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Accelerating progress towards the SDGs: Collaborative policymaking in sanitation for integrated benefits in Sub-Saharan Africa

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Abstract In 2020, 54% of the world had access to safe sanitation, but access further reduces to 21% in sub-Saharan Africa . With only eight years left to meet the Sustainable Development Goals (SDGs), there is an urgent need to accelerate action in the sanitation sector. Previous academic research highlights sanitation as vital for supporting cross-cutting outcomes in health, economics, climate, gender equality, and the environment. However, there is a gap in knowledge outputs for policymakers to highlights how action in sanitation can leverage investment from agencies and ministries to achieve multiple SDGs. Our transdisciplinary team (academics, policymakers, and practitioners) co-developed actionable outputs for diverse audiences to fill this gap, building on an existing global evidence review identifying 130 synergies between sanitation and the SDGs.

We identified priority focus areas influencing sanitation policies and financing in Sub-Saharan Africa to collaboratively develop visual aids, policy briefs, and this academic publication to engage cross-sectoral

audiences. Our approach offers insights into the value of theoretical knowledge for policy outcomes in the sanitation sector. It is most likely that SDG6 Targets particularly related to sanitation will not be met by 2030 as the sector suffers from under investment. Co-creation between academia and the development sector is critical for consolidating knowledge/research and development practice to influence investment, progress and innovation.

Keywords Sanitation, SDGs, cross-sectoral, policy, investment, sub-Saharan Africa

1. Introduction

While access to sanitation services in Africa has improved over the last decade following national government and institutional efforts to invest in the sanitation sector, these efforts have been hampered by limited capacity and resources set aside for sanitation policy development (Jones et al., 2019), and a lack of reliable baseline data for monitoring and evaluating progress (Hutton & Chase, 2016; Fukuda-Parr & McNeill, 2019; World Health Organization, 2021). Only an estimated 33% of the population in Sub-Saharan Africa has access to basic sanitation services (WHO & UNICEF, 2021). Through its impact on infectious diseases on human health, the Covid-19 pandemic has slowed progress by deepening pre-existing inequalities in the sanitation sector, especially in Africa (Dickin et al., 2020; Islam et al., 2021). Sanitation is a critical sector for enhancing and supporting sustainable development due to its cross-cutting synergies across health, wellbeing, climate, and the economy. Research evidences the interlinkages between sanitation and all 17 Sustainable Development Goals (SDGs) (Parikh et al. 2021) and identifies the wide-ranging benefits between sanitation and economics (Murta et al., 2018; Ddiba et al., 2020), human wellbeing (Mara et al., 2010; Mara & Evans, 2017), climate change (Delanka-Pedige et al., 2021; Shaw et al., 2021), gender, and equity (Fukuda-Parr & McNeill, 2019). However, these findings have yet to be made accessible to policymakers and practitioners.

Given the imminent 2030 deadline for achieving the Sustainable Development Goals (SDGs), the need to demonstrate action outcomes has become more pronounced. To respond to the pressing need for action we use sanitation as an entry point for enhancing transdisciplinary collaboration between academic research, policy and practice for accelerating progress towards sanitation and outcomes across all the SDGs. Transdisciplinary working among academics, policymakers, and practitioners has gained increasing interest over the last decade in addressing complex challenges at the academic-policy-practice

interface. Models, structures, and tools have formed the basis of academic enquiry (Corazza et al., 2022), where academia presents an opportunity for developing locally relevant action-orientated approaches in practice. Involving stakeholders from a range of sectors, such as engineering, health, education, planning, policy, housing, and urban development (see Lang et al., 2017) can support the iteration of new and emerging logics that are relevant to the sanitation sector and beyond (Hartley, 2022). Developing new knowledge helps to strengthen policy and practice, where the cross-cutting benefits of action in the sanitation sector can overcome issues associated with limited resources and efforts in the sanitation sector.

This paper is based on an action-based research study to translate academic findings into actionable outcomes and valuable outputs for non-academic stakeholders in the sanitation sector and beyond through transdisciplinary collaboration. The core objectives of this work included : (1) identify knowledge gaps towards achieving sanitation outcomes in Sub-Saharan Africa; (2) establish the role of transdisciplinary collaborations in strengthening policy and practice and (3) co-develop non-academic outputs including visuals accessible for policy makers. The paper outlines the process followed to co-develop a visual toolkit through collaboration between academia, policy and practice building on a 2-year global evidence review conducted by Parikh et al., (2021) that maps the linkages between sanitation and the SDGs. The impetus for this work developed out of a shared interest in showcasing the cross-sectoral benefits of action in sanitation and its leading role in supporting development across health, wellbeing, climate, and the economy in Sub-Saharan Africa to influence policy and practice. The collaboration was set up in 2019 between two key partners, University College London (UCL) and WaterAid.

In line with the objectives, we set a critical baseline for action toward achieving sanitation outcomes in Sub-Saharan Africa. In doing so, we established the need for transdisciplinary collaboration toward strengthening policy and practice (Section 2). Sections 3 and 4 outline the collaborative process followed to identify useable and actionable outcomes using sanitation as an entry point before reflecting on the lessons for understanding and enhancing cross-sectoral benefits to support integrated outcomes in the sanitation sector and beyond. Section 5 clarifies how academic knowledge was translated into outputs accessible to a range of policymakers and practitioners to drive actionable results in practice.

2. Collaborative approaches to achieving multiple cross-cutting benefits beyond the sanitation sector

2.1. Assessing progress towards integrated sanitation benefits

The sanitation sector is primarily overlooked in development as its objectives tend to be integrated within strategies for water management (Kemeny, 2007; Mariwah, 2018; Dickin et al., 2020). Because of this, sanitation is often considered a 'neglected' theme in urban and rural development; as a result, sector-specific needs remain unaddressed. Sanitation experts warn that current progress towards the sanitation targets of SDG 6 has been insufficient to date (Mara & Evans, 2017; Mikhael et al., 2021; UN Water, 2021), partially due to a lack of political will, where political mandates do not acknowledge outcomes (or successes) in sanitation in the same way as for transport and energy (World Bank, 2011; Cummings et al., 2017) for example. A lack or absence of fiscal investment and political interest in sanitation, resulting in limited progress on achieving SDG6, causes cascading issues, where it increases the risk of diseases, medical costs, and reduces income generation (Mehrotra et al., 2000; Mara et al., 2010). Despite understanding the links between sanitation, health, and poverty, actions in Sub-Saharan Africa have tended to focus on specific aspects of sanitation in isolation with uneven developmental outcomes (Loevinsohn et al., 2015; Mikhael et al., 2021).

While regional data on the action in the sanitation sector indicates that sanitation services in Africa (excluding North Africa) have increased from 25% in 2000 to 28% in 2015 (United Nations et al., 2018), outcomes across the sanitation sector have varied (United Nations et al., 2018, African Ministers' Council on Water, 2019). Progress is urgently needed in Sub-Saharan Africa, which has lagged behind other African countries in monitoring and reporting progress on sanitation as part of the SDG framework (Estache, 2019; Gabrielsson et al., 2020; Fox & Macleod, 2021). As the sanitation sector has been identified as an entry point for achieving integrated approaches in Sub-Saharan (Jones et al., 2019; Harris & Pearce, 2021, p. 2; Garfias Royo et al., 2022), we show how it provides an untapped avenue for identifying emerging opportunities for intervention and accelerating progress.

Regional organisations have promoted integrated approaches for localisation and monitoring and evaluation in Sub-Saharan Africa in line with international water, sanitation, and hygiene (WASH) commitments (African Ministers' Council on Water, 2015; United Nations et al., 2018; World Health Organization, 2021). Academics and practitioners have reported challenges, particularly around the

localisation of the SDGs, where poor data collection has impeded the full integration of development agendas on the ground (Reddy, 2016; Jones & Comfort, 2020; Harris & Pearce, 2021, Garfias Royo et al, 2022). In particular, the localisation of SDG 6 on sanitation is "yet to attain the aspired safely managed benchmarks" that guarantees the safe management of excreta (Harris & Pearce, 2021, p. 2). Thus, UNICEF East and Southern Africa[1] identify the need to "accelerate the overall regional response to SDG 6" (Harris & Pearce, 2021, p. 2), where 'increased synergies' between sanitation and SDGs provide opportunities for accelerating progress ahead of the upcoming eight year SDG deadline (Dickin et al., 2020; Diep et al., 2020; World Health Organization, 2021)

The implication of limited resources includes the highly variable and unequal access to basic services (Patel et al., 2020), which has become noticeable in the sanitation sector. Limited resources also have a compounding effect on meeting ecological imperatives that simultaneously deliver on fundamental human rights (Fukuda-Parr & McNeill, 2019; Patel et al., 2020, p. 190). As action in sanitation has benefits for other areas, such as climate change and related SDGs, overcoming the barriers of limited resources can open new avenues for involvement and participation across a wide range of stakeholders. For example, off-site composting of faecal sludge can support climate change adaptation (McNicol et al., 2020), which can also be used for the on-site management of sanitation via flood-proof urine diverting structures. Similarly, pit latrines can limit the impact of climate-related high-rainfall events (Howard et al., 2016). However, the wide-ranging benefits of investment and action in the sanitation sector are not at the centre of policy and practice.

While policy and supporting documents provide recommendations for changes in the sanitation sector, they tend to lack practical guidance for the stakeholders that action them. By implication, there is an urgent need for improving guidance around financing in the sanitation sector (Davis et al., 2019; Ddiba et al., 2020; Dickin et al., 2020), planning (McConville, 2010; Ramôa et al., 2017; Spuhler et al., 2020), project implementation (Davis et al., 2019), and monitoring and evaluation (Barrington et al., 2017; Giné-Garriga et al., 2017; Herrera, 2019). This needs to include robust and actionable data on the cross-cutting outcomes of action and investments in sanitation. Incorporating such a focus in these activities requires stronger collaboration between stakeholders to improve accessibility (World Bank, 2009; Freeman et al., 2013; Ddiba et al., 2020) and generate locally relevant knowledge.

[1] In collaboration with national government, global and sub-regional development partners.

2.2. Overcoming siloed approaches

Academics and practitioners have begun to profile opportunities arising from sanitation action, including how it can be used to achieve the SDGs (SuSanA, 2018; Delanka-Pedige et al., 2021; Larsen et al., 2021; Shaw et al., 2021). The above-mentioned global review by Parikh et al. (2021) reveals that failures associated with sanitation delivery can have broader implications for development and equity.

Capitalising on the synergies between sanitation as a service and all 17 SDGs (130 out of 169 SDG Targets) through action and investment can positively impact health, economics, climate, gender equality and the environment. However, synergistic benefits depend on factors that can differ significantly from context to context (Parikh et al., 2021; Diep et al., 2020). Therefore, while a range of theoretical linkages between sanitation and other sectors have been established, there is much to learn about the local context and how sanitation outcomes can play a valuable role in achieving multiple outcomes in policy and practice (McConville, 2010; Ramôa et al., 2017; Ekane et al., 2020).

To support this, we argue that transdisciplinary approaches can bridge knowledge across academia, policymakers, and public representatives to produce localised and practice-oriented recommendations (after Buizer et al., 2011). Transdisciplinary collaboration ultimately enables stakeholders across sectors (involved in theory and practice) to address complex societal problems by realising synergistic benefits (Bulkeley, 2006; Croese, 2021). The value of bringing together theoretical and practical knowledge has also been recognised to support sustainable transitions in infrastructure and access (Frantzeskaki et al., 2021, p. 1650; Frantzeskaki & Rok, 2018) with benefits across the entire sanitation value chain.

Transdisciplinary approaches involves stakeholders related to the problem at hand to open up "knowledge production beyond problem analysis" (Lang et al., 2012). Along this vein, transdisciplinary approaches have strengthened the impact and value of sustainability research (Brandt et al., 2013; Axelsson et al., 2011; Lang et al., 2017). Synergistic outcomes can support cross-sectoral benefits (Hartley, 2022; Kasulo et al., 2020) through deep learning. This is critical for developing actionable knowledge where each stakeholder embarks on a journey of cross-sectoral and transdisciplinary learning.

2.3. Collaboration for enhancing cross-cutting benefits

In a recent appraisal of African urban sustainability, Croese (2021) found that collective approaches

offered opportunities for developing policy and practice around local needs and resources. Noteworthy methods include the processes followed by Anderson et al., (2013) and Swilling (2014) in the South African context, including co-development applications (e.g. CityLabs) with academic and non-academic audiences (Culwick et al., 2019). Consequently, these interactions bring together academic partners to provide the 'evidence' while also 'strengthening the enabling environment' for investment and action with policymakers and practitioners (Hutton & Chase, 2016, pp. 13 and 26).

Toward setting up transdisciplinary collaboration, available studies identified the need for a shared understanding, common interest, and a collective agenda (Patel et al., 2020). In addition, trust plays a critical role in the learning process, where participants must feel safe to share their ideas and learn from each other without fear of judgement. Drawing together these essential aspects of collaborative working can overcome the 'universal set of policy problems' that are often associated with generalised approaches for translating academic knowledge into practical outcomes. This includes the slow dissemination of theoretical knowledge where academic findings are published online (organisational or other platforms), read, digested, and applied by interested practitioners. While this presents a viable avenue for sharing academic knowledge, few policymakers and practitioners engage with educational platforms for knowledge dissemination. Transdisciplinary collaboration can support co-learning, but knowledge generation often takes time. By this stage, the key findings may be outdated or exceed the deadlines for demonstrating their practical value (e.g., the SDG 2030 deadline).

One way to address this concern involves jointly developing knowledge in instances where academic findings are already available and translating this into relevant outputs for many policymakers. This approach is not common in knowledge creation and policy development. Still, it can help to overcome the practical concerns around action and reporting in the Sub-Saharan context concerning sanitation and the universal policy problem associated with disseminating knowledge. Our work contributes to this gap by outlining a co-development approach that collaboratively synthesises available academic expertise and translates it into actionable outcomes using contextual policy and practitioner insights.

3. Gathering data on transdisciplinary collaboration towards integrated sanitation policy and action

This paper uses an action research approach, drawing on stakeholder interactions, observations, and activities as part of the co-development process between UCL and WaterAid partners as its core body of evidence. Data gathering activities included interactions between team members and external contacts, documented in video and written format. This research design and methodology generated significant evidence for mobilising embedded knowledge on how sanitation actions can help achieve all SDGs. It also revealed how learning could be developed across sectors, which supported a rich set of insights for strengthening policy and practice, helping to address the gaps identified in Section 2, namely a current focus on water management, a lack of political will, and fiscal resources. Toward setting up the study, it was necessary to establish collaboration (Section 3.1) and a co-development process (Section 3.2) from which to gather data.

3. 1*Setting up collaboration*

The impetus for the collaborative UCL-WaterAid project developed from the above-mentioned desktop evidence-based review produced by Parikh et al., (2021). The study appraised over 500 global publications on sanitation, where an interdisciplinary team of UCL academics identified 130 synergies and 28 trade-offs between sanitation across all 169 SDG targets. The academic team had disciplinary backgrounds across development planning, engineering, geography, law, and health and aimed to evidence the cross-cutting benefits of investments in sanitation. WaterAid saw value in the rigorous evidence-making but identified a need for outputs accessible to policymakers and African practitioners and this led to a transdisciplinary partnership between UCL academics and Water. Water Aid's aspiration for collaboration was to prioritise and ramp up efforts towards sanitation to meet the 2030 SDG Agenda in ways that could foster universal outcomes and bolster the impact of investment and financing in this area. The UCL and WaterAid team worked together from September 2020 until February 2022 to translate the academic work into policy outcomes for policymakers and practitioners.

3.2. Co-development process

As strict global Covid-19 restrictions were in place at the start of the project, all UCL-WaterAid project meetings happened virtually via MS Teams. We classify our interactions as transdisciplinary (as defined

by Lang et al., 2012; Bergmann et al., 2021), where we brought together stakeholders from different academic disciplines involved in the global review and stakeholder experiences across policy and practice in Sub-Saharan Africa aided by five types of virtual interactions (Figure 1). While each of these interactions is described in detail in the *Supplementary Information* section, workshops with external stakeholders enabled consultation with a broader audience of policymakers and practitioners working on sanitation in Sub-Saharan Africa. This included external workshops with partners at the African Development Bank (ADB) and African Ministers' Council on Water (AMCOW), World Bank, and Sanitation and Water for All, as well as insights gathered at a session run by the UCL-WaterAid team at the AfricaSan6 and Water conference held in 2021[2]. At these sessions, the need and value of translating academic knowledge into actionable outputs were affirmed, including using visuals to support understanding and action. These sessions also built trust and respect across team members through sharing and valuing knowledge.

[Insert Figure 1 here]

[2] The AfricaSan6 session was entitled: Financing toolkit to transform approaches to sanitation provisions, investment, and partnerships for WASH.

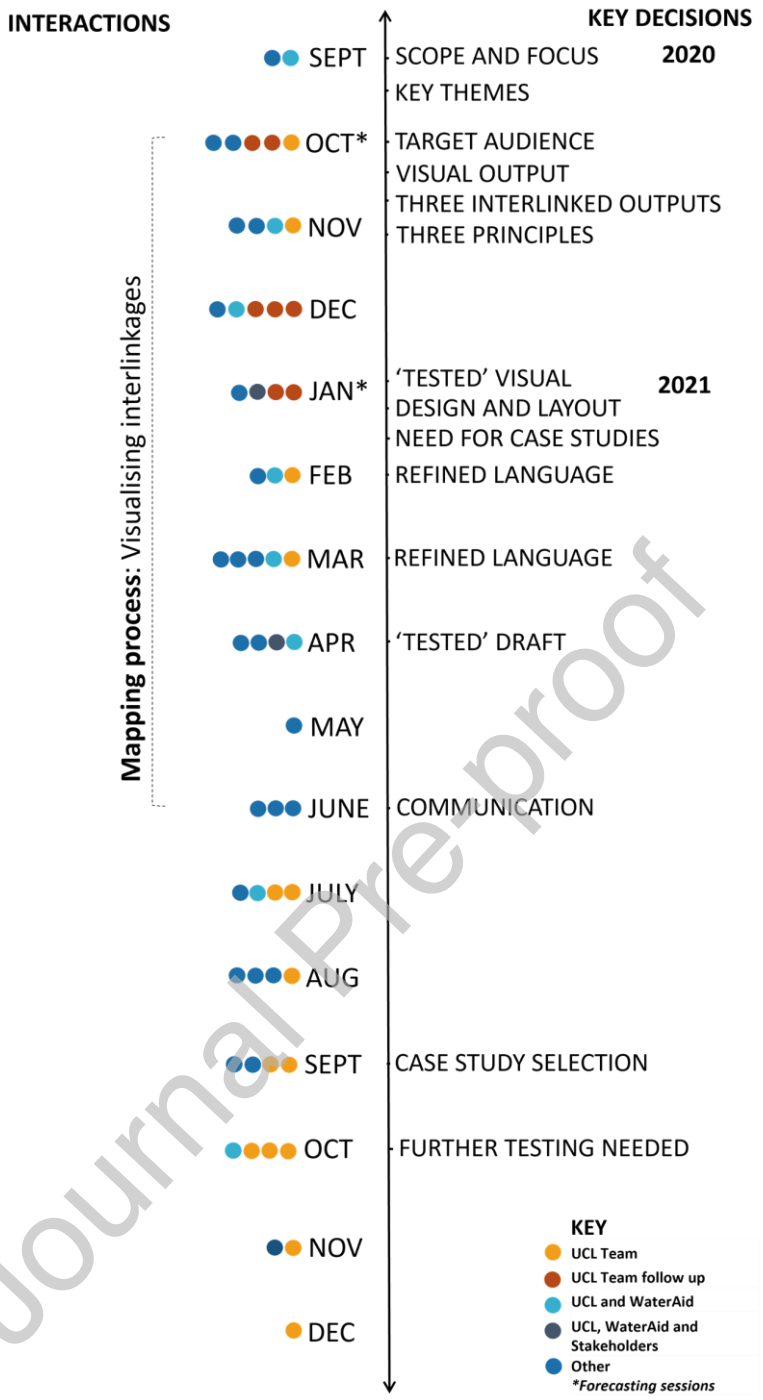

Fig. 1: Overview of interactions on the project indicating the type and project timeline

All virtual interactions were recorded and written notes were taken. Careful attention was paid to who raised the question, including key decision points raised. The recordings and notes were the primary forms of evidence, allowing key themes and principles to emerge and facilitating collaborative review and synthesis of the evidence base and visualising synergies. Results were presented at workshops and

major conferences/events such as AfricaSan6, where key stakeholders reviewed them: African Development Bank and African Ministers' Council on Water, World Bank, Sanitation and Water for All, and End Water Poverty.

Visioning and backcasting exercises

At two team meetings, the project team used visioning and backcasting exercises as strategic tool to identify key themes and goals among group members. This guided discussions around the core message, audience, and expected outputs, which were integral to developing the approach to prioritising and visualising synergies between sanitation and the SDGs. Visioning and backcasting encouraged participants to place themselves 5 or 10 years in the future to consider the outputs, pathways to impact, and stakeholders for meeting WaterAid's aspiration to urgently address gaps in sanitation services in light of the 2030 Agenda. We include an excerpt of other exercises below.

(1) Thinking about the project output, what would be: Desirable? Not desirable? Actions required? How would they be disseminated across regional offices?
(2) Think of the outputs one year down the line; what would be: Desirable? Not desirable? What would the outcomes look like?

The group used the potential for impact in the sanitation sector as a basis for decision-making. Participants used their theoretical and tacit or applied knowledge on aspects of sanitation development gained in academia, policy, and practice.

4. Lessons for understanding and enhancing cross-cutting benefits

Two findings were critical for enhancing the shared experience of the complex cross-cutting benefits. First, the collaborative synthesis of evidence by different project stakeholder groups (Section 4.1), and second, the use of visual summaries to distil and communicate information (Section 4.2). We present each of these lessons in turn.

4.1. Collaboratively reviewing the evidence base: fostering co-learning and trust

The team synthesised the evidence base of the global mapping study by Parikh et al., (2021). Toward synthesising information, team meetings enabled a platform to review the academic material and served

to support communication. For example, language specific to the SDGs, such as 'accelerate progress' and 'reporting', emerged as a critical issue identified and refined via online discussions. Academic team members were challenged to be more specific about the policy outcomes and associated policy language used in the project outputs.

Learning more about sectoral approaches to sanitation also emerged as a key area for co-learning. A group discussion around strategies, key messages and outputs for achieving outcomes across sectors enabled different approaches to be acknowledged as part of the collaborative working process. Hence, a shared understanding developed of which outputs were needed to disseminate knowledge, including the steps required to get there (see Section 5.2). This enabled the team to work towards a common goal, which sat outside the remit of one sector alone and built trust between team members throughout the project.

Trust and mutual respect were essential between project team members, enabled the valuing of academic knowledge in policy outcomes, and constituted an essential ingredient for continued interaction and learning within the team. The group fostered trust when participants shared their views towards achieving a common goal. All team members needed to reflect on their position, knowledge, and how it contributed to actionable outcomes. Not only did trust help to develop a long-lasting working relationship, but it also contributed to the development of robust policy outputs.

4.2. Visualising synergies: making the evidence digestible

The collaboration with academic experts afforded WaterAid access to a wealth of educational resources/cross-disciplinary knowledge that would not have been available. Experts from a wide range of disciplines were able to discuss gaps in knowledge in policy and practice and develop tailored outputs to serve practical application in the field.

From early on, the group recognised visuals as key in the knowledge co-production process. From October 2020 until January 2021, there was active and extensive engagement with target audiences such as funders, policy makers, charities and practitioners in developing the outputs to identify the exact need in this area. Through this process, it was agreed that a visual would function as a critical anchor point for the project to showcase key synergies between sanitation and SDGs in an easy-to-digest format (Figure 2). The group decided the visual would span a range of documents that would appeal to different sub-groups within the target audience (See Section 5.2).

A *synergies visualisation* (see Figure 2) consolidates the integrated benefits of sanitation for the Sub-Saharan context[3]. It retains complexity through the knowledge translation process, highlighting a consolidated set of synergies between sanitation and the SDGs, thus demonstrating the prominence of sanitation in achieving all the SDGs. To develop the visual, the global evidence matrix[4] produced by the global review (see Parikh et al., 2021) served to identify and prioritise the integrated benefits of sanitation. The project team went through each synergy, assigned it a corresponding SDG, and then mapped it visually. Toward mapping interlinkages, the group drew inspiration from Diep et al. (2020), where sanitation acted as the basis or background for assessing cross-cutting benefits.

The diagram was refined over time, and the labels enabled the demarcation and simplification of linkages. For example, the synergy between education (SDG4) and inequality (SDG10) was simplified from 'Incorporating different users (including girls, persons with disabilities and young children) leads to the elimination of discrimination in education and ensures equal access to all levels of education' to 'Reduces discrimination and improves access to education'. They are applied the same way across all synergies represented; the final visual showcases how sanitation benefits multiple goals and targets (

[3] The UCL-WaterAid team acknowledged the relevance and value of the synergies globally, but focused on the development of policy outcomes specifically for the Sub-Saharan Africa context, which fall within the operational mandate of WaterAid and associated project funding.

[4] Where more than one thematic area and/or Sustainable Development Goal was identified, both were included.

Fig. 2). For example, safely managed sanitation in schools can improve access to education (SDG4), promote gender equality (SDG5), reduce discrimination (SDG10) and reduce the risk of violence for girls (SDG16), benefitting four goals simultaneously.

[Insert Figure 2 here]

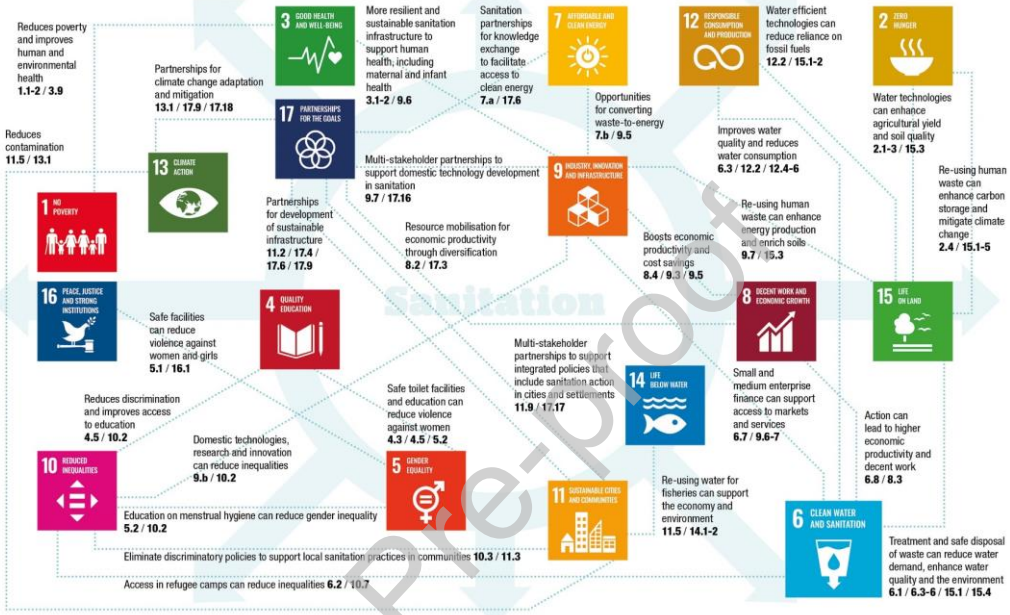

Fig. 2: Synthesis of selected synergies between sanitation and the SDGs.

To ensure the accuracy and usefulness of the final outputs and visuals, the UCL-WaterAid team consulted a wider group of stakeholders for further refinement. The group included a stronger focus on 'transformative change' and considered the language used to define sanitation (February and April 2021, Figure 1). Partners from a range of WaterAid offices in sub-Saharan Africa provided inputs that refined the exact knowledge and how it was translated. A decision was made to amplify the impact of visual outputs by seeking alignment with broader regional policy initiatives in the sanitation sector with ADB, AMCOW, World Bank, Sanitation and Water for All, and End Water Poverty through active engagement with stakeholders at the AfricaSan 6 conference (November 2021).

5. Towards actionable knowledge outputs

This section outlines our analysis of key findings and presents important lessons for translating academic

knowledge into accessible outputs for policymakers and practitioners to address gaps in the sanitation sector in Sub-Saharan Africa.

5.1. Identifying principles: heuristics for action

The SDGs provide a global framework for policymakers to guide action and monitor progress towards the 2030 Agenda. Following a similar framework would build on progress previously made (as outlined by United Nations et al., 2018; Harris & Pearce, 2021; World Health Organization, 2021). During the visioning and backcasting sessions (see Section 2), core thematic areas and links with actionable outcomes were discussed. The team agreed to three themes which overlapped with WaterAid's core themes around universal access, health, climate change, and finance (see 'themes' in Table 1). The group later used them to co-develop three guiding principles to simplify key messages from a complex review making it streamlined for policymakers and practitioners in Sub-Saharan Africa (see Table 1). Between September and November 2020, the team translated themes into guiding principles during joint workshops. WaterAid's core areas of interest around universal access, health, climate change, and finance helped to identify guiding principles. The following three principles emerged as prominent areas needing action.

(1) *Achieving multiple benefits.* Opportunities for realising wide-ranging benefits across health, education, and climate change.
(2) *Identifying commonly missed opportunities.* Opportunities for supporting outcomes in innovation, efficiency, industry, and the economy, have previously been ignored.
(3) *Leveraging equitable benefits.* Opportunities for supporting vulnerable groups including women, girls, children, and people with disabilities.

Table 1: Overview of principles, themes, and associated SDGs

[Insert Table 1 here]

5.2. Diversifying outputs: reaching multiple audiences and research users

The iterative approach followed by the group enabled an incremental refinement of the target audience (policymakers and practitioners in Sub-Saharan Africa) and policy outputs (three interlinking documents).

The initial target audience for the project outputs included: AMCOW, ADB, World Bank, and Water and Sanitation for All. Stakeholders were consulted at key points in the project to understand who are the key organisations driving action in sanitation and what type of outputs would add value to their work in sanitation. This led to refinement of the audience and project outputs. Three key target audiences were identified. The first one includes ministers and high-level officials in Sub-Saharan Africa involved in pan-African and national policymaking in the sanitation sector (including supporting sectors concerning the integrated benefits). These stakeholders require concise guidance and recommendations to shape policymaking and high-level policy documents on sanitation and its integrated benefits. The second key audience includes technocrats, government authorities, utilities, and practitioners (planners, engineers, environmental scientists) involved in everyday decision-making on sanitation issues (through national and regional plans and through sitting on project steering panels). Technocrats require technical details and case studies to support actionable outcomes in practice. The last group includes policy researchers, government research and development units, and supporting policy organisations involved in knowledge production. These stakeholders require more applied detail on translating academic knowledge into practice, including its value for introducing rigour into the decision-making process.

To respond to the specific needs of each audience, the UCL-WaterAid team co-developed three interlinking documents customised for different audiences in terms of focus, language, level of detail, and approach (Table 2). A *Ministerial policy brief* presents high-level findings and core messages for pan-African and national development programmes in sanitation. An e*xtended policy brief* offers greater scientific and localised detail through case studies to provide context and demonstrate how best to apply the high-level findings outlined in the Ministerial policy brief. Finally , this academic article emerged out of the collaborative process itself, where UCL-WaterAid team members identified its relevance for replicating such transdisciplinary partnerships (policy researchers, government research and development, and supporting policy organisations).

Table 2: Overview and description of three interlinking documents

[Insert Table 2 here]

Reaching a diverse audience in Sub-Saharan Africa and developing actionable outputs to accommodate differing roles, functions, and outlooks bolstered the value of academic knowledge in sanitation policymaking. Instead of creating a high-level policy brief for a general audience, the range of targeted outputs opened new avenues for using academic knowledge to potentially drive impact and accelerate progress in the sanitation sector and beyond. Our approach, therefore, contributes towards strengthening cross-sectoral ties between audiences, demonstrating how gaps between academic knowledge and practice can be overcome by developing specific outcomes that target exact knowledge needs and stakeholder activities.

6. Conclusion

Unless there is urgent action in the sector, we will not meet the sanitation targets set out in the SDGs.. This study demonstrates the value and process of co-developing policy outputs for accelerating action in sanitation in Sub-Saharan Africa. Findings demonstrated that collaboratively reviewing, synthesizing and visualising synergies provide opportunities for co-creating accessible and actionable outputs organised around core themes that can inform policy and practice. Our work recognises the need for trust and time investment in building partnerships as key to the co-development process. This study brought together existing knowledge across academia, policy, and practice to showcase the multiple benefits of sanitation across a range of SDGs to boost interest, investment and action from sectors beyond sanitation. . This can help organisations to use their limited resources in ways that can achieve multiple benefits and maximum impact. As discussed elsewhere (Carbonell et al, n.d.) and evident in the extended policy brief with case studies, the active involvement of sanitation beneficiaries is crucial in the development and delivery of appropriate and sustainable sanitation solutions. The robust evidence base, together with the produced outputs have the potential to build confidence and engender interest in sanitation investments as a critical component for achieving the SDGs and supporting inclusive development in Sub-Saharan Africa.

This work is valuable to policymakers, practitioners and academics as it demonstrates the value of sanitation as an entry point and cross-cutting theme for action, while also outlining the steps to get there. With only eight years remain to realise the 2030 Agenda there is an urgency for adapting and homing this kind of approach to boost action in sanitation.

Statements and declarations

Competing Interests This academic paper was developed with WaterAid, who was the funder of the project. The authors report no further competing interests to declare.

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Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1: Overview of principles, themes, and associated Sustainable Development Goals (SDGs)

Principle	Theme	Sustainable Develoment Goal
Principle 1: Achieve multiple benefits	**Health**	SDG 11: Safe and resilient cities
		SDG 3: Human health
	Education	SDG 4: Education
		SDG 5: Gender equity
	Climate change	SDG 11: Safe and resilient cities
		SDG 13: Climate change impacts
		SDG 15: Environmental sustainability
Principle 2: Identify commonly missed opportunities	**Industry and economy**	SDG 8: Industry
		SDG 9: Economy
	Innovation	SDG 2: End hunger
		SDG 7: Energy access and use
		SDG 9: Economy
	Efficiency	SDG 1: End poverty
		SDG 7: Energy access and use
		SDG 8: Industry
		SDG 12: Consumption
Principle 3: Leverage equitable benefits	**Inequality**	SDG 10: Reduce inequality
	Gender	SDG 5: Gender equity

Table 2: Overview and description of three interlinking documents.

Output	Length	Target audience	Additional detail
Ministerial policy brief	2-3 page	Ministers and high-level government authorities.	To include the mapped visual on a full page to enable the user to print and refer to it in meetings.
Extended policy brief	6-8 pages	Minsters, high-level government authorities, and practitioners	case studies to provide more context for ministers, high-level government authorities, and practitioners wanting to know more.
Journal article	5 000 – 7 000 words; approx. 20 pages	Academics, researchers, and practitioners	submitted to a leading journal in the field of study.