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Bending the Linear Economy
On Urban Metabolism
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INTERSECTING

VOLUME 09/2022

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“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”
—Alvin Toffler (1980)

That our world is growingly complex is hardly a radical revelation. The challenge is to act accordingly. To widen our knowledge, we specialize and consequently isolate ourselves in various silos.

In face of overwhelming evidence of our interrelatedness and interdependencies, from our bodies to our environment and our actions within it, we have no other choice than to work at the edges and at the crossroads.

INTERSECTING cuts through strategic policy areas from high-income and low-income countries. It builds upon multi-sectoral, multi-disciplinary, and multi-stakeholder approaches.

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It addresses established and future generations of leaders in public and private spheres.

Bending the Linear Economy
On Urban Metabolism
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Image Source: Landscape under construction in the Amsterdam metropolitan area. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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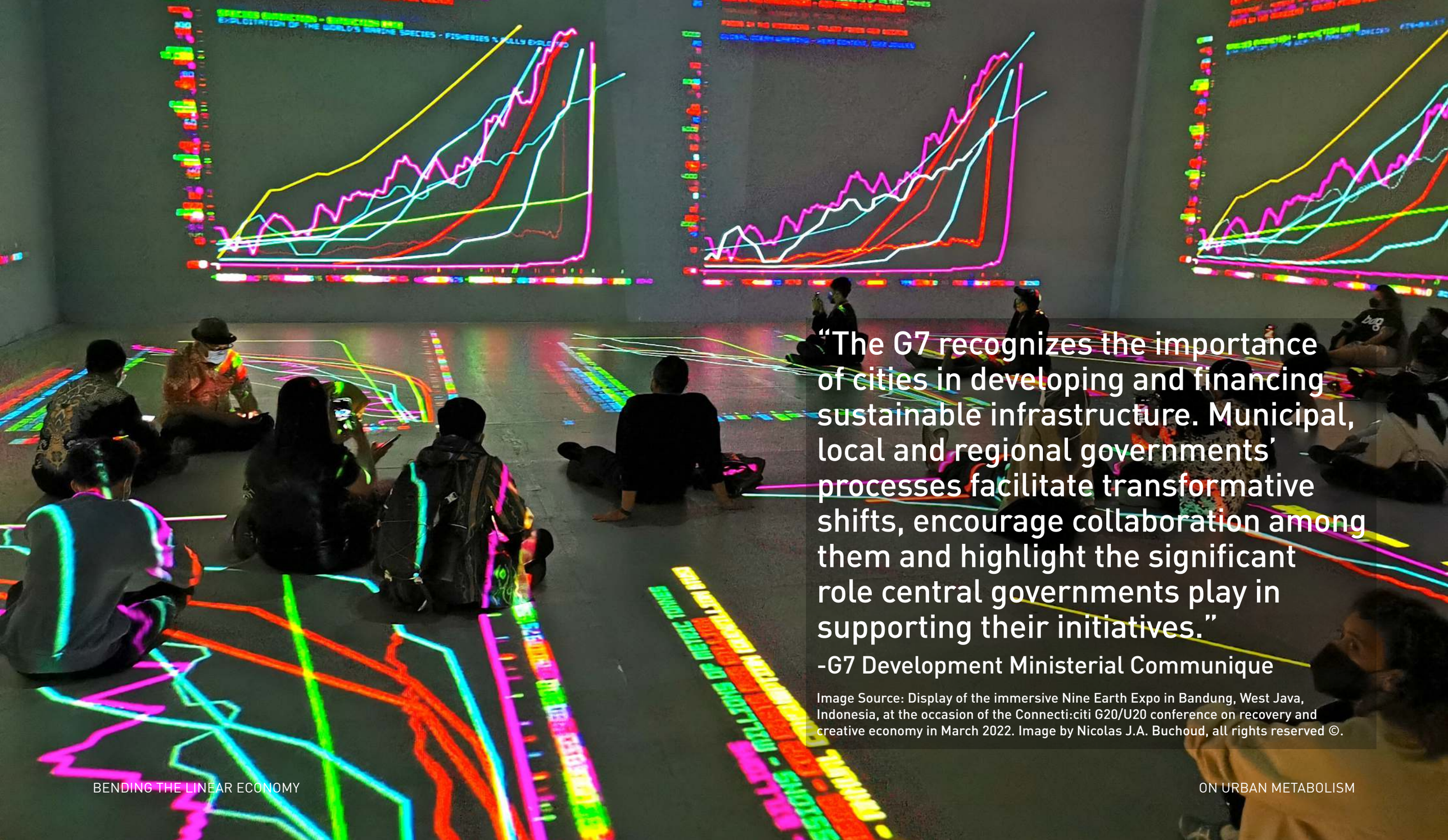

“The G7 recognizes the importance of cities in developing and financing sustainable infrastructure. Municipal, local and regional governments’ processes facilitate transformative shifts, encourage collaboration among them and highlight the significant role central governments play in supporting their initiatives.”

-G7 Development Ministerial Communique

Image Source: Display of the immersive Nine Earth Expo in Bandung, West Java, Indonesia, at the occasion of the Connecti:citi G20/U20 conference on recovery and creative economy in March 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

preface

In the context of increasingly divergent political and infrastructure investment models, coupled with a highly divergent recovery and overlapping global crises, multi-level governance is critical to address systemic challenges. The benefits of such a strategy has been long ignored by national governments until recently. In 2022, the G7 presidency of Germany launched a G7 urban development track to support investments "for a better future and a sustainable planet". It has also acknowledged the formation of an urban engagement group within the G7. As we argued at the 2022 Global Solutions Summit, on the panel "The transformative power of cities and multilateralism in post-Covid G7/G20", achieving a structured involvement of cities and the civil society in G7/G20 agenda setting and delivery is both an issue of governance and finance.[1] In times of growing digital and spatial divides, it is also about nurturing a new culture of living together.

An ambitious and quality dialogue between the G7 and G20 is even more critical now to support the delivery of the Agenda 2030 in times of uncertainties, and especially ahead of the Sustainable Development Goal 11 review in 2023. This has become more critical as initiatives from the past decade within the G20 to set up a globally coherent sustainable urban development agenda were dispersed and lacked coordination. The impact of the G20 to support more sustainable urban systems has been therefore limited, despite the long-standing and multiple initiatives in favor of infrastructure development and connectivity to support economic growth.

Although recent literature, such as that from the International Panel on Climate Change (IPCC, 2022), highlights a growing and systemic resource problem, the G20 has started to recognize the global benefits of sustainable urbanization, the role of cities and the value of multilevel governance to implement a just energy and climate transition. This has been so in the past years, especially during G20 Italy in 2021, in part thanks to the joint work of think-tanks (Think20), the Business 20 and the D20 Long-Term Investors Club.[2] In the Rome Declaration of 2021, the G20 Leaders stressed the link between sustainable urbanization and the development of circular economy to preserve resources and deliver on climate and biodiversity global goals.[3] This follows the release of a white paper by the Urban20 focusing on the issue of waste. It points out the risks of a 'tsunami of waste' by 2030 and introduces governance, technological and financial solutions to address that mega-challenge.

According to the Global Solutions Initiative, doubling global circularity could indeed reduce greenhouse gas emissions by nearly 40% by 2030.[4] To meet ambitious but necessary net zero targets, waste, water and energy provision have to change dramatically and at a large scale. This includes new technologies, transformations in governance and regulatory systems, the implementation of just-transition financial mechanisms and strengthened international cooperation, combined with enhanced technical cooperation and joint capacity building among emerging and developing markets.

An event organized as part of the Urban20 Summit in Jakarta in August 2022 focused precisely on solutions to overcome the systemic finance gaps that largely prevail for sustainable infrastructure, particularly in a context of inflation and rising debt levels, especially in lower income countries. The session gathered the lead co-chairs of the T20 infrastructure investment and climate taskforces along with representatives from major public companies, environment agencies and the governor of Jakarta. Such an innovative format, interconnecting several engagement groups, is also a reflection of the joint statement by the T20/B20/D20 LTIC on sustainable and quality infrastructure, issued at the G20 Finance Ministers' meeting during the Investors Dialogue in Bali in July 2022.

In view of the current and upcoming G20 presidencies of Indonesia (2022), India (2023), Brazil (2024), and then to be followed by South Africa, Volume 9 of the INTERSECTING project focuses on urban metabolism and resources.

We are delighted that the authors of the present INTERSECTING volume challenge conventional wisdom which very often reduces circular economy to the recycling of domestic waste, through 9 interconnected entry points:

#resources #waste #production
#well-being #demand #metabolism
#policies #urban #rural

We are delighted that the present volume is edited during the time of the G7 Urban Development Ministers Summit in Potsdam. This volume also reflects the final communiqué of the T20, which was released in Bali on September 5, 2022, that includes several references to sustainable infrastructure finance, including the proposed creation of a G20 global sustainable urban development platform.[5]

References

1. From a panel with Minister S. Schulze, Mayor P. Kurz, GIZ Managing Director I.G. Hoven, UBA President D. Messner, and representatives of the G20 Indonesia Finance Track at the Global Solutions Summit in March 2022.

2. Climate Change 2022. Impacts, Adaptation and Vulnerability, International Panel on Climate Change (IPCC), Feb. 2022.
https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/

3. Rome G20 Leaders Declaration, Oct. 31, 2021, paragraph 20.
http://www.g20.utoronto.ca/2021/211031-declaration.html

4. Call for action - Reversing the linear path: Circular economy in the roadmap for global recovery, March 2022, Global Solutions Initiative – Circular Economy Solutions Dialogue.
https://www.global-solutions-initiative.org/wp-content/uploads/2022/03/CALL-FOR-ACTION.pdf

5. T20 Communique 2022.
https://www.global-solutions-initiative.org/programs/circular-economy/

resources

Image Source: In Ho Chi Minh City, the changing landscape of the metropolitan core area is affected by the systemic threat of flooding and land subsidence, accelerated by mangrove deforestation and the disappearance of agricultural land.
Image by Nicolas J.A. Buchoud, all rights reserved ©.

resources
waste
production

1.8. Urban biocycles – connecting built and natural environments with people

Andreea OARGA-MULEC, University of Nova Gorica, Slovenia; Petter D. JENSSEN, Norwegian University of Life Sciences, Norway; Vesna LAVTIZAR, Institute for Global Environmental Strategies (IGES), Japan

resources
waste
production

“Our cities are rich in transformed materials, but they are not self-sufficient when it comes to the very fundamental resources: water, food and energy.”

-Paola PLUCHINO

Image Source: A small coastal town on the Cape Coast in Ghana. Today it is a peaceful place with local fishing and little tourism. In the past, Cape Coast Castle was one of the main hubs for the slave trade, a place that reveals all the horror, commercialization and inhumane technologization. September 25, 2021. Image by Nonkululeko Radebe. Photo Credit: Bundesanstalt für Materialforschung und -prüfung, Wolfram Schmidt, all rights reserved ©.

Paola PLUCHINO
Circular economy strategist
Italy

Activating the water-energy-food nexus in cities

Urbanization is a story that began more than 5,000 years ago. In the Middle East, ancient civilizations set up urban archetypes, later spread by the Phoenicians across the Mediterranean basin, including a clear social and spatial separation between the city and neighboring rural land. However, the size and power of urban settlements largely depended on the size of the territory that could support it. To a large extent, the expansion of trade flows became the main driver of urban growth for centuries and a way to overcome narrow city boundaries.

In today's urban world, urban metabolism is an even more relevant concept to understand the in- and out-flows through the city. It enables tracking of the linkages between urban, peri-urban and rural areas, from where cities get fundamental resources such as food, water and other materials. In many cases such as for energy, flows of resources do interconnect cities and peri-urban areas across the globe, accentuating the pressure on local socio-economic and other natural ecosystems. Our cities are rich in transformed materials so, to some extent, it would be possible to recover them from urban mining. However, they are not self-sufficient when it comes to the very fundamental resources of water, food and energy. Moreover, cities not only outsource strategic resources, but also all primary production-related human activities.[1] For this reason, resources and productive work in urban areas of Western countries have increasingly been outsourced, often to distant or politically unstable countries, causing the on-going socioeconomic emergency due to pandemics and resource wars. This long-term trend has significantly, if not exponentially, accelerated since the beginning of the 1990's and at the end of the Cold War. The combined impacts of the COVID-19 pandemic and the ensuing geopolitical crises have brutally disorganized value and supply chains.

It is the right time to strengthen social resilience and to implement circular strategies in cities. Therefore, instead of focusing on the outflow circularization, such as waste, priority should go to rather inflow reduction, which is the real key to lower local dependence on the external world. In order to address the growing resource scarcities triggered by combined economic, climate change and urbanization pressure, Water-Energy-Food (WEF) Nexus is a very effective concept. It is a framework developed by the United Nations to investigate mutual dependency linkages between these three elements to reduce unexpected sectoral trade-offs and promote sustainable development in urban systems.[2]

The best application of the Nexus framework to enable an urban circular metabolism is probably the strategic use of Nature Based Solutions (NBS), defined by the International Union of Nature Conservancy as "actions to protect, sustainably manage, and restore (create) natural or modified ecosystems that address societal challenges (including urban ones) effectively and adaptively, simultaneously providing human wellbeing and biodiversity benefits."

NBS consist of highly productive and interconnected subsystems that can help save energy, produce food and manage water resources in an effective way.[3] The latest available information on the impact of NBS on urban sustainability show ways to renew practices and policies, such as the work conducted by Bocconi University. We would argue that promoting a new vision of urban metabolism supported by nature-based solutions is also a matter of personal engagement. The experience of long lockdowns during the peaks of the COVID-19 pandemic has revived the interest of many for gardening in ways that support and protect ecosystems, soils, resources etc. In many cities, citizens show a growing consciousness and appetite for nature-based solutions and call for local governments' support and engagement. There is a direct link between personal experience during the pandemic and changing ways to envision urban futures, be it about water management, promoting biodiversity, pollination, carbon sequestration, acoustic insulation, climate change adaptation and air quality improvement etc.

The next steps would be to move towards a more integrated bioeconomy, at local, regional and global levels, which will require significant awareness raising. It will take time for new policies and financial incentives to be approved and become new bylaws and regulation but also for such new directions to be well known to citizens, professionals, communities etc. For instance, while the Italian government has set up incentives for greening private areas and buildings, such 'eco-bonus', these should be enhanced under a Nexus perspective focusing on key commodities, be it about food or energy. Training and capacity building programs for local authorities, designers, gardeners, and citizens are also a key component of long-term transformation. In short, deeper cross-sectoral collaboration is necessary to install a durable mindset switch, acknowledging the complementarity between individual and collective abilities to improve urban sustainability with Nature.

References

1. Manfroni M. et al, The profile of time allocation in the metabolic pattern of society: An internal biophysical limit to economic growth, Ecological Economics, https://doi.org/10.1016/j.ecolecon.2021.107183
2. Carvalho P. et al, Nature-based solutions addressing the water-energy-food nexus: Review of theoretical concepts and urban case studies, Journal of Cleaner Production, https://doi.org/10.1016/j.jclepro.2022.130652
3. Babí Almenar J. et al, Nexus between nature-based solutions, ecosystem services and urban challenges, Land Use Policy, https://doi.org/10.1016/j.landusepol.2020.104898

“If we think of how society will be dealing with waste in 500 years from now, would that look more like a system of more and bigger trucks collecting waste, or more like a system where each of us would deal with the waste we generate ourselves using technology that makes this a super convenient process?”

-Himkaar SINGH

Image Source: Wikimedia Commons. December 28, 2015. Tana Shark Waste Shredder at work. Photo Credit: Tanaoy. https://commons.wikimedia.org/wiki/File:TANA_Shark_Waste_Shredder.jpg

Himkaar SINGH
The Compost Kitchen (Pty) Ltd, South Africa

Case study of composting in South Africa

In 2017, South Africa (SA) was experiencing major water scarcity issues, so I left the country to pursue my Masters in Water Management in Germany, Vietnam and Jordan for five months each, to get different perspectives on what the solution for this problem could be.

I found that we needed to repair our damaged soil's ability to hold water by returning organic matter back to the soil. I thought the best way to do that was through a new business model so I returned to SA to start a food waste recycling business with a vision of introducing regenerative agriculture, that would eventually lead SA to water security.

In 2019, I started TCK which collects food waste from households every week, for a monthly fee. The waste is then recycled into vermicompost, using earthworms, which then is given back to customers at the end of each month so that it can be used to grow food again in their home gardens.

TCK completes the cycle of organic waste by giving back compost to the customers who gave them food waste. This way, the public gets surety that their waste has been recycled properly, which builds trust in the recycling industry. It makes them comfortable to pay for the service too. These are some benefits stemming from applications of the Circular Economy model. Additionally, by applying such integrated resource mindset, a problem in one sector (i.e. waste) becomes a solution for another (i.e. soil health).

More innovation like this is needed because TCK found that many people are currently willing to have their food waste recycled, but there was no system in place to provide a service that is simple, convenient, trendy and well-priced. There were no other curbside food waste recycling services and TCK was the first to offer them. In turn, this provided customers with a convenient way to take action and divert food waste away from landfills.

Nevertheless, there are always different customer requirements. Inevitably, there is no solution for all. For some, a weekly collection service works perfectly, whilst others cannot afford to pay for recycling, are located too far away or may not like the idea of keeping food waste in a bin for a week. Additionally, other options such as compost drop-off centers, while free, do not appear to work because some people are too busy to divert from their original routes to drop off their waste at these sites.

In other collection models that have been applied for 3 years now, it was found that water makes up 80-90% of organic waste collected. Therefore, collection vehicles are actually just transporting water, and this is inefficient. Although there is a net benefit of ensuring that organic waste gets composted rather than landfilled, TCK believes the whole-of-society's management of waste needs an update.

TCK believes that our food waste should be composted at our own homes, which also helps us enrich our own soils. The simplest way to compost food scraps at home is to have a compost heap in the garden. But most people are looking for a solution which has no odor, no flies, no vermin and no mess. TCK believes that technology is the solution and that if composting is turned into a convenient process that can be performed at the touch of a button, more people will take it up.

Indeed, when TCK launched a technological compost solution in 2022, it was taken up 36 times faster than the collection system even though the cost was 24 times higher. This signals people's preference for a very convenient and clean way of managing their waste and consequently ensuring that they do not end up in landfills.

What if technological solutions can do the same for the other waste streams? What if there was a machine that we all had at home which turned plastic bottles into 3D printing filament, or which turned glass bottles into kitchen bowls? With technology, the future of waste management looks more like a system where, instead of going door-to-door to collect waste, materials created from waste will be collected. This adds value to the raw material initially used instead of ending up in the landfill.

If we think of how society will be dealing with waste 500 or 1,000 years from now, does it look more like a system of more and bigger trucks collecting waste, or does it look more like a system where each of us deals with the waste we generate ourselves, using technology that makes it super convenient? Innovation will play a key role in the future of waste management. Therefore, we should do our best to enable it.

“The entire life cycle of electric vehicles needs re-consideration for bringing circularity in its end-of-life wastage.”

-Shreya JAISWAL

Image Source: An electric charging point and power station in the area of Nusa Dua in Bali created in the preparation of the G20 2022 Leaders’ summit. Image by Nicolas J.A. Buchoud, all rights reserved ©.

Shreya JAISWAL
Council on Energy, Environment and Water (CEEW), India

Electric mobility as a means of sustainable transportation through the lens of circular economy

With India announcing its ambition to achieve net-zero emissions by 2070 and save 1 billion tons of emissions by 2030 (PIB 2022), circular economy-focused interventions must be prioritized (Harris and Parker 2021). Among all industries, India's transportation industry is expected to boom in energy consumption and CO2 emissions, and requires rapid decarbonization if the country wants to meet its short and long-term commitments (Bhattacharyya et al. 2022). This also highlights the need to include circular economy practices to optimize the transportation sector.

With commitments from all countries to reduce their emissions under the Paris Agreement (UNFCCC 2022), the Indian government has undertaken multiple initiatives. One among them includes promoting the manufacturing and use of electric vehicles in India through GST reduction and subsidy provision under the Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME) scheme (PIB 2022). This illustrates India's potential to cut direct greenhouse gas emissions (with 30% of new EV sales by 2030, 16 MtCO2 of GHG emissions will be reduced (Soman et al. 2022)) while also providing a more sustainable transportation system; therefore, it is necessary to integrate circularity with the EV ecosystem to add pace and scale to decarbonization.

Circularity practices have been modified from "reduce, reuse, and recycle" to substituting the 'end-of-life' concept with "reduce, reuse, recycle, and recover" materials in the production and consumption processes (OECD 2020). This essentially allows rethinking asset usage, component manufacturing using recovered critical resources, and lifespan optimization of electric vehicles. These may be achieved by incorporating novel technological solutions into ecosystem planning and design. The entire life cycle of electric vehicles needs re-consideration to bring circularity in its end-of-life wastage, and here are six essential steps through which this can be achieved:

Remanufacturing
This requires working directly with dealers and dismantlers to reduce their inherent resource-intensive production by simplifying the design, to recover key minerals from the end-of-life battery packs, and to put them back into cell production. Government initiatives like battery waste management rules 2020 can further be leveraged by remanufacturing powertrain components and battery packs with recycled materials and designing them for recyclability.

Rethinking
In India, charging infrastructure is often recognized as a critical barrier to EV adoption. However, there are various charge point operators in the market, and some rethinking is required to ensure that charging systems are interoperable. CEEW-CEF found that standardized infrastructure makes EV roaming possible, whereby drivers may use a single application or platform to access charging stations offered by different providers (CEEW 2022). Hence, interoperability comes to the rescue for reducing the cumbersome process of maintaining multiple access cards and reducing the need to travel an extra mile to access a charging station provided by their service providers.

Reusing/Recycling
Automobile manufacturers such as Ford Motor Company and Volvo Group employ recycled materials to make their vehicles more economical and sustainable (Worford 2022). Such initiatives must be incentivized to nudge other firms to adopt environmentally beneficial business practices.

Reassembling
With concerted efforts for EV transition in India, several states like Karnataka, Goa, and Assam have already introduced incentives for the conversion of old Internal Combustion Engines (ICE) vehicles into EVs through retrofitting kits. Other states of India could adopt such initiatives to achieve national EV penetration targets in India.

Recycling programs
The most expensive component of a battery is the battery cell, which accounts for 40–60% of the total cost today (ACMA 2018). Hence, recycled batteries would become resources in the future, helping to make electric vehicles more lucrative and sustainable. Between 2016 and 2030, according to CEEW, the number of on-road passenger and freight vehicles would increase by more than 2.7 times (Soman et al. 2022). This steady increase in EV adaptation needs indigenized battery recycling and manufacturing programs. Such programs will further localize the supply chain and help reduce the cost of the vehicles.

Refusing/Reducing
A CEEW 2020 analysis showed that high adoption of public transport and shared mobility, with 30% new sales as EVs by 2030, would significantly reduce the energy usage by 27% and 20% respectively (Soman et al. 2022). This will require policies, investments, and behavioral change interventions to prioritize public transport and reduce personal vehicle usage to meet the same travel demand. To encourage people to embrace sustainable transportation, Durham, Vancouver, and Hong Kong use the nudge theory of behavioral economics. Nudge techniques include rewarding employees for using the bus and providing reliable bus and train schedules.

Surging electric vehicle sales with accelerated e-revolution in India have increased demand for its various components. It requires curbing critical resource usage through a circular

economy. This will not only optimize the end-of-life waste of e-vehicles but also generate jobs, growth, and sustainability for India.

References

ACMA. 2018. "EV Study_2018." https://www.acma.in/uploads/docmanager/EV%20Study_2018.pdf.

"Assam EV Policy 2021 - Summary." 2021. September 5. https://evreporter.com/assam-ev-policy-summary/.

Bhattacharyya, Subhes, Daniel Kerr, Nupur Ahuja, Nehal Gautam, John Rowlatt, Sukanya Das, Gopal K Sarangi, Andrew Mitchell, and Naman Agarwal. 2022. "All Change: Equitably Decarbonising India's Transportation Sector." The British Academy. doi:10.5871/just-transitions-a-p/S-B.

CEEW, CEF |. 2022. "One for All, All for One: Interoperability of Public Electric Vehicle Charging in India." CEF | CEEW. Accessed June 2. https://cef.ceew.in/masterclass/analysis/interoperability-of-public-electric-vehicle-charging-in-india.

"Decarbonising Transport." 2018. CEEW. June 21. https://www.ceew.in/decarbonising-transport.

Harris, Susan, and Tobias Parker. 2021. "Supporting Net Zero Through a Circular Economy." Anthesis. https://www.anthesisgroup.com/supporting-net-zero-through-a-circular-economy/.

Gardner, Betsy. 2019. "Nudging for Sustainable Mobility | Data-Smart City Solutions." https://datasmart.ash.harvard.edu/news/article/nudging-sustainable-mobility

Government of Goa. 2021. "Scheme-for-Promotion-of-Electric-Vehicles-in-the-State.Pdf." https://www.goa.gov.in/wp-content/uploads/2021/12/Scheme-for-Promotion-of-Electric-Vehicles-in-the-State.pdf.

"Karnataka EV Policy - Summary." 2020. July 25. https://evreporter.com/karnataka-ev-policy-2/.

MoEFCC. 2020. "Battery-Waste-Management-Rules-2020-Draft." https://www.eqmagpro.com/wp-content/uploads/2020/02/Battery-Waste-Management-Rules-2020-draft.pdf.

OECD. 2020. Managing Environmental and Energy Transitions for Regions and Cities. OECD. doi:10.1787/f0c6621f-en.

PIB. 2022a. "India's Stand at COP-26." https://www.pib.gov.in/PressReleasePage.aspx?PRID=1795071.

PIB. 2022. "Ministry of Heavy Industries." https://www.pib.gov.in/www.pib.gov.in/Pressreleaseshare.aspx?PRID=1795444.

Soman, Abhinav, Harsimran Kaur, Himani Jain, and Karthik Ganesan. 2022. "India's Electric Vehicle Transition," 66.

UNFCCC. 2022. "The Paris Agreement | UNFCCC." Accessed June 2. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

Worford, David. 2022. "Ford and Volvo to Advocate Programs for the Electric Vehicles." Environment + Energy Leader. https://www.environmentalleader.com/2022/02/ford-volvo-participate-in-redwood-electric-vehicle-battery-recycling-program/.

“Recycled waste cellulose fibers can be used on green roofs and walls.”

-Lucia ŇACHAJOVÁ

Image Source: Wikimedia Commons. August 29, 2018. A box of recyclable mixed paper pulp. Photo Credit: Tony Webster. https://commons.wikimedia.org/wiki/File:Recycled_Mixed_Paper_Pulp,_Post-Consumer_Recyclable_Waste_(42555846610).jpg

Lucia ŇACHAJOVÁ
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Paper waste as nature-based solution

Given current challenges such as negative impacts of climate change, unsustainable use of natural resources and growing population, circular economy is considered the key solution to these challenges. To stick to the main principles, which are to save primary resources, maximize the use of secondary resources and prevent waste in general, it should be our main goal to search for sustainable solutions and apply them to everyday life. This article is about solutions to bring paper waste into the loop for cities' climate wellbeing.

Each year around 400 million tons of paper and cardboard is produced worldwide. Even though more than 47 % of the paper production comes from Asia, the Europe's share in 2020 was 85 million tons. More than 25% of paper and cardboard is produced in Germany – the major producer of paper and cardboard in EU.[1] However, paper and cardboard production declined by almost 10 % during the last five years, mainly due digitalization and the increasing use of cardboard as a packaging material.[2] Recycling rate went up to 73.9 % in Europe. Nevertheless, from 2009 to 2019, paper and cardboard were the main packaging waste material in the EU (32.3 million tons in 2019).[3]

The paper industry is one of the largest polluters of air, water and soil. Several types of waste are generated within the paper industry. The dry waste sludge represents the most significant volume of raw material that is being sent to the landfill (16 – 47 kg per each ton of paper product) instead of being used as a valuable resource.

The reason why paper production waste should be reconsidered as a valuable resource is ubiquitous given global warming. It´s well known negative effects on nature and human population can be strongly perceived especially in fast-growing cities. Urgent calls for Nature-Based Solutions in urban areas yields innovation opportunities, optimizing the synergies between nature, society and economy. Urban green roof is one of the several innovative Nature-Based Solutions to mitigate climate change by reducing surface run-off, improving the quality of air, and reducing the effect of urban heat islands.

The biggest cities of the world and their local authorities have already integrated green roofs as part of their regulations. They have granted direct financial support or introduced stormwater taxes. One of the key factors for successful green roof performance is the substrate.

Waste cellulose fibers produced by the paper industry and modified by Fecupral, called Ecopulp could represent the recycled product that can be used in green roofs and walls. The key features of such fibers are non-toxicity, 100% recycled, fully biodegradable, slightly alkaline, and easily customizable to the specifications of the customers. Ecopulp is a dry material with low bulk density, making it very lightweight, on aggregate, and suitable for roofs' load. It is hygroscopic and absorbs water to be later released together with fertilizers and other substances for successful establishment of plants. Enriched with mineral content, organic matter and various additives e.g. fertilizers, this eco-product can be used on extensive or intensive green roofs, in flower beds or pre-mixed with seeds in a sowing substrate. Ecopulp can be used in parks and perform as water storage areas where water slowly evaporates, cooling the urban air rather than letting the water run into the sewage system.

The cellulose fibers offer a great variety of advantages as they can store CO2, increase the biomass of living organisms producing oxygen, reduce the surface temperatures of buildings to save energy, promote biodiversity and many more. Ecopulp enriched with additives can even retain undesired substances like heavy metals from rainwater, thus the storm water can be recycled and used again.

The green roofs and walls market is a fast moving and dynamic one. Direct financial incentives, reduced storm water taxes and a variety of regulatory measures represent some of many green roofs policies to encourage green roofs and walls, promoting the fast expansion of the market.

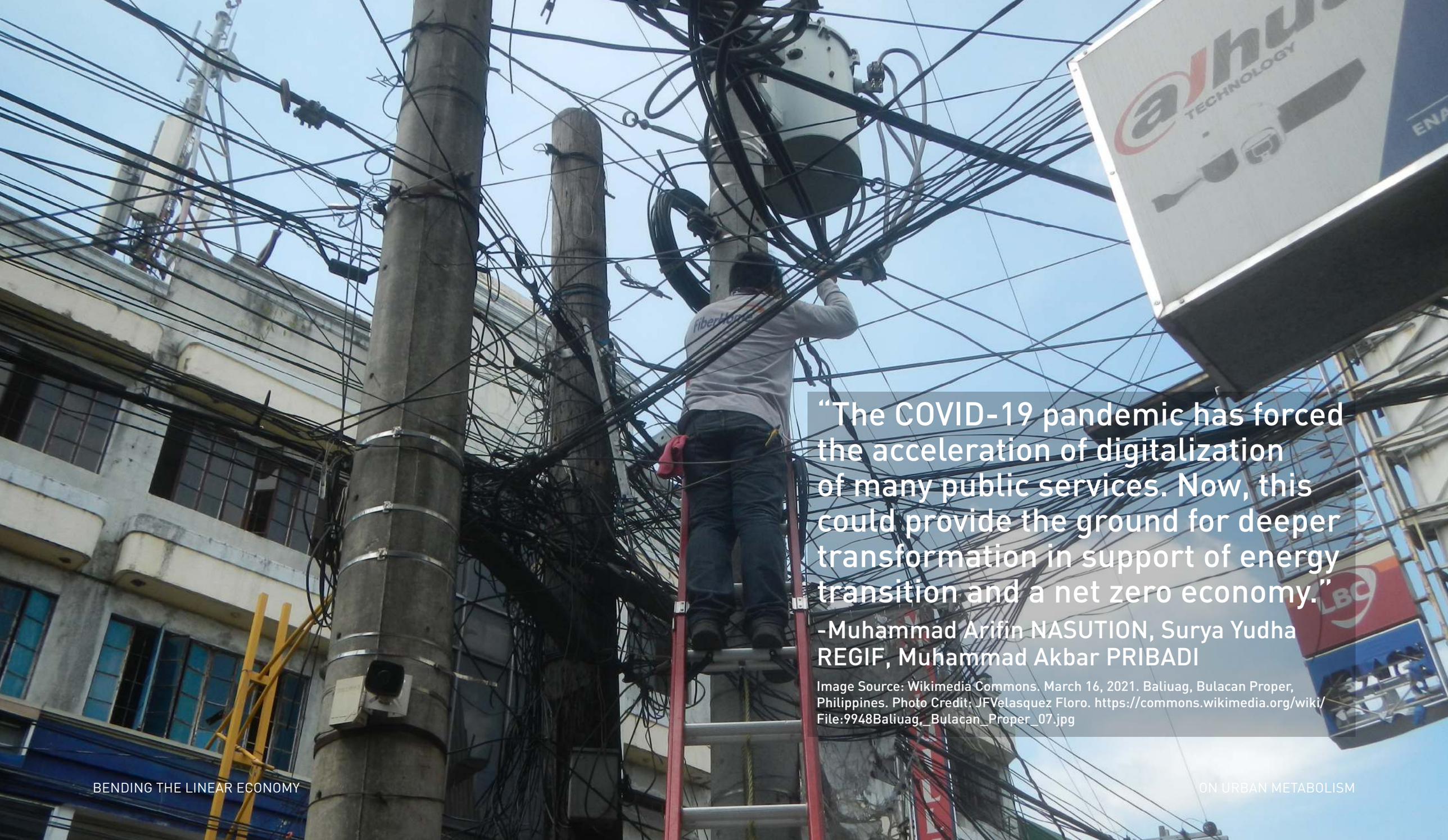
However, this is not the only application of cellulose fibers. Our research and development test results show other possible applications of the fibers. They are as follows: sound insulation in buildings; agriculture – due to its water retention and gradual nutrients release, Ecopulp can be used in agriculture and hydro-seeding; bio-packaging – a sustainable alternative to standard plastic pots in plant industry, or food packaging; road construction and mortar – cellulose fibers maintain high viscosity without affecting the consistency or composition; concrete – Ecopulp can be easily used as a stabilizing and reinforcing additive to cementitious composites; and plasters and paints – as a filler, cellulose fibers protect buildings against weather conditions, fluctuations in temperature and humidity.

References

1. https://www.cepi.org/wp-content/uploads/2021/07/Key-Stats-2020-FINAL.pdf

2. https://www.pulpapernews.com/20201228/12104/analysts-expect-decline-global-paper-demand-years-come

3. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics



“The COVID-19 pandemic has forced the acceleration of digitalization of many public services. Now, this could provide the ground for deeper transformation in support of energy transition and a net zero economy.”

-Muhammad Arifin NASUTION, Surya Yudha REGIF, Muhammad Akbar PRIBADI

Image Source: Wikimedia Commons. March 16, 2021. Baliuag, Bulacan Proper, Philippines. Photo Credit: JFVelasquez Floro. https://commons.wikimedia.org/wiki/File:9948Baliuag,_Bulacan_Proper_07.jpg

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Principles for sustainable post-COVID digital infrastructure in Indonesia

The rapid development of technology and information has affected human interaction, including public services, with the shift from conventional forms of public services to digital services (Zilincikova & Stofkova, 2021). The COVID-19 pandemic has accelerated changes such as the demands of service users whereas technological developments such as big data and information disclosure require bureaucracy to cope with the many transformations. (Arfan et al., 2021). Hence, one major challenge is how the combined digitalization of the economy and public services can support the achievement of the Sustainable Development Goals (SDGs), especially SDG 17 about partnerships for sustainable development (Alisjahbana & Murniningtyas, 2018).

As a consequence of the COVID-19 pandemic, interaction patterns and ways of communicating that occur in urban areas have shifted from a conventional public service infrastructure system to digital public services. Yet, the pandemic has also caused a decrease in income and circulation of buying and selling power of urban communities. Therefore, governments have been compelled to rethink and optimize the role of public service infrastructure in urban areas, while coping with declining revenues, especially at the local level. In that context, we argue that fostering a green economy paradigm is the only way to recover from the pandemic crisis. Investing in a green economy means prioritizing environment and resource conscious economic development and related jobs, supported by sustainable finance as defined by the G20, with an emphasis on just economic and energy transition. Five core transformation principles, that is (1) the wellbeing principle, (2) the justice principle, (3) the planetary boundaries principle, (4) the efficiency and sufficiency principle, and (5)

the good governance principle (Coalition, 2019) could help trigger change at the local level – within cities or even neighborhoods or villages – and globally – through more sustainable value chains.

As illustrated in the first volume of INTERSECTING (Mariatul, Riefky) with the case of Indonesia and the case of regional and cross-border cooperation in South-East Asia, the COVID-19 pandemic has forced the accelerated digitalization of many public services, starting with renewing statistical datasets to implement effectively national welfare policies. This could provide the ground for longer term, deeper transformation of public services in support of energy transition and a net-zero economy. While this is not completely new, we argue pre-crisis concepts of tech-centered smart cities, including related e-government, e-health and other digital transformations such as in mobility services are no longer valid.

We need to build people-centered digital transformations, induced by the pandemic, that move towards more sustainable urban development and investment strategies, which is in turn supported by more effective and users-centric public services. The development of IT systems needs to address pre-crisis and post-crisis socio-economic vulnerabilities, without creating new divides within the society and within cities. Therefore, infrastructure investments and the management of key urban services such as water, waste or energy should be envisioned as opportunities to create effective public and private partnerships responding to people's needs and to long-term sustainability priorities. These are the conditions for the transition from conventional to digital infrastructure, to achieve a new balance in the use of key natural resources on land, at sea and, in particular, in coastal areas.

Reference

Arfan, S., Mayarni, M., & Nasution, M. S. (2021). Responsivity of Public Services in Indonesia during the Covid-19 Pandemic. Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 4(1), 552–562. https://doi.org/10.33258/birci.v4i1.1638

Alisjahbana, A. S., & Murniningtyas, E. (2018). Tujuan Pembangunan Berkelanjutan di Indonesia (Vol. 3, Issue 2).

Zilincikova, M., & Stofkova, J. (2021). Impact of COVID 19 on the provision of services by public administration. SHS Web of Conferences, 92, 01059. https://doi.org/10.1051/shsconf/20219201059

Coalition, G. E. (2019). Principles , priorities and pathways for inclusive green economies : Economic transformation to deliver the SDGs. 1–28. greeneconomycoalition.org

"The transition to a circular economy is a productive one, and a change on how urban growth coalition operates."

-Hugo D'ASSENZA-DAVID

Image Source: At the 11th World Urban Forum in Katowice in the SDG's conference area, presentation of the objectives of the G7 Germany presidency related to sustainable urbanization. June 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Re-orienting the Red Queen? Towards circular and locally productive urban coalitions

Local governments and economic actors, despite their differences and oppositions, constitute coalitions to coordinate public and private resources, and develop, notably from the 1980's, common strategies to foster their position in the inter-urban competition. They establish their city as a 'growth-machine', constantly competing for the attraction of financial and human capital.[1] Insights from biology help to grasp the stakes of this permanent quest for economic growth. In an increasingly dangerous and complex environment, species must continuously innovate to keep their place and survive. As a reference to Lewis Carroll's Alice in Wonderland, this hypothesis pays a tribute to the Red Queen's character, who continuously runs on a scrolling set to maintain her domination.[2] Transposing this to cities, the centrality of GDP to measure economic performance and prosperity inherently forces these to unconditionally seek capital accumulation to keep their position, and not be downgraded.

Economic growth is then the matrix for local policy making, with economic development initiatives as triggers for attracting local investments and skillful workers, and high value-added sectors favored over others for their capacity to maximize returns on investment.[3] Consequently, the dominant model of urban production relies on the dedication of urban land to offices and high standing accommodations. In parallel, globalization and the acceleration of supply chains paves the way for the de-localization of productive systems.[4] Here is the paradox: dominant cities of the urban global archipelago become reliant on highly externalized and vulnerable productive systems.

The shift to a circular economy acknowledges the long-term thrive conditions while going against this atomization logic. Circularity is the corner stone to decoupling human prosperity from material consumption while staying within planetary boundaries[5]. It also questions the dominant socio-ecological regime and implies an effort to re-embed urban metabolism in short material loops[6] and local supply chains, connected and responsive to urban demand.[7] Concealing competition and 'circular' imperatives then reshuffles the deck in urban coalition strategies, with the come-back of localized productive capacities as a sine qua non condition to initiate this transition, which require public interventions to materialize.

This first implies a need to make ground for key productive and logistics infrastructures to collect, re-process, and re-distribute consumed goods and materials as near as

possible to consumption hubs. While these activities are less profitable than other functions, public interventions are required to preserve land from speculative practices and maintain key facilities for a circular urban metabolism. In this perspective, Brussels is an insightful example. While the region develops regulations to safeguard urban functions, notably focusing on a part of productive activities in high value potential areas, institutions like the Bouwmeester or Citydev orient innovation to trigger the combination of urban functions.[8] Public authorities also acquire land, develop infrastructure on it, and make them available to entrepreneurs through emphyteusis.[9]

In parallel to the hardware, giving rise to local productive capacities requires embedding these in local ecosystems. While considering historical or existing networks, skills or productive arrangements to avoid setting up disconnected urban objects, the creation of local knowledge is key to enshrine these elements in future circular perspectives. Like in the EU-funded CENTRINNO initiatives launched in nine cities, this may consist of providing awareness and training schemes in parallel to establishing local diagnoses through Material Flow Analysis, cartographies of actors and industries at stake, as well as identifying local opportunities for synergies.[10]

The transition to a circular economy is a productive one, and changes how urban growth coalition operates. The renewed interest in the material part of the economy, in localized dynamics and in productive infrastructures, brings heuristic perspectives for cities in the re-orientation of their development model, both in the North and in the Global South. However, acting and innovating locally does not suffice. The circular imperative has a cost and requires the deployment of physical infrastructures for which economic profitability is not ensured. Hence, it is critical to recognize their social and environmental usefulness. In fact, the circular transition requires a political and global debate on how we collectively define prosperity, and on what it means to grow in the 21st century. By changing the rules of the game and reorienting the Red Queen's race beyond exponential economic capital accumulation, we open insightful perspectives to accelerate the transition, re-orienting local economic, institutional and research capacities towards an ecosystem growth and socio-ecological thrive.

References

1. Molotch, H. (1976). The City as a Growth Machine: Toward a Political Economy of Place. American Journal of Sociology, 82(2), 309–332. https://doi.org/10.1086/226311

2. Van Valen, L. (1977). The Red Queen. The American Naturalist, 111(980), 809–810.

3. Cuomo, F., Ravazzi, S., Savini, F., & Bertolini, L. (2020). Transformative Urban Living Labs: Towards a Circular Economy in Amsterdam and Turin. Sustainability, 12(18), 7651. https://doi.org/10.3390/su12187651

4. Hall, P. (1993). Forces Shaping Urban Europe. Urban Studies, 30(6), 883–898. https://doi.org/10.1080/00420989320080831

5. Persson, L., Carney Almroth, B. M., Collins, C. D., Cornell, S., de Wit, C. A., Diamond, M. L., Fantke, P., Hassellöv, M., MacLeod, M., Ryberg, M. W., Søgaard Jørgensen, P., Villarrubia-Gómez, P., Wang, Z., & Hauschild, M. Z. (2022). Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. Environmental Science & Technology. https://doi.org/10.1021/acs.est.1c04158

6. Kampelmann, S., & De Muynck, S. (2018). Les implications d'une circularisation des métabolismes territoriaux–une revue de la littérature. Pour, 4, 153–173.

7. Tsui, T., Peck, D., Geldermans, B., & van Timmeren, A. (2021). The Role of Urban Manufacturing for a Circular Economy in Cities. Sustainability, 13(1), 23. https://doi.org/10.3390/su13010023

8. d'Assenza-David, H. (2021). Bruxelles: Une ville productive et résidentielle. Editions du PUCA. https://hal.archives-ouvertes.fr/hal-03340458/document

9. Ibid

10. CENTRINNO. (2021). Whitepaper: CENTRINNO A new industrial revolution that puts citizens at the core of sustainable transformation. https://centrinno.eu/wp-content/uploads/2021/02/Centrinno_WHITEPAPER_2.0_EUproject.pdf

“Feeding a country’s population should be an integral component not only to bioeconomy, but also to a country’s national security action plans.”

-Atanas VLADIKOV

Image Source: The container ship MSC Diletta, one of the world’s largest container ship with more than 400m long and 15m deep in the water, is escorted on its way to Antwerpen along the Escaut river amidst an agricultural landscape. 2022.
Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Bioeconomy and its impact on the propensity to consume foods and generate food waste

Once upon a time – 10,000 years ago – the population of our planet was approximately 5 million, while today this number is close to 8 billion. The exponential growth of world population commenced after the end of World War II, and since then about 4 billion people have started living in urbanized areas and face immense challenges brought about by urbanization and globalization, i.e. air, water, and soil pollution, together with massive waste generation. At the same time, the global capital is managed by approximately 63,000 transnational / multinational corporations (TNCs/MNCs) with about 700,000 branches in different countries. However, three-quarters of the global TNCs/MNCs are head-quartered in Japan, Western Europe, and North America, and in practice, all of the top-100 TNCs/MNCs are based in industrialized countries. Thus, we see the incorporation of global business models, economic patterns, and consumer behaviors into the new integral philosophic paradigm of bioeconomy – economic and social sciences shall be merged with life sciences into a modern understanding of how to preserve and sustain the four spheres of Earth: the geosphere, biosphere, atmosphere, and hydrosphere. To tackle the issue, it is reasonable to shift away from the term "resource(s)" and introduce the new Holy Trinity of bioeconomy: economic capital, human capital and natural capital. To these three interlinked components, two additional ones should be also considered: building a new generation of public policies as well as adopting new technological solutions and innovations. Together, these five elements lay the foundations for the bioeconomy/circular economy, while having as a strong focus for action, influencing the reduction of waste generation of all kinds and finding new solutions and technologies for recycling. For example, the average EU citizen generates about 5.2 tons of waste annually, which is either recycled or disposed of. Germany's recycling rate is approximately 70%, contrary to other EU countries which are still lagging behind.

Considering the four spheres of Earth and the five crucial elements of the circular economy, all processes in the 21st century momentarily trigger, to a certain extent, reactions and responses by various stakeholders, institutions, NGOs and other various interested parties, due to the existence of the Internet of Things, cloud technologies and "big data" processing. Above all, the pivotal factor for all societies, regardless of their culture and their civilization advancements, is food. For the past decade, the UN FAO has been warning about the upcoming global famine. The food crisis spreads across the globe following the "butterfly effect" theory, and thus poses a

significant threat in the age of the bioeconomy as it proliferates its impacts both in the real and cyber economy!

Hence, the aim of integrating "digital footprint" in the economy is to reshape the real economy and trigger both business transformations and especially transformations that naturally culminate in comprehensive progress for nations. For instance, in countries such as Myanmar (formerly Burma) – tea plantation workers do not have the financial capacity to purchase the tea they picked throughout their working day. The emergence of precariat class, as explained by Guy Standing, in third world countries and economically developing countries, such as Bangladesh, Ethiopia, Indonesia, Nigeria, Brazil, and many others, is beginning to impact the supply chains around the world.

On the one hand, according to international data, the global food market rose to $8.3 billion in 2021, and the global functional market for food and beverages averaged $280 billion within the same year. On the other hand, due to intensive investments in R&D in Japan, Western Europe and the US, in particular, modern technologies of recycling waste flows now include thermochemical and biochemical conversion processes, which may deliver new products from food waste, such as water-based gels, bio-adhesives, cellulose, pectin, carotenoids, flavonoids, collagen, biofertilizers, biomethane, biobutanol (car fuel, produced from biomass), and many others. In addition, according to the latest Oxfam Report "Profiting from Pain" (2022), every 30 hours a new billionaire is born, while 1 million people enter extreme poverty. Also, there are 62 new food billionaires, and every two days billionaires in the food and energy sectors increase their wealth by a billion US dollars, according to the same report. Evidently, it is the physical survival of millions of people that is at stake due to food shortages, or malfunctioning of food supply chains, or ruined food markets. This inevitably generates huge migration flows and conflicts and is destructive to the globe, due to the materialization of the "butterfly effect" in practice. These migration flows reshape both the global food supply chain and the structures of waste facilities, as one food commodity is to be produced in one part of the globe, but its waste shall be stored or recycled in another part of the world. For example, every day since the sinking of the mammoth cargo ship in the Suez Canal "Ever Given" in 2021, $10 billion in losses per day of world trade incurred due to the disruption in the delivery of manufactured but undelivered goods. That is why, nowadays, there is a dynamic mixture of various economic signals paired with different cascading crises, resulting from uncoordinated activities or force-majeure events, called "black swans" as explained by Nassim Taleb. Next to natural disasters, the recent COVID-19 pandemic and the ongoing wars around the globe should be seen as a "black swan", as well in the issue of combating hunger. In conclusion, feeding a country's population should be an integral component not only to bioeconomy, but also to a country's national security action plans. And these local actions should be concerted on a global level to establish new megatrends, notably to devise and implement a global plan so that necessary and nutritive food is provided to each and every person on Earth on a daily basis.

“Following the syntrophic principle from nature, waste or energy from a city can ideally provide resource input for agriculture in surrounding rural areas where food for the city is produced.”

-Andreea OARGA-MULEC, Petter D. JENSSEN, Vesna LAVTIZAR

Image Source: Wikimedia Commons. March 26, 2015. Riga fertilizer terminal (Latvia). Photo Credit: Kārlis Dambrāns. https://commons.wikimedia.org/wiki/File:Riga_fertilizer_terminal.jpg

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Urban biocycles – connecting built and natural environments with people

More than half of the world's population now lives in urban areas. While trying to solve the world's environmental challenges, it is also important to focus on cities. Cities rely on extensive imports of water, food, energy, and materials that come not only from regional and rural areas, but from around the world. Cities follow a linear metabolism and function largely like an organism, taking in high-value resources and releasing low-value waste. If we draw a parallel with a biological organism, where different inputs boost metabolism and the output is input to another organism, in ecology this process is called syntrophism, meaning that the well-being of an organism depends on growth factors and cross-feeding. In cities, resource recovery and reuse are low, and increasing consumption leads to more pressure on resources and subsequently pollution, deforestation, and loss of land and biodiversity. As a result, today's cities are not sustainable, even though knowledge and technology exist to transform cities into more sustainable areas. One major obstacle is the institutional framework inherited from an earlier era, which often acts as a barrier to the necessary changes and, at best, provides minimal support for them.

A circular urban metabolism is a key to the future development of sustainable cities. In terms of environmental sustainability, resources should be circulated within the smallest possible geographical area.[1] At the same time, this model can be enhanced by expanding and strengthening the connection with rural areas (i.e. resource providers), creating a larger cycle to benefit both sides. It is recognized that urban agriculture and greening of the cities (e.g., gardens, parks, green walls and roofs) enhance well-being and food security while creating opportunities for the effective use of

biological resources and closing their loops within cities.[2] For example, the highly industrialized city of Kitakyushu in Japan is aiming to establish a so-called SDGs social farm within the city boundaries.[3] At the social farm, food waste will be composted and reused to grow crops using technologies that keep resource efficiency at the highest levels. Workers in charge of the cultivation are people with disabilities and the elderly. They also invite the younger generation to get involved in agriculture to break the widespread perception that farming is a low-status profession. Their concept recognizes that the circular economy is not only about resources and materials but also about people!

Nutrient recovery from excreta (i.e. urine and feces) is another example of a biocycle that can be easily applied in local circulation. Excreta accounts for only 1% of the volume of wastewater from households, yet it contributes to the majority of pathogens, as well as 90% of nitrogen, 80-90% of phosphorus, and about 50% of organic matter.[4,5] While these constituents are the main substances of concern in terms of disease outbreak [6] and water pollution from wastewater, they are also an important source of nutrients for agriculture. The most logical way to recover nutrients from wastewater streams is to capture excreta from the rest of the wastewater. Separate excreta collection can be done in cities and require low flush toilets (i.e., vacuum toilets). This concept is new at the urban scale and thus not yet widespread, largely due to the traditional centralized wastewater infrastructure and corresponding institutional framework. In centralized systems, nutrients from excreta are diluted with other wastewater streams, complicating recovery and reinforcing the linear trend.

The EU-project SiEUGreen (www.sieugreen.eu) demonstrates how excreta and organic household waste can be converted into biogas, liquid and solid fertilizer, or biochar for urban agriculture. Cities are nutrient hotspots for agriculture and offer opportunities for new cycles. Following the syntrophic principle from nature, waste or energy from a city can ideally provide resource input for agriculture in the surrounding rural area where food for the city is produced. Thus, the future circular cities can become hubs in a green economy and produce nutrients for both urban and ex-urban agriculture. At the same time, water pollution can be nearly eliminated, greenhouse gas emissions reduced (e.g. through biogas production) and carbon sequestered in biochar. However, in researching and putting into practice the organic and inorganic the circulation of materials in cities, we must not forget the citizens. People must participate in a circular transition aimed at improving well-being that is decoupled from resource use.[7]

References

1. Takeuchi K., Fujino J., Ortiz-Moya F., Mitra B.K., Watabe A., Takeda T., et al., 2019. Circulating and Ecological Economy - Regional and Local CES: An IGES Proposal. Institute for Global Environmental Strategies. 35 pp.

2. Mohan, S.V., Amulya, K. and Modestra, J.A., 2020. Urban biocycles–Closing metabolic loops for resilient and regenerative ecosystem: A perspective. Bioresource Technology, 306, p.123098.

3. KICS (Kitakyushu Interdependent Business Consortium), 2022. Drawing a Future Vision of Environmental Industry in Kitakyushu (in Japanese) https://www.iges.or.jp/jp/events/20220207-0 (Access June 9, 2022).

4. Meinzinger F., Oldenburg M., 2009. Characteristics of source-separated household wastewater flows: a statistical assessment. Water Science and Technology, 59(9), 1785-1791.

5. Todt, D., Heistad, A., Jenssen, P.D., 2015. Load and distribution of organic matter and nutrients in a separated household wastewater stream. Environmental technology, 36(12), pp.1584-1593.

6. Grove, S. F., Lee, A., Lewis, T., Stewart, C. M., Chen H., Hoover, D. G. 2006. Inactivation of foodborne viruses of significance by high pressure and other processes. Journal of Food Protection, 69:957–968.

7. https://www.resourcepanel.org/reports/decoupling-natural-resource-use-and-environmental-impacts-economic-growth

well-being

Image Source: Wikimedia Commons. July 22, 2020. Mouth of the Nahe in Bingen at Rhine-km 529. Photo Credit: Federal Waterways Engineering and Research Institute. https://commons.wikimedia.org/wiki/File:Niedrigwasser_am_Jungferngrund_im_Rhein_(47374445862).jpg

well-being
demand
metabolism

well-being
demand
metabolism

"It is time to promote a new approach of urban development and introduce a people-centered vision of compact and socially inclusive urban dynamics."

-Kalil Cury FILHO

Image Source: Members of the delegation of Nigeria at the World Urban Forum in Katowice make a stop of the booth of Hungary to discuss their schedule. June 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Directions for a new generation of demand driven urban development models

We hereby call for a new generation of demand-driven urban development models. Digitally enabled human mobility systems could replace traditional infrastructure and zoning policies. So far, they have largely failed to address social demand in most emerging and developing cities. In developed countries, they have otherwise led to a massive and systemic overconsumption of resources such as land or natural resources. Besides, infrastructure finance gaps have grown constantly over the past twenty to thirty years, with crises such as the 2008 Global Financial Crisis or the COVID-19 pandemic hindering local governments' investment capacities. It is time to promote a new approach of urban development and introduce a people-centered vision of compact and socially-inclusive urban dynamics.

Standard mindsets to address urban mobility problems are about creating new infrastructure, modifying or expanding existing networks and adding new modal options to meet the demand. Most cities and even the planned ones, therefore, tend to invest in infrastructure systems that always lag behind rapid demographic growth. The emergence of mega cities brings additional challenges of scale and resources, calling for a new generation of innovative and even disruptive solutions.

The result is that cities have mobility as one of the most critical issues to deal with, including the creation of new avenues and corridors, the limitation of access for vehicles in central areas and the implementation of new models of public transportation such as articulated buses, light rail vehicles, and subways, among others.

On the demand side, urban planners and city managers also make changes in the regulation of land use. Initiatives are taken to avoid traffic peaks, changing the schedule for schools, shops, banks and other public and private services. The regulation of land use and occupation is key to address mobility problems.

All measures seek to expand the offer and quality of public transportation and/or to better organize traffic and mobility. But there are real limitations to implement the solutions envisaged and cost is the most acute one.

Some alternatives are very expensive, such as cost of expropriations, removal of interferences and utilities, and subway

construction, among others. Yet, citizens spend a significant portion of their time on public transportation and/or inside vehicles in traffic jams daily and on long trips, increasing negative aspects like energy consumption, quality of service and air pollution. During the pandemic, mass transportation became a real problem for public health, requiring special care and procedures.

In large cities, due to the cost of living in central areas, a large amount of the population lives in the periphery, far from most services. Many spend a significant part of the day in modes of public transportation. Peripheral areas in big cities do not have important economic activities and quality of life there is typically lower while crime levels are higher. Home office, e-commerce and delivery are growing in importance, and they are part of the solution. However, having more complexity in urban logistics alone is not enough to solve the problem of structural urban inequity.

An innovative approach is to focus on human mobility, instead of urban mobility – putting the citizen as an active actor and trying to reduce drastically the distances and time for travel between home and work, commerce, school or leisure.

Partnerships between public authorities and private companies could create possibilities for citizens to make choices to exchange job positions with similar or new positions in companies and places closer to their homes. There is also the possibility of moving to homes closer to their jobs.

What is suggested here is the co-creation of a public and private program to help local hubs emerge, making it possible for people to be a part of an urban reorganization in a way that home, jobs, services and leisure may become closer to most of the population.

Jaime Lerner, [1] a globally recognized architect and urban planner, three-time Mayor of Curitiba and two-time Governor of Paraná State in Brazil, presented his vision of cities' activities located close to each other, with an inclusive and diverse distribution of population and uses, during Rio+20 (2012). His recommendation was that citizens should live close to work, services and leisure areas. He used the metaphoric figure of a turtle, whose shell has an image very similar to a city distribution and noted that it is an animal that carries its house on its back.

An urban reorganization could be done using digital technology to generate access to data and information about jobs, housing and the market, creating real conditions for people to reduce drastically the quantity and duration of travel, bringing homes and jobs closer and promoting local commerce and services. This creates a neighborly atmosphere, increasing community life and social inclusion.

Many cities already have digital platforms that offer a variety of services to the population, like in Oslo [2, 3] and Hamburg, [4]

and there are enough technical and governance resources to make it possible to adapt these platforms and/or to create new ones to allow the connection between users and activities.

The necessary step to succeed is governmental policy and programs to classify data about citizens, companies, housing and labor market and to allow both companies and users to access the platform, while being open to this innovative and disruptive program, where citizens have an active part in the solution.

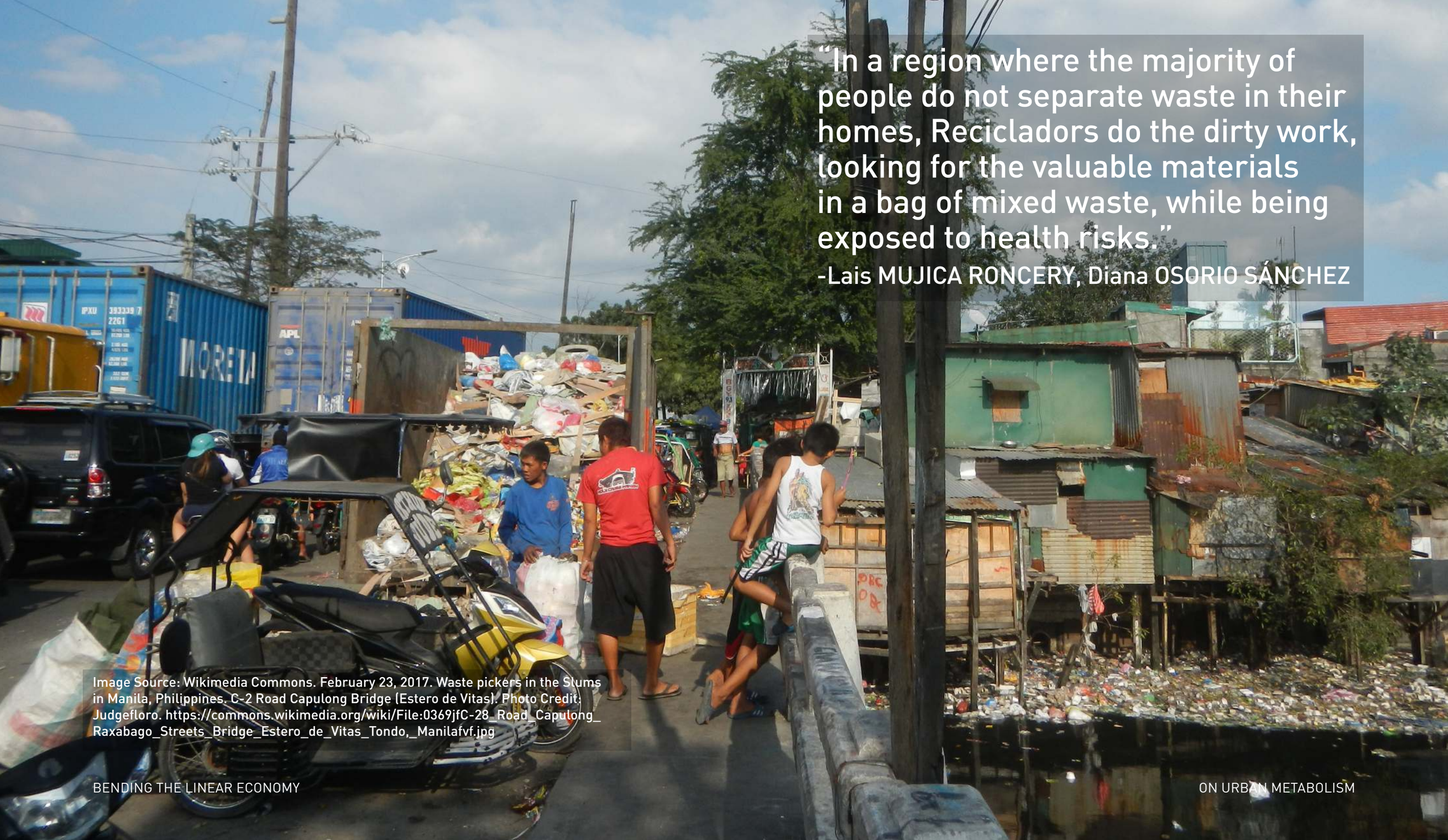
References

1. www.institutojaimelerner.org

2. Oslo as a smart city: www.datek.no

3. Open Data Portals/Nordic Smart City Network: https://nscn.eu

4. www.en.urbandataplatform.hamburg



"In a region where the majority of people do not separate waste in their homes, Recicladors do the dirty work, looking for the valuable materials in a bag of mixed waste, while being exposed to health risks."

-Lais MUJICA RONCERY, Diana OSORIO SÁNCHEZ

Image Source: Wikimedia Commons. February 23, 2017. Waste pickers in the Slums in Manila, Philippines. C-2 Road Capulong Bridge (Estero de Vitas). Photo Credit: Judgefloro. https://commons.wikimedia.org/wiki/File:0369jfC-28_Road_Capulong_Raxabago_Streets_Bridge_Estero_de_Vitas_Tondo,_Manilafvf.jpg

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Social challenges behind recycling in complex cities

In the context of circular economy, recycling is one of the main supporting activities. In urban regions of developed countries, recycling is well structured and makes up part of citizens' daily life. There are labeled and colored collecting bins to separate plastic, paper, glass and organic waste. Citizens check the waste collection schedule and prepare the bins or bags for a specific type of waste to be collected. It can be seen as a routine activity; a habit.

In contrast, recycling in a developing country, such as Colombia, is carried out by the informal sector and is linked to difficult social challenges. In Bogotá, the capital city of Colombia, the job of selecting and collecting recyclable materials is carried out by the Recicladores (recycler or waste pickers). According to the regulatory framework of Colombia, the work of a Reciclador consists of selecting, separating, collecting and transporting recyclable waste.[1] This sector involves three different groups: 1) organized associations recognized by the local governments; 2) unemployed people that have found a temporary job in recycling in order to earn some income; and 3) homeless people.[2,3]

Regardless of whether organized, self-employed or homeless, Recicladores are a vulnerable and heterogeneous group facing various challenges such as extreme poverty, unemployment, lack of primary/secondary education, forced migration due to violence or economic reasons, discrimination, single parents, people with disabilities, elderly people, drug consumers, etc.[2,3] Some people suffer from many of these issues simultaneously; some of them arise one after the other as a chain effect. This population has found in the job of recycling a chance to have an income for subsistence. For many of them, the rudimentary vehicle used as a waste collecting instrument is their home.

It is important to highlight the importance and dignify the job of a Reciclador. We are in debt to recognize the respect they deserve. In a region where the overall population does not separate waste in their homes, Recicladors do the dirty work, looking for valuable materials in a bag of mixed waste, while

being exposed to health risks. Considering that this activity is so important to our planet, why is the responsibility mainly carried by the most vulnerable population in our society? Why is the majority of the citizens not involved?

Here, we identify a deficiency in the recycling culture. So far, the classification of waste at each home is a personal decision. Recent regulations [4] have tried to encourage this practice but they are still not strong enough to permeate through the overall population and waste management schemes of cities. The general population does not know how to recycle or why it is important to do so. Organizations and individuals are generating educational content through social media.[5,6] However, the responsibility of the government is to promote and encourage policies, regulations and mainstream educational content to enable recycling to become a habit in our daily lives. It is also necessary to coordinate work with the waste-management schemes of the cities, involving labeling, schedules, and fees, accompanied by support for innovative awareness-raising materials.

Concerning educational content, a basic understanding of why and how a given material can be recycled, transformed or reused should be distributed. The positive impacts of recycling on our environment should be highlighted. The responsibility of each citizen to carry out this activity should be also be emphasized.

Taking into account the risk factors associated with the job of a Reciclador in our country, in order to improve the quality of living conditions for this population, multiple actions related to the Sustainable Development Goals needs to be taken. For example, formalizing the job of Recicladors may be a step, but as a society we should aim to change the root causes and promote education, peace, fair work, affordable housing, emergency shelter, accompanying programs and networks for vulnerable citizens. Sustainability must be based on better social conditions for our population.

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References

1. Decreto 596 de 2016. Ministerio de Vivienda, Ciudad y Territorio. https://dapre.presidencia.gov.co/normativa/normativa/DECRETO%20596%20DEL%2011%20DE%20ABRIL%20DE%202016.pdf
2. Caracterización Población Recicladora 2020. Unidad Administrativa Especial de Servicios Públicos, Subdirección de Aprovechamiento. Bogotá D.C., 2021. https://www.uaesp.gov.co/sites/default/files/documentos/Caracterizacion%20poblacion%20recicladora%202020%20publicar.pdf
3. Un trabajo que dignifica la ciudad. El reciclador de oficio en Bogotá. Alcaldía Mayor de Bogotá. Secretaría Distrital de Hábitat, Unidad Administrativa Especial de Servicios Públicos – Uaes. Bogotá, 2021. https://www.uaesp.gov.co/sites/default/files/micrositios/aprovechamiento/el_reciclador_de_oficio/El_Reciclador_de_oficio_en_Bogota.pdf
4. Resolución 2184 de 2019. Ministerio de Ambiente y Desarrollo Sostenible. https://www.minambiente.gov.co/wp-content/uploads/2021/08/resolucion-2184-de-2019.pdf
5. https://www.youtube.com/c/MarceLaRecicladora
6. https://bazeroambiental.com/

“Municipal compost facilities turn the challenge into opportunity by helping subsidizing sectors’ cost, rendering the waste into a profitable resource while saving the environment.”

-Mustafa ALJAAR, Rashed ALBATAINEHL

Image Source: At the City Hall of Paris, a meeting to present the municipal community composting project and the now composting units (in the back of the room). Marie de Paris, April 2021. Image by Thierry Sin, https://www.paris.fr/pages/les-utilisateurs-des-lombricomposteurs-sont-satisfaits-17498 , all rights reserved ©.

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Increasing local communities' resilience by implementing circular practices

Jordan, as a developing country, has doubled in population in the last fifteen years to reach 11 million inhabitants as of 2022. Most of the Jordanian population (~90%) is living in urban areas and cities, mainly concentrated in Amman, Zarqa, and Irbid. The increase in urbanization and industrialization in Jordan has led to changing consumer behaviors towards higher living standards and therefore, higher services demand. Jordan's location in a geopolitically unstable region has led to a high influx of refugees in the last 10-15 years from multiple adjacent countries. This rapid population increase has led to an exponential increase in demand for services and multiple infrastructure sectors, such as water and sanitation, solid waste, energy, health, and education. To help relief this pressure on Jordan's infrastructure, international donors have stepped in to fund multiple projects, provide consultations and equipment, and spread awareness. These helped in the increase of resilience in public and municipal services.

The continuous development and the strong relations with countries all over the world and international agencies have helped urban and rural settings in Jordan to overcome this issue to some extent by improving municipal infrastructure. Some technical measures were taken to help, such as improving water and sanitation networks, optimizing MSW fleet and services, private sector participation. This is in addition to the increase in employment and in women's empowerment, as well as the spread of social awareness on the topics of water saving, recycling and sustainability. This has led to i) an increase in water usage efficiency, ii) better management of waste generated, iii) recycling and reusing of materials, iv) efficient energy use, and v) ultimately reducing environmental impacts.

Water and waste are considered as one of the main challenges to be managed by municipalities. This challenge is exacerbated in Jordan which is considered as one of the most water scarce countries with the latest estimations reporting an average of 80 m3 of water per capita. This number further

declines in the Northern region of Jordan which is the most impacted by the influx of refugees. Water supply networks, sanitations system, and solid waste disposal facilities have reached their capacity years before the forecasted critical limits.

Municipal solid waste (MSW) in Jordan is managed mainly by the Ministry of Local Administration (MoLA). Municipalities all around Jordan are responsible for the collection and disposal of the MSW in addition to 21 joint services councils (JSCs). The current MSW collection system covers 90% of urban and 70% of rural areas. AlGhabawi landfill is the only newly established landfill in the last 15 years, being one of the two sanitary landfills in Jordan beside Al-Akaider landfill in the northern region, in addition to 16 unsanitary landfills.

To this date, Jordan lacks full scale separation and recycling facilities. However, 12 pilot projects and facilities were implemented in the last years, mainly supported by the GIZ, that increased the recycling share from 5% to 10%. In Irbid, located in the north of Jordan, a separation and composting pilot facility was funded by the GIZ. This facility helped the local municipality to compost the central fruit market's waste, in addition to the city's agricultural waste. The facility also receives recyclables from major generators in the city such as cardboard and plastics, which are then sold for profit. Such facilities turn the challenge into opportunity by helping to subsidize sectors' cost, rendering the waste into a profitable resource while saving the environment. In Amman, through the cooperation between Greater Amman Municipality (GAM) and the GIZ, a pilot project for separating MSW from source is implemented under the project name "CIRCLE". This project started off by including two districts, with plans to expand to other districts in GAM. It is showing promising results so far.

“After two and a half years of work, we developed 17 interventions; nearly 41,000 m^2 of land were recovered and converted into useful public space; more than 47,000 kilos of reused wood; and hundreds of recovered tires were valued.”

-Ximena GIRALDO MALCA

Image Source: Intervention in the Monserrate neighborhood to restore public spaces, Municipality of Lima with the support of neighbors. August 12, 2019. Photo Credit: ANDINA/Difusión. https://www.andina.pe/agencia/noticia-intervienen-barrio-monserrate-para-recuperar-espacios-publicos-777679.aspx

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From waste to land: the Lima experience of circular public spaces

The circular economy is not just a trend. It is a way of conceiving solutions to the problems that affect the world. In urban centers, one of the main problems is solid waste management. Cities produce domestic, commercial and industrial waste. Although in many places there are treatment systems that, through incineration or other technologies, can partly convert waste into energy, in most parts of the world it ends up in landfills when it is not simply dumped in nature.

While projects and investments are being developed to modernize waste management, it is necessary to motivate actions that allow the use of waste through segregation, upcycling and recycling. In this regard, industrial waste could become a resource to solve urban problems. For instance, in Lima, the project "Limeños al Bicentenario" was initiated by the municipal government based upon the principles of the circular economy in the recovery of public spaces. In 2019, I had the opportunity to lead the Department of City Services and Environmental Management of the Municipality of Lima, the capital of Peru with almost 10 million inhabitants. The number of challenges was enormous, especially due to the economic and operational limitations that subnational governments have. On other hand, people's expectations for a better life and a better city were also pressing.

A recurrent issue people of Lima faced was the lack of public spaces, as Lima has an important deficit of public areas – especially green areas – particularly in the most vulnerable and crowded districts. This is mainly caused by the disorderly growth of the city. In addition, people did not feel safe or happy using existing public spaces (more than 63% expressed displeasure), not to mention that the design of public spaces almost never considered the comfort of children, their caregivers, the elderly and people with disabilities.

Facing the challenge of creating more quality and inclusive public spaces in a short time and with scarce financial resources, we came up with the idea of applying the principles of the circular economy to the development of the city. We combined this with the knowledge developed by the Bernard Van Leer Foundation and Urban 95 to launch the "Limeños al Bicentenario" initiative.[1]

The purpose of the project was to create new public spaces in disused, degraded or underutilized areas that were close to the population. The methodology had a highly participa-

tory approach to ensure sustainability over time. We sought allies from private companies that had industrial waste such as pallets, tires, construction aggregates, paint and bricks, among others, that could be used to create public furniture or to prepare the land.

The wood from the pallets was converted into chairs, benches, tables, ramps, children's games, flower pots and urban gardens. The tires were used for children's games, spatial signage and buffer areas. With the aggregates, soil and other construction waste, volumetric spaces were created on the ground, which were then protected with concrete or vegetation so that young children could exercise motor skills safely. In summary, all the resources were used in the design and implementation of the public space.

After two and a half years of work, we developed 17 interventions. Nearly 41,000 m^2 of land was recovered and converted into useful public space; more than 47,000 kilos of reused wood, and hundreds of recovered tires were valued. Around 85,753 people benefited from the project, and we had 600 active neighbors committed to the maintenance of the recovered areas and the urban gardens.

This practice had several interesting outcomes. At the municipal management level, it was demonstrated that a quick and effective response could be given to people's demands while, at the same time, more comprehensive interventions could be designed following the traditional form of public investment and infrastructure. This also generates the benefit of gaining the community's willingness to change as they would subsequently receive that public investment.

Another outcome is the change in the behavior of the beneficiaries of the spaces. Being involved throughout the process generates a commitment to care and maintain. In addition, observing that the space is recovered with easily accessible resources awakens in them the desire to make and create their own furniture or improve the conditions of their homes using the same recovered materials. In addition, the neighbors have learned through basic carpentry classes how to repair public furniture so that if it is damaged, they do not have to wait for the municipality to come and fix it. This generates autonomy in community management.

At last, the initiative has been the community's appropriation of the green areas, mainly the urban gardens. The community received training in composting techniques, seed recovery and organic farming. The circularity of organic waste was applied here. The result has not only been the generation of hundreds of kilos of fresh vegetables, but above all, the awareness of the community about urban food security.

In conclusion, the experience has demonstrated that concrete actions can be taken to apply circular economy theory in an urban environment. This kind of experience has been especially valued in areas with fewer economic resources. But the most valuable thing is that it activates the practical

action of different stakeholders such as citizens, companies and the government, in the search for better urban environments while relying on options of circularity and sustainability.

References

1. Urban 95 is an initiative led by the Bernard van Leer Foundation and aiming at “creating healthy, safe and vibrant cities where babies, toddlers and their families thrive.”

Bernard Van Leer Foundation (2019). The City at Eye Level for Kids. URL: The City at Eye Level for Kids - Bernard van Leer Foundation

Instituto Metropolitano de Planificación (2021). Análisis Físico Espacial. URL: https://www.imp.gob.pe/wp-content/uploads/2021/02/AN%C3%81LISIS-F%C3%8DSICO-ESPACIAL.pdf

Lima Como Vamos (2019) Lima y Callao según sus ciudadanos. Décimos Informe Urbano de Percepción sobre Calidad de Vida en la Ciudad. URL: https://www.limacomovamos.org/wp-content/uploads/2019/11/Encuesta-2019_web.pdf

Ojo Público (2021) Cartografía de la Desigualdad. URL: https://ojo-publico.com/especiales/cartografia-de-la-desigualdad/index.html

Muñoz, J.; Giraldo, X.; Garaycochea, M.; Vega, C. (2021) Reclaiming green space in Lima. Early Childhood Matters 2021. Bernard Van Leer Foundation. Pag 56-58. URL: https://earlychildhoodmatters.online/2021/reclaiming-green-space-in-lima/

"The water flow of Delhi, particularly that related to the Yamuna, is a clear indication of the city's illness. It directs policymakers towards the many layers that influence water use, and towards the fact that these layers aren't circular."

-Anshula TIWARI

Image Source: Wikimedia Commons. August 4, 2016. Yamunna river, India.
Photo Credit: Shyamal. https://commons.wikimedia.org/wiki/File:Chandigarh_river.jpg

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Unquiet flows the river: Inequalities along the Yamuna

Understanding the complex and ever-evolving city of Delhi is something thousands of people dedicate their lives to. It is a city that is so intertwined that its people, flora-fauna, earth systems and history form one complicated organism, seemingly impossible to unravel. This complexity is what makes the city beautiful and dynamic, but it is also what acts as its biggest foe. This is because Delhi is not functioning optimally as an organism; it is in fact seriously ill. One key indicator of this ill-health is the heavily polluted state of Delhi's primary water source, the Yamuna River, or the 'dying river'. Every year, the sight of a frothy, drain-like stream is commonplace and something that thousands of Delhi residents helplessly see (and smell) on their daily commute to work.

Scholars have divided its 1,376-kilometre course into 5 segments, namely, the Himalayan segment (172 kilometers), Upper Segment (224 kilometers), Delhi Segment (22 kilometers) Eutrophicated Segment (490 kilometers) and Diluted Segment (468 kilometers).[1] The Eutrophicated Segment, as the name suggests, is one in which the river is so polluted that it barely has any oxygen left to support aquatic life. And it is no coincidence that it assumes this state only after it leaves Delhi. There are several reasons available to explain the deplorable condition of Yamuna: untreated sewage, industrial effluents, the dumping of garbage, open sewage drains, lack of sufficient sewage treatment plants, soil erosion, dead bodies, immersion of idols, aesthetic activities and pollution due to in-stream uses of water. It is a sad state of affairs that the water source for a city of 18.6 million people is so heavily compromised. Yamuna is responsible for 724 million cubic meters (mcm) of the total water requirement of Delhi, which stands around 1150.2 mcm.[2] Other sources include the Ganges and Bhakra storage. Annual rain in the city averages at 612 mm, and aids the recharge of groundwater and surface waterbodies such as small lakes and ponds. Out of the total water supplied to Delhi, 20% is consumed and the rest flows back into the Yamuna – treated or untreated.[3]

At the entrance of Delhi, Yamuna's water is diverted via the Wazirabad Barrage for agricultural and industrial purposes. It is 500 meters from this barrage that the river meets its biggest and most polluting drain, the Najafgarh drain. With a load of 76.47 tons per day (TBD), its Biological Oxygen Demand (BOD) stands at 31.82% of the total BOD load of the 25 drains that crisscross the city.[4] The contributions of these drains are evidenced by the darker color the water assumes thereon. The Okhla barrage marks the end of its journey

through the city, from where it flows into the state of Uttar Pradesh.

Delhi consumes water more than what is naturally available to the city. This the case with almost all mega-cities. However, one unique aspect about Delhi is the social dimension related to Yamuna's pollution. India is known for its festivals, and, as a miniature India, Delhi celebrates all major festivals across all religions. Some of them such as Ganesh Chaturthi, Saraswati Puja and Chhat, require devotees to immerse idols of their gods and goddesses in water. Unsurprisingly, Yamuna becomes the natural choice for this. These idols, being made of Plaster of Paris and colored with toxic paints, end up polluting the river even further.

The social factors behind water use brings us to another crucial consideration: who gets water, and who does not. Urban planning in the city has not been able to control unauthorized development such as irregular colonies, slums, urban villages, etc. Water distribution in Delhi is the responsibility of the Delhi Jal Board, but those in unplanned settlements do not have access to it. Neither is their waste disposal connected to sewage treatment plants, which is why it flows untreated into the river. This general absence of basic amenities forces them to live in ways entirely different from middle and upper-class standards of environmentalism; by clearing commons, cooking with fuel, defecating in the open and relying on groundwater.

Groundwater is another aspect related to the water flow cycle of the city. It is heavily overused, with the number of private tube wells ranging from 200,000-360,000.[5] The aquifers are recharged from rainfall, canal seepage, irrigation, return-flow and water bodies. With most of these sources already being polluted, the artificial recharge of Delhi's groundwater is also largely contaminated.

Moving closer to the Yamuna, 46,750 people live on its floodplains. These households have been continually evicted from their homes in the name of 'ecological rejuvenation', although there have not been substantial gains on that front for decades. They have been barred from farming – their generational means of livelihood – for no fault of their own, but due to the state of the river caused by industrial waste and over-consumption by those richer than them. Additionally, this section of the population, along with migrants, beggars and those in unauthorized settlements, do not readily factor into water-related policy decision making.

In conclusion, the water flow of Delhi, particularly that related to the Yamuna, is a clear indication of the city's illness. The flow will direct policymakers towards the many layers that influence water use, and towards the fact that these layers aren't circular. Lastly, it is important to recognize that if Delhi is a diseased organism, then its water flow acts as its veins: crucial, delicate and as complex as the city itself.

References

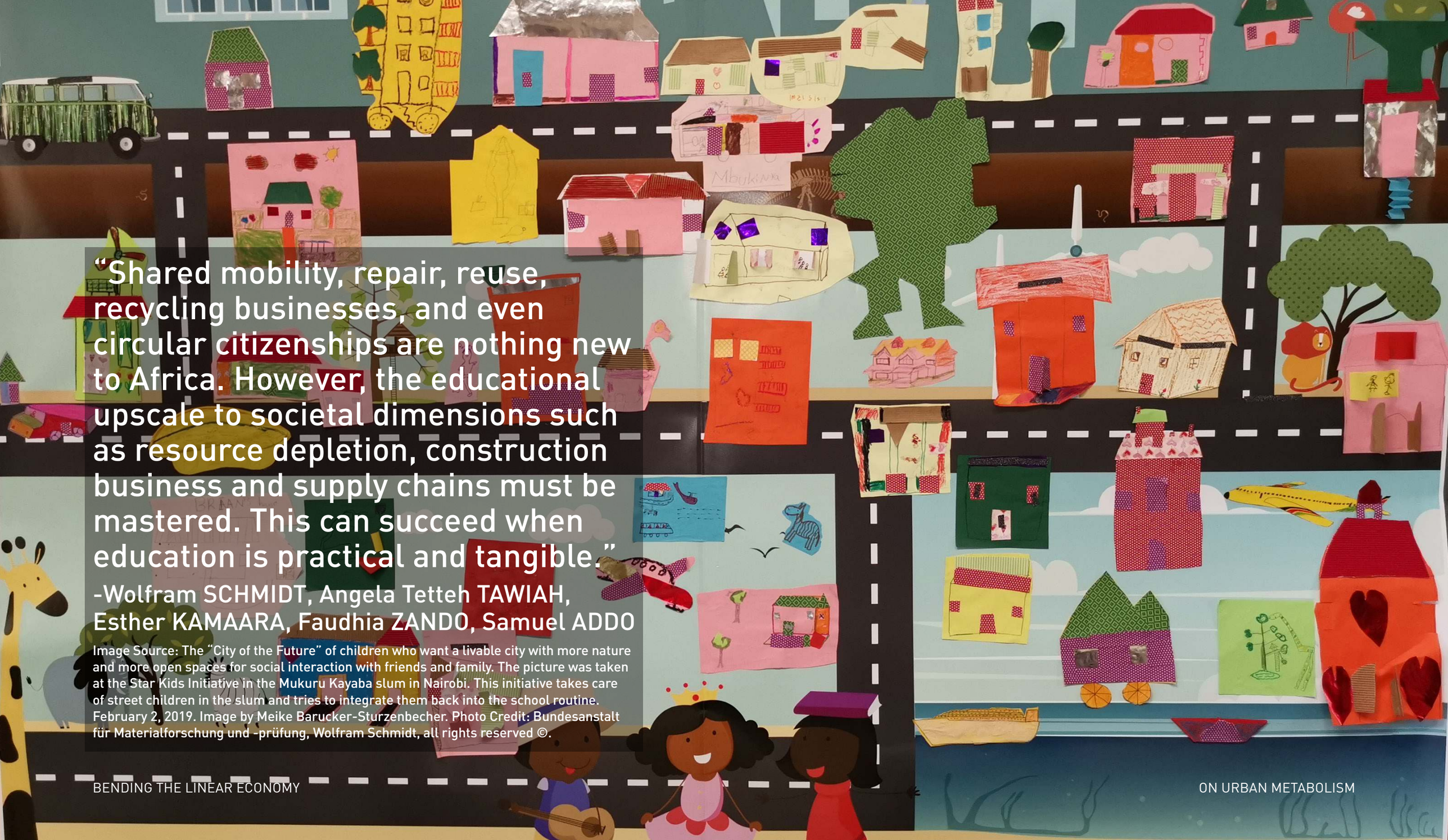
1. Sandeep Arya, Sanjay Das, and Aisha Sultana, 'Assessment and Impact of Industrial Effluents on River Yamuna Ecosystem', International Journal of Current Research 7, no. 9 (2015): 19956–63.

2. Sharma Deepshikha and Arun Kansal, 'Current Condition of the Yamuna River - an Overview of Flow, Pollution Load and Human Use', TERI University, n.d.

3. D Kumar, 'What Are the Causes of Pollution of River Yamuna (India)?', Shareyouressays.com, accessed 4 March 2022, https://www.shareyouressays.com/knowledge/what-are-the-causes-of-pollution-of-river-yamuna-india/111985

4. Rahul Upadhyay, Niladri Dasgupta, and Aziz Hasan, 'Managing Water Quality of River Yamuna in NCR Delhi', Physics and Chemistry of the Earth 36 (2011): 372–78.

5. Augustin Maria, 'Role of Groundwater in Delhi's Water Supply', Urban Groundwater Management and Sustainability 459–470 (2006): 459–71.



“Shared mobility, repair, reuse, recycling businesses, and even circular citizenships are nothing new to Africa. However, the educational upscale to societal dimensions such as resource depletion, construction business and supply chains must be mastered. This can succeed when education is practical and tangible.”

-Wolfram SCHMIDT, Angela Tetteh TAWIAH, Esther KAMAARA, Faudhia ZANDO, Samuel ADDO

Image Source: The “City of the Future” of children who want a livable city with more nature and more open spaces for social interaction with friends and family. The picture was taken at the Star Kids Initiative in the Mukuru Kayaba slum in Nairobi. This initiative takes care of street children in the slum and tries to integrate them back into the school routine. February 2, 2019. Image by Meike Barucker-Sturzenbecher. Photo Credit: Bundesanstalt für Materialforschung und -prüfung, Wolfram Schmidt, all rights reserved ©.

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The subtle power of children to accelerate circular urban construction innovation

To date, Africa's contribution to the overall global carbon emissions is marginal in comparison to Europe or the United States.[1] Thus, Africa's future sustainable growth can start from an offset position with the lowest carbon emissions in the world. In return, the predicted rapid urban growth causes enormous pressure to effectively limit the energy demand and materials required.

Many technologies have been developed to cut down energy demand, which can be implemented in African cities already, thus, contributing to decreasing operational resource demand. The bigger challenge is the inevitable materials requirement. There is no technical solution to it. The only way to build rapidly without exceeding available resources is to radically apply circular, local, and sustainable concepts to materials and construction supply chains.

Circularity has always been a natural concept of humanity when resources are scarce. In overconsuming regions, such as Europe, this concept is only now being rediscovered in the light of climate change. But it has always been a permanent part of African lives. Shared mobility, celebrated as an innovation in Europe today, has been normal in Africa. Repair, reuse and recycling businesses are ubiquitous with a high inclusion of the informal sector, which cannot afford to waste any resource. And even circular citizenships, which are conceptually discussed among policy makers in Europe, are nothing new to Africa. Resources and habitat have always been shared among generations, depending upon the given boundaries and demands.

With the inherent African circularity mindset as a baseline, rapid urban growth challenges can be converted to potentials for a green African innovation. Vernacular technologies and concrete based on regional resources have enormous circularity potentials. The latter is the most viable urban solution due to its low carbon footprint in comparison to other mass materials and its capacity to meet demand everywhere in the world. In conjunction with alternative cementitious constituents, such as calcined clays or agricultural ashes, concrete can become significantly less carbon intensive and enormous local and circular livelihood potentials can be generated.[1]

Yet, these technologies are not implemented because old-school knowledge and application rules are passed on from senior experts to junior experts. However, this teaching-learning cycle does not bring upon the urgently required circular innovation. Thus, it is worthwhile to change the perspective and consider children as possible stimuli to change the minds of senior decision makers. In the past children have been deemed incomplete due to their perpetual state of becoming. This means that their voices in finding solutions to problems have been excluded. However, in the recent past, the world has witnessed the rise of young changemakers such as Greta Thunberg, Malala Yousafzai, and Zulaikha Patel, who are climate justice, girl's education and anti-racism activists, respectively.

While these are few unique role models with wide influence, we should not underestimate the change acceleration capacity of children on a home-based front. Here, children's agentic power is more subtle. It manifests through their open and honest communication and reports on what concerns them. A simple question such as, "Why do we throw cassava peels away when we can also make cement out of it?",[2] could unconsciously urge parents and family members to reflect on ideas that were previously not considered. In the extended African family framework, such passive influence could even have a wider impact.

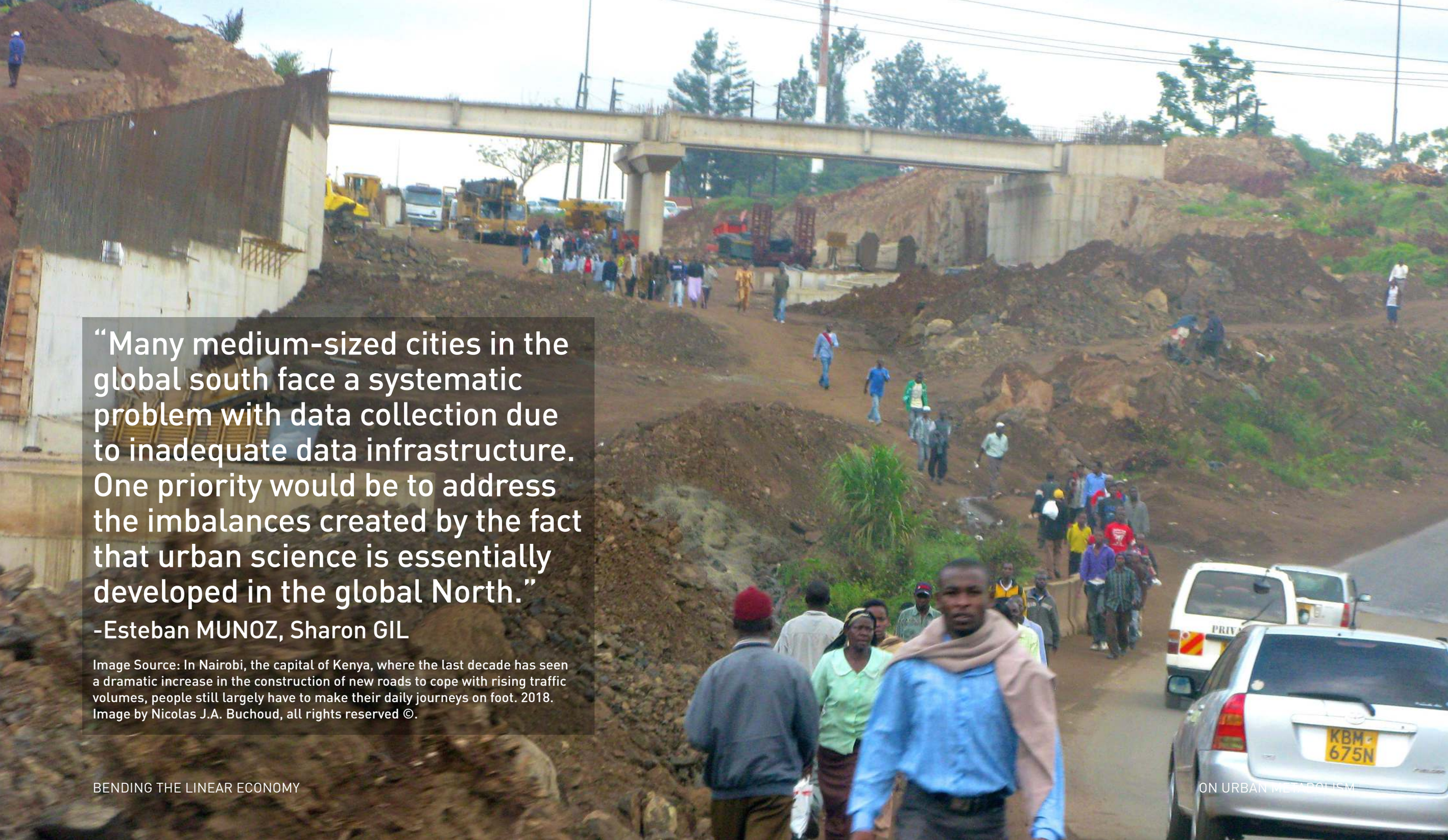
Principles of circularity are not new for children in Africa. Experiences gathered from interaction with children from neglected informal urban settlements, such as Jamestown and Mukuru Kayaba, as well as more rural environments,

such as Bagamoyo, on sustainability goals and climate friendly construction materials have shown that principles of reusing, recycling, sharing and re-engineering are inherently part of their mindsets. However, the awareness of societal dimensions such as resource depletion, construction business models and supply chains must be mastered. This can succeed when education is practical and tangible. Governments and policy makers, thus, need to support accelerator initiatives such as science kits, pilot projects, educational playgrounds or construction sites, and innovation competitions for children.

References

1. W. Schmidt et al., “Sustainable circular value chains: From rural waste to feasible urban construction materials solutions,” Developments in the Built Environment, vol. 6, p. 100047, 2021/05/01/ 2021, doi: https://doi.org/10.1016/j.dibe.2021.100047

2. W. Schmidt and M. J. Barucker-Sturzenbecher, “Bio-based concrete (https://vimeo.com/310549146),” ed. Berlin, 2019, p. 7:51.



"Many medium-sized cities in the global south face a systematic problem with data collection due to inadequate data infrastructure. One priority would be to address the imbalances created by the fact that urban science is essentially developed in the global North."

-Esteban MUNOZ, Sharon GIL

Image Source: In Nairobi, the capital of Kenya, where the last decade has seen a dramatic increase in the construction of new roads to cope with rising traffic volumes, people still largely have to make their daily journeys on foot. 2018. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Accelerating the transition to a circular economy through the creation of local jobs

The United Nations Environment Programme (UNEP), together with partners Circle Economy and ICLEI Local Governments for Sustainability, is developing a tool for the quantification of Circular Economy (CE) at a city level to support local economic transformation towards circularity. The proposed tool focuses on local employment, putting the human aspect of the circular economy transition at the forefront of the discussion. A focused discussion around the number of local jobs and those "un-employed" also forces decision-makers to acknowledge who could be most affected by a circular economy transition.

A collaboration between Brussels, UNEP, the World Council on City Data, and Ecocity Builders[1] highlighted the need to ensure that existing socio-economic inequalities are mirrored in tools dealing with the monitoring of the circular economy transition.

There is a global demand for the adoption of appropriate tools to measure and monitor the transitions toward Circular Economy.[2,3,4,5,6] Local level applications of Circular Economy occurred primarily in the informal sector and waste management[7]. Possible applications at the city level are gaining ground only recently, creating the need for a measure mechanism that works well at a local level as well.

The work of UNEP acknowledges that many medium-sized cities in the global south face a systematic problem with data collection and, consequently, in the adoption of urban metabolism approaches. It is, however, in these places (i.e. urban agglomerations with the highest population growth rates are medium and small cities often with a population lower than 1 million)[8] where change needs to happen.

UNEP advocates for and has developed ways to reduce required input data, ensuring accessibility to more cities. This will break the cycle of systematic-bias of urban-science toward large agglomerations of the global north.[9] The method developed by UNEP and partners classifies local jobs by its circularity index. This methodology proposes the use of a national level input-output table (MRIO) and an extract of the labor force survey for the construction of a city-level circularity measure.

This measure is computed by combining both datasets and quantified as the number of local circular jobs in the city. The main advantage of this approach is that both required datasets are available in most cities around the globe – it is important to include cities with a low data infrastructure.[10]

With this method, we have collected and processed data for more than 140 cities. The results of this endeavor can be accessed via circular-jobs.world. The tool is able to identify top circular sectors within the city by quantifying the potential of economic sectors to create circular jobs. The tool also highlights challenges that the city faces to accelerate the transition to a circular economy.

It is essential that a transition to a circular economy is a just one. Monitoring the transition at a low level of geographical, sectoral and strata aggregation has the potential to be the ideal mix to monitor the just circular economy transition. Such a monitoring framework directly contributes to international agreements such as the Sustainable Development Goals (SDGs) and the New Urban Agenda.

References

1. UNEP (2019). Brussels Capital Region: Circular Economy. Technical Report, United Nations Environment Programme, Nairobi.

2. Jacobi, N., Haas, W., Wiedenhofer, D., and Mayer, A. (2018). Providing an economy-wide monitoring framework for the circular economy in austria: status quo and challenges. Resour. Conserv. Recycling 137, 156–166. doi: 10.1016/j.resconrec.2018.05.022

3. Kalmykova, Y., Sadagopan, M., and Rosado, L. (2018). Circular economy from review of theories and practices to development of implementation tools. Resour. Conserv. Recycling 135, 190–201. doi: 10.1016/j.resconrec.2017.10.034

4. Arruda, E. H., Melatto, R. A. P. B., Levy, W., and de Melo Conti, D. (2021). Circular economy: a brief literature review (2015–2020). Sustain. Oper. Comput. 2, 79–86. doi: 10.1016/j.susoc.2021.05.001

5. Martinho, V. J. P. D. (2021). Insights into circular economy indicators: Emphasizing dimensions of sustainability. Environ. Sustain. Indicators 10, 100119. doi: 10.1016/j.indic.2021.100119

6. Papageorgiou, A., Henrysson, M., Nuur, C., Sinha, R., Sundberg, C., and Vanhuyse, F. (2021). Mapping and assessing indicator-based frameworks for monitoring circular economy development at the city-level. Sustain. Cities Soc. 75, 103378. doi: 10.1016/j.scs.2021.103378

7. Vanhuyse, F., Fejzi, E., Ddiba, D., and Henrysson, M. (2021). The lack of social impact considerations in transitioning towards urban circular economies: a scoping review. Sustain. Cities Soc. 75, 103394. doi: 10.1016/j.scs.2021.103394

8. UN (2015). World Urbanization Prospects: The 2014 Revision: (ST/ESA/SER.A/366). Technical Report, United Nations, New York, NY.

9. Creutzig, F., Lohrey, S., Bai, X., Baklanov, A., Dawson, R., Dhakal, S., et al. (2019). Upscaling urban data science for global climate solutions. Glob. Sustain. 2:e2. doi: 10.1017/sus.2018.16

10. Muñoz H, M. E., Novak, M., Gil, S., Dufourmont, J., Goodwin, E., Confiado, A., & Nelemans, M. (2021). Tracking a Circular Economy TransitionThrough Jobs: Method Developmentand Application in Two Cities. Front. Sustain. Cities, 3. https://doi.org/10.3389/frsc.2021.787076

"The aim is to develop circular and regenerative cities through enabling active citizen involvement and systemic change to re-think the current approach to material flows in cities."

-Andra TANASE

Image Source: Wikimedia Commons. March 6, 2021. Open Data Day Taiwan 2021 is the celebration event of the International Open Data Day in Taiwan, and in this year's agenda, our topic to focus primarily on is "Open River Data". Photo Credit: Isocyclo. https://commons.wikimedia.org/wiki/File:Open_Data_Day_Taiwan_2021_Taipei_36.jpg

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The energy circularity challenge of Cluj-Napoca and how to out-innovate the „Two-Speed Europe"

Working on innovative solutions for the transition to circular economy, SMART city, and energy efficiency are not only buzz concepts but also imperatives in our time. What makes these processes truly innovative in the context of Eastern Europe? How can a two-speed Europe be overcome? What can be the differentiating factor that brings true ownership and real relevance to the context? The experience of the REFLOW project sheds light and formulates possible conclusions to these questions as well as provides insights on the experience of this highly ambitious project. Issues such as the role of service providers in urban transformations, turning challenges into opportunities in urban infrastructures, points of entry in changing consumer behavior and understanding flows of materials are different viewpoints from which the above questions will be approached. While circular economy and energy efficiency represent hot topics in policy making and are on the agendas of civil society and local authorities, the angle from which these topics are tackled define the complexity and the quality of the efforts put in. The fact that circular economy is a policy priority for the EU, marking its commitment to a sustainable future, is now clear in terms of EU discourse and policy provisions, and urban strategies across Europe. However, how this is done, how participative it is, and awareness of local contexts are still to be proven. Looking at the case of Eastern European countries, considered to be the low performers on circularity, there is a need to rethink interventions. Due to the previous "innovative" practices of the industrial and educational sectors during Communism, the current circular practices are often met with the sarcastic remarks such as, "Do you know how green we were during Communism?" or, "We were zero-waste, as we had rationed milk, bread and butter." Hence, just bringing up the rhetoric of circular economy into Eastern Europe does not work. We look to the experience of the Municipality of Cluj-Napoca, ARIES Transylvania and the National Institute for Research and Development of Isotopic and Molecular Technologies (INCDTIM), as partners and representatives of the Cluj Pilot of the REFLOW project, to suggest what might work.

The REFLOW project is one of the flagship projects of the EU's Horizon 2020 program. Gathering a consortium of over 40 partners "The REFLOW project aims to develop circular and regenerative cities through enabling active citizen involvement and systemic change to re-think the current approach to material flows in cities. The project utilizes Fab Labs and maker spaces as catalysts for change in urban

and peri-urban environments." [1] REFLOW attempts to work at the intersection of policy/governance work, business practices, research and academia contributions and citizen's engagement in order to propose circular urban metabolisms along these lines. The work is piloted in 6 cities (Amsterdam, Berlin, Cluj-Napoca, Milan, Paris, Vejle) and the impact is assessed at social, environmental and economic levels. Each pilot city focuses on a different material flow (plastics, food, textiles, wastewater, energy etc.) and the governance models, business models and inputs into the common open data platform.

In this context, the Cluj-Napoca pilot focused on energy efficiency. It was a challenging task as energy is a delicate "material" to track and trace for circularity. Yet, it is very relevant for the priorities of the municipality given the energy crisis and current war in Ukraine. The Cluj-Napoca pilot worked on three main aspects. First on technological innovations, second on awareness raising and education, and third on policy infrastructure. This approach was needed because direct tech solutions are futile without the value-system in place and the policy infrastructure. As a technological innovation, the partner institutions installed a RETROFIT Kit (hardware and software component) on the site of the Energetic College of Cluj Napoca, to trace energy flows and to design options for efficiency and circularity. Furthermore, the INCDTIM team developed an integrated renewable energies tree (wind, solar and electromagnetic waves) with the perspective of having it as a public utility installation. To raise awareness and as part of the education component, we organized several round tables and workshops, and created learning materials to be included in an MA course. And finally, we gave constant input on local and regional policies, including circular economy in the Integrated Development Plan of Cluj Napoca. Thanks to the REFLOW project, Cluj-Napoca is now included in the '100 climate-neutral cities challenge' of the EU.

The biggest challenge was the pandemic that significantly reduced the possibilities for knowledge exchange and networking. And this increased the risk of a one-size-fits-all solution or imported solutions from Western Europe. Another challenge was dealing with a highly centralized energy provider system in Cluj Napoca. A third challenge was the low awareness about the importance and profitability of circular business models. We worked in our pilot project with companies, and eventually managed to define together the opportunities for new business models. The transition to a circular model is for sure not finalized, but the sustainable energy models are now part of the initiatives in Cluj-Napoca. A two-speed Europe is an expression that cannot reflect a truly circular mindset. "Increasingly we are acknowledging that people (and their technologies) are just as much part of our 'ecologies' as are nature and the physical features of our planet," Michiel Schwarz, A Sustainist Lexicon.

1. https://reflowproject.eu/about/
2. https://reflowproject.eu/wp-content/uploads/2020/06/Reflow_Whitepaper.pdf

"We need to start thinking in terms of systems and not applying a project-based rationale, and we need to change today."

-Mihai TOADER-PASTI

Image Source: In Paris in the spring of 2022, at the time of the presidential election campaign, a small, peaceful citizen demonstration against global warming and the destruction of biodiversity is surrounded on its way through the streets by heavily armed anti-terrorist units. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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The social network(s) of building the circular economy

The forgotten art of the circular economy: We have had the circular economy model applied for thousands of years. With the 3rd industrial revolution to address rapid urbanization and consumption, we sacrificed circularity for speed, which was in turn driven by the pursuit of abundance, becoming more and more dependent on the fast and unsustainable economy.

The fast-track to (re)building circular economy in cities: Putting the economy on steroids had a compounding negative effect on nature, resources and people. Therefore, we now have to pay the bill and start reversing the trend at scale. Luckily, digitalization, democratization of knowledge and access to finance provide the tools necessary to create this new world, but it is up to us to move and not wait anymore.

Cities are an organism where one part's pain has ripple effects on others: The reason cities have attracted so many people and surface is because this is where the biggest, vastest and most diverse intersections take place, creating a continuous flow of knowledge and ideas, better access to education, offering better health care and social services, providing more safety and access to opportunities and growth, and so on. In the last century rapid unplanned urbanization set people and cities into a complicated relationship, but there is still hope. We need both good counsel and commitment from both parties to make it work.

Not all economies were created equal: Technically speaking, transition in some industries is easier to achieve (e.g. food) than others (e.g. construction or technology) because of source location of raw materials and their post-use lifecycle created by all the high-tech processes. On the other hand, people have a special emotional relationship with food, making it way harder to find an alternative to bananas or meat, for example.

The love story of people, products and services: It is very complicated to give an overall score in terms of circular economy and sustainability performance as the direct and indirect impact is so vast in terms of scope, space and time. Deciding based on local priorities is limited as there are consumers living in another part of the world than where the production takes place; there are also other problems in their localities. We must stop unconscious consumption.

Even though consumption is now made easy, we have to change the relationship we have with products, services and people across industries.

Remote work could be the catalyst of change for hybrid settlements: Historically, you could not be a supporter of both the urban and the rural, but nowadays you do not have to choose anymore and are able to be wherever you want while being equally productive. This will not only dramatically improve the flows of materials and energies outside cities, creating more intersections between urban and rural areas, but also improve the flow of knowledge, creativity and ideas. Diversity is critical for a population to adapt to changing environments, thus, this is what's needed for our cities – to better intersect urban and rural areas in order to make cities and villages liveable again, and to find the right balance.

Changing players' behavior – unlearn in order to relearn: In order to save cities and their economies, people need to visit rural areas and understand what they have missed so that they can create a stronger bond with the scenery that exists outside the city boundaries. As in Plato's Cave allegory, WeWilder.com can be the light of fire and sun that frees a person, a group and, eventually, cities. WeWilder is an ecosystem of change in Romania that empowers the local circular economy to influence the life of visitors through immersive experiences in nature and local life, showing everyone how they can live sustainably and be happier.

Setting the ground for decentralized change-making: There is a sweet spot and the right quantity of frustration that drives the creation of a changemaker. Too much or too little can paralyze change. We need plenty of grassroots project-based proof of concepts that work and can feasibly be scaled. One of them is intreVecini.ro (between neighbors) where sustainable communities are created in the neighborhood by bringing people together. Photovoltaic panels are introduced in the block of flats to start the discussion about energy. The project creates an actual and metaphorical garden, to kick start the discussion about e.g., food. In parallel, this is transferred and scaled up in other blocks, cities, and parts of the world as everything will be open source.

City scale project-based co-creation initiatives: To compensate for the high risk of overlapping in decentralized change-making, an organization or a framework to bring everyone together is needed. It is not necessary to provide money, which can create complications, but to act more as a group therapist that glues all the initiatives in the same direction, strategically. Decentralized actions but coordinated efforts is the key to change urban and rural settlements from bottom up.

Cities, an offline social network with hugs, without likes: We used to complain about the use of social media among young people, but now it has become a problem regardless of age. It is easy to blame technology or people, but it is

harder to acknowledge that cities used to be the ‘social media’ that people enjoyed in the past before everyone started searching for a better alternative and ended up with the ‘internet’.

Creating an infinite group of courageous thinkers and doers that test ideas and scale initiatives, that try other approaches and engages everyone, that apply bottom-up, top-down, horizontal and vertical approaches across industries and poles of power is of paramount importance. If everyone is in the same team, having various roles and different commitments, there is less fighting to be addressed and more impact to be achieved.

We need to start thinking in terms of systems and not apply a project-based rationale. We need to change today.

“If the materials that are being reused through the circular economy do not necessarily help mitigate broader relations of inequity among communities, should these processes still be categorized as being constitutive of the circular economy?”

-Gökçe GÜNEL

Image Source: The development of Riyadh, the capital of the Kingdom of Saudi Arabia, now includes major investments in public transportation to offset a car-oriented, resource-consumption-intensive (including land) growth model. 2020.

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On status quo utopia, technocratic dictatorship, and constitutive processes of the circular economy

Gunnar Hartmann (GH): The urban development plan for Masdar City was to be a tabula rasa city built from scratch. In hindsight, the Masdar initiative remained the development of a vision with an overemphasis on innovation. How long do you think we will continue to talk about "smart cities" when what we need are smart citizens?

GG: Yes, I think you are right in pointing out that Masdar City overemphasized innovation. I see Masdar City as a "status quo utopia", which aims at keeping existing social, political, and economic relations intact in a bounded environment, offering stability against the disruptive consequences of climate change. Decision-makers in Abu Dhabi, who were the proponents of this status quo utopia, in some ways recognized the precariousness and fragility of contemporary social, political, and economic relations, and acknowledged the overwhelming impact of climate change and possible energy scarcity. In this sense, they neither took the present order for granted nor did they interrogate its validity and legitimacy. Masdar City served as an indicator of the possibility of an everyday life structured around specific technical adjustments, refusing to be subordinated to the effects of climate change.

Given this overemphasis on innovation, perhaps one way of reading the question you pose about the transition from smart cities to smart citizens is about broader conceptions of climate change. Could we think about climate change as a political problem rather than as a technical problem? If we saw climate change as a political problem, what kinds of projects would we undertake that would address the needs of a diverse range of humans and nonhumans? At Masdar, scientists argue that they were building a "technocratic dictatorship" and believed that we had to give up various political rights in order to be able to abate the impacts of climate change. But a technocratic dictatorship like Masdar ultimately produces and legitimizes exclusions based on religious affiliation, gender, race, ethnicity or class background, strengthening boundaries. For instance, while

working class immigrants in the United Arab Emirates may not deserve to be protected by this technocratic dictatorship, highly skilled engineers become critical to the emergence of this future. Instead of building technocratic dictatorships that justify exclusions, we must come up with climate change mitigation scenarios that challenge these exclusions.

GH: If Masdar has exhausted its closed-system concept, doesn't the circular economy's holistic approach propose the exact opposite? While Masdar City has firmly defined a boundary, circular economy business models must transcend existing regional as well as national boundaries. Who should steer such processes? What is your view?

GG: Maybe I can respond by thinking specifically about electricity infrastructure. In the early 2000s, conversations on energy and climate change focused on the dichotomy between decentralization and centralization. For instance, while Masdar City was an example of a decentralized project, wherein one set of buildings could satisfy its electricity needs without relying on the grid, DESERTEC, a project that aimed at building giant solar thermal power stations in the Sahara to support electricity consumption in Europe, stood in for the efficacy of large centralized networks that would allow cooperation across borders. Neither of these projects fulfilled their goals as planned. Masdar City is currently part of a grid that stretches across the Arabian Peninsula. DESERTEC never took off, but nevertheless facilitated further investments in renewable energy in North Africa, particularly in Morocco. These two examples show how the binary between centralization and decentralization might be something we need to rethink. Perhaps the most effective models will rely on a mix of solutions, using both closed systems and holistic approaches.

GH: From your experience, what practices could drive the circular economy?

GG: We think of the circular economy as a process of investing in materials that are less resource intensive, eliminating waste and pollution, and reusing what might conventionally be considered waste as a resource in manufacturing new materials. It is a process that requires collaboration among communities of producers and users and will build on new conversations that emerge between groups that might otherwise be conceptualized as separate entities. Perhaps it is important to ask if the circular economy, as a concept, is nimble enough to operate at multiple scales. What would a neighborhood-focused circular economy model look like, for instance? Or could we think of urban initiatives like C40 Cities as possible drivers of the circular economy, which might test the concept in different contexts? Given the kinds of supply chain problems we are observing in the world today, this question becomes even more significant.

GH: Yes, but isn't the market-economy based on such a separation between producer and consumer, and does

narrowing the gap between the two, to some extent, call into question the function and role of the market? In other words: Will we see new types of markets rising, at least for certain activities?

GG: That's a great question. Yes, I think we are already observing new types of markets emerge. Some of these transformations parallel the rise of new technologies such as electric vehicles and rooftop solar panels, where consumers of electricity also begin to serve as producers for a grid. At Masdar City, scientists collaborated on the "ergos" project, and imagined that future inhabitants of the eco-city could be issued a balance of energy credits as a means of defining and regulating an allocated energy budget. Through individual monitoring and regulation, "ergos" aimed at decreasing the energy consumption of Masdar City's residents. Accounts would be filled with energy credits at the beginning of each validity period and diminished or increased to commensurate with the user's practices. These scientists believed that "ergos" could take root as an energy currency, and could one day replace the UAE's national currency Dirham. "Ergos" would offer a correction to the monetary system and serve as a means for helping humanity in confronting energy and climate challenges.

If we take a broader look at exchange relations beyond electricity production and consumption, one important example that comes to mind is mutual aid networks. Could we see mutual aid networks that allow crowdsourcing and facilitate broad grassroots support for people's material needs as examples of the circular economy in action? Perhaps new forms of markets will prioritize such collective action, while at the same time building solidarity.

GH: You have written about carbon capture and storage technologies, which rely on reusing the carbon dioxide emitted from industrial plants for enhanced oil recovery. Is this another type of circular use?

GG: Carbon capture and storage is an interesting example because it makes us ask whether the circular economy is a formal intervention or a political prompt. CCS is a controversial technology because there is the possibility that concentrated amounts of carbon dioxide will leak or seep from storage sites, and neither short- nor long-term liability protocols related to such incidents are in place yet. At the same time, by injecting carbon dioxide into fields and forcing oil out, oil producers may extend the lifespan of their oilfields. For oil producing countries like the UAE, carbon capture and storage is a unique opportunity, enabling them to extend the lifespan of oilfields and to participate in international climate change diplomacy. Yet, if this process of using carbon dioxide strengthens the fossil fuel economy, then should we still see it as being a valuable component of the circular economy? Or should we think about qualitative differences between the kinds of products that sit at the center of such models?

The circular economy is a useful form, but what are the materials whose flows it should facilitate? What are its contents? And if the materials that are being reused through the CE do not necessarily help mitigate broader relations of inequity among communities, should these processes still be categorized as being constitutive of the circular economy?

References

Spaceship in the Desert: Energy, Climate Change and Urban Design in Abu Dhabi, 2019, Duke University Press

“A Dark Art: Field Notes on Carbon Capture and Storage Negotiations at COP 17, Durban,” 2017, Reprint in Energy Humanities: An Anthology, edited by Dominic Boyer and Imre Szeman, Johns Hopkins University Press, p. 261-269

“What is Carbon Dioxide? When is Carbon Dioxide?” PoLAR: Political and Legal Anthropology Review, Special Issue on “Climate Transformations” vol. 39, no 1, 33–45

“City-led initiatives must be embedded into a transition of city services, infrastructure, business innovations and jointly leverage the different tools cities have at their disposal.”

-Magash NAIDOO, Marion GUÉNARD

Image Source: In the outskirts of Indonesia’s capital Jakarta, construction of the new MRT network is accelerating after years of stalemate (shown here with business districts in the background and agricultural land and water systems in the foreground). 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Circular transitions from the consumption side: Influencing lifestyles at city level

Cities typically develop their climate action plans and measure progress using production-based greenhouse gas inventories. These inventories map how much emissions are emitted by different sectors that operate within cities' jurisdictions and it is therefore mainly these emissions that are targeted in local mitigation efforts.

Consumption-based emissions—the indirect emissions associated with food choices, consumer goods (such as clothes, electronics and appliances), travel habits, supply chains and many more activities that keep cities running but are not directly tied to local production—are proving to be a major blind spot of current mitigation efforts. Estimates show that the emissions produced by consumption in cities are likely to be at least as high as the emissions directly linked to local production[1]. Worryingly, they remain unaddressed in local plans since lifestyles are usually not seen as falling under the area of influence of local jurisdictions.

According to the 1.5-Degree Lifestyles study,[2] per-capita lifestyles carbon footprints need to reach 2.5 (tCO2 e) by 2030 and 0.7 by 2050 in order to limit global warming to 1.5°C. This means that for developed countries a reduction of average lifestyles carbon footprints by 80–93 percent by 2050 and by 23–84 percent in developing countries is needed. Such a shift requires transformative and systemic change across sectors and levels of governance.

Nutrition, housing and mobility account for approximately 75 percent of total lifestyle carbon footprints. These are sectors that often either fall under the jurisdiction of local governments or that are heavily influenced through their procurement practices, investments and policies. Positioned at the intersection of consumption and production systems, cities have a direct and an enabling role to play in this transition. Consumption-based emissions resulting from lifestyles can be addressed through circular economy principles and action by leveraging different levers local governments have at their disposal.

Levers of action

Regulatory and planning instruments: Lifestyle changes only take us so far if city infrastructure and services don´t support circularity. While cities have legal control for certain regulatory instruments that directly influence lifestyles (e.g. housing regulations, infrastructure development), they can also play a strong lobby role, particularly when they band together, for aspects that are not directly within their control through vertical integration with regional and national regulatory instruments. A good example of this type of lobbying can be found in South Africa, where 4 Metropolitan Municipalities are in the process of convincing national government to align to their more ambitions targets on net-zero carbon buildings.[3]

Economic instruments: City procurement power can be harnessed as a catalyst to shift industries to a new, circular normal and to unlock new value propositions in new and existing businesses. For instance, Pittsburgh's Climate Action Plan 3.0 commits the city to purchasing local produce and food products.[4] In addition, cities can provide financial (e.g. tax breaks, subsidies) and non-financial incentives (e.g. space allocation, innovation centers) to catalyze adoption of certain circular and sustainable goods and services. An example of this is provided by the rebates for greywater harvesting and rainwater reuse at household level implemented by the city of Guelph (Canada).[5]

Communication instruments: City-led communication around sustainable lifestyles campaigns will compete for attention against the billboards and other mass consumption advertisements that currently shape what is seen as affluent. This is why it is critical to first focus on low-hanging lifestyle shifts people can implement right away and focusing on co-benefits (e.g. cost savings, health, practicality, sense of community). The 1.5-Degree life campaign in Turku[6] (Finland) focused on co-creating with youth communication materials that emphasize the benefits of shifting to low carbon lifestyles.

Knowledge & monitoring: What gets measured gets managed. Tracking progress on consumption-based emissions is key and many different methodologies exist based on the level of granularity needed and capacity available. ICLEI USA worked with Philippstown to develop an innovative GHG inventory accounting for household consumption patterns that revealed consumption-based emissions amounted to 198,703 MtCO2e, an 83 percent increase over the production-based contributions.[7]

Concluding remarks

City-led initiatives towards sustainable lifestyles must be holistic and embedded into a transition of city services, infrastructures and business innovations and jointly leverage the different tools cities have at their disposal to influence lifestyles.

However, nudging residents towards sustainable lifestyles raises the question of who is being nudged. Do these groups have access to services and goods that allow them to live a fulfilling life in the first place? Cape Town's guide to 50 liters of water per day[8] during the 2018 water crisis was met with social resistance from parts of society that were already following sufficiency principles out of necessity. To support community acceptance and social equity, local efforts to support lifestyles shifts must go hand in hand with measures that play against patterns of disadvantages and address inequalities.

References

1. C40 (2018) Consumption-based emissions of C40 cities. Accessed via: https://resourcecentre.c40.org/resources/consumption-based-ghg-emissions

2. Institute for Global Environmental Strategies, Aalto University, and D-mat ltd. 2019. 1.5-Degree Lifestyles: Targets and Options for Reducing Lifestyle Carbon Footprints. Technical Report. Institute for Global Environmental Strategies, Hayama, Japan.

3. https://www.cityenergy.org.za/wp-content/uploads/2021/09/The-South-African-Buildings-Programme-V16.pdf (24.05.2022)

4. Global Lead City Network on Sustainable Procurement (2021) City of Pittsburgh: Sustainable Procurement Profile. Accessed via: https://glcn-on-sp.org/fileadmin/user_upload/Pittsburgh/GLCN_city_profile_-_Pittsburgh.pdf (24.05.2022)

5. ICLEI (2021) Guelph, Canada: Rebates for Greywater Reuse and Rainwater Harvesting. Accessed via: https://circulars.iclei.org/resource/guelph-canada-rebates-for-greywater-reuse-and-rainwater-harvesting/# (24.05.2022)

6. City of Turku (2020) 1.5-Degree Life. Accessed via: https://www.turku.fi/en/carbon-neutral-turku/15-degree-life (24.05.2022)

7. ICLEI USA (2021) Transitioning to a Circular Economy: Measuring Where to Start. Accessed via https://icleiusa.org/transitioning-to-a-circular-economy-measuring-where-to-start/ (24.05.2022)

8. Cape Town etc (2018) "Level 6b: Your guide to 50 liters a day". Accessed via: https://www.capetownetc.com/water-crisis/cape-town-water-crisis-guide-50-litres/ (24.05.2022)

“With limited resources at our disposal, it is essential to maximize the utility and to cut down the material and energy consumption in cities. Circular Economy with its cradle-to-cradle approach provides an ultimate solution for that.”

-Krunal PAREKH

Image Source: The coal, LNG and sugarcane terminals in the Pasir Gudang industrial and fuel storage area on the Johor River in Malaysia, bordering Singapore. The actual footprint of modern urban systems goes far beyond their location and is fed by globally integrated energy, supply and value chains. 2022.

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Locating "well-being" at the intersection of urban metabolism and circular economy

Cities are the largest consumers of mainly non-renewable global resources and are the most prolific waste generators. Rapid urbanization, increase in global population, unsustainable consumerism and the pandemic has portrayed dramatic environmental and socioeconomic consequences. The commitment to SDG 11 and 12 demonstrate the urgency of the steps that must be taken. Several policy measures have been implemented in recent years to overcome these challenges but due to the linear practice of take-make-dispose in urban centers, the environmental, economic and social aspects have not been taken at equal fronts which reduces well-being in cities. According to a study, the urban metabolism model must include measures of health, income, employment, education, leisure, housing and communal activities.[1] To accomplish the intended aim of greater well-being in cities, the linear wasteful model should be bent to a closed-loop circular economy.

Urban metabolism (UM) is the total of socioeconomic and technical activities that occur in cities, including energy production, and elimination of waste.[2] In recent practice, it is evident that analysis of output (waste) and its management in UM is utilized to reflect sustainability and the well-being of a city.[3] COVID-19 unveiled many inconsistencies in the flows of materials and energy sources in urban centers, making UM an essential framework for the future. In addition to urban centers, the material and energy flows of rural regions should also be taken into consideration, especially in developing countries.[4] If UM is not considered in conjunction with rural contexts, the urban-rural divide in developing countries would result in severe socioeconomic consequences, worsening well-being in cities.[5]

With limited resources at our disposal, it is essential to maximize utility and cut down the material and energy consumption for UM. Circular Economy (CE) with its cradle-to-cradle approach provides an ultimate solution for UM. With CE, the amount of waste is minimized and secondary raw materials are used for a new life cycle.[6] Extracting as much value from resources as possible promotes high-value material cycles compared to typical recycling.

When we understand well-being in cities as the capacity to create appropriate circumstances for residents to have a decent quality of life,[7] a question emerges: can the implementation of a CE framework, let's say of water management, in two different cities of equal size and same energy demand,

enhance the urban livability? Studies suggest that different cities have distinct metabolic processes, even if they may utilize about the same quantities of energy and resources because they are heavily influenced by site-specific characteristics.[8] This points out a very crucial aspect of localization of CE framework for UM, wherein interrelations of local contexts related to culture, lifestyle, economy, health, accessibility, education and many more are taken into consideration.

In addition to tangible infrastructure, social infrastructure is also required to move towards the localization of CE at the intersection of UM to ensure well-being in cities. 'Social innovation' provides a way forward – it refers to innovation and services that are driven by and delivered to address local social needs, primarily disseminated through organizations whose primary goals are social.[9] The nature and implementation of social innovations determine aspects such as the economy, lifestyle, demographics, mobility, changes in environmental impacts, and culture; in all, transforming metabolic flows of energy and material in the cities. Progression from linear to the circular model will allow resources to be utilized multiple times leading to lower input demand. Perhaps this would make cities more sustainable and resilient, forming new synergies within and beyond the urban space.

Cities are growing in size and complexity while the rate of production, consumption and waste is rising. The more we understand the complexities of the urban system, the clearer it becomes that conventional ideas and practices are no longer sustainable.[10] The intersection of UM and CE offers significant potential for policymakers and global citizens with a new framework to elevate well-being in cities.

References
1. Newman, P.W.G. 1999. "Sustainability and Cities: Extending the Metabolism Model." Landscape and Urban Planning.
2. Kennedy, Christopher, John Cuddihy, and Joshua Engel-Yan. 2008. "The Changing Metabolism of Cities." Journal of Industrial Ecology.
3. Pincetl, Stephanie, Paul Bunje, and Tisha Holmes. 2012. "An Expanded Urban Metabolism Method: Toward a Systems Approach for Assessing Urban Energy Processes and Causes." Landscape and Urban Planning 107(03).
4. Timmeren, Arjan van. 2014. "The Concept of the Urban Metabolism (UM)." Inaugural speech of A. van Timmeren, "ReciproCities. A dynamic Equilibrium."
5. Desogus, Arch. Giulia, and Ing. Pasquale Mistretta. 2016. "Metabolism. The Relationship between Urban and Rural Contests." RSA Annual Conference Graz.
6. Patrizia, Ghisellini, Catia Cialani, and Ulgiati Sergio. 2016. "A Review on Circular Economy: The Expected Transition to a Balanced Interplay of Environmental and Economic Systems." Journal of Cleaner Production.
7. del Mar Martínez-Bravo, J. M., Martínez-del-Río, and R. Antolín-López. 2019. "Trade-Offs among Urban Sustainability, Pollution and Livability in European Cities." Journal of Cleaner Production.
8. Pincetl, Stephanie, Paul Bunje, and Tisha Holmes. 2012. "An Expanded Urban Metabolism Method: Toward a Systems Approach for Assessing Urban Energy Processes and Causes." Landscape and Urban Planning 107(03).
9. Goonetilleke, Ashantha, Tan Yigitcanlar, and Shinyi Lee. 2011. "Sustainability and Urban Settlements: Urban Metabolism as a Framework for Achieving Sustainable Development." Summit Proceedings of the 4th Knowledge Cities World Summit.
10. Davide Longato, Giulia Lucertini, Michele Dalla Fontana, and Francesco Musco. 2019. "Including Urban Metabolism Principles in Decision-Making: A Methodology for Planning Waste and Resource Management." Sustainability (Switzerland) 11(7).

policies

Image Source: In the Rotterdam region, computerized and digitized intensive, on-the-ground food production and open-field farming coexist and compete. As the world's leading exporter of food, the Netherlands is undergoing a controversial reform of agricultural practices aimed at reducing its carbon footprint. 2022.

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“Circular Economy presents itself as a new material flow management for cities.”

-Holger KUHLE

Image Source: Wikimedia Commons. May 8, 2021. Construction of the twin apartment high-rises at Kalvebod Brygge in Copenhagen. There will be a common base at the ground with culture, a shop and waste sorting. Photo Credit: Leif Jørgensen. https://commons.wikimedia.org/wiki/File:Construction_of_Kaktus_Towers_02.jpg

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Cities as enablers for circular economy – cities as providers for cooperation across businesses

The increasingly respected concept of "Circular Economy" (CE), which is discussed in the context of cities under the topic "Urban Metabolism", refers to, among others, two key pillars of the economy: the global supply chains and the infrastructure axes. To the extent that circular economy has a transformative character because it is intended to reduce resource consumption and avoid waste, it promises to become an effective lever for cities' sustainable transformation, both internally and externally in their manifold transactions with their environment and the world.

CE presents itself as a new material flow management for cities. It is an instrument for the implementation of sustainable economic practices and contributes to various Sustainable Development Goals (SDG) at the same time. Questions arise as to what possibilities for action exist for a sustainable design of material flows at the city-regional level. There are pioneering cities where systematic efforts are being made to promote CE. Their experiences show that they are most successful when combined with activities linked to the strengthening of the regional economy, especially small and medium-sized enterprises.

Pioneering city approaches to CE provide useful insights into the importance of local and regional level of action as well as the fundamental importance of actor relationships for material flow management. There are basically three principles to achieve the latter: (1) influencing markets through prices; (2) "soft" instruments to stimulate coordination and cooperation, and (3) legal regulation. Cities are faced with the first challenge of activating internal and the second of inter-company (urban-regional) action relationships. These are defined by the transaction relationships i.e. the way in which the companies regulate the economic and material exchange processes with each other. Experiences with ecological pioneer companies show that material flow relationships can only be shaped in the long term in terms of environmental relief if the companies involved can expect net profits in the long term. It is a matter of savings effects and/or of environmental economic returns exceeding coordination costs.

On the one hand, it is important for cities to maintain hard and soft infrastructure that enable coordination, cooperation and, finally, the above-mentioned net profits of supply chain stakeholders for the development of target-oriented conditions. At the same time, it is important for city adminis-

trations to know the transaction structures to exert influence through appropriate strategic approaches. A distinction should be made between networked transaction relationships, fragmented transaction relationships and hierarchically dependent transaction relationships. For each specific transaction pattern, there are different problem areas with regards to the transition to a circular economy. City-regional circular economy industry concepts represent an adequate means for cities to find solutions for the use of materials that lead to new products and services.

Since locations and companies are in fierce competition in the face of increasing volatility in the course of geopolitical and technological changes within global supply chains, and trust between the actors must be established for the circularity of materials and economies in favor of a selective joint approach, intelligent network management becomes necessary. Cities play an important role in this. They are inevitable because the density of production and consumption concentrates competitors in them. This is to be changed through circularity and cooperation.

“In light of the eco-economic paradox of rural development, the implementation of circular models requires a long-term perspective and cannot be achieved only by technological solutions.”

-Ieshan MISRI

Image Source: Women working on their field in Divtan, Gujrat. Aga Khan Rural Support Programme (India). Photo Credit: Polok Sarkar, all rights reserved ©.

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The pressing and challenging need for circular rural economy

The idea of "development" has positioned itself as a "central organizing" concept in understanding the world. Everything is a developmental problem, be it poverty, liberty, sustainability, communalism, security, inequality, crime, hunger, or even prosperity (Ferguson, 1994). The conventional development model that has come from the West has helped a considerable amount of people improve their living standards, but we argue it has also done so at the expense of natural and social systems. It is this realization that has driven researchers, thinkers, policymakers and innovators to incorporate within the scope of sustainability the complex social and environmental constraints (Steffen et al., 2015). The idea of circular economy has gained prominence as an effective framework to deal with the problem of resource depletion on one side and that of waste generation on the other (Gregson, 2015).

In low and middle-income countries, rural communities are typically grappling with issues resulting from mismanagement of the waste generated and lack of effective waste management systems in place (Mihai et al., 2022). Rural ecosystems and land are under immense pressure due to large-scale peripheral urbanization processes which, in some sense, are the markers of development under linear economic models of development (Caldeira, 2017). Additionally, the inability of many rural socio-economic systems to generate a significant amount of viable employment and job opportunities leads to out-migration which not just adds to the "waste" but also leads to weakening of the rural communities due to the out-flow of social and human capital (Bock, 2016; Quaranta, Citro and Salvia, 2016). It has been time and again observed that the processes of marginalization in the rural areas are associated with the loss in the quality and quantity of socio-economic and environmental capital (Leal Filho et al., 2016).

The issue of development and sustainability in rural areas goes beyond just environmental concerns. The bending of the economy approach of the circular economic model could particularly work for the inclusive sustainable development of rural areas by aiding them to develop resilient development strategies (Gregson, 2015). One such example is the redesigning of the agri-food systems which can trigger change in all phases of the process by adopting regenerative farming practices, sustainable consumption, and effective waste management through the establishment of

food redistribution channels and food banks. These help in the reuse of the excess food (Jurgilevichl et al., 2016). At the same time, there are examples such as composting which helps in organic waste management by converting organic agriculture and food waste into cooking gas and organic manure ("Compost connect & circular economy," 2022).

However, the dynamics of rural areas more than often profoundly political, driven by complex social, economic, and environmental factors, characterized by "eco-economic" paradox. That is, a typical rural area holds relatively high ecological value but at the same time is typified by a low level of conventional economic activities and welfare (Marsden, 2009). The implementation of such circular models requires a long-term perspective and cannot be achieved only by technological solutions. Technological and digital solutions may help in overcoming certain infrastructural limitations and in some cases may even play a pivotal role. Yet, the implementation of the circular-economic model for development would require communities' ability to establish synergetic "community-based business hubs", food and financial networks, etc. (Marsden, 2017). Adoption of a circular economic model that integrates sustainability in terms of natural resources and socio-economic development can lead to the operationalization of the development paradigm which favors localization of economic activities and recalibration of economic behavior.

The complexity of "development" in rural areas ordains a wider interpretation and understanding of the concept of circular economy which not only establishes a harmonizing system within the different sectors of the rural territories but also takes into account the impacts of decades of growingly imbalanced urban-rural dynamics. Any systemic change towards a circular economy needs to be closely supported by policies that are not just oriented towards environmental sustainability and social well-being but also foster a sense of commitment and cooperation among stakeholders, both at regional and national levels.

References

Bock, B.B. (2016). Rural Marginalisation and the Role of Social Innovation; A Turn Towards Nexogenous Development and Rural Reconnection. Sociologia Ruralis, Volume 56(4), 552–573. Available at: http://onlinelibrary.wiley.com/doi/10.1111/soru.2016.56.issue-4/issuetoc

Caldeira, T. P. R. (2017). Peripheral urbanization: Auto construction, transversal logics, and politics in cities of the global south. Environment and Planning D: Society and Space, 35(1), 3–20. https://doi.org/10.1177/0263775816658479

Compost connect & circular economy. (2022, January 5). Compost Connect. https://www.compostconnect.org/circular-economy/

Ferguson, J. (1994). The anti-politics machine: "development," Depoliticization, and bureaucratic power in Lesotho. University of Minnesota Press. (p.xiv)

Gregson, N., Crang, M., Fuller, S., and Holmes, H. (2015) Interrogating the Circular Economy: The Moral Economy of Resource Recovery in the EU. Economy and Society, 44(2), 218-243, Available online: http://dx.doi.org/10.1080/03085147.2015.1013353

Jurgilevich, A., Birge, T., Kentala-Lehtonen J., KaisaKorhonen-Kurki, K., Pietikäinen, J., Saikku, L.,and Schösler, H. (2016). Transition Towards Circular Economy in the Food System. Sustainability, Volume 8(1), 69. Available online: http://dx.doi.org/10.3390/su8010069

Leal Filho, W., Mandel, M., Al-Amin, A.Q., Feher, A., and Jabbour C.J.C. (2016). An Assessment of the Causes and Consequences of Agricultural Land Abandonment in Europe, International Journal of Sustainable Development and World Ecology. Available online: http://dx.doi.org/10.1080/13504509.2016.1240113

Marsden, T., and Farioli, F. (2015). Natural powers: From the Bio-Economy to the Eco-Economy and sustainable Place-Making. Sustainability Science, Volume 10(2), 331–344. Available online: http://dx.doi.org/10.1007/s11625-014-0287-z

Mihai, F.-C., Gündoğdu, S., Markley, L. A., Olivelli, A., Khan, F. R., Gwinnett, C., Gutberlet, J., Reyna-Bensusan, N., Llanquileo-Melgarejo, P., Meidiana, C., Elagroudy, S., Ishchenko, V., Penney, S., Lenkiewicz, Z., & Molinos-Senante, M. (2022). Plastic Pollution, Waste Management Issues, and Circular Economy Opportunities in Rural Communities. Sustainability, 14(1). https://doi.org/10.3390/su14010020

Quaranta, G., Citro, E., and Salvia, R. (2016). Economic and Social Sustainable Synergies to Promote Innovations in Rural Tourism and Local Development. Sustainability, Volume 8, 668. doi:10.3390/su8070668

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., and Ludwig, C. (2015). The Trajectory of the Anthropocene: The Great Acceleration. The Anthropocene Review, 2(1), 81-98. Available online: https://doi.org/10.1177/2053019614564785

> "Instead of being overarching, circularity regulations should be rather pivotal to the process (...); they should become relevant rules for the application of existing standards and constitutional rules for every future standard development."
>
> -Pheladi TLHATLHA, Alex DODOO, Sarah GRIESBAUM, Wolfram SCHMIDT

Image Source: A large waste-to-energy plant operated by Greater Paris Waste Management is being renovated to comply with new regulations on CO2 emissions and air pollution. It is located in the Paris-Ivry area, which is currently being redeveloped as part of a large-scale urban renewal project. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Ways to integrate circular economy principles in standards and regulations for urban construction materials

Urban landscapes are exponentially increasing across the world. Circular supply and value chains gradually become fundamental elements of this urban growth. There is demand for more sustainable infrastructure and habitats within cities and a need to ensure that these are aligned and work synergistically. It is important to prioritize every future stage of urban development sustainability equally as safety becomes more and more apparent. This calls for an appropriate regulative framework.

Standards have been crucial in facilitating the application of technologies and in ensuring safety in the built environment. Globally, they are important transmission belts of technology into the society, but their specific relevance is different in the global South than in the global North. Most countries in the global North have a long tradition of complex standard systems and respective institutions. However, since standards can only be built on existing knowledge, the accelerated knowledge and technology development of today and the high complexity it creates, often results in standards lagging behind innovation. The global North can be considered as over-standardized, which requires re-engineering of the system. At the same time, the global South is rather at a level of under-standardization, which poses a safety and reliability challenge when it comes to the implementation of novel technologies.

The existing standardization framework, where circularity is not included in the development process, turns out to be an obstacle for the effective implementation of sustainable urban concepts. To date, each standard in the built environment is focused on one specific problem. A circular process chain would comprise of multiple resources, players, processes, and products, each of which today has its own universe of applicable standards. These do not consider necessities of the standard universes of other processes, not to mention the holistic framework. In addition, each standard universe has grown and become increasingly complex in the past decades. For example, one major concrete standard of the past is replaced with an increasing number of individual standards: one for every test procedure for fresh and hardened properties, one for every constituent, and a multitude of individual standards for specific applications. This means that for one well-understood process, 40 or more standards have to be fulfilled, and this is clearly an obstacle to novelty and circularity. Therefore, the invention of overarching standards on circular economy, which embed all existing standards in the urban built environment, are destined to dramatically fail as they would create a complex regulative monster. In fact, simplification is required. Instead of being overarching, circularity regulations should be rather pivotal to the process. Instead of trying to include all existing standards, they should become relevant rules for the application of existing standards and constitutional rules for every future standard development. They should be reduced to the very core elements of circularity, and not be characterized by over-complexity.

Since there is no universal definition of circularity, there cannot also be universal regulation. Therefore, standards should not aim for utopia – one apparent or a temporary single best solution. Rather, standards should facilitate stakeholders in identifying the fractions of viable and non-viable solutions within the pool of possible operations and help to apply the good ones safely based on performance criteria without defining arbitrary thresholds. To become pivotal and constitutional, the regulations should rather express a mindset, limited to the most relevant principles. Like the ten commandments in the Bible, they should be globally adjustable to fit any framework. They should be non-specific and flexible to quickly adapt to societal and technological challenges. Ideally, they should be applicable also in the informal framework that characterizes the urban construction business in many regions of the global South. Such pivotal circularity rules support existing standard systems all over the world to better evolve. In the over-standardized global North, such a pivotal set of circularity rules can help to reduce and re-engineer towards sustainability.
In the under-standardized global South, new standards that are required can be directly developed based on circularity without requirement to implement existing but outdated standards. This way, novel standards developed in the global South can spearhead greener and future-oriented urban technologies. However, the successful implementation of circularity in industry and society depends on the strong support of global collaborators from standardization bodies, research, politics, and society.

“A more decentralized, bottom-up paradigm for new cities is essential to ensure a more sustainable, inclusive, and accessible city making process. The Guided Organic Growth principles provide the outlines towards a much-needed shift in new city making.”

-Heba ELHANAFY

Image Source: The “Superjednostka” building in Katowice on Wojciecha Korfantego Avenue is one of the largest residential buildings in Poland. It is an iconic example of modernist concrete architecture and is often associated with Le Corbusier’s Cité radieuse in Marseille. After several decades and more or less successful renovations, it is still in use. The maintenance of the public space around it, including the green areas, is no longer carried out at its scale. Different times and models collide coherently. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Rethinking the future of urban infrastructure in the Global South

The Global South is becoming urbanized at an extraordinary pace. The UN projects that the world urban population will rise by over two billion people by 2050, with most of that increase concentrated in Africa and Asia. The scale of the challenge that urban governments face in providing even the most basic services is already evident in countries like India and Nigeria, which are expected to see 416 million and 189 million new urban residents over the next 30 years respectively. The list of challenges that cities are facing in the Global South, and especially the hundreds of millions of current and future slum residents, is daunting and will require a litany of complex reforms and investments. At the other end of the spectrum, there are new cities-projects which are master-planned, built, and populated – often "from scratch" – usually by a central coordinating entity. Most of these new cities are over-planned, often following either the Chinese-grid planning paradigm, an American-suburban model, or the international model. These approaches leave little space for emergent market forces or for residents to communicate their needs, both being crucial for shaping cities.

The effects of both under-planning and over-planning have been fully demonstrated in existing and new cities developed throughout the Global South. Governments have either failed or have been unable to engage in urban planning that enhances service provision in rapidly growing megacities. Some cities have outgrown their fixed boundaries; thus, planning on a metropolitan scale becomes increasingly fragmented, further increasing the difficulty of coordinated action. In these unplanned environments, the economy and the housing stock are largely informally led. This limits growth.

New cities present an excellent opportunity to generate urban economic vibrancy, solve market failures, and unlock innovation. However, until a deliberate shift occurs in the planning paradigms applied in new city developments, these cities will continue to suffer from a common set of challenges. The need for a paradigm shift is clear. New cities need to be rethought: changing from top-down, master-planned projects to organic, bottom-up phenomena, like all cities throughout history. In essence, new cities must be reformulated as emergent labor markets where people move for better economic opportunities and, in turn, for an improved quality of life for themselves and their families. This new paradigm should aim to create functional, affordable, and sustainable growth. And importantly, the new paradigm must be respon-

sive to all stakeholders involved, especially residents and businesses. Through this emphasis on responsiveness, the paradigm will be much better equipped than the current status quo to help solve the main challenges of new city-making in the 21st century.

Guided Organic Growth is a paradigm shift in new city-making which outlines three main ways of rethinking urban futures in the Global South:
(1) New city-making as shared spheres of activities between the urban developer, the host country governments (national, regional, and/or local), and the community. Building a city from the ground up should be a cooperative process between the city's main three stakeholders: the urban developer, the host country government(s), and the community. For example, when it comes to public goods, activities can be categorized into essential and less essential developments. Developments that require technical planning capabilities and financial resources, like critical infrastructure (e.g. roads, electricity, and water), can be considered essential developments that the charter city developer should develop in cooperation with the national government to ensure infrastructure is developed in alliance with the host country infrastructure.

(2) New city-making as a combination of top-down and bottom-up processes. Comprehensive approaches should be coupled with bottom-up planning and participatory decision-making approaches to ensure plans are not misaligned with underlying community practices, norms, and needs.

(3) New city-making as a short- and long-term process. Building out the entire city ahead of attracting residents and business is both unnecessary and counter-productive to creating a thriving urban environment compared to a phased approach. For example, to attract low-income residents to the city early in its development, lower density, self-built, and temporary housing should be permitted so that affordability remains high. Over time, greater variety in style and density of housing will emerge to meet the demand as the city grows.

A more decentralized, bottom-up paradigm for new cities is essential to ensure a more sustainable, inclusive, and accessible city-making process. The Guided Organic Growth principles provide the outlines towards a much-needed shift in new city-making.

References

Auerbach, Adam (2020): The Political Geography of Public Service Provision in India's Urban Slums. Social Science Research Council.
Charter Cities Institute (2022): Planning Guidelines. https://chartercitiesinstitute.org/reference-guides/planning-guidelines/

Haas, Astrid (2018): Africa is rapidly urbanizing but central city development is not keeping pace. In Bloomberg CITYLAB, 2018.

United Nations (2019). UN- Department of Economic and Social Affairs.

Zheng & Tan (2020): Toward Urban Economic Vibrancy Patterns and Practices in Asia's New Cities. The MIT Press

“Integrating and incorporating a circular economic model in urban policy and development framework, and particularly in the water sector, is challenging but not impossible.”

-Kartikey CHATURVEDI

Image Source: The new toll highway connecting Denpasar and Nusa Dua in Bali (Mandara toll road) has undergone a lift ahead of the 2022 G20 summit, including a “G20” logo in saltwater plants (center of photo). This new infrastructure and its financing model have sparked lively debate due to the sensitive natural environment of the mangroves. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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From mass production to production by masses: a Gandhian circular economy of water

Since the start of this millennium, we are witnessing a rapid increase in the rate of urbanization worldwide, and a consequent pressure on natural resources for energy, water, nutrients, and material.[1] The continuous extraction of resources to sustain the urban economy and city lifestyles pose a risk of depletion of natural resources and further contributes to environmental degradation i.e., through waste generation.[2]

Water is one of the resources that is under threat and by focusing on the urban water challenge, a better understanding of this threat will be illustrated. By 2050, it is expected that the global urban population will have doubled, resulting in significant increase in urban water consumption.[3] In turn, the increased urban water demand will result in increased wastewater production and inevitably contamination of the water supply. Additionally, climate change exacerbates pre-existing water shortages [4] by changing, among others, the urban water cycle, the volume, distribution, timing, and quality of available water.

With the prevailing model, under the Urban Metabolism (UM) metaphor, the cities' ecosystem has been heavily disrupted as more than 70% of CO2 emissions are generated in cities – or can be attributed to their activities -, mindless of extraction of resources which have increased to 12-fold between 1900 and 2015. If this business-as-usual approach continues to be applied, some 45 cities will face extremely high-water stress by 2030.[5] In addition, it is commonly argued that unregulated urban planning as well as practicing the linear economic model have adversely impacted urban metabolism and sustainability performance.[6] In order to build Sustainable and Resilient Cities and Communities, moving away from a model of production that focuses on growth alone without taking into account environmental and ecological impacts, appears to be a viable solution.

The Circular Economy (CE) model with its focus on the five Rs, notably Rethink, Refuse, Reduce, Reuse, Recycle, illustrates the path to move away from the Linear Economic Model. The urban metabolism concept presents a useful framework for designing a sustainable water system whilst incorporating circular economy principles. Specifically, the UM provides a framework of Material Flow Analysis (MFA) to track the actual quantity of water extracted, energy used in the process of extraction and distribution and finally, the wastewater released back to the environment.

A significant feature of the CE model is its focus on reducing resource dependency, reducing environmental footprint, minimizing waste, and generating income. In the urban context, a sectoral analysis is necessary to be carried out to establish the baseline conditions and to help prepare a blueprint - through multi-stakeholder participation - to apply the principles of Circular Economy.[7] Broad stakeholder participation will not only help the latter realize their socio-eco responsibility but also assist them to reorient their activities, focusing on i.e., ensuring effective water management.[8] For example, from an industrial perspective, providing incentives to adopt wastewater reuse technologies; from a residential perspective, focusing on decentralized wastewater management which can further be used to develop sub-regional horticulture and green cover; and from an agricultural perspective, roping farmers' associations to adopt micro-irrigation techniques and switching to organic farming, are some of the techniques that can be applied to enhance water efficiency. Applying those will not only minimize material intake but it will upscale resource efficiency by transforming waste into wealth and making cities more water resilient.[9]

Thus, a multipronged effort is needed to promote the circular economy model in the water sector which includes policy design, introduction of institutional mechanisms, promotion of new technologies, ensuring availability of financial support, stakeholder mapping and engagement, especially in countries like India where the water sector is profoundly unorganized. Most importantly, awareness and confidence-building measures to restore trust in government policies are means to ensure better compliance and effective implementation [10] of the CE model.

Nevertheless, integrating and incorporating a circular economic model in the urban policy and development framework, and particularly in the water sector, is challenging but not impossible. These challenges are likely to be even more difficult to address especially in developing countries where a high level of socio-spatial inequality is anticipated. Perhaps, a sound approach can be found in the Gandhian economic model, that lays the foundation of Production by Masses rather than Mass Production, based on which reorganizing production around small and medium industries that are labor-intensive whilst conserving energy and resources, could help utilize the demographic dividend into the framework of Circular Urban Metabolism.

References

1. Swyngedouw, H. (2006). In the Nature of Cities - Urban Political Ecology and The Politics of Urban Metabolism.

2. Kennedy Pincetl Bunje. (2010). The study of urban metabolism and its applications to urban planning and design.

3. Delgado Rodriguez. (2021). Water in Circular Economy and Resilience.

4. Delgado G. (2013). Climate change and metabolic dynamics in Latin American cities.

5. World Economic Forum. (2018). Circular Economy in Cities: Evolving the model for sustainable future.

6. Rapoport E. (2011). Interdisciplinary Perspectives on Urban Metabolism.

7. Heshmati A. (2015). A Review of the Circular Economy and its implementation.

8. Huber Mung. (2021). Circular Cities: Circular Water economy for cleaner, greener, healthier and more prosperous cities.

9. Bancheva S. (2014). Integrating the concept of Urban Metabolism into Planning of sustainable cities.

10. Swyngedouw, H. (2006). In the Nature of Cities - Urban Political Ecology and The Politics of Urban Metabolism.

"If a circular economy is the goal, then the market must be regulated in a way that lets circular businesses thrive – and not merely survive in a niche financed by a few, green, affluent customers."

-Susanne LANGSDORF

Image Source: The left bank of the Seine in Paris is increasingly the scene of two worlds: the world of leisurely city dwellers and the last mile of regional and global logistics. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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European policies for encouraging circular transitions in cities

Magdolna MOLNÁR (MM): To what extent do you think the CE has become more important in the European policy agenda in recent years?

Susanne LANGSDORF (SL): Resource efficiency has been on the European agenda for quite a while, with the first strategy coming out in 2005 and even earlier than that, in Environment Action Programmes. In 2015, the focus shifted towards Circular Economy, with the first Circular Economy Action Plan. From an environmental perspective, this shift had two sides. On the one hand, a broader understanding of resource conservation and the discussion on resource use targets, or per capita resource use, became part of a broader discussion about efficiency and waste reduction. On the other hand, elements of the circular economy such as concrete recycling goals were introduced. A shift in focus to the beginning of the product circle and on product design was also made.

The Circular Economy Action Plan of 2020 includes some further developments to previous strategies, such as more emphasis on product policy, including design, or the inclusion of "textiles" as another key product value chain. However, these developments are an evolution of previous strategies; they are not a game changer. Through a pessimistic lens, one could emphasize that the Action Plan does not contain ambitious quantitative goals, e.g. for material footprint. As the plan does not set binding quantitative goals, it could mean that its effect on the real world remains as difficult to measure as previous related strategies. After all, previous strategies have not led to a reduction in annual waste generation and the recycling content in our products remains low, among others.

Through a positive lens, one could say that the CEAP 2020 envisions more binding legislation, and the Commission has been pushing for a number of legislative proposals in the last years. These range from the revision of waste shipment regulation to the revision of the waste framework directive. As for the latter, the European Commission is still commissioning research. Research results shall support the revision of the waste framework directive so the actual revision will still take

some time. The previously announced "revision of the Ecodesign directive" has developed into a proposal for a "Regulation establishing a framework for setting eco-design requirements for sustainable products", thereby repealing the Ecodesign Directive (2009/125/EC) which regulates the energy use of products. If the proposal is adopted, it could be a leap forward for the European circular economy, proposing standards regarding repairability, durability and recyclability. Also, the implementation of the EU CEAP requires the revision of numerous existing legislations and the adoption of further legislative proposals regarding CE. While the CEAP is not necessarily a game changer by itself, the dynamic it creates seems to be in favor of developing concrete legislation and, therefore, it seems that the CE has become more important. But it will only come into effect once the legislation is adopted.

As for the reasons why the topic seems to be gaining momentum, there are a number of interrelated answers. For one, circular economy aligns with the new European Commission's and Mrs. von der Leyen's compelling story and vision for sustainability. With climate change being understood by many as the major challenge of our time, an environmental narrative – the European Green Deal – was developed. Next to becoming climate neutral, the decoupling of economic growth from resource use is one major goal of the European Green Deal. The other major reason as to why CE is becoming more relevant is the high resource dependency of the EU. The EU and its financially strong industries have successfully satisfied their resource demand through the global market in the past.

However, supply chain disruptions in recent years have possibly increased the awareness of the high dependencies. The list of critical raw materials (CRM) of the European Commission increased from 14 CRMs in 2011 to 30 CRMs in 2020. Circular Economy is one key solution for high dependencies.

MM: What do you currently find to be the biggest breakthrough in European legislations in terms of introducing more circular practices in cities?

SL: Key legislation for CE, like those mentioned before, do not target cities specifically. However, it can be expected that some of the opportunities will become easier to realize in cities. For example, it is likely that the right to repair could see positive effects much more easily in cities as the density of people, or appliances to repair, is higher, while repair shops in the countryside may suffer from too few customers. High store rents in cities, however, may nevertheless make life difficult for small repair businesses. While certain elements of the circular economy and the currently developed policies seem, in principle, especially fitting for urban settings, this remains to be proved in practice. A mere tax privilege for repair may not be sufficient incentive in high wage and high rent places.
New business models, e.g. the sharing economy which is often acknowledged as a pillar of CE, are also more likely to flourish in cities, as density is high, distances are short and potential customers are aplenty. Furthermore, cities are hubs of innovation. The circular economy will require a lot of innovative ideas to reduce, reuse, recycle the materials we use. And with

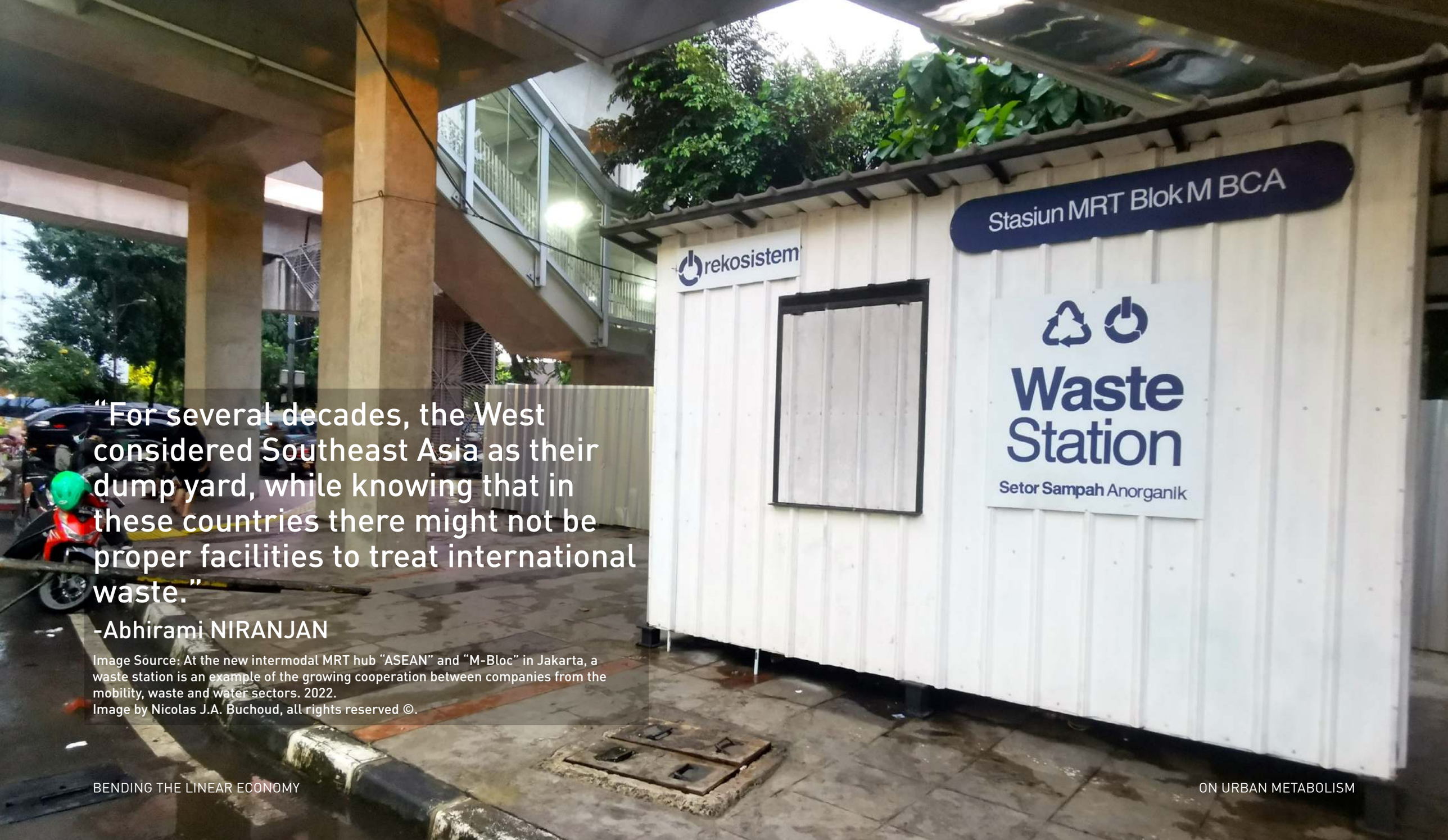
a lot of people with different ideas and educational backgrounds, as well as with research centers located in cities, many of these ideas are more likely to develop within cities.

MM: Where do you still see policy gaps?

SL: As mentioned above, legislative support of CE has been limited in the past. Strategies and, sometimes, high goals have been around for decades, but legislation and concrete measurable goals are rare, with the exception of waste legislation (i.e. from the waste framework directive to legislation on specific waste streams, such as packaging waste or the Waste from Electrical and Electronic Equipment (WEEE)). However, the framework for setting eco-design requirements for sustainable products would change that in the future. As the legislation is not yet in place, albeit first regulations have seen changes, and its effects have not yet played out, it is difficult to say what the biggest policy gaps might be.

On a more general level, it can be said that "green/circular" companies have often competed on unfair grounds. If primary raw material prices do not reflect the environmental and often social prices on society, and, on the other hand, the positive effects of circular solutions are in fact financial disadvantages to circular companies, they are doomed to fail. For example, if a repair shop employs a technician in Europe, it creates a job, and the repair of products saves resources and reduces CO2 emissions. But often it will not be able to compete with a new technical appliance that's mass produced. If a circular economy is the goal, then the market must be regulated in a way that lets circular businesses thrive, and not merely survive in a niche financed by a few, green, affluent customers.

However, while these issues may be a bit more relevant for cities, they are not city specific. The biggest policy gap – or the biggest potential to tap into – especially in urban settings is, in my opinion, city planning. Here, we are not talking of circular economy with a product focus but with an infrastructure focus, especially building and transport, which account for the biggest material streams. The "reduction" element of the circular economy is still mostly overlooked, possibly because people connect it with renunciation and because there is no business case behind it. Cities must be built in a way that allows for material-lite living. It is due to a grave lack of imagination to focus the transition of transport, for example, on e-mobility and not on building cities that require less commuting. The latter saves materials, reduces CO2 emissions and would reduce land use, which brings further co-benefits, e.g. for biodiversity and health. On top of that, commuting time has been identified as one of the everyday activities that is related to the highest stress levels. Obviously, city re-structuring takes time, so city planning is not a quick fix. But it is a lasting fix; one that would save public money and is much too often overlooked.



“For several decades, the West considered Southeast Asia as their dump yard, while knowing that in these countries there might not be proper facilities to treat international waste.”

-Abhirami NIRANJAN

Image Source: At the new intermodal MRT hub “ASEAN” and “M-Bloc” in Jakarta, a waste station is an example of the growing cooperation between companies from the mobility, waste and water sectors. 2022.
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“Not your dumping ground”: rethinking ex-situ recycling

The world generates around 2.01 billion tons of municipal solid waste, out of which at least 33% is not managed in an environmentally friendly manner. High–income countries generate 683 million tons, which accounts for 34% of the total globally produced waste. Out of this waste only 32% is food and organic waste, while 51% is dry waste which can be recycled, such as plastic, paper, cardboard, metal, and glass. The daily per capita waste production of these countries is projected to increase by 19% by 2050.The operation cost of integrated waste management in these countries tallies to around $100 which is much higher than in middle- and low-income countries (M/LIC).[1] The solution of high-income countries to their waste management is exporting it to the Global South. This movement of waste has led to coining terms like “Waste Colonialism” [2] or “Toxic Colonialism.” [3]

This article focuses on Southeast Asia and the recent trends of countries refusing to be dumping grounds of the West [4] – a practice that has been carried out for more than 25 years.[5]

China used to be one of the largest waste importers in the region.[6,7] The origin of this practice can be traced backed to the 1980’s and 1990’s, when the country had an abundance of cheap labor which could use better quality plastics as a resource for their manufacturing sector. The waste exchange was not limited to plastics and started out as a mutually beneficial business deal.

Improper recycling causes severe harms to the environment. Being conscious of this fact, various countries in this region are taking steps towards better environmental policies. China, for instance, implemented a series of policies, starting with Operation Green Fence (February 2013), that re-enforced existing laws like inspection.[8] By late 2017, the country completely banned imports of 24 types of solid waste such as unsorted paper, textiles, cardboard, plastics.[9] By March 2018 this policy was enforced under the name of Operation Nation Sword,[10] ending China’s role as the region’s largest waste importer.

Sri Lanka recently returned 3,000 tons of waste to England, thanks to a petition filed in the Supreme Court by a local environmental group.[11] Since China’s legislature, Malaysia has also been inundated with more international waste.[12]

Refusing to be the waste yard of the world, the Malaysian government started sending back waste shipments by late 2019. The country also shut down 200 recycling facilities due to water contamination and respiratory diseases.[13] Similarly, Indonesia and Philippines have not shied away from making headlines for returning waste to their respective countries since 2019.[14,15]

For several decades, the West considered South-East Asia as their dump yard with knowledge that there might not be proper facilities to treat waste. Moreover, the West have misled countries by mislabeling waste containers. Despite this, M/LICs have been blamed for environmental pollution, even if studies have shown that M/LICs produce much less waste. For example, America is the largest generator of plastic waste.[16]

In the long run, it is best to process waste in their respective countries where it was generated. The cost of shipping and dealing with the environmental damages abroad could be channeled into research for technology for efficient waste management instead.

References

1. Trends in solid waste management. (n.d.). The World Bank. https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

2. 'Waste colonialism': World grapples with west's unwanted plastic. (2021, December 31). the Guardian. https://www.theguardian.com/environment/2021/dec/31/waste-colonialism-countries-grapple-with-wests-unwanted-plastic

3. What is toxic colonialism? - Definition from Safeopedia. (2016, January 7). safeopedia.com. https://www.safeopedia.com/definition/3056/toxic-colonialism

4. Deutsche Welle (www.dw.com). (n.d.). After China's import ban, where to with the world's waste? DW.COM. https://www.dw.com/en/after-chinas-import-ban-where-to-with-the-worlds-waste/a-48213871

5. The west has been dumping tens of millions of tons of trash in Southeast Asian countries for more than 25 years - now they want to send it back. (2019, May 28). Business Insider. https://www.businessinsider.in/the-west-has-been-dumping-tens-of-millions-of-tons-of-trash-in-southeast-asian-countries-for-more-than-25-years-now-they-want-to-send-it-back/article-show/69543657.cms

6. Deutsche Welle (www.dw.com). (n.d.). After China's import ban, where to with the world's waste? DW.COM. https://www.dw.com/en/after-chinas-import-ban-where-to-with-the-worlds-waste/a-48213871

7. China: Amount of disposed waste 2019. (2020, October 15). Statista. https://www.statista.com/statistics/279117/amount-of-disposed-garbage-in-china/

8. What operation green fence has meant for recycling. (2016, February 11). Waste360. https://www.waste360.com/business/what-operation-green-fence-has-meant-recycling

9. China to ban all solid waste imports from Jan 2021. (2020, December 10).

Waste Management Review. https://wastemanagementreview.com.au/china-to-ban-all-solid-waste-imports-from-jan-2021/

10. What is the national sword? (2020, May 6). Center for EcoTechnology. https://www.centerforecotechnology.org/what-is-the-national-sword/

11. Biowaste, body parts from morgues: Sri Lanka returns 3,000 tonnes of garbage to UK. (2022, February 21). India Today. https://www.indiatoday.in/world/story/biowaste-body-parts-from-morgues-sri-lanka-returns-3-000-tonnes-of-garbage-to-uk-1915975-2022-02-21

12. Picheta, R. (2020, January 20). Malaysia has sent back tons of plastic waste to rich countries, saying it won't be their 'garbage dump'. CNN. https://edition.cnn.com/2020/01/20/asia/malaysia-plastic-waste-return-scli-intl/index.html

13. Malaysia sent 4,120 tons of plastic trash back to 13 rich countries, saying it refuses to be the 'rubbish dump of the world'. (2020, January 21). Business Insider. https://www.businessinsider.in/science/news/malaysia-sent-4120-tons-of-plastic-trash-back-to-13-rich-countries-saying-it-refuses-to-be-the-rubbish-dump-of-the-world/articleshow/73486811.cms

14. Philippines returns huge amounts of waste 'illegally shipped' by Canada. (2019, May 30). euronews. https://www.euronews.com/2019/05/30/philippines-returns-huge-amounts-of-waste-illegally-shipped-by-canada

15. Indonesia returning hundreds of containers of waste to west. (2019, September 19). Phys.org - News and Articles on Science and Technology. https://phys.org/news/2019-09-indonesia-hundreds-west.html

16. 'Deluge of plastic waste': US is world's biggest plastic polluter. (2021, December 1). the Guardian. https://www.theguardian.com/environment/2021/dec/01/deluge-of-plastic-waste-us-is-worlds-biggest-plastic-polluter

"When there is nobody who would make use of my waste materials, it makes no sense for me to separate them."

-Anna PEGELS

Image Source: Wikimedia Commons. May 24, 2022. Plastic waste spreading on the street during the rainy season, causing hygienic crisis. Photo Credit: Fquasie. https://commons.wikimedia.org/wiki/File:Plastic_waste_Ghana.jpg

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Waste separation – policy implications

Martin KOCHAN (MK): Your work focuses on the question how we can incentivize people to separate waste at the source. Why is that so important?

Anna PEGELS (AP): Waste separation is the first step in a chain that seeks to re-introduce materials into the material cycle that would otherwise have been lost. If that step does not take place, it impacts the rest of the chain. To give you an example, if we don't keep paper waste separate from food waste, the paper will be contaminated, for example, with oil. This makes it very difficult or even impossible to recycle later.

The same is true for other materials. Once they are mixed with other types of waste, the only thing we can often do is bring them to the landfill or incinerate them.

MK: What are the main reasons currently to explain why most waste worldwide is not separated?

AP: Many places in the world do not have a recycling system in place yet. When there is nobody who would make use of my waste materials, it makes no sense for me to separate them.

But even when there is a system, sometimes people don't participate. A main reason for this can be in the very design of that system – it does not encourage cooperation. Often, the design of recycling systems focuses on infrastructure (e.g. containers for plastic waste and a treatment facility) and on institutions (e.g. contracts with a waste collection company). We think a lot about these two elements, for example, how to finance a treatment facility. But we don't think about designing the elements so that they encourage cooperation by considering a vital part of the same system – the people. It matters, for example, where exactly containers are placed, how often they are emptied, how they look, etc. We need to give people the possibility to be on board. Otherwise, we risk contamination and loss of recyclable materials, littering, etc.

We need to keep in mind that while many people are very willing to start separating their waste, we are still asking for a lot. Waste usually is something that we just want to get rid of.

It can be unhygienic or even hazardous, and in some cultures, there may be a stigma attached to it. Now, we are asking people to start thinking about their waste, to start handling it differently and to change their habits, which are often deeply engrained in cultural practices. This takes time and convincing, and we need to make the behavioral shift as easy and attractive as possible.

MK: IDOS is conducting several projects on how to increase the share of separated waste. What are the key learnings and policy implications?

AP: I think that one key learning is that there is no silver bullet, even though a lot can be learned from other people's experiences. Every solution needs to be adapted to the circumstances and needs of the given context. But there is a process that we can follow that makes success more likely. These are the four steps:

First, we need to understand the status quo by asking the questions what, who, how, and why. This is really much like detective work:

What exactly is our issue? For example, our separation plant receives mixed waste, and we can only recycle a fraction. But this is not detailed enough. We need to ask which materials exactly are an issue in that waste? Is it food waste, garden waste or hospital waste, etc.?

This leads us to the 'who-question'. Whose behavior causes the issue? Again, "households" is not enough! Is it a specific group of households? Who in the household? Who takes the decision that a household starts to separate, and who implements it? Is it a female or male member? Children? Household employees?

This leads us to the 'how'. How do they currently treat their waste, and how do we need them to do it?

And finally, why do they do what they do? And why would they do what we want them to? If we can't force them – and we rarely can nor should – we need to offer a better option. Convenience, societal or personal values, cost, availability of options and knowledge are all factors that play a key role here.

In each of the above questions, we need to prioritize. What is our most pressing issue? Which group is it mainly affected? What is their main barrier or motivation for change? Who/which barrier is easiest to address?

Second, based on the above answers, we develop targeted interventions. These can be changes in the infrastructure, institutions, communication measures, etc. Behavioral sciences give us some general guidelines of how to develop such interventions. For example, a new behavior should be made:

Simple. It should be easy to understand, with short communication channels, simple rules, minimal additional hassle, maximum convenience, with an eye on costs, etc.

Attractive in terms of money, but also non-monetary means (e.g., generating a "warm glow" for doing something good; creating trust that waste, once separated, will actually be recycled; make it fun through gamification, etc.)

Social: Humans tend to follow the behavior of others, especially their peers, and want to look good in front of them. Furthermore, if given the choice, most of us actually want to cooperate.

Third, we should pilot the intervention and adapt it according to the results of the pilot. Sometimes this brings surprising results, when things we were sure to work suddenly don't, or others we tried because they would be cost-effective but didn't have much hopes for, turn out to be quite impactful.

Only as the fourth step, we should scale up successful solutions.

MK: How can international cooperation facilitate the implementation of these policies?

AP: International cooperation has two key advantages. First, an excellent network and close contact with partners on the ground, and second, the capacity and financial means to bring behavioral expertise into the game. In all the steps mentioned above, close cooperation with partners is key. They have all the contextual knowledge. Performing these steps in as much detail as possible is, however, an investment. By bringing in behavioral expertise and financing, international cooperation can help to ask the right questions and support partners in finding the right answers. If we don't make this investment, we run the risk that entire system will function sub-optimally, and that can be much more expensive. Systems, once in place are difficult to change, so it is usually better to try and get it right from the start.

"General principles and mindset are more important than detailed calculation schemes or arbitrary threshold definitions. For most decisions, few but context-specific decision criteria are sufficient."

-Michael Havbro FABER, Karen SCRIVENER, Wolfram SCHMIDT

Image Source: Construction work for the development of new neighborhoods in the new district Thu Duc (formerly in the 2nd arrondissement), exhibition of construction materials, power lines and other lines. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Bottlenecks in implementing sustainable and circular technologies within the construction sector

The construction sector is currently responsible for more than 20% of global annual CO2 equivalent emissions. Cement and steel manufacturing accounts for around two thirds of this, and the rest results from other construction materials, transport, and construction processes. Ongoing operation and maintenance of buildings represents almost an additional 30% of global CO2 equivalent emissions. Global population growth and rapid urbanization, mainly in developing economies mean that construction activities and materials use will continue to grow. Within the next ten years, the overall global land required for the built environment is expected to double. Solutions for reducing energy use in the operational phase are starting to be implemented. These become powerful tools for future cities to grow savings in operations. Therefore, the much greater challenge is to minimize the primary resources and materials demanded, and emissions involved in processing and construction. This will involve different architectural and structural design approaches, the development of novel materials and more hybrid materials use, new concepts for standards and regulations, as well as reassessment of overall safety concepts. However, this can only succeed in the most sustainable way when circularity becomes an integral component of every decision, plan and process.

Sustainability has to be the leading objective of best practices in the construction sector – at global and local scales. This concerns the entire regulation and organization around construction, all links in the construction value chains, and the associated technologies and stakeholders. Potential emission reductions due to appropriate and smart application of already existing but not adequately applied technologies must be exploited immediately. In addition, novel and viable technologies

must be developed. Holistic strategies based on circularity principles for the development and management of structures must be coherently established and implemented across all public sectors, and emission benchmarks must be introduced to facilitate the process.

However, implementation is difficult. During a workshop at EPFL in Lausanne, Switzerland, industry leaders, associations, policy makers and researchers discussed the framework of the GLOBE Global Consensus on Sustainability in the Built Environment (www.rilem.net/globe) and the relevant bottlenecks in the implementation of sustainable solutions in the built environment. The following classification was derived: **Technological bottlenecks**, where use of new or modified existing materials with reduced emissions was impeded by perhaps unjustified concerns about reliability and safety; **Regulatory bottlenecks**, where procurement methods and standards have not been developed with circularity in mind, and, thus, are difficult to adapt; **Perception bottlenecks**, where decision makers perceive circular solution paths as inferior to the established linear ways, which they have learnt or which they apply in their specific region; **Business model bottlenecks**, where more sustainable and circular approaches simply lack incentives and, hence, remain financially unviable for possible change makers; and **Measurement bottlenecks**, where decision making fails due to lack of metrics, benchmark criteria or just pure data to show the real savings brought about by approaches for enhanced sustainability and circular economics.

In order to achieve the required mindset change, communication adapted to relevant stakeholders is key. Enhanced sustainability and circularity involve human beings and is contextual. This is why no single approach or concept can work everywhere. Therefore, general principles and mindset are more important than detailed calculation schemes or arbitrary threshold definitions. Eventually, the GLOBE workshop concluded that for most decisions, just a few but context specific decision criteria are sufficient as opposed to the extensive and complex assessment and check lists currently often proposed.

The policy framework must generate an environment, where the adequate solutions can be distinguished from the obviously dysfunctional ones and greenwashing solutions can be identified. In support of correct and timely implementation, simplicity should be prioritized and clear rules be set. All stakeholders in the market must be aware of their responsibilities and held liable. In addition, early adopters must be motivated and supported to become role models. A major change driver is interdisciplinarity, which in addition to multiple STEM disciplines must engage socio-economic and communication experts in an integral effort to assure that the quest for sustainability adequately accounts for people within their cultural and geographical contexts. These aspects need to be addressed in public and academic education, at all levels.

“Even though the circular economy must be implemented locally, it cannot be solved at the city level; it must be approached from a multilateral perspective with strong participation from manufacturing industries and multinational consortia.”

-Holger PRANG

Image Source: Oil and gas facilities in the Europort area of the Rotterdam port and dam system together with the New Canal (Nieuwe Waterweg) and the towns of Maasdjik and Maasluis (left). 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Digital strategies - new collaborations and barriers of informed decision-making

Gunnar HARTMANN (GH): Cities produce large amounts of data but is this type of information currently being used?

Holger PRANG (HP): Cities have become big data producers. Not only do we have more data than ever, we also have a wealth of linking possibilities. The mass of data makes it possible for us to access many different types and domains of data in urban development today, for example about land, buildings, the environment, as well as social and economic data. But data alone is not a guarantee for us to work better together across disciplines. What we need are interactive tools such as data platforms, interactive maps or other visualizations that enable data linkages and the creation of future scenarios with the participation of many. However, this new experimental urban data culture is not yet strongly present in the field of urban development. New forms of collaboration through digital tools are one of the most important research topics and fields of action in the sphere of a digital city.

GH: The City Science Lab at HafenCity University Hamburg is one of the leading research centers in Germany dealing with the transformation of cities in the context of digitalization. So, what does the Lab do?

HP: Basic research is conducted in our Lab, which is published in dissertations, conferences and publications. A long-standing cooperation with the MIT Media Lab in Cambridge (USA) not only enables a lively exchange of technology, but also an international scientific network with similarly organized labs, for example in Taiwan, Mexico or Toronto.[1] Another close cooperation partner is the United Nations, with which a technology and innovation accelerator for cities (UNITAC) is currently being set up.[2]

More than 20 percent of humanity now lives in informal settlements, and more than 50 percent of megacities, with more than ten million inhabitants located in the global south. In these cities, the data infrastructure is often inadequate.

Every day, we practice the balancing act between very local and global perspectives. The promise of urban technology is not only connectivity within cities, but also between cities and nations. In so-called Digital Urban Twins, cities are digitally recreated as twins to model scenarios for cities of the future. Currently, we are developing the Connected Urban Twin with cities of Munich and Leipzig. It is a federally funded icebreaker project that is intended to set standards for Germany.[3] In it, we are not mapping the entire city, but trying to make technologies compatible with each other. For example, the digital participation system (DIPAS) developed for Hamburg will be made usable for other cities as part of the project.[4]

However, these transfers are challenging. They require suitable IT systems and standards, and, above all, people who can formulate the respective location-specific challenges. Technical tools must be culturally embedded. Local people, who operate within political structures and must be able to use these innovations, remain crucial.

GH: From your experience, what practices could drive the digital transformation?

HP: In order to practice new forms of digital collaboration, many cities are founding City Labs as places where future scenarios for the city are developed together in an agile manner, close to the needs of the users, often in real experiments. The City Science Lab at HafenCity University in Hamburg was founded in 2015 when the then-mayor had to provide housing for around 40,000 refugees in the city within four months. In the Finding Places project, the city's population was called upon to make concrete suggestions for possible accommodations on interactive maps.[5]

Today, the City Science Lab serves as a place for dialogue between administration, science, civil society and business, based on digitized data. In the multi-stakeholder lab, we work on concrete requirements that not only come from the city administration, but also from business or civil society, and develop collaboration, participation and planning tools. For example, citizens can comment on new residential areas; new mobility is implemented, modeled and evaluated in pioneering projects; data platforms bring together social and land use data so that the social infrastructure of a city can be developed; and park areas can be designed with the neighborhood in virtual realities. With Google, the Air View project was just launched to analyze air quality because in the future it will be central to finding a good working model with Big Data companies as well.[6]

The City Science Lab is part of the Digital Strategy of the city of Hamburg and is deliberately located at a university because this is understood as a relatively neutral place.[7] We are researching tools that enable informed decision-making and thus also promote democracy. It is not a closed research lab, but an open place with work and presentation spaces so that, for example, administrative staff can collaborate with researchers.

GH: What do you think are the biggest barriers to implementing such digital strategies when it comes to circular economy?

HP: Enabling accountability with a high detail of material information throughout the supply chain is very complex and requires new monitoring and resource management systems. Circular economy concepts such as eco-design, remanufacturing, reuse, and sharing economy are emerging and will be enabled by smart cities technologies such as IoT, AI, and digital twins.[8] However, there is a lack of full implementation. Supply chains are global, digital strategies are local or national and the policy reach for cities is limited. Data protection regulations are organized differently in different countries that are part of the value chain.

Circular economy is a model that can help reduce consumption of natural resources and improve society and the environment, but it cannot happen in isolation. International cooperation is needed. However, in my opinion, focusing on the local circular economy will not be successful due to the lack of infrastructure and the competitive disadvantages of various cities. It is very difficult to decouple material flows within a city from global markets. Even though the circular economy must be implemented locally, it cannot be solved at the city level; it must be approached from a multilateral perspective with strong participation from manufacturing industries and multinational consortia. European and national policies can provide direction and guidance. Standardization in the field of circular economy is crucial for the development of frameworks, common definitions and tools for implementation. The organization of data and how it is connected is highly complex and requires advanced digital tools that are not widely available yet. There is a lack of complete understanding of the lifecycle of products and services. Decarbonization of supply chains is likely to happen sooner, paving the way for a circular economy solution.[9]

References

1. Projects of City Science Lab, HafenCity University Hamburg. https://www.hcu-hamburg.de/en/research/csl/research, https://citysciencelab.hamburg/ (accessed August 10, 2022).
2. United Nations Innovation Technology Accelerator for Cities (UNITAC) Hamburg. https://unitac.un.org/ (accessed August 10, 2022).
3. Connected Urban Twins - Urban Data Platforms and Digital Twins for Integrated Urban Development (CUT) of the cities of Hamburg, Leipzig and Munich started in 2021. https://connectedurbantwins.de/ (accessed August 10, 2022).
4. Lieven, Claudius & Lüders, Bianca & Kulus, Daniel & Thoneick, Rosa. (2021). Enabling Digital Co-creation in Urban Planning and Development. doi:10.1007/978-981-15-5784-2_34.
5. Noyman, Ariel & Holtz, Tobias & Kröger, Johannes & Noennig, Jörg & Larson, Kent. (2017). Finding Places: HCI Platform for Public Participation in Refugees' Accommodation Process. Procedia Computer Science. 112. 2463-2472. doi:10.1016/j.procs.2017.08.180.
6. Project Air View Hamburg: Pilot project for sustainable urban planning launched. https://blog.google/intl/de-de/unternehmen/engagement/project-air-view-hamburg/ (accessed August 10, 2022).
7. Digital Strategy for Free and Hanseatic City of Hamburg, Senate Chancellery, Department of IT and Digitalization, Document Nr 21/19800. https://www.hamburg.de/contentblob/14924946/e80007b350f1abdc455cfaea7e8cd76c/data/download-digitalstrategie-englisch.pdf (accessed August 10, 2022).

“The adoption of new circular practices does not only depend on market conditions, but also on social, cultural and cognitive factors.”

-Hilde REMØY, Alex WANDL

Image Source: A look at the conference area of the World Urban Forum 11 in Katowice, Poland, which raises the question of the physical form of knowledge building and sharing, as well as policy making through large assemblies, e.g. on urbanization, climate, biodiversity, etc. 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Challenges for circular urban development

A shift towards a more Circular Economy is, in many policies, seen as crucial to achieving a more sustainable and inclusive built environment that meets future demands. In the last decade, the European Commission's research funding has supported numerous initiatives aiming to reduce waste generation through shifts towards Circular Economy approaches. Many cities and regions followed and started to develop circular economy strategies, action plans and circularity monitors. The difficulties and challenges of implementing a seemingly simple concept are mainly to narrow, slow down and close materials streams and thereby reduce our dependency on raw material input. Europe's geopolitical dependency on resource-rich countries has become very apparent during the last years. In this article, we identify some of those challenges and propose potential ways forward.

Neglecting the double role that the built environment plays in the transition to circularity is a fundamental issue. Most policies and activities focus on the fact that the building and deconstruction sector is one of the most polluting and resource-intensive sectors globally. Modular design, design for de- and re-assembly, a focus on refurbishment instead of demolition and the shift towards bio-based building materials are all state-of-the-art and have become more common practice, specifically in new building projects. However, the (perceived) housing shortage in many European cities and the call for quick and cheap production of houses may have adverse effects because it often leads to the linear, business-as-usual approach of the construction sector.

Widely underestimated is the role of the built environment in defining the spatial playing field for all other sectors of the economy that aim to go circular. The "circular city" has, as the car-oriented or the pedestrian-oriented city did, a specific urban form and structure as well as a dedicated infrastructure system. Since most industries focus on efficiency gains in their production and on material and energy synergies with other companies, there is little knowledge of how to (re)integrate forms of large-scale industrial symbioses, reuse, sharing and recycling into our cities while also

improving the quality and liveability of urban environments.

A specific challenge is that parts of the production chain, like mining, scraping and recycling, that were outsourced to countries with lower environmental and social standards – thus shifting our environmental burdens – will have to return to Europe if we want to have control over scarce resources. Automation, newer and cleaner technologies will help dampen the negative impacts. Still, urban planning and design in Europe will have to deal with environmental and social challenges, which we haven't dealt with for half a century.

Crucial for the aspects above is an understanding of the urban mine and the materials, components, and products at our disposal in the future. With building information models, building passports and digital city twins, we have the technology at our hands to gather the information for new buildings and infrastructure. However, implementation is slow and international (data) standards are lacking. The knowledge concerning the existing building and infrastructure stock is meagre and often limited to amounts of material. Still, knowledge of the quality and re-usability of building components sits with a few frontrunners in the sector. The situation asks for a fundamental change in the building sector, starting with architects, who have to design with the urban mine in mind; the builders who need to learn to apply new building techniques and the deconstruction companies that have to become material and components brokers. Developing buildings or parts of buildings as a service instead of selling it to future owners, may be one way of simplifying this process, as the responsibility for the materials components and related data stay within one entity.

The extended life span of buildings and infrastructure adds another level of complexity to the transition toward circular cities. To ensure that expected positive effects of the shifts towards a circular economy are actually becoming a reality, and to avoid or at least to indicate unintended negative consequences, monitoring systems have to be established. The few available urban circular economy monitors all suffer from the same weaknesses, and public data is often limited to waste. Cross (national) border data is insufficiently available. Data about the treatment of waste outside of Europe is sketchy at best. To improve this situation, legal changes on the European and national levels have to take place, which will take years.

A tendency to maintain current practices is one of the main barriers for developing a more circular built environment. Adoption of new practices does not only depend on market conditions, but also on social, cultural and cognitive factors. Considering the dynamics of diffusion of innovation, organizational change is essential to foster the transition to a circular built environment. While the exponentially increasing prices for materials and construction products encourage the shift to circularity in construction practices, this trend needs to be further accelerated. To achieve a broader uptake and the motivation for circularity in society, several paths

will need to be adjusted. Architects and real estate developers will need to change their business models and develop their design expertise. Real estate investors and asset managers need new value propositions and assessment models. The governments should steer circularity and prioritise circular initiatives. Finally, the end-users, being house, office, industry, retail or leisure owners or tenants, must also understand the necessity of change. In order to realize the transition towards a more circular environment, new forms of collaboration and participation of wider groups of industry and society are needed.

Image Source: The polder area of “The Pearl” in Doha, Qatar, with Bariya Beach (foreground) and Marsa Arabia (background) Marina. A real estate and infrastructure project worth over $10 billion led by UDC-United Development Company, a Qatari investment company. The Pearl is located on over 4 million m^2 of reclaimed land. September 2022. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Image Source: The July 2022 meeting of G20 finance ministers and central bank governors in Bali featured “Sustainable Finance for Climate Transition,” which included the finance ministers of Indonesia, India, and South Africa, as well as representatives of multilateral development banks. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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Image Source: The July 2022 meeting of G20 finance ministers and central bank governors in Bali was themed “Sustainable Financing for Climate Change,” and was attended by the finance ministers of Indonesia, India and South Africa, as well as representatives of multilateral development banks. Image by Nicolas J.A. Buchoud, all rights reserved ©.

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