Presentation: Definitions/frameworks with citizen examples

Slide 2:

In this presentation, I want to give you an overview of what different definitions and frameworks exist describing circular economy. Furthermore, I want to introduce you to the concept called waste hierarchy, which entails how preferable different circularity options are. Last but not least, I want to connect the provided theoretical background with some real world examples of citizen initiatives in the energy sector tackling different stages of the circular economy process already today.

Slide 3:

Definitions of what a circular economy is are diverse and usually lengthy, as you can see here on screen. This definition is the attempt from Kirchherr and colleagues to bring together the aspects of circular economy in a review paper about the concept itself. The definition reads:

“A circular economy describes an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.”

I want to highlight a few keywords here: First, the concept is about business models, which you have already heard about in one of the introductory online lectures. Second, the concept is about the actions of reducing, reusing, recycling and recovering materials. Third, we aim to employ the concept to reach environmental quality, economic prosperity, social equity - and ultimately a sustainable development for us and future generations.

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The EU waste hierarchy is a framework describing the most desirable treatment of waste in a circular economy effort ensuring resource efficiency. The guideline for EU member states describes the prevention and re-use of material as the preferred option. It is followed by the category recycling, which includes composting. Then, energy recovery and waste disposal on a landfill as a last resort when none of the other categories are feasible. The concept is part of the EU's circular economy strategy.

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Circular economy frameworks are adopted to different contexts and show different granularity in their categorization. As one of the first big economies, the [People's Republic of China in 2008](https://ellenmacarthurfoundation.org/videos/circular-economy-opportunities-in-china) set out on a circular economy journey. They adopt in their Circular Economy Promotion Law the principles Reduce, Reuse, and Recycle. Around the same time in 2008 the European Union introduced another R to the aforementioned list, namely Recover, and facilitated the concept in the Waste Framework Directive. In the scientific literature, we can also find so called 6R-Frameworks which are broken down further including the categories Remanufacture, and Redesign.

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Eventually, the most nuanced framework includes 9Rs. This framework was published by the Dutch environmental assessment agency in 2017, a country with one of the most ambitious circular economy targets within Europe. We will go through the different strategies here and understand what they mean. You probably recognised that all strategies mentioned under the former frameworks are covered with this. We will start from the top:

R0: Refuse

 *Make product redundant by abandoning its function or by offering the same function with a radically different product*

R1: Rethink

 *Make product use more intensive (e.g. by sharing product)*

R2: Reduce

 *Increase efficiency in product manufacture or use by consuming fewer natural resources and materials*

R3: Reuse

 *Reuse by another consumer of discarded product which is still in good condition and fulfills its original function*

R4: Repair

 *Repair and maintenance of defective product so it can be used with its original function*

R5: Refurbish

 *Restore an old product and bring it up to date*

R6: Remanufacture

 *Use parts of discarded product in a new product with the same function*

R7: Repurpose

 *Use discarded product or its parts in a new product with a different function*

R8: Recycle

 *Process materials to obtain the same (high grade) or lower (low grade) quality*

R9: Recover

 *Incineration of material with energy recovery*

The reason I chose to go along with the most nuanced framework in detail is that I want to provide you in the next step with an example for each strategy used by citizen initiatives, sometimes the **examples even address multiple parts of the framework**. This should serve as well to get the thinking process going for the hackathon on Friday.

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For the Refuse strategy, I have brought an example from northern Germany with me. In rural regions a lot of people rely on their car a lot to simply get around - a trip to the supermarket or a doctor's visit etc. With shared electric cars to their disposal from the initiative "Doerpsmobil" those trips can be made with electric vehicles providing the same service and making the private (or at least the secondary) ownership of a combustion engine car unnecessary. Often such shared electric vehicles are charged by local renewable energy sources providing extra environmental benefits.

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Staying in the mobility sector, the citizen initiative Urstrom in central Germany promotes not only the use of a shared vehicle but provides possibilities to use a shared cargo bike with even less environmental impact. Rethinking is about intensifying the usage of products and maybe challenging the conventional modes of service provision.

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For the angle of reducing material consumption, we are moving out of Germany to Finland. Here, the Oulu cooperative offers high-quality thermal imaging and ventilation measurements to detect heat loss in houses. Addressing detected issues with for example improved insulation, will lead to less material throughput for heating the space and ultimately will also reduce the heating bill of the owner.

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Returning to Germany, in the sunny southern Freiburg region an association instructs how to reuse old solar panels and build in DIY fashion modules which can be attached to the fence of balconies. Those solar photovoltaic modules are usually connected to the apartment unit or the house via a conventional plug. In a nutshell when the sun shines the demand at the grid connection gets reduced by the produced amount from the solar panel. The tenant or owner saves with this low-tech solution directly on his/her electricity bill.

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Not only in Europe are citizen initiatives tackling circularity issues in the energy sector. In the picture you can see a technician from the Vermont energy cooperative in the US. He is maintaining and repairing heating systems to prolong their service lifetime.

Slide 12:

Refurbishing is referred to as *Restore an old product and bring it up to date*. That's exactly what the energy cooperative in Heidelberg did with the building for their headquarters. They took an old american military barrack in the city and renewed the insulation to meet modern building standards in Germany. Furthermore, solar PV panels were installed to create locally produced and consumable renewable energy for the operation of the building.

Slide 13:

The operation of *Using parts of discarded products in a new product with the same function*, referred to as remanufacturing is mostly associated with high value and complex products. Thus, remanufacturing requires a specific expertise which is most likely one of the reasons why I did not find any good examples from the citizen energy domain. Maybe its worth thinking of that gap as an opportunity for your own project?! (click)

To illustrate the example still, remanufacturing is common in conventional mining businesses where heavy duty trucks or excavators are used. The picture shows parts which may be objects which are remanufactured by producers. The advantages of such operation of remanufacturing are faster fix of the problem not relying on extensive international supply chains, which would cost more time to get everything back running. Besides the lifted resource pressures through the strategy, a strong economic incentive pushes the action - because "time is money, right?!".

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Using parts of discarded products to build different "new" products is called repurposing. Two excellent examples from the citizen energy sector are DIY wind turbines built by a french initiative using among other things the alternators of old cars to then produce in a second life electricity (picture to the left). The right hand picture tells essentially the story of the energy transition: "from oil barrels to renewable wind energy" - and showcases creativity is key in repurposing.

Slide 15:

*Process materials to obtain the same (high grade) or lower (low grade) quality* - Examples of recycling in citizen energy initiatives are not too abundant either. Therefore, I choose to show you the example of precious plastic. They provide open source instructions for recycling of different types of plastics. So, discharged plastics can turn into a beautiful stool, which you can see on the slide.

Slide 16:

Lastly, when none of the aforementioned categories seems to make sense to bring materials back into the loop through burning materials to recover energy. This is for example done by an Italian cooperative, who collect wood scraps from local wood production to fuel a district heating network.

Slide 17 & 18:

Literature and further readings.