**A Framework to Support Localized Solid Waste Management Decision Making: Evidence from Qatar**

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**Table S1:** Summary of the recommendations from the systematic literature review

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| **Category No. from highly recommended to lowly** | **Recommendations from the systematic review** |
|  | Renewable energy utilizing waste treatment technologies (Poudineh et al., 2021), prioritize energy efficiency projects and invest in cleaner energy to sustain the long-run economic growth and reduce environmental degradation(Mrabet et al., 2017), need for policy studies to support technologies specific to the country (Sharma and Jain, 2020); food waste reduction by downsizing housing or amount of food purchased (Salem et al., 2021), learn from pandemic response for food waste generation for sustainable policies (Ben Hassen et al., 2020); SDG goals linked to wastes should be a priority so should compare and contrast modes of engagement (Lang and Mason, 2018) (Kunčič, 2018); amend the Qatar Construction Specifications to utilize waste for construction applications (Reid et al., 2016); QNRF's comprehensive change in the research, development, and innovation ecosystem by repurposing and developing practical and innovative solutions for key economic sectors ("QNRF seminar shines light on solutions for sustainable waste management in Qatar," 2022)  Connect established sustainability initiatives by institutions such as Qatar University, Hamad International Airport and Ashgal's commitment to environmental sustainability ("HIA's new feat in waste management," 2022) ("Qatar : Ashghal mandates sustainability on sites for MOTC public bus transport program project," 2021) ("Qatar University promotes several sustainability initiatives during Qatar Sustainability Week 2022," 2022) ("Qatar's airport to recycle waste for landscaping and provide compost to third parties," 2022) with the one's being implemented by the State of Qatar 🡪 to achieve the strategy of wastes recycling and treatment, by expansion of its facilities, sanitary landfills, waste separation plants, banning plastics and construction wastes recycling, composting, and changing behavior by campaigns in developing the sustainability across the State of Qatar ("Gulf delegation visits Domestic Solid Waste Management Centre in Mesaieed," 2022)("New waste management center to develop circular economy in Qatar," 2022)("Qatar makes great strides in waste recycling: Official," 2022)(Hussein et al., 2022). |
|  | Gasification for electricity production (Al-Moftah et al., 2021); good waste to biochar via pyrolysis (S. Elkhalifa et al., 2019); biochar for carbon dioxide sequestration and soil applications (Rehrah et al., 2018); biosolids for agricultural applications further studies (Ali et al., 2021; Majeed et al., 2021); wastes for water treatment (organic and heavy metal) adsorbents (Al-Ghouti et al., 2020a) (El-Azazy et al., 2021) (Hassan et al., 2020) (El-Azazy et al., 2019) (El-Shafie et al., 2022) (Al-Absi et al., 2021) (Al-Ghouti et al., 2019); segregating and giving back electronic waste devices to the proper disposal and recycling stream (Alghazo et al., 2019); market promotion of recycled construction materials in and out of Qatar, as well. (Hahladakis et al., 2020) (Hassan K.E.-G.  Al-Kuwari M.S., 2016). |
|  | Multi-disciplinary approach between engineering, health, toxicology, environment, geology (Zyoud et al., 2015); Examination to see further application for waste materials for insulation application (Marri et al., 2021); aggregates compressive strengths for suitability of the concrete mixtures for construction purposes(Shah et al., 2014)(Tokgoz et al., 2016); impact of arid climatic conditions on plastic fragmentation, degradation of microplastics (Alagha et al., 2022); MSW treatment – metal extraction 🡪 solvent leaching technique to recycle ashes(Al-Ghouti et al., 2020b); food waste studies - technoeconomic feasibility and sustainability studies to enhance food waste treatment (Samar Elkhalifa et al., 2019)(Shahbaz et al., 2023);, food waste and security nexus studies (Sharif and Irani, 2016), measurement of food waste (Aktas et al., 2018), food system mitigation strategies and potential implications on food waste (Niles et al., 2018), investigate Qatari consumers influence by subjective norms on avoid food wastage (Nair, 2021), LCA comparisons with other food waste treatment scenarios, such as pyrolysis or other composting techniques including vermicomposting (Al-Rumaihi et al., 2020)(Alhazmi et al., 2021). |
|  | Awareness on controlling wastage and consumerism to communities (Abbasi, 2018), unsustainable food consumption patterns reforms from public health perspective (El Bilali H., 2020)(Brennan and Browne, 2021), preparation and storage of fruits and vegetables to reduce food waste (Conrad et al., 2018), ethical consumption behavior in an Islamic environment rather than luxury/overconsumption in organizations and communities (Sharif, 2016) (Abdelzaher and Abdelzaher, 2017) (Sharif et al., 2019); professional development vision for teachers, holistic integration of sustainability values (Al-Thani et al., 2021)(Fekih Zguir et al., 2022) |
|  | Facility management for efficient resource management (Rybkowski et al., 2017); quantifying medical waste and addressing appropriate control strategies (Fatema et al., 2020); include human 'people' and organizational factors as part of the food waste reduction (Irani et al., 2018); encourage firms by communicating benefits exceeding the costs of pursuing environmental initiatives (Chen et al., 2018); environmental (waste and pollution, climate change, energy efficiency) management with social and governance in companies (Khovrak, 2020); green supply chain management and logistics approach to improve the environmental performance of processes and products (Ahmed et al., 2020) (Zhang et al., 2018); focus on supply chain agility since it is associated with enhanced firm performance (Al-Shboul, 2017). |
|  | Multi-dimensional appraisal of the system to address low rates of plastic recycling (Hahladakis and Aljabri, 2019) (da Costa et al., 2020); Life Cycle Assessment (LCA) shows mechanical recycling of plastics is favored solution for plastic waste management (Al-Maaded et al., 2012); competitiveness between the private sector companies in treatment and recycling of household waste ("QC panel holds meet to review MME proposals for regulating, recycling and treating waste," 2020); monitoring of microplastics in different environmental matrices in aquatic, terrestrial and atmospheric settings (Sakshi et al., 2021); open doors for entrepreneurs for innovative plastic replacement (Srinath et al., 2020); nexus approach for plastic management (Gonçalves, 2019). |
|  | Cyclopean concrete using site excavated boulders instead of conventional concrete due to good structural behavior and a lower environmental impact (Al-Hamrani et al., 2021); potential use of Tunnel Boring Machines (TBM) muck obtained from the Doha Metro project's Gold Line as replacement for gabbro aggregates (Taqa et al., 2021); carbon-neutrality by the use of solar energy to help power Qatar during the tournament - legacy as a carbon reduction project (Cup, 2021); the sustainable framework that respects the social, economic, human, and environmental goals can be utilized for the nation's goals (Koç, 2019); green economy interest in the mega event to develop educational curricula (Preuss, 2013); utilize the environmental and climate assurances included in the 2022 FIFA World Cup bidding procedure including efficient waste management (Fermeglia, 2017). |
|  | Viability and technoeconomic feasibility of using fertilizers developed from waste (Al-Jabri et al., 2021); Carbon capture technology alongwith waste treatment to evaluate environmental impacts while also considering economic factors (Al-Ansari et al., 2016)(Al-Ansari et al., 2017); application of green waste biochar for plant growth tests in a large-scale greenhouse settings (Ghiat et al., 2022). |
|  | Employ indicators including waste impacts on natural environment like Data Envelopment Analysis (DEA) method (Chia-Nan et al., 2021), Inclusive Sustainable Transformation Index as a useful tool for policy makers and analysts (Lin et al., 2019) and ICT indicators for achieving the SDGs (Godwell et al., 2020). |
|  | To overcome economic, political, financial barriers national data should be available to researchers (Alshawaf et al., 2021); lack of data on food waste makes it difficult to realize the true scale of the problem (Abdelaal A.H. Mackey H.R., 2019); a systematic process of data collection and analysis for all end-of-life processes, optimization of waste collection and closed-loop recycling processes (Al-Thani et al., 2022). |
|  | Promoting sustainable urbanization examples in Qatar, Abu Dhabi and Dubai (Jong et al., 2019) (Asmyatullin et al., 2020); learn from China regarding the planning and development of industrial cities and manage to achieve the coordinated development (Sidong et al., 2020). |
|  | Landfill waste diversion using sustainable technology (Marsh and Steer, 2021); re-engineering existing landfills (Reporter, 2014) |
|  | Establishing lean institute awareness and creation by applying appropriate lean manufacturing tools and future research(Goshime et al., 2019); growth of manufacturing and effective management of supply chains are key elements for economic development (AL-Shboul et al., 2018). |
|  | Involvement and cooperation of all parties in different sector (international, local, and municipalities) for successful sustainable waste management solution and circular economy awareness (Hemidat et al., 2022). |
|  | National legislation and regulations to create and reinforce laws on waste management, reward rather than punish, society pay principle. Responsible units by municipality or a system (Malaeb, 2011). |

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