Policy Brief

Sustainable Development Through Circular Economy in Pakistan

Dr Aneel Salman

Sheraz Ahmad Choudhary

Hasnain Akram

January 2024

KSBL-IPRI Chair Economic Security

IPRI Islamabad Policy Research Institute
Research | Innovation | Dialogue | Policy

KSBL

Executive Summary

The concept of a circular economy (CE) has emerged as a crucial response to the unsustainable linear model of production and consumption that has occurred since the Industrial Revolution. Diverging from the "Take-Make-Use-Dispose" approach of the linear economy, the Circular Economy, characterised by the “Reduce-Recycle-Reuse” approach, prioritises the reduction of resource dependency, extension of product lifecycles, and elimination of waste to realise social, economic, and environmental benefits. Pakistan tackles notable challenges in embracing circular economy principles, particularly in waste management, transportation, and agriculture. With an annual generation of approximately 30 million metric tons of municipal solid waste and limited sustainable disposal methods, waste management is an intact area for circularity in Pakistan's economy. Pakistan's sufficient renewable energy potential provides a promising opportunity for achieving circular economy goals and reducing dependency on fossil fuels. To promote circularity, key focus areas include strengthening solid waste management through a comprehensive action plan, adopting the Polluter Pays Principle, and raising awareness about pollution consequences. Adopting circularity in waste management, linked with initiatives in renewable energy, electric vehicles, and sustainable agriculture, will not only tackle environmental challenges but also push sustainable economic growth. Through these strategic measures, Pakistan holds the potential to embrace a circular economy, covering the way for a future characterised by resilience and sustainability.

Recommendation:

- Awareness campaigns, educational programs, and media initiatives may be employed to inform citizens about the harmful effects of pollution on public health, the environment, and the economy.
- To foster the growth of charging infrastructure, the government may facilitate public-private partnerships. This approach will encourage entrepreneurship in the charging infrastructure sector and expedite the establishment of a comprehensive charging network throughout Pakistan.
- Collaborating with private companies like Vital Green can be instrumental in providing farmers with education and training on the latest organic farming techniques. Such initiatives will enhance farmer knowledge and adoption of

sustainable agricultural practices, contributing to long-term agricultural sustainability. The government may take proactive steps to address the issue of food waste.

- To capitalise on solar energy potential, the government may assign suitable land in resource-rich arid zones. Developing relevant infrastructure in these zones will facilitate the establishment of solar projects and maximise their efficiency.

Introduction:

Pakistan, a developing economy with rapid population growth, faces considerable hurdles in effectively managing its depleting resources, controlling pollution, and mitigating the impacts of climate change. Waste management poses substantial challenges in Pakistan, marked by insufficient infrastructure and inefficient systems that contribute to pervasive pollution and environmental degradation. The linear economic model is leading a country like Pakistan towards resource inefficiency, wastage maximisation and a weak recycling system.

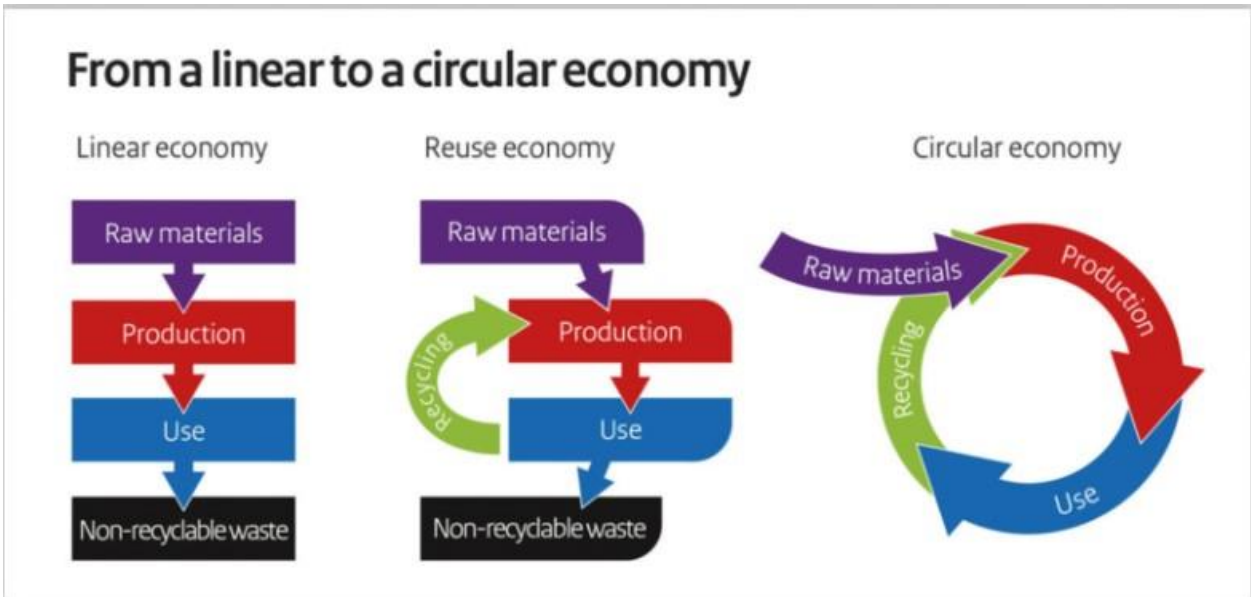
In Pakistan, the principles of a circular economy offer significant opportunities to advance resource efficiency, minimise waste, and foster sustainable development. Embracing resource-efficient practices, improving waste management, and recycling systems, advocating for circular business models, and emphasising sustainable agriculture are essential steps. Recognising the importance of circular economy principles is crucial for the government, businesses, and society at large, fostering an understanding of the interconnectedness between sustainability and economic growth. This policy paper is an attempt to present a case of increased circularity in Pakistan's economy and suggests a pragmatic pathway in the light of global best practices.

Understanding the Concept of Circular Economy

The world embraced a linear model of production and consumption in the era of the Industrial Revolution. The advent of machines enabled humans to mass-produce at a lower cost. The growing global population further increased the demand for goods normalising the "Take-Make-Use-Dispose" model. However, this linear economic model was based on the wrong belief in the endless availability of natural resources. The growing population have put the earth's resources under strain. The ever-increasing extraction and processing of natural resources have resulted in around half of all global Carbon dioxide emissions and over 90 % of global biodiversity loss.[1] The Circular Economy (CE) suggests a system of economic production that is less to zero dependent on resources, is focused on enhancing the life cycle of products and is aimed at eliminating waste for greater social, economic, and environmental gains. Emerged in the 1970s, it seeks to reduce resource consumption in industrial

[1] https://stateofgreen.com/en/news/moving-towards-a-circular-economy/

production.[2] It proposes a resilient approach inspired by the natural cycle and presents itself as an antidote to the linear economy (LE) model prevalent in the industrial sector. Circular Economy has been widely accepted in public policies, including those of the European Union and China, as a response to sustainability concerns. The growing population, which is projected to reach 9 billion people by 2050, followed by the increasing demand for goods, has resulted in significant environmental impacts, such as biodiversity loss and scarcity of raw materials due to extraction demands, leading to market price fluctuations and global economic instability. Circular Economy is guided by the following key principles: designing manufactured products with added value and longer lifecycles, creating versatile products that can be used in multiple ways throughout their useful life to promote reuse, establishing an organised system for returning solid waste to the industrial sector, where recycled secondary raw materials remain competitive in the market, and adopting a systemic approach to supply chain management that recognises the interconnectedness of energy production, material extraction, and the natural environment.



Source: From Linear to Circular Economy[3]

[2] KPMG. (2020, April 28). Potential economic pay-off of a circular economy – KPMG. https://assets.kpmg.com/content/dam/kpmg/au/pdf/2020/potential-economic-pay-off-circular-economy-australia-2020.pdf

[3] https://slidemodel.com/circular-economy-to-save-the-planet/from-linear-to-circular-economy/

Why does Pakistan Need a Shift from a Linear to a Circular Economy?

Because of the continuous consumption of fossil fuels in the production systems and transport sector, Carbon dioxide emissions have more than doubled in Pakistan in the past two decades.[4] Similarly, solid waste generation in Pakistan is around 49.6 million tons a year, which has been increasing by more than 2.4 % annually.[5] These factors combined have led to increased pollution and associated environmental consequences. Although, Pakistan's share in the global greenhouse emissions is almost negligible, but it has been ranked as the fifth most affected country due to climate change.[6] Other than the environmental threats, the linear model of production has put a strain on the country's mineral resources. The petroleum division has recently released a report stating that the country has almost exhausted its known oil and gas reserves. As per the Petroleum Division report, Pakistan has consumed almost 80% of its known oil reserves.[7] The situation becomes further scary if future consumption and population trends are factored in, which are exponentially rising. This calls for a complete rethinking of the linear economy and a shift towards circular economy as it offers governments a transformative opportunity. By doing so, the government can redefine the narrative surrounding economic growth, liberating it from the constraints of escalating resource consumption and environmental harm. For example, the concept of degrowth and its application in China, examining the ecological challenges posed by the country's rapid economic growth. It emphasises the environmental costs of China's development, including air pollution, water scarcity, soil erosion, and overconsumption of resources.[8] This transition would present a promising pathway to decouple economic output from resource-intensive practices, fostering sustainability and environmental preservation.

The 28th Conference of Parties (COP-28) took place in Dubai, UAE, with representatives from 197 countries presenting their initiatives to curb global warming and engaging in discussions on future climate actions. The circular economy was

[4] https://energyandcleanair.org/wp/wp-content/uploads/2021/07/CO2-Emissions-from-Pakistans-Energy-sector_30_07_2021.pdf
[5] https://www.trade.gov/country-commercial-guides/pakistan-waste-management#:~:text=Pakistan%20generates%20approximately%2049.6%20million,countries%2C%20creating%20serious%20environmental%20problems.
[6] https://energyandcleanair.org/wp/wp-content/uploads/2021/07/CO2-Emissions-from-Pakistans-Energy-sector_30_07_2021.pdf
[7] https://tribune.com.pk/story/2391711/depleting-oil-gas-reserves
[8] https://monthlyreview.org/2023/07/01/degrowing-china-by-collapse-redistribution-or-planning/

one of the major themes in COP-28. Global Plastic Action Partnership combines governments, businesses, and civil society to combat plastic pollution and promote sustainability. In Ghana, over 2,000 waste pickers contribute significantly to cleaning up beaches, drains, and various sites[9]. Shifting to renewable energy is crucial, addressing 55% of emissions, but insufficient alone. The remaining 45% of global greenhouse gas emissions stem from product and food production and use. To meet Paris Agreement targets, Pakistan must adopt a new economic model—eliminating waste, promoting circularity, and regenerating nature to create opportunities, enhance resilience, and reduce emissions. A circular economy is essential to complete this transformative vision[10].

A deeper transformation is needed, requiring a reconstitution of what safety means in the context of business. The rich business introduced the concept of a "safety doughnut," symbolizing the delicate balance between planetary boundaries and social essentials[11]. The current scenario indicates exceeding planetary limits and falling short of life's essentials for millions. Driving a redesign of business, a shift from extracting value to generating benefits is needed. Alternative ownership models, such as steward ownership and platform cooperatives, are highlighted as emerging solutions. Individuals working in or with businesses need to become redesigners, using a tool that explores how the design of a business can block or unlock transformative actions. The goal is to move toward a business world, where people and the planet, not just finance, drive decision-making.[12]

Pakistan's SDGs performance:

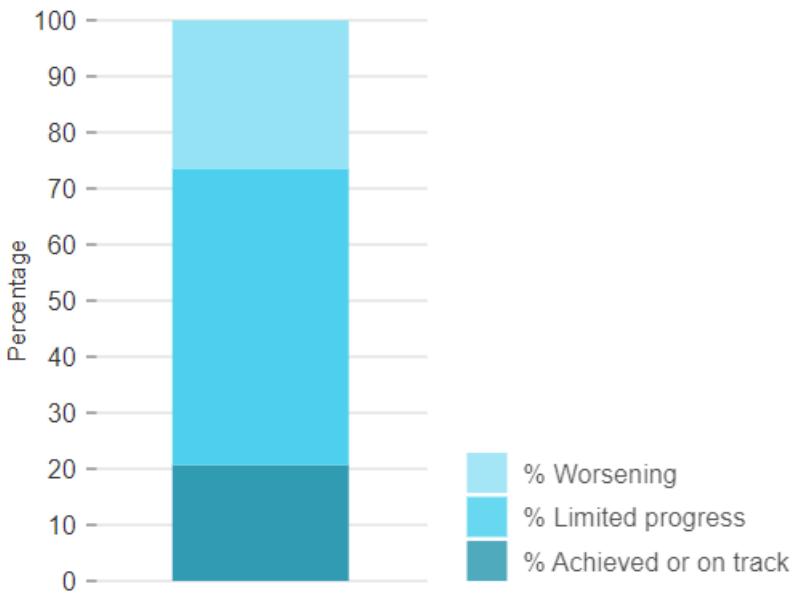
Sustainable Development Goals (SDGs) though ambitious but important agendas that Pakistan need to achieve by 2030. Pakistan is the first country to adopt the SDGs as its national development agenda through a unanimous National Assembly Resolution in 2016. The country has made considerable progress since then by mainstreaming these goals in national policies and strategies, provincial growth strategies and Pakistan's long-term development perspective.[13]

[9] https://europeansting.com/2023/11/30/cop28-these-are-the-key-talking-points-for-the-2023-climate-summit/
[10] https://www.ellenmacarthurfoundation.org/topics/climate/cop
[11] https://www.kateraworth.com/
[12] https://www.youtube.com/watch?v=UIXBw09y_b4
[13] https://www.sdgpakistan.pk/uploads/pub/Pak_SDGs_Status_Report_2021.pdf

SDG Index Rank	SDG Index Score	Spillover score
128/166	*59.0*	*99.3*
Indicators performance		
No Poverty	Significant challenges remain	Moderately improving (2023)
Zero hunger	Major challenges remain	Stagnating (2023)
Good health and well-being	Major challenges remain	Stagnating (2023)
Quality Education	Major challenges remain	Stagnating (2023)
Gender equality	Major challenges remain	Stagnating (2023)
Clean water and sanitation	Major challenges remain	Moderately improving (2023)
Affordable and clean energy	Major challenges remain	Stagnating (2023)
Decent work and economic growth	Major challenges remain	Stagnating (2023)
Industry, innovation, and infrastructure	Major challenges remain	Stagnating (2023)
Reduced inequalities	Challenges remain	On track or maintaining SDG achievement (2023)
Sustainable cities and economies	Major challenges remain	Stagnating (2023)
Responsible consumption and production	Challenges remain	Moderately improving (2023)
Climate action	SDG Achieved	Moderately improving (2023)
Life below water	Major challenges remain	Moderately improving (2023)
Life on land	Major challenges remain	Stagnating (2023)
Peace, justice, and strong institutions	Major challenges remain	Stagnating (2023)
Partnership for the goals	Major challenges remain	Moderately improving (2023)
Source: Sustainable Development report, 2023.[14]		

[14] https://dashboards.sdgindex.org/profiles/pakistan

Status of SDGs target for Pakistan (% trend Indicators)



Circularity Index of Pakistan: Circularity Gap Report

Circular Economy, a global impact organisation, released its annual *The Circularity Gap Report 2022* which maps countries' distance from the safe and just space.[15] This is another way of demonstrating how far countries' economies are from their circularity potential. As per the report, Pakistan's distance to a safe and just place is far, which means the country must do a lot more to exploit its circularity potential.

[15] https://www.circularonline.co.uk/wp-content/uploads/2022/01/Circularity-Gap-Report-2022.pdf

Source: The Circularity Gap Report 2022[16]

[16] https://www.circularonline.co.uk/wp-content/uploads/2022/01/Circularity-Gap-Report-2022.pdf

Towards Circular Economy: Global Precedents

Countries around the globe have recognised the need for more sustainable and resource-efficient economic models, and the concept of circular economy is gaining momentum. To upgrade their economy to a circular economy, many countries have adopted legislative frameworks and innovative approaches. EU is the forerunner in the race towards a circular economy. In 2020, the EU adopted a Circular Economy Action Plan considering the significance of fostering innovation as a catalyst for transitioning towards a circular economy.[17] This action plan commits to defining a "Safe Operating Space" for efficient use of natural resources. It also aims to decouple environmental collapse from economic growth and to set international rules on waste reduction and management. France has also enacted a very ambitious "France's Anti-waste and Circular Economy Law".[18] The objective of the legislation is to eradicate waste and pollution right from the initial design phase and shift the entire linear models of production, distribution, and consumption to circular economic models. Not only the governments but also private businesses are also contributing to the shift towards a circular economy. For example, Renault is leading the automobile industry in transitioning towards circular economic models of production.[19] By remanufacturing vehicle components, increasing the proportion of reused plastic material, and creating a second life for electric batteries, it is extending the lives of vehicles along with keeping the materials in use for extended periods ultimately reducing the use of new raw materials.

Recent surveys and studies reflect growing support for post-growth, degrowth, and growth-critical positions among both scientists and the public[20]. In climate policy research, 73% of researchers globally and 86% in the EU express support for post-growth. Sustainability scholars and German Environment Agency staff also show significant backing for growth-critical concepts. The Spanish public (61%) and international scientists (69%) favour growth-critical positions, with limited support for green growth. Public opinion in Europe indicates an average of 61% in favour of post-growth, though lower among disadvantaged communities. Additionally, numerous polls highlight public agreement that environmental protection is more

[17] https://op.europa.eu/en/publication-detail/-/publication/9dc6aa01-39d2-11eb-b27b-01aa75ed71a1
[18] https://ellenmacarthurfoundation.org/circular-examples/frances-anti-waste-and-circular-economy-law
[19] https://ellenmacarthurfoundation.org/circular-examples/groupe-renault
[20] https://www.jasonhickel.org/blog/2023/11/24/how-popular-are-post-growth-and-post-capitalist-ideas?s=08

important than economic growth, with varying levels of support for post-capitalist policies and anti-capitalist sentiments.[21]

The green growth versus degrowth debate is primarily about technology, asserting that degrowth scholarship supports technology aligned with ecological coherence, social justice, and empirical feasibility. Critiquing green growth scenarios for relying on speculative negative emissions technology and unrealistic decoupling assumptions, the moral and ecological concerns associated with maintaining high energy use in rich countries.[22]

Linkage between circular economy and degrowth:

An analysis of panel data on the Circular economy across 28 European countries has indeed shown that economic growth in these nations led to a fourfold increase in resource extraction compared to the reduction achieved through Circular economy practices[23]. As long as the stock of materials in buildings and infrastructure continues to grow, the extraction of primary resources remains necessary, as the supply of recycled material is insufficient[24]. Even if an equilibrium is reached, where there is a zero net addition to the stock (all new construction material demand is satisfied with secondary materials), non-recyclable materials like fossil fuels and some biomass will still need extraction. This holds for the shift from fossil to renewable energy, as it requires an increased number of metals and other materials, all of which must be extracted initially.

Meanwhile, the circular economy, focused on resource efficiency, is gaining popularity as an environmental growth strategy. Governments and the UN see it as staying within planetary boundaries. However, those advocating for post-growth question the possibility of decoupling growth, suggesting a different socio-economic context for a sustainable circular economy[25]. Circular business models must focus on genuinely slowing down and reducing resource flows, actively limiting the throughput of materials in societies[26]. While circular economy (CE) has the potential

[21] https://www.jasonhickel.org/blog/2023/11/24/how-popular-are-post-growth-and-post-capitalist-ideas?s=08
[22] https://monthlyreview.org/2023/07/01/on-technology-and-degrowth/
[23] https://www.sciencedirect.com/science/article/pii/S0921800922002683
[24] https://www.sciencedirect.com/science/article/pii/S0921800922002683
[25] https://www.frontiersin.org/research-topics/60841/what-is-the-relationship-between-circular-economy-and-economic-growth
[26] http://www.sciencedirect.com/science/article/pii/S0959652619308066

to be disruptive, this can only be achieved within a transformative economic system. The concept of degrowth in affluent nations is no longer a niche academic fantasy; it is emerging as a serious contender in mainstream economic thought[27].

More and more experts and activists are talking about the idea of "degrowth," which suggests a big change in the way we run our economies to deal with the effects of climate change. This concept, supported by both scholars and activists, calls for a planned and fair decrease in how much stuff we use as a society. The ultimate aims are to take better care of the environment, make sure everyone is treated fairly, and improve the overall well-being of people. Choosing a path of degrowth could guide Pakistan towards a slow but positive economic journey. Considering these insights, it's crucial for the Pakistani government to adjust its current policies in line with the goals of degrowth. This would help ensure the well-being of society and alleviate the strain on the environment.[28]

There is an opportunity for all stakeholders – including academics, practitioners, and governments – to collaboratively experiment with and refine economic models that embrace circular principles while staying within planetary boundaries. The crucial aspect is cooperation to achieve a redistribution of knowledge and power, for instance, through open-source models, enabling a more equitable distribution of earnings and assets[29].

Swiss Waste Management Model

Switzerland is well-regarded for its valuable waste management practices, standing out despite the nation's substantial annual per capita waste production exceeding 90 million tonnes. Switzerland maintains one of the highest global recycling rates of a remarkable 50%. This success is attributed to a strong waste management policy, emphasising waste reduction and the promotion of recycling. Embedded in the Swiss Environmental Protection Act is the effective implementation of the "Polluter Pays Principle," wherein citizens face taxation balanced to their waste generation. This taxation mechanism serves not only as an economic tool but also to raise public awareness about individual waste production, encouraging citizens to adopt measures for waste minimisation.

[27] https://doi.org/10.1038/d41586-022-04412-x
[28] https://pjss.bzu.edu.pk/index.php/pjss/article/view/1381/1117
[29] http://www.sciencedirect.com/science/article/pii/S0959652619308066

The Swiss waste management policy places significant importance on providing citizens with the necessary infrastructure to facilitate recycling efforts. This general approach encompasses both material recycling and energy recovery through alternative waste treatment methods. The heat generated during these processes efficiently contributes to district heating, particularly benefiting administrative structures. To boost recycling initiatives, the government ensures easy access to recycling facilities for the public. Furthermore, citizens are granted the opportunity to dispose of waste at no cost, conditional upon their adherence to correct waste elimination protocols. Switzerland prohibited the disposal of combustible waste in landfills in 2000, simultaneously increasing alternative waste treatment capacities to enhance waste management effectiveness[30].

Following these waste treatment processes, a detailed de-metallisation procedure is employed to reclaim valuable metals such as iron, stainless steel, aluminium, and copper from the ash. The resulting residue, lacking commercial value, is carefully deposited in contained landfills designed to mitigate adverse environmental impacts. The responsibility for waste disposal costs lies directly with waste producers, with individual waste generation carefully monitored and taxed accordingly. Official waste disposal bags, exclusively provided by authorities, serve as the sole legitimate means for urban waste collection, with costs varying based on size and volume. To reinforce compliance, the Swiss government takes rigid measures against illegal waste disposal and littering, imposing penalties as a means of ensuring adherence.

Closing the Loop

Closing the Loop (CTL) began its journey as an NGO in 2012 and transitioned into a social enterprise in 2014, recognising the enormous potential for growth and aiming to achieve sustainability through commercial operations.[31] Operating with a team of 5 employees in Europe and collaborating with 12 local partners, one in each country, CTL has demonstrated a successful circular economic model in its mission to collect and responsibly recycle end-of-life mobile phones from emerging markets. In many emerging markets, there is a lack of formal infrastructure, adequate laws and regulations surrounding electronic waste management, and limited consumer awareness about proper recycling practices. This results in an alarming amount of

[30] https://www.eea.europa.eu/publications/managing-municipal-solid-waste/switzerland-municipal-waste-management

[31] https://eulacfoundation.org/en/system/files/case_studies_circular_economy_eu_lac.pdf

electronic waste, particularly end-of-life mobile phones, being discarded in landfills, posing environmental and health hazards. CTL addressed these challenges through an innovative approach that linked waste issues to recycling opportunities, effectively matching supply, and demand. The organisation collects end-of-life mobile phones from consumers through partnerships with churches and other communities, as well as purchases them from phone repairers and scrap dealers, provided these entities are not involved in illegal or unsafe activities. Through its operations in more than ten countries, CTL has created local economies of responsible waste collection, positively impacting approximately 2,000 people in its supply chain. These individuals, often from marginalised communities, financially benefit from participating in safe and environmentally responsible waste collection processes. Since 2014, CTL's efforts have resulted in the rescue of over 2 million discarded mobile phones from ending up in landfills. By responsibly recycling these end-of-life devices, CTL significantly reduces electronic waste pollution and its associated environmental impacts. In Africa alone, around 3,000 people have directly benefited financially from CTL's circular economic model[32]. By providing a market for end-of-life mobile phones, the organisation empowers local communities and individuals engaged in waste collection, contributing to sustainable livelihoods and poverty alleviation. CTL's remarkable achievement lies in demonstrating that it is indeed possible to collect millions of discarded phones in regions with limited waste management infrastructure, regulatory frameworks, and consumer awareness. Through their initiatives, CTL has raised awareness about proper recycling practices, setting an example for others to follow.

By linking waste issues to recycling opportunities, CTL has not only prevented millions of mobile phones from ending up in landfills but also empowered local communities and fostered responsible waste collection practices in emerging markets.

Potential Areas for Circularity in Pakistan's Economy

1- Solid Waste Management

Pakistan currently produces an estimated 30 million metric tons of municipal solid waste (MSW) annually, and this amount is expected to significantly rise in the future

[32] Chrome extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.closingtheloop.eu/sites/default/files/2021-07/CTL%20Due%20Diligence%20Report%202020-2021.pdf

due to factors such as rapid population growth, urbanisation, and economic development.[33] Presently, only about 50% of this waste is collected, and less than 20% of the collected waste is disposed of in an environmentally responsible manner.[34] Consequently, solid waste management has been largely overlooked and remains an untapped resource, but it also presents a substantial opportunity for Pakistan to embrace circular economy principles and enhance its economic sustainability by adopting a more comprehensive approach to waste management.

2- Renewable Energy

Pakistan possesses significant untapped potential in solar and wind power generation. According to the World Bank, utilising a mere 0.071 % of the country's land area for solar photovoltaic (solar PV) power could meet the current electricity demand.[35] Moreover, Pakistan benefits from abundant wind resources, with well-defined wind corridors and average wind speeds of 7.87 m/s in 10 % of its windiest regions.[36] Despite several successful projects, the current installed capacity of solar and wind energy remains relatively low, comprising just over 1,500 Megawatts, a mere 4% of the total capacity, which represents approximately 2% of the overall electricity generation.[37] Transitioning to a circular economy aligns with Pakistan's ultimate objective, and fully harnessing the potential of renewable energy sources plays a pivotal role in achieving this goal. By capitalising on renewables, Pakistan can significantly reduce its dependence on fossil fuels, leading to a marked reduction in oil imports. This shift towards renewable energy also has far-reaching positive environmental consequences, mitigating greenhouse gas emissions and contributing to the fight against climate change.

---

[33] https://www.adb.org/sites/default/files/publication/784421/solid-waste-management-pakistan-road-map.pdf

[34] https://moderndiplomacy.eu/2023/04/15/waste-management-in-pakistan-and-its-economic-potentials/

[35] https://www.worldbank.org/en/news/feature/2020/11/09/a-renewable-energy-future-for-pakistans-power-system#:~:text=Pakistan%20has%20tremendous%20potential%20to,is%20also%20an%20abundant%20resource.

[36] https://www.worldbank.org/en/news/feature/2020/11/09/a-renewable-energy-future-for-pakistans-power-system#:~:text=Pakistan%20has%20tremendous%20potential%20to,is%20also%20an%20abundant%20resource.

[37] https://www.worldbank.org/en/news/feature/2020/11/09/a-renewable-energy-future-for-pakistans-power-system#:~:text=Pakistan%20has%20tremendous%20potential%20to,is%20also%20an%20abundant%20resource.

3- Electric Vehicles

The transportation sector in Pakistan has been experiencing rapid growth, leading to a heavy dependence on oil-based products. The country's annual expenditure of nearly USD 13 billion on oil imports raises concerns about its environmental and economic implications.[38] Burning fossil fuels, including oil, is projected to increase the country's emissions fourfold by 2030, exacerbating environmental challenges.[39] Fortunately, Pakistan presents a favourable market opportunity for the adoption of electric vehicles (EVs), especially in the two-wheeler and three-wheeler segments. As approximately 37% of electricity generation in Pakistan comes from renewable sources, coupling this with the efficiency of EVs can result in a remarkable 70-80 % reduction in environmental emissions compared to conventional fossil fuel vehicles (FFVs).[40] This means that while EVs produce zero tailpipe emissions, their overall impact leads to significant reductions in environmental emissions throughout the entire energy value chain. Facilitating the uptake of electric vehicles in Pakistan can yield numerous benefits. First and foremost, it would substantially reduce the country's dependence on fuel imports, contributing to greater energy security and financial savings. Additionally, the adoption of EVs would help optimise unutilised generation capacity, leading to a more efficient and sustainable energy system. Notably, electric vehicles play a crucial role in reducing greenhouse gas emissions, aligning with Pakistan's commitment to combatting climate change. From a circular economy perspective, promoting electric vehicles would advance environmental preservation efforts. By curbing emissions and promoting cleaner energy sources, Pakistan would move towards a more sustainable and resource-efficient transportation system. The reduction in environmental pollution and preservation of natural resources contribute to a circular economy approach that focuses on sustainable practices and minimising waste. In short, the adoption of electric vehicles in Pakistan holds immense promise for environmental preservation and sustainable economic growth. By shifting towards cleaner transportation options, the country can substantially decrease emissions, reduce reliance on oil imports, and shift towards a circular economy.

[38] https://lei.lums.edu.pk/wp-content/uploads/2021/05/evReport.pdf
[39] https://lei.lums.edu.pk/wp-content/uploads/2021/05/evReport.pdf
[40] https://lei.lums.edu.pk/wp-content/uploads/2021/05/evReport.pdf

4- Sustainable Agriculture

The agriculture sector remains the cornerstone of Pakistan's economy, supporting a significant portion of the population through direct or indirect involvement. Accounting for approximately 24 % of the Gross Domestic Product (GDP) and employing half of the labour force, agriculture plays a vital role.[41] However, this sector encounters various challenges, including water scarcity, climate change impacts, soil degradation, insufficient research and development, weak supply chain management, and limited financing opportunities. Nonetheless, the potential for sustainable farming offers a promising solution, promoting social, economic, and environmental sustainability in the agricultural business domain. Another pressing issue faced by the agriculture sector is food wastage, a matter highlighted in the report by the Ministry of National Food Security & Research.[42] Pakistan experiences annual food wastage cost is USD 4 billion, with 26 % of its food production, equivalent to 19.6 million metric tonnes, being discarded each year.[43] This wastage often results from superficial criteria such as appearance, size, and colour, despite efforts to ensure food security. To address these challenges and unlock greater benefits, advocating for increased sustainable agriculture and food preservation is essential. Embracing sustainable agricultural practices not only mitigates the adverse effects of water scarcity, climate change, and soil degradation but also fosters a more resilient and productive agricultural sector. By promoting research and development initiatives, improving supply chain management, and enhancing access to financing, the agriculture sector can achieve more robust and sustainable growth, contributing positively to the overall economy and the livelihoods of rural communities. Moreover, tackling food wastage is critical for environmental, social, and economic reasons. Implementing efficient and responsible food preservation strategies can significantly reduce food loss and its associated environmental impact, including greenhouse gas emissions from decomposing food. Furthermore, reducing food wastage enhances food security, ensuring that more people have access to adequate and nutritious food, which positively impacts public health and well-being. Economically, minimising food wastage saves valuable resources and

[41] https://tribune.com.pk/story/2410844/growing-for-a-greener-future-sustainable-agriculture-brews-in-pakistan
[42] https://www.nation.com.pk/02-May-2023/pakistan-yearly-wastes-food-worth-dollar-4-billion-report
[43] https://www.nation.com.pk/02-May-2023/pakistan-yearly-wastes-food-worth-dollar-4-billion-report

reduces financial losses for farmers, businesses, and consumers alike, creating a more efficient and resilient food system.

The promotion of sustainable agriculture and the adoption of effective food preservation practices are essential steps to achieve greater environmental, social, and economic benefits in Pakistan's agricultural sector.

Recommendations

Strengthening Solid Waste Management:

- The new Hazardous Waste Management Policy for 2022 is a significant step forward in dealing with the problem of dangerous waste in Pakistan. This policy tool will empower Pakistan to take a crucial role in fulfilling its responsibilities in the movement and disposal of hazardous wastes across borders. Moreover, it will assist Pakistan in reaching the Sustainable Development Goals and maintaining the European Union's GSP Plus status.[44]
- To address pollution effectively, creating public awareness about its consequences is imperative. People need to become conscious of the urgency to tackle this problem. Awareness campaigns, educational programs, and media initiatives should be employed to inform citizens about the harmful effects of pollution on public health, the environment, and the economy. This uncovered effort will encourage individuals and communities to take an active role in pollution prevention and waste management.
- Emulating successful waste management models, Pakistan can adopt the Polluter Pays Principle, wherein consumers who generate more waste are subject to taxation. This policy will incentivise waste reduction at the source. Encouraging citizens to reduce their consumption of goods will play a significant role in waste minimization. For instance, promoting products with minimal packaging and advocating the use of cloth or canvas bags instead of plastic bags during shopping will lead to reduced waste generation. Emphasising the importance of waste reduction through public awareness campaigns and legislative support will foster a sustainable shift in consumer behaviour.

---

44 https://mocc.gov.pk/SiteImage/Misc/files/National%20Hazardous%20Waste%20Management%20Policy%202022.pdf

Developing the Renewable Energy

Enhancing climate change mitigation involves the development, adoption, and deployment of environmental technologies (ET). The international trade of environmental goods and services (EGS) serves to access ET embedded in environmental products, facilitating the dissemination of these technologies[45]. Expanding trade in EGS has the potential to bring further environmental benefits to Pakistan. Pakistan can control its environmental hazards by comprising goods and services that are supplied for an environmental purpose and have a positive impact in reducing emissions. To capitalise on solar energy potential, the government should earmark suitable land in resource-rich arid zones. Developing relevant infrastructure in these zones will facilitate the establishment of solar projects and maximise their efficiency. To drive innovation and advancements in renewable energy, the government may incentivise the private sector to invest in emerging technologies that enhance the consistency and reliability of renewable energy sources.

Promoting Electric Vehicles

The automotive sector in the world is undergoing a transition from hydrocarbon-based fuels to more efficient and eco-friendly technologies due to growing concerns about environmental harm. With the current population growth and the associated rise in industrial activities, it is anticipated that, unless proactive measures are taken, the use of Fossil Fuel Vehicles (FFVs) and the resulting environmental impact will escalate in the future. Hence, there is a pressing need to shift the focus towards environmentally friendly technologies, particularly Electric Vehicle Technology. In response, Pakistan has introduced its inaugural Electric Vehicle (EV) policy (2020-2025) through the Engineering Development Board (EDB), featuring key recommendations such as customs duty exemption and additional sales tax relief on the import of four-wheel electric vehicles. Additionally, locally manufactured electric vehicles with power up to 50/kWh are subject to only a 1% sales tax[46]. To foster the growth of charging infrastructure, the government may facilitate public-private partnerships. This approach will encourage entrepreneurship in the charging

[45] https://www.wto.org/english/res_e/booksp_e/wtr22_e/wtr22_ch6_e.pdf
[46] https://invest.gov.pk/sites/default/files/2020-07/EV%2023HCV%20130620%20PDF.pdf.pdf

infrastructure sector and expedite the establishment of a comprehensive charging network throughout Pakistan.

Facilitating Sustainable Agriculture:

Collaborating with private companies like Vital Green can be instrumental in providing farmers with education and training on the latest organic farming techniques.[47] Such initiatives will enhance farmer knowledge and adoption of sustainable agricultural practices, contributing to long-term agricultural sustainability. To bolster the long-term sustainability of agricultural production, the government may prioritise the adoption of renewable energy sources. Emphasising solar-powered water pumps and irrigation systems presents a viable alternative to conventional energy sources, offering cost-effective, renewable, and environmentally friendly energy solutions for the agriculture sector. The government may take proactive steps to address the issue of food wastage. By implementing policies and programs promoting food preservation and discouraging wastage, significant progress can be made. Establishing additional food storage facilities and warehouses will ensure proper food preservation and reduce wastage.

These recommendations collectively aim to push Pakistan towards a more sustainable and environmentally deliberate future, encouraging economic development while minimising the ecological footprint.

[47] https://tribune.com.pk/story/2410844/growing-for-a-greener-future-sustainable-agriculture-brews-in-pakistan

Conclusion

Pakistan has a significant opportunity to move towards a circular economy, thereby addressing pressing environmental challenges and fostering sustainable economic growth. Incorporating circularity principles in solid waste management, renewable energy, electric vehicle adoption, and sustainable agriculture can drive positive changes in the economy. By incentivising circular practices, raising awareness, and encouraging collaboration between the public and private sectors, Pakistan can achieve its circular economy potential and pave the way for a more resilient and sustainable future. The government, businesses, and society must recognise the importance of circular economy principles and understand how they connect sustainability and economic growth. Collaboration among policymakers, industry leaders, researchers, and communities is crucial to establishing frameworks, infrastructure, and support systems for implementing circular economy strategies. Embracing a circular economy can help Pakistan conserve resources, preserve the environment, generate new job opportunities, and contribute to addressing climate change impacts. It's time for Pakistan to work out the benefits of a circular economy and struggle for resource efficiency and waste reduction to build a sustainable and resilient future.

About the Authors

Dr. Aneel Salman holds the distinguished KSBL-IPRI Chair of Economic Security at the Islamabad Policy Research Institute (IPRI) in Pakistan. As a leading international economist, Dr Salman specialises in Monetary Resilience, Macroeconomics, Behavioural Economics, Transnational Trade Dynamics, Strategy-driven Policy Formulation, and the multifaceted challenges of Climate Change. His high-impact research has been widely recognised and adopted, influencing strategic planning and policymaking across various sectors and organisations in Pakistan. Beyond his academic prowess, Dr Salman is a Master Trainer, having imparted his expertise to bureaucrats, Law Enforcement Agencies (LEAs), military personnel, diplomats, and other key stakeholders furthering the cause of informed economic decision-making and resilience.

Sheraz Ahmad Choudhary is a Research Associate at IPRI. He is affiliated with the University of Sussex and his areas of expertise are Macroeconomics, Trade Public Finance, and Environmental Economics.

Hasnain Akram is working as a Research and Advocacy Specialist in SMEDA, Lahore. Previously, He was working as a Research Assistant at Chair Economic Security, Islamabad Policy Research Institute. His research interests include Economic Security, Political Economy, Trade, Energy and Power, and Energy and Climate Policy.