Reducing Community Carbon Footprint by a Circular Economy Approach in the Republic of Serbia

Information on link between circular economy and mitigating climate change, including case studies

UNDP | Year 2020 | Pre-Challenge Innovation Call

Global perspectives - linking circular economy & climate change mitigation

The Global Development Agenda 2030, the EU Green Deal and Paris Agreement provide clear guidance on how climate and environmental challenges of today's world can be turned into development opportunities. The EU Green Deal (European Union, 2019 Link) clearly states that an inclusive transition towards sustainable society can only be achieved by investing in cutting the pollution and moving to a clean and circular economy. Societies aiming to become sustainable, climate-resilient and to reduce their carbon footprints need to reconsider the way they produce and consume resources and energy. During the 2018 Climate Change Conference (COP24 to the UNFCCC), one of the conclusions indicates that raising the ambition of climate action is possible through applying the circular economy approach. This was also identified by the "Study on Circular Economy being Crucial to the Paris Goals".

Over the past five decades, our global population has doubled, the extraction of materials has tripled and the gross domestic product has quadrupled. The extraction and processing of natural resources have accelerated over the last two decades and accounts for more than 90 per cent of our biodiversity loss and water stress and approximately half of our climate change impact. By looking historical trends only, further growth in the use of natural resources is projected by 110 per cent by 2060 leading, among others, to an estimated increase of greenhouse gas emissions by 43 per cent.

This fact calls for an immediate transformational shift from predominant economic models based on linear patterns of production, consumption and disposal to models which decouple prosperity from resource extraction and environmental degradation (double decoupling). In other words, doing better with less. Transformation based on decarbonization goals boosts existing and develops new economic sectors, create green jobs, promotes technological innovation and cultural development and generates income.

The modelling undertaken by the UNEP International Resource Panel (IRP) has indicated that with the right resource efficiency and sustainable consumption and production policies in place, by 2060 growth in global resource use could be slowed by 25 per cent, while global domestic product could still grow by 8 per cent – especially for low- and middle-income nations – and greenhouse gas emissions could be cut by 90 per cent compared to projections for continuing along with historical trends. As such, advancing the circular economy in the context of low carbon community development and their integrated planning can hardly be avoided.

Key strategies for achieving circularity at community level

In many societies, the circular economy is predominantly perceived from the viewpoint of improved waste management in terms of reducing, reusing and recycling of waste. While this needs to remain as one of the core elements of any circular economy initiatives, it is also important to further broaden this narrative towards a more holistic, cross-sectoral, business-oriented and systemic circular economy approach. In this way, the nationally appropriate model of circularity should address business development initiatives that go a step beyond waste management.

Besides waste reuse and recycling and setting up the secondary raw materials markets, key strategies for achieving sustainability and circularity at the community level would also require actions such as:

1) introducing a new approach to designing buildings, urban districts and areas, increasing their lifetimes and utilizing their capacities, while keeping in mind the whole life cycle and end-of-life recirculation of materials and energy;

2) sustaining and extending the lifetime of built infrastructure by considering maintenance, refurbishing and transformation before demolition;

3) recognizing the future value of built assets from the circular economy perspective by registering assets and materials they are built from (bill of materials and/or EPDs), thereby avoiding lock-ins of future environmental and health hazards and prioritizing the use of recycled, recyclable, nature-based and less toxic resources/materials, constructions (buildings), interior and insulation;

4) including new business, exploitation, and facility management models by which spaces are to be better utilized and run in a much more efficient manner

5) organizing more efficient and user-friendly infrastructure, furniture and equipment; and

6) organizing more efficient, electro and smart transport systems.

Figure 1. below explains different practical approaches towards a circular economy and present the lifecycle principle from a slightly different angle (Accenture, Gaining an Edge from the Circle, 2015. Link).

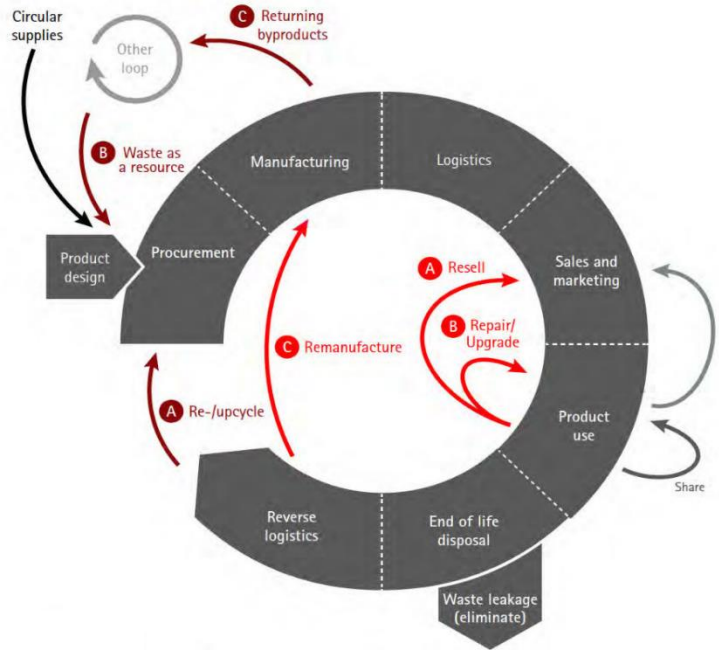

Figure 1 - Circular Business models, Gaining an Edge from the Circle- Accenture strategy, 2015

The EU perspectives of circularity & low carbon development

The European Commission has adopted a new Circular Economy Action Plan (EC, 2020. Link) - one of the main blocks of the European Green Deal, Europe's new agenda for sustainable growth. The new Action Plan announces initiatives along the entire life cycle of products, targeting for example their design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that the resources used are kept in the EU economy for as long as possible. It introduces legislative and non-legislative measures targeting areas where action at the EU level brings real added value.

The European Commission has adopted an Eco-Design directive setting limits, for instance, for the energy consumption of the main energy-consuming products sold on the EU market, as an effort to tackle climate change, reduce GHG emissions and mitigate environmental impacts. In the coming years, the Eco-Design Directive will span over more categories ensuring not only energy efficiency but broader resource efficiency (including water usage) as well as to tackle the issue of the lifecycle of products (Europa.eu, 2016. Link). Therefore, the *„Commission will explore the possibility of establishing more product-specific and/or horizontal requirements in areas such as durability (e.g. minimum life-time of products or critical components), reparability (e.g. availability of spare parts and repair manuals, design for repair), upgradeability, design for*

disassembly (e.g. easy removal of certain components), information (e.g. labelling of plastic parts) and ease of reuse and recycling (e.g. avoiding incompatible plastics), greenhouse gas and other emissions, and to further establish the scientific basis for developing corresponding criteria that meet the requirements of the Eco-design Directive." (Europa.eu, 2020. Link).

The transition towards low carbon and circular economy should ensure sustainability for the corporate sector and strengthens competitiveness at global, and in particular, the EU market. For example, the European Commission introduced two initiatives to maximize the impact of taxation on meeting the EU's climate goals. The revision of the Energy Tax Directive (ETD) and the creation of a Carbon Border Adjustment Mechanism (CBAM) was identified in the European Green Deal as means to help with the transition towards a greener and more sustainable economy, together with the European Green Deal investment plan, the just transition mechanism and other measures. Such a mechanism will help the EU market to reduce the risk of carbon leakage and the price of imports would reflect more accurately their carbon content. Therefore, products generated through carbon-intensive processes will no longer be welcome at the EU market.

EXAMPLES

Company: Sanicula

Source Link

Location: Serbia

Short description

Sanicula Co LLC established a completely circular process of production of the essential oils; from the manufacturing of reproductive material to the foundation of plantations, the use of own mechanization for preparation of the soil, planting, treatment, maintenance of planted surfaces, a harvest of raw herbs to their processing into oil and reuse of biomass leftovers.

Throughout the distillation of herbs, a new by-product emerges - biomass leftovers. These leftovers are turned to biomass pellets to be further used as a heating fuel in the distillation

process. Ash, as a residue created upon burning of the bio-pellet, is used as an organic fertilizer. In such a way, the company has created near zero-waste production process in line with the principles of the circular economy.

The project "Innovative approach to production of pellet out of medical herbs" of the Sanicula Co LLC has been selected as one of the innovative solutions for lowering the emissions of greenhouse gasses by implementing the concept of "zero waste" in the production process. With the support of the UNDP/GEF funded project, Sanicula Co LLC was able to elaborate and apply new business model & technology that helped the company to transform into profitable, socially and environmentally responsible corporate.

Results

- Business operations achieve 10 times higher CO_2 absorption compared to emissions
- Zero-waste production achieved (grain to oil, residue to pellet, pellet to ash to organic fertilizer)
- Fossil fuel replaced with renewable energy (biomass and solar)

City: Stockholm

Source Link

Location: Stockholm, Sweden

Short description

The City of Stockholm has carried out innovative energy efficiency renovation of four fourteen-floor buildings and two four-floor buildings built in 1961 (324 apartments). Similar to other older buildings, these had problems with thermal bridges and climate shell insulation. A significant amount of heat and energy was lost in the existing energy installations in these buildings, due to long distances of poorly insulated pipes for heating and water, as well as the absence of heat recovery systems.

The climate shell refurbishment consisted of a package of innovative technologies:

- Additional insulation of 80 mm on building façade and 200 mm on basement walls.
- A new type of roof construction with added insulation.
- New four glass windows with U-value 0,7 W/(m2K).
- The separate heat exchanger in every building for the district- /geothermal heating.
- Heat pumps recovering heat from the exhaust air and transmitting it to produce heat and hot water
- Wastewater heat exchange system to preheat fresh water
- Installation of “pipe in pipe” system to reduce hot water circulation losses
- Water-saving tap water fixtures to reduce water consumption
- Electricity saving measures, including low energy lighting fixtures for common spaces and modern and more effective elevators
- Renewable energy installation: photovoltaic cells to produce electricity for the building use.

Expected results

Expected savings compared with baseline:

- CO_2 emission reduction: 54%
- Space heating and domestic hot water use reduction: 54%
- Purchased electricity reduction: -17%
- Total energy consumption reduction: 50%

Company: Stabilplastik

Source Link

Location: Czech Republic

Short description

Stabilplastik is Europe's only manufacturer of zero waste, 100 % recycled mix plastic pallets.

Plastic shipping pallets "Stabilplastik" are made of recycled mixed plastic (polyethylene, polypropylene and other materials). The primary raw material is the granulate made of the sorted and recycled plastic waste. The pallets can be repeatedly recycled after their lifecycle is over.

The durability of Stabilplastik pallets is far greater compared to wooden pallets; during common use, there is almost no wear. Plastic pallets do not succumb to mould, fungi or wood-decaying insects. There is no need to treat them with insecticides and fungicides.

Stabilplastik pallets also have a modern design and greater durability, which means low costs per each turnover. The labelled pallet also becomes a returnable packaging.

Stabilplastik pallets meet the health safety criteria and fulfil European hygiene standards for application in the food industry. They are resistant to most chemical substances, which also makes them fit for use in the chemical industry.

Text is taken from EC circular economy stakeholder platform. Link

Results

- cause 74 % lower CO_2 footprint than wooden and other pallets
- 6-10 times longer life span than wooden pallets
- certification for indirect use in food industries
- made of 100% recycled mixed plastics, which complies with zero - waste production
- resist to humidity and bio-organisms; no need for extra treatment, especially when used for export and in clean production facilities
- easy to maintain, washable and protected from static electricity
- made of one piece, so there are no nails (safer for handling).

Company: MudJeans

Source Link

Location: The Netherlands

Short description

The Need: The rise of 'fast fashion' has meant that clothes utilisation rates have declined steeply since 2000. Furthermore, less than 1% of the material used to produce clothing is recycled into new clothing, which leads to a loss of USD100 billion/year.

The Solution: MUD jeans are made from 40% recycled content; the material is derived from discarded jeans.

What makes it particularly circular? The jeans are offered through a subscription model so that repairs are free and users can swap their jeans for a new pair.

The result: More flexibility for customers; more predictable material supply chain for MUD. Lower environmental impact associated with jeans.

Text is taken from Ellen MacArthur site. Link

Results

- 62% of CO_2 savings compared to the average jean footprint. Link
- MUD Jeans are made with up to 40% recycled content
- Partnership with RE:Pack a returnable packaging company to lower the shipping footprint.

This Photo by MudJenas, taken from Click.NL

Company: Department of Transport and Main Roads - Queensland

Source Link

Location: Australia

Short description

TMR is finding ways to use recycled crushed glass as a substitute for sand and aggregate in road materials. Up to 10 per cent can be used in asphalt bases and up to 20 per cent in gravel bases.

Used tyres are recycled and processed into crumb rubber, which is blended into bitumen to be used in asphalt and sprayed seals. Crumb rubber not only recycles old tyres, but can improve the longevity and performance of roads.

The system removes, rejuvenates, and relays existing asphalt in a single pass. This results in small amounts of waste being sent to landfill, minimising consumption of new materials and positively impacts traffic safety.

When asphalt is removed from existing roads it is processed into reclaimed asphalt pavement (RAP) material which can be incorporated back into new asphalt. The use of RAP provides cost savings, reduces the reliance on raw aggregate and bitumen, and diverts waste from landfill

Construction and demolition (C&D) waste is material recovered from construction and demolition sites such as concrete, brick and glass, and can be used as an alternative to natural aggregates and sand in road bases. TMR is also investigating the use of C&D waste in concrete

Fly ash and blast furnace slag are industrial wastes from coal fired power plants and steel production. These waste products can be used to replace up to 70% of the cement used in pavements. Up to 35% of the cement used in structural concrete can be replaced with fly ash, up to 50% with a combination of fly ash and slag, and 60 to 70% with slag.

Results

- Up to70% reduction in greenhouse gas emissions from the use of fly ash.
- Up to 8000 tonnes of waste prevented when using waste demolition materials for roads.
- 2 million m^2 of pavement has been recycled using HIPAR
- Up to 40 % reclaimed asphalt pavement can be used in new asphalt.
- 10 to 20 % recycled glass can be used in roads

- A million tyres forecast to be saved from landfill by June 2021.

City: Sao Paolo - composting

Source Link

Location: Brazil

Short description

The pilot project on urban composting is located in the Lapa district, one of the city's 96 districts, stretching over an area of 3,000 m^2. Officially opened in 2015, the project has been overseen by technical experts to monitor its economic and environmental benefits. The types of waste accepted at the composting park include fruits, vegetables, green garden waste and structuring materials such as wood chips. The maximum treatment capacity of the composting park is 54 tons/week and a total output of high-quality compost of 10.8 tons/week.

The city plans to launch another 10 similar decentralized composting parks by 2020 in different regions across São Paulo to complete the waste management system of the City and makes it circular.

Text is taken from C40 case study platform

Results

- Reduction of 87% of greenhouse gas (GHG) emissions from organic waste treated compared to the business as usual scenario. This should bring the GHG emissions from 819,1 kg CO_2eq/t to 110,3 kg CO_2eq/t and amounts to about 160 tons of CO2e avoided per month.
- Indirect emissions reductions from compost use in agriculture that are estimated at -130.5 kg CO_2eq/t and that would lead to an estimated net saving of 20.2kg CO_2eq/t.

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City: Hong Kong

Source Link

Location: Hong Kong

Short description

Hong Kong's sewage production is expected to grow significantly due to a growing population. A further challenge is that the city's buildings account for 90% of electricity consumption and 60% of the carbon emissions.

As the first large-scale waste-to-energy facility in Hong Kong, T.PARK is a key environmental infrastructure project in the city's "Climate Action Plan 2030+". The plant uses fluidized bed incineration to process wastewater sludge from the large sewage treatment works in the city. With a total capacity of 2,000 tons of sludge per day, it will meet the needs of the city beyond 2030. Previously, the wet and energy-rich sludge was dumped in landfills.

All wastewater generated within the facility is treated on site for reuse, resulting in zero effluent discharge to the sea. Adjacent to the facility is an Environmental Education Centre equipped with educational and leisure facilities, including a spa, exhibition halls, upcycling showrooms, wetland garden and bird sanctuary.

Text is taken from C40 city case studies page.

Results

- With incineration at T.PARK, the residual ash uses 90% less landfill volume.
- CO_2 emissions from landfilling are significantly reduced.
- The process also generates renewable energy to power the plant while surpluses are transferred to the city's grid.
- Drinking water is provided by a desalination plant. Rainwater is collected for non-potable uses.
- The sludge based powerplant will generate 80 million kWh of electricity annually to power the wastewater treatment plant and for transfer to the grid, generating cost savings and powering 4,000 households.
- At the facility, double-door design and the negative air pressure inside the sludge delivery bays help to prevent odours and dust pollution.

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PRE – CHALLENGE CALL FOR PROPOSALS
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