Digital support for an improved circular plastic economy

Outcome of the participatory scenario development workshop

Pizzol, Massimo; Løkke, Søren

Publication date:
2020

Document Version
Publisher's PDF, also known as Version of record

AALBORG UNIVERSITY
DENMARK

Report

Digital support for an improved circular plastic economy

Outcome of the participatory scenario development workshop

Massimo Pizzol and Søren Løkke

Department of Planning, Aalborg University, Rendsburggade 14, DK-9000 Aalborg

Aalborg – 21 September, 2020

ISBN 978-87-93541-18-4

AALBORG UNIVERSITY
DENMARK

Foreword

This report documents the process and outcome of the participatory development workshop organized within the context of the *Maritimt Block-k*raft project funded by *Industriens Fond*. The project examines how the digital transformation affects the competitiveness and future growth opportunities of Danish companies, including whether Blockchain-based technology can support this transformation. The workshop is part of the work package: *Circular Plastic Blockchain readiness*.

The workshop allowed us to explore how Blockchain-based technology can be integrated into the full plastics value chain to support the circular economy in the Danish plastics sector.

We want to thank the participants for constructive participation and look forward to future engagements in this important topic.

AALBORG UNIVERSITY
DENMARK

Background and objective of the workshop

Scenarios are "*what-if stories about the future, expressed in words, numbers, maps, and/or graphics. They are descriptions of plausible futures and do not claim to offer any certainty about future developments because uncertainty is assumed to be inherent in a complex world."* Ash et al. (2009)

According to Ash et al. (2009) a participatory scenario development workshop is usually done with participants from diverse backgrounds, and implies the collaboration and incorporation of different perspectives to create shared vision of future. It should emulate an ideal planning situation and ensure the creation of credible scenarios as experiential knowledge is linked to data. Also, it should create scenarios with high relevance as the participants work together across disciplines relevant to decision making needs, as well as with high legitimacy as stakeholders from different backgrounds are involved and participate in creating a common vision. It is a highly creative process, which enables the user to "think out of the box", and be visionary and can be applied to any decision-making scale from the regional to the local.

On June 16th, 2020 we organized an online participatory scenario workshop with in total 12 stakeholders related to the Danish blockchain and plastic domain.

The participants in the workshop included representatives from industries that use, produce or process plastic and plastic waste, companies working with plastic waste logistics, the National Plastics Center, the plastics industry, and experts in blockchain technology from academia and the consultancy sector. The purpose of the workshop was to explore scenarios to be used in connection with the *Maritimt Block-kraft* project. More specifically, the purpose of the workshop was to derive scenarios that explore opportunities and barriers to the use of Blockchain technology in supporting increased and improved recycling of plastics, with a focus on post-industrial and post-commercial plastics, and on both SMEs and larger companies.

Workshop procedure

We selected the participants based on our existing network and web search. Participants were all affiliated to a Danish institution working either in the domain of blockchain or in the domain of plastic supply chain. Participants were provided specific information material in advance, this included the definition of scenarios, the features of a participatory scenario development workshop as outlined above, and the focal issue (cf. next section). The workshop was held online using the platform Zoom for video meeting and the platform Google Jamboard as whiteboard. This was due to the COVID-19 virus restrictions existing at the time that impeded physical meetings. The workshop duration was four hours so the workshop was conducted in a rather condensed form compared to other similar participatory scenario development workshops that can last up to two days. The workshop was held in Danish.

We used a modified version of the four-stages step by step procedure suggested by Ash et al. (2009). It is important to note that the procedure is not presented to the participants in advance so these are not aware of what step comes next.

The first substantial modification was that the focal issue – the main problem addressed by the workshop formalized in terms of a research question geographically and a temporally explicit – was defined in advance by us, the organizers, instead of being defined inductively by the participants.

The selected focal issue was: "*Can Blockchain-based technology contribute to the circular plastics economy in Denmark by 2030?"* Typically, the answer to a focus problem constructed in this way would be: "*it depends"*. This focal issue was selected based on preliminary interview work and making sure it aligned with the overall project objectives and especially with the workshop objective, which was explorative in nature.

First stage on state of the art and outlook

The first stage of the workshop proceeded with the identification of *present conditions and current trends* - historical areas and developments that led to present situation and whether these are expected to continue or change - and *concerns for the future*. For each of these two topics, participants were asked to individually write down max. two sentences on a (digital) post it. In plenum these were then selectively clarified and discussed to obtain further feedback, with specific attention to those being controversial, contrasting, unclear. Leading moderator questions for each of the two topics are presented in the box below.

Present conditions and current trends

What is the status of blockchain today in Denmark? What about plastic recycling? Where is the Danish plastic recycling industry going? Why do we need novel plastic tracking technologies? What about the use of blockchain in Denmark, is it progressing?

Concerns for the future

What future problems we expect in plastic supply and recycling? Are blockchain technologies going to cost, are they going to be used, does development proceed too slowly, what about intake of technology?

Second stage on driving forces and scenario logics

In a second stage we focused on the identification of driving forces, the main factors that influence future developments of a system. These range across demographic, economic, social-cultural, political, technological, and environmental factors affecting the focal issue under analysis. In this specific workshop the drivers were intended as factors that affect blockchain tech development and circular plastic management. For example, the increase in plastic supply in the future, or the increase in digitalization in society could be trends for specific drivers. Answering the question of "*What are the factors that will shape this problem?"* Each participant listed at least two drivers in (digital) post-it, either economic, social, political, or environmental drivers with no restriction.

In plenum, supported by us in a facilitator role, the participants reduced the whole list down to approximately ten drivers using various approaches, such as clustering and grouping the drivers into categories and removing duplicates. Substantial effort was used in clarifying to each other the meaning of each driver. Again, in plenum with facilitator, the participants ranked the drivers based on their uncertainty and importance, by plotting them on the uncertainty/importance plan (2 x 2matrix, or two axis plot). They started by taking one driver and placing it in the middle of the chart, then taking another and comparing it relatively to the first one. Then the next, etc.

Finally, in plenum with facilitator, the participants set up the two scenarios axes. The scenarios axes were based on two critical uncertain drivers that seem to influence most or all of the others. After selecting the two most important and uncertain drivers the participants named the dimensions according to these two, obtaining the basis for the four scenario logics. Participants made different attempts using the most or second most uncertain/important drivers, and identified the result that was most satisfactory for the group.

A typical scenario development workshop would then result in a list of scenario assumptions and scenario storylines, as well as a quantification of these. A narrative for each scenario logic is usually developed. Visioning refers to figuring out what the future will look like or how you envision the future to be. It entails breaking down the vision into timeframes, which allows planning from the near to a distant future. However, these steps were beyond the scope of this workshop and were therefore not included.

Outcome of the workshop and findings

The full list of the statements produced by participants is provided in the Appendices 1-4, while on following we summarize the main outcomes for each stage.

First of all, we stress that the scope of the exercise, as formalized in the focal issue, was restricted to Denmark and the time horizon of 2030, therefore the findings presented on following should be considered in the light of such narrow scope, i.e. Danish conditions and a relatively short-term perspective.

Identified state of the art and outlook

In the first stage of brainstorming on present conditions and current trends we observe that the discussion developed around three main points:

The fame and mystery of blockchain. Blockchain is a tool that is poorly understood by those who are not developers, but nevertheless attracts great interest and promises great improvements. The technology is maturing fast, applications exist and can be used as inspiration for others, but implementing blockchain in supply chains is indeed complicated as involves several collaborating actors and, sometimes, not even necessary. Key quote: *"Although many are interested in Blockchain there are not many situations where it is used in practice"*

The complexity of plastic supply chains. Plastics and especially plastic waste are diverse in value and composition, and this affects their potential use, reuse, and recycling. Besides, they are hard to trace. Information on how plastic moves from one point in the supply chain to another is often unavailable. Key quote: "*It is not transparent as to where a waste stream comes from and ends up. It's an imperfect and immature marked"*

The role of consumers and companies. These seem to be the actors that are currently more relevant for the problem of implementing blockchain in plastic supply chains. Consumers demand more circular practices and green products, and also are interested in traceability, although not necessarily in blockchain as a way to ensure that. Companies have economic concerns as well as privacy concerns, blockchain solutions might be costly and some data might not be sharable, and moving towards circular plastic management practices such as using recycled plastic is not necessarily convenient given the prices of virgin versus secondary plastic materials. Key quote: *"The value of recycled plastic is low, it can't pay for Blockchain technology"*

In the brainstorming on concerns for the future we can pool the statements into two main groups, technology-related concerns and market-related concerns.

Technology related concerns regard not only the blockchain technology, but also the plastic domain. For example, one concern is that an excessive focus on how current available technology for using blockchain looks like - complex, not user friendly, obscure - might obstacle its further adoption in (plastic) supply chains, although one should discount these problems because they are related to the immaturity of the technology and will in principle be solved soon. Regarding plastic, a technological concern is that of slow digitalization of its value chain, i.e. that the digital information available on plastic streams will remain too low in the near future to allow for the implementation of technologies like blockchain, and that in general the technology for plastic separation and recycling will not progress sufficiently to solve the plastic mixture problems, outlined in the previous section.

Market related concerns were expressed that relate to e.g. whether consumers will keep a sufficiently interest for plastic traceability to warrant the implementation of blockchain technologies in this domain, or whether the value of recycled plastic would be sufficiently high. Also, concerns about the costs of implementation of blockchain technologies were raised. Finally, we should mention concerns about the future ownership and availability of data as these indirectly can give market advantages and the note that consumers might be indifferent to the use of blockchain, as their main concern is the outcome of the use of blockchain, e.g. improved traceability.

Identified driving forces and scenario logics

The second stage on identification and selection of drivers was the most demanding stage of the workshop. Several drivers were identified and these drivers were bundled initially in five groups:

- *Regulation*. For example: “increased state requirements for recycling of plastic”, “EU regulation”, etc.
- *Technology development*. For example: “better and more mature Blockchain”, “development of Blockchain infrastructure”.
- *Market*. For example: “Prices for plastic”, “Use of tokens”, etc.
- *Consumers*. For example: “perception of consumers towards blockchain”, “consumer choices regarding sustainability”, “catastrophes affecting consumer perception”
- *Strong actors*. For example: “lead company models”, “strong interest organization”

Then substantial time was used in clarifying their meaning as much as possible, merging similar ones, and removing duplicates. The final list is available in Appendix 3.

Another intense discussion was then carried out to place the drivers in the uncertainty / importance matrix. We observed a rather good agreement across the participants in the expected trends and in qualifying the importance or uncertainty of the drivers in more detail than the simple short statement, whereas the most difficult task was to place the drivers in relation to each other and thus in the more quantitative (or semi-quantitative) assessment of their uncertainty and importance.

The results can be observed in the figure of Appendix 3. (cf. Danish translation of the drivers in Appendix 3. too) where the drivers are mostly placed on the diagonal across the low uncertainty-high importance quadrant (top left) to the low importance-high uncertainty quadrant (bottom-right). In other words, many of the identified important drivers exhibit a predictable trend according to the participants, whereas the uncertain and difficult to predict ones were those not perceived to affect the problem substantially. Only three drivers were left in the high uncertainty-high importance quadrant (top-right), that is the space from where drivers are selected usually to define the scenario axes. It is important to remind that participants were not aware of this on beforehand, i.e. the participants did not know that after the mapping of drivers, the two most important and uncertain ones would be selected to build the scenario logics, and this allowed to avoid any bias in the mapping.

The participants quickly agreed that the driver about catastrophes was not instrumental to the definition of scenarios, because such driver could be used in principle in any scenario exercise, and because it was perhaps suggested given the specific conditions at the time, i.e. the fact that the workshop was held during the COVID-19 lockdown, thus a very exceptional and from certain perspectives catastrophic situation.

Therefore, the two scenario axes were defined as follows: the influence of leading companies on all actors (strong or weak) and the technology development for the context of plastic (fast or slow). The intersection of these two axes creates four scenario logics. This can be see in the figure provided in Appendix 4.

It is worth providing more detail about these two drivers. In the driver “technology development especially for this context” the mentioned “context” is the plastic domain and not the blockchain domain. So, this driver identifies all technological development outside the blockchain and blockchain infrastructure domain, and instead specifically happening in the plastic-related industry and value chain towards an increased plastic circularity, e.g. new technologies for sorting, identifying, and labelling plastic materials. The driver was considered less important than e.g. the driver on requirements on identification of plastic, or dependent on it: *"If you don't believe that the tech development will follow suit regulation, then nobody will start with it"*. The driver is uncertain because the participants were split between optimism regarding tech development in the plastic domain and pessimism considered the historical development has been slow: *“we are one of the worse countries in EU to recycle plastic, tech for recycling of plastic has not done much more progress in the last 30 years”.* We stress that this driver excludes technology development in the blockchain domain, which was described as a separate driver: "(technological) development of better blockchain solutions". This was assessed of high importance but very low uncertainty. Key quote: *"I am quite sure there will be development in this area [blockchain, ed.], there is a lot of work in this area, I don't think this is where the problem is, although there is still a need for further development".*

The driver "Leading example: a value chain uses Blockchain and others are "forced" on" is about strong actors and first movers that can pave the way for the others. It was assessed of medium importance and high uncertainty, as once triggered is then very important, but it is unsure whether it will be triggered at all. The leading example actor can be a region, state, large retailer chain, or company, e.g. the example of the large shipping company Mærsk was mentioned. Key quote: *"If Mærsk says either you use our system or you don't get any products then we are forced to jump in".*

Final remarks and evaluation

The main outcome of the workshop is thus a combination of two dimensions that together identify four logical scenarios depending on the pace of technology development in the plastic domain and on the strength of the role of key leading actors. Examples of these scenarios could be: A large company is leading the adoption of blockchain tech in the plastic supply chain supported by new development in the technology for identifying plastic waste fractions based on their composition. Or a scenario where many small companies start using blockchain coupled with different technology advancements in the plastic tracking and sorting.

The main reflection is that the two final drivers selected for the scenarios, perhaps surprisingly, are independent of blockchain technology. This somehow suggests that there is an excessive focus on blockchain *as such* rather than at the problems where blockchain can be used to solve. This mirrors ideas that were put forward several times in the workshop, that blockchain is essentially a means to an end, not the end as such. This way, the workshop clearly indicates that the main challenges are of organizational, economic and cultural nature, when it comes to the implementation of a system supporting improved plastic circular economy. Blockchain can be a tool that works under the hood and allows or contributes to allowing a specific result to materialize, e.g. the traceability of plastic

flows. Key quotes: *"you don't need to know that there is blockchain under the tech solution if it just works and does the job you expect".*

As a critical evaluation of the workshop, we report on the two main feedback received. The discussion was perceived as too much "parallel", mainly due to the digital format of the workshop that makes it more difficult to have a very interactive discussion than if it would have been happening in person. We therefore recommend in the future to maintain the live format or find different digital tools that allow more interaction. However, the digital format did also lower the entry-barrier for participation which enabled a broader spectrum of participants. Participants found interesting that the workshop involved both practitioners, university, and the technology world, three dimensions that need to interact and understand each other, and it was clear that a common understanding had to be reached between the three types of actors regarding the issues addressed in the workshop such as the use of blockchain, the circular plastic strategies, and the combination of the two. Reaching this common understanding was implicitly the main goal of the workshop and quickly become the main challenge of the workshop – it is not sure if such common understanding was reached in full but at least some good steps were made towards it. This reflects the well-known notion in participatory scenario development that the process is just and perhaps even more important than the actual result.

Essential Bibliography

Chapter 5.1 How to explore the future with a scenario exercise, in Ash et al. (eds.), 2009, Ecosystems and human well-being - A manual for assessment practitioners. Can be downloaded here: https://www.unep-wcmc.org/resources-and-data/ecosystems-and-human-wellbeing--a-manual-for-assessment-practitioners

AALBORG UNIVERSITY
DENMARK

Appendices

Appendix 1.

Statements on the topic of current trends (original on left and translation on right)

Direkte print af labels på plast emballagen kan give kontamination fremadrettet i en cirkulær verden	Direct printing of labels on plastic packaging can lead to future contamination in a circular world
Man tager noget i den fysiker verden og transponer i den digitale, men de to afspejler ikke hinanden	Man takes something in the physical world and transposes in the digital, men they to do not reflect each other
Samarbejde er nødvendigt men det kan give problemer ved deling af følsomme informationer	Collaboration is necessary but it can cause problems when sharing sensitive information
Mange interesserer sig for Blockchain men der er ikke mange situationer hvor det bliver brugt i praksis	Many are interested in Blockchain but there are not many situations where it is used in practice

Noget affald og additiver kan ikke deklareres præcist mht. receptur og indholdsstoffer pga. hemmeligholdelse. Det kan gøre det besværligt at sortere/genanvende	Some waste and additives can't be declared precisely in terms of recipe and substance content due to secrecy. This can make it difficult to sort / recycle
Plastfraktioner er svære at identificere for de første led i værdikæden, så værdien efterfølgende mindskes.	Plastic fractions are difficult to identify for the first links in the value chain, so the value is subsequently reduced.
Behov for øget sporbarhed	Need for increased traceability
Forskellige teknologier til fysisk støtte til sporbarhed er på vej, fx keramiske sporstoffer og 3D print på overflade.	Various technologies for physical support for traceability are on the way, such as ceramic trace elements and 3D printing on the surface.
Overblik over samlede miljøpåvirkning - fx til perspektivering af afbrænding	Overview of public environmental impact – e.g. for the perspective of incineration
Kortlægning på tværs af konkurrenter vs Deling af konkurrencefølsom information.	Mapping across competitors vs. sharing competitive information.
Mere integration mellem virksomheder og i forsyningskæde	More integration between companies and in the supply chain
Tvivlsom om private og firmaer kan på tværs af hinanden bruge Blockchain som fælles formål til bedre cirkulær genanvendelse	It is doubtful whether individuals and companies can cross-use Blockchain as common goal for better circular recycling
Blockchain automatiserer processer og ændre verdikæder, forbedrer transparensen, forbedrer kvalitet	Blockchain automatizes processes and changes value chains, improves transparency, improves quality
Implementering af Blockchain teknologi er kompliceret, fordi det ofte omfatter mange organisationer og flere dele af disse	Implementing Blockchain technology is complicated because involves often many organizations and several parts of them
Der er for mange laminater i plasten	There are too many laminates in plastic
Værdien af genanvendt plast er lav; kan ikke betale for Blockchain teknologi	The value of recycled plastic is low; can't pay for Blockchain technology
Der er ikke transparens mht. hvor affaldsstrøm kommer fra og ender henne. Uperfekt og umodent marked	It is not transparent as to where a waste stream comes from and ends up. Imperfect and immature marked
Recirkuleret plast må ikke genbruges til fødevarer	Recycled plastic must not be used for food applications

De store virksomheder køber plast emballage fra forskellige leverandører. Disse har intet incitament til at skabe recirkuler-bar emballage da firmaet ikke betaler ekstra for det	The big companies buy plastic packaging from different suppliers. These have an no incentive to create potentially circular packaging as the company doesn't pay extra for it
Der bliver flere og flere vare som forbrugeren /firmaerne vil have genanvendt. Dette giver udfordringer da forskelligheden er for stor på plasten	There will be more and more goods that the consumer / companies will want recycled. This presents challenges as the diversity is too high for plastics
Motivering af den enkelte borger vs "maskiner" og automatisering	Motivation of the individual citizen vs "machines" and automation
Tvivlsom om værdien af det recirkuler-bar plast kan betale for Blockchain teknologi	Doubtful whether the value of a circular plastic can pay for Blockchain technology
Blockchain teknologi er brugt i andre sektorer til at løse lignende problemer (mange har prøvet det og har også fundet af at det er ikke det de skal bruge)	Blockchain technology has been used in other sectors to solve similar problems (many have tried it and have also found it is not what they need)
Blockchain kan give en decentralt styret infrastruktur i modsætning til at registrere information i en central database.	Blockchain can provide a de-centrally managed infrastructure as opposed to registering information in a central database.
I en public Blockchain er information i princippet tilgængelig for alle.	In a public Blockchain information in principle available to everyone.

Appendix 2.

Statements on the topic of concerns for the future (original on left and translation on right)

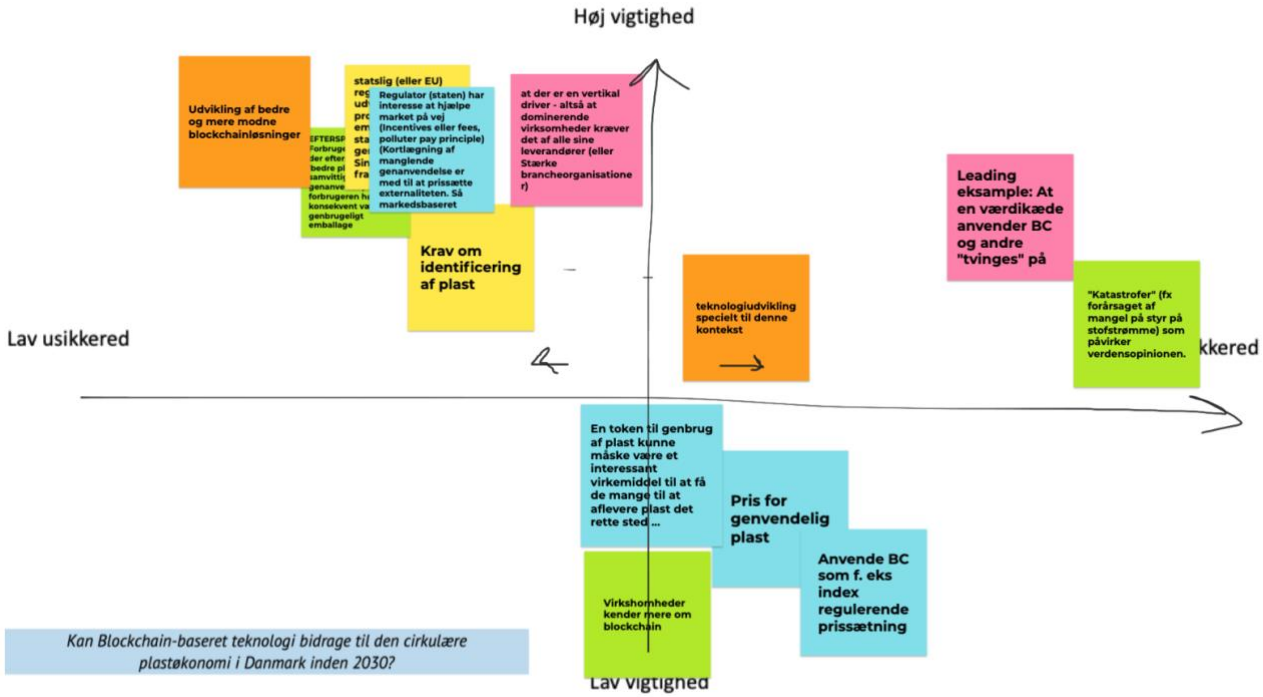
Bekymring som borger - hvor ender alt plast og hvor meget ressourcer man bruger til genanvendelse vs produktion - hvem er ansvarlig	Concern as a citizen - where does all plastic end up and how much resources are used for recycling vs production - who is responsible
Det er en udfordring at vi vurderer fremtiden ud fra hvad Blockchain kan bruges til i dag. Men formodentligt kommer der mere integrerede og "easy-to-use" løsninger om kort tid	It is a challenge that we assess the future based on what Blockchain can be used for today. But presumably more integrated and "easy-to-use" solutions will come soon
Bliver der nok mængder af specifik type plast til at udnytte forskelige kapaciteter	Will there be enough quantities of specific type of plastic to utilize different capacities
Emballage er ofte "beskidt" - fx. af den som den har indeholdt. Det er en udfordring af adskille rent og beskidt emballage af samme type	Packaging is often "dirty" - e.g. from what it has been containing. It is a challenge to separate clean and dirty packaging of the same type
Om bioplast vil udkonkurrere behovet for genanvendelse af traditionel plast.	Whether bioplastics will outcompete the need for recycling of traditional plastics.

Der er øget efterspørgsel efter genanvendt plast for bedre branding.	There is an increased demand for recycled plastic for better branding.
Måske Blockchain teknologi ikke er løsningen på ret mange problemer i den "virkelige verden"	Maybe Blockchain technology is not the solution to quite a few problems in the "real world"
Der er ikke efterspørgsel efter hvor plast kommer fra	There is no demand for where plastic comes from
Blanding af bionedbrydelig plast med ikke bionedbrydelig (klassisk plast)	Mixture of biodegradable plastic with non-biodegradable (classic plastic)
Blandede og beskidte fraktioner genanvendes kemisk eller forbrændes med CO2 fangst	Mixed and dirty fractions are recycled chemically or incinerated with CO2 capture
Skaffe tilstrækkelige mængder af ret kvalitet plast	Obtain sufficient quantities of fairly quality plastic
Der er ikke brug for den decentralisering, som Blockchain teknologien tilbyder.	There is no need for the decentralization that Blockchain technology offers.
Om emballager er tilstrækkeligt digitaliseret til at kunne indgå i en Blockchain løsning	Whether packaging is sufficiently digitized to be included in a Blockchain solution
Om Blockchain bliver for økonomisk tungt at håndtere (tager tid at indtaste data og hvem har råd til det?)	Whether Blockchain becomes too financially cumbersome to handle (takes time to enter data and who can afford it?)
Prisen på ny plast kommer for tæt på genanvendt plast i fremtiden så genanvendt plast vælges fra grundet prisen	The price of new plastic comes too close to recycled plastic in the future so recycled plastic is not chosen due to the price
Der er brug for nemme teknologiske løsninger, de nuværende er for kompliceret	Easy technological solutions are needed, the current ones are too complicated
Der er mere brug for samarbejde imellem forskellige aktører end for Blockchain (som er kun en del af en større løsning)	There is more need for collaboration between different actors than for Blockchain (which is only part of a larger solution)
Øget brug for gennemsigtighed	Increased need for transparency
Information monopoler er en udfordring fordi de ikke er reguleret	Information monopolies are a challenge because they are not regulated
Der er behov for opgør med monopol på data	We need to revolt against monopoly on data

Producent ansvarlighed i regulering, men det kan også lede til at vi få mere data på plast fordi vi tester mere	Producer responsibility in regulation, but it can also lead to us getting more data on plastic because we test more

Appendix 3.

Identified drivers of change after sorting, and their placing in the uncertainty / importance matrix (original on left and translation on right)



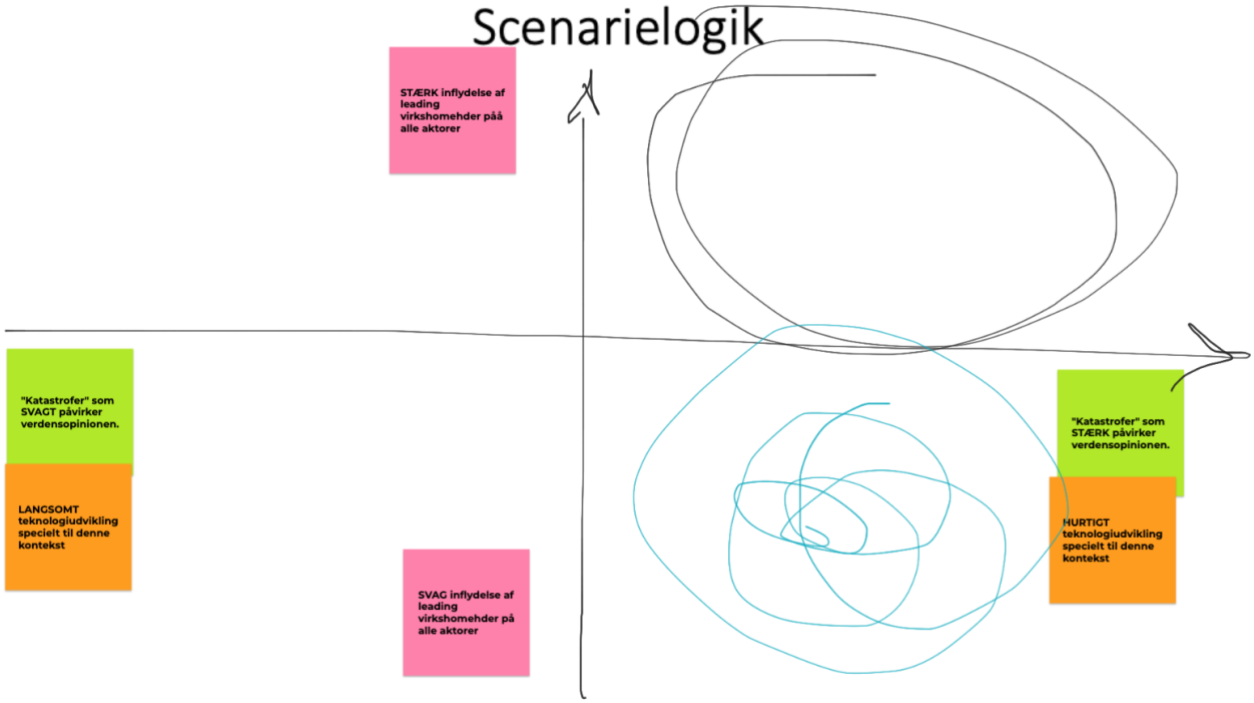
Udvikling af bedre og mere modne Blockchain løsninger Efterspørgsel: forbruger/virksomheder efterspørgsel på 'bedre plast samvittighed' fx genanvendt plast, forbrugeren højlydt / konsekvent vælger genbrugeligt emballage Statslig (eller EU) regulering f.eks. udvidet producentansvar for emballage, et statslige krav til genanvendelse, Single Use Directive fra EU, etc.	Development of better and more mature Blockchain solutions Demand: consumer / companies demand for 'better plastic conscience' e.g. recycled plastic, consumer loudly / consistently chooses reusable packaging Government (or EU) regulation e.g. extended producer responsibility for packaging, a state requirement for recycling, Single Use Directive from the EU, etc.

Regulator (staten) har interesse at hjælpe marked på vej (Incitamenter eller gebyrer, forureneren betaler princip). Kortlægning af manglende genanvendelse er med til at prissætte eksternaliteten. Så markedsbaseret regulering kan potentielt hjælpe alle. Og regulator kan påtage sig omkostninger af kortlægning.	The regulator (the state) has an interest in helping the market on its way (Incentives or fees, the polluter pays principle). Mapping of lack of recycling helps to price the externality. So, market-based regulation can potentially help everyone. And the regulator can support the costs of mapping.
Krav om identificering af plast	Requirement for identification of plastic
At der er en vertikal driver - altså at dominerende virksomheder stiller krav til alle sine leverandører (eller stærke brancheorganisationer)	That there is a vertical driver - that is, that dominant companies make demands to all their suppliers (or strong industry organizations)
En token til genbrug af plast kunne måske være et interessant virkemiddel til at få de mange til at aflevere plast det rette sted	A token for recycling plastic could perhaps be an interesting tool to get many to deliver plastic to the right place
Virksomheder kender mere om Blockchain	Companies know more about Blockchain
Pris for genvendelig plast	Price for recyclable plastic
Anvende Blockchain som f. eks indeks regulerende prissætning	Use Blockchain as e.g. index regulatory pricing
Teknologiudvikling specielt til denne kontekst (i.e. plast relateret, f.eks. plast genanvendelse, identificering, sporing)	Technology development specifically for this context (plastic-related, e.g. plastic recycling, identification, tracking)
Førende eksempel: At en værdikæde anvender Blockchain og andre "tvinges" på	Leading example: That a value chain uses Blockchain and others are "forced" on
"Katastrofer" (fx forårsaget af mangel på styr på stofstrømme) som påvirker verdensopinionen.	"Disasters" (e.g. caused by lack of control over drug flows) which affect world opinion.

AALBORG UNIVERSITY
DENMARK

Appendix 4.

Identified scenario logics (original on left and translation on right)



STÆRK indflydelse af førende virksomheder på alle aktorer SVAG indflydelse af førende virksomheder på alle aktorer "Katastrofer" som SVAGT påvirker verdensopinionen. "Katastrofer" som STÆRK påvirker verdensopinionen. LANGSOM teknologiudvikling specielt til denne kontekst HURTIGT teknologiudvikling specielt til denne kontekst	STRONG influence of leading companies on all actors WEAK influence of leading companies on all actors "Disasters" that WEAKLY affect world opinion. "Disasters" that STRONGLY affect world opinion. SLOW technology development especially for this context FAST technology development especially for this context