

Dokumentation Data conversation

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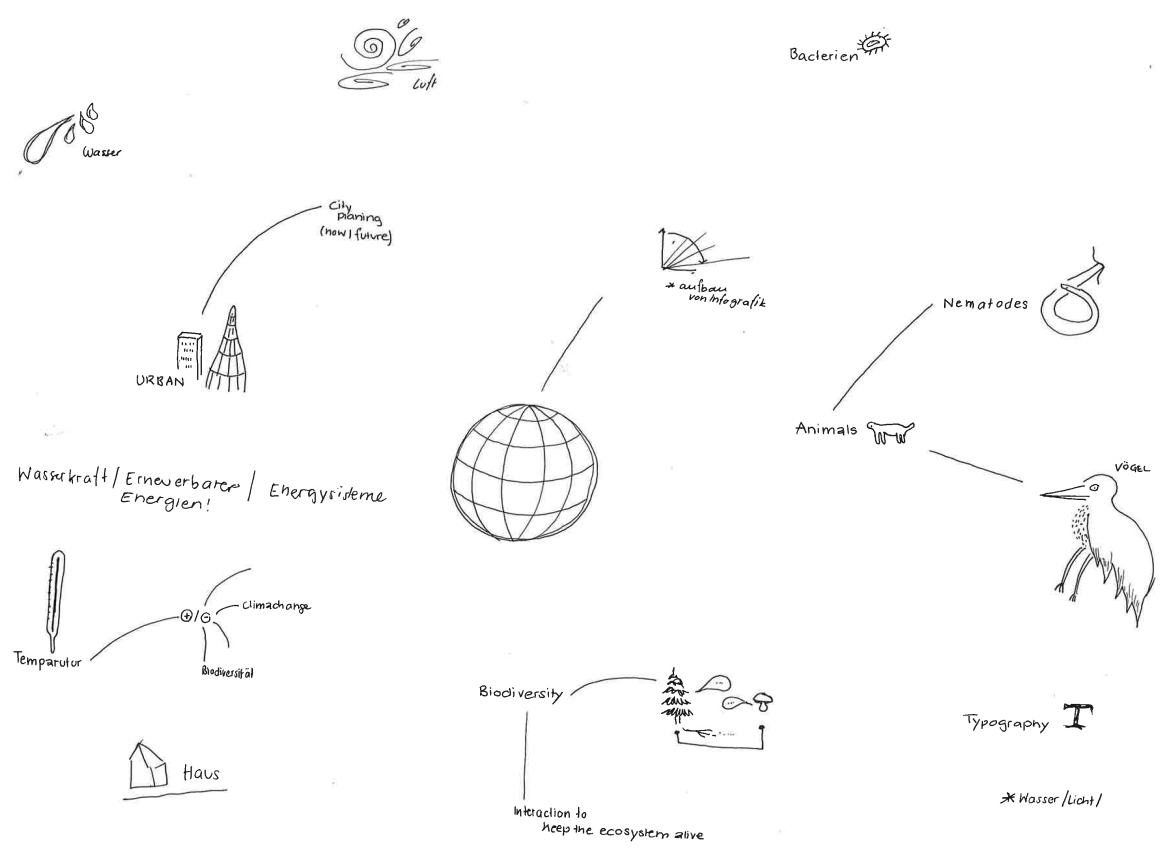
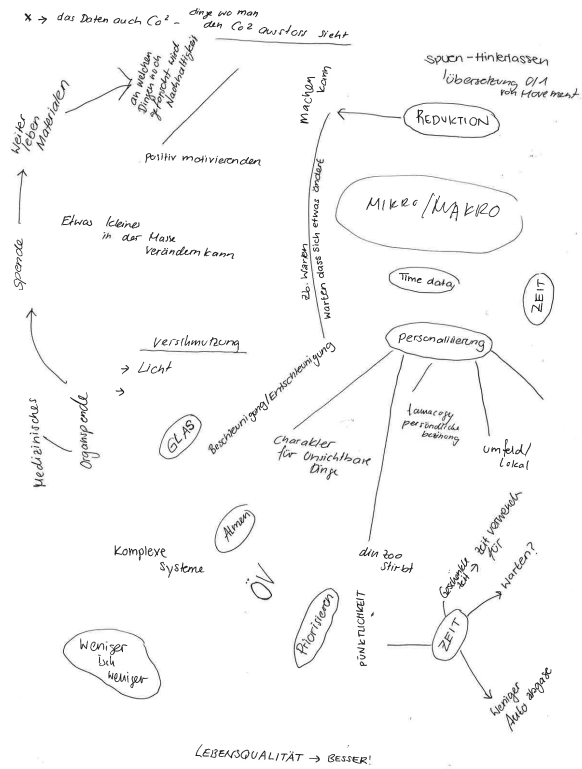
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Table of contents

Explore		Implementation	
3	Mindmaps / Brainstorming	25	Code Structure
4	Mindmap	26	Code
5	Datasheets	27	Figma
6	Focused topics	28	Final
7	Survey	29	Darkmode
8	Dataset	30	Further Ideas
9	Brainstorming with the topic data		
Concept			
10	First Idea		
11	First Idea Linear Story		
12	Which parts are inside?		
13	Additional expectations		
14	Prototyp elements		
15	Prototype		
16	Concept Idea		
17	Interaction with the table		
18	Our goals		
Design			
19	Elaboration concept		
20	Visual language sketches		
21	Visual language directions		
23	Visual language elaboration		

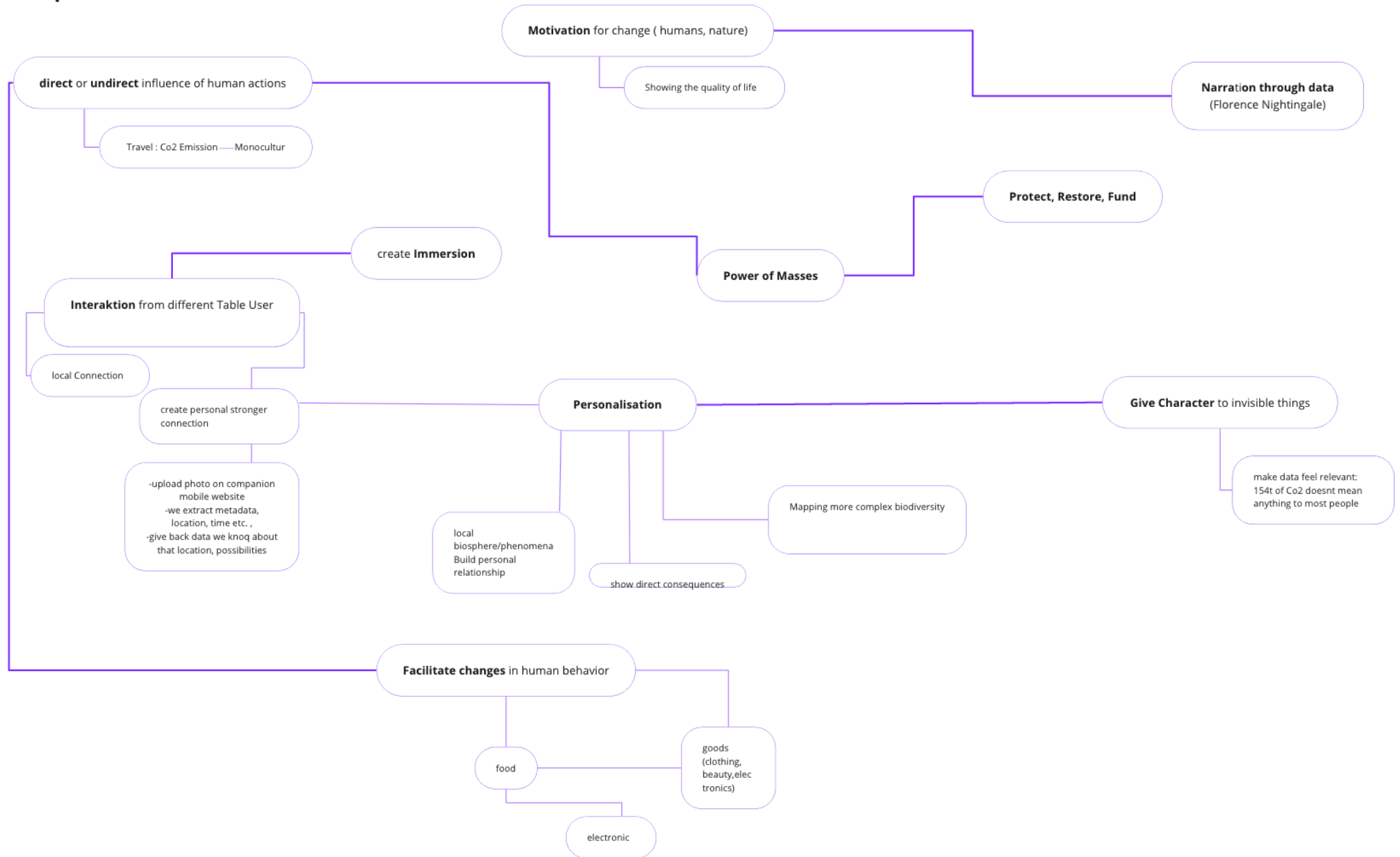
Brainstorming

Explore



Mindmap

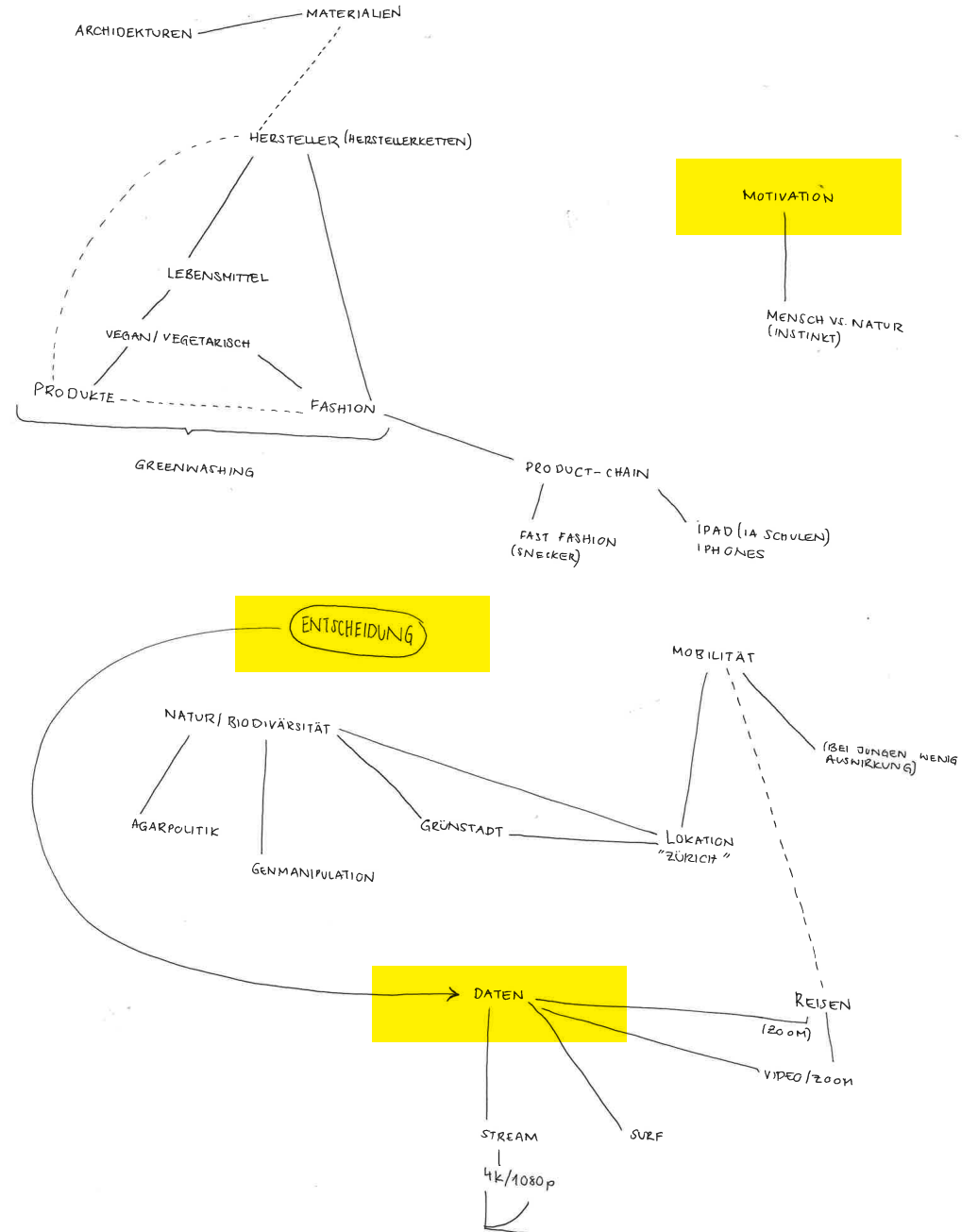
Explore



After committing to a topic the search for data was started. Despite being known area of research there is a lot of controversy about the accuracy of published data in the media. Another reason for unvalid data is the rapid technological improvements happening in communication & storage technology. On top of that the covid-19 epidemic lead to an imense increase in data use and distorted the validity of found datasets even more. In the end we got lucky and found a quite fresh paper by researchers from the University of Maryland, Purdue, MIT, Yale and the Imperial College London. Those sources were trustworthy and offered a good dataset in addition to their paper.

In addition to the usual energy use of data use they incorporated the use of land and water into their calculations, which paints a way more accurate picture of the situation.

This lead us to include those factors in our data visualisation.

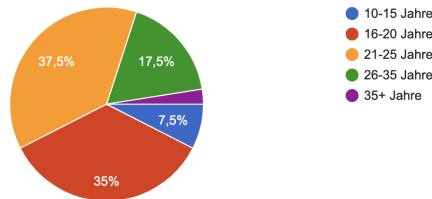


Survey

To get out of our bubble and get the feel for urgent topics to tackle we created a survey which was sent to approximately 50 people of our target group. In the survey we wanted to get a feel for leverage points we could use to facilitate long term change in their behaviour. Besides the topics of interest and their knowledge about those topics we wanted to see how willing they would be to change their behaviour in their daily life. And what kind of change would be the most acceptable one for them.

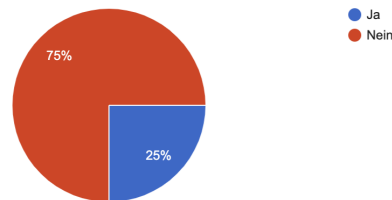
Explore

Wie alt bist du?
40 Antworten



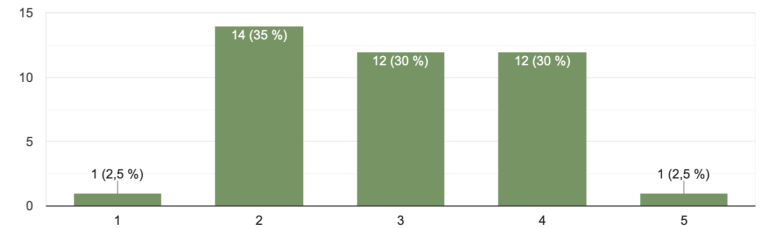
Kennst du den Einfluss von deinem Datenverbrauch auf den Klimawandel? (Streaming, Medienkonsum, Datenspeicher-Cloud, Serverfarmen)

40 Antworten



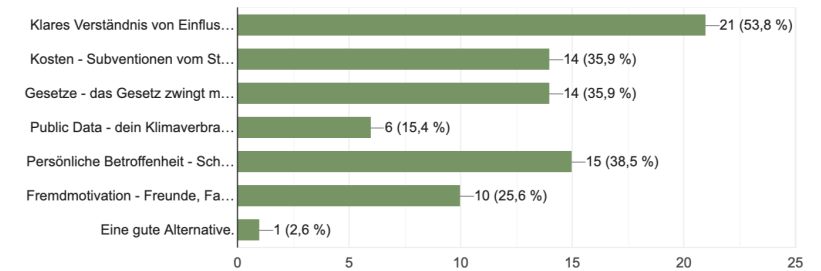
Wie fest ist Klimaschutz Thema in deinem Alltag?

40 Antworten



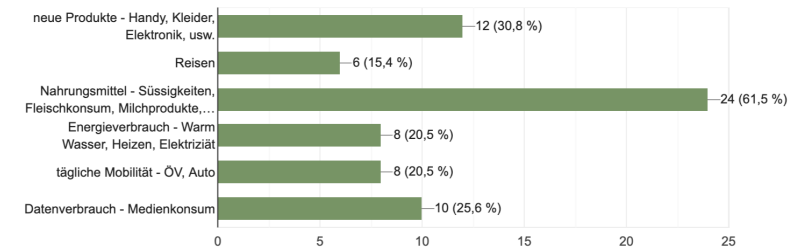
Was würde dich dazu motivieren diesen Schritt zu tätigen?

39 Antworten



In welchem dieser Lebensbereiche könntest du am einfachsten deinen Konsum reduzieren?

39 Antworten



Dataset

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	
1																										
2																										
3		Footprints for specific applications											Monthly Footprints						ASSUMPTIONS							
4		Platform	Data Usage (GB/hr)		Carbon Footprint (g CO2e/hr)		Water Footprint (L/hr)		Land Footprint (cm²/hr)		Platform	Carbon Footprint (g CO2e)		Water Footprint (L)		Land Footprint (cm²)		Streaming Serv	4 hours of streaming a day for 30 days							
5			min*	max	min	max	min	max	min	max		min	max	min	max	min	max	Videoconferenc	15 1-hour videoconferencing meetings a week for 4 weeks							
6		Netflix [15]	1.0	7.00	28.056	440.565	0.744	5.205	11.069	77.480	Netflix	3366.77	52867.80	89.22	624.57	1328.23	9297.63	Social Media	2 hours of app use a day for 30 days							
7		Hulu [16]	1.4	7.20	37.876	453.153	1.004	5.353	14.943	79.694	Hulu	4545.14	54378.31	120.45	642.42	1793.11	9563.28	Messaging	1 hour of messaging a day for 30 days							
8		Amazon Video [17]	0.9	7.00	25.251	440.565	0.669	5.205	9.962	77.480	Amazon Video	3030.10	52867.80	80.30	624.57	1195.41	9297.63	Miscellaneous	4 hours of miscellaneous web use a day for 30 days							
9		Youtube [18]	0.2	15.98	6.313	1005.747	0.167	11.882	2.490	176.876	Youtube	757.52	120689.64	20.08	1425.81	298.85	21225.16									
10		Spotify [19]	--	0.04	--	2.518	--	0.030	--	0.443	Spotify	--	302.10	--	3.57	--	53.13									
11		Skype [20]	0.1	1.86	2.806	117.064	0.074	1.383	1.107	20.588	Skype	168.34	7023.86	4.46	82.98	66.41	1235.26									
12		Zoom [21]	0.5	2.50	15.150	157.345	0.402	1.859	5.977	27.672	Zoom	909.03	9440.68	24.09	111.53	358.62	1660.29									
13		Webex [22]	0.5	2.58	12.625	162.380	0.335	1.918	4.981	28.557	Webex	757.52	9742.78	20.08	115.10	298.85	1713.42									
14		FaceTime [23]	--	0.18	--	11.329	--	0.134	--	1.992	FaceTime	--	679.73	--	8.03	--	119.54									
15		Google Hangout [24]	0.3	3.24	7.575	203.919	0.201	2.409	2.989	35.862	Google Hangout	454.51	12235.12	12.05	144.54	179.31	2151.74									
16		Google Duo [25]	--	0.48	--	30.210	--	0.357	--	5.313	Google Duo	--	1812.61	--	21.41	--	318.78									
17		Facebook [26]	0.1	0.16	2.525	9.818	0.067	0.116	0.996	1.727	Facebook	151.50	589.10	4.02	6.96	59.77	103.60									
18		Twitter [27]	--	0.36	--	22.658	--	0.268	--	3.985	Twitter	--	1359.46	--	16.06	--	239.08									
19		Instagram [28]	--	0.10	--	6.294	--	0.074	--	1.107	Instagram	--	377.63	--	4.46	--	66.41									
20		Snapchat [29]	--	0.16	--	10.070	--	0.119	--	1.771	Snapchat	--	604.20	--	7.14	--	106.26									
21		TikTok [30]	0.5	1.40	13.467	88.113	0.357	1.041	5.313	15.496	TikTok	808.03	5286.78	21.41	62.46	318.78	929.76									
22		WhatsApp [31]	0.008	0.40	0.224	25.175	0.006	0.297	0.089	4.427	WhatsApp	6.73	755.25	0.18	8.92	2.66	132.82									
23		WeChat [32]	0.004	0.11	0.112	6.923	0.003	0.082	0.044	1.218	WeChat	3.37	207.69	0.09	2.45	1.33	36.53									
24		Online Gaming [33]	0.040	0.30	1.122	18.881	0.030	0.223	0.443	3.321	Online Gaming	134.67	2265.76	3.57	26.77	53.13	398.47									
25		Web Surfing [34]	--	0.15	--	9.441	--	0.112	--	1.660	Web Surfing	--	1132.88	--	13.38	--	199.23									
26																										
27		* Some applications only had a single data usage value, assumed to be the maximum																								
28		Data was collected from number of sources, listed on the 'References' tab.																								
29																										
30																										
31																										
32		Application-Based Monthly Water Footprints as...																								
33		Platform	kg bananas (1056 L/kg bananas)		kg potatoes (287 L/kg potatoes)		kg tomatoes (200 L/kg tomatoes)		kg oranges (533 L/kg oranges)		L beer (296 L water/L beer)															
34			max	min	max	min	max	min	max	min	max	min														
35		Netflix	0.084	0.591	0.311	2.176	0.446	3.123	0.167	1.172	0.301	2.110														
36		Hulu	0.114	0.608	0.420	2.238	0.602	3.212	0.226	1.205	0.407	2.170														
37		Amazon Video	0.076	0.591	0.280	2.176	0.402	3.123	0.151	1.172	0.271	2.110														
38		Youtube	0.019	1.350	0.070	4.968	0.100	7.129	0.038	2.675	0.068	4.817														
39		Spotify	--	0.003	--	0.012	--	0.018	--	0.007	--	0.012														
40		Skype	0.004	0.079	0.016	0.289	0.022	0.415	0.008	0.156	0.015	0.280														
41		Zoom	0.023	0.106	0.084	0.389	0.120	0.558	0.045	0.209	0.081	0.377														
42		Webex	0.019	0.109	0.070	0.401	0.100	0.575	0.038	0.216	0.068	0.389														
43		FaceTime	--	0.008	--	0.028	--	0.040	--	0.015	--	0.027														
44		Google Hangout	--	0.137	--	0.504	--	0.723	--	0.271	--	0.488														
45		Google Duo	--	0.020	--	0.075	--	0.107	--	0.040	--	0.072														
46		Facebook	0.004	0.007	0.014	0.024	0.020	0.035	0.008	0.013	0.014	0.024														
47		Twitter	--	0.015	--	0.056	--	0.080	--	0.030	--	0.054														
48		Instagram	--	0.004	--	0.016	--	0.022	--	0.008	--	0.015														
49		Snapchat	--	0.007	--	0.025	--	0.036	--	0.013	--	0.024														
50		TikTok	0.020	0.059	0.075	0.218	0.107	0.312	0.040	0.117	0.072	0.211														
51		WhatsApp	0.000	0.008	0.001	0.031	0.001	0.045	0.000	0.017	0.001	0.030														
52		WeChat	0.000	0.002	0.000	0.009	0.000	0.012	0.000	0.005	0.000	0.008														
53		Online Gaming	0.003	0.025	0.012	0.093	0.018	0.134	0.007	0.050	0.012	0.090														
54		Web Surfing	--	0.013	--	0.047	--	0.067	--	0.025	--	0.045														
55																										
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Brainstorming with the topic data

Explore

1. Visionary approach data have less data - can have little influence on it

2. local data - Zurich (personalised)

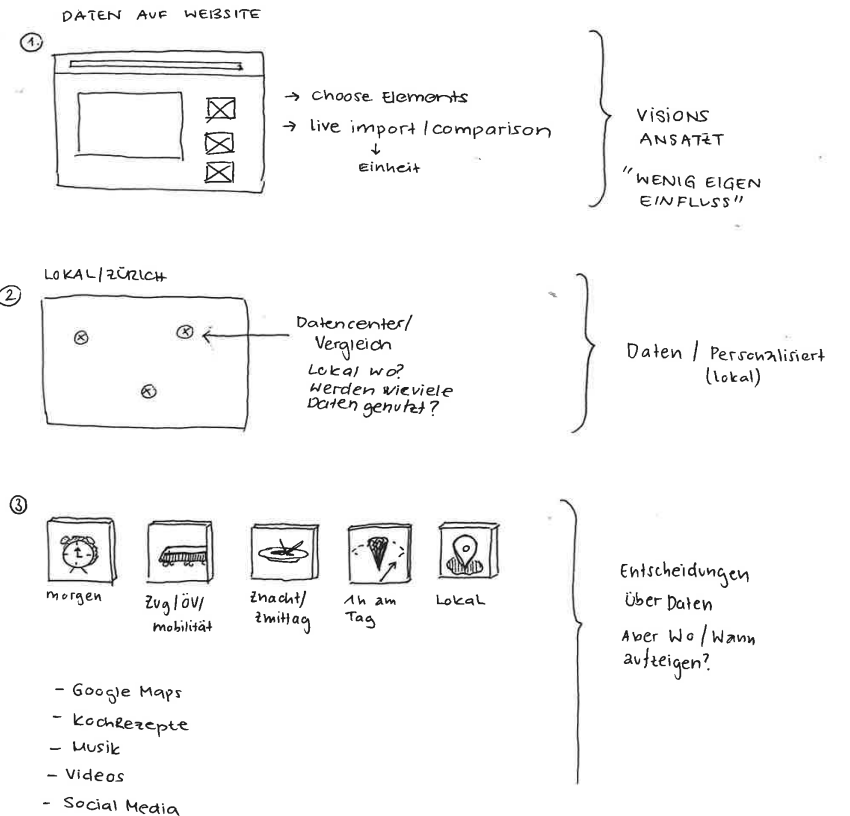
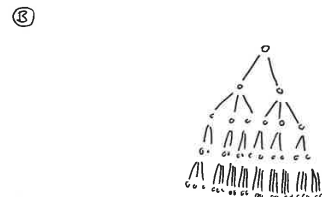
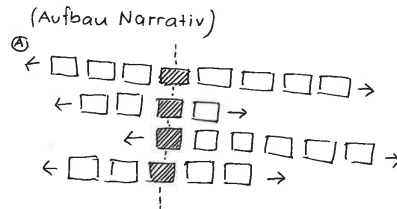
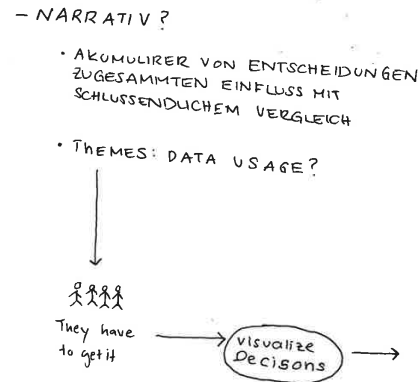
3. decisions e.g. over one day to show one approach decisions

Questions:

What is our narrative?

How does the storyline build up tree-like or always just options?

What does the user really need to understand?

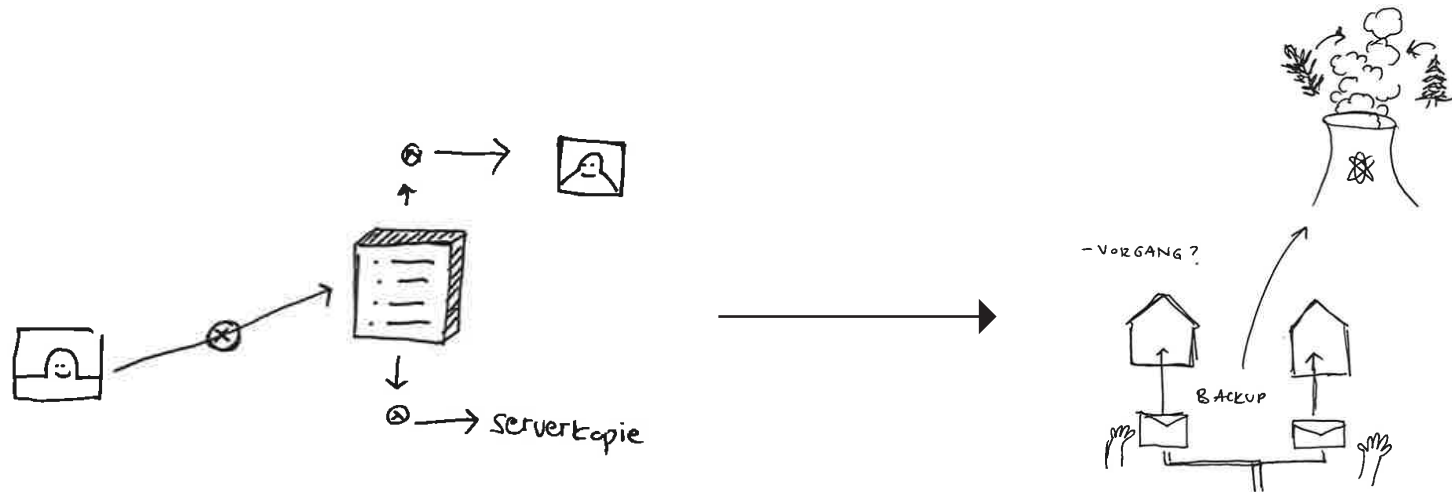
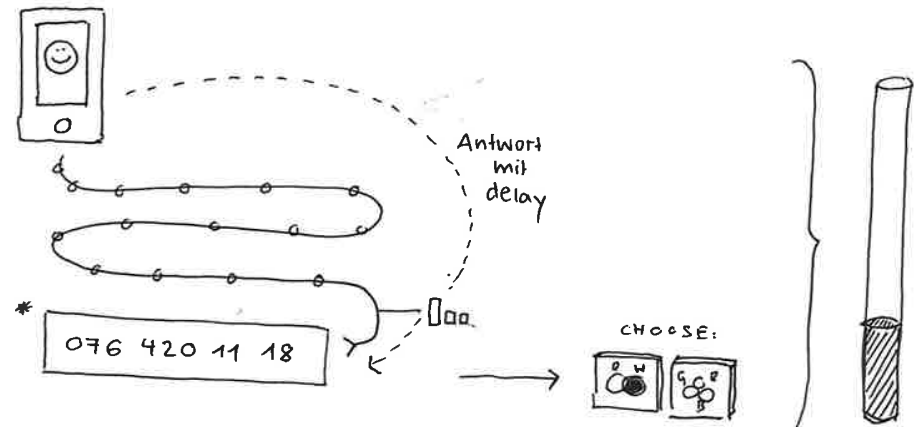


First Idea

Idea of communicating via data, sms etc.

The data is consumed via the server.
How can we show this?

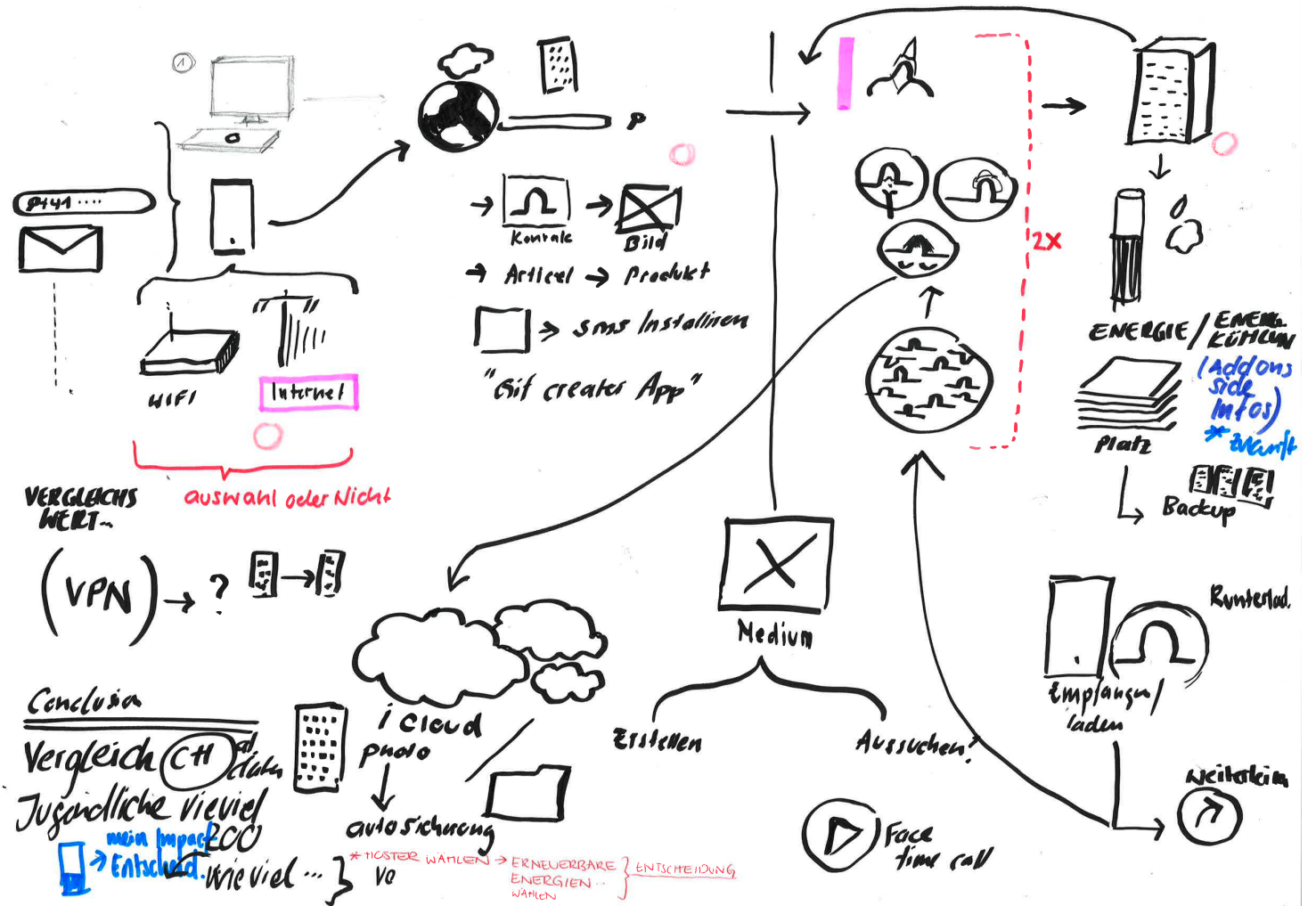
Concept



First Idea Linear Story

Concept

At the beginning our idea storyline was linear. We were describing different stations.



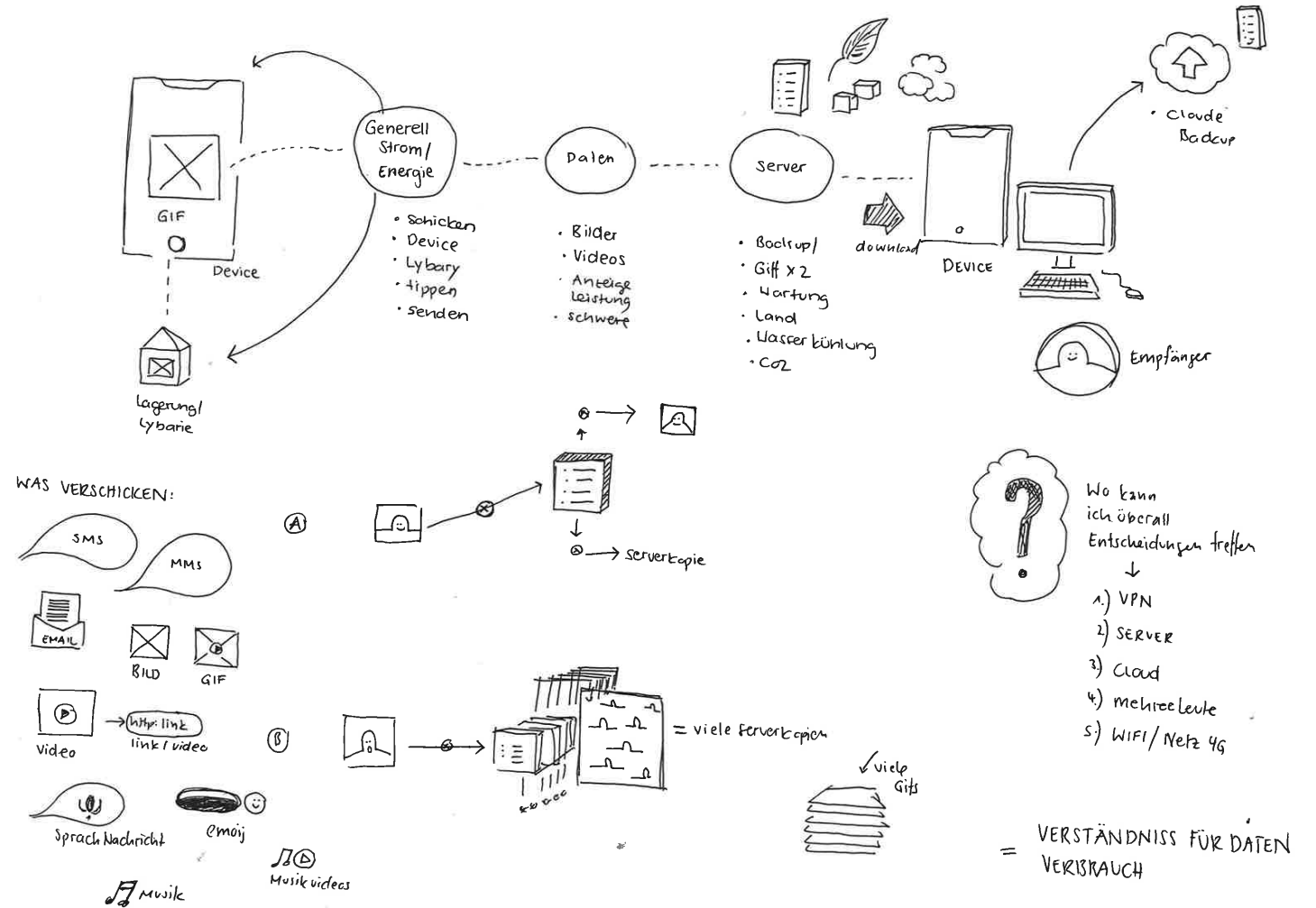
Which parts are inside?

Concept

Which things consume electricity energy at all?

What do we want to include?

VPN, backup, group chat, receiver, decisions.



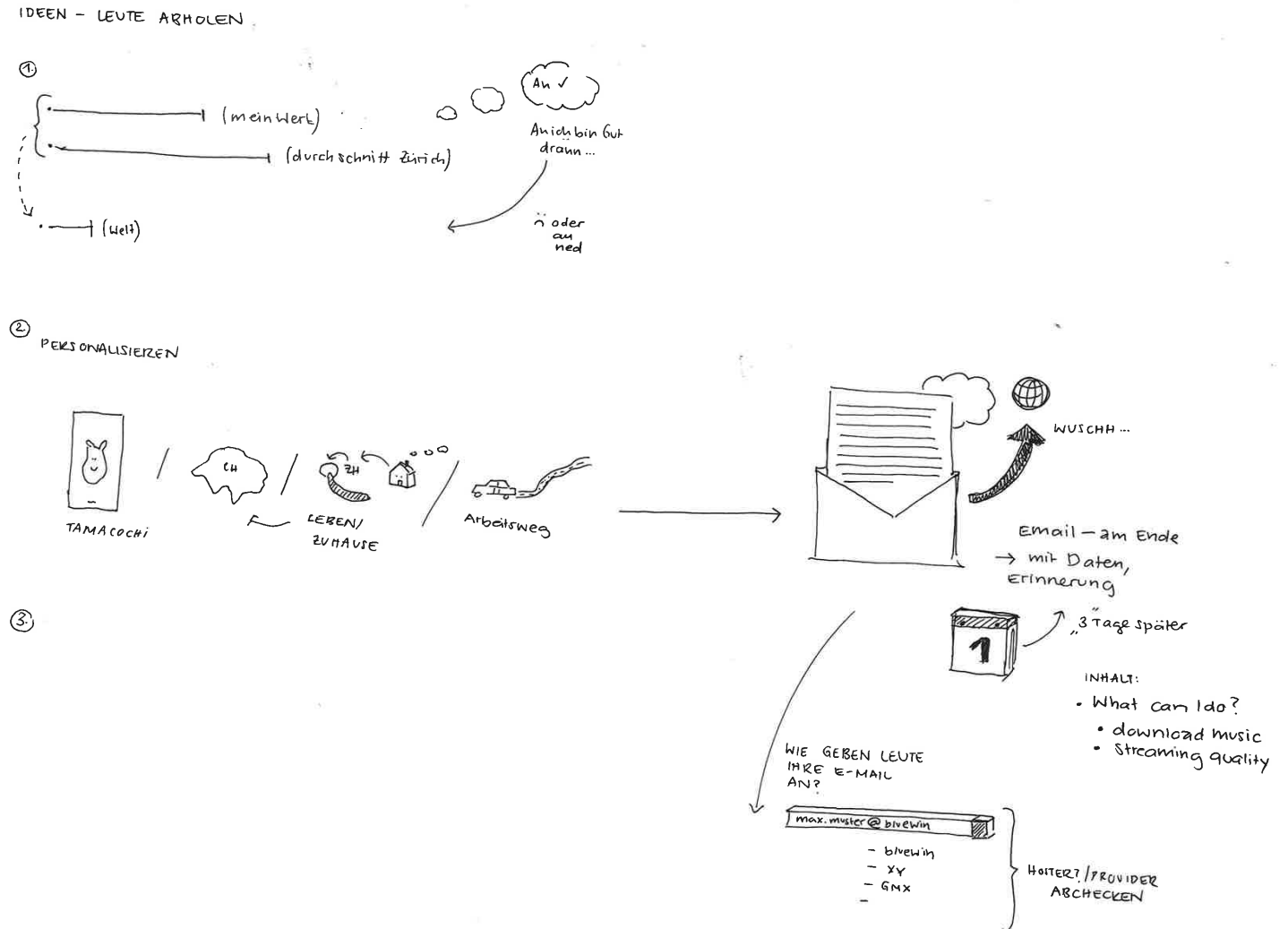
Additional expectations

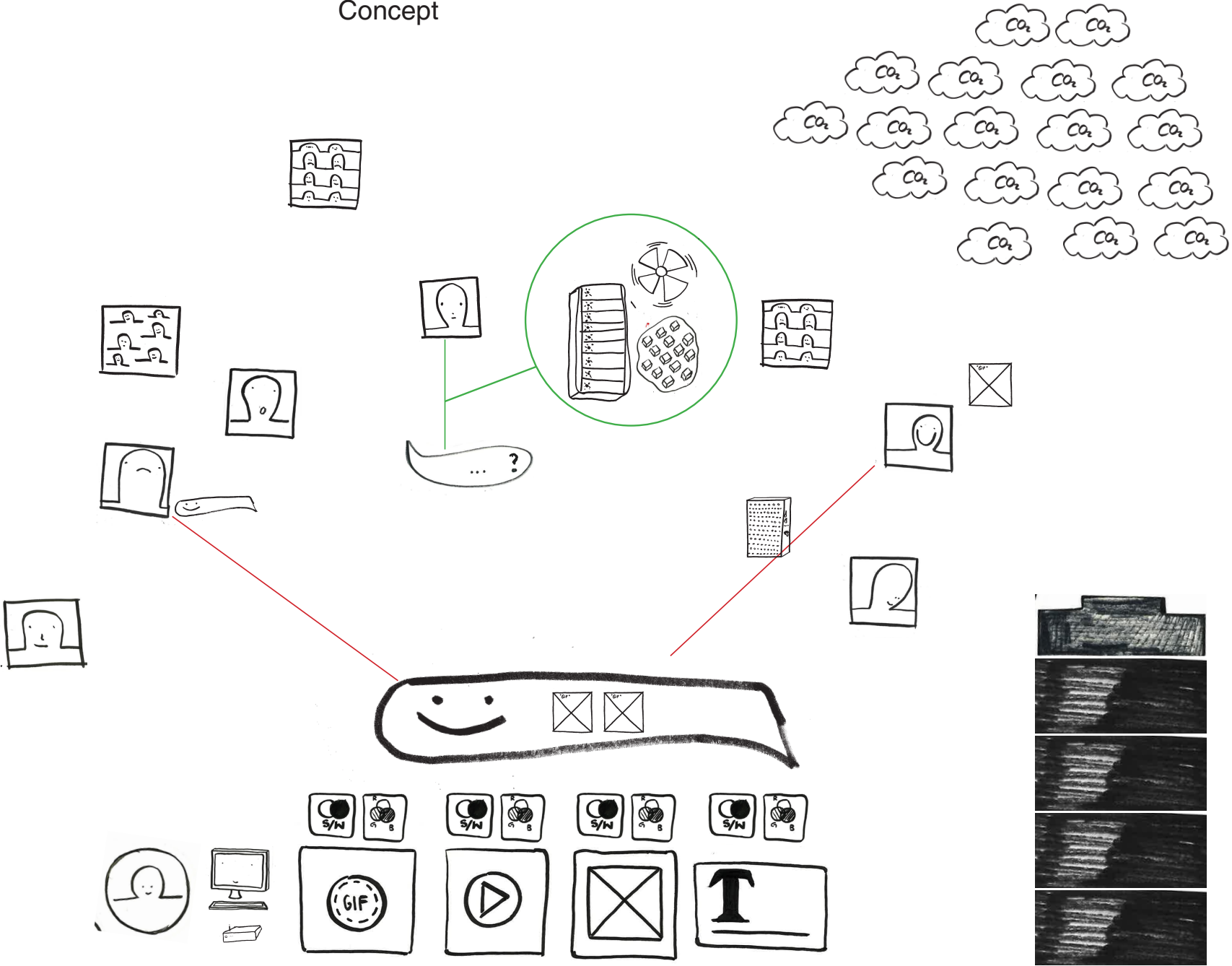
Concept

1 Personalise

2 Compare zurich and you - you think you are well off, then compare world

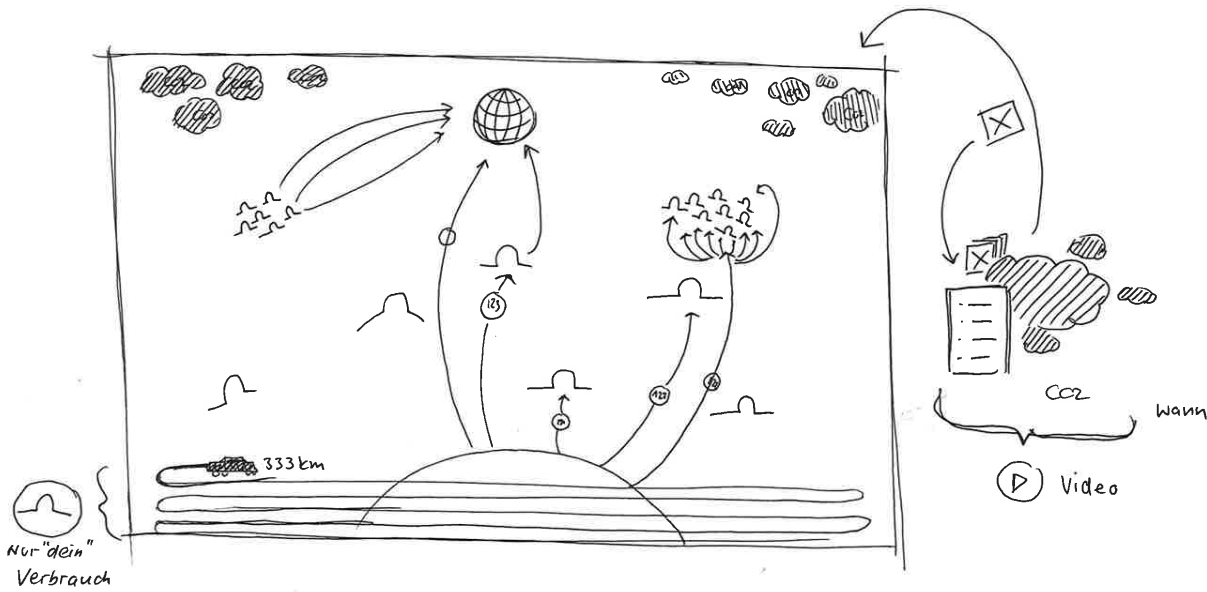
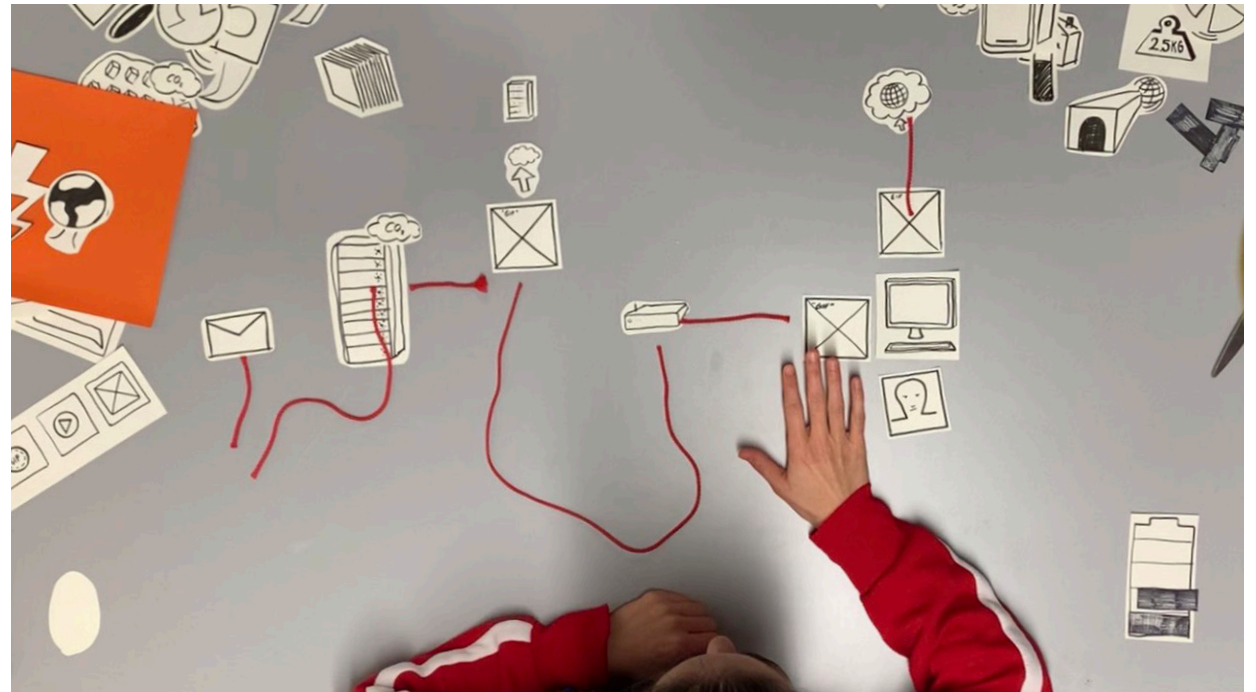
3 Email with delay





Concept Idea

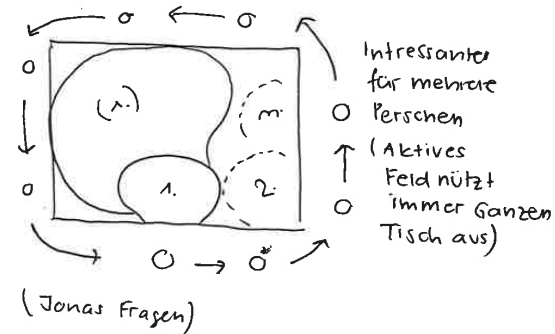
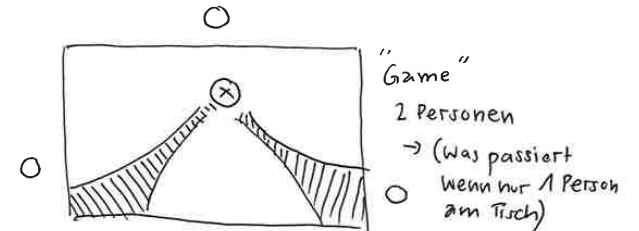
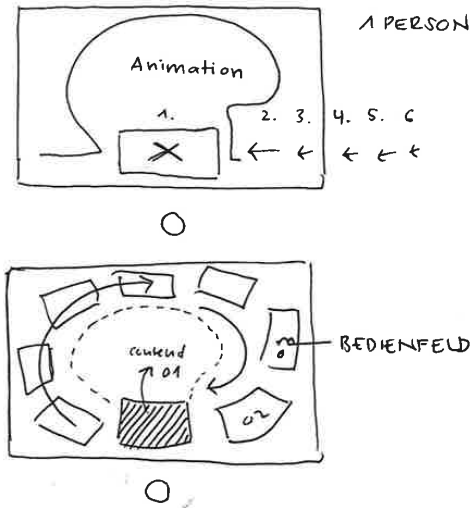
Concept



Interaction with the table

Concept

A number of different interactions with the table were feasible for us. We thought about a participatory design, in which a group of users interact with each other and gameify the experience. Due to the use case of an exhibition we didn't choose that option. Another idea was to make it an experience where the user had to walk around the table and complete the journey of the message. The same reason as before let us to reject that idea. In the end we agreed on a centered experience in which the direction the users have to approach the table was set clear.



Our goals

We defined a series of goals we wanted to achieve with our data visualisation.

Those goals were used to lead us through the concept phase of the work. Due to the tight time schedule we recognized how valuable those goals were to keep us on track of what we wanted to achieve.

Concept

WAS WOLLEN WIR VERMITTELN

- ① WISSEN VERMITTELN = DATEN VERBRAUCH
- ② DATEN BRAUCHEN STROM/ENERGIE
 - ↳ WOHER KOMMT DER?
 - ↳ WARUM BRAUCHEN DATEN STROM?
 - ↳ SERVER VORGANG / ENERGIE VERBRAUCH
- ③ SERVER WIRD MIT ERNEUERBARER ENERGIE / STROM BETRIEBEN → UNTERSCHIED AUSWIRKUNGEN CO₂
- ④ FASSBAR MACHEN WAS VERBRAUCH KONKRET BEDEUTET → AUSWIRKUN ABSTRAKTE ZAHL IN WAS KONKRETES ÜBERSETZEN / ALLTÄGLICHE HANDLUNG
- ⑤ WO HABE ICH EINFLUSS DARAUFG WENIGER DATEN ZU BRAUCHEN
- ⑥ WO VERBRAUCHE ICH ÜBERHAUPT DATEN?
- ⑦ VERGLEICH
 - | | |
|-----|-------------|
| ICH | UNTERNEHMEN |
|-----|-------------|
 - LAND → ENERGIE BEZUG
 - | | | | | |
|----|---|--------|---|------|
| CH | / | EUROPA | / | Volt |
|----|---|--------|---|------|

70 km Auto fahre

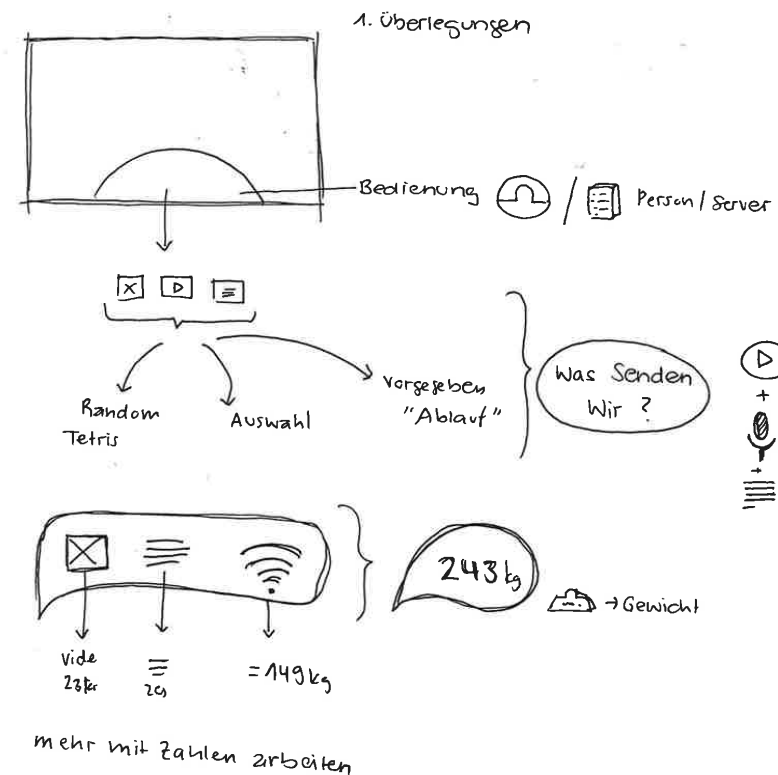
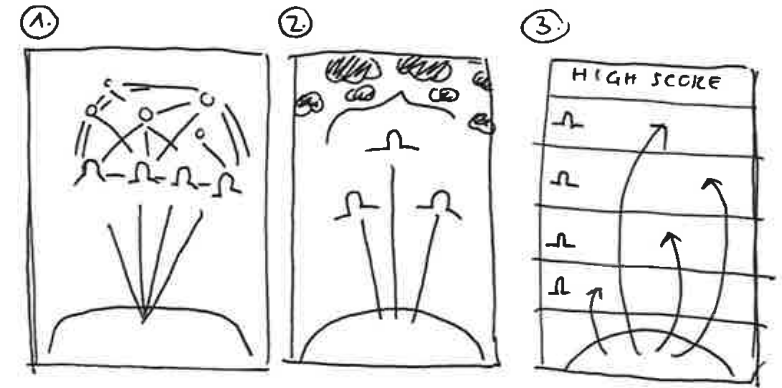
Elaboration concept

While creating our concept a lot of specific decisions had to be made fast.

One of the main questions which came up was the role of the user. We decided against the user being the server itself to make it a more personal and relatable experience. Another big question was the level of depth on describing the infrastructure of the internet. While not going to deep into the details to make it a structured and understandable experience, it was still necessary to show the acting players in the visualisation and their impact.

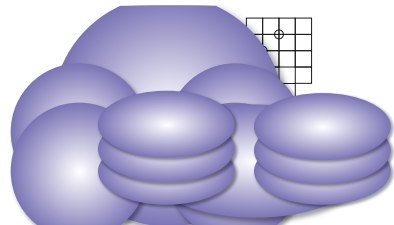
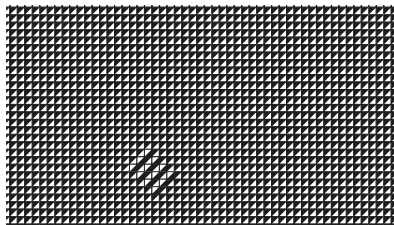
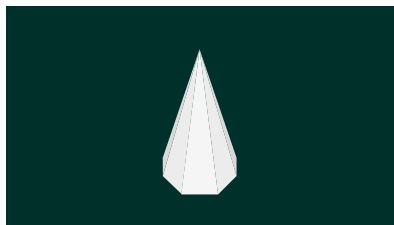
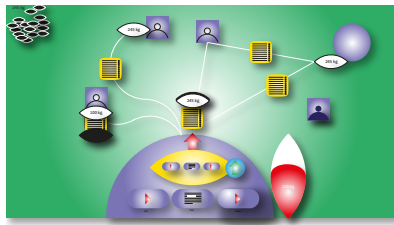
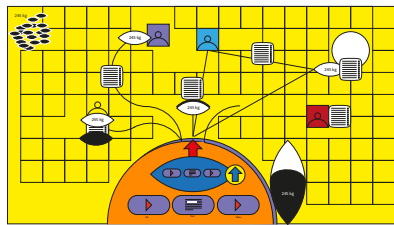
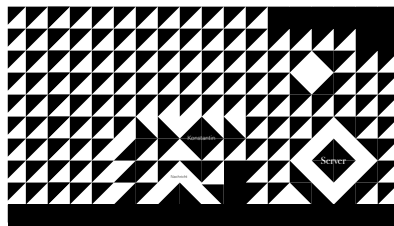
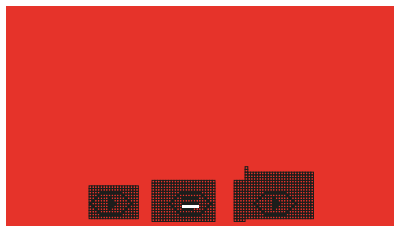
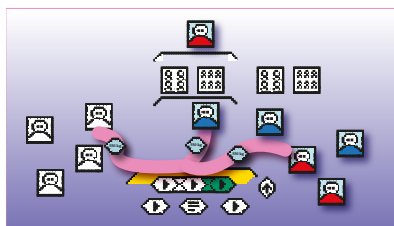
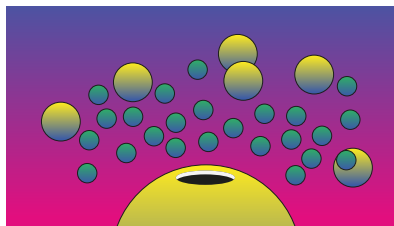
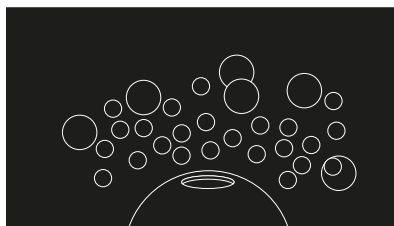
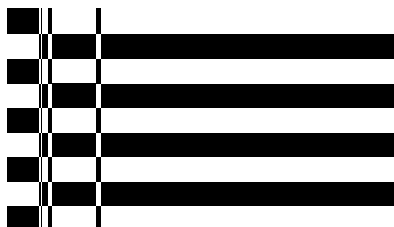
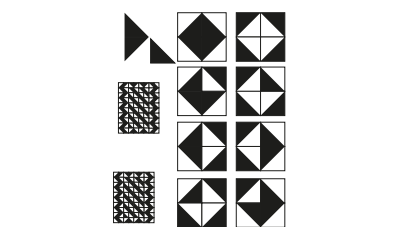
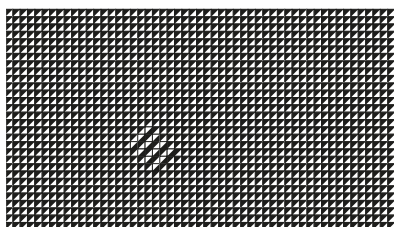
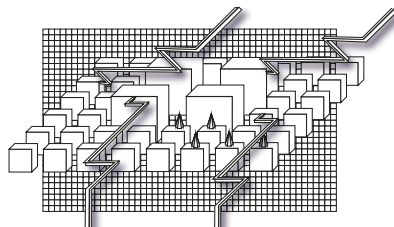
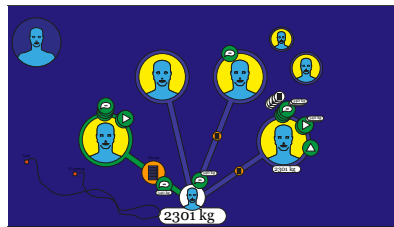
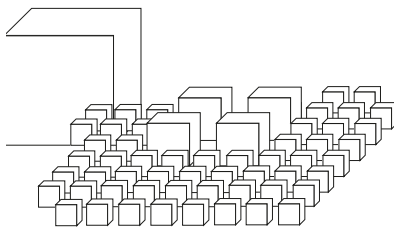
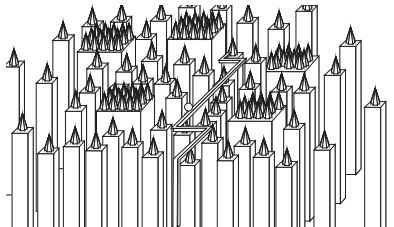
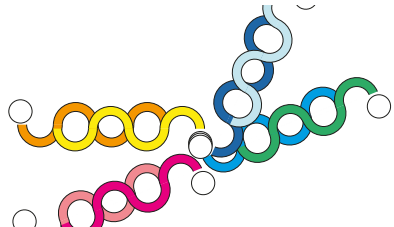
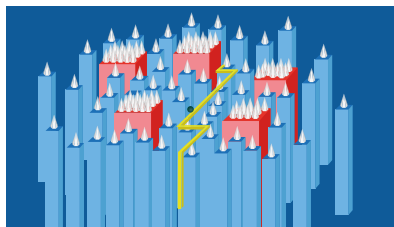
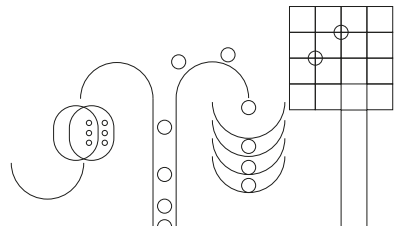
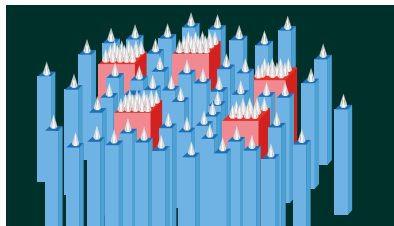
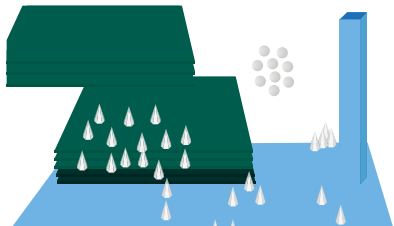
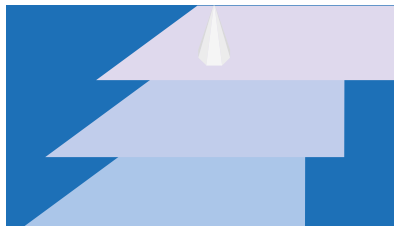
A similar thought went into the media types and their impact. While a few ideas would certainly create a deeper understanding we left them on the side for further steps because we felt they would need enough time to implement in a clear way and would create a feeling of chaos if not thought out in detail.

Concept



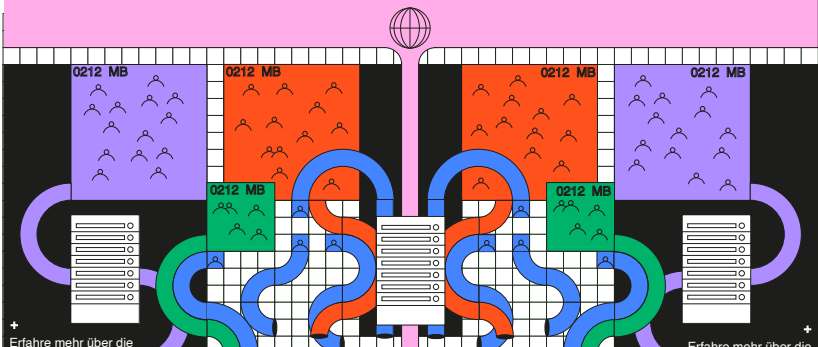
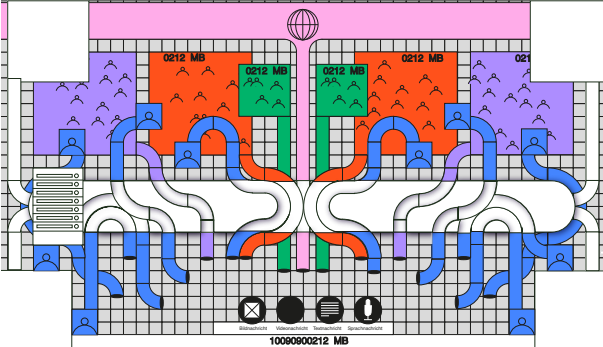
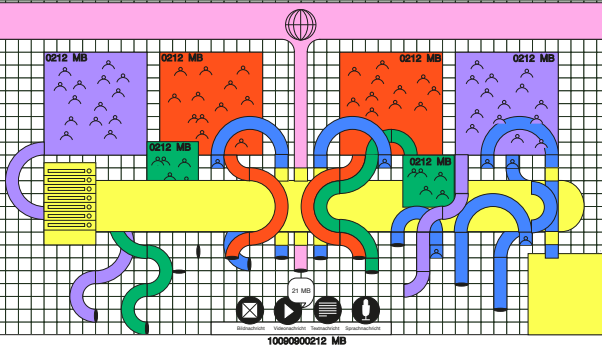
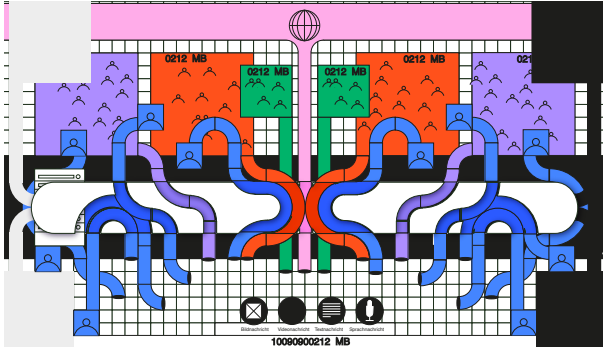
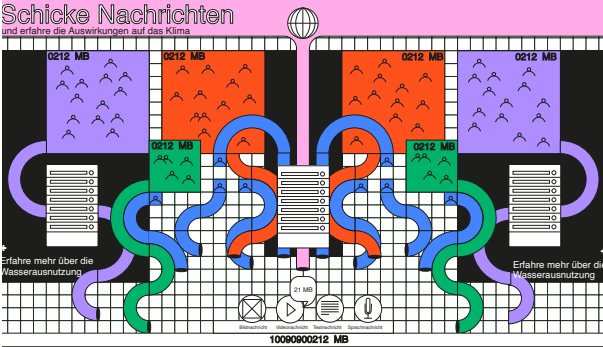
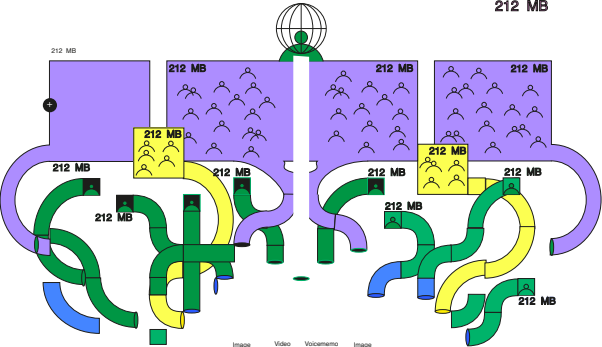
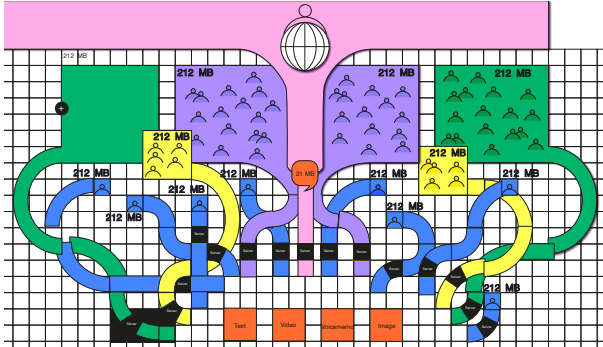
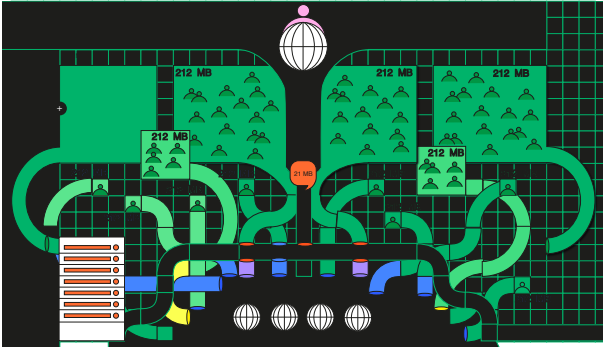
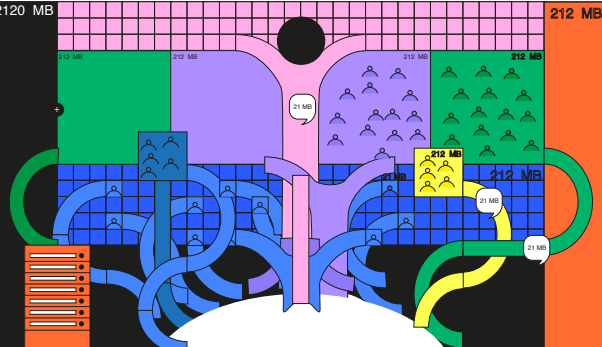
Visual language sketches

Design



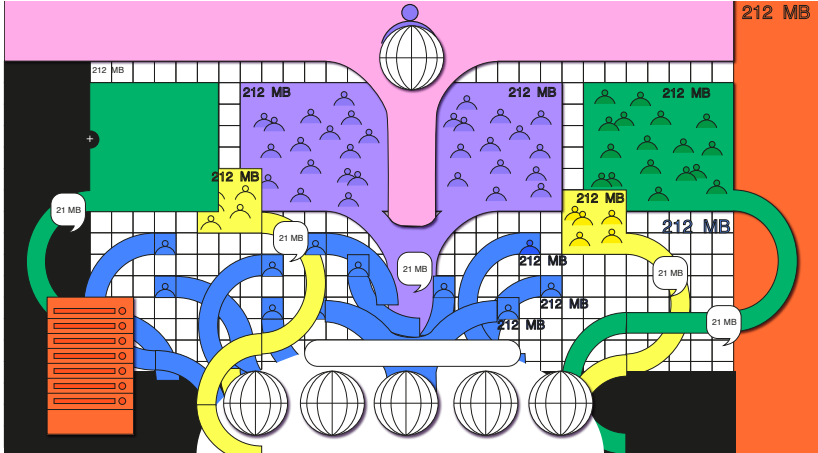
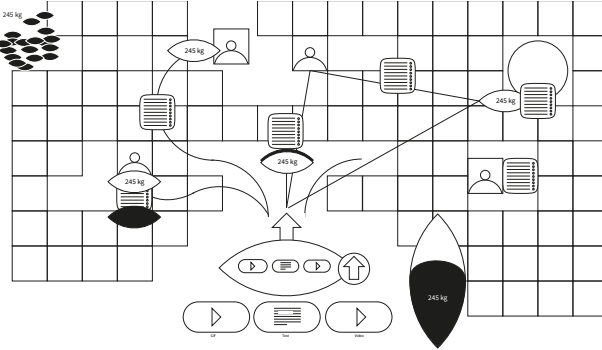
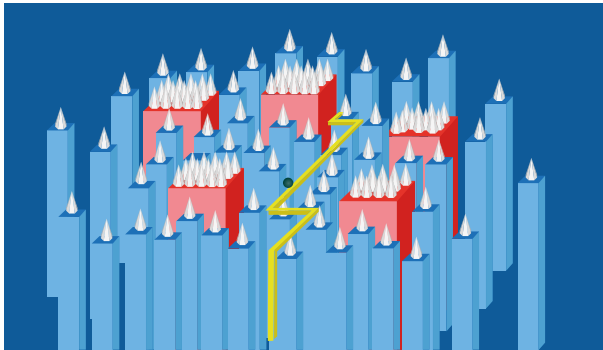
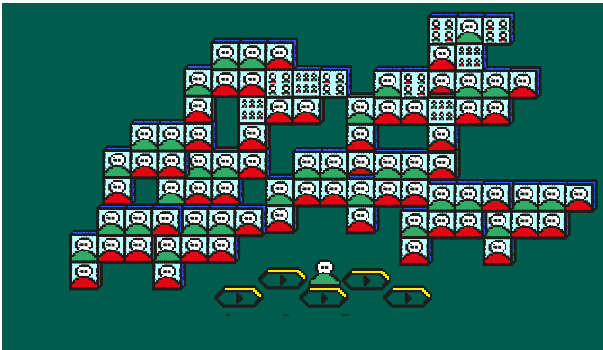
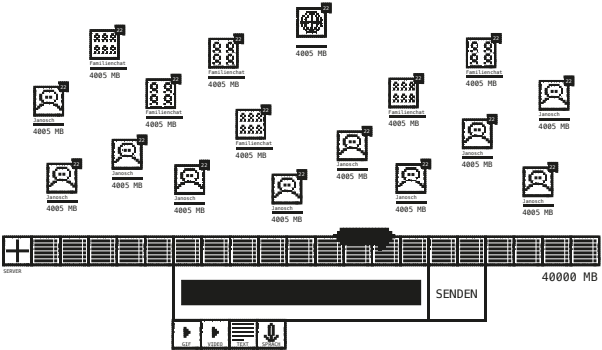
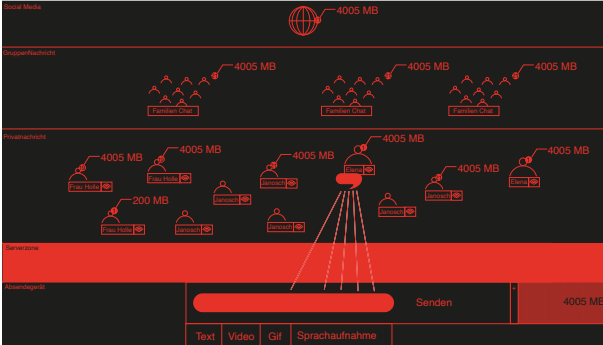
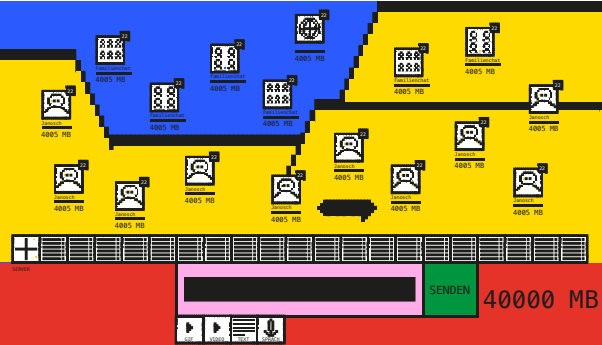
Visual language directions

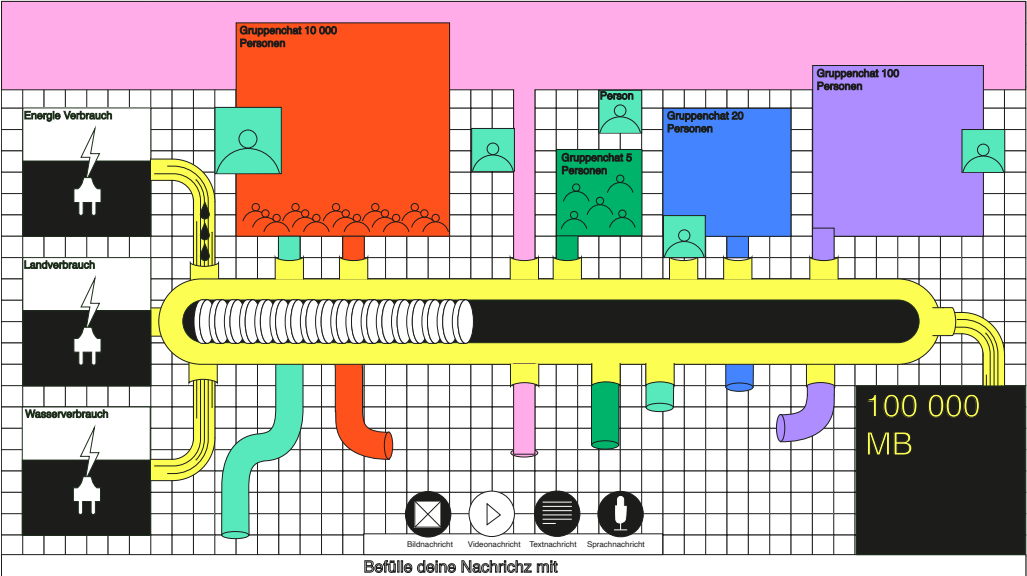
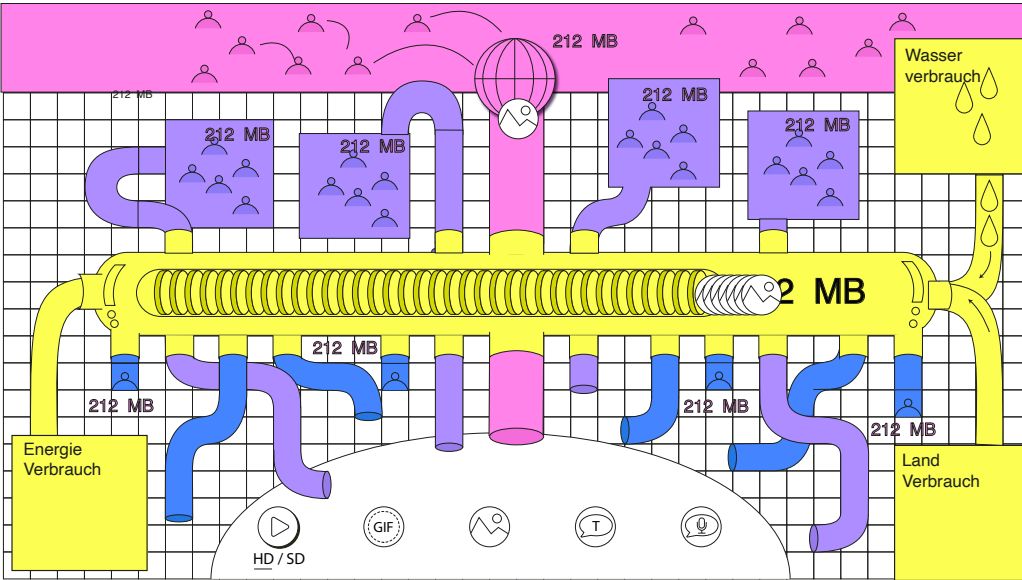
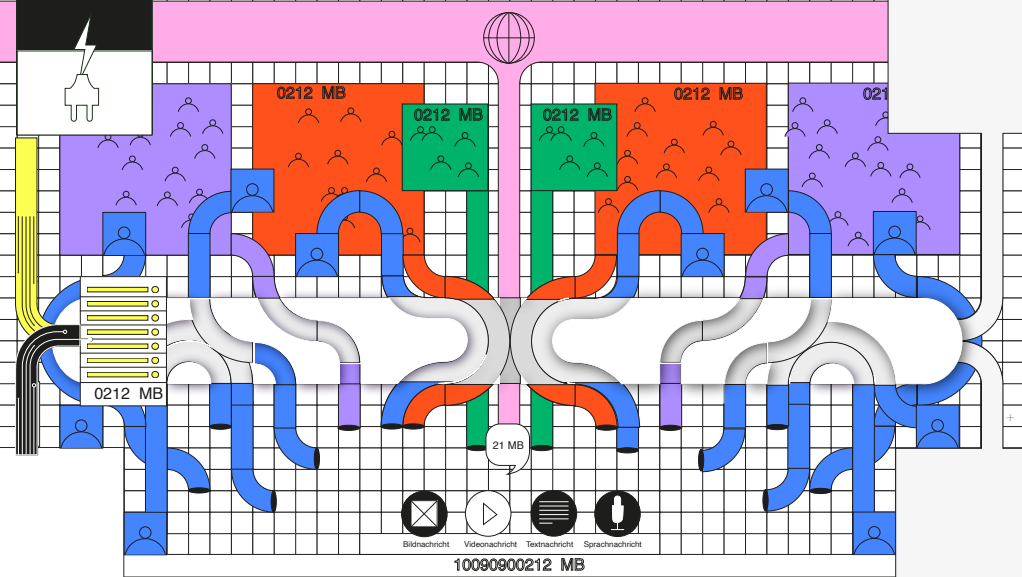
Design



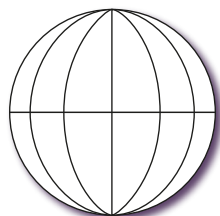
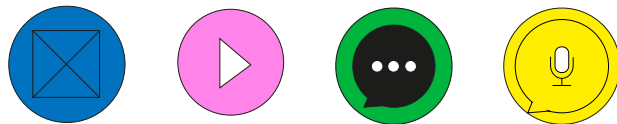
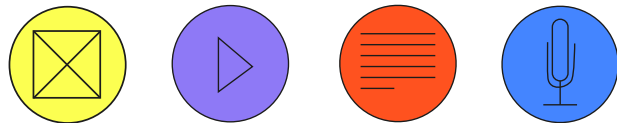
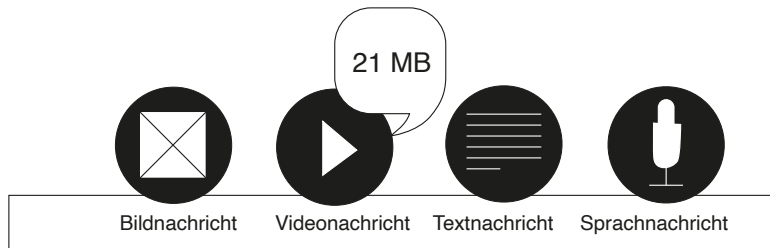
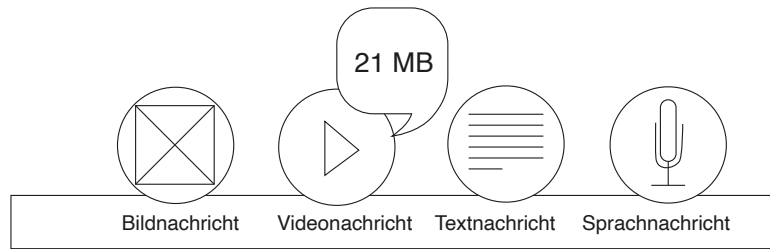
Visual language directions

Design

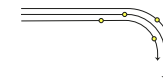
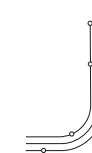
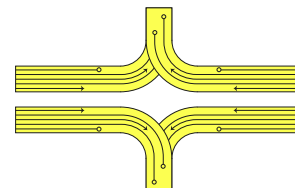
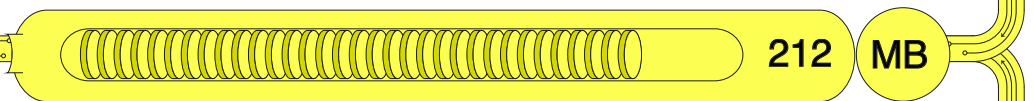
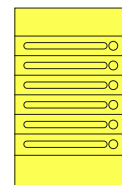
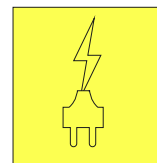
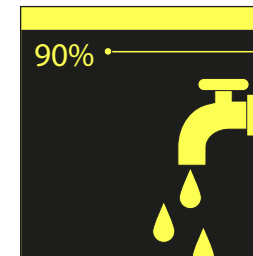
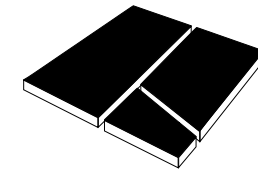
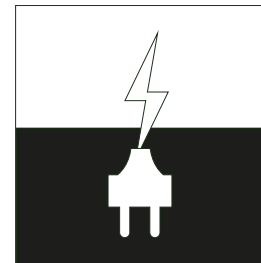
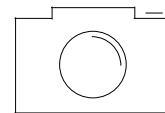




Visual language elaboration



Design

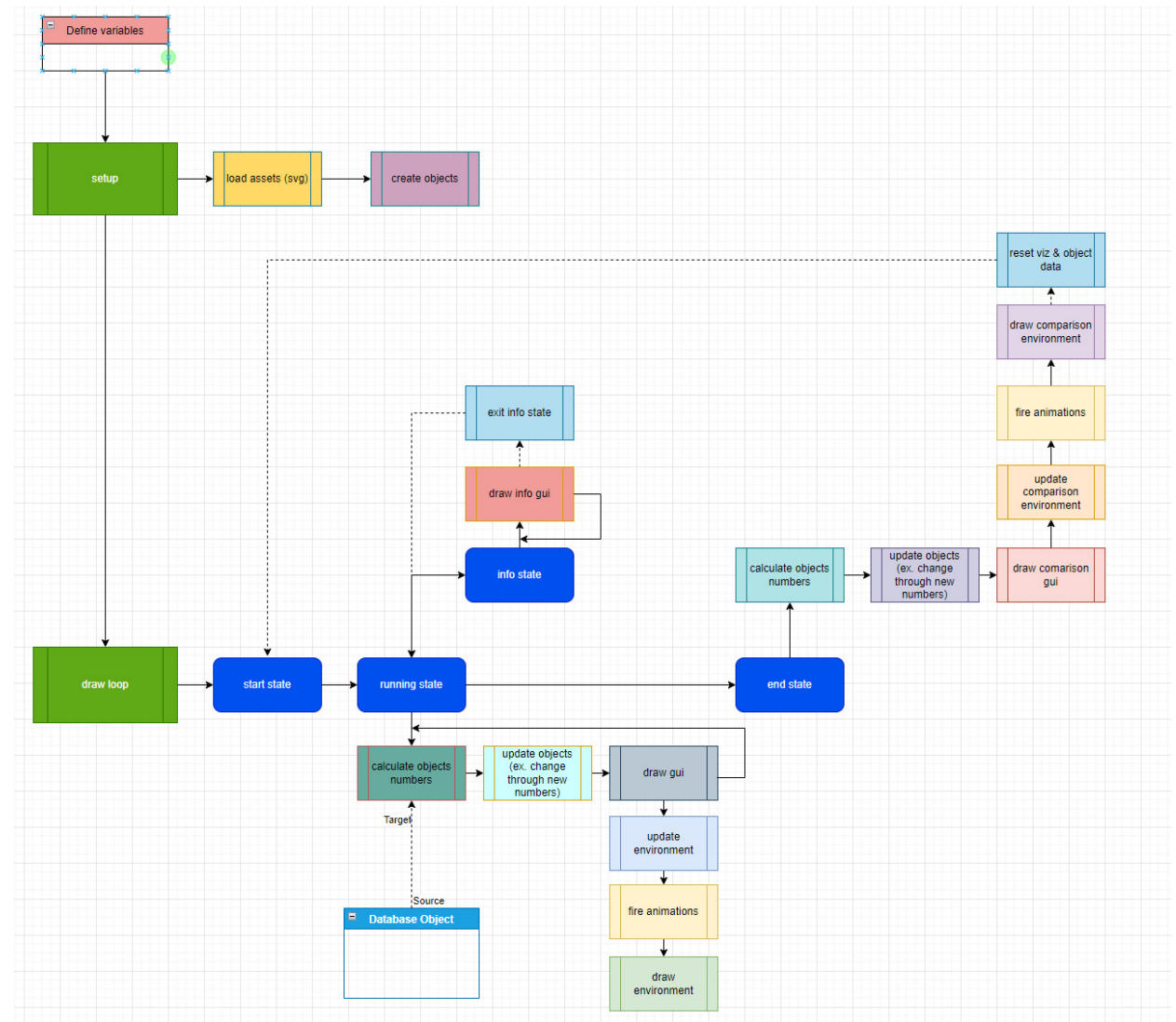


Code Structure

A flow chart was created to define the structure and logic of the program.

Focus here was the calculations based on the interaction from the user and the program. Those calculations then defined how the elements on the screen had to behave. A big emphasis was made on the modularity of the logic blocks, so the architecture wouldn't be tied to the visual representation on the screen. This was done to ensure a working program and gave the opportunity to use the short time to go as deep into the visual implementation as possible without rewriting parts of the code for each addition to it.

Implementation



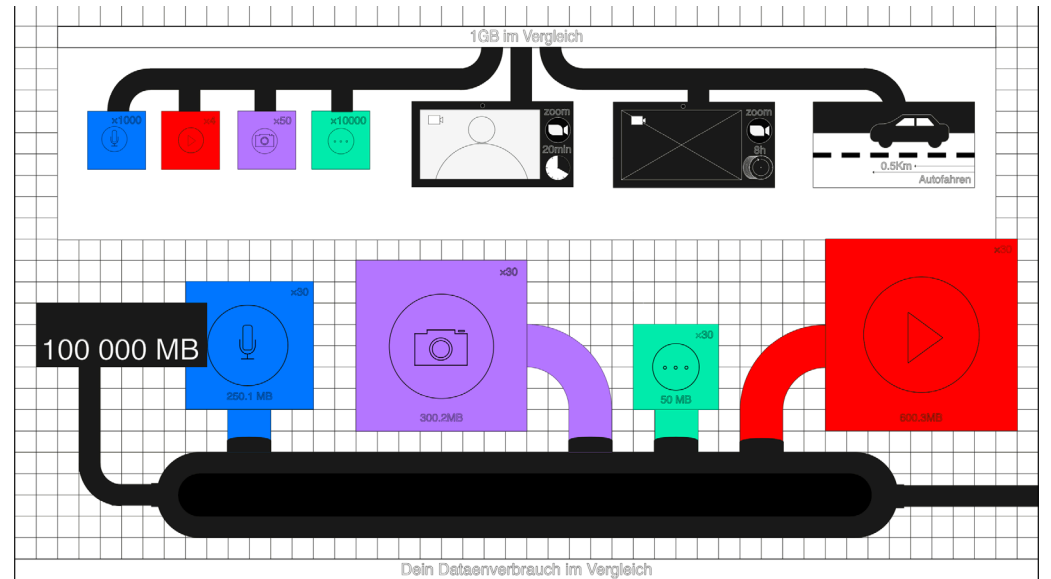
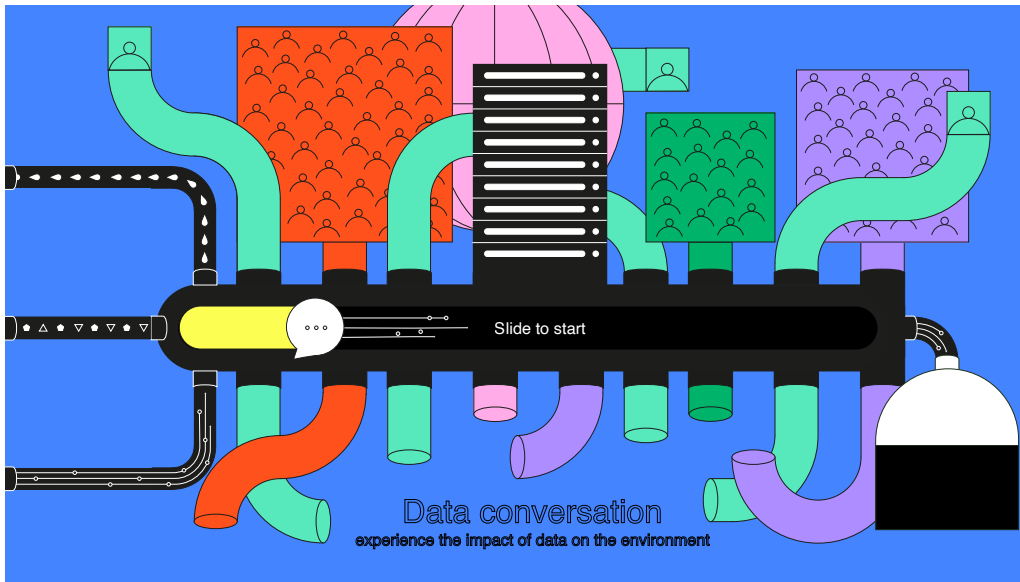
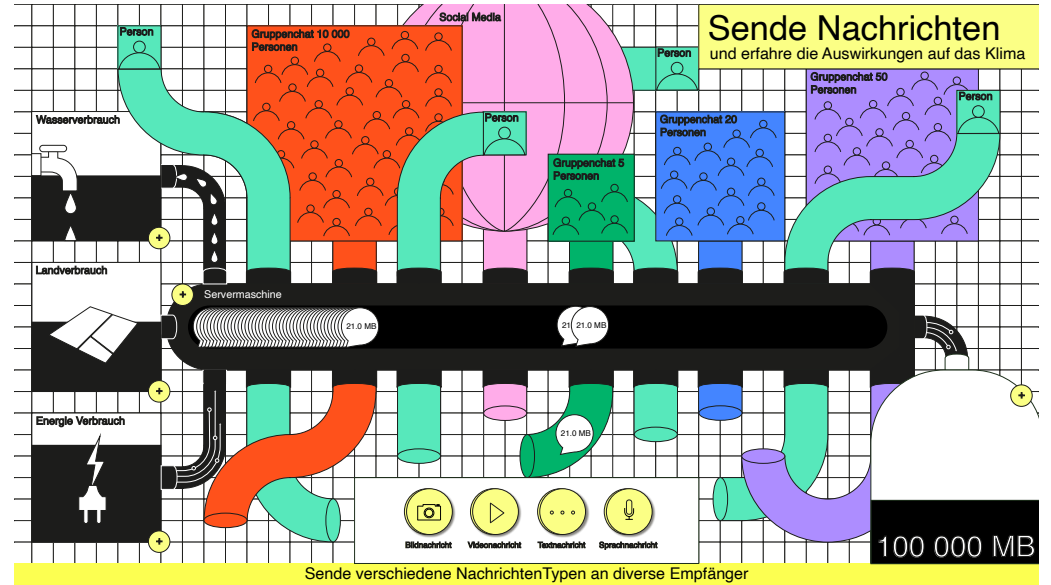
Code

The web based implementation was created based on p5.js and done in a object oriented way. While generating a bit more boilercode, the modularity of the program was needed to work on it because the development of the visualisation was done in parallel and required a flexibility to change certain elements during the finalization phase.

Implementation

```
1 //Data Object for Calculation Base
2 const dataCalculationObject = {
3   co2Factor: 0.05,    //gCO2 per MB
4   waterFactor: 0.002, //liter per MB
5   landFactor: 0.0000035, //m^2 per MB
6   carFactor: 0,      //500m pro GB
7   trainFactor: 0,   //
8   airplaneFactor: 0, //1.5sec pro GB
9   chargesFactor: 7.8, //Gramms per Phone Charge
10  tomatosFactor: 0.2, //Liter Water per Gramm tomatos
11 }
12
13 //Data Object for Personal Impact
14 const dataPersonalImpactObject = {
15   co2: 0,
16   water: 0,
17   land: 0,
18   numberImage: 0,
19   numberVideo: 0,
20   numberText: 0,
21   numberVoice: 0,
22   dataSize: 0,
23 }
24
25 //Data Object for Comparison
26 const dataComparisonObject = {
27   car: 0,
28   train: 0,
29   airplane: 0,
30   charges: 0,
31   tomatos: 0,
32 }
33
34
35
36 screenObjects.push({
37   name: 'mediaObjectImage',
38   pos: [(screenWidth * (18.5/48)),(screenHeight * (22.6/27))],
39   size: [(screenWidth * (2/48)),(screenHeight * (2/27))],
40   screenName: 'Image',
41   dataWeight: 5,
42   state: 'passive',
43   touchable: true,
44   pathName: 'imageIconImg',
45 })
46
47 screenObjects.push({
48   name: 'mediaObjectVideo',
49   pos: [(screenWidth * (21.5/48)),(screenHeight * (22.6/27))],
50   size: [(screenWidth * (2/48)),(screenHeight * (2/27))],
51   screenName: 'Video',
52   dataWeight: 250,
53   state: 'passive',
54   touchable: true,
55   pathName: 'videoIconImg',
56 })
```





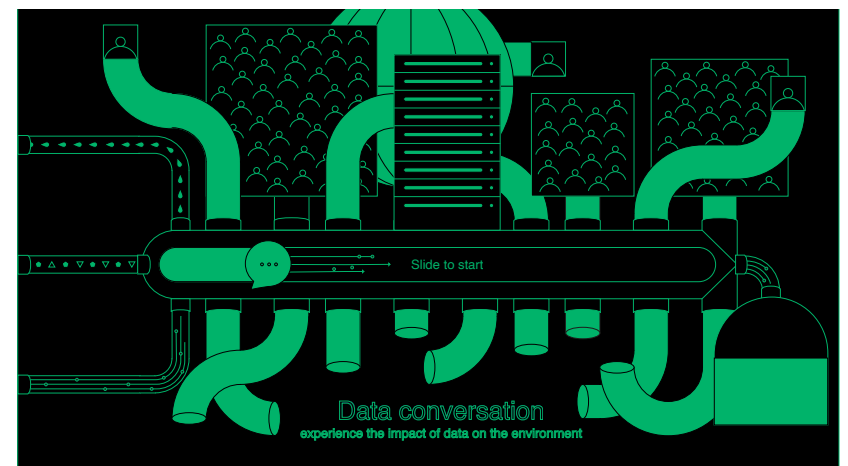
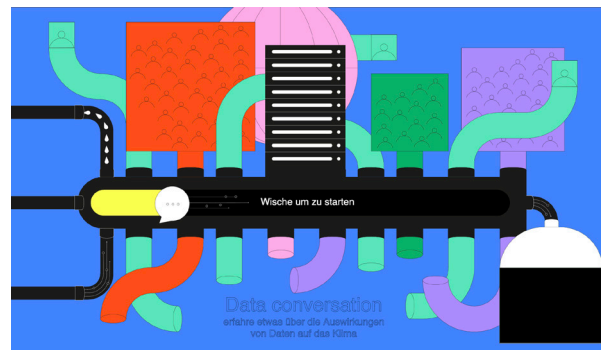
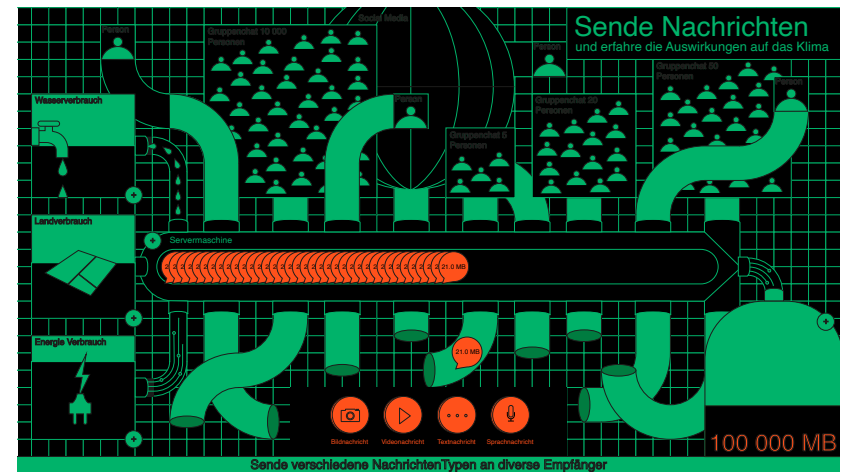
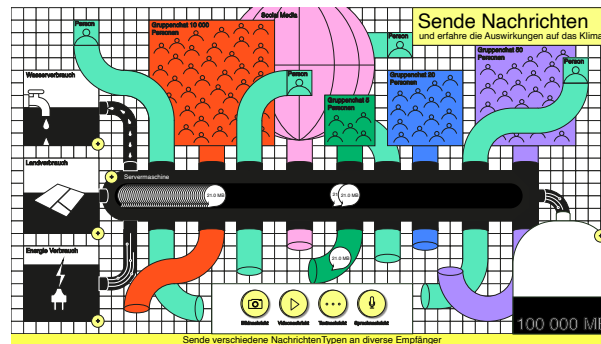
Darkmode

Implementation

As the data use in the internet is the main focus of the visualisation our own impact on it was always on our minds.

Besides the content which is displayed, the screens of the used device can require up to 80% of the complete energy use depending on the device and content.

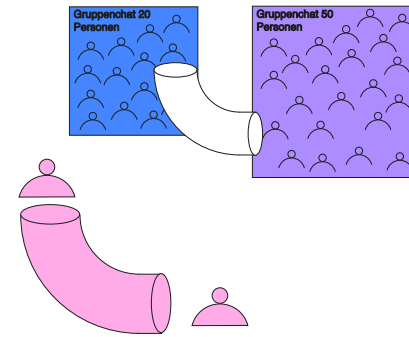
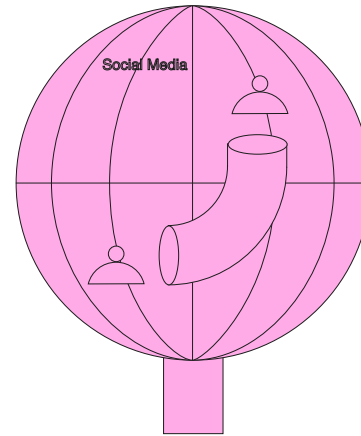
To minimize our impact we generated a dark mode, which is focused on high efficiency. Displaying white color on a screen is by far the most energy intense use. Therefore we used a black background and simple base colors (red, green, blue) to decrease our energy use.



Further steps

1. Let the user groups send content between each other. See how your actions might let loose a avalanche of content which is out of your control
2. Give the user the option to select different kinds of compression & quality settings for the chosen media type to show the huge amount of impact just by small adjustments
3. Send the user an email with a summary of their journey and a list of data saving measurements they can take
4. List explicit content providers and show their eco friendliness
5. Give more explanation and examples to the use of water, land and energy

Implementation



HD / SD



JPG / PNG

