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OPEN CALL

LONDON DESIGN BIENNALE

Design In An Age Of Crisis

«Sustainable and circular city districts as a service»

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PREFACE

The following paper tries to put up a micro-based framework that might help to identify design solutions from different disciplines that might help to respond to the given global challenges. The citations have been included as green links within in text, a lighter green color indicates that a source is only available in the german language. As I have learned about this Open Call of the LONDON DESIGN BIENNALE just a few days ago, one can only find ten brief examples in the annex, on how this micro-based framework might help thinking about the given global challenges, due to shortage of time. Nevertheless I hope that this paper might contribute in a fruitful way to the collection of ideas of this Open Call.

I

THE BIG PICTURE

In his talk *«Programming and Scaling»* at the HASSO PLATTNER INSTITUTE in Potsdam in 2011 computer-pioneer ALAN KAY, who is the inventor of the graphical user interface for personal computing, talked about the way how software is shaped today. As he pointed out, the written lines of code of software systems have reached a level of complexity, *«that at some point the systems are too complicated for a human being to go in. Too many feedback-loops, too many self-regulatory systems and stuff, and you wind up at best negotiating with the system»*. He compared the current situation of software-design to Mexico-City, *«so it is 20 million people, couldn't be more smoggy, and it is a kind of a mess»*, also pointing to a bug in MICROSOFT-Word, that has been reported literally thousands of times. As he noted, the bug has been unable to fix, as the relevant code lines could not be identified any more. As ALAN KAY presented in his talk, one can find new concepts for software-design taken from computer-sciences from the 1950's that are able introduce a new design-approach that fits a human scale.

This is just a brief spotlight and example on the importance of design and how it can help to shape new structures and patterns in order to deal with the challenges in this global interconnected world, ranging from environmental pollution to climate change. In a recent study at research institute EMPA in Switzerland about the phenomena of so-called *«planned obsolescence»* in products, researcher PETER JACOB reported that in general occurring problems in products do not arise intentionally and can be rather viewed as unexpected results from price pressure and long supply chains, lacking communication. As an example he points out that about 100 different suppliers alone are involved in providing a car air conditioning system.

So how it might be possible to think at all about design in an age of crises taken those deep and interconnected global challenges into account? Perhaps a good starting point would be to identify some of the most important issues that need to be addressed. Within his article *«Climate change and the 75% problem»* BILL GATES pointed to the sectors of electricity, agriculture, manufacturing, transportation and building that bring in a deep demand for innovation. Some months ago the EUROPEAN COMMISSION has presented the EUROPEAN GREEN DEAL that focuses on a climate-neutral Europe, a circular economy, building renovation, zero-pollution, ecosystems and biodiversity, a farm to fork strategy, transport, large investments, research and development, innovation, and external relations. Taking this into account as leading principles for challenges in design, it is also important to break down those macro-perspectives to a more micro-based framework, that enables thinking about the given areas in a practical way.

As there is an ongoing trend towards urbanisation worldwide, a starting point may be to center first ideas and principles around cities. Bringing this back to the quote of ALAN KAY mentioning Mexico-City, it might be a useful task not only to think about how software could be shaped, but also about liveable and great cities. In fact, there is also a increased awareness that a lot of the areas that bring in a need for innovation have a close connection to cities. So for example political scientist BENJAMIN R. BARBER introduced in the year 2013 the idea of putting cities at heart of future policies within his book *«If mayors ruled the world. Dysfunctional Nations, Rising Cities»*, adding more to it in the year 2017 with his book *«Cool Cities. Urban Sovereignty and the Fix for Global Warming»*. Discussions of the presented ideas with mayors around the world also led to founding of the GLOBAL PARLIAMENT OF MAYORS in the year 2016 as a new governance platform, helping to address various cross border topics of cities worldwide. The uptake of his ideas from experienced mayors might indicate that is could be a useful micro-based framework for addressing questions of design to the presented given challenges. Some interesting thoughts of

the importance of cities can also be found in an article titled *«The Localist Revolution»* by NEW YORK TIMES OPINION columnist DAVID BROOKS from the year 2018: *«But under localism, the crucial power center is at the tip of the shovel, where the actual work is being done.»*

By taking a closer look one can also see that putting cities on the global agenda has already been happening before: In the year 2005 the C40 CITIES CLIMATE LEADERSHIP GROUP has been established now representing 96 of the largest cities from all over world with about 700 million inhabitants, sharing ideas and knowledge. In the year 2008 the EUROPEAN COMMISSION has founded the COVENANT OF MAYORS initiative aiming at decarbonisation, reducing the impact of climate change and promoting access to clean and affordable energies from renewable sources. Up to now about more than 10.000 cities are signatories to this approach, representing about 320 million inhabitants.

So connecting the named global challenges to cities, that are also closely tied to the region they are located in, could be valuable approach for thinking about design in an age of crises.

II

ZOOMING-IN: CITIES

Within the next research programme for Europe from the years 2021 to 2027 the EUROPEAN COMMISSION has identified 5 so-called *«missions»*, partly inspired by the putting of a man on the moon, addressing highly important sectors of research and innovation. One mission area aims at climate-neutral and smart cities, titled *«100 climate-neutral cities by 2030 - by and for the citizens»*, building up on various research programmes that haven been established in the years before. One of them is the *«17 Smart Cities and Communities Lighthouse»* project of the EU SMART CITIES INFORMATION SYSTEM, that brought together 46 so-called pioneering *«lighthouse-cities»* working on various challenges like new urban mobility concepts, energy from renewable sources and smart city concepts. Those have been accompanied by so-called *«fellow-cities»*, listening and learning from the presented approaches.

So for example within the GROW SMARTER project a 16 building block project area with 687 dwellings in the city of Cologne has been turned into a low energy district, cutting CO_2 by 72 percent in the Stegerwald neighbourhood, also offering mobility stations for shared electric cars and bicycles. The REMOURBAN project transformed a neighbourhood suffering from energy poverty in Nottingham by implementing a innovative community heating approach, also using the whole house refurbishment approach by ENERGIESPRONG.

Those examples clearly demonstrate that the presented general ideas of focusing on cities to tackle major challenges have already been transformed into specific research programmes and will continue to do so. This for sure brings in further perspectives to be kept in mind for thinking about how design can contribute addressing the given challenges.

Besides those actions taken by the EUROPEAN COMMISSION, also cities themselves have come up with a wide range of actions in the last years. In the year 2008 three-quarters of the Zurich population voted in favour for the so-called *«2000 -Watt Society»* till the year 2050. This concept, developed by ETH ZURICH looks out for balancing global energy demand by bringing each persons energy consumption to a maximum of 2000 watts per year. It serves as a vision for the cities development, focusing on energy efficiency and renewable energies, sustainable buildings, new mobility concepts and a higher awareness of the cities inhabitants. On aim to reach that goal is

the concept of a *«2000 -Watt Site»*, that takes not individual buildings but entire site into account thinking about various topics like energies from renewable sources and mobility. The Kalkbreite Cooperative in Zurich gives one example how this looks in practice, that can be viewed as a village within the city.

A design principle that underlines those ideas titled *«The 15 minutes-city»* has been introduced by CARLOS MORENO, a professor at PARIS-SORBONNE UNIVERSITY, who is also an adivsor to Mayor ANNE HIDALGO, that just recently has been re-elected. It looks out for re-distributing all relevant needs of urban life within a 15 minutes walk or riding a bicycle. So the introducing of bike-lanes in Paris in the last months are already part of a bigger picture that has been put up for the city. A similar concept of titled *«20 minutes neighbourhoods»* has also been introduced by the city of Portland within their climate action plan.

A city that is taking walking and cycling seriously as an important part of a general mobility concept is Utrecht in the Netherlands. Just recently a plan for a new city district for 12.000 inhabitants has been introduced, that will only focus on pedestrians and bicyclists becoming a car-free suburb. The uptake of cycling in the city is also a result of a design approach that takes a close look at the needs of bicyclists in order to make it comfortable and safe to ride a bicycle. The city also holds one of the largest bicycle parking garages in the world with more than 12.000 spaces available. As CECILIE KIILERICH from COPENHAGENIZE point out within her talk *«Bicycle Urbanism by Design»* at UNIVERSITY OF ART AND DESIGN OFFENBACH in Germany within conference *«re/set mobility design»* in November 2019, the success of the city of Copenhagen is also largely based on a long-term strategy and design principles.

The city of Barcelona has introduced the concepts of so-called *«superblocks»*, focusing on pedestrian areas, low-speed zones and recreational green spaces, that will also be supported by the EUROPEAN INVESTMENT BANK, and has also come up with a long-term commitment for a programme titled *«Trees for Life»*. This strategy will be put into practice from the year 2017 till 2037 considering trees as an integral and important part of the cities infrastructure. The city of Vienna also is looking at green strategies to counteract growing temperatures in summer, a research platform for city greening on buildings and rooftops titled *«grün statt grau»* (green not grey) has also been established.

Within aspects of a bio-based circular economy the EUROPEAN COMMISSION has introduced various projects, e.g. URBIOFIN that aims at converting the organic fractions of municipal waste to bio-based products like chemical building blocks, bio-based polymers and additives. The new WAYSTUP! project will establish pilot-plants in European cities for shaping new value chains based on the transformation of urban bio-based waste into a wide range of products within the cities contexts.

At present the city of Helsinki is approaching its world-wide competition of the *«Helsinki Energy Challenge»* awarding 1 million Euros for a concept for transforming the city heating to renewable sources without using biomass. The winning approach will be put into practice till the year 2029 contributing to the goal of Helsinki becoming carbon-neutral till the year 2035. The C40 NETWORK is collaborating with the competition in Helsinki, as well as the WORLD ECONOMIC FORUM'S GLOBAL FUTURE COUNCIL. In the first Webniar of the competition mayor JAN VAPAAVUORI clearly summed it up what this competition is all about: *«And because we do not have a plan and do not know how to do it, we decided to invite the rest of the world to help us»*.

This brief spotlight on cities shows that there are already a lot of steps taken trying to find answers to the given global and interconnected challenges. Summing all of this up might open up the chance to look out for a sketch of a micro-based framework, providing an outlook for a useful perspective on how to deal with the given challenges.

III

ZOOMING-OUT: IN SEARCH OF A FRAMEWORK FOR THE BIGGER PICTURE

Having taken a look at the bigger picture and some examples of cities and their working concepts to tackle the given challenges it seems that identifying a micro-based framework for cities might be helpful. Although a lot of projects and ideas are already in place, there is no obvious connection framing it all to a bigger picture. Of course all of the given measurements are important and contribute to provide useful solutions, but connecting links are missing.

In an article BILL GATES pointed out that although there has been put tremendous efforts do deal with the current situation – e.g. drastically reducing traffic including almost all of global air traffic – CO_2-emissions this year will approximately only drop about 8 percent: *«What's remarkable is not how much emissions will go down because of the pandemic, but how little.»* He also notes that economists have proposed a carbon taxation of 100 Dollar per ton of CO_2 for shifting investments to social and technical innovations, while the current actions would virtually sum up for a taxation of 3.200 and 5.400 Dollar for a ton of CO_2. This highlights that is not only important to get some things done, but also how those things are done. As he puts it, there is a need of new carbon-zero approaches for producing electricity, making things, growing food, keeping buildings cool and warm, and moving people and goods around the world. *«Any comprehensive response to climate change will have to tap into many different disciplines. Climate science tells us* why *we need to deal with this problem, but not* how *to deal with it. For that, we'll need biology, chemistry, physics, political science, economics, engineering, and other sciences.»*

As it is possible to put up complex design principles even for cities and metropolitan regions the TIR CONSULTING GROUP of JEREMY RIFKIN has proven. In the year 2016 the study *«The Third Industrial Revolution Roadmap Next Economy for The Metropolitan Region of Rotterdam and The Hague»* has been presented to its clients from this region in the Netherlands. The study adresses a wide range of topics including mobility, industries, energies from renewable sources and net-zero energy districts. In the year 2019 JEREMY RIFKIN also presented his latest book titled *«The Green New Deal»* laying out ideas and frameworks how a zero-carbon economy might look like. In an interview with German TV-station DEUTSCHE WELLE in October 2019 one can read the following: *«In ‚The Green New' Deal I point out that we're on the cusp of a collapse of the fossil fuel civilization. This is hard for people to imagine - we've lived 200 years off fossil fuels across all of civilization. Our construction materials, our fertilizers, pesticides, pharmaceutical products, food additives, power, transport, heat, light, packaging - it's everything.»* This goes right along with the activities of BILL GATES who is for example looking out for new ideas in agriculture, as his article *«We should discuss soil as much as we talk about coal»* demonstrates.

Another framework on how to address the given global challenges that also brings in a regional and city perspective with it, has just been introduced in Amsterdam with the so-called *«City Doughnut»*. It is an attempt to break down the general principles of the *«Doughnut Economics»* by author and scientist KATE RAWORTH to a local level. This concept is adding a variety of topics on how to measure economic success, that also takes natural cycles and boundaries into account, as well as social values. In some respect the *«Doughnut Economics»* is laying out the goals and aims that need to be adressed by the introduction of a working carbon taxation. A working group from various EU-institutions is also taking a closer look at this approach on how this could be applied to a regional or local level. An interview with KATE RAWORTH at the workshop *«Trees as Infrastructure»* by EIT CLIMATE-KIC and the DARKMATTER LABS in London provides further insights

to this approach, that helps identifying and thinking about important sectors within future economics. The THRIVING CITIES INITIATIVE, that also the C40 NETWORK is part of, has come up with a methodological guide for downscaling this concept to the city level as a tool for transformative actions. The city of Amsterdam has adopted it as a vision, also the city of Copenhagen will use it as a framework.

In the year 2015 THOMAS RAU and SABINE OBERHUBER put out a book titled *«Material Matters»* in the Netherlands, summing up a whole range of ideas and working examples to the general concept of *«Products as a service»*, that has also been published in Germany and Italy in the year 2018. Within their approach at enterprise Turntoo they are working on concepts on how to design products and buildings that will not end up as waste, but are to be considered as a material depot for future generations to come. The main idea is based on the concept that all products will stay within the ownership of the enterprises bringing them to the market – customers will only lend them for a certain span of time. Within that approach aspects of regaining the chosen materials will be become an important part of each business model, introducing a circular design approach right from the beginning. To highlight this idea they have come up with *«The Universal Declaration of Material Rights»* being inspired by the *«The Universal Declaration of Human Rights»*. Materials are given a wide range of rights not to be turned into waste, making them available for future generations. In their book they also pointed to already working examples of *«Products as a service»* that have been developed along with profession of THOMAS RAU being an architect. In a coopartion with PHILIPPS LIGHTNING, the concept *«Light as a service»* has been introduced, becoming the business-model of SIGNIFY providing circular lightning, enterprise BOSCH has introduced circular approaches for its washing machines in Belgium within the *«Papillon project»* and in the Netherlands within *«Blue Movement»*. The lending approach of *«Products as a service»* will increase the returning financial values for enterprises the longer a product will work properly and the better all materials can be regained at its end-of-life. In the architecture sector the MADASTER FOUNDATION has been established, also being supported by the HORZION 2020 research and innovation program of the EUROPEAN UNION. It functions as a library storing information in detail about the materials, components and products of buildings, so that one day all of them can be regained and put to a future use. By this approach the aspect of how to dismantle a building will become a major part within the design process in architecture, preventing turning valuable materials and products to useless waste one day. An example would be would be the new office-building of the TRIODOS BANK by RAU ARCHITECTS in the Netherlands, that comes along with a material-passport, making it possible to regain all materials, components and products one day for future use. The approach of *«Products as a service»* is introducing a highly remarkable concept for business-models of products led by design-principles, bringing in a great potential to foster innovations within a circular economy.

In the year 2019 ALAN KAY participated not only as a speaker at the conference *«50 years of the internet»* in London, but also within a one-on-one conversation at the summit of the ELLEN MACARTHUR FOUNDATION that focuses on establishing a circular economy. The topic was the question on how to scale up the circular economy. As a preparation he put together a pre-read titled *«How?»* followed by a rather longer subtitle *«When 'What Will It Take?' Seems Beyond Possible, We Need To Study How *Immense Challenges* Have Been Successfully Dealt With In The Past»* that holds a lot of valuable thoughts and practices that can help thinking about on how to put up a frame for a bigger picture. One of key messages he pointed out was the following: *«So one quotation I like you to take away with you was done by Einstein some years ago and he said we cannot solve our problems with the same levels and kinds of thinking we use to create them. This is the number one thing I'd like you to take away.»* In his pre-read he compiled a number of huge organized projects in history that came up with relevant solutions to given problems. For example the XEROX PARC-project, an ARPA follow-up, shaped personal computing and the internet, that we

still use today. ALAN KAY was part of it working as a group leader, inventing the graphical user interface. The financial volume of that research-project was about 120 million Dollars, that also provided a huge return-on-investment to enterprise XEROX alone by introducing the project's developed laser-printer to the market, as he noted. The research was not peeled down to a hard goal though, it rather followed along a vision aiming at computers to become *«interactive intellectual amplifiers for all humans on earth pervasively networked worldwide»* introduced by JOSEPH CARL ROBNETT LICKLIDER at ARPA before. As ALAN KAY sees it, a vision what to achieve within a research project is of a great importance: *«What the funders did was to put together a vision which is not the same as a goal and it's not the same as a mission. A vision is a picture of a future state of things which would be really nice if we had.»* Within his pre-read he also points out that it is important to find a spot just in-between the state of *«better»* and *«perfect»*, in order to leverage *«what is actually needed»*. At the end of the conversation he summed it all up to the following: *«You don't need the transistors so much, you don't need the gas engines so much, you just need really good designers.»* So the thoughts and experiences within the field of science, engineering and innovation of ALAN KAY for sure can provide valuable suggestions for developing a useful frame for the bigger picture of the given global challenges. Due to the current situation I also want to briefly cite the ending of his pre-read, that apparently seems to even more actual than last year: *«Like a vast epidemic (which will be one of the upcoming immense challenges) much needs to be done beforehand, in the immediate present, and long-term in the future, including training the next generations of problem finders, solvers–and–problem avoiders.»*

As the idea for developing a micro-based framework is focusing on cities, I want to bring in two incitements from Germany within the ongoing discussion about the energy transition. The HOUSE OF ENERGY in the region of Hessen has just recently opened a call for papers for its upcoming yearly magazine *«Perspectives»* (translated) dealing with *«The second half of the energy transition. Connecting electricity, heat and mobility»*. In an article in July of 2020 within the newspaper TAGESSPIEGEL BACKGROUND in Berlin, CHRISTIAN GROWITSCH, director of technology marketing and business models at FRAUNHOFER SOCIETY, put together some principal ideas to *«The city district – key to energy transition»*. Similar to the topic of the HOUSE OF ENERGY he points out the importance of connecting the fields of electricity, heat and mobility: *«In addition to networking between stakeholders, the key to successful CO_2 reduction in the neighbourhood lies in the joint optimisation of the energy-consuming sectors electricity, heat and mobility, where digitalisation enables intelligent sector coupling and forward-looking steering of energy use in the neighbourhood. That is why it is important to think consistently locally and digitally.»* As energies from renewable sources also bring in a decentralized approach he is welcoming the newly established OPEN DISTRICT HUB SOCIETY, that aims at fostering communication and cooperation between science, real estate enterprises and other sectors, for bringing ideas to practice within so-called real-life-laboratories. A similar approach can be found within the project *«smood – smart neighbourhood»* that has been put up the region of Thuringia that is funded by the German FEDERAL MINISTRY OF EDUCATION AND RESEARCH. All of this indicates, that taking a closer look at city districts and building sites, like e.g. in Zurich, as well as the innovative approach of the city of Helsinki and its global competition, might be a path to follow for developing a micro-based framework for the bigger picture. This might perhaps also fit within the *«what is actually needed»* approach that ALAN KAY mentioned in his pre-read.

As one can see from the spotlight on cities, there are already a lot of actions and projects implemented at the city levels. What is missing though, is a common connecting framework or goal that would engage cities in an ongoing conversation, preventing to invent the wheel over and over again in similar, but unconnected projects. Within the initiative CITY OF THE FUTURE at FRAUNHOFER SOCIETY a research focus on cities has been established, also trying to communicate already available working concepts in various sectors like mobility, energy and heat, to a network

of cities and regions. Within its recent strategy paper *«Future-proof cities and regions»* the initiative proposes to establish an *«Agency for future-proof cities and regions»* in Germany in order to document and to communicate the many existing best-practice approaches that already have been developed. Within the existing city-networks on the Global and European level of GLOBAL PARLIAMENT OF MAYORS, C40 and the COVENANT OF MAYORS this might be an interesting concept not only for Germany, but beyond, also taking the upcoming mission of the EUROPEAN COMMISSION to *«100 climate-neutral cities by 2030»* into account.

An already established insitution aiming in the same direction has been put into practice within the BIOREGIONS FACILITY of the EUROPEAN FOREST INSTITUTE (EFI) in March 2020. It aims at advancing a forest-based circular and bio-based economy in European regions supporting networking and policy learning within the fields of innovation, institutions, infrastructures and investments. Within the current situation a team at the EFI including its director MARC PALAHI has also come up with a 10-point action plan to create a circular bio-economy devoted to sustainable well-being. Another example can also be found within the SMART SPECIALISATION PLATTFORM of the EUROPEAN COMMISSION that supports regions to implement a strategy that supports technological, as well as practice-based and social innovations. It promotes an inclusive process of stakeholders within the so-called *«quadruple helix»*-approach encouraging regional public administration, enterprises, research institutions and social initiatives to develop a common future outlook for the given region.

As the future of cities and its districts is not only shaped by technological innovations, but also by social ones, the book *«Soft City»* of DAVID SIM, CREATIVE DIRECTOR AT GEHL, from the year 2019 shows. The company of architect and urban planner JAN GEHL, who pleads for pedestrian-friendly and future-proof cities, is located in Copenhagen. His work for cities around the world has also been featured in a documentary movie titled *«The human scale»* from the year 2012.

So summing all of this information up, the presented thoughts and ideas might help sketching a micro-based framework for city districts that – quoting ALAN KAY – offers a «*a future state of things which would be really nice if we had*».

IV

SKETCH FOR A CIRCULAR CITY DISTRICT AS A SERVICE

The following is a sketch trying to connect all the presented ideas and thoughts by setting up a micro-based framework for a city that helps to identify relevant challenges, interconnecting them, and by that making it easier to find and look out for solutions that might fit in. It might also serve as a common vision or goal for cities that makes it easier to communicate solutions with the given already established networks of cities and existing EU-programmes. So thinking about a desirable future of living in cities I want to present a brief sketch of SUSTAINABLE AND CIRCULAR CITY DISTRICTS AS A SERVICE (SCCDAAS). In the following different 5 important sectors will be addressed and how they will connect to this approach.

SCCDAAS will function as the fundamental units shaping the energy transition providing heat and electricity from renewable sources. Instead of looking at each building separately, the aspects of producing, storing, distributing electricity, heat and cold will become a business-model for the district as a whole. Traditional energy suppliers and the inhabitants of the district will establish a cooperative structure to finance and maintain a net-zero approach for electricity and providing heat from renewable sources. By that SCCDAAS are providing an organized structure for district economics that can be also linked to other sectors. Districts as whole will by that be transformed

into decentralized plants for producing energy, heat and cold, also storing and distributing it. The roofs and facades of buildings and the surrounding area will provide the ground-laying infrastructure, traditional energy suppliers will develop a calibrated concept for providing the electricity, heat and cold from renewable sources that fit the given sites. *«Heat and Electricity as a Service»* within SCCDAAS will open up new and long-term revenue streams for traditional energy providers, that can be also linked to other sectors like mobility. Taking the term of a decentralized plant seriously there will be also a need of supervision and maintenance in the district, shaping a wide range of new professions. So (serial) building renovation for cutting heating demand of buildings can become vital part of the business model of *«Heat and Electricity as a Service»*, taking the district as a whole into account. This also brings in the chance to further tap into the field of architectural concepts of roofs and facades gaining solar heat and energy, also identifying most suitable solar spaces of the district, taking also different seasons of the year within respects for energy demand into account. SCCDAAS will also bring in the opportunity for innovation, connecting architecture and technologies for decentralized energy production in a vital way. All of this will transform the the appearance of the SCCDAAS areas, as space will be needed for new infrastructures like district heating, storage facilities, digital coordination and on-site maintenance.

As SCCDAAS will function as a decentralized power plant, this will give the chance connecting this approach to the already seen mobility transition in cities. In the last years new mobility concepts ranging from pedelecs, cargo-bikes, bike-sharing and electric scooters have been introduced, as well as electric cars, transforming the way to move within a city and its districts. Having introduced the concept of *«Heat and Electricity as a Service»* that also brings in storage facilities for electricity, this provides the opportunity to also link this to electric powered vehicles like pedelecs, scooters and cars. Taking SCCDAAS as an organized structure for city district economics the idea of *«Mobility as a Service»* will closely connect the inhabitants of a district to the already existing public transport system of the city. Public transport can already be viewed as a working concept of *«Mobility as a Service»*, central mobility stations within SCCDAAS will add (cargo-)bikes and electric vehicles like pedelecs, scooters and cars to this public service. This will establish another revenue stream within SCCDAAS by providing a energy-charging infrastructure, also for offering service and maintenance of the shared vehicles. In order to provide an easy access for the inhabitants of the district already existing smart-cards of the public transport systems can be used, that can be also linked to further business-models within SCCDAAS. Being backed and closely connected to the public transport system within a cooperative setting, this will function as a reliable service, providing all relevant options of mobility for inhabitants, including having access to a car. This introduces the opportunity to reshape the mobility infrastructure of the district, promoting a 15 minute concept for the inhabitants primarily focusing on walking and bicycling. The concept of *«Mobility as a Service»* will make a car-ownership less attractive, providing needed additional space for infrastructure e.g. greening for counteracting heat waves or storing facilities of the district's decentralized energy production.

As SCCDAAS bring in new professions and jobs to the district, which are also based on the ongoing digital transition, that enables a decentralised approach for electricity, heat and mobility services. The given tools of digital technologies are already also transforming businesses, schools and universities by decreasing commuting. In an interview JEREMY RIFKIN in the year 2019 he was asked if he would still fly to Zurich in ten years: *«No, then I'll give video lectures from home. Today, a lot of people still want you to be there. The next generation will have become more accustomed to virtual contacts.»* The internet today is giving the opportunity of cutting down the need for mobility to a large extent. SCCDAAS will therefore provide district community buildings for a shared office-like-infrastructure for enabling people working remote, that can also be used by schools and universities, e.g. offering special infrastructure for giving talks or attending online-

conferences. It will also serve as a district town hall, discussing SCCDAAS related economics and offering recreational spaces. University campuses can be taken as a reference for it, providing a large set of a common used infrastructure for a whole lot different purposes. This will also include a refectory or network of restaurants that are located in the district. Access to all of these services, e.g. computers, printers office-rooms, can be provided by smart-cards, that also work for the mobility concept. There will be also public maker-spaces providing digital tools like 3D-printing, as well as professional services for greening the district, aiming at reducing heat in summer and a highest rate of biodiversity in flora and fauna. All of this can be also closely connected the schools of the district, opening up doors for a wide range of hands-on educational projects.

SCCDAAS will also play a important role within the circular transition. A material library will be put up in the city district, that will document and store information about all relevant products, components and materials being used in architecture and within the local district energy-plant. There will be a network of those material libraries of SCCDAAS in the city, that will function as a huge material depot. In order to promote a further transition to a circular economy the cities public procurement will be closely tied to the local SCCDAAS-network focusing on the concept *«Products as a service»* in tenders. By that all new products that will be introduced to SCCDAAS will be guaranteed to be taken back one day by the manufactures in order to regain the materials, e.g. PV-modules, pedelecs and electric scooters. Introducing this as common legeal framework for cities local, regional or national concepts for urban mining will arise, for the given case that manufacturers cannot provide this service on their own. SCCDAAS-networks will also promote concepts for reducing waste and sorting materials for the existing recycling chaines. Introducing a campus-like approach with a refectory or networks of restaurants can reduce the waste of single-use packaging for food, introducing also long-term cooperations with regional farmers. This can also be accompanied by reuseable take away approaches or plant-based compostable foodservice packaging. The SCCDAAS of a city will also look out for concepts for regaining phosphorus and other nutrients that are crucial for agriculture and farming. Within the concept of a bioeconomy SCCDAAS will also take the lastet material innovations into account for establishing new regional value chains for products based on residues from regional forest-industries and agriculture.

Within the ongoing climate transition SCCDAAS will establish new ways for dealing with water scarcity, also looking out for concepts of re-using established water-streams. By shaping novel blue-green infrastructures in SCCDAAS questions of strong rainfall prevention will be adressed. The aim will be to store and use the local rainwater to ensure that the site vegetation, urban trees and effects on evaporation cooling in the district will be be improved, also for groundwater regeneration. The greening of rooftops and facades will help to store and filter water, also cooling down the temperatures of building surfaces in summer, reducing the costs of cooling that will raise in the upcoming years. Greening will also create valuable recreational areas and reduce CO_2 in SCCDAAS, as well as noise and filter pollutants.

The applied concepts and working practices of SCCDAAS will be shared within the already exidsting city networks, bringing together best-practice examples from all over the world. Similar to the *«Helsinki Energy Challenge»* it might be a good idea to establish a similar challenge fitting the presented concept of SCCDAAS in order to identify useful working parctices. As this is just a brief first sketch, comments and remarks to this concept are welcome. In the annex you find as a suggestion 10 working design-examples that can contribute to the idea of SCCDAAS.

I | HAMBURG WATER CYCLE | *Energy, Water*

The City of Hamburg has introduced this novel concept for its new city-district Jenfelder Au. It is based on the idea to collect rain-, grey- and blackwater sperately. The blackwater will be used to generate heat and electricity for the district.

[1] Website: https://www.hamburgwatercycle.de/en/home/

II | PUMPED HEAT ENERGY STORAGE, UK | *Energy, Heat, Storage*

A Pumped Heat Energy Storage on grid-scale has been developed, shuffling heat between two tanks containing mineral gravel by means of a working gas, generally an inert gas such as argon.

[1] Video: https://youtu.be/IMD_CptGayc
[2] Article The Engineer 2019: https://www.theengineer.co.uk/...

III | ELECTRIC THERMAL ENERGY STORAGE, GERMANY | *Energy, Heat, Storage*

This approach heats up volcanic stones to temperatures of 600 degrees celsius and higher that can be turned back into electricity by a steam turbine.

[1] Website: https://www.siemensgamesa.com/en-int/...
[2] Video: https://youtu.be/d--f0rGI7DQ

IV | NAKED ENERGY, UK | *PV, Thermal Energy*

A solution for combined solar heat and power in a single product. The design is suitable for rooftops, ground and building façade installation.

[1] Website: https://www.nakedenergy.co.uk/
[2] Specific project: https://www.specific.eu.com/...

V | INTERMODAL BUSINESS CLASS, GERMANY | *Mobiliy as as service*

Master project of designer TIM J. PETERS for an intermodal service concept to establish a more sustainable and efficient way of urban future mobility.

[1] Website: https://www.timjpeters.com/portfolio/...
[2] Video: https://vimeo.com/408904765

VI | RIVERSIMPLE, UK | *Mobility as a Service*

A car powered by hydrogen and built with lightweight materials, only available for a monthly fee, including maintenance, insurance and fuel to run it.

[1] Website: https://riversimple.com/

VII | BIO-HYBRID, GERMANY | *Electric Bike-Car Hybrid*

An urban tansport vehicle with an electric motor. It connects a bicycle-approach with cargo volume and weather protection of a small car.

[1] Website: https://www.biohybrid.com/en/
[2] Video: https://youtu.be/DgjJYvbvL9o

VIII | AEROSHIELD, USA | *Building renovation*

This MIT Spin-off is using transparent aerogels for providing high insulating windows.

[1] Website: https://www.aeroshield.tech/

XI | GAP SOLUTIONS, AUSTRIA | *Building Insulation*

A transparent building envenlope for preventing heat loss, using ecologically safe pre-fabricated modules. The added honeycombs prevent overheating in summer, allowing storing heat in winter.

[1] Website: http://www.gap-solutions.at/en/...

X | FRATER, ITALY | *Circular Economy*

A recycling-process of used absorbent personal products, that can be used as secondary raw materials. It is suitable for baby diapers, feminine pads and products for incontinence.

[1] Website: https://fatergroup.com/uk
[2] Article: https://www.reuters.com/...