***Median age (E5)*** does not show a clear geographical region of high intensity, an even distribution is shown.

Data about the ***Median age (E5)*** of the researched cities show that the selected Naturvation cities have a diverse age range (Figure 20). In comparison with the ***Median age (E5)*** data for all cities in Europe the selected cities show to have an overall older median age. With 42,3 for the selected regions and 42,1 when taking all regions in account. With Coventry (*United Kingdom*) with 35,6 years as the youngest region and Genova (*Spain*) as the oldest with 50,6 years.

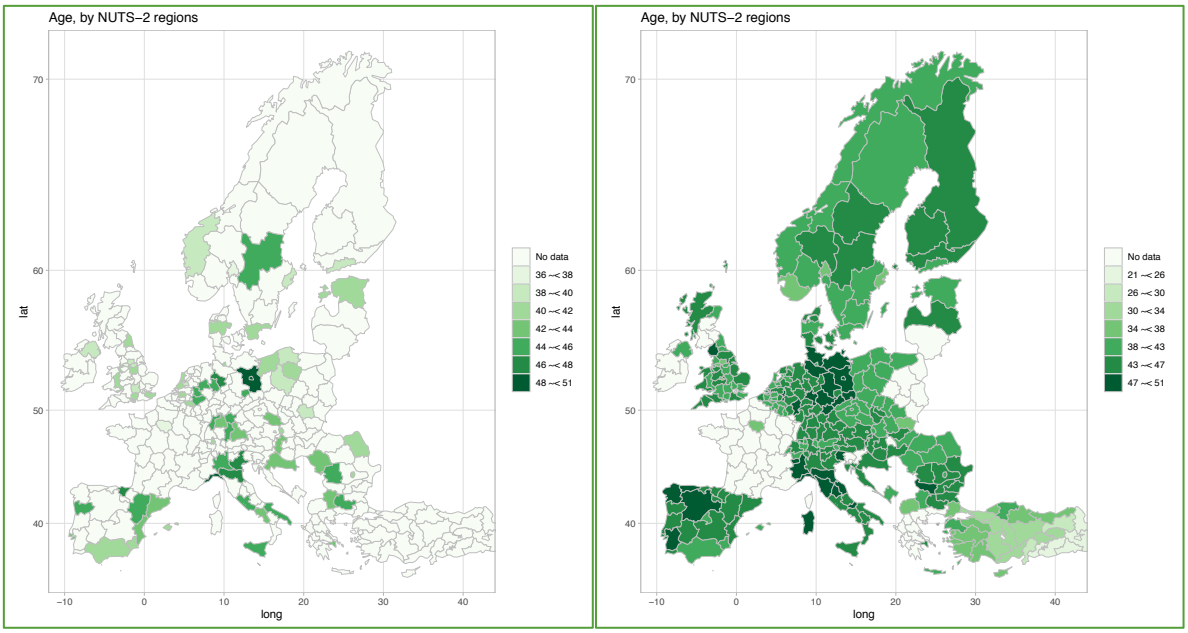

FIGURE 20: MEDIAN AGE NATURVATION CITIES & MEDIAN AGE EUROPE

G3[20] & G4[21]: UNIVERSITY INFLUENCE

Looking at the data about ***University appearance (G3)*** and ***University ranking (G4)*** (shown in Figure 21) shows that almost all (94 out of 99) cities have a university. Cities without a university are Allicante (*Spain*), Doncaster (*United Kingdom*), Györ (*Hungary*), Medway (*United Kingdom*) and Palma de Mallorca (*Spain*). Data on ***University appearance (G3)*** is missing for Bialystok (*Poland*). The high score of universities implies that the case cities of 99 cities are taken with a preference for university cities. Having a university could also be expected with the rule that every city, to be included, should have a population over 200.000 inhabitants (Almassy, et al., 2018). Larger cities are expected to have a university more often than smaller cities (Moulaert & Farid, 2003).

The ***University ranking (G4)*** shows that best performing cities within the QS ranking, Shanghai ranking, Leiden ranking, and Times university ranking are Barcelona (*Spain*) with a score of 12,00, Stockholm (*Sweden*) with a score of 9,50, and Amsterdam (*the Netherlands*) with a score of 8,50. This could also be influenced by the fact that these are larger cities (respectively with 5.432.802, 2.198.044, and 1.320.301 inhabitants (***Population (X1)***) and therefore it could be that there are multiple universities, increasing the chance of being ranked in a university rankings. Besides the population benefit, the higher scoring cities could be identified as more 'western' cities within Europe. The first more 'eastern' city in the list is Budapest (Hungary) with a score of 2,25 times at place 29 of 50. This can be explained by the fact that university rankings often score on scientific publications which is shown to be higher in western regions (***Scientific pipelines (D1)***) (Moulaert & Farid, 2003).

[20] G3: University appearance
[21] G4: University ranking

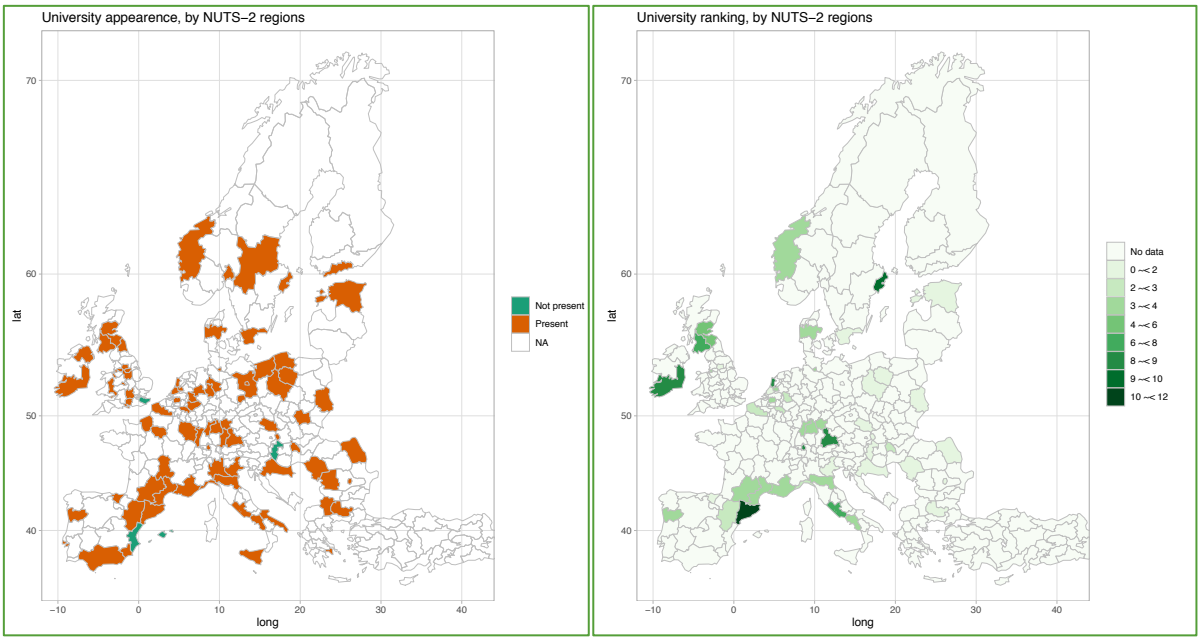

FIGURE 21: UNIVERSITY

G7: GREEN ECONOMIC PERFORMANCE

When looking at the data for the ***Index regional green economic performance (G7)*** within Europe it shows that the selected case cities lack some depth (shown in Figure 22). When looking at all the data for Europe it shows that Scandinavia, and therefore northern Europe is scoring best. Whereas, when looking at the case cities it appears that scores are divided over Europe, showing an even distribution of ***Index regional green economic performance (G7)*** scores. Indicating a weakness when using this data as a regional context factor.

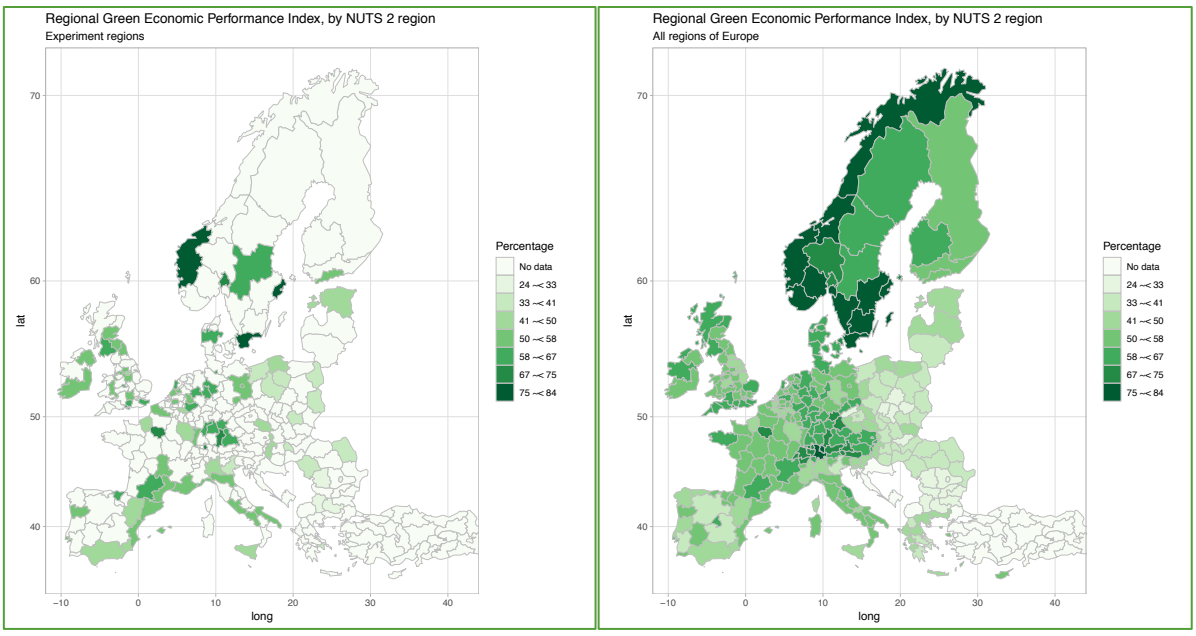

FIGURE 22: REGIONAL GREEN ECONOMIC PERFORMANCE NATURVATION CITIES & REGIONAL GREEN ECONOMIC PERFORMANCE EUROPE

5.2. EXPERIMENT DISTRIBUTION

The theoretical framework (chapter 2.3) states that sustainability experiments can be grouped into the different habitats. Discussed within the first guided expectation: ***Habitats offer a contrasting configuration of regional context factors enabling the specific type of sustainability experiment to be successful***. The two analytical contrasting axes are used to group the NBS initiatives. Table 8 gives an overview of the NBS initiatives distribution[22]. The Naturvation database introduce a hybrid form on the governance axis and two hybrid forms on the knowledge axis, defined as system and combinational innovations.

TABLE 8: NBS DISTRIBUTION

	Number of NBS
Governmental	272
Non-governmental	257
Hybrid	438
Technical	396
Social	316
System	48
Combinational	164
Valley	54
Makerspace	56
Middleground	36
Do-it-ourselves	47

When only looking at NBS initiatives with data on the transferability and grouping them into the conceptual framework (as stated in the 2.5 Conceptual framework) the distribution appears to be equal (shown in Figure 23). The hybrid NBS initiatives are added because of the large numerical group in contrast to the governmental and non-governmental experiments (respectively 231, 111 and 130 NBS initiatives). The system and combinational forms on the knowledge axis are not separately added to the figure due to their small number of initiatives (respectively 31 and 80 NBS initiatives), making the influence of these groups difficult to test. With the usage of the generated conceptual framework it is possible to group all NBS initiatives.

[22] These are total numbers (971 NBS initiatives), without the delimitations on transferability data.

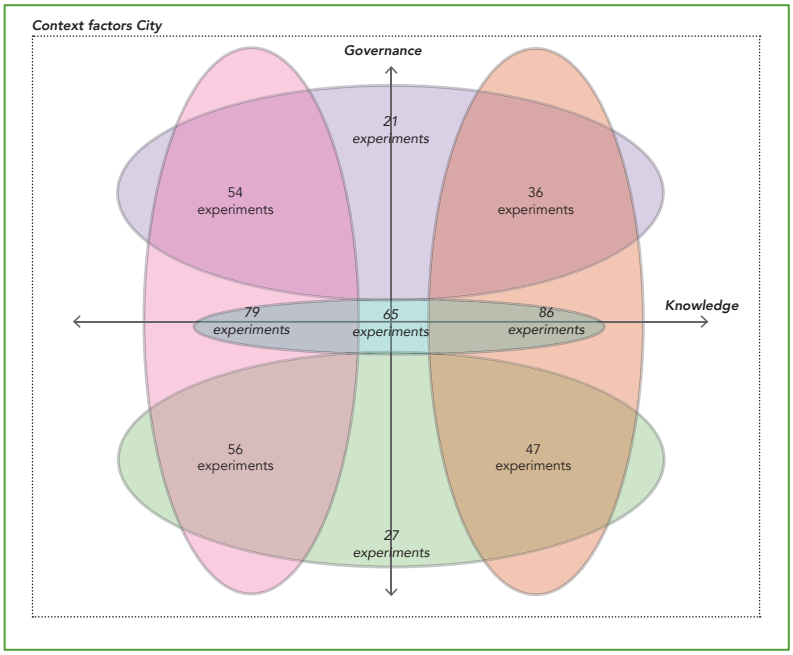

FIGURE 23: EXPERIMENT DISTRIBUTION

5.3. KNOWLEDGE DIFFERENTIATION

The theoretical framework (chapter 2.3) states that sustainability experiments can be of a hybrid form, providing a possible overlap between sets of favourable regional context factors. Discussed within the second guided expectation: ***There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.*** Looking at the necessary knowledge for experiment types as a base for a set of favourable regional context factors, a differentiation can be made between technological and social NBS initiatives. As presented in the theoretical framework (chapter 2.3) technological innovations are expected on the left quadrants and social innovations are expected on the right quadrants of the conceptual model. The Naturvation dataset did also sort out system innovations and NBS with a combination of innovation types. Due to the small number of NBS in those categories (respectively 31 and 80) these are included in this results section but not further discussed. Results are shown in Appendix 5.3.: System innovation and Appendix 5.4.: Combinational innovation type. When looking at the relation between the ***Knowledge type (A2)*** and ***Transferability*** (see

Table 9 and Figure 24) it appears that the combinational innovation type has the highest transferability score, followed by social and then technological.

From theory it was expected that Technological NBS initiatives would be more successful than Social NBS initiatives. This expectation was formed based on the possibility of knowledge transfer from both experiment types. However, the result of this test shows that the opposite is occurring.

TABLE 9: TRANSFERABILITY RATE BY KNOWLEDGE TYPE

	Mean	N	Std. Deviation
Technological	0,53	189	0,500
Social	0,65	169	0,478
System	0,77	31	0,425
Combinational	0,75	80	0,436
Total	0,63	469	0,484

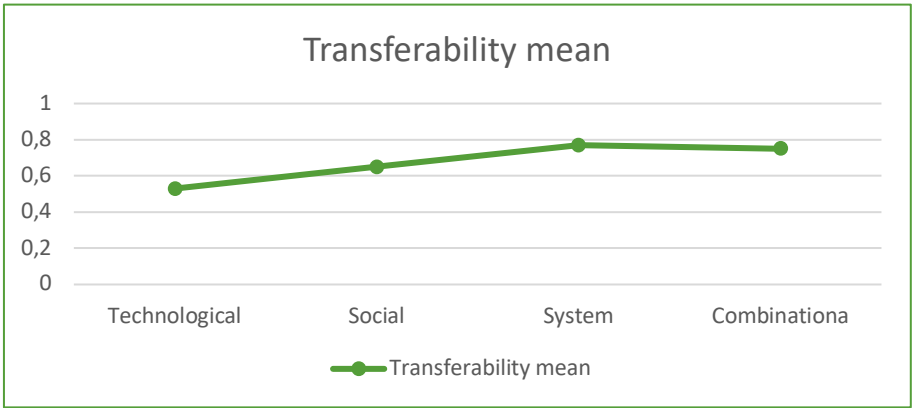

FIGURE 24: TRANSFERABILITY KNOWLEDGE

Before statistically testing the mean differences through an ANOVA the homogeneity of the data is tested with a Levene's test, see Table 10. This test shows that there is a significant difference in variance (Brymann, 2012; Field, 2012). The assumption of homogeneity of the variance is therefore violated. This can be explained by the differences in number of test cases between the three innovation types (respectively 189, 169, 31 and 80 NBS initiatives). Because of the violation of the homogeneity assumption it is necessary to look at the Welch's F (1951) and Brown and Forsythe (1974) F ratio instead of the normal ANOVA F ratio (Brymann, 2012; Field, 2012), see Table 11. The difference in group means is significant (0,001 < α), with an α of 5%. This means that there is a significant difference in group mean when looking at the type of innovation.

TABLE 10: LEVENE'S TABLE KNOWLEDGE

	Levene Statistic	df1	df2	Sig.
Based on Mean	20,676	3	465	,000
Based on Median	5,546	3	465	,001
Based on Median and with adjusted df	5,546	3	459,719	,001
Based on trimmed mean	20,676	3	465	,000

TABLE 11: BROWN-FORSYTHE ANOVA KNOWLEDGE

	Statistic	df1	df2	Sig.
Welch's	5,783	3	122,582	,001
Brown-Forsythe	6,093	3	256,364	,001

As an additional test the correlation between the ***Transferability*** and ***Knowledge type (A2)*** is tested, to do so the linearity between both is tested, see Figure 25[23] (Field, 2012). The

[23] Innovation type: 1= Technological, Innovation type 2 = Social, Innovation type 3 = System, Innovation type 4 = Combination

scatterplot shows a low linear explanation, expected because of the nominal scales of both variables. The normality of data is analysed through a P-P plot, shown in Figure 26. Herein, it is shown that both variables are normally distributed. This in combination with the linearity test indicates the possibility to use a Pearson r correlation.

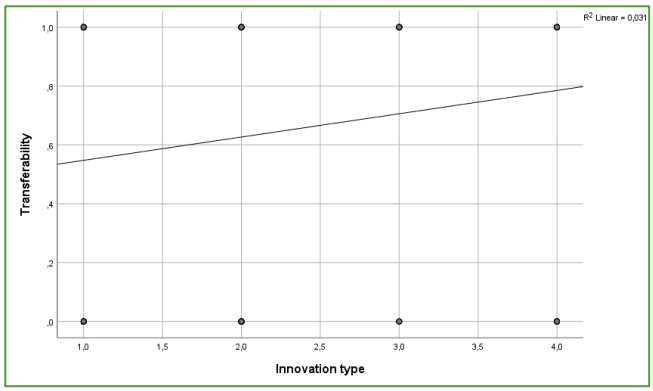

FIGURE 25: TRANSFERABILITY TO KNOWLEDGE

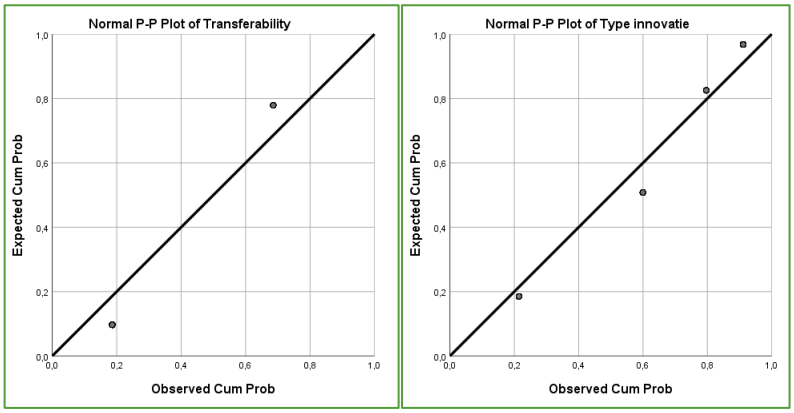

FIGURE 26: P-P PLOTS TRANSFERABILITY & KNOWLEDGE

The correlation analysis (shown in Table 12) indicates a significant correlation between the ***Transferability*** and the ***Knowledge type (A2)*** (0,000 < α), with an α of 5%. Indicating the influence of different knowledge types on the transferability of NBS initiatives. Therefore, the analytical differences on the knowledge axis are interesting to further analyse. However, this correlation of 0,184 is indicated as a small positive effect (Brymann, 2012; Field, 2012). Therefore, expanding with the analysation of a set of favourable regional context factors will add depth to the statement that ***Transferability*** cannot be predicted by just looking at the ***Knowledge type (A2)***.

TABLE 12: CORRELATION KNOWLEDGE

		Transferability
Knowledge type	Correlation coefficient	,184
	Sig.	,000
	N	469

5.3.1. REGIONAL CONTEXT FACTORS

Technological and Social NBS initiatives are tested on their favourable regional context factors influencing the ***Transferability*** of the NBS initiative. This analysis does also research the possible analytical contradiction on the knowledge axis. Favourable regional context factors are regional context factors that show a significant correlation with the ***Transferability*** of the NBS initiative. An overview of favourable regional context factors for both groups is given in Figure 27[24]. Showing a contrasting set of favourable regional context factors. Except for ***Open-source and sharing culture (B1)*** and ***Knowledge exchange among actors (D4***) which are influencing the transferability of both NBS initiative groups. Indicating the importance of knowledge sharing for both technological and social NBS initiatives.

Open-source and sharing culture (B1) shows to be a positive influence on the transferability of technological NBS initiatives and a negative influence on the transferability of social NBS initiatives. ***Open-source and sharing culture (B1)*** is used as a measure for the cultural intention to share knowledge through business channels. Indicating that for social NBS initiatives to be transferred less knowledge sharing is better. The positive influence of ***Open-source and sharing culture (B1)*** on the ***Transferability*** of technological NBS initiatives can be explained due to the importance of codified knowledge on the left side of the habitat framework.

Knowledge exchange among actors (D4) has a positive influence for technological as well as social NBS initiatives. Indicating ***Knowledge exchange among actors (D4)*** as a possible general regional context factor.

A detailed explanation of influencing set of regional context factors for each group is given below.

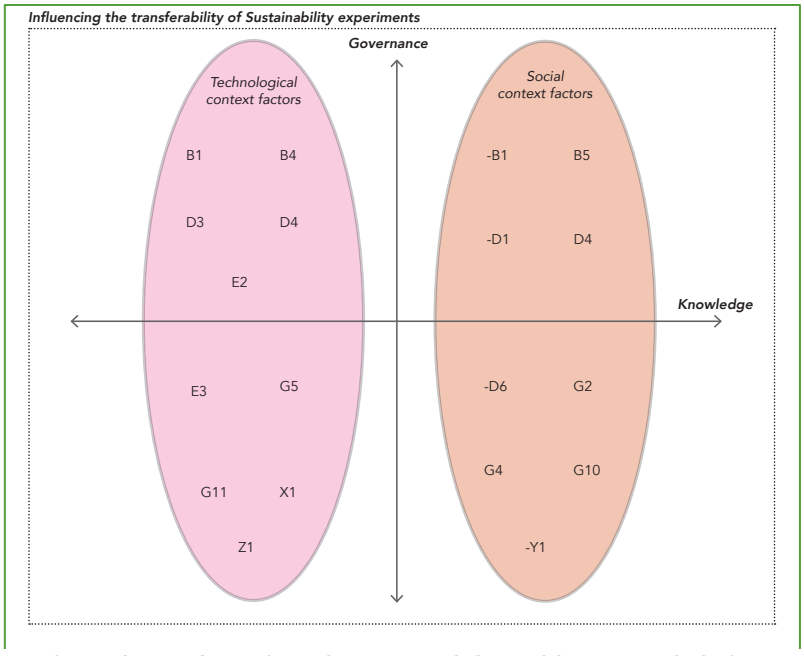

FIGURE 27: KNOWLEDGE AXIS FAVOURABLE REGIONAL CONTEXT FACTORS

[24] Minus signs display a negative correlation

TECHNOLOGICAL INNOVATION

Technological NBS initiatives (189 NBS initiatives), show to have ten favourable regional context factors, as shown in Appendix 5.1.: Technological innovation. These ten favourable regional context factors show a positive significant correlation towards the *Transferability* of technological NBS initiatives.

Technological NBS initiatives are expected to be in favour of a surrounding that is technological specialised, science based and capable of codified knowledge sharing. These characteristics are presented within for instance the *Technological specialization (C3)*, *Scientific pipelines (D1)*, and *Co-publications (D5)* regional context factors. Therefore, these regional context factors are expected to be within the set of favourable regional context factors correlating with the *Transferability* of the NBS initiatives. and the transferability. However, when looking at the correlation table, all of these indicators show no significant correlation. This can be explained through an empirical misfit with a lack of data or theoretical with a wrong conceptualisation of favourable factors for technological NBS initiatives. *Citations of patents (E3)* shows a significant positive correlation. Indicating that the theoretical connection between codified knowledge and technological NBS initiatives is still possible. Therefore, on the bases of technological NBS initiatives, it is expected that there is an empirical disconnection between the stated conceptual model and available data.

SOCIAL INNOVATION

Social NBS initiatives (169 NBS initiatives), show to have nine favourable regional context factors, as shown in Appendix 5.2.: Social innovation. These nine favourable regional context factors show a significant correlation towards the Transferability of social NBS initiatives.

The results show a significant small negative correlation from *Open-source and sharing culture (B1)* towards transferability (Brymann, 2012). Indicating that having a higher score on *Open-source and sharing culture (B1)* reacts into a lower possibility for transferability. Indicating that with social NBS initiatives are in favour of personal contact information sharing instead of codified knowledge sharing. Also seen in the fact that *Knowledge exchange among actors (D4)* and *International meetings (G10)* is indicated as a small significant positive influence (Brymann, 2012). Both focussing on the importance of personal contact for knowledge sharing.

Additionally, *Scientific pipelines (D1)* show a small significant negative correlation towards transferability. Agreeing with the fact that knowledge exchange is not performed through conventional ways. Having less scientific publications stimulates knowledge development in an unconventional personal way. The negative significant correlation strengthens this statement.

Interesting to see is the significant negative correlation coefficient for *Economic wealth (Y1)* of -0,173. Even though it is indicated as a small association it shows that with a lower score for *Economic wealth (Y1)* the *Transferability* of social NBS initiatives increases. The explanation for this can be found in the idea that with a lower GDP, inhabitants show to be more efficient in thinking of new social innovations to make life a bit easier (Dasgupta, Laplante, Wang, & Wheeler, 2002). Evolving in being more efficient in transferring social NBS initiatives to other places.

5.4. GOVERNANCE DIFFERENTIATION

The theoretical framework (chapter 2.3) states that sustainability experiments can be of a hybrid form, providing a possible overlap between sets of favourable regional context factors. Discussed within the second guided expectation: ***There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.*** Looking at the governance of experiments as a base for a set of favourable regional context factors, a differentiation can be made between governmental, non-governmental and hybrid NBS initiatives. As presented in the theoretical framework (chapter 2.3) governmental NBS initiatives are expected on the upper quadrants and non-governmental NBS initiatives are expected at the lower quadrants of the conceptual framework. The Naturvation dataset did also sort out hybrid lead NBS initiatives. When looking at the relationship between ***Governance type (A1)*** and ***Transferability*** (see Table 13 and Figure 28) it appears that non-governmental lead NBS initiatives have the highest transferability score, followed by hybrid and then governmental.

From theory it was expected that Governmental NBS initiatives would be more successful than Non-governmental NBS initiatives. This expectation was formed based on the facilitation for both experiment types. However, the result of this test shows that the opposite is occurring.

TABLE 13: TRANSFERABILITY RATE BY GOVERNANCE TYPE

	Mean	N	Std. Deviation
Governmental	0,57	111	0,498
Non-governmental	0,67	132	0,470
Hybrid	0,63	228	0,483
Total	0,63	471	0,484

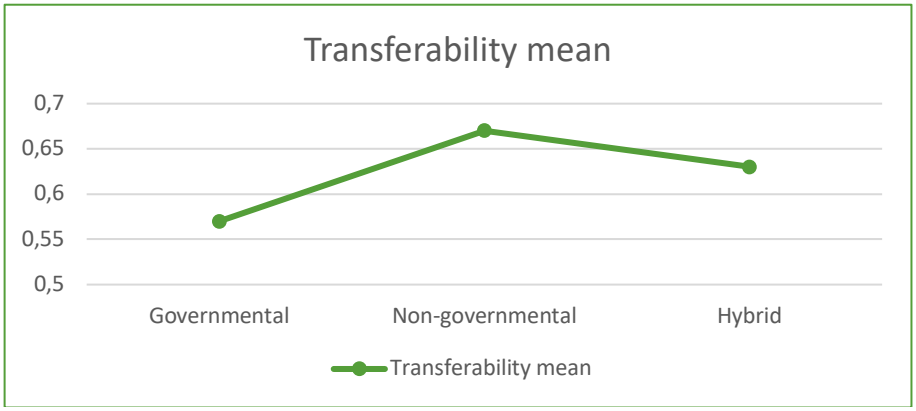

FIGURE 28: TRANSFERABILITY GOVERNANCE

Before statistically testing the mean differences through an ANOVA the homogeneity of the data is tested with a Levene's test, see Table 14. This test shows that there is a significant difference in variance (with sig. of 0,8% which is smaller than the α of 5%) (Brymann, 2012; Field, 2012). The assumption of homogeneity of the variance is therefore violated, group variances are significantly different. This can be explained by the differences in the number of test cases between the three governance types (respectively 111, 132 and 228 NBS initiatives). Because of the violation of the homogeneity assumption it is necessary to look at the Welch's F (1951) and the Brown and Forsythe (1974) F ratio instead of the normal ANOVA F ratio (Brymann, 2012; Field, 2012), see Table 15. The difference in group means is not significant (0,235 & 0,231 > α), with an α of 5%.

TABLE 14: LEVENE'S TABLE GOVERNANCE

	Levene Statistic	df1	df2	Sig.
Based on Mean	4,905	2	468	,008
Based on Median	1,478	2	468	,229
Based on Median and with adjusted df	1,478	2	467,240	,229
Based on trimmed mean	4,905	2	468	,008

TABLE 15: ANOVA TABLE

	Statistic	df1	df2	Sig.
Welch's	1,455	2	254,597	,235
Brown-Forsythe	1,472	2	377,235	,231

As an additional test the correlation between ***Transferability*** and ***Governance type (A1)*** is tested, to do so the linearity between both is tested, see Figure 29[25] (Field, 2012). The scatterplot shows a low linear explanation, expected because of the nominal scales of both variables. The normality of data is analysed through a P-P plot, shown in Figure 30. Herein, it is shown that both variables are normally distributed. This in combination with the linearity test indicates the possibility to use a Pearson r correlation.

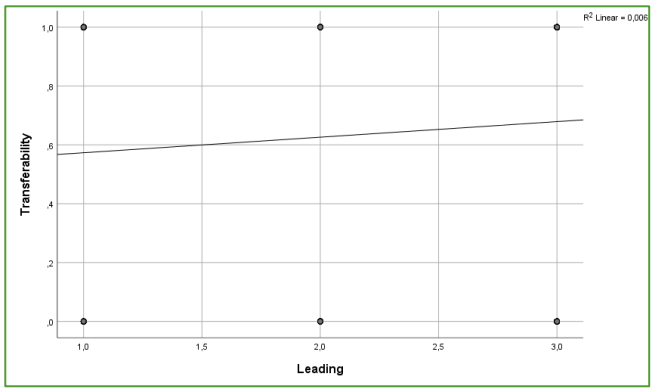

FIGURE 29: TRANSFERABILITY TO GOVERNANCE

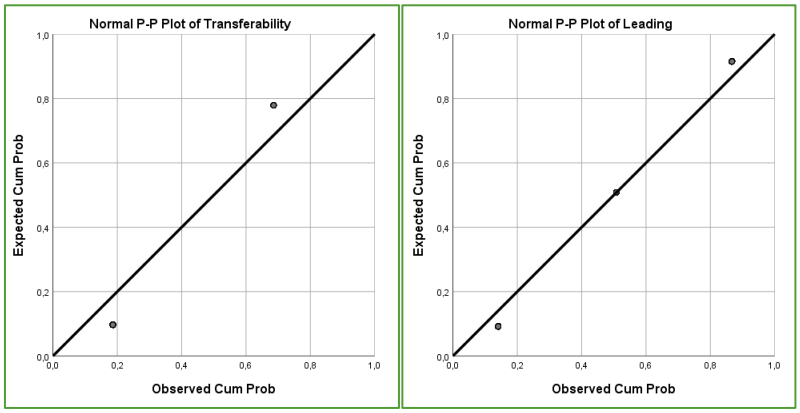

FIGURE 30: P-P PLOTS TRANSFERABILITY & GOVERNANCE

[25] Leading type: 1 = Governmental, Leading type 2 = Hybrid, Leading type 3 = Non-governmental

The correlation analysis (shown in Table 16) indicates no significant correlation between the ***Transferability*** and the ***Governance type (A1)*** with an α of 5%. On a 10% level there is a relationship indicated with a correlation coefficient of 0,078 between the ***Transferability*** and ***Governance type (A1)***. It is stated that there is a significant difference in transferability mean of NBS initiatives between the different governance types. However, this influence shows a small positive correlation, only significant at an α of 10%, therefore it is important to expand the analysation with tests for other favourable regional context factors. Creating depth to the statement that Transferability cannot be predicted by only looking at the Governance type (A1).

TABLE 16: CORRELATION GOVERNANCE

		Transferability
Governance type	Correlation coefficient	,078
	Sig.	,090
	N	471

5.4.1. REGIONAL CONTEXT FACTORS

Governmental, Non-governmental and hybrid lead NBS initiatives are tested on their favourable regional context factors influencing the ***Transferability*** of the NBS initiative. This analysis does also research the possible analytical contradiction on the governance axis of the habitat framework. Favourable regional context factors are regional context factors that show a significant correlation with the ***Transferability*** of the NBS initiative. An overview of favourable regional context factors for each group is given in Figure 31[26]. Showing a contrasting set of favourable regional context factors. Except for ***Innovation type (A2)***, ***Creative class index (B4)***, ***Scientific pipelines (D1)*** and ***Patents (D3)*** which are influencing the ***Transferability*** of two experiment groups. A detailed explanation of influencing set of regional context factors for each group is given below.

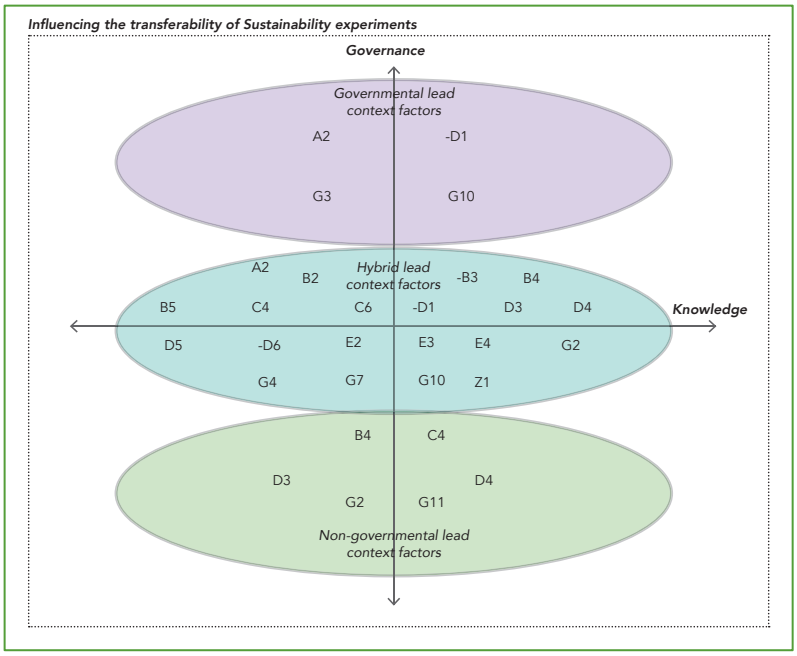

FIGURE 31: GOVERNANCE AXIS INFLUENCING REGIONAL CONTEXT FACTORS

[26] Minus signs display a negative correlation

GOVERNMENTAL LEAD

Governmental lead NBS initiatives (111 NBS initiatives), show to have four favourable regional context factors, as shown in Appendix 6: Correlation Governance differentiation. A significant positive correlation is found between the ***Transferability*** and ***Innovation type (A2)***, ***University appearance (G3)***, and ***International meetings (G10)***.

There is a significant negative correlation between transferability and ***Scientific pipelines (D1)***. Having more scientific publications show to have a negative effect on the ***Transferability*** of governmental lead NBS initiatives. From theory it was expected that especially in the valley habitat (governmental lead technological NBS initiatives) a science-based culture is available (Van den Heiligenberg et al., 2017), the negative correlation with ***Scientific pipelines (D1)*** contradicts this theoretical statement.

NON-GOVERNMENTAL LEAD

Non-governmental lead NBS initiatives (132 NBS initiatives), show to have six favourable regional context factors, shown in Appendix 6.2.: Non-governmental lead. These six regional context factors are: ***Creative class index (B4)***, ***Employment in technology and knowledge-intensive sectors (C4)***, ***Patents (D3)***, ***Knowledge exchange among actors (D4)***, ***Internet access (G2)*** and ***Personal trust (G11)***.

Knowledge exchange among actors (D4) and ***Personal trust (G11)*** show a positive significant correlation towards the ***Transferability*** with non-governmental lead NBS initiatives, indicating the importance of having personal interaction and transferring knowledge through personal contact. As also discussed with the favourable regional context factors for social NBS initiatives. Therefore, one should expect also the influence of having an ***Open-source and sharing culture (B1)***. However, this indicator does not show a significant correlation towards transferability, indicating that the influence of personal contact to transfer knowledge is not including the business or scientific culture of the city.

HYBRID LEAD

Hybrid lead NBS initiatives (228 NBS initiatives), show 20 favourable regional context factors, shown in Appendix 6.3.: Hybrid. Of which ***Knowledge exchange among actors (D4)*** appears to have the highest influence, with a correlation coefficient of 0,347.

The combination of ***Creative class index (B4)***, ***Knowledge exchange among actors (D4)***, ***Internet access (G2)***, ***International meetings (G10)*** and ***Personal trust (G11)*** introduces the idea of a habitat with the need for connection to others. It is interesting to see that this does not count for ***Intentional communities (G9)*** which is also based on interpersonal contact.

5.5. HABITAT DIFFERENCES

It is stated that the type of habitat influences the set of favourable context factors influencing the transferability of an NBS initiative (see chapter 2.3). It can be predicted that there is a difference in ***Transferability*** mean per group of habitat experiments. By testing this relationship, it appears that there is a difference in transferability score per habitat (see Table 17 and Figure 32). The do-it-ourselves habitat shows the highest ***Transferability*** mean.

From theory it was expected that Technological NBS initiatives and Governmental NBS initiatives would be more successful than Social NBS and Non-governmental initiatives. Leading to the idea that the Valley habitat experiments would be most successful of all habitat types. However, results on the Knowledge and Governance types showed that the

contradicting is occurring with this data set. Also resulting in the fact that the Do-it-ourselves habitat is scoring highest of all habitats on ***Transferability***. Which is contradicting to the theory but complementary to earlier results within this research.

TABLE 17: HABITAT MEAN

	Mean	N	Std. Deviation
Valley	0,46	54	0,503
Makerspace	0,57	56	0,499
Middleground	0,64	36	0,487
Do-it-ourselves	0,77	47	0,428
Total	0,60	193	0,491

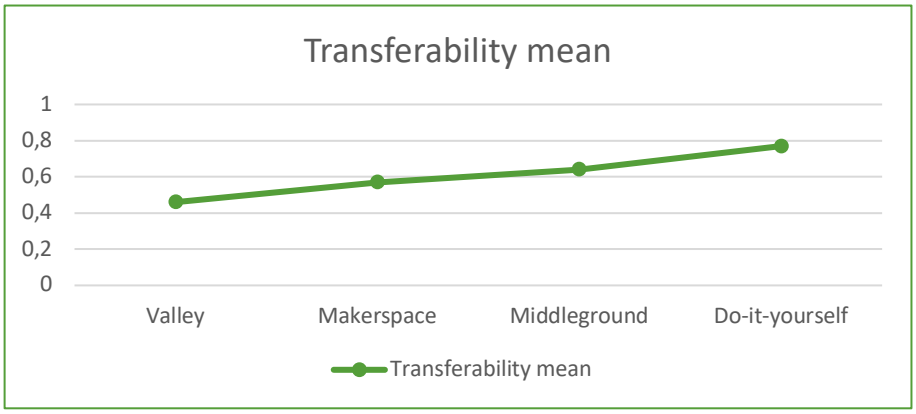

FIGURE 32: TRANSFERABILITY HABITATS

Before statistically testing the mean difference through an ANOVA the homogeneity of the data is tested with a Levene's test, see Table 18. This test shows that there is a significant difference in variance (with sig. of 0,0% which is smaller than the α of 5%) (Brymann, 2012; Field, 2012). The assumption of homogeneity of the variance is therefore violated, group variances are significantly different. This can be explained by the differences in the number of test cases between the four habitat types (respectively 54, 56, 36 and 47 NBS initiatives). Because of the violation of the homogeneity assumption it is necessary to look at the Welch's F (1951) and the Brown and Forsythe (1974) F ratio instead of the normal ANOVA F ratio (Brymann, 2012; Field, 2012), see Table 19. The difference in group means is significant (0,014 & 0,017 < α), with an α of 5%.

TABLE 18: LEVENE'S TABLE HABITATS

	Levene Statistic	df1	df2	Sig.
Based on Mean	11,246	3	189	,000
Based on Median	2,179	3	189	,092
Based on Median and with adjusted df	2,179	3	186,232	,092
Based on trimmed mean	11,246	3	189	,000

TABLE 19: ANOVA TABLE HABITATS

	Statistic	df1	df2	Sig.
Welch's	3,713	3	99,672	,014
Brown-Forsythe	3,485	3	178,206	,017

As an additional test the correlation between ***Transferability*** and ***Habitat type (A3)*** is tested, to do so the linearity between both is tested, see Figure 33[27] (Field, 2012). The scatterplots show a low linear explanation, expected because of the nominal scales of the variables. The normality of data is analysed through a P-P plot, shown in Figure 34. Herein, it is shown that both variables are normally distributed. This in combination with the linearity test indicates the possibility to use a Pearson r correlation.

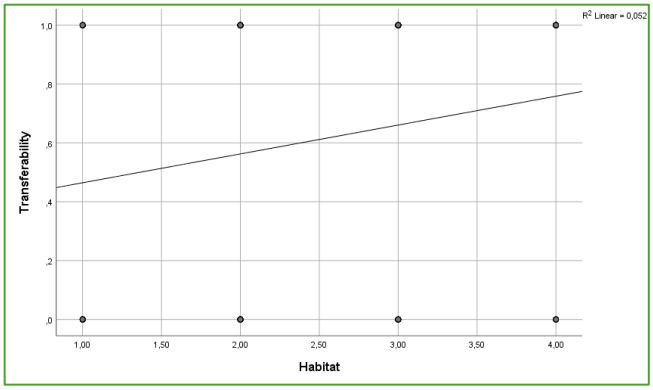

FIGURE 33: TRANSFERABILITY TO HABITAT

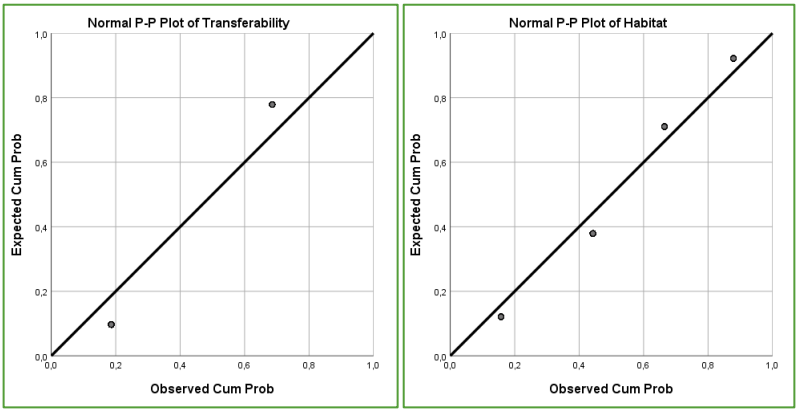

FIGURE 34: P-P PLOTS TRANSFERABILITY & HABITAT

The correlation analysis (shown in Table 20) indicates a significant correlation between the ***Transferability*** and the ***Habitat type (A3)*** (0,002 < α), with an α of 5%. Indicating the influence of different habitat types on the ***Transferability*** of NBS initiatives. In combination with the significant difference in ***Transferability*** mean for habitats a contrast can be acknowledged. However, this correlation of 0,226 is indicated as a small positive effect (Brymann, 2012; Field, 2012). Therefore, expanding with the analysation of a set of favourable regional context factors will add depth to the statement that ***Transferability*** cannot be predicted by just looking at the ***Habitat type (A3)***.

TABLE 20: CORRELATION HABITATS

		Transferability
Habitat type	Correlation coefficient	0,226
	Sig.	0,002
	N	193

[27] Habitat type 1 = Valley, Habitat type 2 = Makerspace, Habitat type 3 = Middleground, Habitat type 4 = Do-it-ourselves

5.5.1. REGIONAL CONTEXT FACTORS

Valley, Middleground, Makerspace and the Do-it-ourselves habitat NBS initiatives are tested on their favourable regional context factors influencing the ***Transferability*** of the NBS initiative. This analysis does also research the possible analytical contradiction on the ***Habitat type (A3)*** as stated in the habitat framework (see chapter 2.3). Favourable regional context factors are regional context factors that show a significant correlation with the ***Transferability*** of the NBS initiative. An overview of favourable regional context factors for each group is given in Figure 35[28]. Showing a contrasting set of regional context factors for each ***Habitat type (A3)***. Except for ***Creative class index (B4)*** and ***Foreign index (G5)*** which are influencing the ***Transferability*** of two experiment groups. A detailed explanation of the influencing set of regional context factors for each group is given below. It should be noted that due to the small experiment groups results are inconclusive and hard to generalise. These results give a possible outcome but are neither decisive nor generalizable. An abductive reasoning is chosen to analyse these outcomes. Indicating if the theoretical application of the habitat definitions is useable for further research with a larger dataset. These results are therefore included to indicate the possible difference between habitats and can be used as an indication for further research. The results do show some strange favourable regional context factors, expected to be as a result of having small sample sizes.

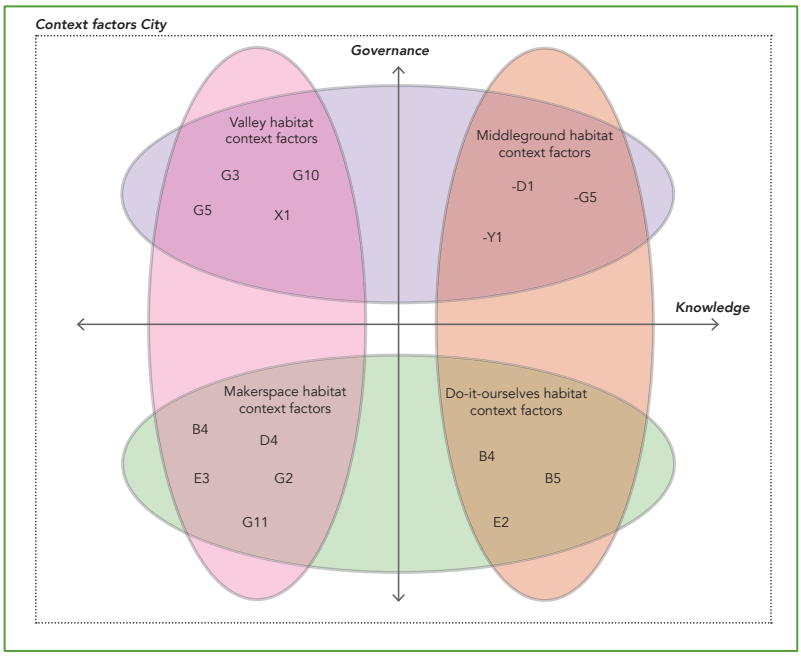

FIGURE 35: HABITAT INFLUENCING REGIONAL CONTEXT FACTORS

VALLEY HABITAT

When looking at Valley NBS initiatives (54 NBS initiatives) four regional context factors sow to be favourable, results shown in Appendix 7.1: Valley habitat. A significant positive correlation is found with the ***University appearance (G3)***, ***Foreign index (G5)***, ***International meetings (G10)*** and ***Population (X1)***. The Valley habitat is a combination of Technological and

[28] Minus signs display a negative correlation

Governmental lead NBS initiatives. This is also shown in the fact that the four significant favourable regional context factors are influencing either technological or governmental lead experiments on their own. ***Foreign index (G5)*** and ***Population (X1)*** influence the transferability of technological experiments. ***University appearance (G3)*** and ***International meetings (G10)*** influence the transferability of governmental lead experiments.

MAKERSPACE HABITAT

When looking at Makerspace NBS initiatives (56 NBS initiatives) five regional context factors show to be favourable, results shown in Appendix 7.2.: Makerspace habitat. A significant positive correlation is found with the ***Creative class index (B4)***, ***Knowledge exchange among actors (D4)***, ***Citations of patents (E3)***, ***Internet access (G2)*** and ***Personal trust (G11)***. The Makerspace habitat is a combination of Technological and Non-governmental lead NBS initiatives. This is also shown in the fact that the five significant influencing regional context factors are influencing either technological, governmental lead or both experiment types. ***Creative class index (B4)***, ***Knowledge exchange among actors (D4)*** and ***Personal trust (G11)*** did show to be influencing technological experiments as well as non-governmental lead experiments. It can therefore be expected that these regional context factors are specific regional context factors for Makerspace experiments.

MIDDLEGROUND HABITAT

When looking at Middleground NBS initiatives (36 NBS initiatives) three regional context factors show to be favourable, results shown in Appendix 7.3.: Middleground habitat. A significant negative correlation is found with ***Scientific pipelines (D1)***, ***Foreign index (G5)*** and ***Economic wealth (Y1)***. The Middleground habitat is a combination of Social and Governmental lead NBS initiatives. This is also shown in the fact that ***Scientific pipelines (D1)*** and ***Economic wealth (Y1)*** did show to be influencing Social or Governmental lead NBS initiatives. In which ***Scientific pipelines (D1)*** is acknowledged as a favourable regional context factor for both NBS initiative types. ***Foreign index (G5)*** does show a significant correlation of -1 however, only three NBS initiatives where used to test the correlation between ***Foreign index (G5)*** and the ***Transferability*** of Middleground habitat NBS initiatives. Making this result meaningless.

DO-IT-OURSELVES HABITAT

When looking at Do-it-ourselves NBS initiatives (47 NBS initiatives) three regional context factors show to be favourable, results shown in Appendix 7.4.: Do-it-ourselves habitat. A significant positive correlation is found with Creative class index (B4), Hipster index (B5) and Adult learning (E2). The Do-it-ourselves habitat is a combination of Social and Non-governmental lead NBS initiatives. Opposite to the results of favourable regional context factors for the other NBS types for the Do-it-ourselves habitat the two out of three favourable regional context factors are not stated as favourable for neither Social nor Non-governmental NBS initiatives. The Hipster index (B5) does show to be a favourable regional context factor for the Transferability of Social NBS initiatives.

5.6. GENERIC SET OF REGIONAL CONTEXT FACTORS

The third guided expectation discusses the possibility to predict the transferability of an NBS initiative through a set of favourable general regional context factors without

distributing the experiments over the habitat framework. The third guided expectation is: ***A generic set of regional context factors without making a distinction in*** **experiment type, influences the success of sustainability experiments explaining an uneven geographical distribution.** To test the influence of each of the regional context factors on the ***Transferability*** of an NBS initiative a correlation analysis is performed.

Appendix 8: shows the results, where 22 out of 37 indicators show a significant correlation. Introducing the influence of a large generic set of favourable regional context factors without grouping the NBS initiatives on the axes or on their habitat. When not specifying the type of NBS by either ***Governance type (A1)***, ***Knowledge type (A2)*** or ***Habitat type (A3)*** there are 22 indicators influencing the transferability. When a city or region wants to increase the transferability rate of the NBS within the city or region it is, therefore, possible to follow and look at these 22 indicators.

There are no regional context factors with a correlation coefficient above the 0,3 border (below 0,3 a small association is acknowledged, above a medium or strong) (Brymann, 2012). Due to the large number of small associations, it is stated that one or two regional context factors do not influence or predict the ***Transferability*** of an NBS initiative on itself. Therefore, a combination of regional context factors is necessary, positively answering guided expectation 3.

The large generic set of regional context factors is a contradicting remark towards the analytical diversification of the habitat framework as stated by Van den Heiligenberg et al. (2017). The framework is a theoretical diversification on experiment level with no additional overarching component. The observable reality does show overarching regional context factors influencing the ***Transferability*** of NBS initiatives.

5.7. SUMMARY

The provided results in previous sub chapters are used to check the guided expectations conducted from the theoretical framework. The following guided expectations are researched:

1. Habitats offer a contrasting configuration of regional context factors enabling the specific type of sustainability experiment to be successful.
2. There is an overlap between habitat favourable sets of regional context factors for hybrid sustainability experiments.
3. A generic set of regional context factors without making a distinction in experiment type, influences the success of sustainability experiments explaining an uneven geographical distribution.

From the researched guided expectations, five experiment type sets of favourable regional context factors and one generic set of favourable regional context factors are conducted. A favourable regional context factor is indicated as a significant correlation between the ***Transferability*** and the regional context factor. This summarizing chapter only includes correlation results when more than 15% of the sample is used for the correlation test (N at least 70). 15% is chosen as a minimum due to the fact that with an N below 70 does not offer enough reliability to conduct conclusions (Field, 2012). Which is also the reason that the sets of favourable regional context factors for habitat specific NBS initiatives is not taken into account within this summarizing chapter. Table 21 shows all regional context factors favourable for a type of NBS initiatives. The generic set of favourable regional context factors is highlighted in green, all influencing the ***Transferability*** without grouping the NBS initiatives on the analytical Knowledge and Governance axes.

It can be seen that there is a general set of regional context factors influencing the transferability of NBS without grouping the experiments as an experiment type, highlighted in green. These influence the ***Transferability*** of an NBS without specification for ***Knowledge type (A2)*** or ***Governance type (A1)***. The analysis shows that only six indicators influence

specific types of NBS initiatives without being part of the generic set of favourable regional context factors. This indicates that either the general set of favourable regional context factors is too broad or that there is no need for a distinction between experiment types.

As previously discussed with the conceptual framework (see chapter 2.5), it can be expected that multiple habitats are necessary to explain the ability of a city to host successful sustainability experiments. Offering that this will show with either a broad generic set of favourable regional context factors or with a great overlap between experiment type specific sets of regional context factors. This result shows that the first possible appearance occurs, a broad generic set of favourable regional context factors. Also due to the fact that overlap on the two axis is minimal. This touches on the theoretical and methodological questions of this research: *'Does the habitat framework help to explain the currently occurring geographical uneven distribution between cities in their ability to host successful sustainability experiments?'* and *'Is it possible to systematically test the influence of regional context factors on the success of sustainability experiments with existing data?'*. Stating that either the theory is not developed enough to explain multiple occurring habitats within a city or that the methodological research is not developed enough to overcome multiple occurring habitats within a city.

TABLE 21: INFLUENCING INDICATORS

	Concept	Indicator number	Dimension	Influence
Independent variables	A: Experiment information	A2	Knowledge type	Positive
	B: Culture	B1	Open-source and sharing culture	Positive / Negative
		B2	Counterculture of young people who are open to innovation	Positive
		B3	Counterculture of alternative lifestyles, with a role for creatives	Negative
		B4	Creative class index	Positive
		B5	Hipster index	Positive
	C: Regional network	C1	Cooperative culture	Positive
		C4	Employment in technology and knowledge-intensive sectors	Positive
		C6	Employment dispersion	Positive
	D: Learning culture	D1	Scientific pipelines	Negative
		D3	Patents	Positive
		D4	Knowledge exchange among actors	Positive
		D5	Co-publications	Positive
		D6	Co-authored patents	Negative
	E: Demographic information	E2	Adult learning	Positive
		E3	Citations of patents	Positive
		E4	R&D expenditure	Positive
	G: General context factors	G2	Internet access	Positive
		G3	University appearance	Positive
		G4	University ranking	Positive
		G7	Index regional green economic performance	Positive
		G9	Intentional Communities	Negative
		G10	International meetings	Positive
		G11	Personal trust	Positive
Control variables		X1	Population	Positive
		Y1	Economic wealth	Negative
		Z1	Surface of the city	Positive

An overview of the different sets of favourable regional context factors and their correlation score is presented in

Table 22. An interesting favourable regional context factor is ***Open-source and sharing culture (B1)*** which shows a positive association for Technological NBS initiatives and a negative association for Social NBS initiatives. Defining a clear contradicting point between the two Knowledge types. However, the ***Open-source and sharing culture (B1)*** does not show significant influences on the generic set or with the different Governance types towards ***Transferability***. Showing that this regional context factor does not apply within to the analytical contrast between Technological and Social sustainability experiments.

The generic set of favourable regional context factors is almost equal to the set of favourable regional context factors influencing the ***Transferability*** of Hybrid NBS initiatives. The set of favourable regional context factors for Hybrid NBS initiatives shows one unique influencing regional context factor, ***Co-publications (D5)***. Whereas the generic set of favourable regional context factors shows three unique regional context factors, ***Intentional communities (G9)***, ***Personal trust (G11)*** and ***Population (X1)***. Indicating the broadness of the Hybrid NBS initiatives group, almost as broad as the complete set of NBS initiatives. Another influence for this result can be that the group of Hybrid NBS initiatives covers 48% of all NBS initiatives researched. Indicating the large influence of this group on the generic set of regional context factors. For further research it could be interesting to look for a more diverse and equal set of sustainability experiments to overcome the influence of one experiment type.

The counterculture is discussed by means of the contradicting ***Counterculture for young people who are open to innovation (B2***) and ***Counterculture of alternative lifestyles, with a role for creatives (B3)*** regional context factors. Indicating possible analytical contradiction on the knowledge axis of the conceptual framework. Expectation was that ***Counterculture for young people who are open to innovation (B2)*** will occur on the Technological side and ***Counterculture of alternative lifestyles, with a role for creatives (B3)*** will occur on the Social side of the conceptual framework. Indicating to be a favourable regional context factor with each group of NBS initiatives. However, a contradicting result appears, both regional context factors show to be positively/negatively favourable for Hybrid NBS initiatives.

TABLE 22: SETS OF FAVOURABLE REGIONAL CONTEXT FACTORS

		Generic	Technological	Social	Governmental	Non-governmental	Hybrid
Governance type	A1						
Knowledge type	A2	0,184			0,205		0,198
Open-source and sharing culture	B1		0,226	-0,218			
Counterculture of young people who are open to innovation	B2	0,144					0,251
Counterculture of alternative lifestyles, with a role for creatives	B3	-0,126					-0,225
Creative class index	B4	0,188	0,172			0,325	0,225
Hipster index	B5	0,241		0,401			0,332
Cooperative culture	C1						
Innovative cooperation	C2						
Technological specialization	C3						
Employment in technology and knowledge-intensive sectors	C4	0,124				0,181	0,180
Foreign controlled firms	C5						
Employment dispersion	C6	0,115					0,184
Creative jobs	C7						
Scientific pipelines	D1	-0,176		-0,221	-0,211		-0,208
Patents	D3	0,214	0,244			0,251	
Knowledge exchange among actors	D4	0,280	0,177	0,281		0,304	0,347
Co-publications	D5						0,188
Co-authored patents	D6	-0,132		-0,216			-0,172
Impact of knowledge production to cross-regional mobility	E1						
Adult learning	E2	0,181	0,199				0,293
Citations of patents	E3	0,106	0,300				0,162
R&D expenditure	E4	0,114					0,208
Median age	E5						
Internet access	G2	0,171		0,179		0,350	0,190
University appearance	G3				0,263		
University ranking	G4	0,144		0,292			0,284
Foreign index	G5						
Cultural openness	G6						
Index regional green economic performance	G7	0,099					0,224
Sustainable Cities Index	G8						
Intentional Communities	G9	-0,093					
International meetings	G10	0,228		0,325	0,364		0,164
Personal trust	G11	0,170	0,235				
Population	X1	0,109	0,210				
Economic wealth	Y1			-0,173			
Surface of the city	Z1	0,131	0,186				0,220

Figure 36[29] show the visualisation of the different sets of favourable regional context factors for each experiment type (Indicator numbers used, see chapter 4.3 for total list) Including the additional Governance type, Hybrid NBS initiatives, as an overflow between Governmental and Non-governmental NBS initiatives. When an indicator number is displayed in an overlapping section this means that it is favourable multiple types of NBS initiatives, all overlapping ellipses. Spatial location of the indicator numbers does not state something about the place on the axes but only on the sets of favourable regional context factors the regional context factor is part of.

[29] Minus signs display a negative correlation

The figure acknowledges above mentioned theoretical problems. Such as the small number of unique favourable regional context factors for each experiment type and the analytical contrast between sets of favourable regional context factors on the x or y axis.

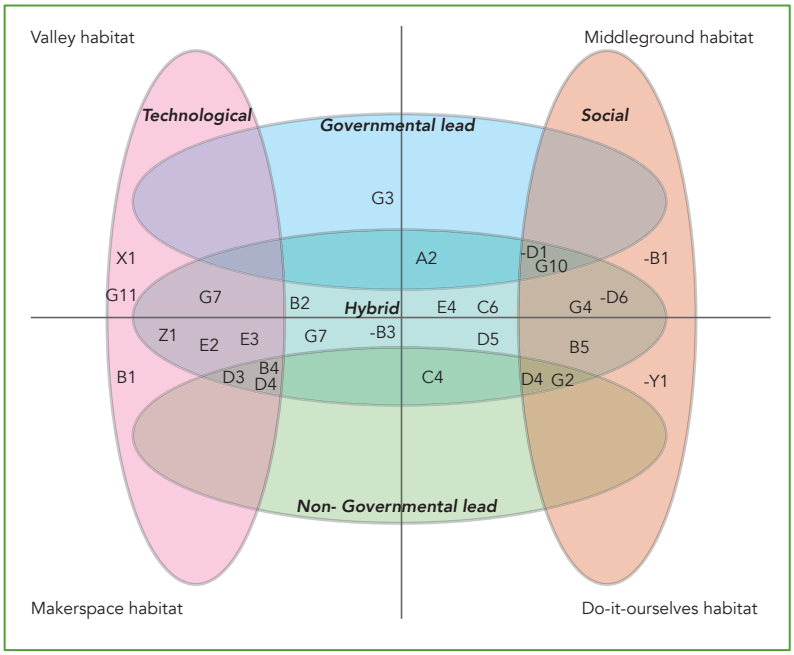

FIGURE 36: INFLUENCING INDICATORS

6. CONCLUSION

This thesis focusses on the idea that there are differences in the ability of a city to host successful Nature-Based Solution (NBS) initiatives. Addressing the following research question: ***'In what way can the difference between cities in their ability to host successful sustainability experiments be explained by their regional characteristics?'.*** Success is for this research defined as transferability of the experiment to other regional contexts. When looking at Europe there occurs to be a great difference between cities, which cannot be explained by geographical location (Broto & Bulkeley, 2013a). Although this thesis did not focus on city level but on regional differences due to a lack of NBS data on city level, a first geographical analysis did show the uneven distribution over Europe. A clear frontrunner spatial area such as north-western Europe is not found or proven with this thesis, the frontrunner region of north-western Europe is often expected by transition research (Wittmayer, Van Steenbergen, Rok, & Roorda, 2016).

This research indicates that besides geographical position the regional context of a city influences the success of sustainability experiments. The regional context of a city is built on regional context factors determining the social, economic and cultural configuration of a city (Fornahl, 2003). These regional context factors can be influenced by either the inhabitants or governance of the city, making the set of context factors broad and transmutable (Scott, 2006).This research translated differences between cities into sets of favourable regional context factors, using the theoretical idea of different innovative habitats (Van den Heiligenberg et al., 2017).

In order to answer this research question a dataset with 471 NBS initiatives within 99 cities in Europe is analysed. To explain the uneven distribution of successful sustainability experiments between these 99 cities a successful sustainability experiment is defined as an NBS intervention which is transferred to another location (as defined in 2.4) (Bai, Roberts, & Chen, 2010). This research used the differences between experiment types as a base for different sets of influencing regional context factors. Additionally, this research conducted a generic set of influencing regional context factors influencing all types of experiments.

This thesis uses an explorative data-driven quantitative approach to research the stated guided expectations and the conceptual framework (presented in 2.5). The explorative approach is chosen because of the theory-building nature of this research. The research focuses on the bridge between deductive and inductive research, taking a theoretical approach as a starting step and build further on it. Herewith, possible new theoretical routes are explored. Due to the explorative character of this research a broad range of regional context factors is analysed on their influence and applicability. This provided the possibility of answering both the theoretical as well as the empirical side of the research question. Firstly, with analysing whether the usage of the habitat framework of Van den Heiligenberg et al. (2017) is usable to explain the geographical uneven distribution of successful sustainability experiments. Secondly, analysing the possibility of systematically researching the geographical uneven distribution of successful sustainability experiments.

This thesis showed that the differences between cities in their ability to host successful sustainability experiments can be indeed explained by differences in their regional context factors for different experiment types. These sets can be empirically researched through usage of the conceptual framework. Although, one should remember that every NBS initiative is different (Kabisch, et al., 2016). The different sets can be seen as an explanation for the geographically uneven distribution of transferability. However, it should be noted that this

thesis is a first attempt for realising a conceptual and empirical framework to systematically research geographical differences between cities in their ability to host successful sustainability experiments. Due to the fact that cities are known to be able to host multiple experiment types (Scott, 2006), the almost all inclusiveness of the generic set of regional context factors can be explained.

Additionally, this thesis shows the importance of regional context factors in analysing the success of sustainability experiments. Combining the Transition Management field and Evolutionary Economical Geography field is proven to be an interesting addition to literature on answering the geographical differences between successful sustainability experiments. This thesis provided an addition to earlier research of Van den Heiligenberg et al. (2017) on this existing literature gap. With the addition of a conceptual framework that can help researching more systematically what differences in regional context factors are favourable for different experiment types. However, future research is necessary to expand on this newly introduced combination. Focussing on favourable regional context factors within broader samples. When further expanding literature on this subject it could be of a great influence for policy makers in their ability to host successful sustainability experiments.

The answer to the main research question is built through answering the three stated sub questions, discussed in 6.1, 6.2 and 6.3.

6.1. USEFULNESS HABITAT CONCEPT

The first sub question was: ***'Is the habitat concept useful when explaining differences in the success of sustainability experiments?'***. For the usability of the habitat theory the possibility to group sustainability experiments on the analytical contrasting habitats is tested. First of all, throughout the research the NBS concept shows to be broader than the used sustainability experiment concept within the habitat theory. Possible hybrid forms are presented and analysed, making the applicability of the habitat framework tensed. However, results show that a different set of regional context factors can be acknowledged when differentiating on the different NBS types. Showing that NBS initiatives can be sorted into different types of habitats and have different sets of favourable regional context factors for transferability. This research made the assumption that NBS initiatives are similar to sustainability experiments. However, stating that all NBS initiatives are innovative is not fully correct. The location and application are in most cases the novelty to the concept. This difference does not change the applicability of a habitat quadrant system. Focussing on the transferability instead fits with this scope.

Secondly, this research analysed the influence of regional context factors in general on the transferability of NBS initiatives. Showing a large set of regional context factors that influence the transferability of all NBS initiatives. Showing that different types of sustainability experiments are not per se in need of a different set of regional context factors, limiting the need for the habitat concept. Being one of the remarks to the usefulness of the habitat framework. The theoretical addition of having multiple habitats in one city and the possibility of hybrid forms could explain this result.

Lastly, this research did show presence of the analytical contrast as provided in the habitat framework as expected. With checking on differences between knowledge or governance experiment groups. Both analyses show a significant difference between the groups in their transfer of the NBS. Besides, the results show clear different sets of favourable regional context factors.

6.2. REGIONAL CONTEXT FACTORS

The second sub-question focusses on difference in the transferability of NBS and the habitat type of the NBS: ***'What regional context factors are available to explain the differences between cities in hosting successful sustainability experiments?'***. This research showed a large set of possible predictive regional context factors. With conducting this list, it appeared that there is still a lack of public data upon some of the conceptual differences between habitats. City-level data is missing or incomplete, weakening the reliability and conclusions of the research. It also shows that finding contextual indicators for social ranges is varying from difficult to impossible.

6.3. RELATIONSHIP WITH SUCCESS

The last sub-question is stated as: ***'Is there a relation between the experimental habitats and the success of a sustainability experiment?'***. This research showed significant difference in the ***Transferability*** mean of different habitat type NBS initiatives. Indicating the necessity of grouping NBS initiative types and further examining possible habitat differentiations. Additionally, different sets of favourable regional context factors and the analysis between habitat specific experiments did show differences in ***Transferability***. Simply said there is a difference in the transferability of NBS initiatives, however, this simple answer is not all-inclusive. Grouping NBS initiatives within habitats and then test their relationship with the ***Transferability*** of the NBS initiatives did show a lot of flaws. As stated with the answer of the first sub-question, NBS initiatives aren't as black and white as the applicability of the habitat theory states, decreasing the usability of the data. From the 471 NBS initiatives (with data on transferability) only 193 NBS initiatives could be categorized into a habitat. Therefore, it was impossible to form concluding sets of regional context factors for each NBS type due to the small data set.

7. DISCUSSION

This discussion chapter reflects upon the theoretical and methodological contribution of the current study. These contributions are made from the stated theoretical and methodological guided questions: *'Does the habitat framework help to explain the currently occurring geographical uneven distribution between cities in their ability to host successful sustainability experiments?'* and *'Is it possible to systematically test the influence of regional context factors on the success of sustainability experiments with existing data?'*. Followed by a critical discussion on the limitations and policy implications. Lastly, suggestions for future research are provided.

7.1. THEORETICAL CONTRIBUTION

This thesis provides new theoretical insights and additions to existing literature in explaining the geographically uneven distribution of cities in their ability to host successful sustainability experiments. Expanding on the ideas of having habitats differentiating the needs of different types of sustainability experiments, linked to a city. However, this research could be seen as a first step in developing a quantitative framework for systematically analysing the transferability of sustainability experiments with usage of the regional context in which the sustainability experiment is performed in. With this first attempt, many steps should follow to build a proven testable theory.

The first addition to the habitat framework was adding hybrid experiments forms to the analytical diversification on knowledge needed for the experiment and governance involved in the experiment. axis. Especially the hybrid governance form did show to be an important influence in this research. With 48% of all NBS initiatives being of a hybrid governance form indicating the large set of hybrid experiment types.

The second addition to the habitat framework is with a generic set of regional context factors favourable for all experiment types. The results for the set of regional context factors for hybrid lead NBS initiatives did show a large resemblance with the generic set of regional context factors. Showing a large set of influencing context factors, possibly explaining the uneven distribution of NBS transferability between cities.

The results for the hybrid experiments and the generic set of regional context factors show resemblance in their remarks on using the habitat concept. Both show to be of great influence. However, both are delimiting the need for four experimentation habitats.

7.2. METHODOLOGICAL REFLECTION

This thesis is a first attempt to systematically test the geographical uneven distribution of cities in their ability to host successful sustainability experiments. With this first attempt it is tried to empirically test the adapted qualitative habitat framework of Van den Heiligenberg et al. (2017). This thesis shows some flaws within the usability of available public data on regional context factors. Proxy indicators are used to quantify favourable regional contexts as described for the different experimental habitats. The usage of a systematic empirical approach offers the possibility to overcome the anecdotal base of the habitat framework.

Throughout this research the availability of city-level data on the different analytical contrasts of the habitat framework appeared to be difficult. Which makes it possible that conducted conclusions are limited or formed by the used proxy indicators. Some of the used regional context factors appear to be promising, such as the ***Creative class index (B4)*** and

Personal trust (G11). Which indicate specific contrasts between sets of favourable regional context factors. However, especially with the Governance type (A1) diversification it is shown that conducting contrasting sets of favourable regional context factors is difficult with the result of having a large set of favourable regional context factors for Hybrid NBS initiatives. Which was also greatly overlapping with the generic set of favourable regional context factors influencing the *Transferability* of all NBS initiatives. Therefore, the used methodological design and its operationalisation can be seen as a first step into systematically analysing differences. However, future steps need to be made to prove the systematic resemblance between cases and regions.

7.3. LIMITATIONS

The first limitation is with the choice of NBS and the Naturvation database, used due to the availability of the broad database with usable data on 471 NBS interventions distributed over Europe. Throughout the research it appeared that data on the transferability was often missing (total database is with 976 NBS interventions), as well as the problem that the sample choice was made outward of this research. The transferability rate of a city is not a strong variable by data from Naturvation, due to the limited number of NBS initiatives per city. This research, therefore, focussed on NBS level without extrapolating it to city level. When including more NBS with data on their transferability the explanation of uneven distribution of transferred NBS interventions could be linked better. Besides, a larger usable dataset also increases the possibility of statistical testing and the possibility to look at habitat specific regional context factors.

A second limitation of this research is the fact that the built database is based on existing indicators used as proxies for the regional context factors that possibly could explain the uneven distribution between cities. These proxies aren't always comprehensive or completely applicable to reality. The quantification of information is still lacking, especially on the more social parts of the indicator spectrum. However, this research focusses on finding the most applicable regional context factors influencing the transferability. It does not include adding new indicators. The conclusion is at best of what can be expected with the current available public data.

The last limitation is on how this research uses the concept of experimentation. Combining the idea that experimentation is needed for a sustainability transition with the transferability of NBS initiatives shows some flaws. Due to the fact that an NBS on itself is not directly an experiment. The experimental part is transporting knowledge and applying it in a new geographical situation (Bai, Roberts, & Chen, 2010). Broto & Bulkeley (2013) state the importance of knowledge transfer and transformation of knowledge to be the innovative part of sustainability experiments. Whereas it is unknown if this equals experiments as introducing newly developed products or processes. However, as Schumpeter already stated, innovation can be seen as a new combination of existing conditions (Dodgson, 2011), and therefore, the choices and assumptions made in this research are legitimised with the available period of time and possibilities.

7.4. POLICY IMPLICATIONS

From this research several policy implications can be derived. First of all, it should be noted that there is a difference in cities, and therefore also in the transferability of NBS. Hence,

the research for favourable regional context factors. The results present differing sets of regional context factors specific or non-specific for the NBS type. These sets can be used to influence and increase the transferability of NBS.

Furthermore, based on this research it can be stated that focussing on a specific type of NBS and its favourable regional context factors is not always necessary. This research also presents a general set of influencing regional context factors that can explain the uneven distribution of successful sustainability experiments. The low number of specific indicators in contrast to the large overlap between sets is an interesting point for further research. This thesis added the set of general influencing regional context factors to the habitat framework and shows that this is an interesting addition.

7.5. Future research

Future research is advised to either focus on a broader scope of cities or on preference habitats per city. First of all, Naturvation only includes cities bigger than 200.000 inhabitants (Almassy, et al., 2018). It is expected that with smaller cities the influence of a specific habitat is also bigger. The diversity within a city and its sustainability experiments is larger with having bigger cities, this therefore touches upon the theoretical reflection of having multiple habitats within one city. Analysing influencing regional context factors, to increase transferability, is therefore, easier with smaller cities. This could also offer new insights and more precise sets of influencing regional context factors, with a better diversification of habitats. It will also show more diversification in the data of the regional context factors, due to the choice for the larger cities 93 out of 99 cities host one or multiple universities. Introducing a problem with the influence of university research and the counterculture of cities with a lot of students, which is expected on the left side of the habitat framework (the valley and makerspace habitat).

Furthermore, focussing on grouping cities in the habitat framework could be interesting. As also stated in the theoretical framework (see chapter 2.5) modern cities are transmutable and complex (Scott, 2006), introducing the possibility of having multiple favourable habitats in one city. Having multiple habitats in one city makes it difficult to analyse different sets of regional context factors for each experiment type. Which can be a reason for the large set of general regional context factors. It may therefore be interesting to focus future research on the possibility of having multiple habitats in one city. Developing a framework for testing and differentiating cities on their ability to host multiple experiment types and how the multiple habitats interfere and relate with each other.

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8. APPENDIX

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8.2. APPENDIX 2: LIST OF RESEARCHED CITIES

City	Nuts 2	Nuts 3	Country	Country code
Antwerp	BE21	BE211	Belgium	BE
Liege	BE33	BE332	Belgium	BE
Plovdiv	BG42	BG421	Bulgaria	BG
Sofia	BG41	BG412	Bulgaria	BG
Zagreb	HR04	HR041	Croatia	HR
Brno	CZ06	CZ064	Czech Republic	CZ
Århus	DK04	DK042	Denmark	DK
Tallinn	EE00	EE001	Estonia	EE
Helsinki/Helsingfors	FI1B	FI181	Finland	FI
Aix-en-Provence	FR82	FR824	France	FR
Clermont-Ferrand	FR72	FR724	France	FR
Lille	FR30	FR301	France	FR
Marseille	FR82	FR824	France	FR
Montpellier	FR81	FR813	France	FR
Nancy	FR41	FR411	France	FR
Rouen	FR23	FR232	France	FR
Saint-Etienne	FR10	FR102	France	FR
Strasbourg	FR42	FR421	France	FR
Toulouse	FR62	FR623	France	FR
Augsburg	DE27	DE271	Germany	DE
Bielefeld	DEA4	DEA41	Germany	DE
Bonn	DEA2	DEA22	Germany	DE
Bremen	DE50	DE501	Germany	DE
Essen	DEA1	DEA13	Germany	DE
Frankfurt am Main	DE40	DE411	Germany	DE
Hamburg	DE60	DE600	Germany	DE
Hannover	DE92	DE929	Germany	DE
Karlsruhe	DE12	DE123	Germany	DE
Leipzig	DED5	DED53	Germany	DE
München	DE21	DE212	Germany	DE
Münster	DEA3	DEA33	Germany	DE
Nürnberg	DE25	DE254	Germany	DE
Stuttgart	DE11	DE111	Germany	DE
Wuppertal	DEA1	DEA1A	Germany	DE
Athens	EL30	EL301	Greece	EL
Budapest	HU10	HU101	Hungary	HU
Györ	HU22	HU221	Hungary	HU
Dublin	IE02	IE021	Ireland	IE
Bari	ITF4	ITF47	Italy	IT
Bologna	ITH5	ITH55	Italy	IT
Catania	ITG1	ITG17	Italy	IT
Genova	ITC3	ITC33	Italy	IT
Milano	ITC4	ITC45	Italy	IT
Napoli	ITF3	ITF33	Italy	IT
Palermo	ITG1	ITG12	Italy	IT
Roma	ITI4	ITI43	Italy	IT
Venezia	ITH3	ITH35	Italy	IT
Bergen	NO05	NO051	Norway	NO
Oslo	NO01	NO011	Norway	NO
Bialystok	PL34	PL343	Poland	PL
Bydgoszcz	PL61	PL613	Poland	PL
Gdynia	PL63	PL633	Poland	PL
Krakow	PL21	PL214	Poland	PL
Lublin	PL31	PL314	Poland	PL
Poznan	PL41	PL415	Poland	PL
Szczecin	PL42	PL424	Poland	PL
Lisboa	PT17	PT170	Portugal	PT
Porto	PT11	PT114	Portugal	PT
Bucuresti	RO32	RO321	Romania	RO
Craiova	RO41	RO004	Romania	RO
Iasi	RO21	RO213	Romania	RO
Timisoara	RO42	RO424	Romania	RO
Bratislava	SK01	SK010	Slovakia	SK
Ljubljana	SI04	SI041	Slovenia	SK
Alicante	ES52	ES521	Spain	ES
Barcelona	ES51	ES511	Spain	ES
Bilbao	ES21	ES213	Spain	ES
Córdoba	ES61	ES613	Spain	ES
Málaga	ES61	ES617	Spain	ES

Murcia	ES62	ES620	Spain	ES
Palma de Mallorca	ES53	ES532	Spain	ES
Sevilla	ES61	ES618	Spain	ES
Zaragoza	ES24	ES243	Spain	ES
Göteborg	SE31	SE313	Sweden	SE
Malmö	SE22	SE224	Sweden	SE
Stockholm	SE11	SE110	Sweden	SE
Zurich	CH04	CH040	Switzerland	CH
Amsterdam	NL32	NL326	The Netherlands	NL
s-Gravenhage	NL33	NL332	The Netherlands	NL
Utrecht	NL31	NL310	The Netherlands	NL
Belfast	UKN0	UKN01	United Kingdom	UK
Bradford	UKE4	UKE41	United Kingdom	UK
Cardiff	UKL2	UKL22	United Kingdom	UK
Coventry	UKG3	UKG33	United Kingdom	UK
Doncaster	UKE3	UKE31	United Kingdom	UK
Edinburgh	UKM2	UKM25	United Kingdom	UK
Glasgow	UKM3	UKM34	United Kingdom	UK
Greater Manchester	UKD3	UKD33	United Kingdom	UK
Greater Nottingham	UKF1	UKF!4	United Kingdom	UK
Leeds	UKE4	UKE42	United Kingdom	UK
Liverpool	UKD7	UKD72	United Kingdom	UK
Medway	UKJ4	UKJ41	United Kingdom	UK
Newcastle	UKC2	UKC22	United Kingdom	UK
Portsmouth	UKJ3	UKJ31	United Kingdom	UK
Reading	UKJ1	UKJ14	United Kingdom	UK
Sheffield	UKE3	UKE32	United Kingdom	UK
Sunderland	UKC2	UKC23	United Kingdom	UK
Wakefield	UKE4	UKE45	United Kingdom	UK
Wirral	UKD7	UKD74	United Kingdom	UK

8.3. APPENDIX 3: OPERATIONALISATION TABLE

			Indicator	Calculation	Measurement	Database	NUTS	Year
Dependent variable	Long-term success		Transferability	A measure that represents whether the experiment is transferred to new experiments	Percentage: Number of transferred NBS / Number of NBS (of which data about transferability is available)	Urban nature atlas	NUTS 3	2017
Independent variables	A: Experiment information	A1	Governance type	A nominal measure that represents by what type of organisation the experiment is guided	Type of initiating organisation: Government = 1 Private sector = 2 Citizens or community groups = 3 All other answers = 0 Highest percentage of NBS in group define the guidance preference of a city	Urban nature atlas	NUTS 3	2017
		A2	Knowledge type	A nominal measure that represents the type of innovation	Type of innovation: Technological innovation = 1 Social innovation = 2 System innovation = 3 Combination = 4 Highest percentage of NBS in group define the innovation type preference of a city	Urban nature atlas	NUTS 3	2017
		A3	Habitat type	A nominal measure that represents the habitat type of the experiment	Governmental + Technological = Valley Non-governmental + Technological = Makerspace Governmental + Social = Middleground Non-governmental + Social = Do-it-ourselves	Urban nature atlas	NUTS 3	2017
	B: Culture	B1	Open-source and sharing culture	A scale measure of the estimated elasticity of knowledge production to human capital for individual regions by controlling for other knowledge inputs, i.e. R&D	Regression analysis Values below 0,7 can be considered as "low"; from 0,7 to 0,89 as "medium low"; from 0,9 to 0,99 as "medium"; from 1 to 1,10 as "high" and above 1,11 as "very high".	Espon	NUTS 2	2000
		B2	Counterculture of young people who	A nominal measure of territorial pattern of innovation	Smart technological application area = 1 European science-based area = 2	Espon	NUTS 2	2006

			are open to innovation		All other answers = 0			
		B3	Counterculture of alternative lifestyles, with a role for creatives	A nominal measure of territorial pattern of innovation	Creative imitation area = 1 Smart and creative diversification = 2 All other answers = 0	Espon	NUTS 2	2006
		B4	Creative class index	A scale index score about the science-based creativity of a city.	To create the final Global Creativity Index, it constructed the talent, technology and tolerance variable based on principle component analysis. In other words, each of the scores are based on the actual performance and not the rank of each individual variable	Martin Prosperity	NUTS 1	2010
		B5	Hipster index	Scale measure on the hipster population of a city	Average score based on the number of vegan eateries, coffee shops, tattoo studios, vintage boutiques, and record stores per 100.000 inhabitants	Movehub	NUTS 3	2018
	C: Regional network	C1	Cooperative culture	A scale measure on the cooperation degree, number of collaborating regions in INTERREG IIIc projects	Cooperation degree defined as the number of collaborating regions in INTERREG IIIc projects in the program period of 2000-2006	Espon	NUTS 2	2006
		C2	Innovative cooperation	A scale measure on the cooperation arrangements on innovation activities	Percentage of cooperation arrangements on innovation over all innovation activities	Eurostat	NUTS 1	2000
		C3	Technological specialization	A scale measure on human resources in Science and Technology	Persons with higher education and/or employed in Science and Technology as of % of labour force.	European Regional Competitiveness Index	NUTS 2	2013-2014
		C4	Employment in technology and knowledge-intensive sectors	A scale measure on the employment in technology and knowledge intensive sectors	Percentage of employment over the total employment	European Regional Competitiveness Index	NUTS 2	2013-2014
		C5	Foreign controlled firms	A scale measure on the employment in foreign controlled firms	Percentage of employment over total employment	Eurostat	NUTS 1	2015
		C6	Employment dispersion	A nominal measure on the typology of knowledge economy regions. Regions being either technologically advanced, scientific, networking, or a combination	TASCNE = 1 All other answers = 0	Espon	NUTS 2	2010

		C7	Creative jobs	Scale measure on the annual employment in creative class	Number of jobs in arts, culture and entertainment related activities per 1.000 inhabitants	Espon	NUTS 2	2008
	D: Learning culture	D1	Scientific pipelines	Scale measure on the number of scientific publications.	Nu	European Regional Competitiveness Index	NUTS 2	2011-2012
		D3	Patents	Scale measure on the number of high technology EPO patent applications	Number of patent applications per 1.000.000 inhabitants	European Regional Competitiveness Index	NUTS 2	2011-2012
		D4	Knowledge exchange among actors	A nominal measure on the knowledge networking organisation within the region	Clustering regions = 1 Networking regions = 2 All other answers = 0	Espon	NUTS 2	2006
		D5	Co-publications	Scale measure on the number of international co-publications	Average proportion of the publications of a university co-authored by two or more countries	Leiden Ranking	NUTS 3	2013-2016
		D6	Co-authored patents	Scale measure on the number of patents co-authored with inventors from outside the region	Number of patents co-authored per inhabitant	Espon	NUTS 2	2006
	E: Demographic information	E1	Impact of knowledge production to cross-regional mobility	A scale measure on the estimated impact of knowledge production to cross-regional inventor's mobility by territorial patterns of innovation when controlling for other knowledge inputs	Results deriving from a regression analysis: higher values indicate that knowledge production increases when cross-regional mobility increases	Espon	NUTS 2	2006
		E2	Adult learning	Scale measure in participation in education and training by adults	Percentage of adults (25-64 years) participating in education and training	Eurostat	NUTS 2	2017
		E3	Citations of patents	Scale measure on the number of citations made to patents from other regions	Number of citations made to patents from other regions per inhabitant	Espon	NUTS 2	2006
		E4	R&D expenditure	Scale measure on the total R&D expenditure	Total R&D expenditure as percentage of the GDP	European Regional Competitiveness Index	NUTS 2	2012-2013
		E5	Median age	Scale measure on the median age of population	Median	Eurostat	NUTS 2	2017
	G: General context factors	G2	Internet access	Scale measure on households with access to the internet at home	Percentage of the total number of households	Eurostat	NUTS 2	2017
		G3	University appearance	Nominal measure on the representation of the presence of a university	Present = 1 Not present = 2	World higher education database	NUTS 3	2018

		G4	University ranking	Scale measure on the average number of universities' appearances in four different university rankings: QS, Shanghai, Leiden, and Times	Number of universities' appearances in four different university rankings: QS, Shanghai, Leiden, and Times	The cultural and creative cities monitor	NUTS 3	2014
		G5	Foreign index	Scale index on tolerance of foreigners, foreign-born population, and integration of foreigners	Percentage of total population who: - very strongly agrees with the statement: "The presence of foreigners is good for this city." - is foreign-born - very strongly agrees with the statement: "Foreigners who live in this city are well integrated."	The cultural and creative cities monitor	NUTS 3	2014
		G6	Cultural openness	Scale measure on the cross-culture contact	Examination of percentage of cross-cultural contact	Eurobarometer	NUTS 2	2007
		G7	Index regional green economic performance	A scale measure with an analysis based on GREECO's conceptualisation and operationalisation of the green economy and the indicator definition and collection.	Average of index values of spheres 1 to 5: Environmental, Social, Territorial, Economic, and Econos.	Espon	NUTS 2	2011
		G8	Sustainable Cities Index	Scale measure on the sustainability of a city, on the values for people, planet, and profit indicators	Percentage of sustainability index	Arcadis	NUTS 3	2016
		G9	Intentional Communities	Scale measure on the total number of intentional communities	Fellowship intentional communities	Ecobase Global ecovillage network	NUTS 2	2018
		G10	International meetings	Scale measure on the number of international meetings	Number of international meetings per 100.000 inhabitants (corporate, government, and NGO meetings)	ICCA	NUTS 3	2016
		G11	Personal trust	Scale measure on the interpersonal trust within cities	Percentage of the population that strongly agrees with the fact that most people in the city can be trusted	Eurostat	NUTS 3	2015
Control variables		X1	Population	Scale measure on the number of inhabitants of a city	Number of inhabitants	Eurostat	NUTS 3	2015
		Y1	Economic wealth	Scale measure on the gross domestic product at current market prices	Percentage GDP on total population	Eurostat	NUTS 3	2015
		Z1	Surface of the city	Area	Area in km^2	Eurostat	NUTS 3	2015

8.3.1. Description used indicators

Experiment information

The first indicator of experiment information is the ***Governance type*** of the experiment. Defining if the experiment was Governmental, Non-governmental, or hybrid lead. This data is used for defining the habitat type of the experiment in combination with the innovation type. A total of 966 NBS is tested with data on the governance type. Data for the governance type is taken from the Urban Nature Atlas, Naturvation, from the year 2017.

The second indicator of experiment information is the ***Knowledge type*** of the experiment. Defining if the experiment was Technical, Social, System, or a Combinational innovation type. This data is used for defining the habitat type of the experiment in combination with the Governance type. A total of 923 NBS is tested with data on the innovation type. Data for the transferability is taken from the Urban Nature Atlas, Naturvation, from the year 2017.

As a combination of the ***Governance type*** and the ***Knowledge type*** the ***Habitat type*** of an NBS is computed. Valley habitat is defined as governmental lead technological innovation, 124 NBS tested. Makerspace habitat is defined as non-governmental lead technological innovation, 104 NBS tested. Middleground habitat is defined as governmental lead social innovation, 75 NBS tested. Do-it-ourselves habitat is defined as non-governmental lead social innovation, 97 NBS tested. With a total of 193 NBS which could be defined to a habitat type, by theoretical information. The hybrid leading type, system innovation type and combinational innovation type are not defined to a specific habitat yet.

Culture

The first indicator of cultural context factors is the measure of open-source and sharing culture (B1), 509 tested NBS. Conducted from Espon as a regression number for the estimated elasticity in which knowledge production leads to human capital for individual regions in Europe. Defining the ability of a region to use open-source knowledge and transform this into economical possibilities. With this indicator the cultural intention to share tacit knowledge through business channels is measured. Data is gathered through Espon and is from the year 2000.

The second indicator of cultural context factors is the measure of having a counterculture of young people who are open to innovation (B2), 850 tested NBS. It is a nominal measure about if the region is smart technological, science-based or defined differently. Expected to measure influences of a counterculture for the Valley and Makerspace habitats, where science and technology are stated as important. Data is gathered through Espon, from the year 2006.

The third indicator of cultural context factors is the measure of having a counterculture of alternative lifestyles, with a role for creatives (B3), 850 tested NBS. It is a nominal measure about if the region is creative, smart creative, or defined differently. Expected to measure influences of a counterculture for the Middleground and Do-it-ourselves habitats, where creativity is stated as important. Data is gathered through Espon, from the year 2006.

The fourth indicator of cultural context factors is the Creative Class index (B4), 840 tested NBS. Constructed from scores on creativity with talent, technology and tolerance

performance of a country. Therefore, the Creative Class index is measured on a country level. Expected to influence transferability in the Middleground and Do-it-ourselves habitats, due to the creative aspect. Adding a second indicator to test creativity in the sub-culture of a city. Data is gathered through Martin Prosperity database on the Creative Class, from the year 2010.

The fifth indicator of the cultural context factors is the Hipster index (B5), 620 tested NBS. A constructed scale measure to score the number of vegan eateries, coffee shops, tattoo studios, vintage boutiques, and record stores per 100.000 inhabitants. Indicator is used to measure possible hipster, counterculture activities in cities. Expected that with a counterculture inhabitant are expected to be more open to NBS. Data is gathered from Movehub, from the year 2018.

REGIONAL NETWORK

The first indicator of the regional network context factors is Cooperative culture (C1), 831 tested NBS. The Cooperative culture measure is a scale measure on the cooperation degree of a city, scored by the number of collaborating regions in INTERREG IIIC projects for the period between 2000 and 2006. Used to measure the influence of international cooperation between businesses and governments within regions. Data is gathered from Espon, from the year 2006.

The second indicator of the regional network context factors is Innovative cooperation (C2), 918 tested NBS. The Innovative cooperation is a percentage of the cooperation between businesses with innovative projects. The percentage is taken of cooperation arrangements on innovation overall innovation activities. Giving a general idea on the level of cooperation within a region. Data is gathered from Eurostat, from the year 2000.

The third indicator of the regional network context factors is Technological specialization (C3), 918 tested NBS. A scale measure on the percentage of persons with higher education and/or employed in science and technology of the total labour force. Indicating the idea of the importance of technological inhabitants in a city. Expected to give an influence on the transferability with technological innovations. Data is gathered from the European Regional Competitiveness Index, from the years 2013 and 2014.

The fourth indicator of the regional network context factors is Employment in technology and knowledge-intensive sectors (C4), 928 tested NBS. An indicator used as an edition of the Technological specialization (C3). Measuring the percentage of employment in technology and knowledge-intensive sectors over the total employment on a scale. Expected to double-check results from the Technological specialization (C3) indicator. Data is gathered from the European Regional Competitiveness Index, from the years 2013 and 2014.

The fifth indicator of the regional network context factors is Foreign controlled firms (C5), 947 tested NBS. A scale measure on the employment within foreign controlled firms as a percentage over the total employment in a region. Indicating a possible global orientation of a city. Data is gathered from Eurostat, from the year 2015.

The sixth indicator of the regional network context factors is Employment dispersion (C6), 957 tested NBS. A nominal measure on the type of knowledge sharing within the city. Cities can be either technologically advanced, scientific, networking or a combination. When having a combinational type it is indicating that there is a dispersion in the type of employment within the city. Showing expected diversity as stated for the Middleground habitat. Data is gathered from Espon, from the year 2010.

The seventh indicator of the regional network context factors is Creative jobs (C7), 830 tested NBS. The scale measure about the number of jobs in arts, culture and entertainment-related activities per 1.000 inhabitants is used to indicating the creativity of a city. Expected to have an influence on the social innovation side of the habitat spectrum. Also expected to positively influence when Technological specialization (C3) or Employment in technology and knowledge intensive sectors (C4) show a negative influence, as being opposite indicators with the habitats. Data is gathered from Espon, from the year 2008.

Learning culture

The first indicator of the learning context factors is the Scientific pipelines (D1), 928 tested NBS. Scientific pipelines (D1) is a scale measure on the number of scientific publications per 1.000.000 inhabitants. Indicating possible influence of scientific learning, expected with the Valley habitat. Used as a contrary indicator of Patents (D3). Data is gathered from the European regional competitiveness index, from the years 2011 and 2012.

The second indicator of the learning context factors is the Patents (D3), 804 tested NBS. Patents (D3) is a scale measure on the number of patent applications per 1.000.000 inhabitants. Indicating a possible influence of patenting learning of a city, expected with the Middleground or Makerspace habitats. Used as a contrary indicator of Scientific pipelines (D1). Data is gathered from the European regional competitiveness index, from the years 2011 and 2012.

The third indicator of the learning context factors is the Knowledge exchange among actors (D4), 850 tested NBS. A nominal measure on the type of knowledge networking organisation within regions, defining either a clustering, networking or other defined region. When indicating the city as within a clustering or networking region this is expected as an influence with the habitat where personal knowledge exchange is important, especially with social innovations. Data is gathered from Espon, from the year 2006.

The fourth indicator of the learning context factors is the Co-publications (D5), 624 tested NBS. Used as a scale measure on the number of international co-publications. With the average proportion of the publications of a university co-authored by two or more countries. Also indicating possible global pipelines and globally orientation of the city. Used contrary to the Co-authored patents (D6) data. Data is gathered from the Leiden Ranking, from the years 2013 till 2016.

The fifth indicator of the learning context factors is the Co-authored patents (D6), 792 tested NBS. Used as a scale measure on the number of international co-authored patents. With the number of patents co-authored with inventors from outside the region, scored per inhabitant. Also indicating possible global pipelines and globally orientation of the city. Used contrary to the Co-publications (D5) data. Data is gathered from Espon, from the year 2006.

Demographic information

The first indicator of the demographic context factors is the Impact of knowledge production to cross-regional mobility (E1), 755 tested NBS. Data are results from a regression analysis on knowledge production with cross-regional mobility. Higher values indicate increasement of knowledge production when cross-regional mobility increases. It is a scale measure on impact controlled for other knowledge inputs. Data is gathered from Espon, from the year 2006.

The second indicator of the demographic context factors is Adult learning (E2), 825 tested NBS. A scale measure on the participation of inhabitants in education and training with an age between 25 and 64 years. Expected from theory is that especially the Valley habitat NBS are influenced by the idea of long-life learning. A learning surrounding is a basis for the science-based surrounding. Data is gathered from Eurostat, from the year 2017.

The third indicator of the demographic context factors is the Citations of patents (E3), 774 tested NBS. A scale measure on the number of citations made to patents from other regions. Showing possible pipelines from a patent perspective. Data is gathered from Espon, from the year 2006.

The fourth indicator of the demographic context factors is the R&D expenditure (E4), 937 tested NBS. Measuring the total R&D expenditure of a region on a scale. Taken as a percentage of the GDP. Expected to influence the technological NBS, due to the research and development technological innovations increase. Data is gathered from the European Regional Competitiveness Index, from the years 2012 and 2013.

The fifth indicator of the demographic context factors is the Median age (E5), 821 tested NBS. A scale measure of the median age of the population. It is expected that a younger median age will show more willingly to innovate, and therefore, within this research it is expected to have an influence in the transferability of NBS. Data is gathered from Eurostat, from the year 2017.

General context factors

The first indicator of the general context factors is Internet access (G2), 802 tested NBS. Giving a percentage of the number of households with internet access over the total number of households. Having internet access increases the possibility to transfer knowledge without physical proximity. Data is gathered from Eurostat, from the year 2017.

The second indicator of the general context factors is the University appearance (G3), 947 tested NBS. Indicating if the case city has a University or not., therefore used as a nominal indicator. Data is gathered from the World higher education database, from the year 2018.

The third indicator of the general context factors is the University ranking (G4), 539 tested NBS. As an addition to the University appearance (G3) indicator, the university ranking measures the number of universities' appearances in four different university rankings. All universities within the city are added up to a total per city. The university rankings are: Qs, Shanghai, Leiden, and Times. Data is gathered from the cultural and creative cities monitor, from the year 2014.

The fourth indicator of the general context factors is the Foreign index (G5), 163 tested NBS. A scale measure on the tolerance of foreigners, foreign-born population, and integration of foreigners. A combined percentage of the three aspects taken from a citizen survey. Important to acknowledge is the large number of missing data points for the foreign index. However, this was the best data set available on foreign acceptance, it is expected that such an indicator influences the innovative possibilities of a region and knowledge dispersion. For further research, a different and further developed proxy as an indicator is preferred. Data is gathered from the cultural and creative cities monitor, from the year 2014.

The fifth indicator of the general context factors is Cultural openness (G6), 900 tested NBS. A scale measure on the percentage of cross-cultural contact. Indicating personal connection and the possibility for knowledge sharing. Data is gathered from Eurobarometer, from the year 2007.

The sixth indicator of the general context factors is the Index regional green performance (G7), 938 tested NBS. Used as a scale measure with an analysis on environmental, social, territorial, economic and Econos scores. Defining the performance of a region on green economic activities. Data is gathered from Espon, from the year 2011.

The seventh indicator of the general context factors is the Sustainable cities index (G8), 661 tested NBS. A scale measure of the sustainability of a city, on the values for people, planet, and profit indicators. Data is gathered from Arcadis, from the year 2016.

The eighth indicator of the general context factors is the Intentional communities (G9), 957 tested NBS. A scale measure of the total number of intentional communities. Taken as a proxy for knowledge dispersion in a region. Data is gathered from Ecobase Global ecovillage network, from the year 2018.

The ninth indicator of the general context factors is the International meetings (G10), 598 tested NBS. A scale measure of the cumulative number of international meetings organised in a city. Taken as a proxy for knowledge dispersion in a region. Data is gathered from ICCA, from the year 2016.

The tenth indicator of the general context factors is Personal trust (G11), 408 tested NBS. A scale measure on the percentage of the population of a city who strongly agrees with the fact that most people in the city can be trusted. Data is gathered through a citizen survey. Data is gathered from Eurostat, from the year 2015.

8.4. APPENDIX 4: DESCRIPTIVE RESULTS

Indicator number	N	Minimum	Maximum	Mean	Std. deviation
Transfer	471	0	1	,63	,484
A1	966	1	3	1,99	,740
A2	923	1	4	1,98	1,092
B1	509	1065,00	13301,00	9853,5422	3504,38
B2	850	0	2	,67	,687
B3	850	0	2	,77	,894
B4	840	1176,00	4624,00	3844,13	700,40
B5	620	2611,00	69437,00	32653,55	16107,56
C1	831	,00	173,00	66,96	38,43
C2	918	,09	,52	,2270	,09641
C3	918	16,75%	67,80%	42,27%	9,28%
C4	928	1,00%	10,70%	3,98%	1,92%
C5	947	5,15%	38,42%	16,56%	6,44%
C6	957	0	1	,13	,338
C7	830	454017,00	9738213945,00	1829024533,77	2587258384,80
D1	928	184696439	16219920750000000	122351750990754,42	1404150378063699,00
D3	804	1074,00	3263434866,00	62360845,69	407940574,44
D4	850	0	2	1,00	,910
D5	624	6,60%	68,30%	53,7873%	9,85657%
D6	792	,00	9971109,00	3786487,0896	2865872,97318
E1	755	,00	7,27	2,5554	2,65167
E2	825	0,70%	35,50%	11,5038%	7,10434%
E3	774	0	9455706	3324439,94	2468229,313
E4	937	0%	27%	2,17%	3,267%
E5	821	36	51	42,24	2,895
G2	802	74%	99%	89,55%	6,222%
G3	947	0	1	,93	,262
G4	539	0	12	2,90	2,939
G5	163	0	31	17,28	9,495
G6	900	39%	99%	74,71%	15,310%
G7	938	24%	84%	52,26%	10,652%
G8	661	40	54	45,92	2,877
G9	957	0	12	4,29	3,377
G10	598	6	195	36,85	39,780
G11	408	3%	32%	15,09%	9,327%
X1	890	197042	5432802	1002505,53	829882,865
Y1	937	1249959	8895829833	2865201703,88	2108830350,28
Z1	877	40	633886	25400,66	97031,45

8.5. APPENDIX 5: CORRELATION KNOWLEDGE DIFFERENTIATION

Significant correlation in green cells.

8.5.1. APPENDIX 5.1.: TECHNOLOGICAL INNOVATION

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,082
		Sig.	0,259
		N	189
Open-source and sharing culture	B1	Correlation coefficient	,226
		Sig.	0,032
		N	90
Counterculture of young people who are open to innovation	B2	Correlation coefficient	0,078
		Sig.	0,308
		N	173
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-0,068
		Sig.	0,372
		N	173
Creative class index	B4	Correlation coefficient	,172
		Sig.	0,031
		N	158
Hipster index	B5	Correlation coefficient	0,103
		Sig.	0,26
		N	121
Cooperative culture	C1	Correlation coefficient	0,078
		Sig.	0,311
		N	172
Innovative cooperation	C2	Correlation coefficient	-0,022
		Sig.	0,771
		N	171
Technological specialization	C3	Correlation coefficient	0,064
		Sig.	0,399
		N	178
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,124
		Sig.	0,098
		N	178
Foreign controlled firms	C5	Correlation coefficient	-0,046
		Sig.	0,536
		N	184
Employment dispersion	C6	Correlation coefficient	0,042
		Sig.	0,569
		N	189
Creative jobs	C7	Correlation coefficient	-0,051
		Sig.	0,508
		N	171
Scientific pipelines	D1	Correlation coefficient	-0,139
		Sig.	0,063
		N	179
Patents	D3	Correlation coefficient	,244
		Sig.	0,004
		N	139
Knowledge exchange among actors	D4	Correlation coefficient	,177
		Sig.	0,02
		N	173
Co-publications	D5	Correlation coefficient	0,174
		Sig.	0,062
		N	116
Co-authored patents	D6	Correlation coefficient	0,001
		Sig.	0,987
		N	163
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-0,021
		Sig.	0,804
		N	145
Adult learning	E2	Correlation coefficient	,199
		Sig.	0,01
		N	165
Citations of patents	E3	Correlation coefficient	,300
		Sig.	0
		N	156
R&D expenditure	E4	Correlation coefficient	0,064
		Sig.	0,395

		N	180
Median age	E5	Correlation coefficient	-0,015
		Sig.	0,852
		N	164
Internet access	G2	Correlation coefficient	0,089
		Sig.	0,253
		N	166
University appearance	G3	Correlation coefficient	0,022
		Sig.	0,768
		N	184
University ranking	G4	Correlation coefficient	0,148
		Sig.	0,13
		N	106
Foreign index	G5	Correlation coefficient	,339
		Sig.	0,043
		N	36
Cultural openness	G6	Correlation coefficient	0,123
		Sig.	0,11
		N	170
Index regional green economic performance	G7	Correlation coefficient	0,103
		Sig.	0,161
		N	187
Sustainable Cities Index	G8	Correlation coefficient	0,034
		Sig.	0,691
		N	137
Intentional Communities	G9	Correlation coefficient	-0,072
		Sig.	0,323
		N	189
International meetings	G10	Correlation coefficient	0,137
		Sig.	0,136
		N	120
Personal trust	G11	Correlation coefficient	,235
		Sig.	0,043
		N	75
Population	X1	Correlation coefficient	,210
		Sig.	0,007
		N	165
Economic wealth	Y1	Correlation coefficient	-0,026
		Sig.	0,733
		N	181
Surface of the city	Z1	Correlation coefficient	,186
		Sig.	0,014
		N	174

8.5.2. APPENDIX 5.2.: SOCIAL INNOVATION

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,107
		Sig.	0,165
		N	169
Open-source and sharing culture	B1	Correlation coefficient	-,218
		Sig.	0,045
		N	85
Counterculture of young people who are open to innovation	B2	Correlation coefficient	0,136
		Sig.	0,103
		N	145
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-0,088
		Sig.	0,295
		N	145
Creative class index	B4	Correlation coefficient	0,09
		Sig.	0,274
		N	148
Hipster index	B5	Correlation coefficient	,401
		Sig.	0
		N	102
Cooperative culture	C1	Correlation coefficient	0,124
		Sig.	0,143
		N	141
Innovative cooperation	C2	Correlation coefficient	0,081
		Sig.	0,304
		N	165

Technological specialization	C3	Correlation coefficient	0,003
		Sig.	0,969
		N	162
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,115
		Sig.	0,143
		N	165
Foreign controlled firms	C5	Correlation coefficient	0,003
		Sig.	0,969
		N	168
Employment dispersion	C6	Correlation coefficient	0,049
		Sig.	0,527
		N	169
Creative jobs	C7	Correlation coefficient	-0,045
		Sig.	0,591
		N	144
Scientific pipelines	D1	Correlation coefficient	-,221
		Sig.	0,004
		N	166
Patents	D3	Correlation coefficient	0,107
		Sig.	0,201
		N	144
Knowledge exchange among actors	D4	Correlation coefficient	,281
		Sig.	0,001
		N	145
Co-publications	D5	Correlation coefficient	0,049
		Sig.	0,606
		N	114
Co-authored patents	D6	Correlation coefficient	-,216
		Sig.	0,013
		N	132
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-0,046
		Sig.	0,604
		N	132
Adult learning	E2	Correlation coefficient	0,107
		Sig.	0,198
		N	146
Citations of patents	E3	Correlation coefficient	-0,004
		Sig.	0,968
		N	130
R&D expenditure	E4	Correlation coefficient	0,085
		Sig.	0,279
		N	165
Median age	E5	Correlation coefficient	0,044
		Sig.	0,6
		N	146
Internet access	G2	Correlation coefficient	,179
		Sig.	0,031
		N	146
University appearance	G3	Correlation coefficient	0,09
		Sig.	0,245
		N	168
University ranking	G4	Correlation coefficient	,292
		Sig.	0,01
		N	77
Foreign index	G5	Correlation coefficient	-0,197
		Sig.	0,419
		N	19
Cultural openness	G6	Correlation coefficient	0,005
		Sig.	0,951
		N	162
Index regional green economic performance	G7	Correlation coefficient	0,076
		Sig.	0,337
		N	163
Sustainable Cities Index	G8	Correlation coefficient	-0,125
		Sig.	0,183
		N	115
Intentional Communities	G9	Correlation coefficient	-0,114
		Sig.	0,14
		N	169
International meetings	G10	Correlation coefficient	,325
		Sig.	0,001
		N	108
Personal trust	G11	Correlation coefficient	-0,055

		Sig.	0,682
		N	58
Population	X1	Correlation coefficient	-0,096
		Sig.	0,235
		N	156
Economic wealth	Y1	Correlation coefficient	-,173
		Sig.	0,025
		N	168
Surface of the city	Z1	Correlation coefficient	0,137
		Sig.	0,086
		N	159

8.5.3. APPENDIX 5.3.: SYSTEM INNOVATION

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,005
		Sig.	0,98
		N	31
Open-source and sharing culture	B1	Correlation coefficient	0,284
		Sig.	0,239
		N	19
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,478
		Sig.	0,013
		N	26
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-,514
		Sig.	0,007
		N	26
Creative class index	B4	Correlation coefficient	0,098
		Sig.	0,632
		N	26
Hipster index	B5	Correlation coefficient	0,281
		Sig.	0,217
		N	21
Cooperative culture	C1	Correlation coefficient	0,208
		Sig.	0,307
		N	26
Innovative cooperation	C2	Correlation coefficient	-0,147
		Sig.	0,438
		N	30
Technological specialization	C3	Correlation coefficient	0,237
		Sig.	0,225
		N	28
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,352
		Sig.	0,066
		N	28
Foreign controlled firms	C5	Correlation coefficient	-0,175
		Sig.	0,356
		N	30
Employment dispersion	C6	Correlation coefficient	0,147
		Sig.	0,437
		N	30
Creative jobs	C7	Correlation coefficient	-0,116
		Sig.	0,573
		N	26
Scientific pipelines	D1	Correlation coefficient	-0,069
		Sig.	0,726
		N	28
Patents	D3	Correlation coefficient	0,235
		Sig.	0,248
		N	26
Knowledge exchange among actors	D4	Correlation coefficient	0,198
		Sig.	0,333
		N	26
Co-publications	D5	Correlation coefficient	-0,041
		Sig.	0,866
		N	19
Co-authored patents	D6	Correlation coefficient	-,509
		Sig.	0,008
		N	26
	E1	Correlation coefficient	0,345
		Sig.	0,099

Impact of knowledge production to cross-regional mobility		N	24
Adult learning	E2	Correlation coefficient	0,146
		Sig.	0,476
		N	26
Citations of patents	E3	Correlation coefficient	-0,023
		Sig.	0,911
		N	26
R&D expenditure	E4	Correlation coefficient	0,262
		Sig.	0,17
		N	29
Median age	E5	Correlation coefficient	0,073
		Sig.	0,723
		N	26
Internet access	G2	Correlation coefficient	0,092
		Sig.	0,656
		N	26
University appearance	G3	Correlation coefficient	,484
		Sig.	0,007
		N	30
University ranking	G4	Correlation coefficient	-0,148
		Sig.	0,584
		N	16
Foreign index	G5	Correlation coefficient	.
		Sig.	.
		N	3
Cultural openness	G6	Correlation coefficient	0,143
		Sig.	0,467
		N	28
Index regional green economic performance	G7	Correlation coefficient	-0,096
		Sig.	0,615
		N	30
Sustainable Cities Index	G8	Correlation coefficient	-0,276
		Sig.	0,268
		N	18
Intentional Communities	G9	Correlation coefficient	-0,028
		Sig.	0,884
		N	30
International meetings	G10	Correlation coefficient	0,367
		Sig.	0,085
		N	23
Personal trust	G11	Correlation coefficient	0,457
		Sig.	0,157
		N	11
Population	X1	Correlation coefficient	0,288
		Sig.	0,145
		N	27
Economic wealth	Y1	Correlation coefficient	0,114
		Sig.	0,549
		N	30
Surface of the city	Z1	Correlation coefficient	-0,014
		Sig.	0,941
		N	29

8.5.4. APPENDIX 5.4.: COMBINATIONAL INNOVATION TYPE

			Transferability of the experiments
Governance type	A1	Correlation coefficient	-0,034
		Sig.	0,767
		N	80
Open-source and sharing culture	B1	Correlation coefficient	0,185
		Sig.	0,229
		N	44
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,331
		Sig.	0,004
		N	75
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-,279
		Sig.	0,015
		N	75
Creative class index	B4	Correlation coefficient	,316
		Sig.	0,006

		N	74
Hipster index	B5	Correlation coefficient	0,217
		Sig.	0,118
		N	53
Cooperative culture	C1	Correlation coefficient	0,018
		Sig.	0,88
		N	75
Innovative cooperation	C2	Correlation coefficient	-0,042
		Sig.	0,72
		N	76
Technological specialization	C3	Correlation coefficient	0,052
		Sig.	0,665
		N	72
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,111
		Sig.	0,352
		N	72
Foreign controlled firms	C5	Correlation coefficient	-0,088
		Sig.	0,444
		N	78
Employment dispersion	C6	Correlation coefficient	,260
		Sig.	0,021
		N	79
Creative jobs	C7	Correlation coefficient	-0,04
		Sig.	0,735
		N	75
Scientific pipelines	D1	Correlation coefficient	-0,206
		Sig.	0,08
		N	73
Patents	D3	Correlation coefficient	,317
		Sig.	0,007
		N	72
Knowledge exchange among actors	D4	Correlation coefficient	,468
		Sig.	0
		N	75
Co-publications	D5	Correlation coefficient	0,022
		Sig.	0,876
		N	53
Co-authored patents	D6	Correlation coefficient	-0,136
		Sig.	0,268
		N	68
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	0,067
		Sig.	0,584
		N	69
Adult learning	E2	Correlation coefficient	0,176
		Sig.	0,136
		N	73
Citations of patents	E3	Correlation coefficient	-0,157
		Sig.	0,202
		N	68
R&D expenditure	E4	Correlation coefficient	0,134
		Sig.	0,256
		N	74
Median age	E5	Correlation coefficient	0,103
		Sig.	0,393
		N	71
Internet access	G2	Correlation coefficient	0,23
		Sig.	0,059
		N	68
University appearance	G3	Correlation coefficient	-0,057
		Sig.	0,618
		N	79
University ranking	G4	Correlation coefficient	-0,009
		Sig.	0,945
		N	57
Foreign index	G5	Correlation coefficient	0,074
		Sig.	0,772
		N	18
Cultural openness	G6	Correlation coefficient	0,091
		Sig.	0,459
		N	69
Index regional green economic performance	G7	Correlation coefficient	0,049
		Sig.	0,667

		N	80
Sustainable Cities Index	G8	Correlation coefficient	0,101
		Sig.	0,441
		N	60
Intentional Communities	G9	Correlation coefficient	-0,007
		Sig.	0,954
		N	79
International meetings	G10	Correlation coefficient	0,253
		Sig.	0,065
		N	54
Personal trust	G11	Correlation coefficient	0,141
		Sig.	0,502
		N	25
Population	X1	Correlation coefficient	,277
		Sig.	0,016
		N	76
Economic wealth	Y1	Correlation coefficient	-0,118
		Sig.	0,302
		N	79
Surface of the city	Z1	Correlation coefficient	-0,053
		Sig.	0,665
		N	70

8.6. APPENDIX 6: CORRELATION GOVERNANCE DIFFERENTIATION

Significant correlation in green cells.

8.6.1. APPENDIX 6.1.: GOVERNMENTAL LEAD

			Transferability of the experiments
Knowledge type	A2	Correlation coefficient	,205
		Sig.	,031
		N	111
Open-source and sharing culture	B1	Correlation coefficient	,019
		Sig.	,892
		N	52
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,076
		Sig.	,456
		N	99
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-,095
		Sig.	,347
		N	99
Creative class index	B4	Correlation coefficient	-,041
		Sig.	,704
		N	88
Hipster index	B5	Correlation coefficient	,205
		Sig.	,081
		N	73
Cooperative culture	C1	Correlation coefficient	,084
		Sig.	,409
		N	99
Innovative cooperation	C2	Correlation coefficient	-,039
		Sig.	,696
		N	102
Technological specialization	C3	Correlation coefficient	-,099
		Sig.	,318
		N	103
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	-,022
		Sig.	,821
		N	104
Foreign controlled firms	C5	Correlation coefficient	-,130
		Sig.	,177
		N	109
Employment dispersion	C6	Correlation coefficient	,021
		Sig.	,830
		N	111
Creative jobs	C7	Correlation coefficient	,018
		Sig.	,863
		N	98
Scientific pipelines	D1	Correlation coefficient	-,211
		Sig.	,031
		N	104
Patents	D3	Correlation coefficient	,122
		Sig.	,273
		N	82
Knowledge exchange among actors	D4	Correlation coefficient	,102
		Sig.	,314
		N	99
Co-publications	D5	Correlation coefficient	,028
		Sig.	,823
		N	67
Co-authored patents	D6	Correlation coefficient	-,157
		Sig.	,129
		N	95
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-,073
		Sig.	,502
		N	86
Adult learning	E2	Correlation coefficient	,011
		Sig.	,913
		N	94
Citations of patents	E3	Correlation coefficient	-,056
		Sig.	,607
		N	88
R&D expenditure	E4	Correlation coefficient	,021
		Sig.	,829

		N	106
Median age	E5	Correlation coefficient	,115
		Sig.	,268
		N	94
Internet access	G2	Correlation coefficient	-,088
		Sig.	,389
		N	98
University appearance	G3	Correlation coefficient	,263
		Sig.	,005
		N	110
University ranking	G4	Correlation coefficient	-,001
		Sig.	,993
		N	57
Foreign index	G5	Correlation coefficient	,254
		Sig.	,361
		N	15
Cultural openness	G6	Correlation coefficient	-,100
		Sig.	,321
		N	101
Index regional green economic performance	G7	Correlation coefficient	-,054
		Sig.	,582
		N	106
Sustainable Cities Index	G8	Correlation coefficient	-,093
		Sig.	,429
		N	75
Intentional Communities	G9	Correlation coefficient	-,186
		Sig.	,051
		N	111
International meetings	G10	Correlation coefficient	,364
		Sig.	,002
		N	70
Personal trust	G11	Correlation coefficient	,059
		Sig.	,734
		N	36
Population	X1	Correlation coefficient	,171
		Sig.	,088
		N	101
Economic wealth	Y1	Correlation coefficient	-,065
		Sig.	,503
		N	109
Surface of the city	Z1	Correlation coefficient	,167
		Sig.	,087
		N	106

8.6.2. APPENDIX 6.2.: NON-GOVERNMENTAL LEAD

			Transferability of the experiments
Knowledge type	A2	Correlation coefficient	,143
		Sig.	,104
		N	130
Open-source and sharing culture	B1	Correlation coefficient	,139
		Sig.	,303
		N	57
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,063
		Sig.	,497
		N	118
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	,011
		Sig.	,908
		N	118
Creative class index	B4	Correlation coefficient	,325
		Sig.	,000
		N	114
Hipster index	B5	Correlation coefficient	,073
		Sig.	,529
		N	77
Cooperative culture	C1	Correlation coefficient	,096
		Sig.	,307
		N	115
Innovative cooperation	C2	Correlation coefficient	,124
		Sig.	,168
		N	125

Technological specialization	C3	Correlation coefficient	,113
		Sig.	,203
		N	128
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	,181
		Sig.	,040
		N	129
Foreign controlled firms	C5	Correlation coefficient	,015
		Sig.	,866
		N	130
Employment dispersion	C6	Correlation coefficient	,060
		Sig.	,496
		N	132
Creative jobs	C7	Correlation coefficient	-,094
		Sig.	,312
		N	117
Scientific pipelines	D1	Correlation coefficient	-,083
		Sig.	,346
		N	130
Patents	D3	Correlation coefficient	,251
		Sig.	,008
		N	112
Knowledge exchange among actors	D4	Correlation coefficient	,304
		Sig.	,001
		N	118
Co-publications	D5	Correlation coefficient	-,030
		Sig.	,783
		N	86
Co-authored patents	D6	Correlation coefficient	-,049
		Sig.	,625
		N	104
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-,077
		Sig.	,456
		N	97
Adult learning	E2	Correlation coefficient	,134
		Sig.	,153
		N	115
Citations of patents	E3	Correlation coefficient	,179
		Sig.	,070
		N	103
R&D expenditure	E4	Correlation coefficient	,047
		Sig.	,593
		N	130
Median age	E5	Correlation coefficient	,007
		Sig.	,937
		N	115
Internet access	G2	Correlation coefficient	,350
		Sig.	,000
		N	109
University appearance	G3	Correlation coefficient	-,059
		Sig.	,506
		N	130
University ranking	G4	Correlation coefficient	,071
		Sig.	,524
		N	82
Foreign index	G5	Correlation coefficient	,114
		Sig.	,664
		N	17
Cultural openness	G6	Correlation coefficient	,121
		Sig.	,186
		N	122
Index regional green economic performance	G7	Correlation coefficient	,025
		Sig.	,781
		N	131
Sustainable Cities Index	G8	Correlation coefficient	,028
		Sig.	,795
		N	87
Intentional Communities	G9	Correlation coefficient	-,014
		Sig.	,876
		N	132
International meetings	G10	Correlation coefficient	,172
		Sig.	,116
		N	85
Personal trust	G11	Correlation coefficient	,311

		Sig.	,038
		N	45
Population	X1	Correlation coefficient	,054
		Sig.	,559
		N	120
Economic wealth	Y1	Correlation coefficient	-,100
		Sig.	,258
		N	129
Surface of the city	Z1	Correlation coefficient	-,041
		Sig.	,664
		N	117

8.6.3. APPENDIX 6.3.: HYBRID

			Transferability of the experiments
Knowledge type	A2	Correlation coefficient	,198
		Sig.	,003
		N	228
Open-source and sharing culture	B1	Correlation coefficient	,042
		Sig.	,637
		N	129
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,251
		Sig.	,000
		N	203
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-,225
		Sig.	,001
		N	203
Creative class index	B4	Correlation coefficient	,225
		Sig.	,001
		N	206
Hipster index	B5	Correlation coefficient	,332
		Sig.	,000
		N	149
Cooperative culture	C1	Correlation coefficient	,064
		Sig.	,364
		N	201
Innovative cooperation	C2	Correlation coefficient	,032
		Sig.	,640
		N	217
Technological specialization	C3	Correlation coefficient	,116
		Sig.	,092
		N	211
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	,180
		Sig.	,009
		N	212
Foreign controlled firms	C5	Correlation coefficient	-,038
		Sig.	,574
		N	223
Employment dispersion	C6	Correlation coefficient	,184
		Sig.	,006
		N	226
Creative jobs	C7	Correlation coefficient	-,042
		Sig.	,556
		N	202
Scientific pipelines	D1	Correlation coefficient	-,208
		Sig.	,002
		N	214
Patents	D3	Correlation coefficient	,217
		Sig.	,003
		N	189
Knowledge exchange among actors	D4	Correlation coefficient	,347
		Sig.	,000
		N	203
Co-publications	D5	Correlation coefficient	,188
		Sig.	,021
		N	150
Co-authored patents	D6	Correlation coefficient	-,172
		Sig.	,018
		N	191
	E1	Correlation coefficient	,070
		Sig.	,341

Impact of knowledge production to cross-regional mobility		N	187
Adult learning	E2	Correlation coefficient	,293
		Sig.	,000
		N	203
Citations of patents	E3	Correlation coefficient	,162
		Sig.	,025
		N	190
R&D expenditure	E4	Correlation coefficient	,208
		Sig.	,002
		N	214
Median age	E5	Correlation coefficient	-,045
		Sig.	,526
		N	200
Internet access	G2	Correlation coefficient	,190
		Sig.	,007
		N	201
University appearance	G3	Correlation coefficient	-,003
		Sig.	,961
		N	223
University ranking	G4	Correlation coefficient	,284
		Sig.	,002
		N	119
Foreign index	G5	Correlation coefficient	,053
		Sig.	,735
		N	44
Cultural openness	G6	Correlation coefficient	,095
		Sig.	,173
		N	208
Index regional green economic performance	G7	Correlation coefficient	,224
		Sig.	,001
		N	225
Sustainable Cities Index	G8	Correlation coefficient	,048
		Sig.	,537
		N	170
Intentional Communities	G9	Correlation coefficient	-,070
		Sig.	,292
		N	226
International meetings	G10	Correlation coefficient	,164
		Sig.	,044
		N	151
Personal trust	G11	Correlation coefficient	,171
		Sig.	,106
		N	90
Population	X1	Correlation coefficient	,115
		Sig.	,100
		N	205
Economic wealth	Y1	Correlation coefficient	-,078
		Sig.	,245
		N	222
Surface of the city	Z1	Correlation coefficient	,220
		Sig.	,001
		N	211

8.7. APPENDIX 7: HABITAT CORRELATION

Significant correlation in green cells.

8.7.1. APPENDIX 7.1: VALLEY HABITAT

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,135
		Sig.	0,329
		N	54
Knowledge type	A2	Correlation coefficient	0,083
		Sig.	0,55
		N	54
Open-source and sharing culture	B1	Correlation coefficient	0,141
		Sig.	0,484
		N	27
Counterculture of young people who are open to innovation	B2	Correlation coefficient	-0,002
		Sig.	0,988
		N	50
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-0,038
		Sig.	0,792
		N	50
Creative class index	B4	Correlation coefficient	-0,114
		Sig.	0,476
		N	41
Hipster index	B5	Correlation coefficient	0,284
		Sig.	0,089
		N	37
Cooperative culture	C1	Correlation coefficient	0,09
		Sig.	0,534
		N	50
Innovative cooperation	C2	Correlation coefficient	0,048
		Sig.	0,742
		N	49
Technological specialization	C3	Correlation coefficient	-0,056
		Sig.	0,693
		N	52
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	-0,218
		Sig.	0,121
		N	52
Foreign controlled firms	C5	Correlation coefficient	-0,113
		Sig.	0,422
		N	53
Employment dispersion	C6	Correlation coefficient	-0,092
		Sig.	0,509
		N	54
Creative jobs	C7	Correlation coefficient	-0,103
		Sig.	0,481
		N	49
Scientific pipelines	D1	Correlation coefficient	-0,109
		Sig.	0,448
		N	51
Patents	D3	Correlation coefficient	-0,15
		Sig.	0,362
		N	39
Knowledge exchange among actors	D4	Correlation coefficient	-0,01
		Sig.	0,943
		N	50
Co-publications	D5	Correlation coefficient	0,31
		Sig.	0,084
		N	32
Co-authored patents	D6	Correlation coefficient	-0,018
		Sig.	0,901
		N	49
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-0,127
		Sig.	0,43
		N	41
Adult learning	E2	Correlation coefficient	0,2
		Sig.	0,192
		N	44
Citations of patents	E3	Correlation coefficient	-0,022

		Sig.	0,886
		N	46
R&D expenditure	E4	Correlation coefficient	-0,028
		Sig.	0,841
		N	53
Median age	E5	Correlation coefficient	0,115
		Sig.	0,451
		N	45
Internet access	G2	Correlation coefficient	-0,164
		Sig.	0,264
		N	48
University appearance	G3	Correlation coefficient	0,305
		Sig.	0,026
		N	53
University ranking	G4	Correlation coefficient	-0,089
		Sig.	0,646
		N	29
Foreign index	G5	Correlation coefficient	0,606
		Sig.	0,048
		N	11
Cultural openness	G6	Correlation coefficient	0,093
		Sig.	0,523
		N	49
Index regional green economic performance	G7	Correlation coefficient	0,18
		Sig.	0,197
		N	53
Sustainable Cities Index	G8	Correlation coefficient	0,09
		Sig.	0,59
		N	38
Intentional Communities	G9	Correlation coefficient	-0,194
		Sig.	0,16
		N	54
International meetings	G10	Correlation coefficient	0,42
		Sig.	0,013
		N	34
Personal trust	G11	Correlation coefficient	0,26
		Sig.	0,282
		N	19
Population	X1	Correlation coefficient	0,295
		Sig.	0,042
		N	48
Economic wealth	Y1	Correlation coefficient	0,265
		Sig.	0,058
		N	52
Surface of the city	Z1	Correlation coefficient	0,155
		Sig.	0,278
		N	51

8.7.2. APPENDIX 7.2.: MAKERSPACE HABITAT

			Transferability of the experiments
Governance type	A1	Correlation coefficient	-0,196
		Sig.	0,148
		N	56
Knowledge type	A2	Correlation coefficient	0,058
		Sig.	0,669
		N	56
Open-source and sharing culture	B1	Correlation coefficient	0,325
		Sig.	0,121
		N	24
Counterculture of young people who are open to innovation	B2	Correlation coefficient	0,167
		Sig.	0,247
		N	50
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	0,039
		Sig.	0,79
		N	50
Creative class index	B4	Correlation coefficient	0,368
		Sig.	0,01
		N	48
Hipster index	B5	Correlation coefficient	-0,132
		Sig.	0,471
		N	32

Cooperative culture	C1	Correlation coefficient	0,021
		Sig.	0,888
		N	49
Innovative cooperation	C2	Correlation coefficient	0,003
		Sig.	0,982
		N	51
Technological specialization	C3	Correlation coefficient	0,151
		Sig.	0,271
		N	55
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,131
		Sig.	0,34
		N	55
Foreign controlled firms	C5	Correlation coefficient	0,005
		Sig.	0,972
		N	55
Employment dispersion	C6	Correlation coefficient	0,182
		Sig.	0,178
		N	56
Creative jobs	C7	Correlation coefficient	-0,161
		Sig.	0,27
		N	49
Scientific pipelines	D1	Correlation coefficient	-0,015
		Sig.	0,913
		N	55
Patents	D3	Correlation coefficient	-0,191
		Sig.	0,221
		N	43
Knowledge exchange among actors	D4	Correlation coefficient	0,29
		Sig.	0,041
		N	50
Co-publications	D5	Correlation coefficient	-0,174
		Sig.	0,34
		N	32
Co-authored patents	D6	Correlation coefficient	0,001
		Sig.	0,996
		N	46
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	0,015
		Sig.	0,927
		N	40
Adult learning	E2	Correlation coefficient	0,068
		Sig.	0,648
		N	48
Citations of patents	E3	Correlation coefficient	0,353
		Sig.	0,019
		N	44
R&D expenditure	E4	Correlation coefficient	-0,138
		Sig.	0,315
		N	55
Median age	E5	Correlation coefficient	0,097
		Sig.	0,507
		N	49
Internet access	G2	Correlation coefficient	0,357
		Sig.	0,016
		N	45
University appearance	G3	Correlation coefficient	-0,146
		Sig.	0,292
		N	54
University ranking	G4	Correlation coefficient	0,17
		Sig.	0,308
		N	38
Foreign index	G5	Correlation coefficient	0,322
		Sig.	0,398
		N	9
Cultural openness	G6	Correlation coefficient	0,103
		Sig.	0,473
		N	51
Index regional green economic performance	G7	Correlation coefficient	0,133
		Sig.	0,327
		N	56
Sustainable Cities Index	G8	Correlation coefficient	0,039
		Sig.	0,817
		N	38

Intentional Communities	G9	Correlation coefficient	0,07
		Sig.	0,607
		N	56
International meetings	G10	Correlation coefficient	-0,107
		Sig.	0,536
		N	36
Personal trust	G11	Correlation coefficient	0,457
		Sig.	0,028
		N	23
Population	X1	Correlation coefficient	0,042
		Sig.	0,776
		N	48
Economic wealth	Y1	Correlation coefficient	-0,143
		Sig.	0,306
		N	53
Surface of the city	Z1	Correlation coefficient	-0,086
		Sig.	0,548
		N	51

8.7.3. APPENDIX 7.3.: MIDDLEGROUND HABITAT

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,092
		Sig.	0,594
		N	36
Knowledge type	A2	Correlation coefficient	0,119
		Sig.	0,488
		N	36
Open-source and sharing culture	B1	Correlation coefficient	-0,382
		Sig.	0,16
		N	15
Counterculture of young people who are open to innovation	B2	Correlation coefficient	0,036
		Sig.	0,857
		N	28
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-0,022
		Sig.	0,913
		N	28
Creative class index	B4	Correlation coefficient	-0,131
		Sig.	0,506
		N	28
Hipster index	B5	Correlation coefficient	0,199
		Sig.	0,374
		N	22
Cooperative culture	C1	Correlation coefficient	-0,188
		Sig.	0,339
		N	28
Innovative cooperation	C2	Correlation coefficient	-0,086
		Sig.	0,635
		N	33
Technological specialization	C3	Correlation coefficient	-0,225
		Sig.	0,193
		N	35
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,2
		Sig.	0,242
		N	36
Foreign controlled firms	C5	Correlation coefficient	-0,092
		Sig.	0,594
		N	36
Employment dispersion	C6	Correlation coefficient	0,227
		Sig.	0,184
		N	36
Creative jobs	C7	Correlation coefficient	-0,05
		Sig.	0,801
		N	28
Scientific pipelines	D1	Correlation coefficient	-0,38
		Sig.	0,022
		N	36
Patents	D3	Correlation coefficient	0,198
		Sig.	0,312
		N	28
	D4	Correlation coefficient	0,241

Knowledge exchange among actors		Sig.	0,217
		N	28
Co-publications	D5	Correlation coefficient	-0,147
		Sig.	0,504
		N	23
Co-authored patents	D6	Correlation coefficient	-0,134
		Sig.	0,514
		N	26
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-0,142
		Sig.	0,472
		N	28
Adult learning	E2	Correlation coefficient	-0,077
		Sig.	0,671
		N	33
Citations of patents	E3	Correlation coefficient	0,065
		Sig.	0,768
		N	23
R&D expenditure	E4	Correlation coefficient	0,124
		Sig.	0,471
		N	36
Median age	E5	Correlation coefficient	0,141
		Sig.	0,435
		N	33
Internet access	G2	Correlation coefficient	0,144
		Sig.	0,415
		N	34
University appearance	G3	Correlation coefficient	0,2
		Sig.	0,243
		N	36
University ranking	G4	Correlation coefficient	0,196
		Sig.	0,452
		N	17
Foreign index	G5	Correlation coefficient	-1
		Sig.	0
		N	3
Cultural openness	G6	Correlation coefficient	-0,168
		Sig.	0,359
		N	32
Index regional green economic performance	G7	Correlation coefficient	-0,178
		Sig.	0,322
		N	33
Sustainable Cities Index	G8	Correlation coefficient	-0,096
		Sig.	0,662
		N	23
Intentional Communities	G9	Correlation coefficient	-0,274
		Sig.	0,105
		N	36
International meetings	G10	Correlation coefficient	0,07
		Sig.	0,752
		N	23
Personal trust	G11	Correlation coefficient	-0,093
		Sig.	0,786
		N	11
Population	X1	Correlation coefficient	-0,027
		Sig.	0,882
		N	32
Economic wealth	Y1	Correlation coefficient	-0,409
		Sig.	0,013
		N	36
Surface of the city	Z1	Correlation coefficient	0,229
		Sig.	0,186
		N	35

8.7.4. APPENDIX 7.4.: DO-IT-OURSELVES HABITAT

			Transferability of the experiments
Governance type	A1	Correlation coefficient	0,039
		Sig.	0,794
		N	47
Knowledge type	A2	Correlation coefficient	-0,104
		Sig.	0,486
		N	47

Open-source and sharing culture	B1	Correlation coefficient	-0,216
		Sig.	0,312
		N	24
Counterculture of young people who are open to innovation	B2	Correlation coefficient	-0,092
		Sig.	0,558
		N	43
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	0,123
		Sig.	0,433
		N	43
Creative class index	B4	Correlation coefficient	0,344
		Sig.	0,034
		N	38
Hipster index	B5	Correlation coefficient	0,535
		Sig.	0,003
		N	29
Cooperative culture	C1	Correlation coefficient	0,284
		Sig.	0,072
		N	41
Innovative cooperation	C2	Correlation coefficient	0,179
		Sig.	0,23
		N	47
Technological specialization	C3	Correlation coefficient	0,231
		Sig.	0,127
		N	45
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	0,268
		Sig.	0,072
		N	46
Foreign controlled firms	C5	Correlation coefficient	0,186
		Sig.	0,21
		N	47
Employment dispersion	C6	Correlation coefficient	-0,22
		Sig.	0,137
		N	47
Creative jobs	C7	Correlation coefficient	0,064
		Sig.	0,686
		N	43
Scientific pipelines	D1	Correlation coefficient	-0,197
		Sig.	0,189
		N	46
Patents	D3	Correlation coefficient	0,08
		Sig.	0,623
		N	40
Knowledge exchange among actors	D4	Correlation coefficient	0,185
		Sig.	0,235
		N	43
Co-publications	D5	Correlation coefficient	0,126
		Sig.	0,457
		N	37
Co-authored patents	D6	Correlation coefficient	-0,171
		Sig.	0,319
		N	36
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-0,236
		Sig.	0,166
		N	36
Adult learning	E2	Correlation coefficient	0,315
		Sig.	0,045
		N	41
Citations of patents	E3	Correlation coefficient	-0,092
		Sig.	0,583
		N	38
R&D expenditure	E4	Correlation coefficient	0,086
		Sig.	0,571
		N	46
Median age	E5	Correlation coefficient	-0,262
		Sig.	0,098
		N	41
Internet access	G2	Correlation coefficient	0,185
		Sig.	0,258
		N	39
University appearance	G3	Correlation coefficient	-0,082
		Sig.	0,586
		N	47

University ranking	G4	Correlation coefficient	0,133
		Sig.	0,535
		N	24
Foreign index	G5	Correlation coefficient	.
		Sig.	0
		N	4
Cultural openness	G6	Correlation coefficient	0,096
		Sig.	0,524
		N	46
Index regional green economic performance	G7	Correlation coefficient	0,096
		Sig.	0,524
		N	46
Sustainable Cities Index	G8	Correlation coefficient	-0,03
		Sig.	0,872
		N	31
Intentional Communities	G9	Correlation coefficient	-0,029
		Sig.	0,846
		N	47
International meetings	G10	Correlation coefficient	0,288
		Sig.	0,122
		N	30
Personal trust	G11	Correlation coefficient	0,185
		Sig.	0,585
		N	11
Population	X1	Correlation coefficient	0,119
		Sig.	0,435
		N	45
Economic wealth	Y1	Correlation coefficient	-0,071
		Sig.	0,637
		N	47
Surface of the city	Z1	Correlation coefficient	-0,239
		Sig.	0,132
		N	41

8.8. APPENDIX 8: GENERIC SET OF REGIONAL CONTEXT FACTORS

Significant correlation in green cells.

			Transferability of the experiments
Governance type	A1	Correlation coefficient	,078
		Sig.	,090
		N	471
Knowledge type	A2	Correlation coefficient	,184
		Sig.	,000
		N	469
Open-source and sharing culture	B1	Correlation coefficient	,075
		Sig.	,248
		N	238
Counterculture of young people who are open to innovation	B2	Correlation coefficient	,144
		Sig.	,003
		N	420
Counterculture of alternative lifestyles, with a role for creatives	B3	Correlation coefficient	-,126
		Sig.	,010
		N	420
Creative class index	B4	Correlation coefficient	,188
		Sig.	,000
		N	408
Hipster index	B5	Correlation coefficient	,241
		Sig.	,000
		N	299
Cooperative culture	C1	Correlation coefficient	,080
		Sig.	,105
		N	415
Innovative cooperation	C2	Correlation coefficient	,038
		Sig.	,428
		N	444
Technological specialization	C3	Correlation coefficient	,054
		Sig.	,261
		N	442
Employment in technology and knowledge-intensive sectors	C4	Correlation coefficient	,128
		Sig.	,007
		N	445
Foreign controlled firms	C5	Correlation coefficient	-,037
		Sig.	,431
		N	462
Employment dispersion	C6	Correlation coefficient	,115
		Sig.	,013
		N	469
Creative jobs	C7	Correlation coefficient	-,050
		Sig.	,313
		N	417
Scientific pipelines	D1	Correlation coefficient	-,176
		Sig.	,000
		N	448
Patents	D3	Correlation coefficient	,214
		Sig.	,000
		N	383
Knowledge exchange among actors	D4	Correlation coefficient	,280
		Sig.	,000
		N	420
Co-publications	D5	Correlation coefficient	,085
		Sig.	,140
		N	303
Co-authored patents	D6	Correlation coefficient	-,132
		Sig.	,009
		N	390
Impact of knowledge production to cross-regional mobility	E1	Correlation coefficient	-,008
		Sig.	,876
		N	370
Adult learning	E2	Correlation coefficient	,181
		Sig.	,000
		N	412
Citations of patents	E3	Correlation coefficient	,106
		Sig.	,039

		N	381
R&D expenditure	E4	Correlation coefficient	,114
		Sig.	,016
		N	450
Median age	E5	Correlation coefficient	,004
		Sig.	,928
		N	409
Internet access	G2	Correlation coefficient	,171
		Sig.	,001
		N	408
University appearance	G3	Correlation coefficient	,060
		Sig.	,195
		N	463
University ranking	G4	Correlation coefficient	,144
		Sig.	,021
		N	258
Foreign index	G5	Correlation coefficient	,146
		Sig.	,208
		N	76
Cultural openness	G6	Correlation coefficient	,060
		Sig.	,211
		N	431
Index regional green economic performance	G7	Correlation coefficient	,099
		Sig.	,034
		N	462
Sustainable Cities Index	G8	Correlation coefficient	,011
		Sig.	,847
		N	332
Intentional Communities	G9	Correlation coefficient	-,093
		Sig.	,044
		N	469
International meetings	G10	Correlation coefficient	,228
		Sig.	,000
		N	306
Personal trust	G11	Correlation coefficient	,170
		Sig.	,026
		N	171
Population	X1	Correlation coefficient	,109
		Sig.	,025
		N	426
Economic wealth	Y1	Correlation coefficient	-,075
		Sig.	,106
		N	460
Surface of the city	Z1	Correlation coefficient	,131
		Sig.	,006
		N	434