



Environmental Performance of Kidney Replacement Therapies: Comparative Lifecycle Assessment of Dialysis and Kidney Transplantation



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ABSTRACT #: WCN23-0315

BACKGROUND

- Health care activities account for more than 5% of annual global greenhouse gas (GHG) emissions¹
- Kidney replacement therapies (KRTs) have a disproportionately high environmental impact across clinical care²
- Life cycle assessment (LCA) methodology quantifies a broad range of environmental impacts across the life cycle of products, processes and services³

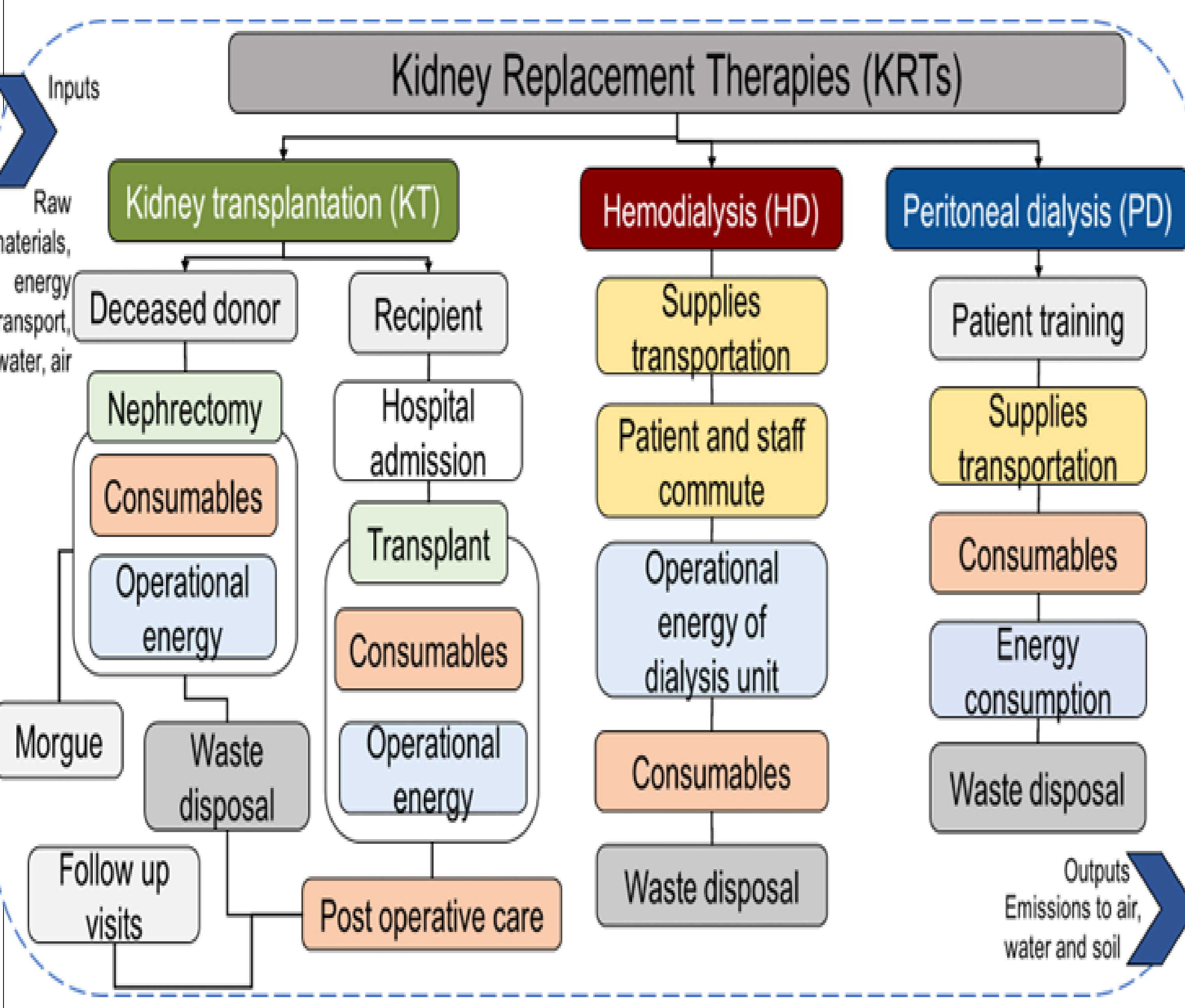
OBJECTIVES

- Evaluate and compare the environmental impacts of KRTs (deceased donor kidney transplantation (KT), in-centre hemodialysis (HD), and automated peritoneal dialysis (PD), using LCA
- Quantify and compare materials and energy required for KRTs
- Identify 'hotspots' of impact for each therapy

MATERIALS AND METHODS

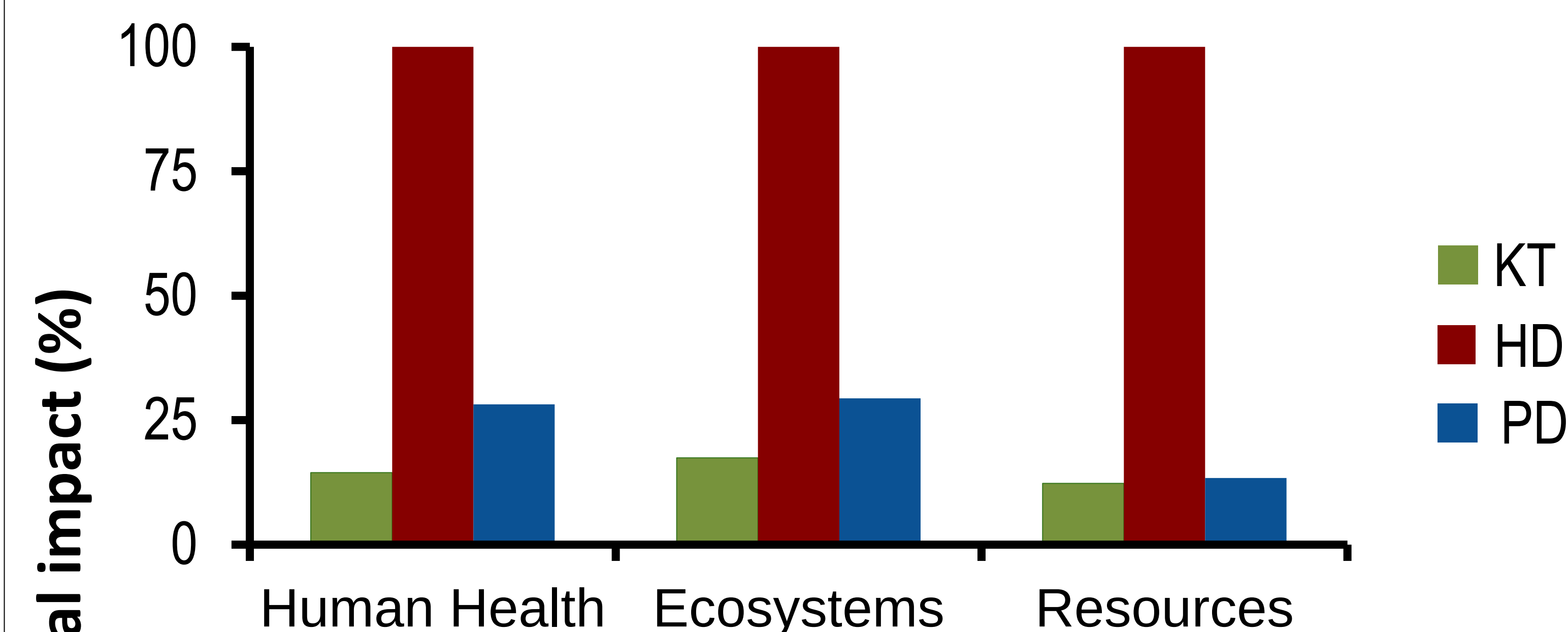
- Process-based LCAs were performed according to International Standards of Organizations 14041 and 14044 guidelines, using SimaPro version 8.3.0.0.
- Functional unit was defined as emissions for 1 patient per therapy per year
- Gate to grave approach was used, including supply transport, therapy process and end of life for all KRT processes

System boundary for KRTs

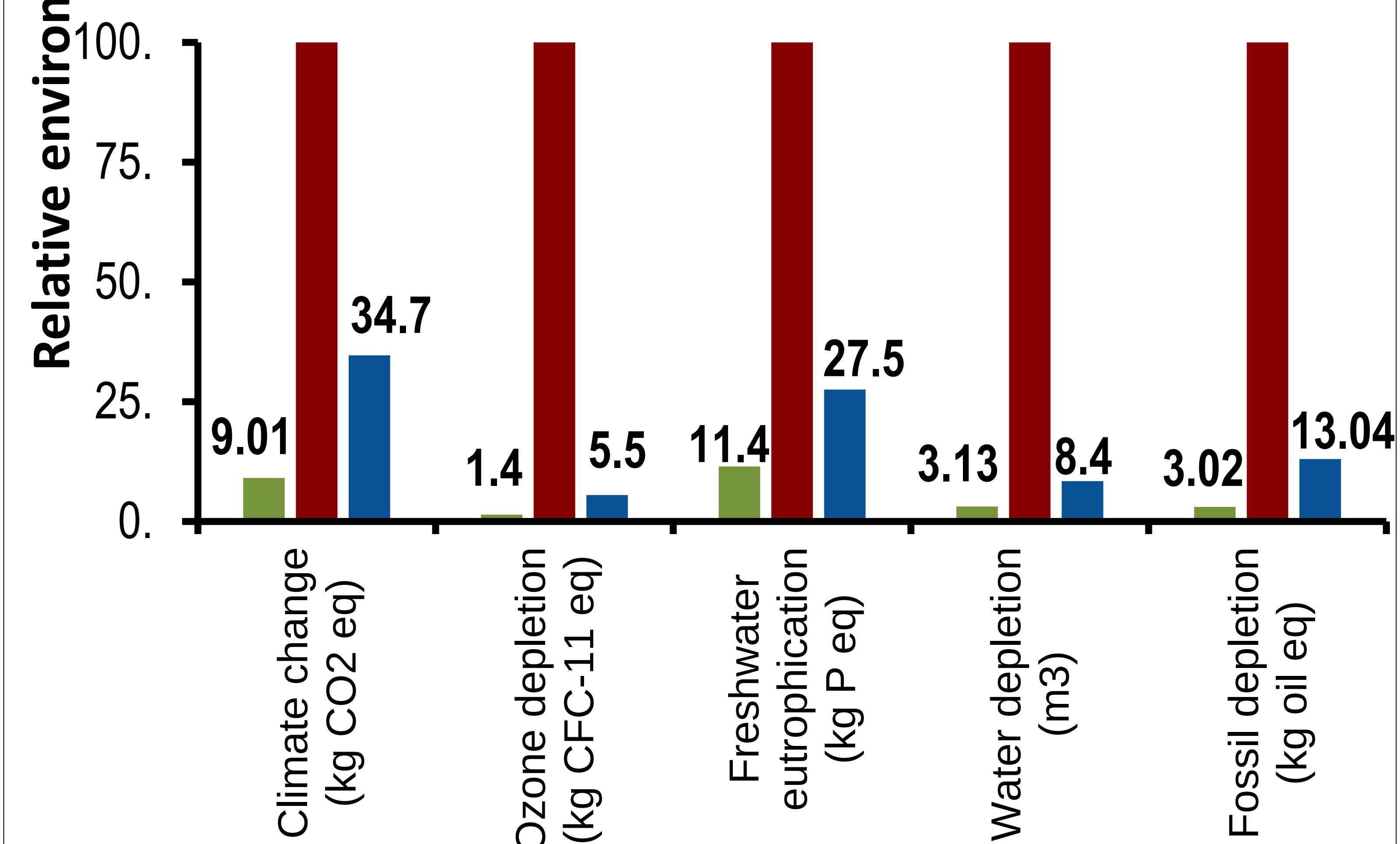


RESULTS

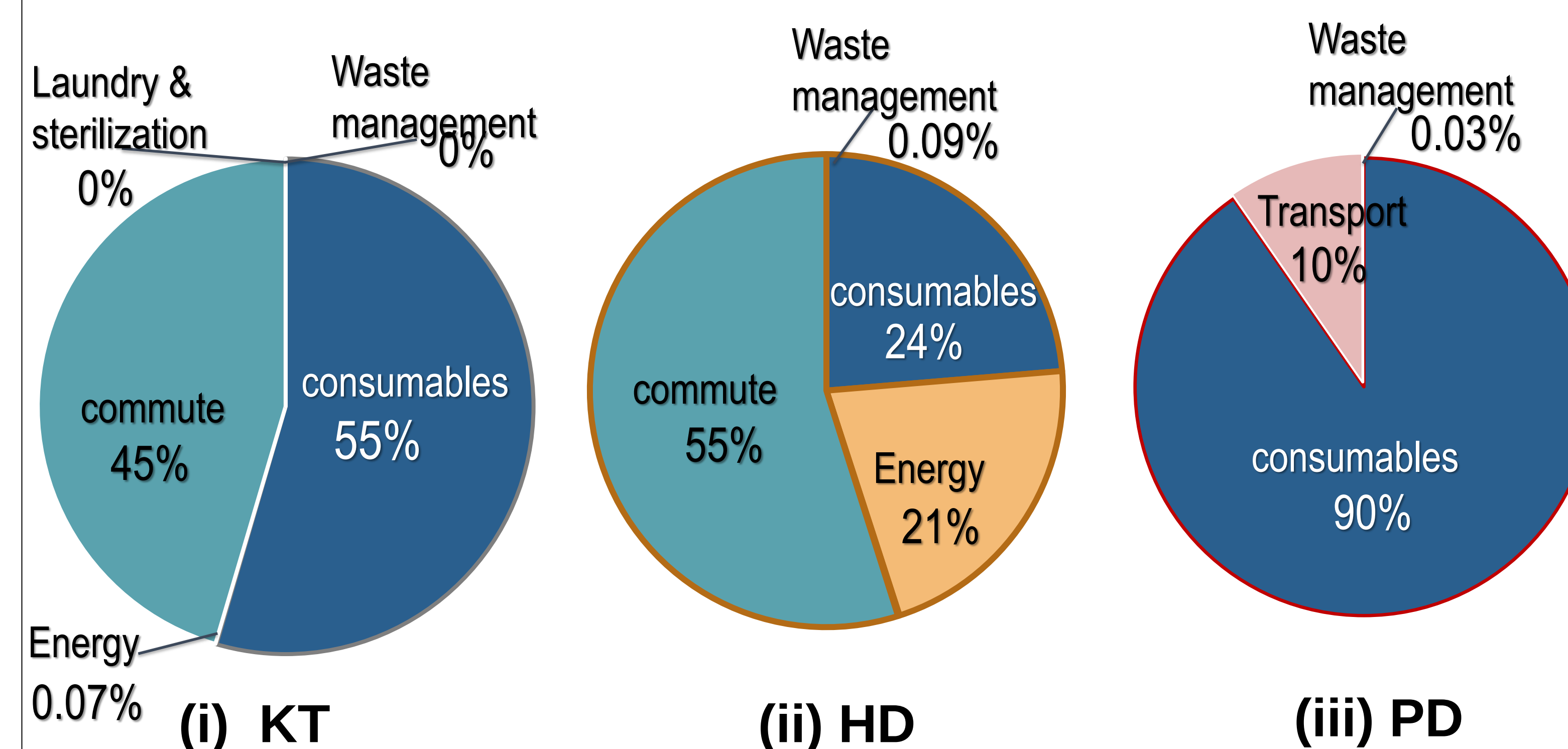
(a) Environmental and health impacts of KRTs



(b) KRT selected environmental impact categories



(c) Process contributions to total CO2eq emissions by KRT



	Climate change (kg.CO2 eq.)	Equivalent Driving Distance (km) of standard gasoline-powered passenger vehicle ⁴
KT	360	1438
HD	3960	15819
PD	1370	5473



CONCLUSIONS

- HD has the highest environmental impact across all LCA categories
- In the Climate Change category, HD has 91% more impact than KT and 65.3% more than PD
- Patient commute/ transportation to health facilities and usage of consumables in surgical and dialysis processes were responsible for the majority of climate change impacts across KRTs
- For every 100L of water used in KT, over 3300L are consumed in HD, and over 280L of water is consumed during PD
- When equipoise exists between dialysis modalities, patients and providers may prefer PD over HD for its lower environmental impact
- HD has considerably more negative effects, approximately 10x more than other KRTs, on the environment including impacts on human health, ecosystems and natural resources

FUTURE DIRECTIONS / RELEVANCE

- Integrate these data with clinical outcomes and lifecycle costing of KRTs to enhance informed decision-making for sustainable kidney care
- Investigate barriers to accessing KT for all eligible patients
- Optimize environmental performance of dialysis therapies, advocating for low emission transport, optimal use of video-/teleconferencing appointments, and 'environmentally favorable' procurement

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