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RESEARCH ARTICLE

Digital Equity as a Catalyst for Circular Economy Transitions

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Abstract

In an era in which sustainable development requires both technological advancements and social presence, this study examined the crucial role of digital equity in facilitating the adoption of circular economy (CE) practices and principles, grounded in the fundamental human right to live with dignity and opportunity. Although digital equity and sustainability receive support, the collaboration, particularly from the perspective of constitutional rights as a key link, remains inadequately addressed. This research study proposes and tests a structural equation model (SEM) examining the relationships between Digital Equity (DE), the Right to Live (RL), and the adoption of a circular economy (CE). Using validated constructs aligned with the UN Sustainable Development Goals (SDGs), the model assesses the causal relationships across three scopes: digital equity, the right to live, and the adoption of a circular economy. By outlining digital equity as a driver of social human rights to live, which in turn supports circular and sustainable practices, this study identifies key research gaps in sustainability analysis. The model proposes that advancing towards a circular economy (CE) involves not only frameworks and improvements but also a commitment to digital equity, digital inclusion, and digital social integrity.

Keywords Digital Equity · Right to Live · Circular Economy · Sustainable Development Goals

1. Introduction

Digital equity has emerged as a central enabler of achieving sustainable development, particularly for SDGs 4, 8, 9, 11, and 17 (Rothe et al., 2023). As technology continues to drive global advancement, gaps in digital access and literacy exacerbate existing socioeconomic differences (Mishi & Anakpo, 2022). The right to live in a just and inclusive society imposes equitable access to digital tools, infrastructure, and skills (Sanders & Scanlon, 2021). Digital equity encompasses not only internet accessibility but also affordability, technological literacy, and the ability to leverage digital resources for education, employment, and innovation (Ahuja, 2023). Worldwide, governments facilitate targeted intervention policies and practices to counter digital inequalities (van Kessel et al., 2022). Legislators can bridge the digital gap by implementing government directives that promote broadband expansion, subsidised internet access, and digital literacy courses (Correa, 2024). Investing in ICT infrastructure, mainly in marginalised communities, aligns with SDG 9 by promoting innovation and sustainable industrialisation (Kumar & Chatterjee, 2023).

A circular economy (CE) approach can further improve digital equity by encouraging the sustainable use of digital resources (Williams et al., 2024). Recycling and refurbishing electronic devices reduce e-waste and provide reasonably priced technology to marginalised populations (Gonzales et al., 2023). Digital sustainability projects, such as open-source educational resources and e-learning platforms (SDG 4), facilitate expansive access to knowledge (Oladokun & Oyelabi, 2021). Additionally, smart cities (SDG 11) are influencing digital innovation to improve urban living conditions, ensuring that technology-driven

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development does not overlook vulnerable groups (Al-Mujahed, 2024). Arimoro (2025) discusses the right to live as a manifold concept that extends beyond mere survival, encompassing the opportunity for individuals to thrive in an environment that promotes dignity, equity, and well-being. This right works in tandem with digital equity, supporting a more comprehensive understanding of human thriving. Digital equity ensures that all individuals have equal access to the opportunities provided by the digital age, which is increasingly necessary for education, employment, and social participation (Afzal, Khan, Daud, Ahmad, & Butt, 2023).

This research study proposes the Right to Live as an essential mediating construct linking digital equity to sustainability outcomes (Alhassan & Adam, 2024). According to the Universal Declaration of Human Rights and sustainability studies, the Right to Live is theorised here not simply as being, but as the confidence of a respectable being, evident through access to education, policy protection, sustainable practices, and intergenerational equity (Powers, 2024). It is suggested that digital equity alone may not be sufficient to drive circular economy (CE) activities; rather, it facilitates the social and policy environments necessary for individuals and organisations to participate in circular practices.

2. Literature Review

The evolution to a circular economy (CE) offers a sustainable alternative to the traditional linear economic model (Gorokhova, Shpatakova, Toponar, Zolotarova, & Pavliuk, 2023). It emphasises resource efficiency, waste reduction, and resource reuse through recycling, reuse, and remanufacturing (Chiang, Ma, Wen, & Lin, 2024). CE adoption is modelled by several variables, with the SDGs functioning as sub-variables that guide the overarching sustainability goals (Torreggiani, 2024). The "right to live" serves as a mediating variable influencing individual and corporate decisions regarding sustainable practices (Thiet, 2024). The digital revolution is often cited as a significant facilitator of sustainability, accelerating innovations in production and sustainable city development (Salvi et al., 2022). However, digital equity does not guarantee fair or efficient outcomes. Inequalities in access to digital infrastructure, literacy, and functional support—collectively referred to as digital equity—can significantly affect the scope of sustainable transitions and individuals' and communities' ability to contribute to them (Williams, 2022). Although previous findings have attributed responsibility for digitalisation to sustainability, few have analytically examined the causal pathways through which digital equity might influence pro-environmental actions, specifically within a rights-based framework (Lee & Fu, 2024).

2.1. Theoretical Development

The theoretical framework, which combines digital equity with SDGs 4, 8, 9, 11, and 17, along with circular economy (CE) principles and the right to live, highlights the importance of inclusive and sustainable development (de Souza Campos, Karl, & Vazquez-Brust, 2023). From the perspective of Adult Learning Theory (ALT), individuals are equipped with expertise and intelligence to participate sustainably (Motorga, 2023). Asset-Based Community Development (ABCD) and Asset-Based Learning Theory (ABLT) emphasise capitalising on local resources and strengths, promoting community-driven solutions (Qiaoyu, Rosnon, Amin, & Burhan, 2024). The capability approach focuses on the development of fundamental liberties and opportunities for happiness. In contrast, social justice theory emphasises the right to access resources and opportunities, ensuring that no one is left behind (Yadav, 2025). Finally, systems thinking theory emphasises the need for universal, cooperative energies to promote sustainable development (Voulvoulis et al., 2022). Collectively, these theories present a comprehensive framework that integrates digital equity, the circular economy, and the achievement of SDGs, aligning with the fundamental right to live with dignity and opportunity.

2.2. Research Model and Hypothesis Development

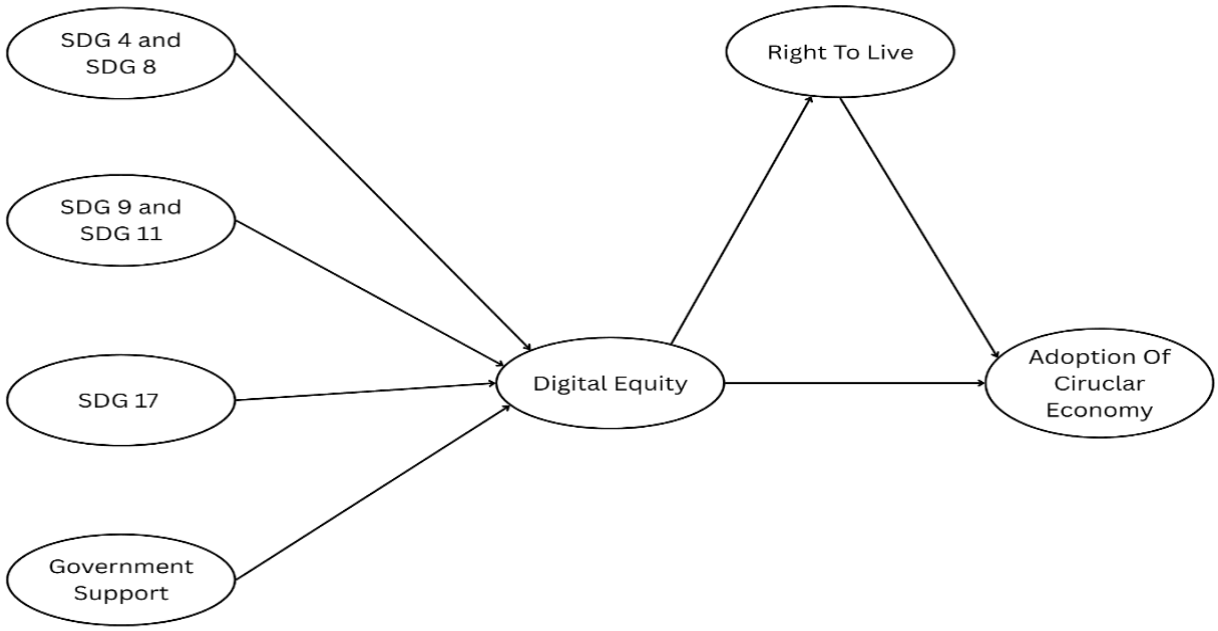

Figure 1. The Research Model

2.2.1. Education and Digital Empowerment (SDG 4 & 8) and the Role of Technology in Education Access The United Nations Sustainable Development Goals (SDGs) highlight the significance of equitable and inclusive education (SDG 4) and decent work and economic growth (SDG 8) (Kreinin & Aigner, 2022). Both these goals emphasise the critical function of education in advancing empowerment, economic development, and social inclusion, with digital technologies serving as mechanisms for realising these objectives (Rane et al., 2023). As shown in Figure 1, the integration of technology in education is pivotal for ensuring access, quality, and inclusivity, and for fostering enduring learning opportunities for all.

2.2.2. Sustainable Innovation (SDG 9 & 11) and Digital Tools Enabling Circular Economies Awan (2021) argues that sustainable innovation is central to achieving two of the United Nations Sustainable Development Goals (SDGs): SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities). Sisinyize (2024) explains that these goals highlight the need for sustainable industrialisation, infrastructure, and urban development that prioritise environmental stewardship, economic inclusion, and societal well-being. In this perspective, Mondal et al. (2023) examine how digital tools have emerged as essential enablers of circular economies, promoting the competent use of resources, waste reduction, and innovation in commercial models. Anttiroiko (2023) examined how the adoption of digital technologies is transformative in moving toward circularity, addressing the global environmental and economic challenges that businesses and cities face.

The circular economy (CE) can serve as a crucial engine of job security and creation by encouraging innovative employment opportunities in recycling, remanufacturing, sustainable logistics, and repair-based businesses (Bergmann et al., 2025). In contrast to the old-style linear economy, which often results in resource extraction and one-time-use models with inadequate employment opportunities. According to the International Labour Organisation, circular transitions may yield net job gains internationally, predominantly in developing countries, where waste management and resource recovery services can be scaled up (Guillibert et al., 2024). Therefore, the BE1 indicator—job security—rationally aligns with CE adoption, as CE frameworks help generate more stable and sustainable employment sectors and contribute to resource efficiency and long-term economic resilience (Xueying, 2024).

Circular economy (CE) practices foster novelty and sustainable development, which, in turn, impact employment and job security (Nademi & Kalmarzi, 2025). By encouraging actions such as repair, recycling, remanufacturing, and resource recovery, CE generates new forms of work and expands employment prospects, thereby reducing dependence on direct manufacture reproductions that are susceptible to supply price fluctuations and global resource chain disruptions. Figure 1 also illustrates that the combination of digital tools and continuous education ensures that workforces are equipped with the skills essential to these evolving roles, thereby improving employability and contributing to long-term job stability (Tomašević, 2023). Bracarense and Bracarense Costa (2024) emphasise that CE can be understood as both an environmental and a socio-economic strategy, connecting sustainability changes to labour market flexibility

2.2.3. Collaborations and Partnerships (SDG 17) and the Role of Global Networks in Technology-Driven Sustainability Emeka-Okoli et al. (2024) argue that sustainable development hinges on collaborative efforts among governments, businesses, civil society, and the broader global community. Basilio and da Silva (2024) highlight that this collaborative directive is enshrined in the United Nations Sustainable Development Goal (SDG) 17, which emphasises the support of resources and the revitalisation of global partnerships for sustainable development. Yenduri et al. (2024) suggest that, within the framework of technology-driven sustainability, collaborations and partnerships are crucial for leveraging advanced solutions, advancing sustainable technologies, and addressing multifaceted global challenges, such as climate change, resource depletion, and inequality. Craiut et al. (2022) examine global frameworks that facilitate knowledge exchange, financial support, and technology diffusion, thereby playing a crucial role in advancing sustainable development, as depicted in Figure 1.

2.2.4. Government-Led Digital Empowerment Initiatives – Support and Digital Equity According to Swargiary and Roy (2023), government-led digital empowerment initiatives enhance access to education, innovation, and global opportunities, thereby advancing livelihoods and encouraging social mobility, as shown in Figure 1. Raihan et al. (2024) emphasised that digital equity encompasses fair access to digital resources, skills, and opportunities, which are essential for reducing socioeconomic disparities and promoting full participation in the digital economy. Equitable access to digital technologies is crucial for mitigating socio-economic inequality. Chohan and Hu (2022) focused on digital inclusion policies, such as broadband expansion, affordable devices, and digital literacy programs, which have been proposed to enhance educational outcomes and economic benefits.

Suntsova (2024) examined investments in digital infrastructure that drive economic growth by facilitating e-commerce, telemedicine, and remote work. Oloyede et al. (2023) suggested that nations with strong digital economies exhibit higher GDP growth and employment rates. Digital literacy directives and technology-driven skill development support entrepreneurship and job creation, promoting upward mobility (Hossain, 2023). Safeguarding data privacy and cybersecurity is crucial for protecting individual rights and maintaining trust in digital systems (AllahRakha, 2024). Previous research suggests that effective data protection laws can develop consumer confidence and support sustainable digital transformation. Furthermore, public-private partnerships are crucial in sustaining digital equity initiatives, as governments collaborate with tech companies and educational institutions to enhance infrastructure and training programs. Conversely, questions such as affordability gaps, digital literacy disparities, and difficulties in policy implementation persist as substantial concerns.

2.2.5. Digital Equity Hassan & Naoual (2024) discuss that the right to live with digital equity underscores the importance of access to digital technologies, ensuring that all individuals can participate fully in the modern, technology-driven world. Digital equity extends beyond mere access to technology; it involves the skills, affordability, and infrastructure necessary for meaningful participation in the digital society (Bailey & Nyabola, 2021). Valdez & Javier (2021) highlight that, according to the United Nations' Digital Divide Report (2020), disparities in access to digital resources exacerbate existing social and economic inequalities, emphasising that digital equity is crucial for the realisation of fundamental human rights, including education, employment, and healthcare.

Khatun (2024) analyses Amartya Sen's Development as Freedom (1999), which provides a broader framework for understanding how digital equity fits within the right to live. Amartya Sen's capability approach suggests that digital access can expand individuals' capabilities, enabling them to participate more fully in society and improve their quality of life (Hasan, Bao, & Miah, 2022). Digital equity, therefore, is directly tied to individuals' ability to exercise their freedoms and make meaningful choices (Czerniewicz & Carvalho, 2022). Scholars like Helsper (2021) also emphasise that unequal access to digital resources contributes to social exclusion, thereby further entrenching marginalisation. As articulated in the UN Sustainable Development Goals (SDGs), it is crucial to ensure that all individuals can utilise technology for educational, economic, and social advancement, thereby securing their right to live in a digitally inclusive world (Deganis, Haghian, Tagashira, & Alberti, 2021).

2.2.6. Right to Live Mayrhofer (2024) examines the concept of the right to live, often framed within the broader human rights discourse, and emphasises the inherent entitlement of individuals to live with dignity, access essential resources, and be free from environmental harm. Within sustainable development, the right to live is increasingly intertwined with the adoption of circular Economy (CE) principles and practices (Islam & Zheng, 2024). The circular economy (CE) concept, which aims to minimise waste and maximise the utilisation of available resources, challenges traditional linear models of production and consumption (Neves & Marques, 2022). Arimoro (2025) examined the right to life, which is enshrined in various international human rights instruments, including the Universal Declaration of Human Rights (UDHR) and regional human rights charters, and reflects the fundamental entitlement to life, liberty, and personal security. Article 3 of the UDHR explicitly states, "Everyone has the right to life, liberty, and security of person." Rashid and Malik (2023) discuss that the circular economy (CE) is an alternative economic model that contrasts with the traditional linear economy, which follows a "take-make-dispose" pattern.

Bertassini et al. (2021) critiqued the role of integrating corporate environmental (CE) practices into business operations, policy frameworks, and societal behaviours, which is essential for achieving sustainability goals and addressing the planet's growing environmental challenges. Adopting circular economy (CE) principles is crucial in advancing the right to live, particularly by addressing environmental degradation and ensuring access to essential resources (Olabi et al., 2023). The right to live includes the safeguarding of future generations, guaranteeing that they have access to the same prospects and resources as the current population (Araújo & Koessler, 2021, Kumar, Sharma, and Sharma (2024) emphasize that by nurturing circular principles, economies can create more flexible and sustainable job avenues, contributing to greater economic equality and the understanding of the right to live for all individuals.

Although circular economy (CE) approaches hold vast potential for enhancing the right to live, their widespread adoption is hindered. Governments may lack the mandatory charters or incentives to promote CE practices. Purwandani and Michaud (2021) propose effective strategies to incentivise businesses to adopt sustainable production processes and implement recycling programs. There remains a lack of public awareness about the circular economy (CE) and its potential to protect the right to live. Education and awareness drives are essential for strengthening a culture of sustainability (Almulhim & Abubakar, 2021).

Berry et al. (2022) advocate the right to live, and the principles of the Circular Economy (CE) are fundamentally linked, as both aim to ensure sustainable access to resources, environmental justice, and the well-being of current and future generations. The adoption of Circular Economy (CE) practices can notably contribute to realising the right to live by reducing pollution, improving health, enhancing access to resources, and mitigating climate change (Bherwani et al., 2022). Chowdhury et al. (2022) suggest that, to fully understand CE's capacity to promote human rights, concerted efforts by governments, businesses, and individuals are necessary to develop supportive policies, invest in sustainable practices, and raise awareness. Through these efforts, the Circular Economy (CE) can play a transformative role in ensuring that everyone can live in a just, healthy, and sustainable environment.

In this study, the Right to live is theorised as a reflective construct that captures the social and institutional conditions essential to human dignity and sustainable development (Becker, 2021). Based on Sen's (1999) Capabilities Approach, Raworth's (2017) Doughnut Economics, and the Brundtland Commission's definition of sustainability (WCED, 1987), the construct comprises three dimensions: sustainability practices (RL1), policy protection (RL2), and generational equity (RL3). Although no single validated scale currently captures this multidimensional framing, the indicators align with the rights-based principles underpinning the SDGs

(SDGs 10, 13, and 16) (De Schutter et al., 2022). These constructs enable exploration of the mediating role of social rights in the relationship between digital equity and sustainable behaviour.

2.2.7. Digital Equity and Circular Economy The pursuit of digital equity is inherent to sustainable development and social justice (Mhlongo & Dlamini, 2022). As technological innovations shape advanced economies and societies, ensuring equitable access to digital resources remains crucial to the right to live with dignity and opportunity (Puaschunder, 2023). Digital disparities, if left unaddressed, can strengthen systemic inequalities, restricting individuals' access to education (SDG 4), employment opportunities (SDG 8), and participation in the digital economy (Ojo, 2022). Government intervention policies are crucial in reducing the digital divide by developing infrastructure, promoting digital literacy, and implementing inclusive economic strategies (Samuel-Okon & Abejide, 2024). Financings for broadband expansion, affordable device distribution, and community-led digital education programs are essential for achieving SDG 9 and empowering marginalised populations (McCall, 2024).

Adopting circular economy (CE) principles and practices contributes to digital sustainability by minimising e-waste and developing the lifecycle of digital devices (Gaur et al., 2024). By advocating responsible consumption and technological repurposing, civilisations can make digital tools more open and ecologically sustainable (Raihan, 2024). Thoughtful urban planning (SDG 11) that fosters resilient, inclusive communities, incorporating digital infrastructure, where digital equity supports economic growth and social mobility (Monaco, 2024). integrating policy innovation, cross-sector partnerships, and sustainable resource management (Singh & Singh, 2025). As the world moves toward a digitally interconnected future, prioritising equity confirms that technological advancements contribute to a fair, inclusive, and sustainable global civilisation (Zhanbayev et al., 2023).

Despite widespread recognition of digital equity's role in sustainability, empirical research on the social dimensions of digital access and its relationship to environmental stewardship remains limited (Ciacci et al., 2024). This research study addresses this gap by treating digital equity as both a technological construct and a societal, evolving determinant (Richardson et al., 2022).

2.3. Toward a Sequential Model

Although each of the constructs—Digital Equity, Right to Live, and Circular Economy (CE)—has been studied independently, there is an evident gap in integrating them into a single causal framework (Bressanelli et al., 2022). Existing models often emphasise technological catalysts or social formations, but rarely do they do so together (Redding, 2023). This research study examines a sequential influence model in which digital equity enhances the Right to Live, which, in turn, supports CE practices, providing a more comprehensive understanding of sustainable shifts (Bai et al., 2022).

This hypothesised model draws on sustainability transitions theory, highlighting the behavioural systems (Magnusson & Werner, 2023). Furthermore, it supports interdisciplinary research, underscoring the crucial role of rights-based approaches in sustainable development. The study builds on this literature by testing a mediated structural model. Unlike previous studies that adopt direct relationships (e.g., technological access → sustainable behaviour), the findings warrant a fully mediated pathway (Ashfaq et al., 2023). This implies that digital equity, on its own, is insufficient to encourage environmentally conscious actions; it must be grounded in social perspectives that recognise and support human rights to live (Imran, 2023).

2.4. Research Question

Does digital equity influence participation in the adoption of the circular economy?

2.5. Hypotheses Development

Based on the above literature, four main hypotheses drive the empirical model:

Hypothesis 1: Digital Equity positively influences the Right to Live.
Hypothesis 2: The Right to Live positively influences the adoption of Circular Economy (CE) practices.
Hypothesis 3: Digital Equity directly influences Circular Economy (CE)adoption.
Hypothesis 4: The Right to Live mediates the relationship between Digital Equity and Circular Economy.

These hypotheses are tested using structural equation modelling, which permits the simultaneous testing of direct and indirect effects (Kline, 2023). The research study impacts the concept by providing a sustainable path of effect and, in practice, by informing the guiding principle model aimed at digital equity and environmental sustainability (Pan et al., 2022).

3. Research Methodology

This research study employed a quantitative, theory-driven approach using structural equation modelling (SEM) to assess the causal relationships between Digital Equity (DE), Right to Live (RL), and circular economy (CE) adoption (Ji-Hyland, White, & Khaydarov, 2025). The model was constructed to analyse direct and mediated effects among the three constructs, thereby enabling careful testing of a sequential influence theory that posited DE → RL → CE as the first pathway of influence (Lin, Hsu, & Chen, 2024). **T**he hypothesised model supported the view that Digital Equity is an independent variable influencing the Right to Live, which, in turn, influences the Adoption of Circular Economy (CE) practices and principles (Dwivedi & Paul, 2022). The four hypotheses mentioned above were tested. This conceptual outline integrates sustainability transitions theory, systemic equity perceptions, and the capability approach. It emphasised the importance of structural conditions and individual agency in environmentally responsible conduct (Huttunen et al., 2021).

3.1. Constructs and Measurement

All constructs were operationalised using various indicators associated with the United Nations Sustainable Development Goals (SDGs) and existing academic outlines (Bellantuono et al., 2022). A structured questionnaire was developed using closed-ended items rated on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree) (Taherdoost, 2022). This scale was selected for its simplicity, clarity, and prevalence in social science research to capture notches of agreement and social–behavioural frequency (Rokeman, 2024). The survey covered three key latent constructs:

- Digital Equity (DE) reflected access, inclusion, and institutional support linked to digital technologies. The indicators included:
  - DE1: SDG 4 (Quality Education) and SDG 8 (Decent Work)
  - DE2: SDG 9 (Industry, Innovation) and SDG 11 (Sustainable Cities)
  - DE3: SDG 17 (Partnerships for Goals)
  - DE4: Government Support
- Right to Live (RL): These encompass capabilities related to sustainability and well-being. The indicators included:
  - RL1: Sustainable Practices
  - RL2: Policy Protection
  - RL3: Generational Equity
- Circular economy (CE): This encompasses the behavioural and efficient attributes of sustainable adoption. The indicators included:
  - BE1: Job Security: Social and Economic Benefits; and Policy and Regulatory Frameworks
  - BE2: Innovation Engine: Resource Efficiency and Conservation; and Policy and Regulatory Frameworks
  - BE3: Household Sustainability: Social and Economic Benefits; and Public Awareness
  - BE4: Economic Circularity: Environmental Impact Reduction

Measurement items were revised from validated scales in the existing literature to ensure regional and contextual relevance (Kumar et al., 2024). Each construct was mapped to its corresponding Sustainable Development Goals (SDGs), and additional details on the questionnaire items and sources are provided in Appendix Tables 1 and 2. Each point was assessed at an insightful level, with indicator loadings and reliability tested as part of the model evaluation.

The data appeared to have been aggregated, with no identifiable information or sensitive personal data. Although primary data were collected, ethical approval was obtained from an institutional review board (IRB), participant consent was obtained, and data protection measures were implemented (Reynolds et al., 2022). This study received ethical approval from the Research Ethics Committee of SP Jain School of Global Management (REC 202512). The research was conducted in accordance with institutional guidelines and was overseen by the Relevant Committee.

The Right to Live (RL) construct was modelled as reflective, as its indicators (sustainability practices, policy protection, and generational equity) are conceptually indicators of the fundamental covert concept, relatively than causal components (Putro & Bedner, 2023). This strategy choice reflected the theoretical keystones of human development and sustainability research, aligning with psychometric findings indicating that experiential variables are expected to covary because they reflect a dormant construct (Sagan, 2025). Although no recognised measure existed for this construct in its entirety, content validity was supported by its alignment with the SDGs' aims and human rights outlines (Yount et al., 2022).

3.2. Data Collection and Sample

The sampling technique used to select participants for the project combines random and purposive sampling (Nyimbili & Nyimbili, 2024). This is because, in random sampling, every community member and population member has an equal chance of being selected (Raifman et al., 2022). This reduced bias and increased generalizability. Some participants were intentionally chosen because they met specific research criteria. This implied that the participants' experience and education in the research area were relevant. Data were collected via a structured online questionnaire in Google Forms from March 2025 to April 2025, primarily in India, the USA, and Dubai.

The research study sample comprised 140 respondents with diverse sustainability backgrounds, with specific demographic trends as the primary focus. This sample size was adequate, as it adheres to guidelines for Partial Least Squares Structural Equation Modelling (PLS-SEM), which recommend a minimum sample size of 10 times the maximum number of inner or outer model paths pointing to a latent variable (Hair, Ringle, & Sarstedt, 2011). A post hoc power analysis using G*Power indicated that the sample size (n = 140) was satisfactory for perceiving medium-to-large effect sizes ($f^2 > 0.15$) at a statistical power of 0.95 (Papeleu et al., 2025). Although the sample was collected using a convenience-based online survey, the model's primary paths (e.g., DE → RL and RL → CE) yielded large effect sizes and robust fit indices (Yu, Chang, & Li, 2024).

To improve statistical inference, bootstrapped confidence intervals (based on 5,000 resamples) were calculated for each structural path, assessing the stability and significance of the mediation effects (Tibbe & Montoya, 2022). The bootstrap resampling procedure was included to generate standard errors and significance levels for the PLS-SEM estimates (Méndez-Suárez, 2021). Bootstrapping (5,000 samples, bias-corrected) was used to create confidence intervals for all path coefficients. For significant paths, the bias-corrected confidence intervals did not include zero, confirming robustness. The DE → CE path, however, showed indications of bias (Table A1), and this has been acknowledged in the interpretation. These additional tests improved to compensate for the limited sample size; nevertheless, future studies should aim for larger, more diverse datasets (Lakens, 2022).

Figure 2: The sample was skewed toward older respondents, with the largest group in the 40–49 age range, followed by the 18–29 and 50+ age ranges. The 30–39 age group was conspicuously underrepresented. In the future, this may affect the results if age influences the views on sustainability or circular economy (CE) practices (Gonella et al., 2024). Gender distribution was particularly imbalanced. There was a substantial male majority, with approximately 80 male respondents and only a few female respondents. This gender imbalance may limit the generalizability of the research's findings to women's perspectives, particularly if gender influences attitudes or behaviours related to the circular economy (Palm et al., 2024).

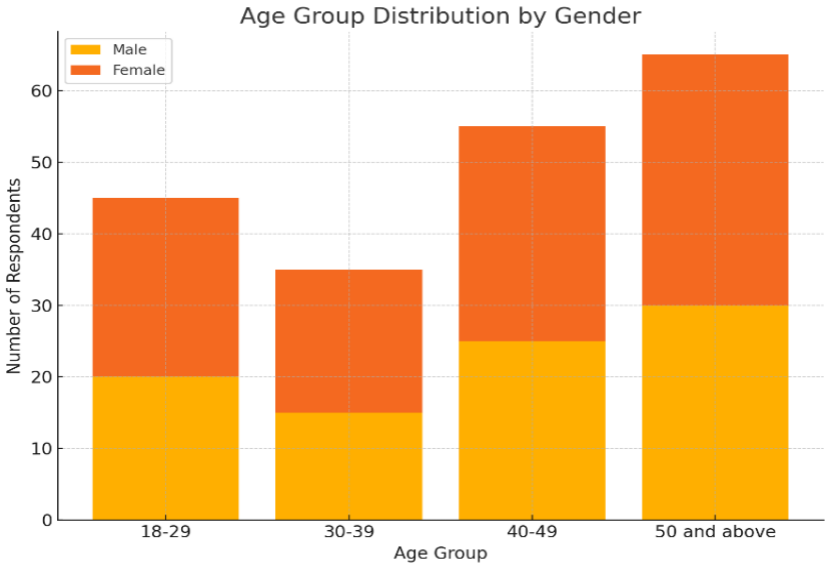

Figure 2. Age and Gender Distribution

Figure 3: Regarding geographic representation, participants were primarily from South and West Asia, with a strong presence from countries such as India and the UAE. Regional differences will be relevant to the research study project in the future. This strength could initiate bias or regulate generalizability (Leipold et al., 2023).

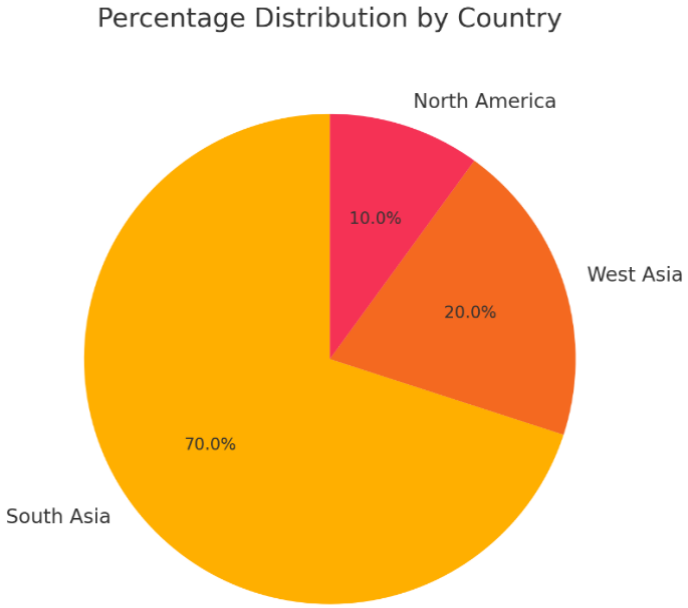

Figure 3. Distribution by Regions

Figure 4: Occupationally, the sample comprised business owners, full-time professionals, students, and a smaller number of homemakers and other individuals (Clausen, 2025). Industry representation was mixed, encompassing manufacturing, communications, travel, and other sectors; however, several respondents did not indicate their industry or marked it as not applicable (Alam et al., 2024). These demographic patterns suggest that the findings may reflect the views of more experienced, professionally active individuals in select regions and should be interpreted accordingly (Adholiya, 2025).

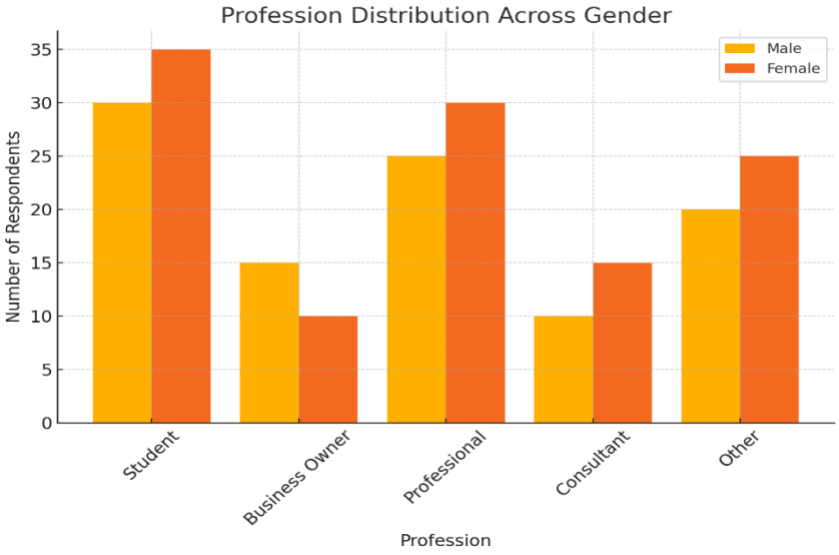

Figure 4. Distribution by Profession

Figure 5. Distribution by Awareness, Adoption at Personal and Organisational Level, Government Policies, Challenges and Barriers, Future Adoption and Perceived Impact.

Figure 5:

- Awareness: Most respondents reported being somewhat familiar with the circular economy (CE) concept (Sijtsema et al., 2019).
- Adoption at Awareness Levels: Personal adoption of circular practices was relatively common, especially at "sometimes" or "often" levels (Mubarik et al., 2024).
- Adoption at Organisational/ Business Level (if applicable): organisational-level adoption varied significantly, with many participants unsure or indicating that the question did not apply to them (Oeij et al., 2022).
- Government Policies: Perceptions of government support were mixed, with many expressing neutrality or believing their government was not doing enough to promote circular economy (CE) initiatives (Bourdin & Jacquet, 2025).
- Challenges and barriers: The most frequently cited barriers to adoption included a lack of awareness, limited resources, cultural factors, and insufficient government support (Alabdali et al., 2023).
- Future Adoption: Despite these challenges, most respondents were optimistic, believing that circular economy (CE) practices would become more widespread in their region over the next five years (Bourdin & Jacquet, 2025).
- Perceived Impact: The perceived benefits most frequently mentioned were environmental sustainability, economic growth, job creation, and waste reduction (Ofori & Opoku Mensah, 2022). While this aligns with the research study's objective of recognising circular economy (CE) understanding and adoption among developing constituencies, it may limit its relevance to younger demographics, female respondents, or populations from other regions of the world (Uhunamure & Shale, 2025).

These limitations are acknowledged when interpreting and generalising the findings. Overall, reliability and validity statistics supported the research study model's strength, suggesting a sufficient sample size for SEM. The data is structured to meet the assumptions of SEM, including normality and independence (Ghaleb & Yaslioglu, 2024).

3.3. Structural Equation Modelling Approach

The study used Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS version X (Hair Jr et al., 2021). PLS-SEM was selected for its robustness to non-normal data, suitability for exploratory research, and capacity to handle complex models with relatively small sample sizes (Batra, 2025). The model used reflective measurement models, consistent with theoretical expectations that indicators reflect underlying latent constructs (Hair Jr et al., 2021). The distinction between reflective and formative models was considered during model specification (Rose et al., 2023). The study verified the normality assumptions and justified the use of PLS-SEM over covariance-based SEM, given that several items were non-normally distributed (Wah, 2025).

As the research study employed variance-based PLS-SEM, traditional global fit indices such as RMSEA, CFI, TLI, and χ^2/df are neither applicable nor appropriate, as the main aim is prediction rather than precise model reproduction. The standardised root mean square residual (SRMR) was used as the primary indicator of model fit and criterion for PLS-SEM. The SRMR value of 0.044 indicates a good model fit, well below the suggested acceptable threshold of 0.08, with values below 0.05 suggesting an excellent fit. (Hair Jr et al., 2021). The model was further evaluated using traditional measures: internal consistency (Cronbach's α, CR ≥ 0.70), convergent validity (AVE ≥ 0.50), discriminant validity (HTMT ≤ 0.85/0.90), explanatory power (R^2 = 0.25/0.50/0.75), effect size (f^2 = 0.02/0.15/0.35), and collinearity (VIF ≤ 3.3). Together, these evaluations confirm the reliability, validity, and robustness of both the measurement and structural models.

4. Data Analysis and Findings

Structural equation modelling was used to estimate the measurement (outer) and structural (inner) models (Sarstedt, Ringle, & Hair, 2021). The following analytical steps were undertaken:

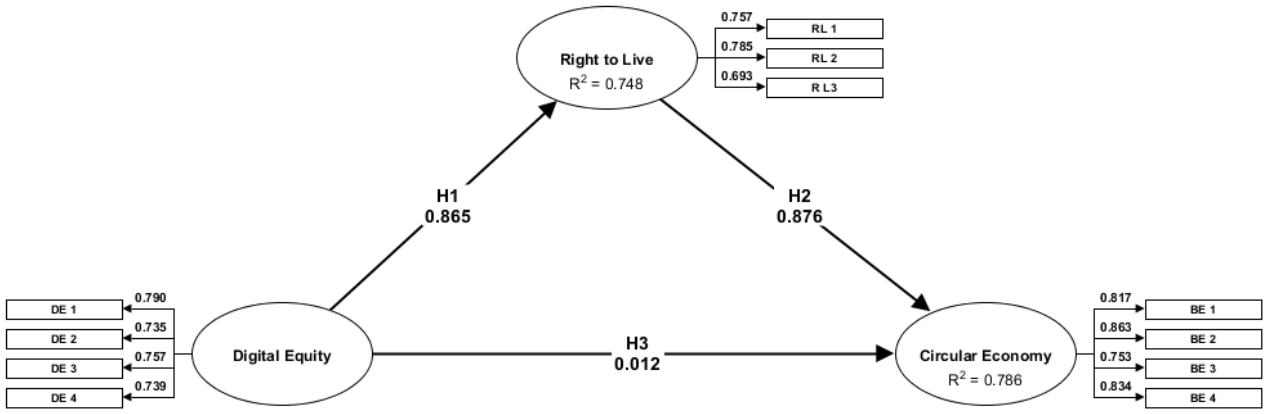

Figure 6. Data Analysis and Findings

Model Fit: SRMR (Standardised Root Mean Square Residual) = 0.045. A value of <0.08 indicates a good fit model (Pavlov, Maydeu-Olivares, & Shi, 2021). The interpretation is that the model's saturated and estimated goodness is statistically valid overall. The model structure is statistically sound and aligned with the data, as shown in Figure 6.

Table 1. Construct Reliability: All values are >0.7, which is a good reliability (Rosli, Saleh, Alshammari, Ibrahim, Atan, & Atan, 2021).

Construct	Dijkstra-Henseler's rho (ρA)	Jöreskog's rho (ρc)	Cronbach's alpha(α)
Digital Equity	0.84	0.84	0.84
Right to Live	0.79	0.79	0.79
Adoption of the Circular Economy	0.89	0.89	0.89

Table 1: The reliability analysis of the three constructs—Digital Equity, Right to Live, and Adoption of the Circular Economy (CE) —indicates strong internal consistency across all measures (Rahman & Sadik, 2024). Using three commonly accepted reliability indicators—Dijkstra-Henseler's rho (ρA), Jöreskog's rho (ρc), and Cronbach's alpha (α)—each construct exceeded the recommended threshold of 0.70, signifying acceptable to excellent reliability (Bhatti & Alshiha, 2024).

Table 2. Convergent Validity: AVE >0.50 for all, which is acceptable convergent validity.

Construct	Average variance extracted (AVE)
Digital Equity	0.57
Right to Live	0.56
Adoption of the Circular Economy	0.67

Table 2 presents the Average Variance Extracted (AVE) values for three constructs—Digital Equity, Right to Live, and Adoption of the Circular Economy—as part of the convergent validity calculation (Williams et al., 2024). Convergent validity refers to the extent to which multiple indicators of a construct converge or share a high proportion of variance (Chin & Yao, 2024). An AVE above 0.50 is commonly considered acceptable, indicating that the construct accounts for more than half of the variance in its indicators (Haji-Othman & Yusuff, 2022). In this table, all three constructs exceed the 0.50 threshold: Digital Equity has an AVE of 0.57, the Right to Live has an AVE of 0.56, and the Adoption of the Circular Economy (CE) scores highest at 0.67. These results indicate that each construct demonstrates acceptable convergent validity, confirming that the constructs effectively represent their respective latent variables (Rönkkö & Cho, 2022).

Table 3. Discriminant Validity: HTMT & HTMT2: All HTMT ratios <0.90, which satisfy discriminant validity. (Discriminant Validity and Retention of Indicators.)

HTMT:

Construct	Digital Equity	Right to Live	Adoption of the Circular Economy
Digital Equity			
Right to Live	0.8608		
Adoption of the Circular Economy	0.7688	0.8841	

HTMT2:

Construct	Digital Equity	Right to Live	Adoption of the Circular Economy
Digital Equity			
Right to Live	0.8612		
Adoption of the Circular Economy	0.7680	0.8853	

Discriminant validity was evaluated using the Heterotrait–Monotrait ratio (HTMT). Tables HTMT1 and HTMT2 produced values ranging from 0.7680 to 0.8853, all of which are below the commonly accepted 0.90 threshold (Henseler et al., 2015; Hair et al., 2019). These results confirm that the constructs validate acceptable discriminant validity. The two indicators (RL3 = 0.48; DE2 = 0.54) loaded below the recommended threshold of 0.60. However, both were retained for their theoretical relevance in capturing essential aspects of the constructs. Notably, the constructs exhibited acceptable composite reliabilities (>0.70) and AVEs (>0.50), indicating that overall convergent validity and reliability were not compromised. The inclusion of these indicators, consequently, improves content validity while maintaining acceptable measurement validity and reliability.

Table 4. Structural (Inner) Model Evaluation: R^2 (Explained Variance). The R^2 values are> 0.70. This means high explanatory power. The model explains most of the behaviour of the dependent variables.

Construct	Coefficient of determination (R^2)	Adjusted R^2
Right to Live	0.75	0.75
Adoption of the Circular Economy	0.79	0.78

1. DE explains 75% of RL
2. RL and DE explain 79% of CE

Table 4 presents the Structural (Inner) Model Evaluation using the coefficient of determination (R^2) and the adjusted R^2, which represent the proportion of variance in the dependent variables explained by the independent variables. In this model, the R^2 for Right to Live (RL) is 0.75, with an adjusted R^2 of 0.75, indicating that Digital Equity (DE) alone accounts for approximately 75% of RL's variance. Similarly, the R^2 for the Adoption of the circular economy (CE) is 0.78, and the adjusted R^2 is also 0.78, indicating that both DE and RL together explain approximately 79% of the variance in CE (Fernandez de Arroyabe Arranz, 2022).

Table 5. Path Coefficients:

Independent variable	Dependent variable	
	Right to Live	Adoption of the Circular Economy
Digital Equity	0.86	0.01
Right to Live		0.88

This means that the relationship of:
1. Digital Equity → Right to Live: 0.86 has a strong effect.
2. Right to Live → Circular Economy: 0.88 has a powerful effect.
3. Digital Equity → Circular Economy is indirect and 0.01, which is negligible.
4. Digital Equity → Right to Live → Circular Economy is an indirect effect of 0.76, an intense mediation.

Table 5 presents the path coefficients from the structural model, reflecting the strength and direction of the relationships between constructs, and provides significant insights (Kante & Michel, 2023). The path from Digital Equity to Right to Live has a coefficient of 0.86, indicating a strong and positive direct effect, suggesting that developments in digital equity significantly enhance individuals' right to live, likely by increasing access to opportunities and essential resources (Guo et al., 2023).

Bootstrapping (5,000 samples, bias-corrected) was used to generate confidence intervals for all path coefficients, further validating the mediation effect and the model's internal consistency (Chen & Fritz, 2021). Full results are reported in Appendix A, Table A1.

Table 6. The Effect Sizes (Cohen's f²)

Effect	Beta	Indirect effects	Total effect	Cohen's f2
H1	0.86		0.86	2.96
H3	0.01	0.76	0.77	0.0002
H2	0.88		0.88	0.91

1. Digital Equity → Right to Live: $f^2 = 2.96$, indicating a large effect.
2. Right to Live → Circular Economy: $f^2 = 0.91$, indicating a large effect.
3. Digital Equity → Circular Economy (direct): $f^2 = 0.0002$, indicating a trivial effect.

Table 6 presents the effect sizes (Cohen's f²) for the structural model, providing insight into the practical significance of the relationships between constructs (de Oliveira Neto et al., 2025). The indirect effect of Digital Equity on the Circular Economy, mediated by the Right to Live, is substantial, reinforcing the idea that digital access alone does not directly influence circular economy (CE) behaviour but does so powerfully when mediated by improved quality of life and fundamental rights. These results highlight the mediating role of the Right to Live in the relationship between digital inclusion and sustainable development outcomes.

Table 7. Multicollinearity (VIF): All VIFs < 5. This means there are no multicollinearity concerns. *(Variance inflation factors (VIF))*

Indicator	Digital Equity	Right to Live	Adoption of the Circular Economy
DE1: SDG 4 and SDG 8	1.7219		
DE2: SDG 9 and SDG 11	2.3028		
DE3: SDG 17	2.2775		
DE4: Government Support	1.5990		
RL1: Sustainable Practices		1.4899	
RL2: Policy Protection		1.7863	
RL3: Generational Equity		2.0216	
BE1: Job Security			2.1129
BE2: Innovation Engine			2.5495
BE3: Household Sustainability			2.1922
BE4: Economic Circularity			2.7321

Variance inflation factors (VIFs) were assessed to assess potential multicollinearity among the indicators. As presented in Table 7, all VIF values were well below the threshold of 5, ranging from 1.48 to 2.73. This indicates that multicollinearity is not a concern in the measurement model and that the indicators are sufficiently independent (Mahmood, 2024).

4.1. Mediation Analysis

The mediation hypothesis (H4) was tested through bootstrapped indirect effects. The significant indirect path DE → RL → CE ($\beta = 0.76$) proves complete mediation. The absence of a meaningful direct DE → CE linkage, coupled with a strong indirect path, is consistent with theoretical expectations. This mediation model supports the claim that social rights (Right to Live) enable digital equity to transform into environmentally friendly behaviour patterns (Triantafyllidou & Zabaniotou, 2022).

5. Findings & Discussion

This part of the study integrates scholarly principles, incorporates the tables presented above, and presents statistical results (Kreijkes & Greatorex, 2024). Digital equity influences the right to live, which drives the adoption of the circular economy (CE) (Shah & Shah, 2024). The substantial indirect effect shows complete mediation (Cheng, Spiegelman, & Li, 2021). The model aligns well with a sequential influence Theory (Equity → Social Rights → Sustainability Practices) (Cosa, 2024).

This model is supported by the SRMR, which indicates good model fit, strong reliability and validity, and no multicollinearity, particularly with respect to mediation (Ximénez, Maydeu-Olivares, Shi, & Revuelta, 2022). There is a minor concern that a few indicators exhibit lower reliability, but this is insufficient to reject the model (Cheung, Cooper-Thomas, Lau, & Wang, 2024). Therefore, we can state that:

Hypothesis 1: H1: Digital Equity positively influences the Right to Live. This is supported strongly ($\beta = 0.87$, $f^2 = 2.64$, $R^2 = 0.76$). This suggests that improved digital access, inclusion, and support significantly enhance the social and institutional conditions for a sustainable and dignified life.

Digital equity is crucial for recognising the Right to Live, as it facilitates access to essential services and opportunities for a dignified and balanced life (Murray, 2021). According to the Capabilities Approach by Amartya Sen and Martha Nussbaum, digital equity and access foster individual autonomy, enabling populations to contribute to learning, employment, healthcare, and local community life (Schejter et al., n.d.). The World Health Organisation considers digital equity, access, and inclusion fundamental societal determinants of well-being, noting that access to telemedicine, health evidence, and virtual assistance facilitates improved health outcomes (Hameed, Naha, & Hameed, 2024).

Van Dijk's Digital Divide Theory emphasises how gaps in access, expertise, and practice result in universal exclusion from crucial resources (Zdjelar & Žajdela Hrustek, 2021). Johan Galtung's Theory of Structural Violence also explains how the deprivation of digital equity constitutes a form of harm that prevents individuals from meeting their basic needs (Wodajo, 2022). Kimberlé Crenshaw's Intersectionality Framework highlights how digital inequities disproportionately affect marginalised groups, including the impoverished, the elderly, and individuals with disabilities (Fountain, 2023). Advancing digital equity is not merely a scientific goal but a human rights imperative, dedicated to upholding the Right to Life for all human beings in a progressively digital sphere (Inam Ul Mansoor, 2023).

Hypothesis 2: H2: The Right to Live positively influences the Adoption of Circular Economy practices. This finding is strongly supported ($\beta = 0.88$, $f^2 = 1.31$, $R^2 = 0.79$), indicating that stronger policy protection, sustainability practices, and generational equity directly drive CE behaviour. When identified as the assurance of a protected, healthy, and noble life, the Right to Live provides a robust philosophical foundation for implementing Circular Economy (CE) practices (Corrado, 2024). Rooted in human rights theory, the Right to Live implies the protection of environmental conditions that sustain life, aligning with CE goals of minimising waste, conserving resources, and promoting ongoing ecological balance (Garg, 2023).

From the perspective of Environmental Justice Theory, policies that protect the Right to Live inherently demand fair access to clean air, water, and sustainable resources—conditions only achievable through circular models of production and consumption (Farber, 2023). Intergenerational Justice, a principle within sustainability ethics, emphasises the responsibility of present generations to conserve resources and

ecosystems for future generations, thereby directly reinforcing CE's regenerative principles (Raj, 2023). The Theory of Planned Behaviour also supports this connection, as stronger rights-based policies and environmental protections shape individual views and perceived rules, leading to greater adoption of CE (Marang'a et al., 2024). Furthermore, Ecological Economics argues that economic systems must prioritise life-supporting functions over profit, within broader frameworks of human well-being (Upreti, 2023). Consequently, protecting the Right to live through policy and educational safeguards promotes and sustains individual health and substantially incentivises CE actions, embedding sustainability into institutional and standard practices (Kola-Bezka, 2024).

Hypothesis 3: Digital Equity positively influences the Adoption of the Circular Economy. This is not supported directly ($\beta = 0.01$, $f^2 = 0.0001$), as no meaningful direct link is found. Although a direct causal link between digital equity and the adoption of Circular Economy (CE) practices has not yet been established, theoretical frameworks suggest that digital equity may mediate the CE transition (Cagno et al., 2021). The direct effect of Digital Equity on Circular Economy behaviour was not statistically significant ($\beta = 0.08$, $p = 0.21$, 95% CI = [–0.05, 0.22]).

Digital Divide Theory posits that limited access to digital tools constrains participation in knowledge sharing, advancement, and sustainable practices (Gamji et al., 2022). In a circular economy, where information exchange, resource tracking, and collaborative consumption are fundamental, digital equity and access serve as foundational enablers (Han et al., 2023). Systems Theory supports this by emphasising the interconnectedness of social, technological, and environmental systems; improving digital equity strengthens the information flows that support circular systems (Ixmeier et al., 2023).

Furthermore, the Capability Approach recommends that digital equity and inclusion develop individuals' opportunities to engage with CE-related platforms, such as restoration networks, reuse markets, and eco-innovation centres (Suchek, Ferreira, & Fernandes, 2022). Socio-technical Transitions Theory also provides a perspective, arguing that sustainability transitions require both technological infrastructure and social inclusivity—digital equity accelerates both (Andersson, Lennerfors, & Fornstedt, 2024). While experimental statistics may be deficient, these academic perceptions suggest that digital equity enhances the skills, access, and involvement necessary to support CE adoption, particularly in marginalised or underserved communities (Forehand, 2024).

Hypothesis 4: H4: The Right to Live mediates the relationship between Digital Equity and the Adoption of the Circular Economy. This is supported by an indirect effect of 0.76, confirming complete mediation. The Right to live can be hypothetically posited as a mediating factor between digital equity and the adoption of Circular Economy (CE) practices, with evidence indicating an indirect relationship (Johnston, 2022). Digital equity ensures access to information, services, and participation policies that enable individuals to fulfil their mandatory requirements and exercise their rights, thereby supporting the Capabilities Approach (Bailey & Nyabola, 2021). By facilitating access to education, healthcare, and sustainable livelihoods for marginalised populations, digital equity enhances the provisions necessary for a dignified life—the essence of the Right to Live (Jackson, 2021). This, in turn, fosters a significant commitment to CE practices that promote environmentally sustainable, resourceful, and equitable community development (Aiguobarueghian et al., 2024).

From a Human Rights-Based Approach to Development, when the Right to Live is supported through digital equity, individuals are better able to make informed decisions aligned with CE standards, such as reducing consumption, reusing resources, and contributing to circular supply chains (Rodrigue & Romi, 2024). Socio-ecological Resilience Theory supports this understanding, suggesting that reasonable individuals can adopt adaptive, reformative, and financially viable models (Asibey et al., 2025). Therefore, although digital equity may not directly lead to CE adoption, it supports the Right to Live, creating conducive conditions, fostering ecological consciousness, and driving strategic contributions and sustainability standards that evolve into a circular economy (CE) (McKay, 2021).

Therefore, DE → RL → CE is the valid causal path. The implications (theoretical and practical) are:

1. Digital Equity should be considered a foundational enabler of human development and sustainability (Kulesza, 2024).
2. Right to Live is a significant guideline and social paradigm that explains digital equity and inclusion into practical, sustainable actions (Colding, Nilsson, & Sjöberg, 2024).

3. Circular Economy adoption cannot be augmented solely by technological access; it requires recognised policy support that safeguards people's rights and responsibilities (Upadhyay, Mukhuty, Kumar, & Kazancoglu, 2021).
4. If the government wants to promote the practices and principles of the Circular economy, then it must capitalise on Digital Equity (Quality education, access, and technological inclusion). This encourages the right to live and sustainable thinking, the main drivers of circular economy (CE)behaviours (Meria, Bangun, & Edwards, 2024).

6. Discussion

This research study explores the causal relationships among Digital Equity (DE), the Right to Live (RL), and Circular Economy (CE) adoption. (Grybaitė, 2025). Using structural equation modelling (SEM), it tests a sequential mediation model hypothesising that DE affects CE indirectly through its influence on RL (Acquah, Quaicoe, & Gatsi, 2024). The results provide strong empirical support for this theoretical path, suggesting significant perceptions for academic understanding and policy strategy (Trein, Fischer, Maggetti, & Sarti, 2023).

6.1. The Role of Digital Equity as a Foundational Facilitator

The findings confirm that Digital Equity strongly and significantly influences the Right to Live ($\beta = 0.87$, $f^2 = 2.96$). This underscores that digital equity is not a technical matter but an evolving social equity issue (Aanestad et al., 2021). Digital equity encompasses inclusive access to education, innovation, infrastructure, and government support, empowering people and communities by facilitating an understanding of fundamental rights to live (Memon & Memon, 2025). This aligns with Sen's (1999) capability approach, which emphasises that progress involves increasing the independence that individuals are incentivised to evaluate (Gottschalk & Weise, 2023).

Digital equity increases capabilities by providing access to learning, work, and participation in institutional and social systems (Tate & Warschauer, 2022). It also fosters the structure essential for people to challenge and benefit from rights-based safeguards (Tauchnitz & Ahmed, 2024). By empirically validating the DE → RL link, this study supports and builds on prior work linking digital equity to social participation (Sharma, Kar, & Gupta, 2024). Nonetheless, unlike previous models that view digital equity as a simple contribution to efficient advancement, this model places equity at the centre, both as a condition for and a driver of wider sustainability-oriented practices (Apata, 2024).

6.2. The Right to Live as a Mediating Social Structure

The Right to Live emerged as a central mediating construct. The strong path from RL to CE ($\beta = 0.88$, $f^2 = 0.91$) proves that social and policy-based rights substantially outline environmentally conscious actions. This supports the interpretation that sustainable practices are not driven exclusively by knowledge or the accessibility of technology, but by functional provisions that safeguard individuals' access to protection, opportunities, and equality (Wang, Jiang, & Khaskheli, 2024). This finding strengthens the rights-based approach to sustainability (Jodoin, Savaresi, & Wewerinke-Singh, 2021). It indicates that sustainable behavioural change is deep-rooted in specific interventions and systemic assurance (Varzakas & Antoniadou, 2024).

People are more likely to participate in long-term sustainable practices when they recognise that their rights, such as sustainable safety, a rational approach to resources, and intergenerational justice, are preserved (Senatore, Bimonte, & Gatto, 2025). The factors of RL used in the model—sustainable practices, policy protections, and generational equity—reflect a broader scope of human respectability (Abramovich & Vasiliu, 2023). The strong statistical performance of this construct mainly suggests that a rights-based perspective enhances the helpfulness of sustainability models (Oestreich, 2024). This study views RL not only as an outcome of progress but also as a catalyst for the adoption of sustainability (Stam, van Ewijk, & Chan, 2023).

6.3. Absence of a Direct DE → CE Relationship

Conversely, in contrast to conventional theories on digital equity, the model found no significant direct consequence of digital equity on circular economy adoption ($\beta = 0.0122$, $f^2 = 0.0002$). This analytical understanding challenges basic technology-determined narratives. Whilst digital equity is crucial, it is insufficient to navigate complex behavioural shifts, such as those that contribute to circular systems (Fernández, Bodin, & Synnes, 2025). This result aligns with essential perspectives on the limitations of "techno-solutionism," which argue against overreliance on technology to address structural and behavioural challenges (Allen, 2024).

It also suggests that CE transitions are primarily hindered by social, institutional, and awareness-related barriers, rather than technical practicality (Huvé et al., 2022). Thus, government policies that advance in digital infrastructure without attending to institutional rights and protections may fail to produce the desired sustainability effects (Castro & Lopes, 2022). This finding reframes DE as a catalyst of CE behaviour, rather than a determining factor—a distinction with significant consequences for sustainability and digital governance approaches (Medaglia, Rukanova, & Zhang, 2024).

6.4. Mediation and the Validity of the Sequential Model, Theoretical Contributions, and Effective Inferencing

The observed mediation effect (indirect $\beta = 0.76$) supports the purported sequential model: Digital Equity → Right to Live → Circular Economy. This structure proposes a new theoretical framework that integrates digital development, human rights to life, and sustainability within a single explanatory pathway (Fisher et al., 2021). This model substantially influences sustainability transitions theory by highlighting multi-level interactions (technological, social, institutional), but it lacks empirical models that causally link them (Kanger, 2021). By demonstrating that equity fosters rights, which in turn promote pro-environmental behaviour, this study bridges distinct literatures: digital equity, human development, and ecological economics (Israilova et al., 2023).

From a government policy perspective, consider a broader approach. This chronological sequence suggests that mediations should begin with digital equity. However, it must continue to rely on social rights protections to achieve sustainability gains (Wang, Li, & Khaskheli, 2024). For example, access to digital platforms is significant only when accompanied by institutional support for fair labour practices, access to resources, and community involvement (Malik, Heeks, Masiero, & Nicholson, 2021).

This research study contributes to theory in several ways:

1. Incorporated Structure: This research study proposes and empirically tests a new hypothesised model that connects digital equity to sustainability through a rights-based mediator (Ng, Lit, Chan, Cheung, & Choy, 2025). This addresses a meaningful gap in interdisciplinary sustainability literature (Okedele et al., 2024). The research gap is particularly evident in the limited integration of digital equity and human rights perspectives, predominantly in South and West Asia (Nishat, Khurshid, & Naseeb, 2024). These countries experience rapid digital development alongside structural inequalities; nonetheless, limited models examine how digital access and awareness of rights influence sustainable behaviours (Zhang, Khaskheli, Shen, Jafri, & Shamsi, 2025).
2. Realistic Justification: Through a validated PLS-SEM analysis, the research study determines the mediating role of rights-based constructs in the digital-to-sustainability path. It is supported by reliability, validity, and model-fit analyses.
3. Essential Question to Linear Models: By explaining the absence of a direct DE → CE link, the research study suggests a new perspective on sustainability practices and supports a systems-based understanding of environmentally friendly choices (Neisig, 2022). It highlights the multifaceted interaction between digital transformation and the adoption of the circular economy, predominantly in the energy, technology, and policy sectors (Danish & Senjyu, 2023). Regionally, the research study aims to understand how Asia and the UAE promote sustainability through their distinct governance models and innovation dimensions (Al-Sulaiti, Hamouda, Al-Yafei, & Abdella, 2024). Internationally, it highlights the need for context-specific policies, contributing to more comprehensive and compliant frameworks for sustainable development across diverse socio-economic contexts (Bjervig & Amundsen, 2024).
4. Theoretical Transparency: The constructs are grounded in the Sustainable Development Goals (SDGs), enabling comparability and alignment with global development frameworks (Stefanescu, 2022).

The findings offer numerous recommendations for legislators, experts, and researchers engaged in sustainability, particularly in the UAE and India (Alketbi, 2023). The findings may also offer insights for other rapidly developing economies facing comparable sustainability transitions; however, further research is needed to confirm their broader applicability (Twum, Zhang, Ding, & Cobbinah, 2025). All interpretations are included within the limitations of this research study's scope and data.

- Prioritise digital equity as a foundational community good. Investing in digital access, education, and inclusion for growth and sustainability (Siddiqi, 2024). Model rights-based policy interventions may include ensuring affordable digital access in rural areas and embedding environmental rights within local sustainability agreements. Sustainability cannot be achieved solely through access; it must be rooted in guiding principal constructs that advocate for the Right to Live, including safeguards for marginalised residents (Mazzucato & Farha, 2024). This can be integrated into community participation in waste management decision-making and improving access to clean energy initiatives aligned with the UAE's Clean Energy Strategy 2050 (Alhosani, 2025).
- Reframe the Circular Economy strategy. CE promotion must move beyond procedural methods and adopt equity-driven, participatory methodologies grounded in individual dignity and long-term advocacy for equality (Al Mokdad, 2025). As outlined in the UAE Circular Economy Policy 2021–2031, current strategies focus on recycling, land diversion, and waste diversion (Al-Thani et al., 2024). Furthermore, this concept can be re-envisioned to encourage eco-design principles that promote product design for reuse, industrial interdependence among manufacturing sectors, and the implementation of resource-efficiency measures across industries (Singhal et al., 2024).
- Coordinate across sectors. Government agencies involved in digital transformation, social development, and environmental sustainability should collaborate to ensure alignment between rationality and effectiveness in policy implementation, promote stakeholder participation, and facilitate the development of integrated sustainability policies tailored to the specific environmental and socio-economic contexts of the UAE and India. The Ministry of Climate Change and Environment, in collaboration with local municipalities, can implement and monitor local waste management and resource efficiency programs (Maiurova et al., 2022). Private sector stakeholders, such as waste management companies, can adopt cleaner production and recycling technologies (Anuardo, Espuny, Costa, & Oliveira, 2022). Lastly, the non-governmental organisations can facilitate awareness programs and community engagement campaigns (Abiddin, Ibrahim, & Abdul Aziz, 2022). Taken together, these will effectively support integrated sustainability practices and policies.

6.5. Limitations, Future Research and Concluding Reflection

While the research study provides strong statistical evidence and theoretical awareness, certain limitations should be acknowledged.

- Sample size and generalizability: The study employed a convenience sample (n = 140) primarily drawn from South and West Asia, with a notable gender imbalance favouring male respondents. This limits the generalisability of the findings, particularly to women and other geographic populations. A post hoc power analysis and bootstrapped confidence intervals were conducted to address concerns about statistical power (Lai, 2021); however, future research should employ larger, more representative samples using random or stratified designs (López, 2023).
- Age groups: Respondents aged 30–39 were notably underrepresented. Future research should consider more age-balanced samples, especially if age moderates sustainability-related attitudes.
- Geographic bias: Most respondents were from India and the UAE. Cultural, economic, and policy variations across regions may limit external validity. Comparative studies across diverse national contexts would be valuable (Findley, Kikuta, & Denly, 2021).
- To assess common method bias (CMB), a one-factor test was conducted (Kock, Berbekova, & Assaf, 2021). The first factor accounted for 51.16% of the variance, slightly above the 50% threshold, suggesting a marginal contribution of CMB. However, Harman's test is considered a limited diagnostic, and we therefore applied additional checks. Additional validity metrics (HTMT, AVE, and CR51) support the integrity of the constructs. A full collinearity test revealed that all variance inflation factor (VIF) values were below 3.3, indicating that CMB is not likely to pose a significant threat to the results. Taken together,

these findings advocate that while CMB cannot be entirely ruled out, it does not invalidate the study's conclusions. Future studies should consider temporal separation or marker variables to reduce CMB risk further.

- Cross-sectional design: Causality is inferred through structural modelling, but longitudinal or experimental designs could improve these inferences (Savitz & Wellenius, 2023). Although mediation is tested using SEM, causality is tentative due to the cross-sectional design (Peiró, Luque-García, Soriano, & Martínez-Tur, 2023). To moderate common method bias, Harman's one-factor test was conducted (Baumgartner, Weijters, & Pieters, 2021). Results indicated that no single factor was dominant, suggesting that CMB is not a significant concern (Podsakoff, MacKenzie, Lee, & MacKenzie, 2003). Future research, employing longitudinal or experimental designs, is recommended to confirm causal pathways (Loh & Ren, 2023). Contextual factors, such as regulatory environments, cultural standards, or technological responsibility, may moderate the observed associations. Future research could investigate such collaborations (Xie, Liu, & Chen, 2023).
- Expanding constructs: This research study focuses on quality education, decent work, industry and innovation, sustainable cities, and partnerships for goals (Piazza, 2024). Additional constructs, such as environmental attitudes, digital literacy, or civic trust, could upgrade the model and expand explanatory power (AbdulKareem & Oladimeji, 2024). Nevertheless, the study's focus, parameters, scope, scale, sample size, and primary objective are to establish and test a baseline model across the UAE, India, and other developing countries (Kumar MV et al., 2022). The hypothesised model focuses on scope, model simplicity, theoretical focus, conceptual clarity and analytical focus (Rocco, Plakhotnik, & Silberman, 2022). Future research is encouraged to build on this groundwork by integrating these additional constructs to achieve a more comprehensive understanding of the topic.
- While the Right to Live construct is theoretically grounded, its multidimensional nature allows for additional justification, validation and further exploration across broader interdisciplinary models and a variety of conceptual frameworks in future studies (Das et al., 2024). This flexibility enables scholars to contextualise the construct across diverse environmental, socio-economic, and policy contexts, thereby enhancing its importance and applicability across different research paradigms (Abujder Ochoa et al., 2025).

In summary, this research study finds that, while necessary, digital equity does not directly lead to low-impact lifestyles, such as adopting the circular economy (CE) (Tan & Lindi von Mutius, 2023). Instead, it enables the Right to Live, a social construct encompassing policy protection, sustainability practices, and equity across generations (Ly & Cope, 2023). This justification, in turn, informs conclusions about sustainability (Klein, Spieth, & Heidenreich, 2021). This mediation context provides a more precise, fair, and actionable understanding of how digital equity and access contribute to sustainable development (Rydzewski, 2025). It suggests that the pathway from access to action is mediated by righteousness—and that technology, rights, and sustainability must be addressed in the gig economy rather than through segregation (Novitz, 2021).

7. Theoretical and Practical Implications

The outcomes of this research study have significant implications that extend beyond theoretical considerations and practical policy applications (Ulaga, Kleinaltenkamp, Kashyap, & Eggert, 2021). By analytically validating the indirect path from Digital Equity to a Circular Economy via the Right to Live, this research study contributes to a deeper understanding of how sustainability changes are socially structured, mediated, and influenced (Gallardo-Vázquez, de Sousa Paiva, & Nuevo-Gallardo, 2025). The effects considered further concern how these findings reconfigure academic discourse and functional policies (Wróblewska, 2021).

7.1. Theoretical Implications

This research study advances the sustainability transition literature by proposing a socially mediated model that highlights influential conditions and rights-based constructs as key promoters of eco-conscious behaviour. While most contexts focus on technological skill, advanced ecosystems, or governance, this model introduces Digital Equity and the Right to Live as sequential antecedents of ecological behaviour pattern transformation,

predominantly from the perspective of Circular Economy adoption (Rejeb, Suhaiza, Rejeb, Seuring, & Treiblmaier, 2022). This signifies a substantial shift away from purely techno-economic models toward a socially embedded perspective on sustainability change, wherein behavioural adaptations for sustainability are not merely a matter of access to innovation but also of equity, inclusion, and empowerment (Tsou, 2025).

This study offers numerous influential suggestions for policymakers and researchers. The model highlights the importance of rights-based policy interventions, suggesting that reframing the circular economy strategy is essential for achieving sustainable development. Furthermore, cross-sector coordination must be prioritised to foster environmental resilience. These findings provide a foundation for future sustainability policies across regions globally.

The research study advances a new mediating mechanism—the Right to Live—ingrained in human development and social justice theory (Govindharaj, 2021). This establishes sustainability as a conservation objective, contingent upon equitable access to digital support, intergenerational equity, and sustainable practices (Sparviero & Ragnedda, 2021). By measuring this mediating role and demonstrating its statistical significance, the research study contributes to the growing body of work that bridges development economics, capability theory, and sustainability science (Chien, 2022). It also establishes the integration of the Sustainable Development Goals (SDGs) as a systematic scaffold that associates diverse academic disciplines (Rajabifard et al., 2021).

The finding indicates no significant direct relationship between Digital Equity and Circular Economy adoption, consistent with existing theories in the digital revolution and sustainable modernisation literature (Du, Xu, & Yuan, 2024). Several existing models assume that improving digital equity and access leads to pro-environmental behaviour (Zawieska et al., 2022). As an alternative, this study suggests that the relationship is contingent on social safeguards and human rights, offering a corrective to models that underplay the significance of social cohesion, integrity, and individual excellence in shaping sustainability outcomes (Das et al., 2024).

7.2. Practical Implications

Governments and associations often perceive digital equity and inclusion strategies as integral to financial or academic development (Pittman, Severino, DeCarlo-Tecce, & Kiosoglous, 2021). This research study indicates that such guidelines should also be considered environmental boosters (Dasandi et al., 2022). Investment in broadband access, digital education, and community infrastructure has cascading effects—first by empowering communities (through the Right to Live), and then by supporting pro-environmental actions such as waste reduction, reuse, and sustainable innovation (Marini Govigli et al., 2022). Consequently, digital inclusion should be prioritised in environmental policy portfolios rather than economic development agendas (Ullah, Niu, & Meo, 2024).

Circular Economy approaches emphasise the importance of recycling, product design, and technological policies (Díaz, Reyes, & Baumgartner, 2022). Nevertheless, these mediations will remain deficient unless a rights-based governance framework backs them. Policy protection, social security, and generational equity are important factors of the Right to Live that must be established as criteria for sustainability changes (Kotkas, 2024).

For example, national circular economy (CE)policies should involve social protection systems that address susceptible people; urban sustainability planning should account for intergenerational equity, warranting that long-term goals are built into modern-day strategies; and lastly, policies advancing reuse and resource proficiency must be correlated to educational and digital equity and access programs.

The research study discloses that intersectoral coordination is critical. Governments and organisations involved in digital education, human rights, education, and sustainability must break down outdated silos (Lah, 2025). An integrated course of action approach could include co-funding projects between digital infrastructure and environmental ministries; cross-cutting outlines that link the SDGs

An integrated course of action approach could include co-funding projects between digital infrastructure and environmental ministries; cross-cutting outlines that link the Right to Education (SDG 4), Decent Work (SDG 8), and Sustainable Cities (SDG 11) to Circular Economy goals (SDG 12); embedding rights-based language into digital literacy and sustainability awareness drives. Such integration ensures that digital equity is not merely accessible but embedded in holistic pathways that incorporate environmentally and socially just practices (Mhlongo & Dlamini, 2022).

Development interventions and NGOs should review their monitoring and evaluation (M&E) frameworks to incorporate mediating variables, such as social rights, when evaluating digital or sustainability projects (Lynn & Apgar, 2024). Conventional M&E focuses on outputs (e.g., number of devices distributed, amount of waste recycled) (Paunovic, Müller, & Deimel, 2023). Nonetheless, this research study advocates incorporating intermediate conclusions such as perceived institutional support, community sustainability awareness, and indicators of generational equity (Mubaslat, 2021). This methodology enhances impact evaluation and aligns monitoring and evaluation (M&E) with the research study's validated causal pathways (Otundo Richard, 2024).

7.3. Key Takeaway and Conclusion

In summary, digital equity alone will not advance to circularity. Government policies must move from access to action, and this transition is only possible through institutional mechanisms that protect and promote the Right to life. Equity, rights, and sustainability are not comparable goals—they are interdependent conditions of an all-encompassing future. This research study investigates the mechanisms through which Digital Equity influences the adoption of Circular Economy practices, suggesting that the Right to Live is a significant mediating variable in this relationship. Using a structural equation modelling approach and constructs aligned with the United Nations Sustainable Development Goals (SDGs), the research tested a sequential model: Digital Equity → Right to Live → Circular Economy. The findings provide strong empirical support for this research framework. Digital Equity was exhibited to notably improve the Right to Live, a multidimensional construct encompassing sustainable practices, policy protection, and intergenerational equity.

In succession, the Right to Live has been intensely linked to sustainable behaviour in the Circular Economy. Necessarily, the study identified no significant direct effect between Digital Equity and Circular Economy adoption, confirming a fully mediated relationship. This path highlights the social and institutional settings that must be in place for digital equity to transform sustainability–oriented practice. These conclusions contribute to a more nuanced comprehension of sustainability changes.

Although international dialogue is increasingly incorporating digital innovation as a tool for sustainability, this study highlights that equity and access alone are insufficient (Shirazi & Hajli, 2021). Technology must be embedded in social systems that confirm equity, protect rights, and encourage long-term action. The presence of policy safeguards, community participation, and intergenerational mindfulness is not unusual; it is essential to achieving systemic transformation.

The study also presents a theoretical interpretation, offering a rights-based mediation model that integrates insights from capability theory, environmental psychology, and development economics (Marques Cebola, Lopes, Vasconcelos, & Caser, 2021). It argues that linear assumptions are repeatedly learned in digital and sustainable innovation models, promoting interdisciplinary methodologies in sustainability research. The effects are evident in a rational assessment: to successfully encourage Circular Economy principles, digital equity must be accompanied by social policies that promise equity and inclusion. Governments and development players should reframe their digital strategies to prioritise sustainability advocates and integrate a rights-based measurement system into project and evaluation processes.

The path from digital equity ecological activeness is not automatic but provisional. This research study proves that the right to live with dignity, protection, and opportunity is the link between justice and sustainability. For communities to transition to circularity, they must start by addressing technology and justice.

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Declarations

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References

Aanestad, M., Kankanhalli, A., Maruping, L., Pang, M. S., & Ram, S. (2021). Digital technologies and social justice. *MIS Quarterly,* 17(3), 515–536.

Abiddin, N. Z., Ibrahim, I., & Abdul Aziz, S. A. (2022). Non-governmental organisations (NGOs) and their part towards sustainable community development. *Sustainability, 14(8),* 4386.

Abramovich, N., & Vasiliu, A. (2023). Sustainability as fairness: A Rawlsian framework linking intergenerational equity and the sustainable development goals (SDGs) with business practices. *Sustainable Development, 31(3),* 1328–1342.

Abujder Ochoa, W. A., Iarozinski Neto, A., Vitorio Junior, P. C., Calabokis, O. P., & Ballesteros-Ballesteros, V. (2025). The Theory of complexity and sustainable urban development: A systematic literature review: *Sustainability, 17(1)*, 3.

Acquah, I. S. K., Quaicoe, J., & Gatsi, J. G. (2024). Modelling circular economy capabilities and sustainable manufacturing practices for environmental performance: Assessing linear (PLS-SEM) and non-linear (fsQCA) effects. *Technological Forecasting and Social Change, 205*, 123501.

Adanma, U. M., & Ogunbiyi, E. O. (2024). The public health benefits of implementing environmental policies: A comprehensive review of recent studies. *International Journal of Applied Research in Social Sciences, 6(5)*, 978-1004.

Adekomaya, O., & Majozi, T. (2022). Promoting natural cycle and environmental resilience: a pathway toward sustainable development. *South African Journal of Chemical Engineering, 42*, 229–240.

Adholiya, A. (2025). Evaluating the Impact of Digitalisation on Circular Economy Growth: Insights from Structural Equation Modelling. *Circular Economy and Sustainability, 1–30*.

Afzal, A., Khan, S., Daud, S., Ahmad, Z., & Butt, A. (2023). Addressing the Digital Divide: Access to and Use of Technology in Education. *Journal of Social Sciences Review, 3(2),* 883–895.

Ahirwar, R., & Tripathi, A. K. (2021). E-waste management: A review of recycling process, environmental and occupational health hazards, and potential solutions. *Environmental Nanotechnology, Monitoring & Management, 15,* 100409.

Ahuja, V. (2023). Equity and access in digital education: Bridging the divide. *In Contemporary challenges in education: Digitalisation, methodology, and management* (pp. 45–59). IGI Global.

Aiguobarueghian, I., Adanma, U. M., Ogunbiyi, E. O., & Solomon, N. O. (2024). An overview of initiatives and best practices in resource management and sustainability. *World Journal of Advanced Research and Reviews, 22(2)*, 1734-1745.

Al Mokdad, A. (2025). Inclusive and Intelligent Governance: Enabling Sustainability Through Policy and Technology. *In Social System Reforms to Achieve Global Sustainability* (pp. 173–238). IGI Global Scientific Publishing.

Alabdali, S. A., Pileggi, S. F., & Cetindamar, D. (2023). Influential factors, enablers, and barriers to adopting innovative technology in rural regions: *A literature review. Sustainability, 15(10),* 7908.

Alam, S. S., Masukujjaman, M., Ahmed, S., Kokash, H. A., & Khattak, A. (2024). Towards a circular economy: cleaner production technology adoption among small and medium enterprises in an emerging economy. *Circular Economy and Sustainability*, *4*(2), 1357-1386.

Alhassan, M. D., & Adam, I. O. (2024). Digital inclusion and sustainable development goals. *Journal of Science and Technology Policy Management.*

Alhosani, K. (2025). Leveraging Public-Private Partnerships for a Circular Industry Economy: *Advancing Economic Sustainability in Industrial Waste Management in the Emirate of Ajman, UAE.*

Alketbi, M. S. A. H. 2023). Sustainable development: influence of economic decisions taken at the state level in the United Arab Emirates (UAE).

AllahRakha, N. (2024). Cybersecurity Regulations for Protection and Safeguarding Digital Assets (Data) in Today's World. *Lex Scientia Law Review, 8(1),* 405–432.

Allen, H. J. (2024). Fintech and techno-solutionism. Available at SSRN 4686469.

Al-Mujahed, L. K. A. (2024). Smart cities and Sustainable Development Goals: A systematic review and future research directions. *Journal of Sustainable Economy, 1(1).*

Almulhim, A. I., & Abubakar, I. R. (2021). Understanding Public Environmental Awareness and Attitudes toward the Transition to a Circular Economy in Saudi Arabia. *Sustainability, 13(18),* 10157.

Al-Sulaiti, A., Hamouda, A. M., Al-Yafei, H., & Abdella, G. M. (2024). Innovation-based strategic roadmap for economic sustainability and diversity in hydrocarbon-driven economies: the Qatar perspective. *Sustainability, 16(9),* 3770.

Al-Thani, D. S. K., Mohamed, M. A., Jacob, F. A., Al Thani, S. A., Khan, H., Kim, S., & Nabil Abdel-Hadi, I. (2024). CIRCULAR ECONOMY PRINCIPLES FOR EFFICIENT WATER AND WASTE MANAGEMENT.

Andersson, J., Lennerfors, T. T., & Fornstedt, H. (2024). Towards a socio-techno-ecological approach to sustainability transitions. *Environmental Innovation and Societal Transitions*, *51*, 100846. https://doi.org/10.1016/j.eist.2024.100846

Antikainen, R., Baudry, R., Gössnitzer, A., Karppinen, T. K. M., Kishna, M., Montevecchi, F., ... & IHOBE, S. P. D. G. A. (2021). Circular Business Models: Product-Service-Systems on the Way to a Circular Economy.

Anttiroiko, A. V. (2023). Smart circular cities: governing the relationality, spatiality, and digitality in promoting the circular economy in an urban region. *Sustainability, 15(17),* 12680.

Anuardo, R. G., Espuny, M., Costa, A. C. F., & Oliveira, O. J. (2022). Toward a cleaner and more sustainable world: A framework to develop and improve waste management through organisations, governments and academia. *Heliyon, 8(4).(*Twum, Zhang, Ding, & Cobbinah, 2025)

Apata, O. (2024, April). Exploring the Nexus Between Digital Transformation and Sustainability. In *2024 IEEE Conference on Technologies for Sustainability (SusTech)* (pp. 120–127). IEEE.

Araújo, R., & Koessler, L. (2021). The rise of the constitutional protection of future generations.

Arimoro, A. E. (2025). Human Rights and Standard of Living in Sub-Saharan Africa: Challenges and Prospects.

Arion, F. H., Aleksanyan, V., Markosyan, D., & Arion, I. D. (2023). Circular pathways to sustainable development: understanding the links between circular economy indicators, economic growth, social well-being, and environmental performance in EU-27. *Sustainability, 15(24),* 16883.

Ashfaq, M., Tandon, A., Zhang, Q., Jabeen, F., & Dhir, A. (2023). Doing good for society! How purchasing green technology stimulates consumers toward green behaviour: A structural equation modelling–artificial neural network approach. *Business Strategy and the Environment, 32(4),* 1274–1291.

Asibey, M. O., Haruna, H. A., Appau, P. K., & Yeboah, V. (2025). Empowering communities, protecting ecosystems: Climate resilience of urban socio-ecological systems. *Journal of Environmental Management, 375*, 124376.

Atzeni, M., Carta, M. G., Primavera, D., Gonzales, C. I. A., Galletta, M., Marchegiani, S., ... & Preti, A. (2024). Reliability and Factor Structure of the Well-Being and Respect for Human Rights Questionnaire in Measuring Caregivers' Perception. *Clinical Practice and Epidemiology in Mental Health: CP & EMH, 20,* e17450179310030.

Awan, U. (2021). Steering for Sustainable Development Goals: A Typology of Sustainable Innovation. In *Industry, innovation and infrastructure* (pp. 1026–1036). Cham: Springer International Publishing.

Baharum, H., Ismail, A., Awang, Z., McKenna, L., Ibrahim, R., Mohamed, Z., & Hassan, N. H. (2023). The study adapted instruments based on Confirmatory Factor Analysis (CFA) to validate measurement models of latent constructs. *International Journal of Environmental Research and Public Health, 20(4)*, 2860.The measurement (outer) model evaluation.

Bai, C., Orzes, G., & Sarkis, J. (2022). Exploring the impact of Industry 4.0 technologies on social sustainability through a circular economy approach. *Industrial Marketing Management, 101*, 176–190.

Bailey, L. E., & Nyabola, N. (2021). Digital Equity as an Enabling Platform for Equality and Inclusion. Pathfinders for Peaceful, Just, and Inclusive Societies/NYU Centre on International Cooperation, June 2021, https://cic. nyu. Edu/resources/digital-equityas-an-enabling-platform-for-equality-and-inclusion.

Basilio, D. G. G., & da Silva, C. D. D. P. (2024). Governance and New International Actors: The Fundamental Role of Networks in Implementing Sustainable Development Goals. Beijing L.

Bastone, A., Leone, D., Ciasullo, M. V., & Matho, R. (2024). Exploring sustainable value drivers of the sharing economy: a sector analysis. *Management Decision, 62(12),* 4118–4137.

Batra, S. (2025). Exploring the application of PLS-SEM in construction management research: a bibliometric and meta-analysis approach. Engineering, *Construction and Architectural Management, 32(4),* 2697–2727.

Baumgartner, H., Weijters, B., & Pieters, R. (2021). The biasing effect of standard method variance: Some clarifications. *Journal of the Academy of Marketing Science, 49*, 221–235.

Becker, A. (2021). Human dignity through action: Transformative human rights education and social work. *Journal of human rights and social work, 6(3),* 173–182.

Bellantuono, L., Monaco, A., Amoroso, N., Aquaro, V., Lombardi, A., Tangaro, S., & Bellotti, R. (2022). Sustainable development goals: conceptualisation, communication, and achievement synergies in a complex network framework. *Applied Network Science, 7(1),* 14.

Bergmann, M., Ntsondé, J., Beulque, R., & Micheaux, H. (2025). Business Models for Strong Circularity—The Role of Informative Policy Instruments Promoting Repair. *Business Strategy and the Environment, 34(2)*, 2273–2296.

Berry, B., Farber, B., Rios, F. C., Haedicke, M. A., Chakraborty, S., Lowden, S. S., ... & Isenhour, C. (2022). Just by design: exploring justice as a multidimensional concept in US circular economy discourse. *Local Environment, 27(10-11),* 1225–1241.

Bertassini, A. C., Ometto, A. R., Severengiz, S., & Gerolamo, M. C. (2021). Circular economy and sustainability: The role of organisational behaviour in the transition journey. *Business Strategy and the Environment, 30(7),* 3160–3193.

Bhatti, M. A., & Alshiha, F. A. (2024). Examining the Influence of Urban Environment and Green Space Perceptions on Quality of Life. Rita Revista Indexada de Textos Acadêmicos (21).

Bherwani, H., Nair, M., Niwalkar, A., Balachandran, D., & Kumar, R. (2022). Application of circular economy framework for reducing the impacts of climate change: A case study from India on the evaluation of carbon and materials footprint nexus. *Energy Nexus, 5,* 100047.

Bjervig, B., & Amundsen, M. (2024). Analysing the Influence of Foreign Direct Investments on Sustainable Development in Developing Countries (master's thesis, Handelshøyskolen BI).

Bogenschneider, K., & Corbett, T. (2021). Evidence-based policymaking: Envisioning a new era of theory, research, and practice. Routledge.

Bourdin, S., & Jacquet, N. (2025). Closing the loop at the local scale: Investigating the drivers of and barriers to the implementation of the circular economy in cities and regions. *Ecological Economics*, *231*, 108542.

Bracarense, N., & Bracarense Costa, P. A. (2024). Green jobs: Sustainable path for environmental conservation, socio-economic stability, and inclusion. *Review of Political Economy*, *36*(1), 351–372.

Bressanelli, G., Adrodegari, F., Pigosso, D. C., & Parida, V. (2022). Towards the innovative circular economy paradigm: A definition, conceptualisation, and research agenda. *Sustainability, 14(9),* 4960.

Bustami, A. (2022). The Legal Relationship between Present and Future Generations: An Intertemporal Perspective on Intergenerational Equity *(Doctoral dissertation, Staats- und Universitätsbibliothek Hamburg Carl von Ossietzky)*.

Cagno, E., Neri, A., Negri, M., Bassani, C. A., & Lampertico, T. (2021). The role of digital technologies in operationalising the circular economy transition: *A systematic literature review. Applied Sciences, 11(8),* 3328.

Castro, C., & Lopes, C. (2022). Digital government and sustainable development. *Journal of the Knowledge Economy, 13(2),* 880–903.

Chen, D., & Fritz, M. S. (2021). Comparing alternative corrections for bias in the bias-corrected bootstrap test of mediation. *Evaluation & the health professions, 44(4),* 416–427.

Cheng, C., Spiegelman, D., & Li, F. (2021). Estimating the natural indirect effect and the mediation proportion via the product method. *BMC Medical Research Methodology, 21*, 1–20.

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modelling: A review and best-practice recommendations. *Asia Pacific Journal of Management, 41(2)*, 745–783.

Chiang, P. C., Ma, H. W., Wen, L., & Lin, C. H. (2024). Reduction, Reuse, Recycling, Recovery, Redesign. In Introduction to Green Science and Technology for Green Economy: *Principles and Applications* (pp. 255–285). Singapore: Springer Nature Singapore.

Chien, F. (2022). The mediating role of energy efficiency in the relationship between sharing-economy benefits and the Sustainable Development Goals (Case of China). *Journal of Innovation & Knowledge, 7(4),* 100270.

Chin, C. L., & Yao, G. (2024). Convergent validity. In *Encyclopaedia of quality of life and well-being research* (pp. 1398–1399). Cham: Springer International Publishing.

Chobdar, M., & Garje, B. Perspective of The Young About the Fundamental Rights: A Need to Raise Awareness for Its Successful Authorisation.

Chohan, S. R., & Hu, G. (2022). Strengthening digital inclusion through e-government: cohesive ICT training programs to intensify digital competency. *Information technology for development, 28(1),* 16–38.

Chowdhury, S., Dey, P. K., Rodríguez-Espíndola, O., Parkes, G., Tuyet, N. T. A., Long, D. D., & Ha, T. P. (2022). Impact of organisational factors on the circular economy practices and sustainable performance of small and medium-sized enterprises in Vietnam. *Journal of Business Research, 147*, 362–378.

Ciacci, A., Ivaldi, E., Penco, L., & Testa, G. (2024). Measuring Digital Sustainability: Paying Attention to the Economic, Social, and Environmental Dimensions: A European Perspective. *Social Indicators Research,* 1–29.

Clausen, L. (2025). *Women Entrepreneurs in the Circular Economy: Global Experiences*. Emerald Group Publishing.

Colding, J., Nilsson, C., & Sjöberg, S. (2024). Smart cities for all? Bridging digital divides for socially sustainable and inclusive cities. Smart Cities, 7(3), 1044-1059.

Correa, M. (2024). Bridging the digital divide: Effective strategies for enhancing broadband connectivity and digital literacy in low-income communities *(Doctoral dissertation, California State University, Northridge)*.

Cosa, M. (2024). Equity Integration in Corporate Social Responsibility: Analysing Stakeholder, Legitimacy, and Social Activism Dynamics. In *CSR, Governance and Value* (pp. 133–154). Singapore: Springer Nature Singapore.

Craiut, L., Bungau, C., Bungau, T., Grava, C., Otrisal, P., & Radu, A. F. (2022). Technology Transfer, Sustainability, and Development, Worldwide and in Romania. *Sustainability, 14(23)*, 15728. https://doi.org/10.3390/su142315728

Czerniewicz, L., & Carvalho, L. (2022). Open, distance, and digital education (ODDE)–An equity view. In *Handbook of open, distance and digital education* (pp. 1–20). Singapore: Springer Nature Singapore.

Danish, M. S. S., & Senjyu, T. (2023). Shaping the future of sustainable energy through AI-enabled circular economy policies. *Circular Economy, 2(2)*, 100040.

Das, D. K. (2024). Exploring the symbiotic relationship between digital transformation, infrastructure, service delivery, and governance for smart, sustainable cities. *Smart Cities, 7(2),* 806–835.

Das, S. S., Singh, K., Kumar, R., Singh, J. N., & Kumar, P. (2024). Exploring the multifaceted landscape of human rights: A comprehensive analysis of theoretical frameworks. *Educational Administration: Theory and Practice, 30*(5), 3346–3365.

Dasandi, N., Graham, H., Hudson, D., Jankin, S., van Heerde-Hudson, J., & Watts, N. (2022). Positive, global, and health- or environmental-framing bolsters public support for climate policies. *Communications Earth & Environment, 3*(1), 239. https://doi.org/10.1038/s43247-022-00507-7

De Abreu, V. H. S., Da Costa, M. G., Da Costa, V. X., De Assis, T. F., Santos, A. S., & D'Agosto, M. D. A. (2022). The role of the circular economy in road transport in mitigating climate change and reducing resource depletion. *Sustainability, 14*(14), 8951. https://doi.org/10.3390/su14148951

De Morais, L. H. L., Pinto, D. C., & Cruz-Jesus, F. (2021). Circular economy engagement: Altruism, status, and cultural orientation as drivers for sustainable consumption. *Sustainable Production and Consumption, 27*, 523–533. https://doi.org/10.1016/j.spc.2020.11.003

De Oliveira Neto, G. C., do Prado Soares, O., Costa, B. K., da Silva, R. N. B., da Costa, P. R., Bernardes, R., … & da Silva, D. (2025). Impact of technological innovation driven by co-creation of value on the performance of multinationals in emerging markets. *Journal of Open Innovation: Technology, Market, and Complexity, 11*(2), 100511. https://doi.org/10.1016/j.joitmc.2024.100511

De Schutter, O., Lamara, F., & Rabier, S. (2022). *The approach is based on human rights and the reduction of multidimensional inequalities*. AFD Research Papers, 260, 1–68.

Deganis, I., Haghian, P. Z., Tagashira, M., & Alberti, A. (2021). *Leveraging digital technologies for social inclusion*. United Nations Department of Economic and Social Affairs. https://www.un.org/development/desa

Di Maria, E., De Marchi, V., & Galeazzo, A. (2022). Industry 4.0 technologies and circular economy: The mediating role of supply chain integration. *Business Strategy and the Environment, 31*(2), 619–632. https://doi.org/10.1002/bse.2919

Diaz, A., Reyes, T., & Baumgartner, R. J. (2022). Implementing circular economy strategies during product development. *Resources, Conservation and Recycling, 184*, 106344. https://doi.org/10.1016/j.resconrec.2022.106344

Du, Y., Xu, J., & Yuan, X. (2024). The development relationship between circular economy and advanced digital technology: Based on an innovative literature review method. *Environmental Technology Reviews, 13*(1), 614–638. https://doi.org/10.1080/21622515.2024.2361642

Dwivedi, A., & Paul, S. K. (2022). A framework for digital supply chains in the circular economy era: Implications on environmental sustainability. *Business Strategy and the Environment, 31*(4), 1249–1274. https://doi.org/10.1002/bse.2964

Ebadi, B. (2023). *Beyond digital access as a human right in cities: Proposing an integrated, multi-dimensional approach.*

Elliott, K., Price, R., Shaw, P., Spiliotopoulos, T., Ng, M., Coopamootoo, K., & Van Moorsel, A. (2021). Towards an equitable digital society: *Artificial intelligence (AI) and corporate digital responsibility (CDR). Society, 58(3),* 179–188. https://doi.org/10.1007/s12115-021-00647-5

Emeka-Okoli, S., Nwankwo, T. C., Otonnah, C. A., & Nwankwo, E. E. (2024). Integrating sustainable development goals into oil & gas operations: A comprehensive review. *International Journal of Management & Entrepreneurship Research, 6*(3), 660–677.

Farber, D. A. (2023). INEQUALITY AND REGULATION Designing Rules to Address Race, Poverty, and Environmental Justice. *American Journal of Law and Equality, 3*, 2–52.

Fauzi, M. A. (2022). Partial Least Squares Structural Equation Modelling (PLS-SEM) in Knowledge Management Studies: Knowledge Sharing in Virtual Communities. *Knowledge Management & E-Learning, 14(1),* 103–124.

Federal Communications Commission. (n.d.). Affordable Connectivity Program. U.S. Government. https://www.fcc.gov/acp

Fernandez de Arroyabe Arranz, C. (2022). The application of Machine Learning methods to the analysis of Business: A study of the implementation of the Circular Economy *(Doctoral dissertation, University of Essex).*

Fernández, S., Bodin, U., & Synnes, K. (2025). On the Interplay between Behaviour Dynamics, Environmental Impacts, and Fairness in the Circular Economy, Business Models and Supply Chain Management. *Significance, 6,* 8.

Findley, M. G., Kikuta, K., & Denly, M. (2021). External validity. *Annual review of political science, 24(1)*, 365–393.

Fisher, J., Arora, P., Chen, S., Rhee, S., Blaine, T., & Simangan, D. (2021). Four propositions on integrated sustainability: Towards a theoretical framework to understand the nexus of environment, peace, and sustainability. *Sustainability Science, 16*, 1125–1145.

Forehand, L. C. (2024). From Access to Equity: The Role of OER and Technology in Higher Education. California State University, Long Beach.Corrado, M. (2024). *Industrial Property Rights in Circular Economy: Challenges and Opportunities.*

Fountain, H. N. (2023). Digital Inclusion in the LIS Literature: An Intersectional Analysis.

Fujimoto, Y., & Uddin, J. (2021). Inclusive leadership for reduced inequality: the economic–social-economic cycle of inclusion. *Journal of Business Ethics,* 1–20.

Gallardo-Vázquez, D., de Sousa Paiva, I. C., & Nuevo-Gallardo, C. (2025). Exploring the Role of Sustainability Reporting Strategies in Promoting Sustainable Development in Social Economy Entities: *The Circular Economy as a Mediator of Sustainable Development, 33(2)*, 2902–2925.

Gamji, M. B. U., Kara, N., Nasidi, Q. Y., & Abdul, A. I. (2022). The challenges of the digital divide and the use of Web 2.0 platforms for knowledge sharing among Nigerian academics. *Information Development, 38(1)*, 149–159.

Garg, D. K. (2023). Environmental Challenges and Sustainable Development. *Journal Global Values, 14*, 203–210.

Gariba, M. I., Odei, S. A., Febiri, F., & Provazníková, R. (2024). Exploring the mediating role of the digital economy in the relationship between fiscal decentralisation and the SDGs dimensions in the EU. *Cogent Economics & Finance, 12(1)*, 2367219.

Gaur, T. S., Yadav, V., Mittal, S., & Sharma, M. K. (2024). A systematic review on sustainable e-waste management: Challenges, circular economy practices, and a conceptual framework. Management of Environmental Quality: *An International Journal, 35(4),* 858–884.

Georgantzis Garcia, D. (2024). The Role of Consumer Perception and Behaviour in the Transition towards the Circular Economy *(Doctoral dissertation, University of Sheffield)*.

George, A. S. (2024). Bridging the Digital Divide: Understanding the Human Impacts of Digital Transformation.

Ghaleb, M., & Yaslioglu, M. (2024). Structural Equation Modelling (SEM) for social and behavioural sciences studies: Steps, sequence, and explanation. *Journal of Organisational Behaviour Review*, *6*(1), 69–108.

GIRALT, L. (2024). A Comprehensive Analysis of the European Union's Integration of the Right to Development and the Sustainable Development Goals: *EU Development: From Policy to Practice*.

Gonella, J. D. S. L., Godinho Filho, M., Campos, L. M. D. S., & Ganga, G. M. D. (2024). People's awareness and behaviours of the circular economy around the world: literature review and research agenda. *Sustainability Accounting, Management and Policy Journal*, *15*(5), 1118–1154.

Gonella, J. D. S. L., Godinho Filho, M., Ganga, G. M. D., Latan, H., & Jabbour, C. J. C. (2024). A behavioural perspective on circular economy awareness: The moderating role of social influence and psychological barriers. *Journal of Cleaner Production, 441*, 141062.

Gonzales, A. L., Kim, Y., & Wang, L. H. (2023). Multi-solving innovations: How digital equity, e-waste, and right-to-repair policies can increase the supply of affordable computers. *Policy & Internet, 15(2),* 162–177.

Gorokhova, T., Shpatakova, O., Toponar, O., Zolotarova, O., & Pavliuk, S. (2023). CIRCULAR ECONOMY AS AN ALTERNATIVE TO THE TRADITIONAL LINEAR ECONOMY: CASE STUDY OF THE EU. *Environmental & Social Management Journal/Revista de Gestão Social e Ambiental, 17(5).*

Gottschalk, F., & Weise, C. (2023). Digital equity and inclusion in education: An overview of practice and policy in OECD countries. *OECD Education Working Papers, (299),* 0_1-75.

Government of India. (n.d.). Digital India. Ministry of Electronics and Information Technology. https://digitalindia.gov.in

Govindharaj, Y. (2021). A theoretical evaluation of enabling humans with social justice, conceptualism, and sustainable development. *Journal of Human Resource and Sustainability Studies, 9(4),* 503–523.

Grybaitė, V. (2025). Green Wealth in Motion: Leveraging the Sharing Economy for a Circular Future. In *Green Wealth: Navigating towards a Sustainable Future* (pp. 307–322). Emerald Publishing Limited.

Gu, W., Li, L., Zhang, S., & Yi, M. (2024). The Path Analysis of Entrepreneurship's Impact on the Circular Economy in Emerging Markets: A Mediating Role of Digital Technology. *Management Decision, 62(9),* 2900–2914.

Guillibert, P., Barca, S., & Leonardi, E. (2024). Labour in the transition to the circular economy. Circular Economy for Social Transformation: *Multiple Paths to Achieve Circularity, 285*.

Guo, Y., Deng, Y., & Meng, Q. (2023). How Does the Citizen's Education Level Affect Their Willingness to Protect Their Internet Rights? ——The Parallel Intermediary Effect of Digital

Information Acquisition Ability and Utilisation Ability. Digital Government: *Research and Practice, 4(4)*, 1–18.

Hagelüken, C., & Goldmann, D. (2022). Recycling and circular economy—towards a closed loop for metals in emerging clean technologies. *Mineral Economics, 35(3),* 539–562.

Hailemariam, A., & Erdiaw-Kwasie, M. O. (2023). Towards a circular economy: Implications for emission reduction and environmental sustainability. *Business Strategy and the Environment, 32(4),* 1951-1965.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). Partial least squares structural equation modelling (PLS-SEM) using R: *A workbook* (p. 197). Springer Nature.

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., Ray, S., ... & Ray, S. (2021). Evaluation of reflective measurement models. *Partial least squares structural equation modelling (PLS-SEM) using R: A workbook,* 75–90.

Haji-Othman, Y., & Yusuff, M. S. S. (2022). Assessing the reliability and validity of the attitude construct using partial least squares structural equation modelling. *Int. J. Acad. Res. Bus. Soc. Sci, 12(5),* 378–385.

Hales, R., & Birdthistle, N. (2023). The sustainable development goals–SDG# 12: responsible consumption and production. *Attaining the 2030 Sustainable Development Goal of responsible consumption and production* (pp. 1–10). Emerald Publishing Limited.

Hameed, K., Naha, R., & Hameed, F. (2024). Digital Transformation for Sustainable Health and Well-being: A Review and Future Research Directions. *Discover Sustainability, 5(1),* 104.

Han, Y., Shevchenko, T., Yannou, B., Ranjbari, M., Shams Esfandabadi, Z., Saidani, M., ... & Li, G. (2023). Exploring how digital technologies enable a circular economy of products: *sustainability, 15(3),* 2067.

Haque, F., Fan, C., & Lee, Y. Y. (2023). From waste to value: Addressing the relevance of waste recovery to the agricultural sector in line with the circular economy. *Journal of Cleaner Production, 415*, 137873.

Hasan, N., Bao, Y., & Miah, S. J. (2022). Exploring the Impact of ICT Usage among Indigenous People and Their Quality of Life: Operationalising Sen's Capability Approach. *Information Technology for Development, 28(2),* 230-250.

Hassan, K., & Naoual, O. T. (2024). Leveraging technology for equity: A literature review on e-inclusion and its potential to advance young people's socioeconomic inclusion. *Revue Internationale de la Recherche Scientifique, 2(4)*, 1936-1952.

Helsper, E. (2021). The digital disconnects: The social causes and consequences of digital inequalities.

Hossain, K. A. (2023). Evaluation of technological breakthroughs in global education and future employment opportunities. *Journal of Liberal Arts and Humanities (JLAH), 4(8),* 1–62.

Huh, D., Li, X., Zhou, Z., Walters, S. T., Baldwin, S. A., Tan, Z., ... & Mun, E. Y. (2022). A structural equation modelling approach to meta-analytic mediation analysis using individual participant data: Testing protective behavioural strategies as a mediator of brief motivational intervention effects on alcohol-related problems. *Prevention Science, 23(3),* 390–402.

Hummels, H., & Argyrou, A. (2021). Planetary demands: Redefining sustainable development and sustainable entrepreneurship. *Journal of Cleaner Production, 278*, 123804.

Huttunen, S., Kaljonen, M., Lonkila, A., Rantala, S., Rekola, A., & Paloniemi, R. (2021). Pluralising agency to understand behaviour change in sustainability transitions. *Energy research & social science, 76*, 102067.

Huvé, S., Brubaker, R., Day, A., & Hudáková, Z. (2022). Enforcing UN Sanctions and Protecting Humanitarian Action: *Towards a Coherent and Consistent Approach*.

Imran, A. (2023). Why addressing digital inequality should be a priority—the Electronic *Journal of Information Systems in Developing Countries, 89(3),* e12255.

Inam Ul Mansoor, S. (2023). An Interface between Digital Privacy and Human Rights: The Challenges Ahead. Available at SSRN 5019128.AbdulKareem, A. K., & Oladimeji, K. A. (2024). Cultivating the Digital Citizen: Trust, Digital Literacy, and E-Government Adoption. Transforming Government: People, Process and Policy, 18(2), 270–286.

Islam, M. Z., & Zheng, L. (2024). Why is it necessary to integrate circular economy practices for agri-food sustainability from a global perspective? Sustainable Development.

Israilova, E., Dudukalov, E., Goryunova, E., & Shatila, K. (2023). Promoting environmental literacy and behaviour change among individuals and communities in the digital era. In E3S Web of Conferences (Vol. 458, p. 06024). EDP Sciences.

Ixmeier, A., Kranz, J. J., Recker, J., & Zeiss, R. (2023). How to unlock the potential of information systems for a circular economy. In *Research handbook on information systems and the environment* (pp. 74–99). Edward Elgar Publishing.

Jackson, E. A. (2021). Sustainable livelihood framework for equitable living in a crisis of a global pandemic. *In Reduced Inequalities* (pp. 1–10). Cham: Springer International Publishing.

Jha, M. K., & Dev, M. (2024). Impacts of Climate Change. In *Smart Internet of Things for Environment and Healthcare* (pp. 139–159). Cham: Springer Nature Switzerland.

Ji-Hyland, C., White, D., & Khaydarov, R. (2025). The Impact of Circular Economy Practices on Sustainable Logistics Performance. *International Journal of Logistics Research and Applications*, 1–27.

Jodoin, S., Savaresi, A., & Wewerinke-Singh, M. (2021). Rights-based approaches to climate decision-making. Current Opinion in Environmental Sustainability, 52, 45–53.

Johnsson, L. (2021). Multidimensional property supplementation: A method for discovering and describing emergent qualities of concepts in grounded theory research. *Qualitative Health Research, 31(1),* 184–200.

Johnston, M. (2022). Critiquing commodification in environmental governance: examples of urban waste governance in Cape Town, Rotterdam, and Bristol.

Kanger, L. (2021). Rethinking the Multi-level Perspective for energy transitions: From regime life cycle to explanatory typology of transition pathways. *Energy Research & Social Science, 71*, 101829.

Kante, M., & Michel, B. (2023). Use of partial least squares structural equation modelling (PLS-SEM) in privacy and disclosure research on social network sites: A systematic review. *Computers in Human Behaviour Reports, 10,* 100291.

Karaca, F., Tleuken, A., Pineda-Martos, R., Ros Cardoso, S., Orel, D., Askar, R., ... & Braganca, L. (2024). Cultivating sustainable construction: stakeholder insights driving circular economy innovation for inclusive resource equity. *Buildings, 14(4),* 935.

Khatun, M. (2024). The Role of Philosophy in Combating Social Inequality in the Digital Era: Ethical Perspectives and Practical Implications. *JOURNAL OF ADVANCE AND FUTURE RESEARCH, 2(10)*, 20–26.

Klein, S. P., Spieth, P., & Heidenreich, S. (2021). Facilitating business model innovation: The influence of sustainability and the mediating role of strategic orientations. *Journal of Product Innovation Management, 38(2)*, 271–288.

Kline, R. B. (2023). Principles and practice of structural equation modelling. Guilford Publications.

Kock, F., Berbekova, A., & Assaf, A. G. (2021). Understanding and Managing the Threat of Common Method Bias: Detection, Prevention, and Control. *Tourism management, 86*, 104330.

Kola-Bezka, M. (2024). Policies and regulatory instruments in pursuit of the circular economy. In *The Human Dimension of the Circular Economy* (pp. 26–45). Edward Elgar Publishing.

Konash, A., & Nasr, N. (2022). The circular economy and resource use reduction: A case study of long-term resource efficiency measures in a medium manufacturing company. *Cleaner Production Letters, 3*, 100025.

Kotkas, T. (2024). Social rights and social sustainability: Can social law promote intergenerational justice? In *Research Handbook on Sustainability and Competition Law* (pp. 320–335). Edward Elgar Publishing.

Kreijkes, P., & Greatorex, J. (2024). Differential effects of subject-based and integrated curriculum approaches on students' learning outcomes: *A review of reviews. Review of Education, 12(1),* e3465.

Kreinin, H., & Aigner, E. (2022). From "Decent work and economic growth" to "Sustainable work and economic degrowth": *a new framework for SDG 8. Empirica, 49(2),* 281–311.

KULESZA, J. (2024). Two sides of the same coin? The Future of the Internet and Sustainable Development. European University Institute.

Kumar MV, M., Patil, J., Shastry, K. A., Darshan, S., Sastry, N. K. B., Moonesar, I. A., ... & Rao, A. (2022). ICT Enabled Disease Diagnosis, Treatment and Management—A Holistic Cost-Effective Approach Through Data Management and Analysis in UAE and India—Frontiers in Artificial Intelligence, 5, 909101.

Kumar, A., Verma, R. K., Chandrasekaran, K., Rangasami, S. R., & Kumari, V. (2024). Advanced scale development methodology through systematic literature review, synthesis, and validation. Vandana, Advanced Scale Development Methodology Through Systematic Literature Review-Synthesis and Validation.

Kumar, N., & Chatterjee, S. (2023). Accelerating progress in SDG 9 (sustainable industrialisation) in the South and South-West Asia.

Kumar, P., Sharma, L., & Sharma, N. C. (2024). Sustainable Development: Balancing Economic Viability, Environmental Protection, and Social Equity. In *Sustainable Partnership and Investment Strategies for Startups and SMEs* (pp. 212–234). IGI Global.

Kumar, S., & Barua, M. K. (2022). A modelling framework of green practices to explore their interrelations as a conduit to policy. *Journal of Cleaner Production, 335*, 130301.

Lah, O. (2025). Breaking the silos: integrated approaches to foster sustainable development and climate action. *Sustainable Earth Reviews, 8(1),* 1.

Lai, M. H. (2021). Bootstrap confidence intervals for multilevel standardised effect size. *Multivariate Behavioural Research, 56(4),* 558–578.

Lakens, D. (2022). Sample size justification. Collabra: psychology, 8(1), 33267.

Lee, C. W., & Fu, M. W. (2024). Conceptualising Sustainable Business Models: *Aligning with Corporate Responsibility. Sustainability, 16(12),* 5015.

Leipold, S., Petit-Boix, A., Luo, A., Helander, H., Simoens, M., Ashton, W. S., ... & Xue, B. (2023). Lessons, narratives, and research directions for a sustainable circular economy. *Journal of Industrial Ecology*, *27*(1), 6–18.

Li, J., Ju, S. Y., Zhu, C., Yuan, Y., Fu, M., Kong, L. K., & Li, M. (2024). The development of a digital intelligence quotient scale: *A new measuring instrument for primary school students in China. Heliyon, 10(16)*.

Liao, X., Nawi, H. M., An, P. H., Mabrouk, F., Kholikova, R., Arnone, G., & Sahawneh, N. M. (2024). Influence of Fintech, Natural Resources, and Energy Transition on Environmental Degradation in BRICS Countries: *The Moderating Role of Human Capital. Resources Policy, 92*, 105022.

Lin, C. A., Hsu, Y. M., & Chen, H. (2024). How Does Internet Celebrity Recommendation Affect Followers' Recommendation Adoption Willingness: A Dual-Path Psychological Processing Model? *Journal of Management & Business Research (2521-4306)*, 41(3).

Loh, W. W., & Ren, D. (2023). The unfulfilled promise of longitudinal designs for causal inference. *Collabra: Psychology, 9(1).*

López, M. (2023). The Effect of Sampling Mode on Response Rate and Bias in Elite Surveys. *Quality & Quantity, 57(2),* 1303–1319.

Lopoukhine, R. (2024). Developing a Circular Building Materials System and Fostering Innovation from Construction, Demolition and Renovation (CRD) Waste: *An Ontario-focused Systemic Policy Analysis and Blueprint for Change.*

Lu, S., Sun, Z., & Huang, M. (2024). The impact of digital literacy on farmers' pro-environmental behaviour: an analysis with the Theory of Planned Behaviour. *Frontiers in Sustainable Food Systems, 8*, 1432184.

Ly, A. M., & Cope, M. R. (2023). New conceptual model of social sustainability: review from past concepts and ideas. *International journal of environmental research and public health, 20(7),* 5350.

Lynn, J., & Apgar, M. (2024). Exploring causal pathways amid complexity. In *Research handbook on program evaluation* (pp. 304–325). Edward Elgar Publishing.

Magnusson, T., & Werner, V. (2023). Conceptualisations of incumbent firms in sustainability transitions: Insights from organisation theory and a systematic literature review. *Business Strategy and the Environment, 32(2),* 903–919.

Maiurova, A., Kurniawan, T. A., Kustikova, M., Bykovskaia, E., Othman, M. H. D., Singh, D., & Goh, H. H. (2022). Promoting digital transformation in waste collection service and waste recycling in Moscow (Russia): Applying a circular economy paradigm to mitigate climate change impacts on the environment. *Journal of Cleaner Production, 354, 131604.* (Alketbi, 2023)

Malik, F., Heeks, R., Masiero, S., & Nicholson, B. (2021). Digital Labour Platforms in Pakistan: Institutional Voids and Solidarity Networks. *Information Technology & People, 34(7),* 1819-1839.

Mann, J. L. (2021). Inclusive partnerships: A key to achieving sustainable development. *In Partnerships for the Goals* (pp. 565–576).

Marang'a, M., Jack, M., Edgar, A., & Irene, N. (2024). Greening the Justice System: Frameworks, Theories, Elements and Practice Imperatives. *Theories, Elements, and Practice Imperatives*.

Marini Govigli, V., Rois-Díaz, M., den Herder, M., Bryce, R., Tuomasjukka, D., & Górriz-Mifsud, E. (2022). The green side of social innovation: Using sustainable development goals to classify environmental impacts of rural grassroots initiatives. *Environmental Policy and Governance, 32(6),* 459-477.

Marques Cebola, C., Lopes, D., Vasconcelos, L., & Caser, Ú. (2021). Environmental Mediation: Definition and Design. In *Peace, Justice and Strong Institutions* (pp. 252–261). Cham: Springer International Publishing.

May, J. R., & Daly, E. (2021). Perspectives on emerging issues in International Environmental Law: the role of human dignity in achieving the Sustainable Development Goals. *Direito em Movimento, 19(1*), 81–107.

Mayrhofer, M. (2024). Framing UN Human Rights Discourses on Climate Change: The Concept of Vulnerability and Its Relation to the Concepts of Inequality and Discrimination. *International Journal for the Semiotics of Law-Revue Internationale de Sémiotique juridique, 37(1),* 91–117.

Mazzucato, M. (2024). Challenges and opportunities for inclusive and sustainable innovation-led growth in Brazil: A mission-oriented approach to public-private partnerships.

Mazzucato, M., & Farha, L. (2024). The right to housing: A mission-oriented and human rights-based approach.

McCall, A. (2024). Impact of community-based education on empowering women in rural and underserved areas.

McKay, P. A. (2021). A quality governance framework for sustainable and resilient socio-ecological systems. Michigan State University.

Medaglia, R., Rukanova, B., & Zhang, Z. (2024). Digital government and the circular economy transition: An analytical framework and a research agenda. *Government Information Quarterly, 41(1),* 101904.

Memon, F. N., & Memon, S. N. (2025). Digital Divide and Equity in Education: Bridging Gaps to Ensure Inclusive Learning. In *Impact of Digitalisation on Education and Social Sustainability* (pp. 107–130). IGI Global.

Memon, M., & Saleem, M. (2023). The Impact of Climate Change and Environmental Pollution on the Right to Life. Available at SSRN 4819570.

Meria, L., Bangun, C. S., & Edwards, J. (2024). Exploring Sustainable Strategies for Education through the Adoption of Digital Circular Economy Principles. *International Transactions on Education Technology (ITEE), 3(1),* 62–71.

Mhlongo, S., & Dlamini, R. (2022). Digital inequities and societal context: Digital transformation as a conduit to achieve social and epistemic justice. In *Innovation practices for digital transformation in the global south: IFIP WG 13.8, 9.4*, Invited Selection (pp. 1-15). Cham: Springer International Publishing.

Mishi, S., & Anakpo, G. (2022). Digital gap in global and African countries: Inequalities of opportunities and the impact of the COVID-19 crisis. *In Digital Literacy, Inclusivity and Sustainable Development in Africa.* Facet Publishing.

Mishra, R., Singh, R. K., & Govindan, K. (2022). Barriers to the Adoption of Circular Economy Practices in Micro, Small, and Medium Enterprises: Instrument Development, Measurement, and Validation. *Journal of Cleaner Production, 351*, 131389.

Mohamed Hashim, M. A., Tlemsani, I., & Duncan Matthews, R. (2022). A sustainable university: Digital transformation and beyond. *Education and Information Technologies, 27(7),* 8961–8996.

Monaco, S. (2024). SDG 11: Make cities and human settlements inclusive, safe, resilient, and sustainable. In Identity, territories, and sustainability: *Challenges and opportunities for achieving the UN Sustainable Development Goals* (pp. 107–115). Emerald Publishing Limited.

Mondal, S., Singh, S., & Gupta, H. (2023). Green entrepreneurship and digitalisation enabling the circular economy through sustainable waste management- An exploratory study of an emerging economy. *Journal of Cleaner Production, 422*, 138433.

Monteiro, E., & Joseph, J. (2023). A review of the impact of Workplace Culture on Employee Mental Health and Well-Being. *International Journal of Case Studies in Business, IT and Education (IJCSBE, 7(2),* 291–317.

Mubarik, M. S., Kontoleon, A., & Shahbaz, M. (2024). Beyond the hurdles: Exploring policy obstacles in the path to circular economy adoption. *Journal of Environmental Management, 370*, 122667.

Mubaslat, A. (2021). Introduction to Waste Management. Jordan: *International Youth Ambassadors Foundation.*

MURRAY, K. M. (2021). DIGITAL EQUITY AND DIGITAL LEGAL RESOURCES: PERSPECTIVES.

Mutezo, G., & Mulopo, J. (2021). A review of Africa's transition from fossil fuels to renewable energy using circular economy principles. *Renewable and Sustainable Energy Reviews, 137*, 110609.

Nademi, Y., & Kalmarzi, H. S. (2025). Breaking the unemployment cycle using the circular economy: Sustainable jobs for sustainable futures. *Journal of Cleaner Production*, *488*, 144655. (Nademi & Kalmarzi, 2025)

Nehaluddin, A., & Lilienthal, G. (2021). Right to water as a human right: A critical overview of international instruments. *Environmental Policy and Law, 50(4-5),* 299–308.

Neisig, M. (2022). The circular economy: rearranging structural couplings and the paradox of moral-based sustainability-enhancing feedback. *Kybernetes, 51(5),* 1896-1914.

Neves, S. A., & Marques, A. C. (2022). Drivers and barriers in transitioning from a linear economy to a circular economy. *Journal of Cleaner Production, 341*, 130865.

Ng, P. M., Lit, K. K., Chan, J. K., Cheung, C. T. Y., & Choy, E. T. (2025). Fostering social entrepreneurship through a social capital approach: an empirical study in China—*Journal of Intellectual Capital.*

Nishat, K., Khurshid, H., & Naseeb, J. (2024). Access to Technology as a Human Right: Legal Implications of the Global Digital Divide. *Mayo Communication Journal, 1(1),* 63–72.

Novitz, T. (2021). Gig Work as a Manifestation of Short-Termism: Crafting a Sustainable Regulatory Agenda. *Industrial Law Journal, 50(4),* 636–661.

Ntanda, A., & Carolissen, R. (2025). Technology's dual role in smart cities and social equality: A systematic literature review. *Journal of Local Government Research and Innovation,* 6, 15.

Nyimbili, F., & Nyimbili, L. (2024). Types of purposive sampling techniques, with examples and applications in qualitative research studies. *British Journal of Multidisciplinary and Advanced Studies, 5(1),* 90–99.

Obiuto, N. C., Ninduwezuor-Ehiobu, N., Ani, E. C., & Andrew, K. (2024). Implementing circular economy principles to enhance safety and environmental sustainability in the manufacturing sector. *Int J Adv Multidiscip Res Stud, 4(2)*, 22-29.

Oeij, P. R., Hulsegge, G., & Preenen, P. T. (2022). Organisational mindfulness as a sustainable driver of employee innovation adoption: Individual and organisational factors. *Safety science*, *154*, 105841.

Oestreich, J. E. (2024). Closing the circle of implementation: the sustainable development goals, universal periodic review, and the rights-based approach to development. *The International Journal of Human Rights, 28(1)*, 69–88.

Ofori, D., & Opoku Mensah, A. (2022). Sustainable electronic waste management among households: a circular economy perspective from a developing economy. *Management of Environmental Quality: An International Journal*, *33*(1), 64-85.

Ojo, T. A. (2022). Digital financial inclusion for women in the fourth industrial revolution: A key towards achieving Sustainable Development Goal 5. *Africa Review, 14(1),* 98–123.

Okedele, P. O., Aziza, O. R., Oduro, P., & Ishola, A. O. (2024). Human rights, climate justice, and environmental law: Bridging international legal standards for social equity. *Human Rights, 20(12),* 232–241.

Olabi, A. G., Shehata, N., Sayed, E. T., Rodriguez, C., Anyanwu, R. C., Russell, C., & Abdelkareem, M. A. (2023). The Role of Microalgae in Achieving Sustainable Development Goals and a Circular Economy. *Science of The Total Environment, 854*, 158689.

Oladokun, O. S., & Oyelabi, G. O. (2021). Open access: A sine qua non for effective information service in open and distance learning and attaining sustainable development goals. In *Open access implications for sustainable social, political, and economic development* (pp. 24-46). IGI Global.

Oloyede, A. A., Faruk, N., Noma, N., Tebepah, E., & Nwaulune, A. K. (2023). Measuring the impact of the digital economy in developing countries: *A systematic review and meta-analysis. Heliyon, 9(7).*

Otundo Richard, M. (2024). Innovative Approaches to Monitoring and Evaluation in Sustainability Projects: *The Impact of Digital Tools and Community Involvement in Kenya.*

Pagliara, F., Aria, M., Brancati, G., Moradpour, A., & Morrison, A. M. (2025). A mixed-method study for the identification of the factors affecting the performance of a tourist destination. *Journal of Destination Marketing & Management, 37*, 101018.

Palm, J., Lazoroska, D., Valencia, M., Bocken, N., & Södergren, K. (2024). A gender perspective on the circular economy: A literature review and research agenda. *Journal of Industrial Ecology*, *28*(6), 1670–1683.

Pan, S. L., Carter, L., Tim, Y., & Sandeep, M. S. (2022). Digital Sustainability, Climate Change, and Information Systems Solutions: Opportunities for Future Research. *International journal of information management, 63*, 102444.

Paoli, A. D., Addeo, F., & Mangone, E. Sustainability and Sustainable Development Goals (SDGs): From Moral Imperatives to Indicators and Indexes. A Methodology for Validating and Assessing SDGs. *Perspectives for a New Social Theory of Sustainability, 47*.

Papeleu, T., Oates, J., Tomassen, P., Adriaansen, A., Leyns, C., Alighieri, C., ... & D'haeseleer, E. (2025). Effects of Intensive Intonation Training in Transgender and Gender Diverse People Aiming for a More Feminine-Sounding Voice: A Randomised Clinical Trial. *Journal of Speech, Language, and Hearing Research, 68(4),* 1711-1742.

Paunovic, I., Müller, C., & Deimel, K. (2023). Citizen participation for sustainability and resilience: A generational cohort perspective on community brand identity perceptions and development priorities in a rural community. *Sustainability, 15(9),* 7307.

Pavlov, G., Maydeu-Olivares, A., & Shi, D. (2021). Using the standardised root mean squared residual (SRMR) to assess exact fit in structural equation models. *Educational and Psychological Measurement, 81(1),* 110–130.

Peiró, J. M., Luque-García, A., Soriano, A., & Martínez-Tur, V. (2023). Fears during the COVID-19 pandemic and their influence on physical health: A cross-sectional study on the general population in Spain. *International Journal of Clinical and Health Psychology, 23(2),* 100361.

Peláez, A. L., Suh, S. M., & Zelenev, S. (Eds.). (2022). Digital transformation and social well-being: Promoting an inclusive society. *Taylor & Francis.*

Piazza, R. (2024). Learning Cities: Catalysts for Sustainable Urban Development through Collaborative Partnerships. Form@ re-Open Journal per la formazione in rete, 24(2), 228–242.

Pillah, T. P. Unlocking the Pillars of Sustainable Development: *A Framework for Intergenerational Equity.*

Pires, P. B., & Branco, C. C. (2025). Interdependence and Trust in B2B Relationships: A Validated Model of Performance Drivers in International Commerce. *International Journal of Marketing, Communication and New Media, (17)*.

Pittman, J., Severino, L., DeCarlo-Tecce, M. J., & Kiosoglous, C. (2021). An action research case study: Digital equity and educational inclusion during an emergent COVID-19 divide. *Journal for Multicultural Education, 15(1),* 68–84.

Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Standard method bias: It is not good, it is complex, it is widespread, and it is not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior, 11(1),* 17–61.

Powers, M. (2024). A Livable Planet: Human Rights in the Global Economy. *Oxford University Press.*

Puaschunder, J. M. (2023). Human rights online: Towards a new generation of human rights in the virtual world.

Purwandani, J. A., & Michaud, G. (2021). What are the drivers and barriers to SMEs adopting green business practices? *Environment systems and decisions, 41(4),* 577–593.

Putro, W. D., & Bedner, A. W. (2023). Ecological Sustainability from a Legal Philosophy Perspective. *JILS, 8,* 595.

Rahman, M. M., & Sadik, N. (2024). Measuring scale for digital financial services, economic growth, performance, and environmental sustainability: evidence from EFA and CFA. *Quality & Quantity,* 1–34.

Raichuk, L., Stolz, J. F., & Linkov, F. (2025). Transforming environmental education in Ukraine, developing a crisis-driven approach to interdisciplinary learning. *Environment Systems and Decisions, 45(3),* 1–22.

Raifman, S., DeVost, M. A., Digitale, J. C., Chen, Y. H., & Morris, M. D. (2022). Respondent-driven sampling: a sampling method for hard-to-reach populations and beyond. *Current Epidemiology Reports, 9(1)*, 38–47.

Raihan, A. (2024). A review of the potential opportunities and challenges of the digital economy for sustainability. *Innovation and Green Development, 3(4),* 100174.

Raihan, M. M., Subroto, S., Chowdhury, N., Koch, K., Ruttan, E., & Turin, T. C. (2024). Dimensions and barriers for digital (in) equity and digital divide: *A systematic integrative review. Digital Transformation and Society.*

Raj, P. (2023). Fostering Intergenerational Equity and Ethical Responsibility in the Blue Economy. Available at SSRN 5017662.

Rajabifard, A., Kahalimoghadam, M., Lumantarna, E., Herath, N., Hui, F. K. P., & Assarkhaniki, Z. (2021). Applying SDGs as a systematic approach for incorporating sustainability in higher education. *International Journal of Sustainability in Higher Education, 22(6),* 1266–1284.

Rane, N., Choudhary, S., & Rane, J. (2023). The metaverse is a cutting-edge platform for achieving the Sustainable Development Goals (SDGs). Available at SSRN 4644035.

Rashid, S., & Malik, S. H. (2023). Transition from a Linear to a Circular Economy. *In Renewable Energy in Circular Economy* (pp. 1–20). Cham: Springer International Publishing.

Redding, G. (2023). Societal knowledge quality as a catalyst for the competitive productivity of technology: One in a set of several universal processes in trajectories of societal progress. *International Business Review, 32(6),* 102096.

Rehman, F. U., Al-Ghazali, B. M., Haddad, A. G., Qahwash, E. A., & Sohail, M. S. (2023). Exploring the reverse relationship between circular economy innovation and digital sustainability—the dual mediation of government incentives. *Sustainability, 15(6),* 5181.

Rejeb, A., Suhaiza, Z., Rejeb, K., Seuring, S., & Treiblmaier, H. (2022). The Internet of Things and the circular economy: A systematic literature review and research agenda. *Journal of Cleaner Production, 350*, 131439.

Reynolds, K. A., Harikumar, V. B., Poon, E., West, D. P., & Alam, M. (2022). While ethical considerations predominate, scientific merit can also influence Institutional Review Board (IRB) determinations, as illustrated by a cross-sectional study. *Journal of Clinical Epidemiology, 150,* 12–17.

Richardson, S., Lawrence, K., Schoenthaler, A. M., & Mann, D. (2022). A framework for digital health equity. *NPJ digital medicine, 5(1),* 119.

Rocco, T. S., Plakhotnik, M. S., & Silberman, D. (2022). Differentiating between conceptual and theoretical articles: *Focus, goals, and approaches. Human Resource Development Review, 21(1),* 113–140.

Rochel, J. (2021). Connecting the dots: Digital integrity as a human right. *Human Rights Law Review, 21(2),* 358–383.

Rodrigue, M., & Romi, A. (2024). An overview of the circular economy. *Handbook on Corporate Governance and Corporate Social Responsibility*, 118–135.

Rokeman, N. R. M. (2024). Likert measurement scale in education and social sciences: explored and explained. *EDUCATUM Journal of Social Sciences, 10(1),* 77–88.

Rönkkö, M., & Cho, E. (2022). An updated guideline for assessing discriminant validity. *Organisational research methods, 25(1),* 6–14.

Rose, J. M., Borriello, A., & Pellegrini, A. (2023). Formative versus Reflective Attitude Measures: Extending the Hybrid Choice Model. *Journal of Choice Modelling, 48*, 100412.

Rosli, M. S., Saleh, N. S., Alshammari, S. H., Ibrahim, M. M., Atan, A. S., & Atan, N. A. (2021). Improving Questionnaire Reliability using Construct Reliability for Research in Educational Technology. *Int. J. Interact. Mob. Technol., 15(4),* 109–116.

Rothe, F. F., Van Audenhove, L., & Loisen, J. (2023). Digital development, inequalities & the Sustainable Development Goals: What does 'Leave No One Behind' mean for ICT4D? *Information Technology for Development, 29(1)*, 9–26.

Rotondi, V., Noris, A., & Carpanzano, E. (2024). Understanding sustainability perceptions: insights from textual analysis and a survey experiment. *World Development Sustainability, 5*, 100182.

Rydzewski, P. (2025). Digital Inequality and Sustainable Development. *Problemy Ekorozwoju, 20(1),* 96-108.

Sagan, M. A. (2025). Generative sustainability: a human resource framework to navigate the future of work *(Doctoral dissertation, University of Nottingham).*

Salvi, M., Jensen, K., Stoermer, E., Scapolo, F., Asikainen, T., & Muench, S. (2022). Towards a green & digital future. *Publications Office of the European Union.*

Samuel-Okon, A. D., & Abejide, O. O. (2024). Bridging the digital divide: Exploring the role of artificial intelligence and automation in enhancing connectivity in developing nations. *Journal of Engineering Research and Reports, 26(6),* 165–177.

Sanders, C. K., & Scanlon, E. (2021). The digital divide is a human rights issue: Advancing social inclusion through social work advocacy. *Journal of Human Rights and Social Work, 6(2),* 130–143.

Sarkhoshkalat, M. M., Afkham, A., Bonyadi Manesh, M., & Sarkhosh, M. (2024). Circular Economy and the Recycling of E-Waste. In New Technologies for Energy Transition Based on Sustainable Development Goals: *Factors Contributing to Global Warming* (pp. 319–354). Singapore: Springer Nature Singapore.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modelling. *In Handbook of market research (pp. 587–632).* Cham: Springer International Publishing.

Sathyanarayana, S., & Mohanasundaram, T. (2024). Fit indices in structural equation modelling and confirmatory factor analysis: reporting guidelines. *Asian Journal of Economics, Business and Accounting, 24(7),* 561–577.

Savitz, D. A., & Wellenius, G. A. (2023). Can cross-sectional studies contribute to causal inference? It depends. *American journal of epidemiology, 192(4),* 514–516.

Schejter, A. M., Shomron, B., Abu-Jaffar, M., Kaf, G. A., Mendels, J., Mola, S., ... & Tirosh, N. Digital Capabilities.

Schroeder, P., & Barrie, J. (2022). Is going circular just? Environmental justice and a just transition—key elements of an inclusive circular economy. Field Actions Science Reports. *The Journal of Field Actions, (Special Issue 24),* 20–25.

Selvakumar, P. (2025). The Role of Technology in Enhancing Social Sustainability. *In Enhancing Social Sustainability in Manufacturing Supply Chains* (pp. 275–302). IGI Global Scientific Publishing.

Senatore, L., Bimonte, G., & Gatto, A. (2025). Sustainable and Resilient Governance of Common-Pool Resources: A Critical Analysis of Non-Cooperative and Cooperative Game Theory Applications. *Journal of Economic Surveys.*

Serdar, C. C., Cihan, M., Yücel, D., & Serdar, M. A. (2021). Sample size, power, and effect size revisited: simplified and practical approaches in pre-clinical, clinical and laboratory studies. *Biochemia medica, 31(1),* 27-53.

Shah, S. S., & Shah, S. A. H. (2024). Trust as a determinant of Social Welfare in the Digital Economy. *Social Network Analysis and Mining, 14(1),* 79.

Sharma, R. (2023). Promoting social inclusion through social policies. *Capacity Building and Youth Empowerment, 76* (617).

Sharma, R. S., Mokhtar, I. A., Ghista, D. N., Nazir, A., & Khan, S. Z. (2023). Digital literacies as policy catalysts of social innovation and socioeconomic transformation: Interpretive analysis from Singapore and the UAE. *Sustainable Social Development, 1(1).*

Sharma, S., Kar, A. K., & Gupta, M. P. (2024). Untangling the web between digital citizen empowerment, accountability, and quality of participation experience for e-government: Lessons from India. *Government Information Quarterly, 41(3),* 101964.

Shirazi, F., & Hajli, N. (2021). IT-enabled sustainable innovation and the global digital divides. *Sustainability, 13(17),* 9711.

Siddiqi, M. M. (2024). Future of digital education: inclusive, immersive, equitable. MediaSpace: DME *Media Journal of Communication, 5(01),* 8–24.

Sijtsema, S. J., Snoek, H. M., Van Haaster-de Winter, M. A., & Dagevos, H. (2019). Let us discuss the circular economy: A qualitative exploration of consumer perceptions: sustainability*, 12(1)*, 286.

Silva, L., Thompson, A., & Jane, K. (2023). Role of NGOs in Waste Management Policies: *Analysis of how non-governmental organisations influence waste management.*

Singh, H., & Singh, B. P. (2025). Bridging e-governance and sustainability: Unveiling synergies for a sustainable future. *In Leveraging futuristic machine learning and next-generational security for e-governance* (pp. 1–24). IGI Global Scientific Publishing.

Singhal, T. S., Jain, J. K., Ramacharyulu, D. A., Jain, A., Abdul-Zahra, D.S., Manjunatha, M., & Srivastava, A. P. (2024). Eco-Design of Products and Processes: A Review on Principles and Tools for Sustainable Manufacturing. *In E3S Web of Conferences* (Vol. 505, p. 01033). EDP Sciences.

Sisinyize, N. L. (2024). Sustainable Development for Society 5.0. In Sustainable Development in Industry and Society 5.0: *Governance, Management, and Financial Implications (pp. 133–148).* IGI Global.

Sparviero, S., & Ragnedda, M. (2021). Towards digital sustainability: The long journey to the Sustainable Development Goals 2030. Digital Policy, *Regulation and Governance, 23(3),* 216–228.

Stam, K., van Ewijk, E., & Chan, P. W. (2023). How does learning drive sustainability transitions? Perspectives, problems, and prospects from a systematic literature review. *Environmental Innovation and Societal Transitions, 48*, 100734.

Stefanescu, C. A. (2022). Linking sustainability reporting frameworks and sustainable development goals. *Accounting Research Journal, 35(4),* 508–525.

Suchek, N., Ferreira, J. J., & Fernandes, P. O. (2022). A review of entrepreneurship and circular economy research: State of the art and future directions. *Business Strategy and the Environment, 31(5),* 2256–2283.

Suntsova, O. (2024). Digital Transformation of the Global Economy: *Challenges and Opportunities*. Available at SSRN 5125647.

Swargiary, K., & Roy, K. (2023). Empowering Minds: Adult Education in India. *Lambert Academic Publishing.*

Tabor, K. M., Stavros, N., & Holland, M. B. (2025). Local conservation action requires ethical investments in global digital equity. *Environmental Conservation, 52(1)*, 9–19.

Taherdoost, H. (2022). Designing a questionnaire for a research paper: A comprehensive guide to designing and developing an effective questionnaire. *Asian Journal of Managerial Science, 11(1),* 8–16.

Tan, M., & Lindi von Mutius, J. D. (2023). Unhook: A Framework of Everyday Sustainable Habits to Reduce Climate Impacts.

Tate, T., & Warschauer, M. (2022). Equity in online learning. *Educational Psychologist, 57(3),* 192–206.

Tauchnitz, E., & Ahmed, S. (2024, October). Framing Ethical e-Governance: A Plaidoyer for a Human-Rights-based Digital Democracy Approach. *In Proceedings of the 17th International Conference on Theory and Practice of Electronic Governance* (pp. 22–27).

Thiet, T. C. (2024). Analysis of the right to live in a clean and healthy environment under Vietnamese law and suggestions for improving it. *Studia Prawnicze KUL, (4),* 113-132.

Tibbe, T. D., & Montoya, A. K. (2022). Correcting the bias correction for the bootstrap confidence interval in mediation analysis. *Frontiers in Psychology, 13*, 810258.

Tomašević, A. N. (2023). Reshaping the future of work: Navigating the impacts of lifelong learning and digital competences in the era of 5.0 industry. *Social informatics journal*, *2*(1), 1–6. (Tomašević, 2023)

Torreggiani, M. (2024). Macro-Level Circularity Indicators: Assessing Sustainable habits and Environmental commitment.

Toșa, C., Paneru, C. P., Joudavi, A., & Tarigan, A. K. (2024). Digital transformation, incentives, and pro-environmental behaviour: Assessing the uptake of sustainability in companies' transition towards circular economy. *Sustainable Production and Consumption, 47*, 632–643.

Trein, P., Fischer, M., Maggetti, M., & Sarti, F. (2023). Empirical research on policy integration: A review and new directions. *Policy Sciences, 56(1),* 29–48.

Triantafyllidou, E., & Zabaniotou, A. (2022). Digital technology and social innovation promoting green citizenship: development of the “Go Sustainable Living” digital application. *Circular Economy and Sustainability, 2(1),* 141–164.

Tsou, C. T. (2025). Analysis of sustainable socio-technical transition-unpacking the development of the NEV sector from the early 2000s through an innovative conceptual framework *(Doctoral dissertation, University of Glasgow).*

Twum, A. K., Zhang, J., Ding, X., & Cobbinah, J. (2025). Realising Green Growth in Belt and Road Initiative Economies: The Roles of Financial Support, Renewable Energy, and Eco-Footprint Dynamics. *Journal of the Knowledge Economy, 1–36.*

Uhunamure, S. E., & Shale, K. (2025). Household Awareness and Perceptions of Circular Economy Development in Limpopo Province, South Africa: A Pathway to Sustainable Development. *Cleaner Waste Systems*, 100316.

Ulaga, W., Kleinaltenkamp, M., Kashyap, V., & Eggert, A. (2021). Advancing marketing theory and practice: *Guidelines for crafting research propositions.* AMS Review, 1–12.

Ullah, S., Niu, B., & Meo, M. S. (2024). Digital inclusion and environmental taxes: A dynamic duo for energy transition in green economies. *Applied Energy, 361*, 122911.

Upadhyay, A., Mukhuty, S., Kumar, V., & Kazancoglu, Y. (2021). Blockchain Technology and the Circular Economy: Implications for Sustainability and Social Responsibility. *Journal of Cleaner Production, 293*, 126130.

Upreti, G. (2023). Eco-sociocentrism: The Earth First Paradigm for Sustainable Living. In Eco sociocentrism*: The Earth First Paradigm for Sustainable Living (pp. 307-367).* Cham: Springer Nature Switzerland.

Valdez, V. B., & Javier, S. P. (2021). Digital divide: from a peripheral to a core issue for all SDGs. *In Reduced Inequalities (pp. 88–101).* Cham: Springer International Publishing.

Van Kessel, R., Hrzic, R., O'Nuallain, E., Weir, E., Wong, B. L. H., Anderson, M., ... & Mossialos, E. (2022). Digital Health Paradox: International Policy Perspectives on Addressing Increased Health Inequalities for People with Disabilities. *Journal of Medical Internet Research, 24(2),* e33819.

Varzakas, T., & Antoniadou, M. (2024). A holistic approach for ethics and sustainability in the food chain: the gateway to oral and systemic health. *Foods, 13(8),* 1224.

Vidal-Ayuso, F., Akhmedova, A., & Jaca, C. (2023). The circular economy and consumer behaviour: Literature review and research directions. *Journal of Cleaner Production, 418,* 137824.

Voitsikhovskyi, A., Bakumov, O., Ustymenko, O., & Syroid, T. (2021). THE RIGHT OF ACCESS TO THE INTERNET AS A FUNDAMENTAL HUMAN RIGHT GIVEN THE DEVELOPMENT OF THE GLOBAL INFORMATION SOCIETY. Law, *State & Telecommunications Review/Revista de Direito, Estado e Telecomunicações, 13(1).*

Wah, J. N. K. (2025). Decoding Structural Equation Modelling: Insights on Data Assumptions, Normality, and Model Fit in Advancing Digital Marketing Strategies. *Journal of Cases on Information Technology (JCIT), 27(1)*, 1–20.

Wang, S., Jiang, X., & Khaskheli, M. B. (2024). The Role of Technology in the Digital Economy's Sustainable Development of Hainan Free Trade Port and Genetic Testing: *Cloud Computing and Digital Law. Sustainability, 16(14)*, 6025.

Wang, S., Li, Y., & Khaskheli, M. B. (2024). Innovation supports sustainable business, law, and digital technologies: economic development and dispute resolution: sustainability*, 16(10),* 3910.

Weiss, M. A. 12. The Porto Alegre Sustainable Innovation Zone (ZISPOA): circular economy, climate resilience, sustainable innovation, participatory community transformation, and inclusive prosperity. *RECONNECTING THE CITY WITH NATURE AND HISTORY, 323.*

Wendt, T. (2021, February). Organised futures. On the ambiguity of the digital absorption of uncertainty. In Frontiers in Education (Vol. 6, p. 554336). Frontiers Media SA.

Williams, D. D. (2022). Digital Equity: Challenges of Implementing the 1:1 *Computing Initiative in Low-Income Areas.*

Williams, J., Prawiyogi, A. G., Rodriguez, M., & Kovac, I. (2024). Enhancing the Circular Economy with Digital Technologies: A PLS-SEM Approach. *International Transactions on Education Technology (ITEE), 2(2)*, 140–151.

Wilson, A., Kask, R., & Ming, L. W. (2024). Exploring circular digital economy strategies for sustainable environmental, economic, and educational technology. *International Transactions on Education Technology (ITEE), 2(2),* 129–139.

Wodajo, K. (2022). Mapping (in) visibility and structural injustice in the digital space. *Journal of Responsible Technology, 9,* 100024.

Wróblewska, M. N. (2021). Research impact evaluation and academic discourse. *Humanities and Social Sciences Communications, 8(1)*, 1-12.

Xie, X., Liu, X., & Chen, J. (2023). A meta-analysis of the relationship between collaborative innovation and innovation performance: The role of formal and informal institutions. *Tech novation, 124*, 102740.

Ximénez, C., Maydeu-Olivares, A., Shi, D., & Revuelta, J. (2022). Assessing cutoff values of SEM fit indices: Advantages of the unbiased SRMR index and its cutoff criterion based on communality. Structural Equation Modelling: *A Multidisciplinary Journal, 29(3), 368–380.*

Xu, H., Jia, Y., Sun, Z., Su, J., Liu, Q. S., Zhou, Q., & Jiang, G. (2022). Environmental pollution is a hidden culprit for health issues. *Eco-Environment & Health, 1(1), 31–45.*

Xu, K., Gan, Y., & Wilson, A. (2024). Stacked Generalisation for Robust Prediction of Trust and Private Equity on Financial Performances. *Innovations in Applied Engineering and Technology, 1-12.*

Xueying, T. (2024). Governance Framework and Implementation Paths of the Green Transformation of Vocational Education and Training in the European Union.

Yenduri, G., Ramalingam, M., Selvi, G. C., Supriya, Y., Srivastava, G., Maddikunta, P. K. R., ... & Gadekallu, T. R. (2024). GPT (generative pre-trained transformer)–a comprehensive review on

enabling technologies, potential applications, emerging challenges, and future directions. *IEEE Access*.

Yin, S., & Yu, Y. (2022). An adoption-implementation framework of digital green knowledge to improve the performance of digital green innovation practices for Industry 5.0. *Journal of Cleaner Production, 363*, 132608.

Yount, K. M., Cheong, Y. F., Khan, Z., Bergenfeld, I., Kaslow, N., & Clark, C. J. (2022). Global measurement of intimate partner violence to monitor Sustainable Development Goal 5. *BMC Public Health, 22(1),* 465.

Yu, M. N., Chang, Y. N., & Li, R. H. (2024). Relationships between Big Five Personality Traits and Psychological Well-Being: A Mediation Analysis of Social Support for University Students. *Education Sciences, 14(10),* 1050.

Zawieska, J., Obracht-Prondzyńska, H., Duda, E., Uryga, D., & Romanowska, M. (2022). In search of innovative digital solutions enhancing social pro-environmental engagement. *Energies, 15(14*), 5191.

Zdjelar, R., & Žajdela Hrustek, N. (2021). Digital Divide and E-Inclusion as Challenges of the Information Society – Research Review. *Journal of information and organizational sciences, 45(2),* 601-638.

Zhanbayev, R. A., Irfan, M., Shutaleva, A. V., Maksimov, D. G., Abdykadyrkyzy, R., & Filiz, Ş. (2023). Demo ethical model of sustainable development of society: *A roadmap towards digital transformation. Sustainability, 15(16)*, 12478.

Zhang, X., Khaskheli, M. B., Shen, C., Jafri, M. A. H., & Shamsi, I. H. (2025). A comparative study of economic activity and sustainable development in China and three South Asian Countries. *Discover Sustainability, 6(1),* 170.

Zheng, S., Ding, M., Li, Q., Sohail, S., & Ullah, S. (2025). How does the stringency of environmental policy affect clean energy justice? *The role of digital infrastructure. Energy, 134800*.

Appendices

Appendix: Table 1: Questionnaire

The questionnaire consisted of closed-ended items measured on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) across three constructs: Digital Equity, Right to Live, and Circular Economy. Demographic and contextual items were categorical.

Item Code	Item Name	Item Description
Digital Equity		
DE1	Education & Digital Empowerment (SDG 4 & 8)	Quality education, decent work, and economic growth drive digital empowerment and uphold the right to live.
DE2	Sustainable Innovation (SDG 9 & 11)	Sustainable innovation, resilient infrastructure, and cities are fundamental rights.
DE3	Collaborations & Partnerships (SDG 17)	Collaborations and partnerships are fundamental rights that drive global cooperation.
DE4	Government Support	Government efforts prioritise digital equity to protect the right to live through education, empowerment, innovation, and global partnerships.
Right to Live		
RL1	Sustainable Practices	Circular economy practices enhance sustainability, improving living conditions and the right to live.
RL2	Policy Protection	Government policies on circular economy (CE) safeguard the right to live through resource efficiency.
RL3	Generational Equity	SDGs-driven circular practices strengthen the right to live for present and future generations.
Benefits of Research		
BE1	Job Security	A circular economy (CE)creates jobs and ensures long-term resource security.
BE2	Innovation Engine	The circular economy (CE)drives innovation and new business opportunities.
BE3	Household Stability	Circular practices help households save money and live sustainably.
BE4	Economic Circularity	Circular economy policies drive economic growth, sustainability, and waste reduction.

Demographic/ Contextual Questions (Not Likert-scaled)

Profile Information

1. Age in Years (18–29, 30–39, 40–49, 50 and above)
2. Gender (Female, Male, Any Other)
3. Country of Residence (options provided)
4. Occupation (Professional, Consultant, Entrepreneur, Homemaker, Student, Retired, Other)
5. Industry (if applicable)
6. Awareness: Familiarity with the concept of circular economy (Not familiar, somewhat familiar, very familiar)
7. Adoption at individual level: Engagement in recycling, reusing, waste reduction (Never, Sometimes, Often, Always)

8. Adoption at organisational/business level: Implementation of circular economy practices (Yes/No/Not sure/Not applicable)
9. Challenges and barriers (e.g., lack of awareness, lack of support, limited resources, cultural factors, others)
10. Perceived benefits: Sustainability, growth, jobs, waste reduction, others

Demographic/ Contextual Questions (Likert-scaled)

1. Government support: Support for circular economy initiatives.
2. Future adoption: Likelihood of circular economy adoption in the next 5 years.

A: Supplementary Statistical Outputs

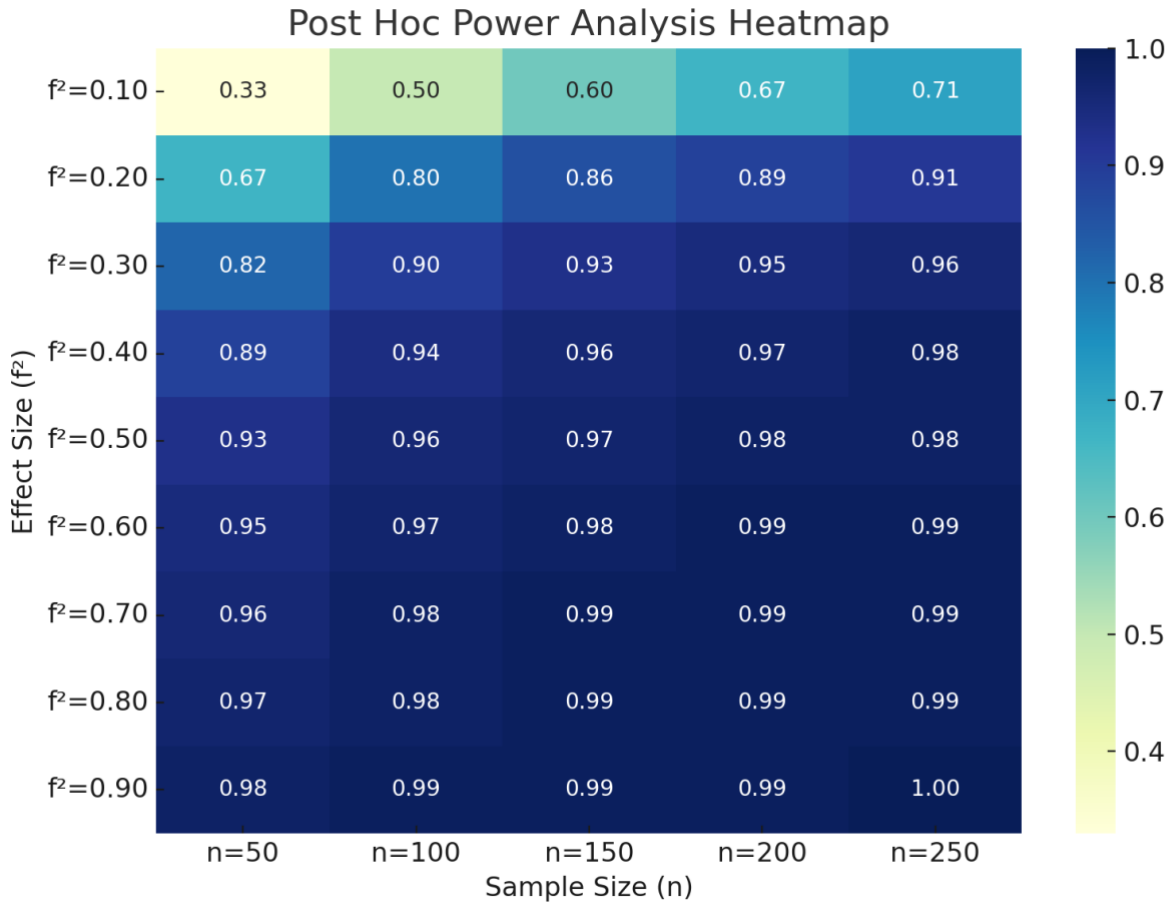
A1. Bootstrapped Confidence Intervals

Bootstrapping with 5,000 resamples was conducted to obtain bias-corrected confidence intervals for each structural path (Huh et al., 2022).

Table A1 summarises the results.

Path	β Coefficient	95% CI Lower	95% CI Upper	p-value
DE → RL	0.87	0.79	0.93	< 0.001
RL → CE	0.88	0.82	0.94	< 0.001
DE → CE	0.01	-0.06	0.07	0.408

A2. Post Hoc Power Analysis A post hoc power analysis was conducted to assess the adequacy of the sample size across varying effect sizes (Serdar et al., 2021). The heatmap below illustrates that for effect sizes $f^2 \geq 0.15$, power exceeds 0.95 even at n = 140. Power = 0.95 for medium effect size ($f^2 = 0.15$) at $\alpha = 0.05$, given n = 140



A3. Extended Model Output The complete model output includes confidence intervals, p-values, and path coefficients for all structural relationships, presented in the bootstrapping results above. These support the statistical robustness of the findings and reinforce the conclusion that RL mediates the relationship between DE and CE.

A4. Indicator Reliability

Indicator	Digital Equity	Right to Live	Circular Economy
DE 1	0.62		
DE 2	0.54		
DE 3	0.57		
DE 4	0.55		
RL 1		0.57	
RL 2		0.62	
R L3		0.48	
BE 1			0.67
BE 2			0.74
BE 3			0.57
BE 4			0.69

A5. Cross Loadings

Indicator	Digital Equity	Right to Live	Circular Economy
DE 1	0.79	0.65	0.64
DE 2	0.74	0.62	0.58
DE 3	0.76	0.66	0.58
DE 4	0.74	0.68	0.53
RL 1	0.63	0.76	0.69
RL 2	0.71	0.78	0.66
R L3	0.58	0.69	0.63
BE 1	0.62	0.74	0.82
BE 2	0.67	0.76	0.86
BE 3	0.60	0.65	0.75
BE 4	0.63	0.75	0.83