

Analysis of the vision exercise

Analyzing Individual reflections

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Towards a materials transition
that phases out fossil feedstock

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1. Introduction

The Investment Theme organizes bi-annual Community Meeting. At the 2nd Community Meeting on the 8th of November 2022, a vision exercise was conducted. The vision exercise consisted of three parts, 1) individual reflection, 2) group discussion, 3) plenary feedback. In this document, the individual reflection is analyzed.

For the individual reflection, worksheets were provided that contained a list of questions. The worksheet can be found in ANNEX I. Wouter Post facilitated the vision exercise, explaining the different tasks ahead and keeping track of time.

2. Method

All written documents are digitalized and anonymized. This means that the filled-in worksheets from the 2nd Community Meeting are typed out without including personal identification data, such as names. Each worksheet received a number. The numbering is randomized and does not follow a logic that would allow tracing the identity of a participant. Thus, digital files do not contain any information that could trace a participant's identity.

When information was illegible, three Asterix on a yellow background were added. The data has only been transcribed by Katharina Biely. Thus, the transcripts have not been checked by a second person. This might translate to transcription errors.

After transcription, files were saved using the worksheet number as the filename. These files were then fed into the software Atlas.ti. This software helps to organize qualitative data analysis as it allows to, for example, tag and code text chunks.

To analyze the data, open and closed coding is used (Glaser & Strauss, 1999). Closed codes refer to terms and concepts predefined by the Investment Theme, such as *pathway* or *domain*. Open codes are applied to identify other reoccurring themes that were not predefined before the analysis. Such codes are *awareness*, *sufficiency*, or *value*. The complete code book can be found in ANNEX II.

Open codes were developed in an iterative manner. Thus, codes were added to the code book when certain themes reappeared. Hence, the data was checked twice to make sure all new codes are coherently covered in the text. The aim was to limit codes to a minimum. However, if necessary new codes were added. For example, in the beginning, the code “recycling” also covered “waste.” Though, after some time, it became clear that waste was also mentioned repeatedly without being connected to recycling. Therefore, a code “waste” was created.

3. Data description

28 people handed their worksheets in. The worksheets have three parts a) dreaming, b) grounding, c) connecting. In total, the worksheet provides ten questions. Table 1 provides an overview of the question structure. The dreaming part contained only one open-ended question. This question could be answered in two ways; 1) a textual description and / or 2) a visual description of one's dream. The grounding part was the most extensive part, containing 6 questions. One of these questions was a closed question providing four answer possibilities (question 2.4). Question 2.3 was also intended to be a closed question. However, it has not been interpreted as such. This will be further elaborated on below. All other questions were open-ended questions, however, three questions (2.5, 2.6, 3.1) asked to provide three examples. Thus, they were limited in what answer should be provided by the participant.

Table 1: Question overview

Section	Dreaming						Grounding				Connecting		
	1	2	3	4	5	6	7	8	9	10			
Type	Open	Open	Open	Domain	Pathway	Semi-open	Semi-Open	Semi-open	Open	Open			
Sheet #	1.1	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3			

Participants got an introduction to the task and had 20 minutes to fill the worksheet in. The complete worksheet also contained detailed descriptions (see ANNEX I). Due to time constraints, only five participants managed to get to the final question (see Table 2). The cut-off is the last question of the grounding block. 28,57% of participants managed to reach the end of the grounding section. This means that substantial information about how to support collaboration could not be collected. Since the Investment Theme specifically aims at supporting collaboration, not collecting much data in the third part of the worksheet is a drawback that needs to be considered for future data collection endeavors. A more detailed overview of answered questions can be found in Table 3.

Table 2: worksheet completion

* rounded to two digits

Number of questions answered	Number of worksheets	% of worksheets*
4	4	14,29
5	0	0
6	3	10,71
7	8	28,57
8	3	10,71
9	5	17,86
10	5	17,86

Table 3: Response overview

Sheet#	Dreaming	Grounding						Connecting		
				Dom.	Path.					
1	x	x	X	x	x	x	x	x	x	
2	x	x	X	x	x	x	x			

3	x	x	X	x	x	x	x			
4	x	x	X	x	x	x	x	x	x	x
5	x	x	x	x	x	x	x	x		
6	x	x	x			x				
7	x	x	x	x	x	x	x			
8	x	x	x	x	x	x	x			
9	x	x	x			x				
10	x	x	x	x	x	x	x	x	x	x
11	x	x	x	x	x	x	x	x		
12	x	x	x	x	x	x	x	x	x	
13	x	x	x	x	x	x	x			
14	x	x	x	x	x	x	x	x	x	x
15	x	x	x		x	x	x			
16	x	x	x	x	x	x	x	x	x	x
17	x	x	x	x	x	x	x			
18	x	x	x	x	x	x				
19	x	x	x	x	x	x	x	x	x	
20	x	x	x	x	x	x	x	x	x	x
21	x	x	x	x	x	x	x	x	x	
22	x	x	x	x	x	x	x	x		
23	x	x	x	x	x	x	x			
24	x	x	x	x	x	x	x			
25	x	x	x		x	x	x			
26	x	x	x	x	x	x	x	x	x	
27	x	x			x	x				
28	x	x		x	x					
count	28	28	26	23	26	27	23	13	10	5

The remainder of this report provides a deep dive into the collected data. First the collected data pertaining to the domain and the pathways will be outlined. Then the dream section will be analyzed. The pathways and domain questions are part of section two (grounding) of the worksheet. However, since they are of vital importance for the Investment Theme, they are presented first (see Sections 4 and 5)

4. Domain

The Investment Theme focuses on two domains, Textiles and Building Materials. To get an overview of the distribution of work aligning with either of the two domains, participants were asked to state to which domain their work fits. These insights can be used to steer activities of the Investment Theme in the upcoming years.

Only seven (of 28) participants indicated one or two of the Investment Theme domains (see Table 4). 12 participants provided an alternative domain (see Table 5). Although a presentation was provided at the beginning of the 2nd Community Day about the Investment Theme structure, and although all participants should know that the Investment Theme focuses on the two domains, most participants did not connect question 2.3 to the Investment Theme domains. It might be noteworthy that also participants close to the Investment Theme (being in a leading position) could not always state that they are part of one domain. **This indicates that question 2.3 needs to be specified if used in the future¹. It also indicates that the communication efforts of the Investment Theme have not been sufficient or clear enough.**

Of those who indicate either or both of the Investment Theme domains, five identified their work with Textiles and six with Building Materials. Though out of these four indicated that their work relates to both domains. **Hence a strict delineation of work fitting to either one of the domains might be difficult.**

Table 4: Domains – respondents identify their work as being related to

Sheet#	Domain		
	Textile	Building Materials	Other
1			x
2			x
3			x
4			
5			x
6			
7			x
8	X	x	
9			
10			x
11	X		
12			
13		x	
14			x
15			
16		x	
17			
18			x

¹ It has to be pointed out that it has been indicated in a comment that the domains should be added to the question, to avoid confusion.

19	x	x	
20			
21	x	x	
22			x
23			x
24	x	x	
25			
26			x
27			
28			x
count	5	6	12

12 participants provided an alternative answer to question 2.3. Table 5 provides an overview of the alternatives indicated on the worksheets. These 12 answers have been further categorized. Four would fit to biobased domains, three are crosscutting, four have an economics orientation (business or consumer), and two are connected to psychology. Two could not be further categorized, though it can be argued that complex systems thinking fits to crosscutting issues. An interesting observation is that two indicated their work would fit to the Proof of Principle Flagship. Wildcard research projects of 2022 had to be assigned to either the Methodological Innovation or to the Proof of Principle Flagship. It can be assumed that these two responses reflect affiliation of specific Wildcards. **In any case these responses further emphasize that the Investment Theme program structure needs to be presented more clearly to avoid a confusion of domains, flagships and pathways.**

Transformative Bio-economies: Proof of concept cases and gaps

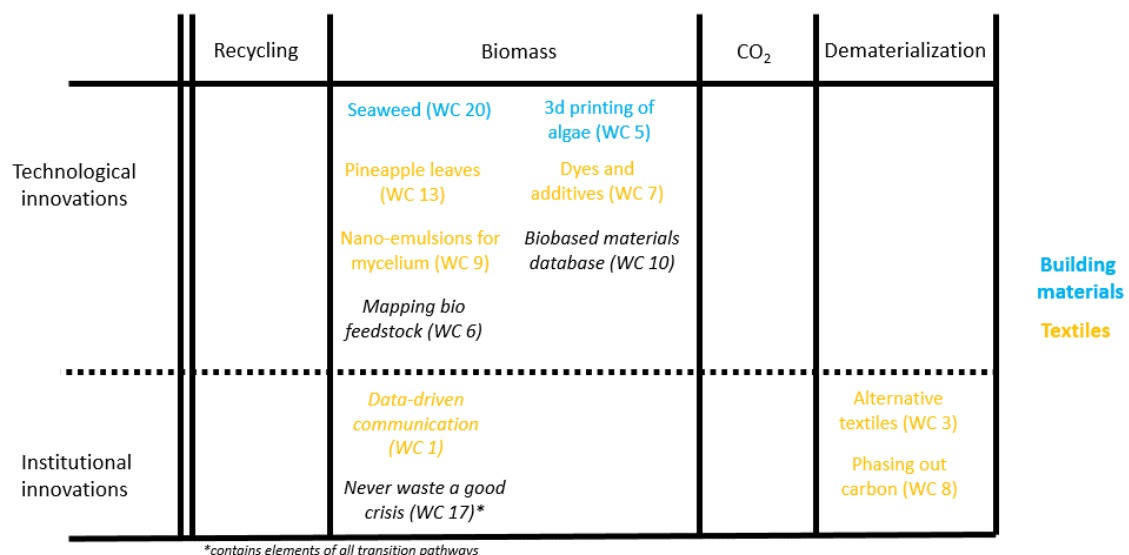


Figure 1: Gap Analysis by Wouter Post 2022

The provided responses reflect the relatively strong representation of the biobased pathway. This has been identified in an earlier analysis of the 2022 Wildcard Projects (see

Figure 1). This has been an internal analysis conducted by Wouter Post, lead of the Proof of Principle Investment Theme Flagship². In the remainder of the text, this analysis will be referred to as “gap analysis.” **Table 5 also indicates a relatively strong business and consumer science orientation** of researchers participating in the 2nd Community Meeting. Finally, interdisciplinarity seems to be rather common. Three respondents indicated that their work is crosscutting, and four indicated that their work fits both Investment Theme domains. **Hence at least a quarter of the participants performs interdisciplinary research.**

*Table 5: Alternative domains participants identify their work being related to (*Does not refer to a hierarchy of categories)*

Sheet#	Domain - Other	Category 1	Category 2*
5	Fractionation --> biomass biobased products	biobased	
12	Biobased sciences + sustainability	biobased	
26	Horticulture, plants	biobased	
23	Production, biobased economy, environment, engineering process, business development	biobased	business
1	Business	business	
17	Behavior science – consumer science	psychology	consumer
28	Psychology, consumer behavior, degrowth	psychology	consumer
2	interdisciplinary	crosscutting	
3	crosscutting	crosscutting	
10	Overarching	crosscutting	
14	Proof of Principle	Proof of Principle	
18	Proof of Principle	Proof of Principle	
7	Complex system thinking		
22	Innovation science		

² This flagship later merged with the Methodological Innovation Flagship

5. Pathways

The Investment Theme has identified four transition pathways relevant to the materials transition. To investigate which pathways are over- or underrepresented within the Investment Theme, question 2.4 asked participants to indicate to which of the four pathways their work relates to. Similar to question 2.3, the resulting information could be used to inform further activities of the Investment Theme.

Table 6 provides an overview of the given responses to question 2.4. Five participants either left the question blank or gave a clear no answer. One person gave a yes-no answer. **Most participants (17) identified their work as fitting to the biobased pathway.** This is an unsurprising result and fits to the results of the gap analysis (see Figure 1). The remaining results are more surprising and provide new information. According to the gap analysis, there is relatively little activity in the dematerialization pathway. However, **dematerialization has been selected by 13 participants.** It is furthermore surprising that **ten participants selected CO₂ and recycling.** The gap analysis showed that both pathways (CO₂ and recycling) are not captured by the Wildcards.

The gap analysis also combined the domains with respective pathways. Such a comparison cannot be made with the data retrieved from the worksheets. That is as only one person only selected Textiles (biobased and CO₂ pathway) and two only selected Building Materials (one selecting all pathways and one biobased and dematerialization). The other ones either selected none of the two or both domains. Looking at the categories of other domains (see Table 5) in conjunction with the indicated pathways, a pattern cannot be detected. It is, though, interesting to note that those categorized as biobased (see Table 5) are not limited to the biobased pathway. Of the four who indicated a biobased domain connection all selected the biobased pathway, but two selected additional ones. One selected all pathways, another person also selected the CO₂ pathway. The latter hint towards a definitory question pertaining to the CO₂ pathway. The CO₂ pathway can be natural or technological. Potentially someone working with plants may also include the CO₂ pathway, interpreted as a natural CO₂ capture.

The differences between the gap analysis can be explained in four ways. First, the gap analysis captures the Wildcard projects of 2022 and not all research performed within the Investment Theme. Thus, the sample is overlapping but different. Second, the gap analysis was based on external categorization, while the worksheets asked for self-categorization. Hence, there might be a difference between how others interpreted someone's work versus how one self-interprets one's own work. Further, the gap analysis used the definitions of the Investment Theme. For example, the Investment Theme strictly limits the CO₂ pathway to technical CO₂ capture and utilization. Different interpretations of pathways lead to different results pertaining to someone's work fitting to a specific pathway. Finally, self-categorization might not be limited to one specific project. The Wildcards are, however, one specific project. The worksheet asked participants to reflect on how their work contributes towards making their dream come true. "Work" might have been interpreted broader and not limited to one specific project. **Therefore, a comparison between the results of the gap analysis and the worksheets needs to be done with caution.**

Table 6: Pathways respondents identify their work as being related to
 * ~ indicates that the participant gave a yes/no answer

	Pathways
--	----------

Sheet#	Biobased	Recycling	CO ₂	Dematerialization
1	x			
2				
3	x	x		x
4	x			
5	x			
6				
7	x	x	x	x
8	x		x	
9				
10				x
11	x		x	
12	x	x	x	x
13	x			x
14	x	x	x	x
15		x		x
16	x	x	x	x
17*	~	~	~	~
18	x		x	x
19				
20				x
21	x	x	x	x
22				
23	x			
24	x	x	x	
25				x
26	x		x	
27	x	x		
28				x
Count	17	9	10	13

It has been stated that delineation of researchers' work as fitting to one of the two domains might be difficult. The same can be stated about the pathways. 79% of respondents selected multiple pathways. From these, five selected four pathways, three selected three pathways, and six selected 2 pathways. Table 7 shows the co-occurrence of pathways. The biobased pathway was ten times selected together with CO₂. This might once more indicate the connection between biobased solutions and natural CO₂ capture. These results indicate two things. **First, communication about the CO₂ pathway needs to be clear. Second a delineation between pathways might be difficult.**

Table 7: Pathway co-occurrence

	Biobased	Recycling	CO ₂	Dematerialization
Biobased	17	8	10	8
Recycling	8	9	6	7

CO₂	10	6	10	6
Dematerialization	8	7	6	13

6. Dreams

In this section, the dream part of the vision exercise will be analyzed. The analysis, as explained above, is based on grounded theory, and thus coding the provided text. In ANNEX IV, a table is provided that shows the codes per document for the dreams section of the individual reflection exercise. The table shows that the amount of data retrieved per worksheet varies greatly. That is, as some participants provided more information than others. Accordingly, some worksheets are more often used in the following analysis. Worksheet 2 contains most codes (52), followed by 27 (26), 8 (24), 25 (23), and 6 (22). Worksheet 15 had only four codes, and worksheet 16 only 6. There are even two worksheets (2, 4) that have no codes in the dream section. That is, as they did not provide text, but only images without explanation (see Figure 2 and Figure 3). Without an explanation, there is too much room for interpretation to code them. For example, Figure 3 has a transition character, as it shows two states. These states are potentially the current and the future state. The future is characterized by more nature components compared to human components. Figure 2 exhibits a state of simplicity, community, and joy. On a sunny day, two people walk along a path that is flanked by trees.

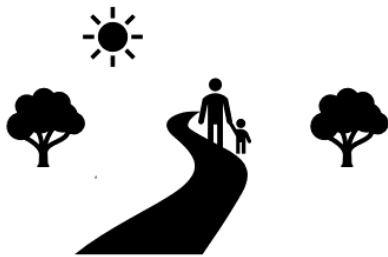


Figure 2: illustration of dream from worksheet 3

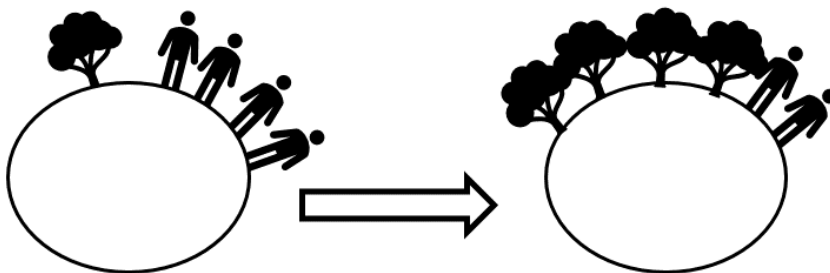


Figure 3: illustration of dream from worksheet 4

The term dream was used instead of visions to detach people's minds as much as possible from the immediate reality. Though, as the analysis shows, not every participant was able to distance oneself from that immediate reality. The purpose of the dream part was twofold. 1) it is assumed that people's actions are at least implicitly directed by one's personal future vision. By using a dreaming – grounding structure, we aimed to identify a connection between participants' visions and their day-to-day work (Gatto, Brunner, Bundi, & Nahrath, 2023). 2) Due to the interdisciplinary character of the Investment Theme, we assumed that vision might

be very different and thus a barrier to collaboration. Thus, having a better idea about similarities and differences among these visions could facilitate future collaboration.

Generally within the field of transition studies, visions are an important tool to, for example, help new developments reach a broader audience (Dueñas-Ocampo, Eichhorst, & Newton, 2023). The effectiveness of change agents is also related to their ability to “clarify problems and articulate clear visions” or “develop narratives that support ongoing action” (Mintrom & Rogers, 2022).

Therefore, one goal of this exercise was to identify participants’ visions. Based on the data retrieved, the aim is then to either compose one common dream or several diverging dreams. Accordingly, coding the dreams helps to identify reoccurring themes and analyze if a common dream or a set of overlapping dreams exist within the Transformative Bioeconomies community.

In this section, common themes within the dream section of the individual reflection exercise will be outlined.

6.1. Reoccurring themes

Before discussing some of the reoccurring themes in more detail, an overview is provided. This analysis is based on 1) word frequency and 2) frequency of applied codes. It needs to be highlighted that the frequencies do not allow generalizing about e.g., the overall importance of topics. Due to the small sample size, no generalizations can be made. Thus, the provided information needs to be understood as mere data description of the given sample. Although frequencies do not say much about the general relevance of themes within the dream section, the analysis will mostly focus on describing reoccurring themes. Hence, those codes that are applied more often will be discussed in more detail.

Word frequency

Table 8 provides an overview of the word frequencies within the dream section of the individual reflection worksheet. The data has been extracted from Atlas.ti and further condensed in excel. Condensed data is indicated by the use of “/” and or “()” (e.g., material(s)). A stop list has been used to exclude terms like “also.” The selected cut-off of frequencies is five.

Table 8: word count extracted from Atlas.ti

	Word	Count
1	people/social/society	40
2	material(s)	33
3	produce/products/production/goods	33
4	natural/nature	28
5	use(d)/using	28
6	consumption/consumers	16
7	Waste	13
8	New	12
9	Resources	12

10	Food	10
11	System	10
12	Less	9
13	Need	9
14	Fossil	7
15	World	7
16	boundaries	6
17	Energy	6
18	Local	6
19	Reduce	6
20	sustainable	6
21	Cycles	5
22	Fast	5
23	Planet	5
24	Recycle	5
25	Reuse	5
26	Transition	5
27	Well	5

The most frequently used cluster of words within the dreams section is “people/social/society.” This cluster could be combined with the cluster “consumption/consumers.” In total, this cluster of words has been used 56 times. **Accordingly, one could conclude that many participants have applied a homocentric perspective.**

The second most used cluster of terms is “produce/products/production/goods” (33). The frequent usage of these words indicates a strong utility-centric perspective on the materials transition. When adding the cluster “use(d)/using” (28), this perspective becomes even more accentuated (61). **Hence a homo- and utility centric perspective seems to prevail in participants’ dreams.**

“Material(s)” has been used 33 times. Though the frequent usage of this cluster might mostly be due to the task at hand; reflecting on the materials transition.

Another frequently used cluster within the dreams section is “nature/natural” (28). The terms “planet” (5) and “world” (7) could be added to this cluster as well. **This cluster then indicates the high importance (40) of the environmental sphere within the given answers.**

If taken together, “reuse” (5), “recycle” (5), “reduce” (6), “less” (9), **the cluster around the topic of the 5 Rs³ has also been referred to frequently (27).**

In total, the impression gained from the word frequency analysis is that the materials transition is viewed from a utilitarian, homocentric perspective in which environmental issues and topics around reduction dominate.

Used codes

45 codes have been applied to the dream section of the individual reflection exercise (see Table 9). The code book, which explains the meaning of all codes, can be found in ANNEX II. **The codes used to identify reoccurring themes deliver a somewhat different image compared to the word frequency outlined above.** The most used code is “environmental impact,” which captures not only negative but also positive impacts of human action. It further captures concepts such as the Environmental Footprint or Planetary Boundaries. Further analysis of the code will be provided below. The word frequency showed that words related to the societal realm were most frequent. To some extent, this is also reflected in the code “environmental impact” as it describes societies impact on the environment.

Interestingly the code **biobased** is the second most frequently used code and indicates the prevalence of the biobased pathway within people’s dreams. The word frequency would rather indicate that the recycling pathway is the most important one. However, the code “biobased” is used more often. **Recycling** and related codes still indicate a rather high relevance of the recycling pathway within the described dreams. Recycling is the 7th most used code and can be connected to the codes “waste” and “long-term use”. The **CO₂ pathway** could be identified three times, confirming results from the gap analysis, this pathway is rather underrepresented in people’s dreams.

Dematerialization has only been mentioned once. This happened in conjunction with a statement also tagged with the codes “efficiency,” “recycle,” and “environmental impact”.

»This new input can be produced within the planetary boundaries, as the whole system is “optimized” using reduce, reuse and recycle strategies (dematerialization)« (worksheet 14). (Quote 1.)⁴

The quote is a clear example of how the material transition is described as reducing the environmental impact through more resource efficiency via the three Rs. This process is connected to the term dematerialization. **Hence the only time the term dematerialization was used, it is connected to efficiency and recycling⁵.**

The **domains** are found with different frequencies. There are nine references to **Textiles** and only two references to **Building Materials**. However, both domains are *outcompeted* (10) by references to the food system (code “food”). Though it needs to be highlighted that the “food” code includes statements about agriculture, animal husbandry, and diet. Thus, this code overlaps somewhat with “biobased”. The low frequency of references to one of the two Investment Theme domains reflects the results from Section 4.

³ Refuse, Reduce, Reuse, Repurpose, Recycle

⁴ A list of all used quotes is provided in ANNEX III

⁵ Compared to the other three pathways, the dematerialization pathway has not been predefined within the Investment Theme and thus leaves more room for interpretation. Based on previous conversations with Investment Theme researchers, dematerialization is also understood as reducing consumption. Hence, one could say that there are at least two interpretations of the dematerialization concept; efficiency and sufficiency.

Production (23) and consumption-related (23) statements were found frequently and confirm the utility- and homocentricity that the word frequency already indicated. Statements about true cost (or true pricing) as well as about the economic system add weight to this conclusion.

Another theme that dominated the dreams were values, awareness, and respect. More will be explained in the section below. However, it can be stated that the awareness of humans' dependence on nature and an appreciation and respect for the human-nature connection translates to a reduction of humans' environmental impact.

Further *connectivities* were often mentioned. A distinction between "human-nature connection," "people-people connection," and "people-material connection" was made, with 17, 7, and 5 tags, respectively.

The code "sufficiency" has been applied 18 times. This code captures the notion of reduced consumption, needs-based approaches as well as self-sufficiency. Interestingly, **this sufficiency has not directly been connected to the dematerialization pathway**. Connected to less consumption the localization of consumption and production has also been a topic, tagged with the code "local" (13).

Finally, the frequency of applied codes also indicates the *relevance* of "institutions" (14) and "governance" (9). The former captures statements about the need to organize societies in a different way to facilitate the materials transition. This idea has at times been connected to top-down measures, hence policies, rules, and regulations.

Table 9: code frequency

	Code	Frequency
1	environmental impact	30
2	Biobased	24
3	Consumption	23
4	Production	23
5	Awareness	21
6	Values	20
7	Recycle	18
8	Sufficiency	18
9	human-nature connection	17
10	Society	17
11	Economy	14
12	Institutions	14
13	Local	13
14	respect	13
15	waste	12
16	food	10
17	societal impact	10
18	governance	9
19	textile	9
20	happy	7
21	people-people connection	7
22	technology	7
23	harmony, balance	6
24	long-term use	6
25	true cost	6
26	efficient	5
27	people-material connection	5
28	intrinsic motivation	4

29	Justice	4
30	CO2	3
31	common good	3
32	energy	3
33	greed	3
34	time	3
35	transport	3
36	building materials	2
37	customized	2
38	extrinsic motivation	2
39	homocentric	2
40	lock-in	2
41	modular	2
42	dematerialize	1
43	disruption	1
44	ecocentric	1
45	plastic	1

6.1.1. Utopias

The task of the dream part of the individual reflection exercise was to think about a dream future in which the materials transition has already taken place, and we have created a sustainable society. The timeframe for that future state was 20 years from now. This timeframe has been chosen as it should not be too far in the future to still allow people to connect their current work endeavors with their future dream. A time horizon of e.g., 100 years, may have allowed engaging more in utopian thinking. However, this may have made it more difficult to connect this utopia to current work.

Not everyone was able to or wanted to dream of an already implemented sustainable society. Some connected their dream more to the present. Thus, there are more and less abstract dreams of the future.

For example, participant 23 stated: "Breeding efforts have resulted in plants that are twice as productive and resistant against plagues and diseases, preferably also have N-fixing properties." And participant number 2 stated: "We have developed the technology to recycle 70-100% of our material (100% is not achievable not even in a dream)."

participant 22 stated:

"A sustainable future for 20 years from now has not (yet) resulted in a fossil feedstock free society. This would demand more time (like the 50 years transitions on average take). However, society has become aware of the damage that is caused by fossil materials, and due to the suitable external and internal motivators, the consumer has also been convinced of the need to change their purchasing and use behavior as a consumer. [...]"

Other statements that are not of a utopian character were for example: "Clothes do not wear out so quickly, your favorite sweater will last very long" (24). "We get healthy food in the supermarkets" (25).

Dreams of an absolute utopian character could not be identified. However, some dreams were more utopian than the ones mentioned before. Also, these dreams do not refer to the impossibility of a dream coming true (as is indicated in some of the quotes above).

Of a utopian character might be the statement of participant 27, who states that there will be no waste: "There is no waste but resources that are continuously used." Focusing on social

aspect of the future, participant number 19 refers to exploitation, local structures and a different economic system:

“The would no longer exploit /marginalize its natural resources + people!
 Drivers have shifted to gross national wellbeing
 More healthy balance individual & collective with greater use of local responsibility & collective action --> new commons established” (19)

Another example stems from participant 16, who envisions the end to the world-overshoot day:

“A closed circular global society where we - as mankind – have no world overshoot day but a world undershoot day. This day is the day that we return more than we take from our natural resources.” (16)

An interesting statement was made by participant number 13 who connected the dream to their current reality:

“We are growing a tiny house in our garden. This is a new approach in which specific trees & bushes are planted and directed to form the house.” (13)

Looking at the utopian character of the dreams it can be stated that on the one hand, it seems that the materials transition is difficult to implement within a 20 year timeframe. On the other hand, the closeness of dreams to reality indicates that the materials transition does not always require big steps. As the remaining analysis will show, achieving the dream is not only related to technology but also to an alternative economic system, alternative institutions, and societal organization, and an improved human-nature relation. Thus, the dreams seem to be of an interdisciplinary character that do not only focus on one aspect (e.g. technology, or policies).

6.1.2. Environmental Impact

The code „environmental impact“ covers all kinds of societal impacts on the environment. Thus, the code encompasses negative and positive, as well as concepts such as, Environmental Footprint, Planetary Boundaries⁶, or nature restoration. Examples are⁶:

“Production + Consumption within a natural + social boundaries” (worksheet 28). (Quote 2.)

“Moreover, the footprint of humans will be much lower” (worksheet 1). (Quote 3.)

Table 10: environmental impact code co-occurrence table

environmental impact			
Code	Co-occurrence	Code	Co-occurrence
respect	7	values	3
awareness	6	harmony, balance	2
consumption	6	people-material connection	2
societal impact	6	waste	2
sufficiency	5	dematerialize	1
biobased	4	efficient	1
human-nature connection	4	food	1
production	4	governance	1
happy	3	intrinsic motivation	1
people-people connection	3	local	1
recycle	3	plastic	1
society	3	technology	1

⁶ Note that the provided quotes are only examples for statements that were tagged with a specific code.

The most frequently co-occurring codes can be found in specific worksheets (2, 6, 10, 12, 19, 20, 22, 23, 28) and are thus not spread out across all responses.

Table 10 provides the code co-occurrence. Note that codes that are not co-occurring with the code “environmental impact” are not included in the Table. **Respect** and **awareness**, and are the most frequently co-occurring codes.

“However, society has become aware of the damage that is caused by fossil materials” (worksheet 22). (Quote 4.)

“People have an honest view of themselves and the world population in terms of the impact they have on each and the planet (the – not their – it’s not ours)” (worksheet 2). (Quote 5.)

Respect and awareness are most of the time co-occurring with each other as well. That is as it is assumed that awareness and respect are connected and that the former is a condition of the latter. However, the quotes specifically connected to the “**respect**” code convey the notion of care.

“Any governing agent supports people in their choices for reducing waste, limiting consumption, and caring for their surroundings” (worksheet 2). (Quote 6.)

“All people care about materials: applying less, using less, using the better kinds safeguarding ecological foundation” (worksheet 20). (Quote 7.)

“They would no longer exploit /marginalize its natural resources + people!” (worksheet 19). (Quote 8.)

The respect and awareness codes are also connected to **consumer choices**.

“Consumers that are more aware about their choices, and how they impact on the earth system” (worksheet 23). (Quote 9.)

“This translates in willingness of consumers to pay the true price for products, reduce their consumption of goods and make more considerate choices that consider the environment as well as the social and economic sustainability of goods” (worksheet 22). (Quote 10.)

These two quotes bridge to the next code, “**consumption**,” which has been a relevant topic in connection to environmental impacts, with six code co-occurrences.

The codes indicate that because people become aware of the negative impact their actions have, they make more considerate (consumer) choices.

Note:

This information-awareness-action nexus is captured in a basic behavioral model, the Information Deficit model (Darnton, 2008). While this is a basic model, many studies have highlighted that this linear connection between awareness and action does not always hold true (Tiller & Schott, 2013). Accordingly, the awareness action gap (or attitude action gap) model has been developed. So although the quotes indicate a connection between awareness and subsequent actions, in practice, it is questionable that this connection will lead to observable behavioral change or more sustainable consumer choices.

Although the code “**Human-nature connection**” only co-occurs four times, it should be mentioned here as well since it is conceptually closely linked to environmental impact. In

contrast to environmental impact, this code is about the connections humans have with the natural environment.

“Society lives within planetary boundaries & in harmony with nature” (worksheet 10). (Quote 11.)

Environmental impact is also tagged six times together with the code “**societal impact**.” In contrast to the code “environmental impact,” this code captures quotes that describe some societal impact on other people. This suggests a connection between the societal and environmental spheres.

»All actors in the system have regard for themselves as well as the needs of others. This “includes the planet”« (worksheet 2). (Quote 12.)

“Production with less societal effects (modern slavery)” (worksheet 28). (Quote 13.)

Pathways

The code “**sufficiency**” co-occurred five times with “environmental impact.” As stated above, sufficiency mostly relates to less consumption and needs-based views. Quote 7, provided above⁷, has illustrated this connection. Other quotes are:

“Focus on being content --> Link consumption on what we need” (worksheet 28). (Quote 14.)

“[...] reduce their consumption of goods and make more considerate choices [...]” (worksheet 22). (Quote 15.)

Participants also had the option to illustrate their dream. Three illustrations can be connected to the “environmental impact” code. The images have been digitalized, with the intention of being as close as possible to the original. Figure 4, Figure 5, and Figure 6, are digitalized drawings that also contained some written information. The codes applied are indicated in the respective figure caption. Figure 4 uses the recycling pathway, Figures 3 and 4 the biobased pathway to reduce environmental impact. In Figure 5, and Figure 6, the social sphere is also of relevance in both illustrations. Figure 4 focuses more on the cycles and the interplay of the human metabolism with the natural metabolism. It could be stated that the illustrations also exemplify potential inaccuracy when interpreting the qualitative data. For example, it could be stated that Figure 6 does not only capture the biobased but also the natural CO₂ capture pathway (which is still the biobased pathway within the investment theme).

Figure 6 does not contain written information, and the participant did also not provide written information separately. Thus, there is more room for interpretation of the illustration. It could be stated that the illustration shows two different states. Potentially these are the now and the 20 years ahead state (in line with the task). The difference between the two states is the ratio of natural to human elements. The future state shows fewer human and more natural elements. Thus, it could be stated that the future is characterized by a decreased environmental impact.

⁷ Quotes that are used several times are only referred to by the quote number. A complete list of all used quotes can be found in ANNEX III.

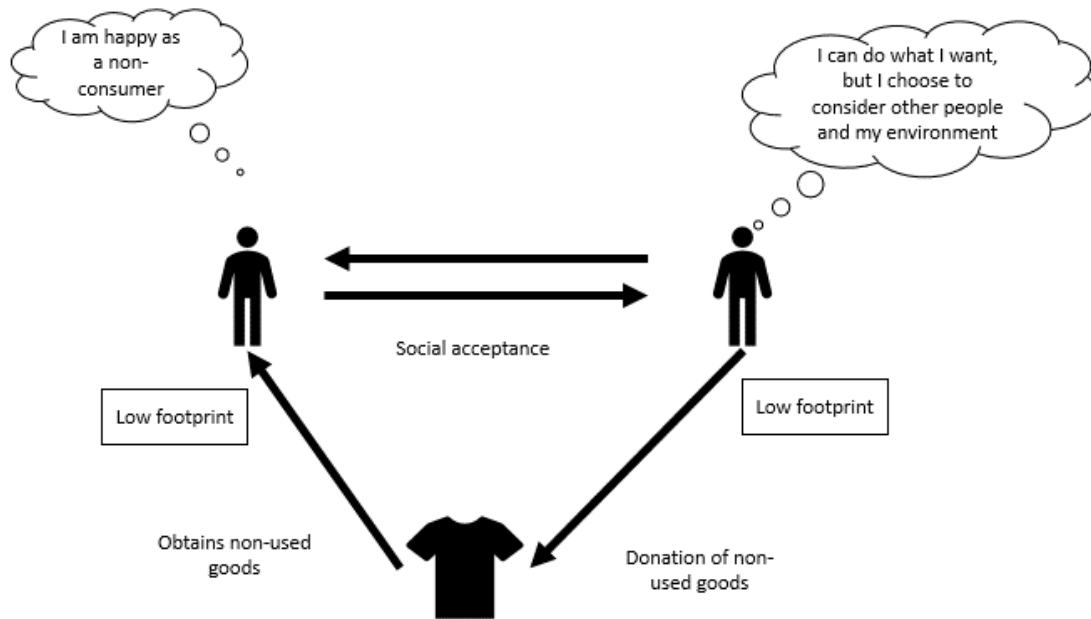


Figure 4: illustration of dream from worksheet 2 (codes applied: awareness, environmental impact, happy, people-people connection, recycle, respect, society, sufficiency, values).

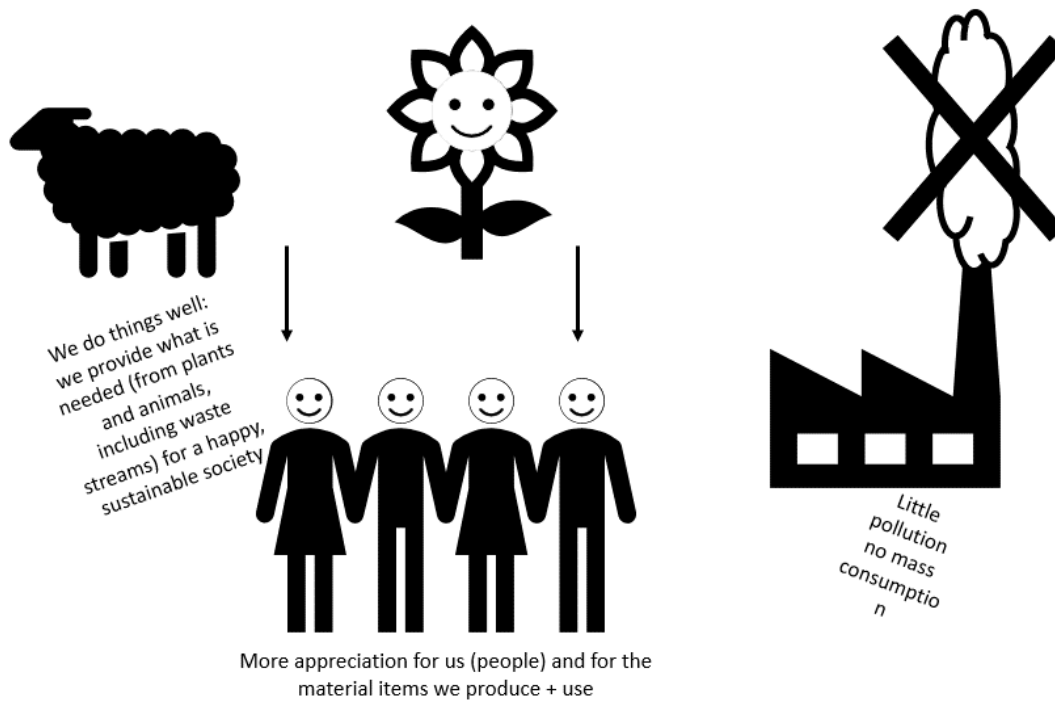


Figure 5: Illustration of dream from worksheet 12 (code applied: biobased, consumption, environmental impact, happy, people-material connection, people-people connection, respect, sufficiency, values).

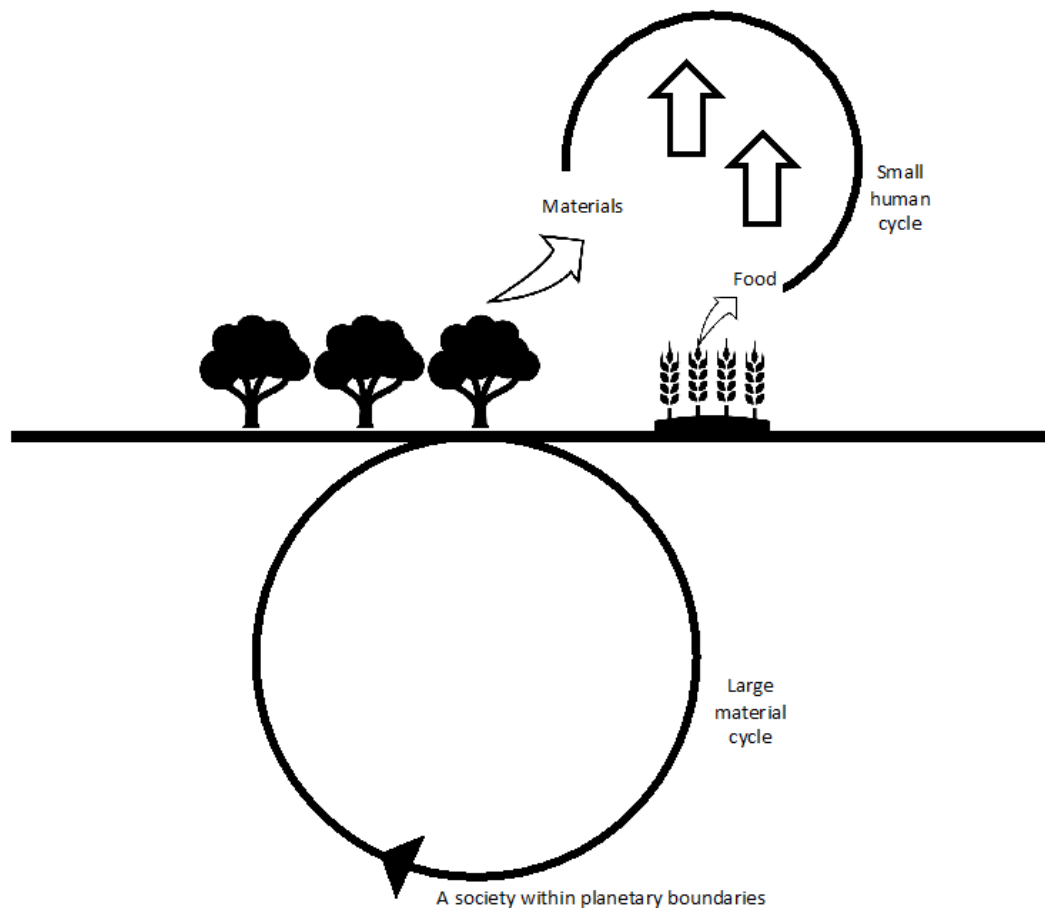


Figure 6: Illustration of dream from worksheet 6 (codes used: biobased, environmental impact, human-nature connection)

6.1.3. Biobased

The second most applied code in the dream section is the code “biobased.” As stated above, this is not surprising as the gap analysis indicated a dominance of the biobased pathway. The co-occurrence table (see Table 11), shows that the other pathways, as well as, both domains are frequently connected to the “biobased” code. Earlier, it was discussed that food outperforms the two Investment Theme domains. However, when looking at the co-occurrence with the biobased pathway, the code “food” has only been applied once. However, as shown earlier, references to textiles still outweigh references to building materials. Examples of the co-occurrence of the codes “**textile**” and “biobased” are:

“I can use the nettle that grows in our surroundings to make my own home textiles” (worksheet 8). (Quote 16.)

“We produce our textiles in Europe, making use of plants/animals/fungi that can grow in our climate” (worksheet 8). (Quote 17.)

One of the two examples of the co-occurrence of the codes “**building materials**” and “biobased” is:

“We are growing a tiny house in our garden. This is a new approach in which specific trees & bushes are planted and directed to form the house. Land growers grow the other input

materials ***⁸ and we asked the local processor to *** this in custom building blocks to shape our home *** etc. It is a very creative/active process/project that is not to complicated...” (worksheet 13). (Quote 18.)

Quote 18 also indicate the frequent co-occurrence of the “**local**” code, which co-occurs four times the code “biobased.” The quote from worksheet 25 also illustrates this co-occurrence and also refers to both domains.

“We consume more on demand: clothing, cars, no fiat financing, fast food, fast consumption, more wooden products --> housing --> furniture --> not everything is produced in China” (worksheet 25) (Quote 19.)

The localization is specifically connected to production and consumption. Arguably in sight of localization, production and consumption are two sides of the same coin. One can only consume locally what has been produced locally. However, the code “production” has been applied more often in conjunction with the code “biobased” than the code “consumption.” This indicates a more production-focused view of the participants.

Examples of quotes that link the codes “biobased” and “**production**” are:

“Production is governed by a combination of new craftsmanship (e.g. mycelium) in combination with new high-technologies (e.g. 3D-printing), which enable local production using local biobased feedstock” (worksheet 6). (Quote 20.)

“After the materials transition all new materials needed for production are from renewable/natural resources” (worksheet 14). (Quote 21.)

One of the quotes that connects the code “biobased to the code “**consumption**” refers to overcoming the barrier of consumer acceptance of new (biobased) products.

“What currently is holding-back consumers to engage with and consume natural, sustainable textile is newness, such barriers should – in a world in which the material transition has happened – be overcome” (worksheet 17). (Quote 22.)

The co-occurrence of these codes could be tied together with the results of Section 6.1.2. (code: environmental impact). **The acknowledgment of the environmental impacts and the need to reduce those is tied to people being closer to nature and being more aware of their natural environment. This closeness translates to a localization of production and consumption, which in turn increases the appreciation of materials that were made out of materials people have a connection to as they are sources in their close surroundings.**

Pathways

As mentioned above, the other three **pathways** are also co-occurring with the “biobased” code. Recycling co-occurs four times and CO₂ two times.

Some quotes connect all three *technological* pathways. Though, the way CO₂ is mentioned rather refers that natural process of capturing CO₂. Therefore, it has not been tagged with the code “CO₂.”

“Re-use of water / nutrients / CO₂ that is stored in plant material” (worksheet 26). (Quote 23.)

⁸ *** indicate illegible text in the worksheet.

The other two CO₂ tags are though referring to the technical process of CO₂ capture and utilization. The following quotes are examples of all three technical pathways being mentioned at once.

“We managed to phase out fossil feedstock by clever combination of biomass use and recycling, CCU [Carbon Capture and Utilization] is starting to scale up” (worksheet 24). (Quote 24.)

»“Looping strategies” are always to keep the materials in the loop including reuse but also novel technologies (CO₂ capture, bioenergy, etc.) can be used to keep the natural materials in the materials system« (worksheet 14). (Quote 25.)

It has been stated earlier that dematerialization has only been used once. However, one can argue that dematerialization can be understood as efficiency and / or sufficiency pathway. These two interpretations of dematerialization have been used as codes and each co-occurs two times with the “biobased” code. Both efficiency quotes that are coded with **efficiency** refer to agricultural issues.

“An agriculture that uses N-fertilizer based on sustainable energy resources (hydropower, waterstof), and use bio stimulants to free phosphorus tied up in the soil to increase phosphorus use efficiency” (worksheet 23). (Quote 26.)

“Breeding efforts have resulted in plants that are twice as productive and resistant against plagues and diseases, preferably also have N-fixing properties” (worksheet 23). (Quote 27.)

Pertaining to **sufficiency**, one tag has been applied to an illustration of a dream (see Figure 5). A description within the illustration states “no mass consumption” (worksheet 12). The other quote has already been provided above and describes the production of one’s own home textiles from nettles. Presumably such a production does not permit mass consumption of home textiles. Therefore, the quote implies the need for sufficiency when making use of the biobased pathway (see Quote 16.).

Table 11: biobased code co-occurrence table

Biobased			
Code	Co-occurrence	Code	Co-occurrence
production	6	Energy	1
textile	5	Food	1
environmental impact	4	Governance	1
local	4	Happy	1
recycle	4	human-nature connection	1
consumption	3	long-term use	1
building materials	2	people-material connection	1
CO ₂	2	people-people connection	1
efficient	2	Plastic	1
sufficiency	2	respect	1
technology	2	societal impact	1
awareness	1	time	1
customized	1	values	1

6.1.4. Consumption and Production

In the previous section, it has been argued that production and consumption can be understood as two sides of the same coin. Accordingly, these two codes are discussed together. Table 12 provides an overview of co-occurrences, which have been sorted by frequencies, starting with the “consumption” code co-occurrences. **Although consumption**

and production are related, the co-occurrence table shows that the codes have been applied to different quotes.

The main differences can be found with the codes “awareness” (6/0), “biobased” (3/6), and “local” (2/7).

Awareness co-occurs six times with consumption but not once with production. The respective quotes all contain some element of conscious choice. A conscious choice requires awareness. It is interesting that the awareness aspect did not come up in relation to production. This may reflect the notion, that the market may offer options, but if they are not taken up by the consumer, they might cease to be offered. Quote 9 illustrates the connection between awareness and consumer choices. The quote from worksheet 2 is another example:

“We have choice: recycle goods, buying second hand, and these goods are linked to fashion as well” (worksheet 2). (Quote 28.)

On the production side, the codes “biobased” and “local” are relevant, with six and seven co-occurrences, respectively. In contrast these codes are only three and two times co-occurring with the “consumption” code. The biobased code has already been discussed. Therefore, I refer the reader to section 7.1.3.

The codes “local,” “production,” and “consumption” only co-occurred together twice, once in Quote 19 and once in Quote 29:

“localized production & consumption as much as possible to: a) Create a closer link between planet & people b) To reduce emissions” (worksheet 10). (Quote 29.)

On the production-side local production is connected to customization and on-demand production.

“Clothes/Food/ *** and so on / Produce on the spot and only in the *** --> no waste material, no energy waste” (worksheet 21) (Quote 30.)

Local production is also connected to local circumstances such as climate (quote 17), self-sufficiency (quote 16), and connection to nature.

“A more local set-up of society (communities) and means of production enables this closer interaction with nature” (worksheet 6). (Quote 31.)

The codes “consumption” and “production” co-occur six times. Two of these have been already been provided above (Quote 2 & 29). Other examples of the production and consumption code co-occurrence are:

“The better choices have been black boxed, because people cannot be expected to inform themselves thoroughly on every product they use: The production, use and waste phase” (worksheet 20). (Quote 32.)

“Production & consumption are thought through to allow for the reduction of consumption, the recycling of materials & reduction of waste streams” (worksheet 10). (Quote 33.)

Pathways

Sufficiency is for both codes co-occurring six times. Though, these are not the same six quotes. Some only refer to one of the two codes. In Quote 6 “limiting consumption” is mentioned and Quote 10 refers to “reduce their consumption of goods.” Other example are:

“As there is not the need to produce new resources, [...]” (worksheet 27). (Quote 34.)

“I have my own little greenhouse to grow all the vegetables I need” (worksheet 8). (Quote 35.)

It has been stated that the dematerialization pathway could be framed by the “efficiency” and the “sufficiency” code. It is interesting that efficiency has not been coded once together with the “production” and “consumption” codes. The dematerialization pathway will be discussed later (see section 6.1.8).

Other more often co-occurring codes are “environmental impact” and “biobased.” However, these two codes have already been discussed in previous sections.

Pertaining to pathways, two more pathways, the “recycling” and the “CO₂” code, have also been applied together with the production” and “consumption” codes. The recycling quotes have already been provided above (see Quotes 28 and 33.).

While recycling is used for production and consumption quotes, the “CO₂” code has only been used for production. The “CO₂” code also connects to technology (Quotes 20 and 25).

Table 12: Consumption and Production code co-occurrence

	production	consumption
Code	Co-occurrence	Co-occurrence
sufficiency	6	6
environmental impact	4	6
awareness	0	6
production	0	6
biobased	6	3
societal impact	3	3
textile	3	3
values	3	3
governance	1	3
happy	1	3
institutions	1	3
local	7	2
economy	3	2
waste	3	2
recycle	2	2
intrinsic motivation	0	2
people-people connection	0	2
human-nature connection	3	1
food	2	1
building materials	1	1
extrinsic motivation	0	1
homocentric	0	1
people-material connection	0	1
respect	0	1
time	0	1
true cost	0	1
consumption	6	0
society	3	0
customized	2	0
technology	2	0
CO ₂	1	0

ecocentric	1	0
greed	1	0
harmony, balance	1	0
long-term use	1	0

6.1.5. Values, awareness, respect

Continuing with the most frequently used codes, awareness scores with 21 tags. It has been indicated before that awareness and respect are connected. Further, respect could be framed as a value. Accordingly, the codes “awareness,” “respect,” and “values” are discussed in conjunction.

The co-occurrence table indicates the connection between the three codes. “Values” co-occurs five and four times with the other two codes. “Awareness,” co-occurs five and eight times, and “respect,” eight and four times.

An example of the co-occurrence of the codes “awareness” and “values” is:

“We do not value growth (economic) as much, instead we focus on personal and natural growth” (worksheet 9). (Quote 36.)

The term *focus* has been interpreted as “awareness” as it can be implied that a shift in values requires awareness.

The codes “awareness” and “respect” can be found in the following examples (see also Quote 5):

“We are aware of these cycles and respect and promote them” (worksheet 27). (Quote 37.)

“People are self-supportive and do not need any validation from others to make decisions” (worksheet 2). (Quote 38.)

One can see that in Quote 37, respect is understood as self-respect and self-awareness. In Quote 5, the *honest* has been coded as awareness and the reference to the impact of behavior has been coded with “respect.”

Finally, an example of the co-occurrence of the codes “values” and “respect” can be found in the following quote:

“People appreciate natural resources but do not only perceive them as resources” (worksheet 10). (Quote 39.)

Table 13 provides an overview of co-occurrences, which have been sorted by frequencies, starting with the “values” code co-occurrences. Several co-occurring codes have already been discussed in previous sections. For example, the code “environmental impacts,” which scores high in co-occurrence for all three codes, has been discussed in section 6.1.2. The code “consumption” has also already been discussed (see section 6.1.4).

Quote 39 indicates a connection to the economic sphere. The code “economy” has mostly been used in conjunction with the code “value.”

»These essentials are produced by actors who are not (solely) driven by monetary goals, but by a sense of good “society ship”« (worksheet 2). (Quote 40.)

“Through all this governments business consumers & citizens take more responsible decisions” (worksheet 19). (Quote 41.)

“A society which has adopted broad holistic values instead of narrow economic ones” (worksheet 6). (Quote 42.)

“Instead of market demand nature’s ecological production capacity becomes a leading principle in food and material production” (worksheet 6). (Quote 43.)

The quotes above indicate a clear value shift related to our economic system. This value shift is connected to the respect⁹ for other humans as well as the environment.

The shift of the economic system can also be seen when looking at the codes “sufficiency,” “happy,” and “greed.” “Sufficiency” is featured high in all other three codes. “Happy” is also co-occurring with the other codes, but less often and “greed” only co-occurs with “values and awareness.”

Quote 44 for example, shows an awareness shift from greed to sufficiency. The code “sufficiency” has been used, because it is understood as the opposite to accumulation (greed).

“People understand that recycling rather than profit-driven depletion is how we not only survive but actually thrive as a population” (worksheet 2). (Quote 44.)

The codes “awareness,” “happy,” and “sufficiency” are also present in Figure 4 and Figure 5. In Figure 4 (worksheet 2) a description states “I am happy as non-consumer.” In the same image, another description indicates people’s free choice for the more sustainable option. This implies a certain level of awareness. In the illustration of worksheet 12 (see Figure 5) one can read, “We do things well: we provide what is needed (from plants and animals, including waste streams) for a happy, sustainable society.”

These two Figures also feature the code “respect.” In Figure 4, one can find the description: “I can do what I want, but I choose to consider other people and my environment.” The *consideration* term may imply respecting other people and one’s environment. Similarly, one can read in Figure 4, “More appreciation for us (people) and for the material items we produce + use.” “Respect” and “sufficiency” are also applied to Quote 7.

In terms of values, it is also interesting to see that the “ecocentric” code, as well as the “intrinsic motivation” code, are listed, but not their pendants (“homocentric” and “extrinsic motivation”). In line with the quotes above, **one could conclude that the values that prevail in a dream in which the materials transition has already taken place are more connected to self-lessness, the support of the community, and the natural environment. Thus, one could speak of a shift from EGO to ECO.**

This shift becomes very clear in Quote 43 (featuring the code “ecocentric”). Worksheet 17 provides two quotes that explicitly mention intrinsic motivation.

“Such behavior would include established sustainable and inherently *** routines and *** -- > coming from *** understanding or at least intrinsic motivation” (worksheet 17). (Quote 45.)

“Both technological development and *** would also stem from a place of intrinsic motivation to preserve nature and regenerate the ecosystem” (worksheet 17). (Quote 46.)

It has to be noted that this finding might conflict with the initial statement that utility- and homocentric statements prevail. This conclusion was based on the observation that the codes

⁹ Note that in the initial coding the code “respect” does not co-occur with the code “economy.” This indicates coding inaccuracy. However, by going through the codes in consecutive analysis of codes, such inaccuracies are revealed and can be corrected.

“production” and “consumption” are applied frequently. This, finding still holds, as we can see by the frequency table (see Table 8 and Table 9). However, it seems that when statements are also connected to the codes “values,” “awareness,” and “respect,” participants take a different perspective. One that focuses more on *the whole*.

Note:

This ties into literature that states that the problem of our econ system is the lack of the inclusion of more holistic values rather than the market system per se (Daniels, 2010a, 2010b; Jamieson, 2007).

The connection of values with the societal sphere can not only be seen in the quotes above (see e.g., Quote 40), it can also be seen in the co-occurrence with the codes “society,” “societal impact,” and “people-people connection.” Generally, all three codes that express connection appear in the co-occurrence table with rather high co-occurrences.

The connection between people and their things is also mentioned. On the one hand a closer connection to people’s belongings could counter a throughway attitude. On the other hand, it supports a materialistic attitude towards life which could have negative environmental impacts. As quote 48 indicates, if stuff tells us who we are we could be drawn to status symbols and consumerism.

»We all have renewed a strong connection to our “stuff.” « (worksheet 24). (Quote 47.)

“Our stuff tells who we are and is valuable” (worksheet 24). (Quote 48.)

The connection between people can be found, for example, in quote 8, and the code “societal impact” can be found in Quote 12, as well as in the quote below.

“Technologies are used in such a way that it serves our needs and does not negatively impact our societal values” (worksheet 11). (Quote 49.)

Examples of the quotes connected to the code “human-nature connection” are quote number 37 as well as the following:

“People finally understood they need the planet more than it needs them” (worksheet 2). (Quote 50.)

“People understand & have internalized the close connection with nature” (worksheet 10). (Quote 51.)

Table 13: Values, awareness, and respect code co-occurrence

	values	awareness	respect
Code	Co-occurrence	Co-occurrence	Co-occurrence
Economy	5	1	0
Awareness	5	0	8
Respect	4	8	0
Society	4	2	3
environmental impact	3	6	7
Consumption	3	6	1
Sufficiency	3	5	3
people-material connection	3	2	4
Production	3	0	0
societal impact	2	3	3
Recycle	2	3	1
people-people connection	2	2	4
intrinsic motivation	2	2	0

Happy	2	1	2
Governance	2	1	1
Greed	2	1	0
Institutions	2	0	0
Justice	2	0	0
Technology	2	0	0
human-nature connection	1	4	3
Biobased	1	1	1
common good	1	0	1
Ecocentric	1	0	0
long-term use	1	0	0
Values	0	5	4
Textile	0	2	0
true cost	0	1	0
harmony, balance	0	0	1
Local	0	0	1

6.1.6. Recycle

Recycling is another transition pathway the Investment Theme has identified. The biobased pathway has already been discussed (see Section 6.1.3). The CO₂ pathway code has only been applied three times. However, it will still briefly be discussed in the next section, followed by a discussion of the dematerialization pathway. Though, in this section, the code “recycle,” which has been applied 18 times, is discussed.

The co-occurrence table (see Table 14) shows that all pathway codes co-occur with recycling. As already established, there are quotes (see Quotes 24 and 25) that feature all three technical pathways (biobased, recycling, and CO₂). It has also already been stated that the code “dematerialize” only co-occurs with the “recycling” code (see Quote 1). Though “efficiency” and “sufficiency” are also co-occurring.

Probably the most interesting co-occurring code that needs to be addressed in this section and that has not yet been discussed is “long-term use.”

“There is no waste but resources that are continuously used” (worksheet 27). (Quote 52.)

“the knowledge, energy and effort go to extend the life time of the goods, reuse them and find them another future use where their value is still the same” (worksheet 27). (Quote 53.)

“This means that overall less material is used (reduce), the materials are kept in as short feedback loops as possible (reuse/recycle) keeping the materials in the loop and therefore decreasing the need for new materials as input in the system” (worksheet 14). (Quote 54.)

These quotes clearly indicate the aspect of cascading use of material that is relevant for recycling of materials. This aspect also implies the repurposing of waste streams. However, the code “waste” only co-occurs two times with the code “recycle” (see Quotes 33 and 53).

Table 14: Recycle code co-occurrence

	Recycle		
Code	Co-occurrence	Code	Co-occurrence
biobased	4	technology	2
long-term use	4	values	2
awareness	3	waste	2
environmental impact	3	dematerialize	1

sufficiency	3	greed	1
CO ₂	2	happy	1
consumption	2	people-people connection	1
efficient	2	respect	1
production	2	textile	1
society	2	true cost	1

6.1.7. CO₂

As mentioned in the section above, the CO₂ code has only been applied three times. Two of these quotes (24 & 25) have already been introduced above. However, to provide all quotes related to CO₂ in one spot, they are repeated below.

“CO₂ flows-reuse from industry” (worksheet 26) (Quote 55.)

“We managed to phase out fossil feedstock by clever combination of biomass use and recycling, CCU is starting to scale up” (worksheet 24). (Quote 24.)

»“Looping strategies” are always to keep the materials in the loop including reuse but also novel technologies (CO₂ capture, bioenergy, etc.) can be used to keep the natural materials in the materials system« (worksheet 14). (Quote 25.)

The codes that have been used in conjunction with these three quotes are “biobased” (2), “long-term use” (1), “production” (1), “recycle” (1), and “technology” (1). Due to the low number of CO₂-related quotes, conclusions can hardly be made. **The only conclusion that can be made, is that the CO₂ pathway is underrepresented.**

6.1.8. Dematerialization

The final pathway is dematerialization. It has been mentioned that the code “dematerialization” has only been applied once in the context of recycling. In contrast, to the other three technical pathways, dematerialization has not been properly defined in the Investment Theme documents (Bos & Leeuwis, 2021). Therefore, there is more freedom for interpretation of the term (Herman, Ardekani, & Ausubel, 1990). Based on conversations with Investment Theme researchers, it is crystalizing that dematerialization has at least two components; efficiency and sufficiency. Literature on the bio-economy, as well as the circular economy, (Holden, Neill, Stout, O’Brien, & Morris, 2023; Pungas, 2023; Tan & Lamers, 2021), indicates that neither of these alternative economic concepts will reduce environmental impact sufficiently without also considering the questions of (profit) accumulation or wants-based consumption. In a recent paper, Figge and Thorpe (2023) outline that reducing environmental impact to meet the planet’s carrying capacity may require a considerate combination of technology (efficiency) and the renunciation of affluence (sufficiency). They use the IPAT equation to illustrate their point, where “A” is translated to sufficiency, and “T” to efficiency. “P” stands for population, a factor not treated in the Investment Theme. However, “I” stands for (environmental) impact. The “I” could also be translated as dematerialization, which is then also determined by efficiency and sufficiency (amongst other possible factors). Along this line of argumentation, the two codes to capture the concept of dematerialization within this analysis are “efficiency” and “sufficiency.”

Table 15, provides an overview of the codes used in conjunction with the codes “sufficiency” and “efficiency.” It needs to be noted that the code “sufficiency” (46) has been applied more often than the code “efficiency” (11). Although, efficiency and sufficiency are understood to

be part of the same concept (dematerialization), the respective codes do not co-occur in all instances. The codes that only co-occur with efficiency but not with sufficiency are “dematerialize,” “energy,” “institutions,” and “long-term use.” A co-occurrence can be found with the codes “environmental impact,” “recycle,” “biobased,” and “food.” While these codes co-occur, they have not been applied to the same quotes. When looking at the quotes it becomes clear that the message of the respective quotes differ quite a bit depending on them being also coded with “efficiency” or with “sufficiency.”

The codes “recycle” and “efficient” were used in the following quotes:

“This new input can be produced within the planetary boundaries, as the whole system is “optimised” using reduce, reuse and recycle strategies (dematerialization)” (worksheet 14). (Quote 1)

“This means that overall less material is used (reduce), the materials are kept in as short feedback loops as possible (reuse/recycle) keeping the materials in the loop and therefore decreasing the need for new materials as input in the system” (worksheet 14). (Quote 54)

These two quotes can be compared with the quotes that feature the codes “sufficient and “recycle.”

“People understand that recycling rather than profit-driven depletion is how we not only survive but actually thrive as a population” (worksheet 2). (Quote 44)

“Production & consumption are thought through to allow for the reduction of consumption, the recycling of materials & reduction of waste streams” (worksheet 10). (Quote 33)

The codes “food,” “biobased,” and “efficient” co-occur in these quotes:

“An agriculture that uses N-fertilizer based on sustainable energy resources (hydropower, waterstoff), and use bio stimulants to free phosphorus tied up in the soil to increase phosphorus use efficiency” (worksheet 23). (Quote 26)

“I would imagine a world where deliberately have organized our different systems (e.g. food and agriculture) in such a way that resources are used as efficient as possible and that the systems are aligned and interoperable with each other” (worksheet 11). (Quote 56.)

The codes “food” and “sufficient” co-occur in these two quotes:

»“Back to basics” – own garden, food preservation etc. less speculation, less traveling etc. Basically – be more satisfied & healthy« (worksheet 26). (Quote 57.)

“I have my own little greenhouse to grow all the vegetables I need” (worksheet 8). (Quote 35)

The codes “biobased” and “sufficiency” are featured in the following quote:

“I can use the nettle that grows in our surroundings to make my own home textiles” (worksheet 8). (Quote 16)

Comparing these quotes, **it can be stated that quotes tagged with the code “sufficiency” are more about simplicity, while those tagged with “efficiency” are about optimization and squeezing more out of given resources.** The sufficiency-related quotes also feature the human component, while those related to efficiency do not. Sufficiency quotes mention “needs” or “happiness.”

One could hypothesize that since, the codes “sufficiency” and “efficiency” are not applied in the same quote, but both co-occur with the same codes, that two different worldviews are expressed. The efficiency coded quotes do not question consumer patterns but rather

attempt to solve sustainability problems with technological solutions. Those tagged with sufficiency, in contrast solve the problem through different consumer patterns and focus on what one really *needs* to thrive and be happy.

The focus on consumption and production pertaining to sufficiency can also be seen when looking at the co-occurrence table, where each of these codes co-occur six times with sufficiency. Other codes that indicate a different mindset and that co-occur with sufficiency are “awareness,” “happy,” “local,” “respect,” “societal impact,” and “values.” None of these codes co-occur with efficiency.

Dematerialization has been farmed as a combination of efficiency and sufficiency. **Given that the code “sufficiency” has been applied more often than the “efficiency” code, it could be concluded that it is relevant that, within the Investment Theme, the dematerialization pathway captures the notion of sufficiency.** It can be argued that the other three pathways (biobased, recycling CO₂) should include efficiency as a baseline. If these pathways would not be efficient in terms of resource use, the employment of these pathways to create a more sustainable society would be put ad absurdum. As the quotes above show, thoughts about efficiency do not necessarily include thoughts about consuming less, or consuming only what one needs to create a happy life. Thus, **if the sufficiency aspect to dematerialization was not included, a substantial part would be left out.**

Table 15: sufficiency and efficiency code co-occurrence

	sufficiency	efficient
Code	Co-occurrence	Co-occurrence
consumption	6	0
production	6	0
environmental impact	5	1
awareness	5	0
happy	4	0
recycle	3	2
local	3	0
respect	3	0
societal impact	3	0
values	3	0
biobased	2	2
food	2	2
people-material connection	2	0
people-people connection	2	0
society	2	0
governance	1	0
greed	1	0
intrinsic motivation	1	0
technology	1	0
textile	1	0
transport	1	0
waste	1	0
dematerialize	0	1
energy	0	1
institutions	0	1
long-term use	0	1

6.2. Crafting a common dream

Based on the codes and reoccurring themes discussed in Section 6.1., one can attempt to craft a common dream. For sure, this common dream does not capture all nuances. Furthermore, there might be conflicting ideas, or differences in priorities. To craft a common dream, one needs to find compromises and build on commonalities across all worksheets. Below, the common dream is presented. Bold terms indicate the connection to codes used in the analysis (see Section 6.1.). Italic sentences are a possible manifestation of the description.

The common dream presented below is based on the analysis of the input from the 2nd Community Meeting. However, the potential manifestation of the dream might not sufficiently reflect the Investment Theme ideas. Thus, future steps are envisioned. Ideally, a common dream will be developed that helps the Investment Theme in its communication efforts. The italic text below are possible manifestations thought out by the author of this report. To further refine the common dream, it is planned to get ideas and inspiration from the critical members of the Investment Theme. After developing common dream, it is envisioned to prepare an illustration together with an explanatory text.

6.2.1. Dream

People have undertaken an inquiry into what one needs to live a happy life. Though happiness is not limited to self-interest but includes the common good. The common good, in turn, includes all people and the planet [**values**].

To become aware that being **happy** is also about the state of other people and the planet, people have (re)created a deeper connection to their natural and social surroundings [**local, connectivity, awareness, respect**]. *People lie in a meadow watching the clouds pass, breathing fresh air, and exchanging stories. People meet in weaving circles where they make shawls out of yarn they spun themselves.*

As people feel happy through connecting with people and nature, they need less stuff to feel happy. Thus, people's material consumption is reduced [**sufficiency**]. Connecting with other people and with nature requires people to get to know their local environment and to slow down. People take time to get to know their community and to create. Instead of instant gratification, people enjoy the time and effort that is put into creation. *People carefully collect plants which they dry to harvest dyes to give a hand-made shirt a beautiful color. The shirt will have the favorite color of a dear friend to whom the shirt will be gifted.*

To further reduce their impact on the planet, people have shifted their production patterns, utilizing principles of the bio-based (biobased pathway), circular (recycling pathway), and carbon (CO₂ capture technology pathway) economy. These principles have been united and are components of the materials transition [**pathways**]. Though, the materials transition is not only based on these three principles, but also on sufficiency and efficiency.

New **technologies** are employed to render the utilization of all three principles possible. For example, CO₂ capture technology has been fully developed to harvest excess CO₂. The captured CO₂ is then used in durable goods. *Window frames are made out of polymers that have been made out of CCU technology.* New recycling technologies have been developed that permit the separation of materials that previously could not be recycled. *Landfills are opened up to make use of the resources that have previously been dumped, because they could not be recycled.* New technologies are also employed to use biobased materials in new ways and to render accessible organic feedstock that has not been accessible before.

Biodegradable bioplastics are made out of algae. These bioplastics are used where sterile packaging is necessary, and other alternatives are not available.

To facilitate **efficiency, production** and **consumption** is designed to enable circularity. To keep products in the cycle as long as possible, [**long-term use**] new **technologies** (such as 3D-printing), as well as craftsmanship, are employed to repair and repurpose products. This strategy also helps to reduce waste streams. The remaining waste streams are mostly not harmful to the environment, as they are either bio-degradable or recyclable. The waste streams that still remain are small enough for the ecosystem to handle. *A whole new industry developed that focuses on repairing products.*

Due to people's sufficiency mindset, products are kept as long as possible. This has the effect that the consumption-production cycle is **slowed down**. Material is held dear, connected to memories and one's personality. *Many people own clothing or furniture from their grandparents.* Thus, people do not only care about each other and the planet but also about the existing products [all three **connectivities**]. The connection between people and the planet is fostered through the products people own and use. Many products are made from biobased materials, which are sourced and produced in the close environment. *For example, people carefully select a tree out of which, with much care, a table is crafted.*

Although people value their possessions, ownership is not a core value. In contrast, people have created a sharing economy, which also contributes to dematerialization. Many things are not owned but shared and swapped within the community [**recycle, common good**]. *Every town has a tool library where people can borrow tools to create, repair and repurpose.*

People strive to live in balance and harmony with each other and nature. People do not strive to own much, but rather enjoy sharing their wealth with others. Due to this mindset, exploitative capitalism ceased to exist. Excess profit and useless accumulation have been identified as a sign of greed, which no longer fit in a world in which sharing of wealth and happiness are understood to create a good life [**economy**]. *The sufficiency economy has been announced, and its principles are taught in schools and universities.*

Institutions have been adapted or put in place that reflect people's values. These institutions support justice and fairness, the development and maintenance of a sense community, sharing of assets, and the respect of planetary boundaries [**institutions, government**]. *An institution has been developed that estimates a company's value by how much the company gives back to society and the planet.*

7. Grounding

The grounding part consisted of five questions see (Table 1). Two of these questions inquired about participants' identification with the domains and the Investment Theme pathways. The results of these questions have already been discussed in Sections 4 and 5. Participants were further asked what they would like to work on to make their dream come true and how their current work contributes to fulfilling their dream. Finally, they were asked what the main challenges in working on their dream (research project) are and whether collaboration could help overcome these challenges.

The first question in the grounding section inquired what project participants would like to work on to make their dream come true (If there were no restrictions (apart from natural laws) – you get all the money, all the time, all the expertise, all you need – what project would you like to start working or expand on now to make your personal dream come true?)

In analyzing the responses, 34 codes were applied. In Table 16, one can find the codes that have at least been applied twice. Reflecting the analysis on the pathways, the biobased (see code biobased and biomass) pathway is most represented in the responses.

“Converting biomass into valuable components” (worksheet 4). (Quote 58.)

“Expanding my current research on developing approaches to give an indication of expected sustainability performance of novel/biobased chains --> which I believe we need to achieve my dream” (worksheet 12). Quote 59.)

Many projects would be about testing or assessing something (see codes assess, demonstrate, modeling, testing).

“I would like to measure the exact and total carrying capacity of the marine system to see how much we can extract/harvest as a whole (all commodities combined)” (worksheet 16). (Quote 60.)

“Showcase that a needs-based society makes people happy at lower costs for the planet communities. The project would also focus more on the consumer, rather than on the producer side” (worksheet 1). (Quote 61.)

“I would like to put metrics to this envisioned material. System starting with the amounts of materials used looped over multiple years (dynamic MFA model) and the qualities of these materials (“new” applications in looping strategies) [and maybe later on with environmental impacts (CO₂, lands use, toxicity, etc)]” (worksheet 14). (Quote 62.)

“Build and test new models for companies to run more responsibly” (worksheet 19). (Quote 63.)

The domains, building materials, and textiles, are both featured two times. Similar to the dream section, the domain is outperformed by food-related projects. The project from worksheet number 6 combines both domains with the food code:

A test farm with several model landscapes and form of regenerative agriculture
- Feedstocks harvested from these landscapes are (***) a workshop to locally produce building and textile products.
- Operated by local community
- The economic and environmental, social impacts are measure” (worksheet 6). (Quote 64.)

The other two examples for the textile and the building material domain are about a textile retail demonstration project and a project to grow a house.

The consumption code has been used considerably more often than the production code. Though, as stated in the dream analysis, production and consumption are two sides of the same coin, as illustrated by quote 65.

“A project that understands/explores how to make consumers happy with consumption or what they really need. Th a sustainable world – where environment + societal effects of production + consumption are minimized” (worksheet 28). (Quote 65.)

Other consumption-related projects are about reducing demand, studying demand, or satisfying demand or satisfying demand with local and biobased products.

Overall, there is a great diversity of projects. Not all can be listed here. Though, some other examples would be projects about values and worldviews or connecting researchers and research projects.

Table 16: codes applied to question 2.1.

	grounding
Biobased	6
Consumption	6
Assessing	4
Biomass	3
decision making	3
Demonstration	3
Economy	3
environmental impact	3
Food	3
Local	3
Modelling	3
Testing	3
Awareness	2
Building materials	2
Happy	2
Production	2
Sufficiency	2
Textile	2
Waste	2

Pertaining to the challenges researchers face in conducting their research, the picture is clear. The main challenges are related to resources (time, money, manpower, and data.). An overview of the codes used to analyze the challenges is provided in Table 17. Manpower has been used most often and refers to the lack of personnel as well as to the lack of capacity, or expertise.

For example, in worksheet 13, it was stated that the suggested research project would be the person’s expertise and that it is not aligned with what the person is currently doing. In worksheet 16 a lack of understanding is mentioned. Clearly manpower, time and money are overlapping issues. In worksheet 24 time and manpower was combined: “Time – too many things on my plate.” In worksheet 19 the aspects of “funding and time” are mentioned as one challenge.

The economics code has been used quite often as well. It refers to the power of industries, the dynamics and logic of the current economic system, lack of profitability or transparency of value chains.

“The current economic paradigm – growth is better” (worksheet 28). (Quote 66.)

“Linear economy = level of consumption, economic growth” (worksheet 25). (Quote 67.)

“Nations have economic grounding in fossil economies” (worksheet 22). (Quote 68.)

“Price of PET” (worksheet 8). (Quote 69.)

Another frequently applied code is “politics,” which captures, politics, governance, regulations, legislations as well as power issues.

“Governments losing position” (worksheet 20). (Quote 70.)

“Government/institutions: Strong government that stimulates movement, regulates current residue management, and enables biobased energy applications of the residues” (worksheet 23). (Quote 71.)

“Planned obsolescence --> the practice of designing product to breaking quickly or become obsolete in short time” (worksheet 25). (Quote 72.)

Table 17: Challenges for conducting research projects

count	code
21	brain power
12	politics
11	economy
9	time
7	money
5	technology
4	complexity
3	consumption
3	preferences
3	sentiment
2	connecting
2	consumer
2	data
2	feasibility
2	values

Since the Investment Theme Transformative Bioeconomies investigates how inter- and transdisciplinary collaboration can support transition processes, we asked if collaboration could alleviate the listed challenges. A majority of respondents indicate that collaboration can help alleviating the challenges that they have listed (see Table 18). 22 participants provided an answer to this question. How collaboration could exactly alleviate the challenges was often not discussed. All responses related to manpower indicated that bringing together people from different fields could help. Furthermore, having people collaborate seems to have the potential to free up some time.

Table 18: can collaboration alleviate challenges

count	code
33	yes
3	no
7	yes/no

8. Connecting

The last section of the worksheet aimed to facilitate connection among researchers. The last question, which inquired how the Investment Theme could support researchers in their endeavors, was hardly answered due to time constrained. The other two questions inquired about what expertise the respective researcher could bring to the table and which expertise the research would profit from. 15 of 28 participants answered the question about their own expertise, and ten provided information about the expertise they would need. An overview is given in Table 19. It needs to be stated that while this was an interesting exercise during the 2nd Community Meeting there is no added value if the exercise is not followed up by continuous possibilities to exchange. It can also be assumed that the sought expertise will differ depending on the project one works on. Thus, the collected information is rather of hypothetical character.

Table 19: expertise offered and sought by participants

sheet #	offer	offer	offer	offer	seek	seek	seek	seek
1	Industry development	Strategic management	Circular economy	x	Social psychology	Material science	partnering up on knowledge, not on transition , Social engineering	x
2	x	x	x	x	x	x	x	x
3	x	x	x	x	x	x	x	x
4	Biomass characterization	Polysaccharide functionality	Biomass conversion	x	Physics	Consumer (***)	chemistry	x
5	Processing/fractionation	Testing	pragmatism	x	x	x	x	x
6	x	x	x	x	x	x	x	x
7	x	x	x	x	x	x	x	x
8	x	x	x	x	x	x	x	x
9	x	x	x	x	x	x	x	x
10	Interdisciplinarity	Systems thinker	Creative mind - energetic	x	Need someone to get me down to earth --> tangible examples	Maybe if possible have quant examples --> modeler or so	Philosopher who can flag theories or concepts I am not aware of	x
11	Business & IT alignment	Semantic modelling (data harmonization)	Interoperability --> connecting different domains	x	x	x	x	x
12	Systems view	Quantifying sustainability	WUR-wide network	x	Partnerships on the social aspects of sustainability	More data/cases to incorporate or evaluate	x	x
13	x	x	x	x	x	x	x	x
14	System analysis (MFA)	Sustainability metrics (LCA)	Product design background	x	Biomass availability	Social science / transition expertise	Material science	x
15	x	x	x	x	x	x	x	x
16	x	x	x	x	x	x	x	x
17	Consumer research	End-product evaluations	x	x				x
18	x	x	x	x	x	x	x	x

19	Transition expertise --> has to build pressure + faster ***	Communication expertise --> how to foster connections	Collective action expertise --> *** a collective action	x	Alternative economic expertise	Gaming to test new economic/legal models	x	x
20	Maintaining and supporting process of change	Normative dematerialize of process of change	An eye for structure *** structural dimension	x	People who work on promising solutions (not just technical) that have a huge potential in themselves	Bridge builders / "translators"	Passionate people	Hands-on people with endurance
21	Material scientist	Chemical background	3D printing expert	x	Robotics	Recycling / Chemical catalysis	x	x
22	System innovation and transitions	Technology adoption	Technology in the global south	x	x	x	x	x
23	x	x	x	x	x	x	x	x
24	Help to link the projects to the bigger picture	Material science knowledge	27 years of experience	Cleaning the story, linking to the bigger picture	x	x	x	x
25	x	x	x		x	x	x	x
26	Energy efficient building & climate control	Transition processes	Material scientist	x	Analytical thinking	Plant cultivation in protected environment	Sector knowledge - implementation	x
27	x	x	x		x	x	x	x
28	Insights in consumer behavior	Insights in economics	x	x	x	x	x	x

9. Conclusions

Based on received informal feedback, the visioning exercise seemed to have been useful for most participants. Though this feedback might be biased as critical feedback might not have been shared. Positive statements were about the time and space that the exercise created to think about goals and personal dreams. Furthermore, we were complimented on the structure and composition of the worksheets. The team has also been approached by participants who wanted to get access to the template and continue working on the ideas they have put down during the 2nd Community Meeting. The main negative feedback we received from participants related to the limited time. The time insufficiency of time pertained to the individual reflection as well as to the group discussion right after the vision exercise.

While improvements to the vision exercise are necessary, based on the above analysis, it can be stated that much relevant information could be harnessed. For example, communication about the Investment Theme's structure needs to be clearer. The domains and pathways within the Investment Theme need to be presented with more clarity. Comparing all four pathways, the biobased pathway is overrepresented. Depending on the goals of the Investment Theme and WUR, the representation of the other pathways might need to be balanced out. From the ongoing work, we know that this is a difficult task. Though, it can be stated that if other pathways (recycling/circularity, CO₂ capture and utilization, as well as, dematerialization) ought to become stronger research avenues of WUR, it might be necessary to invest more in these other areas.

The dematerialization pathway has been captured by the codes "sufficiency" and "efficiency". Literature indicates that dematerialization needs both aspects. Though, the two codes did not co-occur in the dreams. Thus, it could be concluded that researchers either focus on efficiency or sufficiency, but not both. To tackle challenges related to absolute decoupling (Haberl et al., 2020; Kaya Kanlı & Küçükefe, 2023), efficiency and sufficiency endeavors need to be addressed in conjunction. Therefore, it is decisive that the Investment Theme is clear about the meaning and opportunities the dematerialization pathway adds.

Researchers seem to believe in the connection between awareness and action. However, as indicated, research clearly shows that merely raising awareness will not necessarily lead to a change of actions. This is illustrated, for example, by the awareness action gap. Psychological mechanisms of change are complex. For an overview of behavioral science concepts and models in the context of sustainability transitions, the reader might consult the working paper by Biely (2022).

Increased awareness has been connected to an improved or restrengthened human-nature relationship. Apart from awareness, values have also been mentioned as core aspects contributing to researchers' dream world. Thus, not only the technology needs to be in place, but other soft and social variables need to be changed to create a dream world. This supports the need for interdisciplinary research to facilitate transitions.

Barriers to work on the fulfillment of researchers' dreams are related to resources (manpower, money, time) but also to politics and the dominance of the current economic system. The latter two indicate that working on changing the world is hindered by deeper structures. Thus, one might be confronted by a chicken and egg situation. To work on

fundamental change, which also requires changing deeper structures, these deeper structures need to be changed.

The vision exercise and the analysis presented in this document build starting points for potential future steps. The vision exercise could be refined and shared with the wider research community. The exercise could be translated into a survey which could be sent out to new Investment Theme research partners. The results from the dream section could be used to formulate a common dream that is used for communication purposes and further explorations. For example, it could be investigated to what extent Investment Theme researchers and stakeholders agree or disagree with the dream. Individual researcher's work in contributing to make the dream come true could be further surveyed and mapped out. The dream could be used as a basis and trigger for discussion about, for example, deep structural changes.

Visions are key for transitions. They can help to find common ground, reach a broader audience or serve as an inspiration (Dueñas-Ocampo et al., 2023). With this analysis, an important step towards formulating a common vision of the Investment Theme Transformative Bioeconomies has been taken. It is aspired that a vision based on this analysis will serve to bring researchers of all disciplines as well as diverse stakeholders together to work on the Materials Transition.

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ANNEX I

Below you can find the worksheet participants of the 2nd Community Meeting had to fill in. The sheet has been developed by the Investment Theme's Core Team.

Individual reflection:



The individual reflection is split up into 3 parts – dreaming – grounding – connecting

Name: _____

Dreaming



Dream **20 years ahead**. You can create your dream reality based on your imagination and wishes. The only thing that is bound to reality are natural laws. Everything else might change in 20 years' time. Try and disconnect from the current reality. How we organize as a society, what we value, and how we relate to nature, all follow your personal dream!



Think about a sustainable future world in which **the materials transition has already happened**.

What would that future look like?

Please describe below.

You can also make drawings to illustrate your dream! Below the lines, is some space for your drawing.





Space to draw your dream. 

ANNEX II

CODEBOOK

#	Code	Comment
1	agency	x
4	assessing	x
24	awareness	is also about having a choice, also self-awareness, awareness about things in general, personal growth
29	biobased	natural, biobased products, biobased pathway, biobased resources
5	biomass	x
22	brain power	man/woman power, expertise, knowledge, skills
4	building materials	x
1	bureaucracy	x
2	business	x
1	chemistry	x
3	CO2	CO2 pathway, not emissions, emissions are captured by environmental impact. CO2 trading is captured by economy
1	collaboration	x
3	common good	x
1	complexity	x
3	connecting	x
1	consultancy	x
3	consumer	x
23	consumption	consumption and consumers, demand
2	customized	x
2	data	x
3	decision making	x
2	dematerialize	x
3	demonstration	x
1	disruption	x
1	ecocentric	x
30	economy	economics, economy, economic effects, economic paradigm, economic values, prices, market mechanisms
1	efficacy	x
5	efficient	more productive, less input/output
4	energy	x
33	environmental impact	positive and negative, environmental footprint, planetary boundaries, restoring nature, natural problems
2	extrinsic motivation	x
2	feasibility	x
13	Food	Food, agriculture, animal husbandry, diet (vegetarian, vegan), food system
11	governance	rules, legislation, governmental bodies
4	greed	also profit-driven
28	grounding	x
9	happy	x
6	harmony, balance	x
2	homocentric	utility-centred view

17	human-nature connection	x
1	innovations	x
14	institutions	how we organize as society
4	intrinsic motivation	x
4	justice	justice and equality
15	local	x
3	lock-in	x
6	long-term use	x
1	material science	x
3	modeling	modeling, vizualizing
2	modular	x
7	money	money, funding, financial resources
1	narratives	x
5	people-material connection	x
7	people-people connection	x
1	physics	x
2	plastic	x
13	politics	politics, policies, political power, power, regulations, laws
3	preferences	x
24	production	x
1	psychology	x
19	recycle	Reuse, Reduce, circular
13	respect	respect = care Respect is often connected to awareness. One is the consequence of the other. #27: "we are aware of these cycles and respect ... them."
1	scale	x
3	sentiment	x
11	societal impact	social boundaries, society's impact on nature and/or people
17	wociety	x
1	socio-ecology	x
2	solution	x
20	sufficiency	connected to less consumption, less production, degrowth, needs-based, needs-focused, awareness of needs, access to essentials, self-sufficiency
12	technology	x
4	testing	x
11	textile	x
12	time	x
3	transport	x
6	true cost	true cost of goods if externalities were internalized
23	values	things related to values, such as justice, responsibility
1	vision	x
14	waste	Waste is often connected to recycling or reuse. In the end I decided to have an extra waste node because waste was mentioned without referring to reuse.

ANNEX III

Used Quotes in Sections 7.1. and 8.

Quote #	Quote
1	»This new input can be produced within the planetary boundaries, as the whole system is “optimized” using reduce, reuse and recycle strategies (dematerialization)« (worksheet 14). (Quote 1.)
2	“Production + Consumption within a natural + social boundaries” (worksheet 28). (Quote 2.)
3	“Moreover, the footprint of humans will be much lower” (worksheet 1). (Quote 3)
4	“However, society has become aware of the damage that is caused by fossil materials” (worksheet 22). (Quote 4.)
5	“People have an honest view of themselves and the world population in terms of the impact they have on each and the planet (the – not their – it’s not ours)” (worksheet 2). (Quote 5.)
6	“Any governing agent supports people in their choices for reducing waste, limiting consumption, and caring for their surroundings” (worksheet 2). (Quote 6.)
7	“All people care about materials: applying less, using less, using the better kinds safeguarding ecological foundation” (worksheet 20). (Quote 7.)
8	“They would no longer exploit /marginalize its natural resources + people!” (worksheet 19). (Quote 8.)
9	“Consumers that are more aware about their choices, and how they impact on the earth system” (worksheet 23). (Quote 9.)
10	“This translates in willingness of consumers to pay the true price for products, reduce their consumption of goods and make more considerate choices that consider the environment as well as the social and economic sustainability of goods” (worksheet 22). (Quote 10.)
11	“Society lives within planetary boundaries & in harmony with nature” (worksheet 10). (Quote 11.)
12	»All actors in the system have regard for themselves as well as the needs of others. This “includes the planet”« (worksheet 2). (Quote 12.)
13	“Production with less societal effects (modern slavery)” (worksheet 28). (Quote 13.)
14	“Focus on being content --> Link consumption on what we need” (worksheet 28). (Quote 14.)
15	“[...] reduce their consumption of goods and make more considerate choices [...]” (worksheet 22). (Quote 15.)
16	“I can use the nettle that grows in our surroundings to make my own home textiles” (worksheet 8). (Quote 16.)
17	“We produce our textiles in Europe, making use of plants/animals/fungi that can grow in our climate” (worksheet 8). (Quote 17.)

18	<p>“We are growing a tiny house in our garden. This is a new approach in which specific trees & bushes are planted and directed to form the house. Land growers grow the other input materials *** and we asked the local processor to *** this in custom building blocks to shape our home *** etc. It is a very creative/active process/project that is not to complicated...” (worksheet 13). (Quote 18.)</p>
19	<p>“We consume more on demand: clothing, cars, no fiat financing, fast food, fast consumption, more wooden products --> housing --> furniture --> not everything is produced in China” (worksheet 25) (Quote 19.)</p>
20	<p>“Production is governed by a combination of new craftsmanship (e.g. mycelium) in combination with new high-technologies (e.g. 3D-printing), which enable local production using local biobased feedstock” (worksheet 6). (Quote 20.)</p>
21	<p>“After the materials transition all new materials needed for production are from renewable/natural resources” (worksheet 14). (Quote 21.)</p>
22	<p>“What currently is holding-back consumers to engage with and consume natural, sustainable textile is newness, such barriers should – in a world in which the material transition has happened – be overcome” (worksheet 17). (Quote 22.)</p>
23	<p>“Re-use of water / nutrients / CO2 that is stored in plant material” (worksheet 26). (Quote 23.)</p>
24	<p>“We managed to phase out fossil feedstock by clever combination of biomass use and recycling, CCU [Carbon Capture and Utilization] is starting to scale up” (worksheet 24). (Quote 24.)</p>
25	<p>»“Looping strategies” are always to keep the materials in the loop including reuse but also novel technologies (CO2 capture, bioenergy, etc.) can be used to keep the natural materials in the materials system« (worksheet 14). (Quote 25.)</p>
26	<p>“An agriculture that uses N-fertilizer based on sustainable energy resources (hydropower, waterstof), and use bio stimulants to free phosphorus tied up in the soil to increase phosphorus use efficiency” (worksheet 23). (Quote 26.)</p>
27	<p>“Breeding efforts have resulted in plants that are twice as productive and resistant against plagues and diseases, preferably also have N-fixing properties” (worksheet 23). (Quote 27.)</p>
28	<p>“We have choice: recycle goods, buying second hand, and these goods are linked to fashion as well” (worksheet 2). (Quote 28.)</p>
29	<p>“localized production & consumption as much as possible to: a) Create a closer link between planet & people b) To reduce emissions” (worksheet 10). (Quote 29.)</p>
30	<p>“Clothes/Food/ *** and so on / Produce on the spot and only in the *** --> no waste material, no energy waste” (worksheet 21) (Quote 30.)</p>
31	<p>“A more local set-up of society (communities) and means of production enables this closer interaction with nature” (worksheet 6). (Quote 31.)</p>
32	<p>“The better choices have been black boxed, because people cannot be expected to inform themselves thoroughly on every product they use: The production, use and waste phase” (worksheet 20). (Quote 32.)</p>

33	“Production & consumption are thought through to allow for the reduction of consumption, the recycling of materials & reduction of waste streams” (worksheet 10). (Quote 33.)
34	“As there is not the need to produce new resources, [...]” (worksheet 27). (Quote 34.)
35	“I have my own little greenhouse to grow all the vegetables I need” (worksheet 8). (Quote 35.)
36	“We do not value growth (economic) as much, instead we focus on personal and natural growth” (worksheet 9). (Quote 36.)
37	“We are aware of these cycles and respect and promote them” (worksheet 27). (Quote 37.)
38	“People are self-supportive and do not need any validation from others to make decisions” (worksheet 2). (Quote 38.)
39	“People appreciate natural resources but do not only perceive them as resources” (worksheet 10). (Quote 39.)
40	»These essentials are produced by actors who are not (solely) driven by monetary goals, but by a sense of good “society ship”« (worksheet 2). (Quote 40.)
41	“Through all this governments business consumers & citizens take more responsible decisions” (worksheet 19). (Quote 41.)
42	“A society which has adopted broad holistic values instead of narrow economic ones” (worksheet 6). (Quote 42.)
43	“Instead of market demand nature’s ecological production capacity becomes a leading principle in food and material production” (worksheet 6). (Quote 43.)
44	“People understand that recycling rather than profit-driven depletion is how we not only survive but actually thrive as a population” (worksheet 2). (Quote 44.)
45	“Such behavior would include established sustainable and inherently *** routines and *** --> coming from *** understanding or at least intrinsic motivation” (worksheet 17). (Quote 45.)
46	“Both technological development and *** would also stem from a place of intrinsic motivation to preserve nature and regenerate the ecosystem” (worksheet 17). (Quote 46.)
47	»We all have renewed a strong connection to our “stuff.” « (worksheet 24). (Quote 47.)
48	“Our stuff tells who we are and is valuable” (worksheet 24). (Quote 48.)
49	“Technologies are used in such a way that it serves our needs and does not negatively impact our societal values” (worksheet 11). (Quote 50.)
50	“People finally understood they need the planet more than it needs them” (worksheet 2). (Quote 51.)
51	“People understand & have internalized the close connection with nature” (worksheet 10). (Quote 52.)
52	“There is no waste but resources that are continuously used” (worksheet 27). (Quote 53.)

53	“the knowledge, energy and effort go to extend the life time of the goods, reuse them and find them another future use where their value is still the same” (worksheet 27). (Quote 54.)
54	“This means that overall less material is used (reduce), the materials are kept in as short feedback loops as possible (reuse/recycle) keeping the materials in the loop and therefore decreasing the need for new materials as input in the system” (worksheet 14). (Quote 54.)
55	“CO2 flows-reuse from industry” (worksheet 26) (Quote 55.)
56	“I would imagine a world where deliberately have organized our different systems (e.g. food and agriculture) in such a way that resources are used as efficient as possible and that the systems are aligned and interoperable with each other” (worksheet 11). (Quote 56.)
57	»“Back to basics” – own garden, food preservation etc. less speculation, less traveling etc. Basically – be more satisfied & healthy« (worksheet 26). (Quote 57.)
58	“Converting biomass into valuable components” (worksheet 4). (Quote 58.)
59	“Expanding my current research on developing approaches to give an indication of expected sustainability performance of novel/biobased chains --> which I believe we need to achieve my dream” (worksheet 12). Quote 59.)
60	“I would like to measure the exact and total carrying capacity of the marine system to see how much we can extract/harvest as a whole (all commodities combined)” (worksheet 16). (Quote 60.)
61	“Showcase that a needs-based society makes people happy at lower costs for the planet communities. The project would also focus more on the consumer, rather than on the producer side” (worksheet 1). (Quote 61.)
62	“I would like to put metrics to this envisioned material. System starting with the amounts of materials used looped over multiple years (dynamic MFA model) and the qualities of these materials (“new” applications in looping strategies) [and maybe later on with environmental impacts (CO2, lands use, toxicity, etc)]” (worksheet 14). (Quote 62.)
63	“Build and test new models for companies to run more responsibly” (worksheet 19). (Quote 63)
64	A test farm with several model landscapes and form of regenerative agriculture - Feedstocks harvested from these landscapes are (***) a workshop to locally produce building and textile products. - Operated by local community - The economic and environmental, social impacts are measure” (worksheet 6). (Quote 64)
65	“A project that understands/explores how to make consumers happy with consumption or what they really need. Th a sustainable world – where environment + societal effects of production + consumption are minimized” (worksheet 28). (Quote 65.)
66	“The current economic paradigm – growth is better” (worksheet 28). (Quote 66.)
67	“Linear economy = level of consumption, economic growth” (worksheet 25). (Quote 67.)

68	"Nations have economic grounding in fossil economies" (worksheet 22). (Quote 68.)
69	"Price of PET" (worksheet 8). (Quote 69.)
70	"Governments losing position" (worksheet 20). (Quote 70.)
71	"Government/institutions: Strong government that stimulates movement, regulates current residue management, and enables biobased energy applications of the residues" (worksheet 23). (Quote 71.)
72	"Planned obsolescence --> the practice of designing product to breaking quickly or become obsolete in short time" (worksheet 25). (Quote 72.)

ANNEX IV

Table 20: codes per worksheet within the dream section of the individual vision exercise.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	Totals	
Totals	19	53	0	0	7	22	7	24	13	20	7	9	5	20	4	6	14	7	21	17	10	18	11	17	23	11	26	15	406	
awareness	0	8	0	0	0	0	0	0	1	2	0	0	0	0	0	0	2	0	0	0	0	3	1	1	1	0	1	1	21	
biobased	1	0	0	0	2	2	0	4	1	0	0	1	1	3	0	0	1	0	0	0	1	1	2	1	1	2	0	0	24	
building materials	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	
CO ₂	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	3	
common good	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	3	
consumption	0	2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	3	0	1	1	0	4	1	1	3	0	1	3	23	
customized	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	
dematerialize	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
disruption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	
ecocentric	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
economy	0	1	0	0	0	3	0	1	2	0	0	0	0	0	0	1	0	0	3	0	0	0	1	0	0	0	2	0	14	
efficient	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5	
energy	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	
environmental impact	1	4	0	0	0	1	1	1	1	2	0	1	0	3	1	2	1	1	1	1	1	0	2	1	1	2	0	0	2	30
extrinsic motivation	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	
food	0	0	0	0	1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	10	
governance	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	0	0	0	0	0	0	9	
greed	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
happy	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	1	7	
harmony, balance	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	6	
homocentric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	
human-nature connection	0	1	0	0	0	3	0	0	2	3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2	0	4	0	17	
institutions	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	1	3	2	0	1	0	0	0	0	1	0	14	
intrinsic motivation	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	4	
justice	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	4	
local	0	0	0	0	0	2	0	4	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	2	1	0	0	13	
lock-in	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
long-term use	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	2	0	6	
modular	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
people-material connection	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	5	
people-people connection	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	7	
plastic	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
production	1	1	0	0	0	3	0	3	1	2	0	0	1	3	0	0	0	0	0	1	2	0	0	1	0	0	1	3	23	

recycle	1	6	0	0	1	0	0	0	0	1	0	0	0	3	0	1	0	0	0	0	1	0	0	1	0	1	2	0	18
respect	0	5	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	1	0	0	0	1	1	0	1	0	13
societal impact	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	2	10
Society	2	2	0	0	1	3	0	0	1	1	0	0	0	0	1	1	0	1	1	2	1	0	0	0	0	0	0	0	17
sufficiency	1	5	0	0	0	0	0	2	0	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	3	18
technology	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	7
textile	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2	1	0	0	0	9
time	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	3
transport	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	3
true cost	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	6
values	4	2	0	0	0	2	0	0	1	1	1	1	0	0	0	0	2	0	1	2	0	0	0	1	1	0	1	0	20
waste	1	2	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	1	0	2	12