Aslak Dahle

Hyperloop in Nature

Philosophical remarks

Bachelor's project in philosophy
Supervisor: Asle H. Kiran

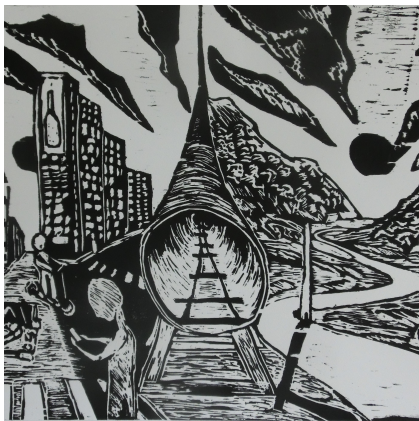May 2021

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Acknowledgement

Content

Hyperloop in Nature - Philosophical remarks

We live in a world where the consequences of human endeavour become increasingly apparent. Our influence on the Earth's systems have become so all-reaching that a new geological period called 'the Anthropocene' is proposed. The severity of the Anthropocene, as global warming and rapid biodiversity loss illustrates, are no longer a question *if* we need to act, but *how.*

Hyperloop becomes relevant in this context by revolutionizing the amount of energy used per passenger in the transportation sector. It may therefore seem unproblematic to implement this technology in the Anthropocene, as we need to reduce our impact on Earth. However, Hyperloop brings forward its own problematic features. This is especially evident with the implementation in nature, which may counter the promised environmentally friendly impact. The aim for this paper is therefore to answer the following research question: 'May Hyperloop be an answer to some of the challenges posed in the Anthropocene?'

A quick introduction to those unfamiliar with the Hyperloop concept may be fruitful. Hyperloop is a possible emerging ultra-high-speed transportation system – combining aspects from both rail and aviation. It consists of a pod traveling through a low-pressurized tube structure, going directly from origin to destination, with small pods around 20-50 people. To get a more visual introduction to Hyperloop, I recommend watching the short video below.

Motivating the research question

The heart of the discussion in this paper centre around Hyperloop in nature[1]. This angle is chosen due to the neglect of this perspective in the Hyperloop literature and research[2]. When nature is questioned in a Hyperloop context, it is mostly from an economic standpoint of view; looked upon because it may be costly to implement or create resistance in the population. That Hyperloop would result in major interventions in nature due to its inherent straight-line properties, is seldom the focus.

One reason for this nature neglect may be due to Hyperloop's 'soft' impact in nature. These impacts are qualitative rather than quantitative and are therefore hard to include in rigid engineering parameter within safety, sustainability, or in regulatory laws. As Swiestra (2015) nicely puts it:

Impacts that are qualitative, ambiguous, and/or indeterminate tend to fly under the radar of the prevailing accountability regime. They are dismissed by technology and policy actors as too fuzzy, or too 'soft,' to take seriously. As a consequence, it is unclear who can be held accountable for them – if anyone. (p. 7)

These soft impacts are still of major importance but tend to be neglected. Birth control pills for example, radically changed and liberated our sexual behaviour, but this effect could not be calculated or foreseen through calculative parameters. Due to the missing focus on Hyperloop's soft impacts, this paper is going to inquiry into these, and illuminate how Hyperloop may affect us as human beings – and especially our connection with nature.

This angle may create a higher degree of ethical awareness behind the developers of Hyperloop. As Swiestra (2015) points out: *'Of all the normativities and moralities that surround us, we are only aware of the small subset that is problematic'* (p. 16)*.* So, by showing how Hyperloop may conflict with nature, we can increase this ethical awareness. As the graph under indicates, there may be a need for this increase.
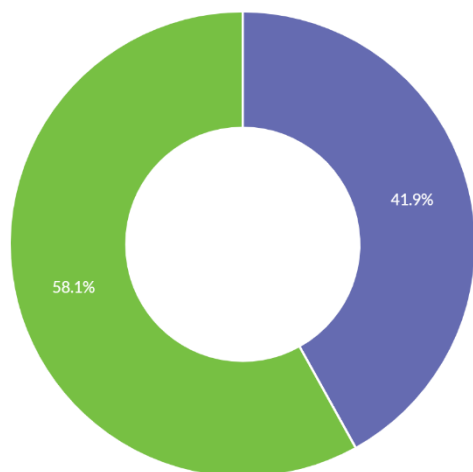
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[1] Nature is here understood in a narrow sense, as wilderness, not as climate. As the paper evolves will a different understanding of nature emerge, which will be made explicit.
[2] See (TEMS et al., 2019) for example.

Choice		Total	
● Not any particularly that I can think of.		26	
● Didn't understand the question.		0	
● Yes, I think there can be some concern regarding:		36	

41.9%

58.1%

Unanswered	Answered		See all answers >
1	62		

The graph above is extracted from a short questionnaire I sent out to developers behind Hyperloop technologies. Most of the answers are from the student organisation 'Shift Hyperloop', but the questionnaire also contains recipients from Hyperloop developers in USA, Germany and Spain. (Dahle, 2021)

Over 40% of the recipients above could not foresee any ethical objections with the implementation of Hyperloop. Why may this be alarming? It is because the developers of a particular technology shape the design and how the technology works – which again affects its use and our being. The 'Collingridge dilemma' can articulate this point precisely.

In an early phase of an emerging technology, it is impossible to foresee with certainty the impact the technology will have on society. At the same time, it is easier to change the design and important parameters so that undesired effects can be avoided or minimized. On the other hand, when the technology is already involved in a praxis – it is easier to see the ethical challenges, but it can be hard to change these effects. This is because the technology in question is embedded in society and its workings. Just imagine the impossible task to change the design of the birth control pills so they are only effective for one week per month – to counter the sinking birth rates or hinder the sexual liberation of women. Even if one

4

managed this, one would not bring society back to status que before the invention, as it has become a part of the way the world works.

Ethical awareness during the stages of development is therefore important, and by trying to show some of Hyperloop's possible soft impacts, a higher ethical awareness may be the outcome.

This may have showed the relevance of my research question. I am now going to sketch out how this is going to be done.

Part One provides the necessary background information for the following discussion. It starts with establishing a common understanding of what Hyperloop is - its expectations and actuality - to get a firm standing on the forthcoming discussion. To even evaluate if Hyperloop can contribute into the Anthropocene, we need to know if the concept is plausible. After this, we will get a better understanding of the Anthropocene and its challenges.

Part two consists in the paper's major argument structure. Here we will get a deeper understanding of how Hyperloop may not be a solution in the proposed geological period Anthropocene – inspired by Heidegger's view on technology. The section will argue for a different connection to nature, where we see ourselves a part of nature, rather than above or besides. In this perspective, Hyperloop hides the solutions in the Anthropocene.

*Part three* will try to unify the ontological understanding of nature with Hyperloop development. It will point at technologies multistability and suggest how Hyperloop development can be made more compatible with this 'new' understanding of nature.

We can now see the journey ahead of us. Let us now reassure that we launch from the same platform - and have a mutual understanding of Hyperloop and the challenges in the Anthropocene.

Part One

A quick introduction to Hyperloop

The Hyperloop system consists of a pod inside a tube, either supported by a sub-structure as shown below or placed inside a tunnel.
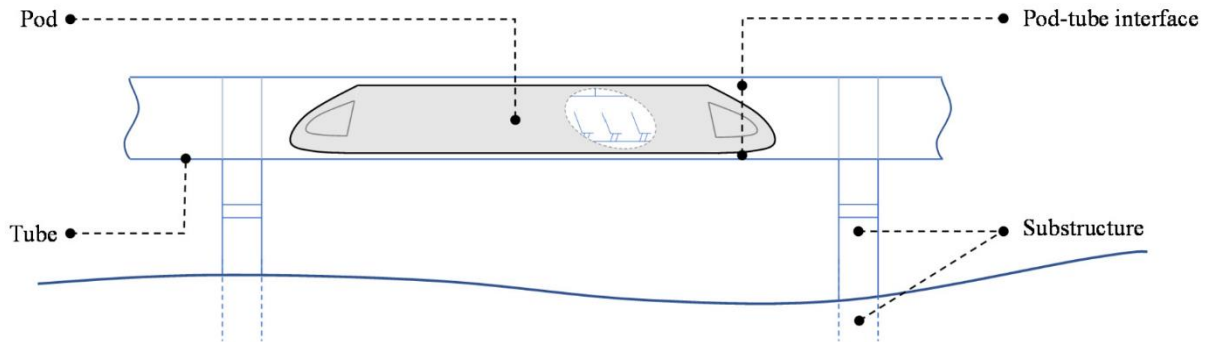
Source: (JRC, 2020, p. 5)

The pod is propelled by an electrical linear motor, i.e., moving due to electrical currents which pulls or attracts the pod forward. One way to understand this, is that the pod is trying to 'catch up' with the magnetic currents which is generated ahead of the pod. The pod is furthermore levitated and guided by magnetic currents – utilizing the same force that repels two magnets from each other. This results in minimal friction, where an Hyperloop pod 'floats' above the track. It may sound unreal, but magnetic levitation technology is in fact already in use at Japan's Maglev trains.

The main difference from rails, however, is the low-pressure environment inside the tube. This aspect has more in common with aviation. Vacuum pumps will be stationed at regularly intervals alongside the tube to remove most of the air, which results in minimal air resistance or drag inside the tube. This allows Hyperloop to reach supersonic speeds up to 1200 km/h with minimal energy usage. For a Maglev train to travel beyond 400 km/h for example, more than 80% of the energy loss is due to air resistance. The energy aspect is further amplified by being able to regenerate most of the energy used in braking to recharge, instead of 'loosing' it to friction. These factors result in highly energy efficient transportation, which potentially can reduce travel time between Oslo – Trondheim to 20 minutes.

Hyperloop's imperative

Hyperloop's low, and possible renewable, energy consumption is Hyperloop strongest imperative in the Anthropocene, which can for now be understood as the current environmental crisis. The European Union's (EU) Green Deal for example, aims to reduce 90% of EU's greenhouse gas emissions by 2050, where transport currently accounts for a quarter of the these emissions (Joint Research Centre, 2020, p. 2). This ambitious goal, and the severity of the current environmental crisis, is creating a space where we need greener and innovative technologies like Hyperloop.

But the need for greener innovative technologies does not imply that Hyperloop is going to be the one who deliver this. For is Hyperloop coming soon, or is it a far-fetched dream? This is an important question to answer; for without being a plausible concept, Hyperloop can certainly not be a solution in the Anthropocene.

This paper cannot answer this question through, but I will point at some factors that may indicate Hyperloop's feasibility. First, I am going to glance at Hyperloop's technical plausibility. Thereafter I am going to illuminate Hyperloop's current development. Thirdly, I will point to some feasibility studies that argues for Hyperloop's competitiveness.

Technical plausibility

Do we have the necessary technology to implement Hyperloop? The short answer to this question is: Yes. Hyperloop draws on experience from both rail and aviation and is based on already existing subsystems. The propulsion and levitation systems are already in use in Maglev trains, and the low-pressure environment is similar to the challenges in aviation and space exploration. There are still challenges that need to be overcome of course - especially within safety – and the technology needs to be optimized. And even though the subsystems work individually, this does not necessarily imply the reliability of the system as a whole. But for this papers purpose and reach, it is sufficient to know that the technology needed, does already exist.[3]

Hyperloop's current development

The shift in the last years Hyperloop patents from conceptual systems overviews to more

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[3] If you have technical question concerning the plausibility of Hyperloop, (TEMS et al., 2019) may answer many of your concerns. (JRC, 2020) has further a good analysis of safety hazards, where Sintef (Grøv et al., u.å.) has published a neat paper on evacuation inside an Hyperloop tunnel.

specific technical issues, indicates a higher level of technical maturity (Joint Research Centre, 2020, p. 15). The creation of regulatory frameworks amplifies this view further, where the NETT council (Non-Traditional and Emerging Transportation Technology) in USA and the JTC20 (Joint Technical Committee) in EU are important. The NETT council allows for public founding of Hyperloop projects – which is an imperative for new infrastructure projects. JTC20 on the other hand, aims to 'define, establish, and standardize the methodology and framework to regulate hyperloop travel systems and ensure interoperability and high safety standards throughout Europe' (Hardt, 2020). These public regulatory initiatives are of high importance if Hyperloop is going to be implemented any time soon – for without cooperation with governments - Hyperloop is just a dream.
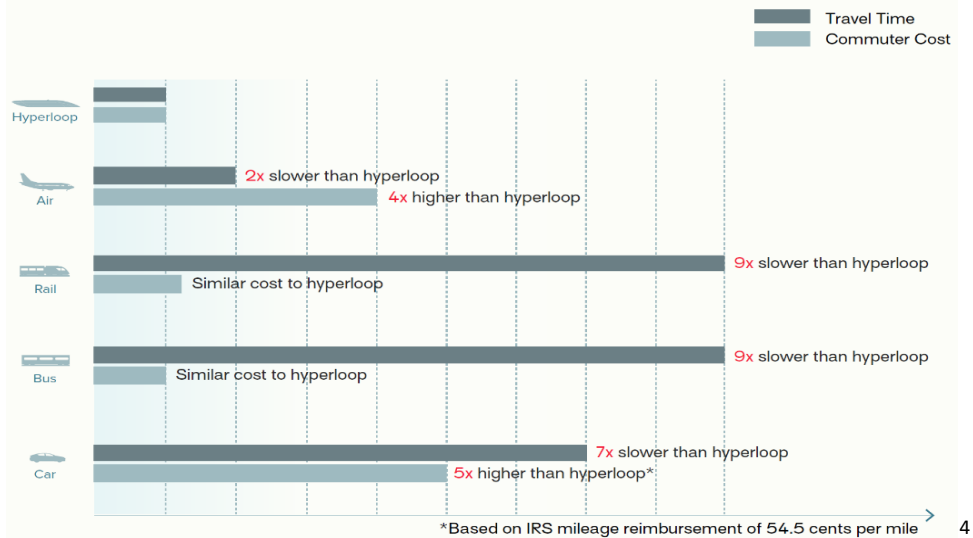
Feasibility studies

It is not enough to evaluate a concepts plausibility by only looking at the technical feasibility. The concept must also be competitive in the market. Based on which feasibility study you read, you will find disjunctive results depending on the topography in the specific corridor and which parameters that are applied. Therefore, to evaluate the different results, it may be a sound assumption that the more detailed and concrete a study gets → the more reliable may the results be. That is one of the reasons the 156 pages long feasibility study preformed in the 'Great Lakes corridor' (Chicago-Cleveland-Pittsburgh) may be a convincing argument for Hyperloop's plausibility. As Alex Metcalf, president in TEMS (co-author of the feasibility study) states:

TEMS has performed over forty feasibility studies for high-speed rail in the United States, and Hyperloop is the first system to be shown as profitable from a financial standpoint, meaning it does not require government subsidies (…) The results of this study show that Hyperloop, due to its inherent efficiencies, is a high-speed transportation system that truly makes economic sense for the Great Lakes corridor and likely for many corridors around the United States. (Hyperloop Transportation Technologies, 2019)

This feasibility study shows that Hyperloop may be profitable from a financial point of view, especially due to express package opportunities during night and less busy hours. One of the reasons you can see in the graph below:

Illustrative Commuter Cost Comparison

Hyperloop fares will vary based on ridership frequency with the expectation that travel will be accessible and affordable. This comparison is based on a one-way, 47-minute hyperloop trip from Cleveland to Chicago at a commuter fare of $40.

Travel Time
Commuter Cost

Hyperloop

Air
2x slower than hyperloop
4x higher than hyperloop

Rail
9x slower than hyperloop
Similar cost to hyperloop

Bus
9x slower than hyperloop
Similar cost to hyperloop

Car
7x slower than hyperloop
5x higher than hyperloop*

*Based on IRS mileage reimbursement of 54.5 cents per mile   4

Source: An overview from (TEMS et al., 2019)

So, to be coarse and abstract: Hyperloop beats the marked for middle long-range transportation in speed, energy usage, and can compete with ticket pricing. As we see in the graph, Hyperloop can compete with aviation at a lower speed, which further illustrates why Hyperloop's energy and environmental aspect is its strongest argument.

However, Hyperloop's carrying capacity needs to be mentioned – as it represents a more fundamental problem. Small pods[5] within enclosed tubes, sets limits for expansion. Even if the departures are frequent with a departing pod every 2 minutes, we usually travel at the same peak hours. Rail can for example easier add more passenger compartments, and aviation can carry bigger passenger loads per flight. Hyperloop's intrinsic capacity limitation may therefore render the revolutionizing effect Hyperloop may bring forth - and for whom – at least in early Hyperloop development. Despite of this, an analysis in the UK study indicates that higher capacities can be realized in Hyperloop compared to aviation (Walker, 2018, p.8).

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[4] These commuter cost calculations may seem too optimistic. But if the ticket price would be closer to an airline ticket between $120 - $200, an UK-study (Walker, 2018, p. 14) argues that this would still represent good value for money and allow Hyperloop to compete well against other modes.

[5] There is not a consensus within Hyperloop literature on the pods carrying capacity. But usually, a place between 20-50 is suggested. (TEMS et al., 2019) for example, operates with an estimate on 50 per pod.

We have now looked upon some indicators for Hyperloop's plausibility. Hyperloop is technically plausible, important regulatory framework are in progress, and feasibility studies show that Hyperloop may be profitable in specific corridors. Therefore, it looks like Hyperloop is more in the category of 'coming soon' than a 'far-fetched dream'.

It may now look like I have already found an answer to my research question. Hyperloop may be a solution in the Anthropocene due to the low energy usage, and the possibility of being based on renewable energy. But the Anthropocene is more than just greenhouse gas emissions. This statement brings us to the next section in Part One, where we will get a better understanding of the Anthropocene.
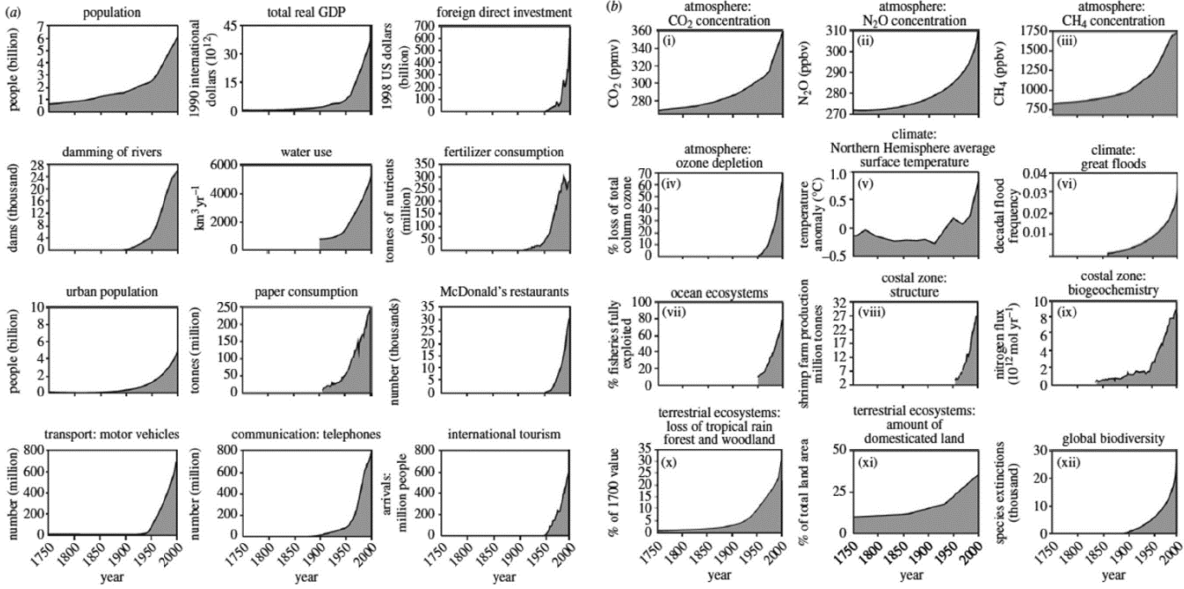
The Anthropocene

The Anthropocene is a proposed new geological period due to human endeavor in nature. Humans have become a *blind geological force*, that are afflicting the nature in the same respect as other natural forces. We have, as the historian Chakrabarty claims: Immense power but unintended force, intentional capacity but unintended side effects (Horn & Bergthaller, 2020, p. 12, 75). How can one justify these claims, where humanity becomes a geological force?

In a respect, humans have always changed their environment: As hunters and gatherers we made species extinct, we farmed the land after the agriculture revolution and so on. The difference, however, is how fast and all-reaching human influence have become. We do no longer mainly affect our local environment; our actions have become global in a greater degree. The Anthropocene is therefore a paradigm shift from a local to a global point of view. It consists of a clash of scales, and it is through these scales we can 'see' the consequences. You cannot, for example, justify global warming through stating that the weather is warmer than usual. To verify global warming, you need to see the broader climate variations for a long period of time.

This sets us on a path of understanding how humans can become a geological force. The accumulation of individual actions becomes a global phenomenon, where there is not *I* who is the force – it is the abstract *us*. We exert geological force – but not as a power (Horn & Bergthaller, 2020, p. 143). The mathematic formula 'more is different' articulates this point precisely. There is, for example, no problem on the scale of the forest if one tree is lumbered. The forest is still vital and will not change any qualitive features. But if one cuts

down many trees, i.e. quantitively the same action; a qualitative different feature emerge. The forest stops being a forest at a point or lose many of its forest-features. This increase of human activity is well presented in the graphs below.

Source: (Horn & Bergthaller, 2020, p. 21-22)

These graphs show an exponential increase in human activity from 1950 and illustrates why greenhouse gas emissions is not the only challenge in the Anthropocene. We are changing the Earth's land surface, oceans, coasts, biological diversity, water and biogeochemical cycles in a dramatic and exponential way. These set of problems are clearly interrelated, as where for example deforestation reduce the biological diversity, and higher temperatures afflict floods and water cycles. This reveals an important understanding of nature; where nature is far from being static or unchangeable (Horn & Bergthaller, 2020).

Nature, borrowing form Earth System Science, is best understood as a *self-regulating, dynamic system in an everchanging equilibrium* (ibid, p. 5). This dynamic system is composed of forces with complex interplays, which influence each other and nature *as a whole*. The biosphere for example, which is comprised of all living organisms, influences the atmosphere by producing oxygen, the hydrosphere (the water cycle) affects the Lithosphere (Earth upper crust) through erosion and so on. Irreversible tipping points occur when the interplay between these forces becomes asymmetric. The Great Oxygen extinction 2.2 billion years ago for example, resulted in a mass extinction of 99% of life on Earth due to a shift in oxygen levels in the atmosphere. Nature's equilibrium does not take life, and human striving, into

consideration. To therefore break with the Holocene – a relatively stable period in the scheme of climate history – is to "break with the conditions that gave birth to the process of which we ourselves are the product" (Horn & Bergthaller, 2020, p. 161).

We now have a better understanding of the Anthropocene. In many aspects, Anthropocene addresses our ways of being in the world. To be able to solve the challenges posed in the Anthropocene we need to do things differently. But what does this entail? How can we act in a way that stabilize, or even decrease, the current exponential growth in the Anthropocene?

This is the place where questioning Hyperloop becomes relevant. Hyperloop shows how we turn towards a technological fix when we stumble upon a problem. For example: 'We pollute and use too much energy in travel', therefore 'green technology as Hyperloop is the solution'. This may not seem problematic. At first glance, Hyperloop will certainly reduce greenhouse gas emissions. But can all our problems be solved through a technological fix - and we can carry on as before?

When we now venture into Hyperloop's soft impacts in Part Two, this picture starts to blur.

Part Two

To start out on this inquiry unto Hyperloop's soft impacts, we first need to realize that technology[6] is not something neutral. It rather mediates our relationship with the world. After this I am going to criticize the thinking behind technological fixes, through pointing out how we do not control nature. If nature is not under our control, we do not foresee all the necessary impacts of our technologies, where it seems unlikely that technological fixes will be *the* solution. This will lead us to the understanding of human and nature as interwoven. But first, why can't we say that technology is a neutral instrument?

Technology is not neutral

By this statement we are moving towards the more philosophical part in this paper, and especially to one philosopher named Martin Heidegger. Heidegger states in *Questions concerning Technology* (1977) that 'the essence of technology is by no means anything technological' (p. 4). The essence of technology is instead a way of revealing. What is revealing? One way to understand this, is that technology reveals nature. Technology *reveals* the tree as plank, the stone as a window, oil as a waterproof layer and so on. It presents nature in specific manners, where the plank for example, is extracted from the tree through the use of technology. In this perspective, the plank is a unique formation of the tree and are a specific way the tree can be experienced as.

But Heidegger's revealing has a more fundamental reach than the explanation above. "It is in and through revealing that reality comes to presence for human beings" and "only in relationship with entities[7] do these entities become reality for them" (Verbeek, 2005, p. 50). The point is that it is through our *relation* with things, humans, concepts – that these become a reality for us. This reality I am going to call the lifeworld. The lifeworld can be described as the felt presence of the world, or how the world appears through your eyes[8].

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[6] Technology is in this paper understood broadly, detonating large scale human brought forth systems - and relatively simple technologies as a hammer.

[7] Entities should be understood as physical presence of things; like a stone, a table – but also humans should be understood as an entity with physical presence.

[8] It would be more correct to say how the lifeworld appear through your *being*, as we do not experience the lifeworld only with our eyes; but how we exist and act in it.

What lies beyond the lifeworld, will I call the physical world or Nature with a capital N. [9]

One way to understand this distinction, is that everything is accessed through our senses – which clearly do not function as a 'recorder' of the physical world. We do not for example, detect ultrasonic sounds as the bat. But the lifeworld is more fundamental than this intuitive explanation. For us to even be able speak of ultrasonic sounds, it must be a part of our lifeworld. What we do not have a relation to stands 'in the dark', which we cannot possibly think of.

Our lifeworld can thereby be understood as our meaningful environment. In this meaningful environment entities refer to one another: The hammer refers to nails, to plank, to building-a-house and so on. These myriad of references thereby invite to certain actions. The hammer invites us to hammer, and with a hammer in hand – we look after something to hammer. These hammer references set us on a certain trajectory, which reveals 'the to-hammer world' but at the same time hides other possibilities. An example can clarify. In my exchange year in USA, it was unthinkable to walk 100 meters to the store to buy food. To go to the store, the car was the solution. The car influenced their trajectory of actions and what they saw as a potentiality. As the car had become the cultural norm of movement, it was hiding my host-parents possibility of walking to the store.

With this understanding of the lifeworld, one can begin to understand how technology is not something neutral. Technology influences our space of possibilities and promotes certain actions. It connects us to the world in specific manners, which sets us upon certain trajectories. Let us apply this understanding on Hyperloop's non-neutrality.

Hyperloop invites us to travel more. By being accessible, flexible and a fast-paced system, it is more convenient to travel longer distances. This will most likely result in an increased travel frequency and kilometres travelled, as the mass-implementation of cars resulted in. This illuminates another interesting point. At first, the car was more of a luxurious item. To travel by car was an attraction. Now the car is a necessary condition for our society to function; and orders and plans our ways of being in the world. The car has 'corrupted our needs' as the French Philosopher Rosseau would have put it; where a luxury item has

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[9] The difference between the lifeworld and the physical world are going to be important for our upcoming discussion – and I would recommend paying extra attention to these terms.

become a necessity. It is easy to see the parallel to Hyperloop implementation, where Hyperloop may start out as a new and exciting mode of transportation, but quickly evolve into something we become dependent upon. In this way, Hyperloop may create a bigger need for ultra-high-speed transportation which will again increase the travel frequency. This may render the energy aspect of Hyperloop, and without this aspect – how can Hyperloop be a solution in the Anthropocene?

We have now looked upon how technology is not something neutral. Technology creates needs and invites us to do certain actions. This realization sets us on a trajectory to doubt that technology can be *the* solution to our environmental problems - and we can carry on as before. Hyperloop for instance, may create a bigger need for long distance traveling – contrary to what we need in the Anthropocene. I am now going to continue this path, by arguing how we do not control nature. If we do not control nature, we are not its masters which can manipulate it as we see fit. This calls for a humbler approach and a new meaning to nature - which has implications for Hyperloop development. Let us start this inquiry.

Technosphere and loss of control

A geologist named Peter Haff is arguing that it is not humans who have become the geological force in the Anthropocene, but Technology. Technology is here understood as large scale technological or 'human-brought-forth' system across the globe, where these systems together create and constitute *the technosphere*. Agriculture can be an example of one of these systems, which requires a complicated set of components to function: Domestic animals, chemicals, farming equipment, trade, and transportation to mention some. Humans are in this view, also a component to this system - an essential part, but nonetheless subordinate to the system (Haff, 2014a, p. 127).

This may sound obscure. 'We are in control of technology, humans made technology happen!" And certainly, without humans in the technosphere, the sphere would cease to exist. The technosphere needs humans to arise and be maintained. But the reverse of this statement is equally valid. Humans are created and maintained by the technosphere. "Without the support structure and services provided by technology, the human population would quickly decline towards its Stone Age base of no more than ten million" (Haff, 2014b, p. 2). Imagine what would happen without vaccines and anti-biotic, modern housing and

clothing for example. This shows how technology and humans are mutually dependent on each other, where both in a way maintain the other.

The technosphere has further a dynamic of its own. This means that humans, as a part, do not possess or control this dynamic. To understand this, I am going to draw on Haff's notion of 'stratum' but apply the terms in a phenomenological way. As we shall see, this will provide an excellent framework to understand how humans cannot be in control of or manage Earth.

The stratum model consists of three stratums or layers of nature, where humans are a part of stratum II. In stratum II, the world presents itself in understandable shapes where humans can directly interact with the stratum's 'format'. The coffee cup for example, comes to presence as a smooth surface with rounded edges and is something-to-drink from. But in Stratum I, this is not how the cup appears. Here the cup consists of molecules, and the cup-shape dissolves into small particles with a different presence. To be able to access this stratum we must translate the stratum I presence to an experienceable stratum II shape through technology. It must take a form we can experience, so we can relate to it, and thereby become a part of our lifeworld. It is for example through the microscope the bacteria comes to presence through a picture, and through CRISPR technology we can interact with DNA as a thread. Technology thereby translates or mediates stratum I to our stratum II, where our interaction is more limited than in stratum II. The major point is this: We have a limited access to this stratum, meaning that what this stratum 'actually is' transcends our lifeworld. It appears for us as we do understand this stratum, but where we actually see it through 'dinted glass'; and technology shapes its appearance.

The same point can be made for stratum III, only in stratum III has dimensions that are too large for humans to directly interact with. We understand this stratum through scales, i.e., technologically translation, but this is still a reduction from the Stratum III 'shapes'. We do not directly perceive the effect of our pollution at a global perspective, only through looking at statistics and accumulation of data.

The stratum model illustrates how the technosphere can have a dynamic of its own, where 'humans are components of a larger sphere they did not design, do not understand, do not control and from which they cannot escape' (Haff, 2014a, p. 131). This provides us with a framework where we can understand how we are not in control of nature. We have an

inadequate understanding and access to the other stratums, and it seems therefore unlikely that we possess or can control these dynamics. To elaborate further on how we do not control nature, we return to Heidegger and his concept of revealing.

Revealing the physical world's limitlessness

We remember how technology revealed the tree as a plank, where the plank is a specific way the tree can be experienced as. The plank is then one aspect of the tree, derived from the more 'fundamental' tree. I will now continue on this thought and illuminate how one can understand the physical world as being *limitless.*

Imagine one was walking in a special forest, where the tree did not show itself as a normal tree, but as plank. Instead of encountering trees in this forest, one saw plank standing upright from the soil, with 'plank branches' and so on. Theses plank-trees are still trees, but only aspects of how a tree can appear. For as we know, a tree can also show itself as roots, bark, seeds, branches and so on. This is how we actual encounter the tree in our lifeworld, meeting all these aspects of the tree.

But one can also say we are walking in a 'special forest' in our lifeworld. But instead of encountering plank-trees, we are encountering trees. And just like a tree encompasses more aspects than a plank-tree, encompasses the tree more aspects in the physical world than what appears in our lifeworld. But we do not access all these different ways the physical world can show itself, when we cannot go beyond our experience of the tree, i.e., our lifeworld. This way of thinking may open up for an understanding of how the physical world can be more than our lifeworld. The claim will be further illuminated by pointing to how the lifeworld is dependent upon our being.

A blind person for example, experiences a room differently than a seeing person. He experiences the room through is hearing, the felt presence of the room; and through this revealing, the room shows itself differently. The way the room is revealed by the blind person, changes how the room appear in his lifeworld. For the lifeworld is not given as a brute fact but is created in the meeting between the physical world and a subject.

This illuminates another important point. The blind person cannot choose how he reveals the room. He is thrown into a way the room can be revealed, by not-seeing, and this applies for our revealing too. We are thrown into the prevailing mode of revealing, and we cannot control how the lifeworld comes to presence. Just like we are thrown into this

moment and how the immediate surroundings appear, we are thrown into a way we *can* reveal the moment and our surroundings.

We are now in a position to make sense of the claim that the physical world is limitless. *It has endless possibilities of showing itself*. But what this entails are outside of humans reach - as we only experience aspects of the physical world in our lifeworld.

This provides a more fundamental argument of how nature is not under our control. The stratum model explained how we do not control what we are able to reveal, as we have an inadequate understanding of other stratums. But this interpretation of Heidegger takes this one step further. The physical world has ways of being which we cannot reveal – ways we cannot understand and relate to – due to our thrownness into the prevailing mode of revealing. This brings doubt to the idea that we can manage Earth through technological fixes. We have a limited perspective on what Nature actually is and it seems therefore unlikely that we can predict the consequences of our technologies adequately. For this reason, it seems unlikely that technological fixes are *the* solutions to the problems faced in the Anthropocene, and we can manage Earth in a proper way. We are not *above* nature and can control it as its masters. It therefore seems more likely that we also need to change our being in the world. But what does this entail?

As I will argue, a different connection to nature may be necessary to decrease the graphs in the Anthropocene. Due to how we do not control nature, we should see ourselves as *a part of nature* rather than its masters. We are interconnected in nature, meaning that we are dependent upon the environment around us. This calls for a humbler approach towards interventions in wilder nature, where the human-world is not the only thing that matter. This will have implications for Hyperloop development - but before we get into this, we need to see how wilder nature should be valued higher than it does today. To see this, we need to continue our 'revealing' path and see *how* the lifeworld is revealed affect what it means to be human.

The human challenging of the physical world

This section is based on Heidegger's article *The Question Concerning Technology* (1977). The section addresses fundamental aspects on how the lifeworld appears in the meeting between the physical world and a subject - and is a critique of modernity. For according to Heidegger, is the way modern technology reveals the lifeworld utterly problematic:

The revealing that rules in modern technology is a challenging which puts to nature the unreasonable demand that is supply energy that can be extracted and stored as such (…) It is stockpiled: that is, it is on call, ready to deliver the sun's warmth that is stored in it (Heidegger, 1977, p. 14–15).

Animals become stored meat in big manufactory halls, the river a dam plantation, the wind something-to-harness and so on. Modern technology challenges the physical world to show itself as a resource and reduce it to one. This way of revealing the lifeworld has the character of being expedient, towards driving the maximum yield at the minimum expense. It is ordering the physical world to be efficient and enhanced, where nature no longer stands 'for itself' but are something *for* humans – something we can utilize.

By challenging and demanding the physical world to be orderable as a resource, *nature shows itself in this way*. To understand this statement, we need to remember how the physical world is more than our lifeworld - where we only experience an aspect of the physical world. When we therefore challenge the physical world to become a resource, it can *respond,* and show one aspect of itself as a resource. It is like a conversation. We challenge the physical world, or forces it through our technological manipulation, and asks; can you be this? And since the physical world has a richness of being, it responds 'Yes'.

This is the danger with modern technology's revealing. The encountering of the physical world as a resource, limits other ways we can discover it - and sets humans upon a way of revealing the lifeworld. According to Heidegger, this can become the only way we experience our lifeworld:

The coming to presence of technology threatens revealing, threatens it with the possibility that all revealing will be consumed in ordering and that everything will present itself only in the unconcealedness of a standing-reserve. (ibid, p. 33)

When Heidegger states that modern technology threatens revealing itself, it means that it *limits or hides* the manifold ways the lifeworld can come to presence. It limits the 'way the lifeworld *can* work' where it is 'seen through' a calculative, expedient perspective. There is then only 'one' way to function in this lifeworld, and we forget we can be in a different manner.

We now have a better understanding of how our being shapes the appearance of the lifeworld. Through encountering the physical world as a resource, nature shows itself accordingly - and at the same time hides other ways it can come forth. Why is this

important? Because how the lifeworld appears affect us as humans and how we want to live our lives.

I will now illuminate this claim through Heidegger's revealing in a less fundamental way. In this understanding of revealing, revealing reveals the tree as a plank, oil as a raincoat and so on. This interpretation will show how wilder nature gets a higher value and can be a good way to understand the more abstract paragraphs above.

The value of less human challenged-forth nature

As we remember from earlier on, we do not control nature and are therefore not its masters. If this is true, we should rather see ourselves as a part of nature rather than above it. This insight dissolves the distinction between nature and human and give nature a new, broader meaning. The difference between 'nature' and human built systems is then a matter of degree rather than kind. Nature will in this perspective encompass human built systems as cities as well, as cities are also nature - but are *challenged-forth* or co-created by humans in a greater degree than 'wilder' nature. Let us investigate further.

Cities are a niche in nature which is composed of life and functions in certain ways. It is composed of humans, rats, trees, traffic lights, buildings, streets and so on, where these components affect each other in myriads of ways and creates the city-world. But the city-world is still nature, as it is a specific way nature can appear as. Just as the plank is derived from the tree, is the city derived from the more fundamental 'wilder' nature.

The difference then, between the wilder nature and cities, is the degree of the human challenging. Humans has challenged-forth the city in a greater degree than wilder nature. The city is forced into existence in a specific manner by humans, where nature appears more expedient; as a *resource* - waiting for us to utilize it. The house for example, shelter us from the weather, the city light helps us see in the dark, the streets make walking easier and so on. One can say that the city function in a more functionalistic manner where things have a clearer propose than in less human challenged-forth nature.

As a thought experiment, imagine that Olav grows up isolated in a city and never been outside its borders. In this city there is no grass or trees, only asphalt and so on. The city is then the 'limit' for what is, and for the sake of the argument, Olav knows nothing about other ways nature can appear. This is thereby Olav's lifeworld. As the city appear more expedient than less human challenged-forth nature, Olav experience his lifeworld as

expedient. The way to be in the lifeworld, to live one's life, may then become to be more and more effective, continuously enhance oneself to become the very best: *Towards driving the maximum yield at the minimum expense* like the city-world evolves.

This characterization of the city-world can be a neat description on how modern society function in many ways, where the exponential growth is what keeps society stabile. If we stop increasing and enhancing, society would fall apart – as it derives it stability by continue growth (Rosa, 2017). To therefore be able to keep up with this 'progress', you as well need to be more effective, optimized and enhance yourself accordingly.

These examples show how the lifeworld affects our understanding of what it means to be human. It can further illuminate why wilder nature gets a higher value. The less human challenged-forth nature has a different mode of being. It is not shaped in an expedient manner or challenged-forth by humans - but has 'room' to reveal the physical world in a different way. One can say it has a as a richness of being, which transcends us, as we are caught in the prevailing mode of revealing.

If one feel like objecting here, and state that wilder nature is as expedient as the city; where the only propose is to reproduce, one may be so deeply rooted in the mode of challenging revealing, that one fail to recognize that nature can be revealed in another way. According to Block (2014) the current fit between Nature as supplier of energy and the human challenging of Nature can be seen as 'the greatest danger', where '..the experience of nature as energy supplier has become so self-evident, that the facticity of the affordance of nature is forgotten and concealed' (p. 21–22). The current fit hides the physical worlds richness, and we fail to recognize that nature can be revealed in a different manner.

How Hyperloop is not a solution in the Anthropocene
It may now seem like we have ventured far away from anything Hyperloop-relevant, so a recap of the argumentation so far may be necessary. I started with showing how we do not control nature, and how this may lead to a new understanding of nature as interconnected. Then we saw how our being influences how the lifeworld comes to presence from the physical world, where modern technology is in danger of reducing the ways it can come forth. This understanding gives less human challenged-forth nature a higher value, where it contains room to reveal the physical world in another way – in contrast with the more expedient city. To therefore see ourselves as a part of nature, where wilder nature gets a

higher value, sets us upon a new trajectory on how to approach our environment. This may be as a solution to many of the problems faced in the Anthropocene as we will meet the wilder nature in a humbler way.

Hyperloop becomes relevant in this context, due to how it may hide this understanding of nature. This will be made expressively in the paragraphs below.

We remember how technology is not neutral but mediates our relationship with the world. Another way technology affects our being is through magnifying and reducing different aspects with a phenomenon. Binoculars for example, can magnify the surface of the moon – but at the same time reduce the experience of the moon as a part-of the sky. Hyperloop, as a fast-paced transportation system with tubes, reduce and amplify the travel experience in a similar manner. Hyperloop amplify the relocation aspect with traveling and reduce the point of traveling to move as fast as possible from point A to point B. Where traveling before entailed to travel through woods and mountains, where one could experience our dependencies, is Hyperloop delivering detached travel from origin to destination. By being in an enclosed tube without the possibility to be aware of the environment one is passing through, one gets the feeling of 'popping up' from one place to another. You can get a similar experience by taking the metro in a big unfamiliar city. Here you get a shallow understanding of the distance between the metro stations and their interrelation, as your experience of the city is limited to the station's immediate surroundings. In the same way does Hyperloop hide our interconnectedness with nature, where it is possible to 'pop up' from city to city without encounter less human challenged-forth nature. This can result in a shallow understanding of nature's dynamics, where we do not experience how we are a part of nature, as in the metro example above. Other modern transportation systems share this aspect, but Hyperloop does this in a greater degree: By going directly and incredible fast between big cities in an enclosed tube, fully detached from the environment one is passing through.

Hyperloop is therefore a part of limiting our access to wilder nature. Why is this aspect problematic? Because we need to *encounter* less human challenged-forth nature to see ourselves as interconnected. We need to let wilder nature 'strike us' in our understandable stratum to get an engaged relationship, where the wilder nature gets a personal meaning (Paul, 2017, p. 82) Because it is precisely through our emotional

encounter within wilder nature, we can 'access' other modes of being - as we do not experience the lifeworld through scales and data. To quote Ihde (1990): 'What is revealed is what excites; what is concealed may be forgotten' (p. 78).

Hyperloop is further a manifestation on our challenging revealing. It challenges the physical world and thereof nature to be effective and enchanted, where Hyperloop delivers maximum speed at minimal expense. It reinforces the look upon nature as a resource, where the goal is to 'seek more and more flexibility and efficiency *simply for its own sake'* (Dreyfus, 2009, p. 27)*.* In this way, the tree does not have an intrinsic value but derives its identity as resource; for the paper industry or enjoyment of nature (Zwier & Blok, 2017, p. 12).

At last, Hyperloop sets us upon a trajectory for how to deal with the environmental challenges. By being a technological fix to a problem, it 'states' that we can technologically fix the environment without changing the way we are in the world. It moves the center of what we see as possible solutions to the environmental crisis, as the car did for my host-parents shopping, and legitimate further interventions in wilder nature in the future.

These examples show how Hyperloop soft impacts hides our interconnection with nature and reinforce the look that we are above it – which we can manipulate as we see fit. It may therefore seem like Hyperloop may not be a solution in the Anthropocene. Hyperloop is trying to 'save' the climate but are willing to override nature in doing so, *which the climate is brought forth from*. This continues to marginalize wilder nature and underpins the path we are already walking – which got us to the problems in the Anthropocene in the first place. But what can we do?

Part Three

To live together with modern technology

When one is starting to argue for the worth of less human challenged-forth nature, it is easy to become conservative in a radical way. Where the solution to our environmental problems is to go backwards and start living like we did in the stone age. But as we have seen in the technosphere, this will result in a catastrophe for the human population as we are dependent on technology and cannot be considered an option. And even though Heidegger is utterly criticizing modern technology, he did not mean for us to reject it. As Dreyfus (2009) argues:

…once we realize – in our practices, of course, not just in our heads – that we receive our technological understanding of being, we have stepped out of the technological understanding of being, for we see what is important in our lives is not subject to efficient enhancement. This transformation in our sense of reality – this overcoming of calculative thinking – is precisely what Heideggerian thinking seeks to bring about (p. 29).

The point is to get a conscious relationship to technology to have a free relationship to it. Let the technological devices enter our daily life, and at the same time leave them outside.

For I do not, for example, think that a solution to the Anthropocene is to stop travelling - where innovation in the transportation sector unwarranted. Travelling seems to be a necessary part of the future. It may be needed to develop a more global consciousness for example, which is necessary to solve Anthropocene's global problems locally. Instantaneously, will the accumulation of holiday traveling likely increase consumption which is not needed in the Anthropocene[10]. The place of travelling in the Anthropocene is beyond this paper purpose and reach, but it points to an important understanding of technology. Technology is not deterministic which is forcing us upon a way. It is rather inviting us; making certain paths easier to walk. You do not have to hammer with the hammer, you can also use it to measure distances, present it as art and so on. For the effect a certain technology brings forth, is created *in the meeting* between technology and its

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10 Hyperloop would mostly invite to business and shorter weekend trips, not long holiday trips, due to small pods with reduced baggage capacity. To enlarge this capacity would mean less passenger per pod and a more expensive ticket. The frequency of holiday traveling can further be regulated if the incentives are strong enough – but seems unlikely.

users. This illuminates the importance of one's cultural understanding in the meeting with technology, where this understanding co-creates the effects a certain technology brings forth. To therefore meet Hyperloop where we see ourselves a part of nature, where we as a culture value less human challenged-forth nature, will allow for more sustainable effects to spur. We may, for example, choose or not choose Hyperloops invitations in a greater degree. It can result in reflections like 'what do I aim to realize with my travels?' or 'Is this leading to a meaningful life?' and counter some of the proposed increased travel frequency.

Rosa underpins this way of thinking, where the goal is not necessarily to slow down but finding *resonance*. Resonance can be understood as glimpses of deeply meaningful experiences where we connect to the lifeworld and become absorbed in it - where for example a slower internet connection would not be particularly helpful in this case. But to open oneself to become moved, one need to be available for these experiences. Resonance 'conceptually requires that we let ourselves be touched, and even transformed, in a non-predictable and non-controllable way' (Rosa, 2017, p. 50). But this is not possible if we are constantly short on time, and trying to be as goal-directed and focused as possible. In these states we cannot afford or have the possibility of being touched and transformed.

The purpose of this paper is then not to reject modern technology, but to see where we can be headed and go forward in a better way. To see ourselves as a part of nature, may provide one of these ways; where wilder nature opens for another understanding of being by "retain the possibility of acknowledging things in their own accord" (Paul, 2017, p. 86).

This leads us to the last section in this paper, where we will look more closely into 'what we can do'.

How Hyperloop can be made compatible with new understanding of nature

I am now going to propose how Hyperloop implementation can be made more compatible with the new understanding of nature, and thereof be a solution in the Anthropocene.

We remember how Hyperloop was limiting our access to less human challenged-forth nature by going directly between cities in an enclosed tube, and thereof concealing our interconnection. This aspect may be less apparent if one creates stations into wilder nature as well. Wilder nature will then become easily accessible for many city residents which normally would not have this access. To prevent the less human challenged-forth nature to become worn down, one would have to make Sherpa-paths in approximately to the station

and so on – but with the opportunity to experience wilder and wilder nature further down the path. This can provide an opening for an engaged understanding in wilder nature, which is the key to see ourselves as interconnected. The technology needed for a Hyperloop pod to change lane is already patented, called 'the switch', which makes an intermediate station a possibility (Joint Research Centre, 2020, p. 13).

Hyperloop, with its inherent straight-line properties, was also hiding our interconnectedness due to the major interventions in wilder nature. Therefore, by approximately limiting Hyperloop implementation to already existing infrastructure, and through tunnels where this is not possible, *acknowledges the wilder natures worth*. It sets us upon a new trajectory of how we want to approach less human challenged-forth nature, and how to solve the challenges in the Anthropocene. It proposes a new path for the future and sets a new standard for interventions. This reveals our interconnectedness with nature by being humbler in our approach, therefore affirming that we are a part of nature - which further opens for more sustainable trajectories to occur.

The arguments in this paper, will of course, not be convincing form an economic standpoint of view. My point that wilder nature is beyond price, with a richness of possibilities of being will not carry much weight compared to the cost of the adjusted course. Tunneling is expensive[11], and a straight-line through wilder nature is easy to justify. 'We are just claiming small piece of land, it is not a big intervention, the animals can be elsewhere, or can even pass under the tubes!' But this way of reasoning, continue to marginalize wilder nature, reinforce the thought that we are in control, and the current graphs in the Anthropocene will unlikely decrease - as we continue the path which got us here.

We therefore need to translate the worth of wilder nature into terms the calculable way of thinking can understand. We need to point to how much resistance it will create in the population by implementing Hyperloop in wilder nature – as the windmill debate has created. Or point to how alienating it would be for a farmer to get a straight-line structure dividing his field and him from the local community. Infrastructure which he will have little use of, as he lives far away from the city. In this way, wilder nature gets a value – even though it is derived only in negative terms.

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[11] But as (Walker, 2018, p. 10) shows will Hyperloop tunnels be cheaper than car- or rail tunnels, as a Hyperloop tunnel will be smaller in diameter.

Concluding remarks

Before we venture into our concluding remarks, we need to look at one relevant criticism of my argument structure - and especially my premise of control. I used some time to argue for how we do not control nature, through pointing at our inadequate understanding of other stratums and our narrow revealing of the physical world. This led us to see ourselves a part of nature, rather than its masters, where it seemed unlikely that we could technologically fix our environment without changing our ways of being in the world. But here one may object and say that we have *enough* control. We do not control everything, but our knowledge and control has become sufficient to technological fix our environment, even though small errors will occur. This is a legitimate objection, and I cannot dismiss it with a decisive argument. But as I hope I have showed, it seems unlikely if one recognizes how fundamental limited perspective we have on Nature – where Anthropocene and its occurring challenges may reinforce this not-in-control perspective. This is moreover a question about time, where the consequences of our actions today, will not only show itself in our nearest future but also within a longer time horizon – something humans are not very good at perceiving. To therefore know if we have enough control to manage Earth, is a question the future is best suited to answer. And to me, it seems that a humbler approach towards wilder nature appears to be a safer path to choose; rather than gambling that we have control and are suited to manage Earth.

After this disclaimer, can we return to the beginning and the Collingridge dilemma. We are still in the developing stages of Hyperloop technologies, and can in a greater degree affect how it will appear. As it is the developers who develops, it seems important they values Hyperloop's environmental impact above the speed aspect - and thereof the value of wilder nature – so more sustainable Hyperloop design can occur. But before this bachelor, this was not the case for the 63 Hyperloop developers as the graphs under shows.

What do you find most attractive with the Hyperloop-concept?
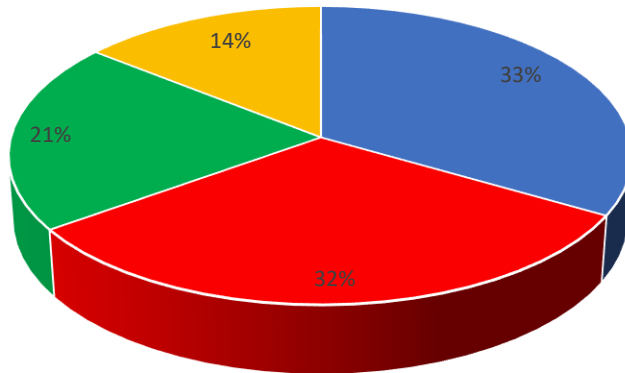
- Hyperloop is a new and exciting technology, which will revolutionize transportation. Exciting to take a part in forming the future!

- The speed aspect. To be able to travel at near sonic speed (above 1000 km/h) and quickly travel between destinations.

- The environmental and energy aspect. A way of traveling long distances without polluting the environment - and minimizing the energy usage per passenger.

- Others: The rest of the answers was within these categories: Flexibility aspect (5), Economical aspect (2), Freight (1), Other (1) and Saftey (0)

(Dahle, 2021)

Only 21% of the respondents thought that the environmental and energy aspect was the most attractive aspect with Hyperloop, where 65 % thought either speed or the newness of the technology was more attractive. This may imply which aspect the developers would prioritize if one had to choose between speed and the environmental impact. But as EU's green deal and the feasibility study from (TEMS et al., 2019) shows, is not speed Hyperloop's strongest argument. Meaning, it is not speed which would result in Hyperloop's realization – but its energy-environmental aspect. This means that one can allow oneself to reduce speed where this is necessary, which makes it easier to follow existing infrastructure and lessen the use of more expensive tunneling.

If this is the way Hyperloop development is going, Hyperloop may be a solid contribution to many of the challenges posed in the Anthropocene. It sets us upon a new trajectory on how we want to deal with less human challenged-forth nature and will revolutionize the amount of energy used in long distance traveling. This would be building for the future, where we have a lesser energy impact on the climate – while still seeing the value of wilder nature. The intermediate stations would moreover open up for our interconnectedness, by inviting people from the city center who normally would not have this type of access to wilder

nature. If we at the same time have a conscious relationship to Hyperloop, and not always accept its 'travel invitations', the amount of traveling does not have to sky-rock.

So, to conclude: We are resting on a different base of knowledge of the consequences of human endeavor than Henry Ford and our predecessor. As Anthropocene shows, is not greenhouse gas emissions the only problem – but also how we approach wilder nature. If we do not adapt our implementation accordingly to this knowledge, we will continue on the path of removing us from wilder nature which hides our interconnectedness as a part. The consequences of this path, where we see ourselves above nature, we are just starting to notice in the graphs of the Anthropocene. My research question will therefore have an ambiguous answer. Hyperloop is an answer to many of the challenges posed in the Anthropocene *if* one limit Hyperloop implementation to existing infrastructure and to tunnels. If not, will Hyperloop's soft impacts – by continue to hide our connection as a part of nature and the trajectory that blossoms out of this understanding – likely exceed its energy aspect. If this is the case, it seems unlikely that Hyperloop would be a solution to the challenges posed in the Anthropocene.

So let us do the other!

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