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Project #Sustainability, Policy Paper §8: Circularity Database: Business case innovations in the Bio-, Blue-, Urban, Shared, Repair and Carbon Economies

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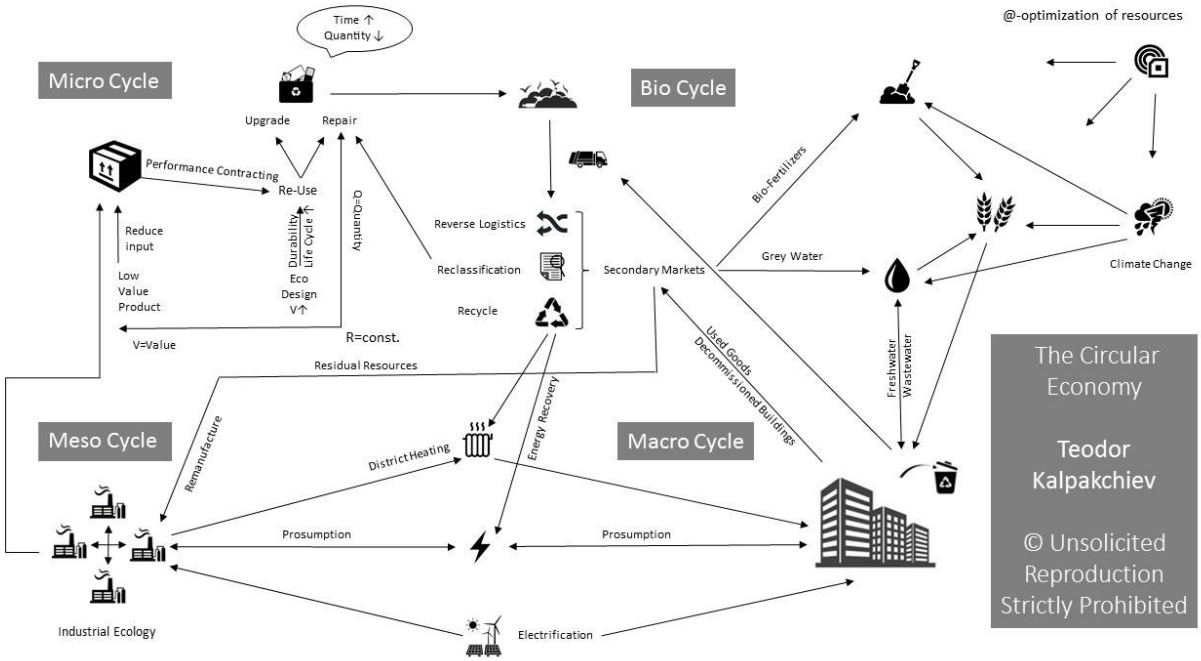

In lieu with the open-source nature of value creation of this platform the following article would continuously collect and analyse models and practices that can curb circularity.

Regeneration and recovery refers to shifting to renewable energy and materials.

- Bioeconomy**:** refers to the reuse, valorization and upcycling of biomaterials, waste and side products

• Low tech: Biowaste into edible protein through feeding crickets or larvae, Biowaste into bio-silk through feeding silkworms, Biobased textiles, Biowaste fed aquaponics for fish, fishwaste as fertilizers and herboils, Greaywater seaweed into food, cosmetics (ocean farming), Biowaste composting for organic fertilizers, Biowaste compression into utensils and biopackaging, and circular supplies such as cellulose bio-ethanol from corn cobs, as cardboard substitute, leaves, husks and stalks and anaerobic digestate from used cooking oil and grease; Biowaste /hemp/coastal algae concrete for retrofitting/pavement/replacing non-sustainable raw materials in construction, Biowaste (e.g. peels) into cosmetic oils and fragrances; Lichen and moss based carbon capture near industrial sites

• Hi-tech: bioethanol, microalgae fuels, cogeneration of heat and energy, compostable packaging from biowaste mushrooms, aquatic plants into paper, yarn from citrus peels celluloses, nutrient recovery from animal waste, biorefineries , hydrogen from biowaste methane, bioethanol from corncob, social enterprises for remote sensing informed optimization of biowaste

Biomimicry – while being the essential inspiration behind CE, it provides further examples such as grease on buildings to improve insulation, copy natural forms for

vehicles or wind turbines, copy natural digestion chemistry, usage of photovoltaic panels as skins for buildings to emulate photosynthesis

- Blue economy: Ocean waves power generation, hydroponics-based regenerative growing of plants and fisheries, sustained with renewable biogas and solar energy, creating energy from turbines in water pipes, carbon recycling for food protein through land based seaweed plants, reusing fishnets as thread for multi-use bags, filling ocean bottles with sand as building blocks, repurposing ocean plastic waste into thread and cushioning for recyclable shoes, modular transparent houses from marine plastics, leather from fish skin

- Urban ecology and urban mining: building for decommissioning and re-purposing of concrete, bio-regionalism, resp. shortening value chains through a focus on local or regional produce, incentivized reverse vending, treating wastewater onsite to reduce environmental footprint, vertical gardening and solar panel installation, integrated solar and food production contributing to flood resilience and food security, waste-to-energy ashes and industrial waste for ceramics and bricks, usage of compost for vertical gardening, using recycled plastics for rotor blades from in water pipes to create electricity, creating modular houses from recycled plastics, collecting methane via a membrane from recycled plastics over biowaste and greywater

Sharing denotes the sharing and recycling economy as well as prolonging the life of products.

- Leasing Society and Tele-Living, Servitization – Public Whirlpools, Sharing of bikes, electric vehicles, e-Trottinettes, Looped refilling of household wares through refilling of multi-use cans and their delivery, Lightning as service, Furniture as service, Clothes as service
- Collaborative models**:** Online free reuse groups *Freecycle*, The makers' movement, co-creation and sharing of 3D printing designs

Optimization refers to increased efficiency, waste minimization and utilization of information and communications technology (ICT).

- Smart Cities, Blockchain and AI: sensor-generated data for optimization of waste collection, electricity and traffic maintenance, household appliances and water use, drone-powered agricultural optimization, collecting data from humanitarian and post-disaster operations to optimize interventions, usage of blockchain to dematerialize money, personal identification and information books (e.g. school grades), usage of AI prediction methods for reselling used clothing back to retailers, use AI to predict product returns and repurposing, AI-powered bioregional urban metabolism
- Ecology of things**:** using RFID, drones and sensors to optimize the bioeconomy

- Industrial and Public Space Ecology**:** Using waste-to-energy plants for co-generation of heat and renewable energy, district heating, residues and chemicals, storing residual human heat from public spaces (train stations), capturing diesel exhaustive fumes and turning the soot into ink, bio-refineries and eco-industrial parks

Looping is defined as closing the technical and biological material cycles.

- Waste prevention**:** usage of biowaste for fertilizers and biodegradable packaging, creating novel products from recycled plastics, edible substitutes of utensils, selling bulk food and parts to avoid packaging
- Repurposing: using marine litter such as bottles stuffed with sand instead of bricks for social housing or transforming ghettos in global south, packaging from plants,
- Downcycling**:** using end of life clothing for emergencies, industrial cloth for cleaning, fitting of upholstery, thread for new clothes; using residue from waste-to-energy plants as a substitute for sand in concrete; using the metal from end of life vehicles for construction of wind turbines and electric bikes
- Repair economy**:** Performance contracting, Fairphone, Repair Cafe Centers, collecting old mobile phones to be transformed into drones, using their cameras to power machine learning for the sorting of waste

Virtualization deals with direct and indirect de-materialization

- Reverse logistics**:** virtual markets, e-books, collection of parts for refurbishment through extended producer responsibility, storage of spare parts connected via reverse logistics with repair cafes

Resource Exchange refers to the utilization of novel materials and technologies

- Carbon Sequestration**:** production of sustainable biofuels through carbon capture, substitution of sand in concrete with waste residues and ashes, carbon capture and storage through calcium looping in concrete and chemical looping, carbon recycling for biofuels through algae, using hydrogen and recycled carbon to create sustainable fuels