Investigating the transmission of faecal pathogens in urban informal settlements in and around Port Vila, Vanuatu, recognising biophysical and demographic diversity

Water, Sanitation and Hygiene informal settlement characterisation

RESEARCH BRIEF

This Master of Integrated Water Management research project uses national census data, household survey data and integrated spatial data to investigate whether there are:

> *locally derived, water-related, faecal pathogen transmission routes in urban informal settlements in and around Port Vila, and are there biophysical and demographic characteristics that increase residents exposure?*

With our local partners, we sought to identify and characterise urban informal settlements in Port Vila, and explore the diversity of these settlements using GIS and remote sensing research methods. The research outcomes highlight that when it comes to reducing the burden of faecal pathogen transmission in such communities, one size rarely fits all.

Informal settlements in Port Vila

Globally, between 863 million and 1 billion inhabitants live in urban informal settlements [1]. Urbanisation is increasing in many regions because of economic migration from rural areas, population growth and in response to weather-related disasters or conflict [2, 3]. Informal settlements can lack access to services, particularly for water, sanitation and hygiene (WASH), and this can be compounded by a lack of accurate, relevant and timely data to describe demographics and living conditions within settlements [2, 4]. Inadequate WASH services can increase the exposure of informal settlement residents to faecal pathogens and affect associated health concerns, notably diarrhoeal diseases and stunting in children [5].

In 2016, the Vanuatu population comprised 272,459 people spread across six provinces with a high proportion of rural inhabitants compared to urban (75% in 2016) [6]. However, urban population growth is higher than rural growth and the number of urban residents is expected to double in 15 years [7]. Lacking sufficient affordable housing, much of this urban growth is in informal settlements [8]. In Port Vila, settlements illegally occupying land are less common than informal lease arrangements between residents and customary landowners [9].

Comparing WASH infrastructure and behaviour characteristics in informal settlements to Port Vila's peri-urban villages and overall national statistics, is an important investigative step in addressing WASH equity across Vanuatu. Using remote sensing and Geographical Information Systems (GIS) methods, combined with national Census data and household survey data (referred to here as the Live and Learn Environmental Education Rapid Household Survey, LLEERHHS), the International WaterCentre and its research partners located urban informal settlements in and around Port Vila and characterised the WASH situation across and between them. In **Figure 1**, identified urban informal settlements (inside the Port Vila Area Council boundary), peri-urban informal settlements, and peri-urban villages are shown.

Research supported by:

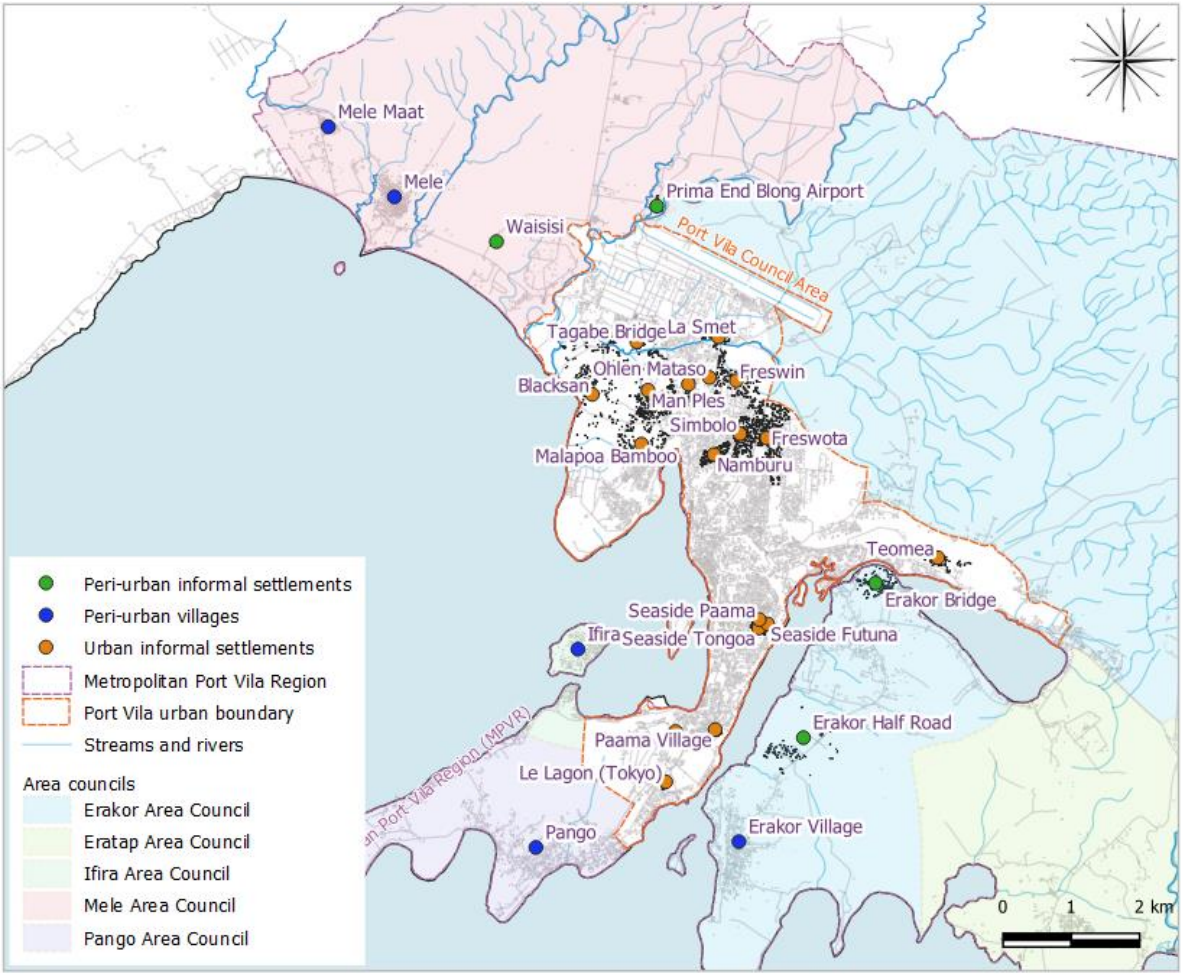

FIGURE 1: SETTLEMENTS IDENTIFIED IN AND AROUND PORT VILA

Water, Sanitation and Hygiene

On average, about 40% of households within each settlement had access to *at least basic* sanitation, as defined by the Joint Monitoring Program (JMP) under Sustainable Development Goal 6 (SDG 6) **(Figure 2)**. The Vanuatu national census does not report faecal sludge management behaviours, which would be used to separate *safely managed* sanitation from *basic*, and thus these categories are reported together as '*at least basic*'. The peri-urban villages had higher proportions of households with *at least basic* sanitation access than the informal settlements (63% vs 35% respectively). Rates of open defecation appeared to be low as reported in census data. However, residents in two of the six settlements that participated in the household survey reported defecation in river, sea or bush locations, indicating census questions may not capture more behaviour-related WASH experiences.

The most commonly reported sanitation types across settlements were flush to septic tanks and dry pit toilets, similar to Vanuatu as a whole (refer to **Figure 3**). Some settlements, like Man Ples, reported several different toilet types, illustrated by the low proportion attributed to the predominant type and the spread of 'other' toilet types reported. This diversity is notable and indicates there are likely preference and contextual factors within these settlements that has increased individual household choice of sanitation options. Conversely, settlements that demonstrated a high predominance of one toilet type, such as Seaside Paama, may have for instance been included in a specific service-provider program that has promoted one toilet type to the exclusion of others.

Data from the 2016 census showed eight settlements had more than 20% of households that used *unimproved* pit toilets. In a baseline survey conducted by Live and Learn Environmental Education one year before the LLEERHHS, households in Blacksan and Erakor Half Road indicated that, when a pit toilet filled, the pit was covered with soil and a new pit dug. Under SDG 6/JMP definitions, this would classify as safely managed provided the soil covering is of sufficient depth.

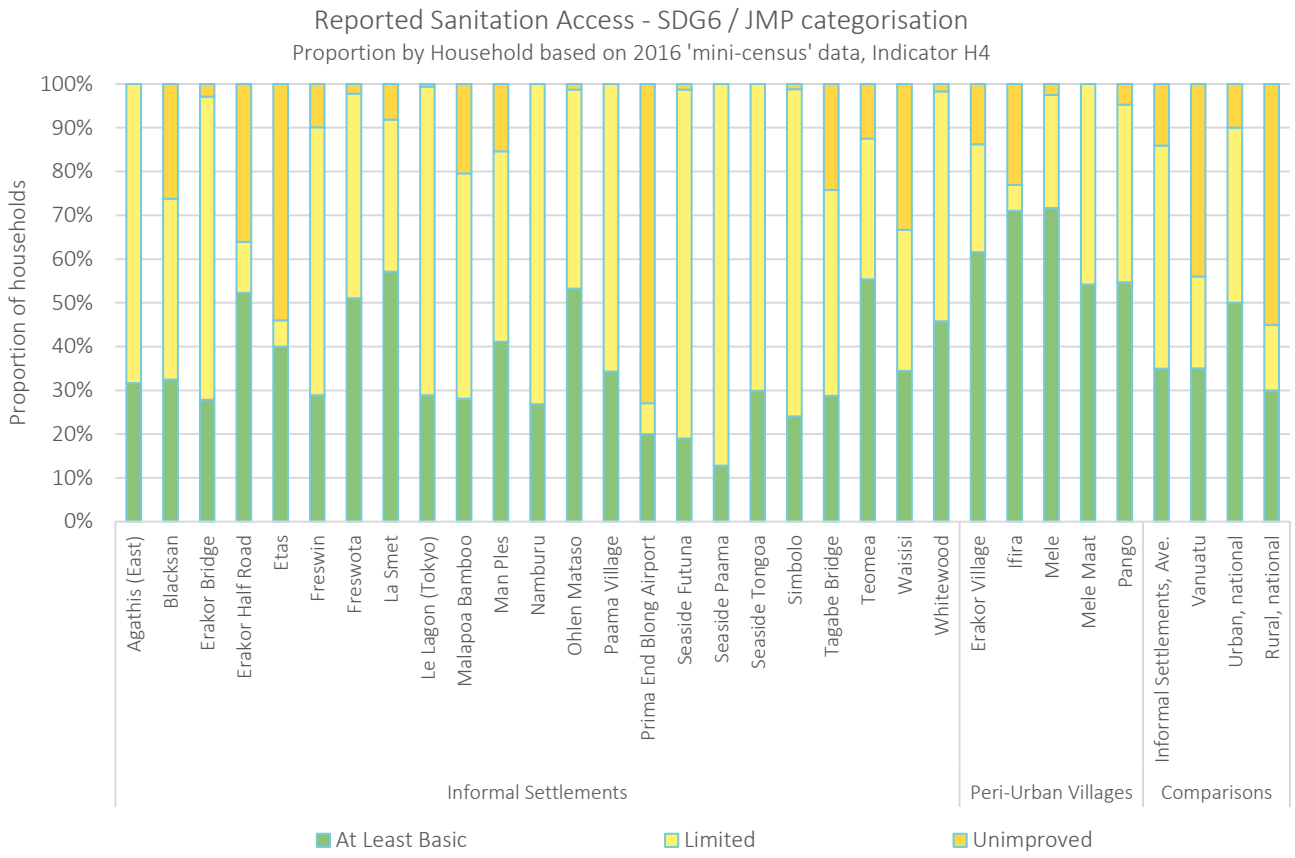

FIGURE 2: CATEGORISATION OF SANITATION ACCESS BY TOILET TYPE ACCORDING TO SDG 6 /JMP DEFINITIONS

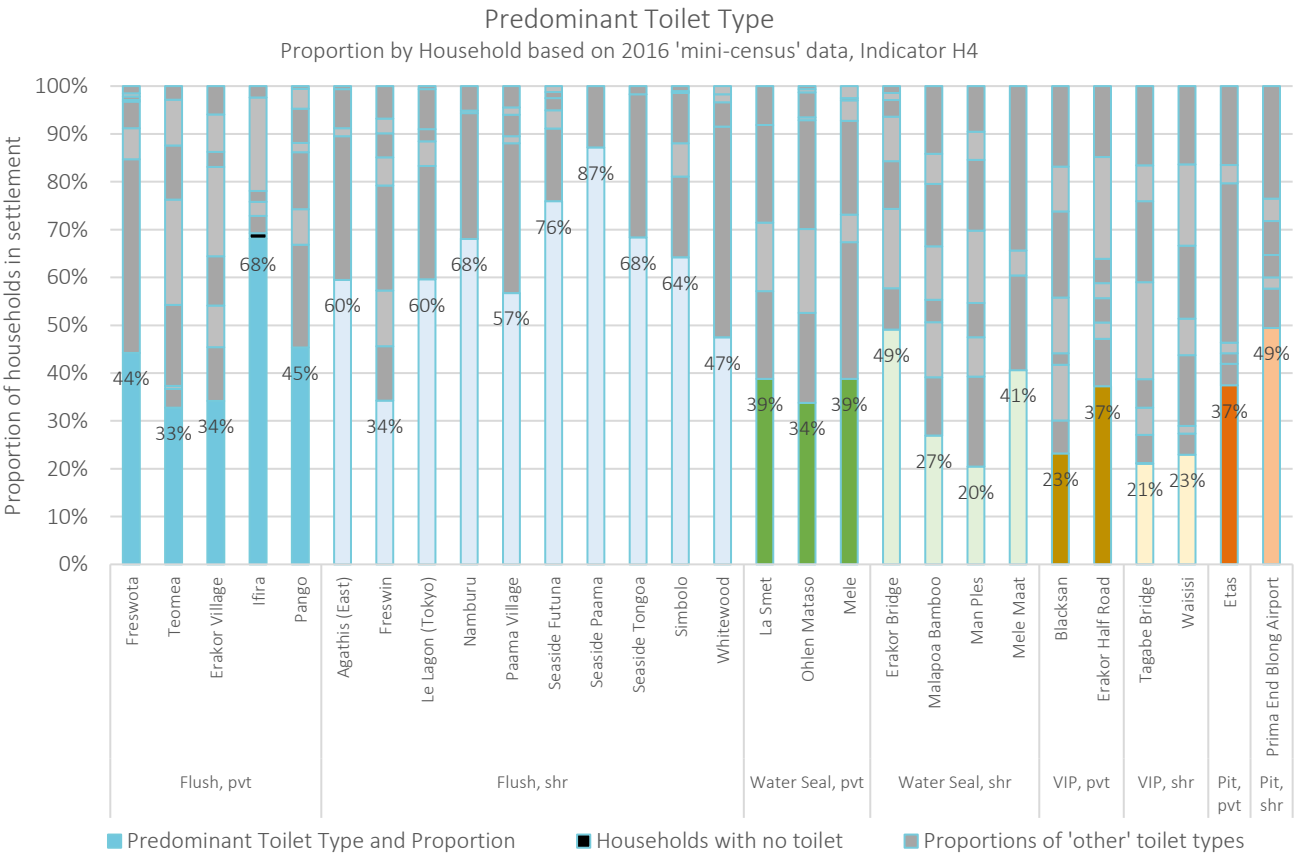

FIGURE 3: PREDOMINANT TOILET TYPE REPORTED BY HOUSEHOLDS IN SETTLEMENTS AND VILLAGES IN THE 2016 CENSUS

In two of six the settlements reporting in the LLEERHHS, more toilets were non-functional or unhygienic than functional, and three other settlements reported between 16% and 29% non-functioning toilets. Data from the LLEERHHS also showed that many households were dissatisfied with their existing sanitation, ranging from 76% in Erakor Half Road to 20% in Ifira. The research investigated linkages between land and housing tenure, and access to sanitation infrastructure, and the strongest relationship across settlements was found to be greater access to *at least basic* sanitation was observed when residents owned their own home. *Limited* sanitation was common (almost 60% on average), reflective of the high incidence of shared sanitation. Census data did not differentiate between household and public/community toilet sharing; however, the LLEERHHS revealed household sharing was more prevalent than public toilets (see **Figure 4**).

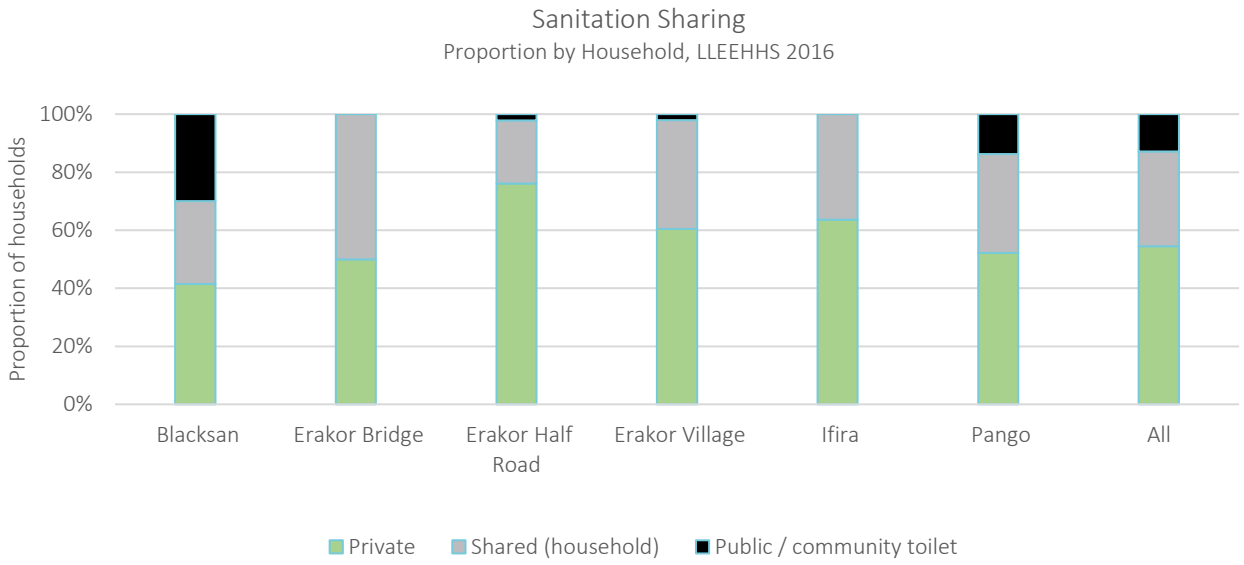

FIGURE 4: SHARED SANITATION FACILITIES REPORTED BY HOUSEHOLDS IN THE RAPID HOUSEHOLD SURVEY

Vanuatu demonstrated notable improvement in universal access to improved water in the last two decades, and this was reflected in this research. Almost 80% of settlement residents reported access to piped water and 93% access to *at least basic* water access in accordance with SDG6/JMP definitions. Peri-urban villages had, on average, 4% more households with *at least basic* water access. Predominant drinking water sources are shown in **Figure 5**. Overall, more shared piped connections were reported than on-premises sources. More than 10% of households in Prima End Blong Airport, Etas and La Smet reported using rivers as a primary drinking water source, while more than 10% of households in Blacksan, Tagabe Bridge and Teomea reported using groundwater as a primary drinking water source.

The SDG 6/JMP categories for hygiene report only the presence of physical facilities (facility with soap and water), and no census data was available to characterise hygiene access across settlements. Data from the LLEERHHS indicated that 50% or more of households across the six surveyed communities had access to a handwashing facility. However, to achieve adequate hand hygiene that can act as a secondary barrier to break faecal pathogen transmission routes, behaviour and knowledge regarding handwashing are equally as important [10]. When combined with behavioural survey questions, the derived proportion of households with adequate hand hygiene reduced across all settlements.

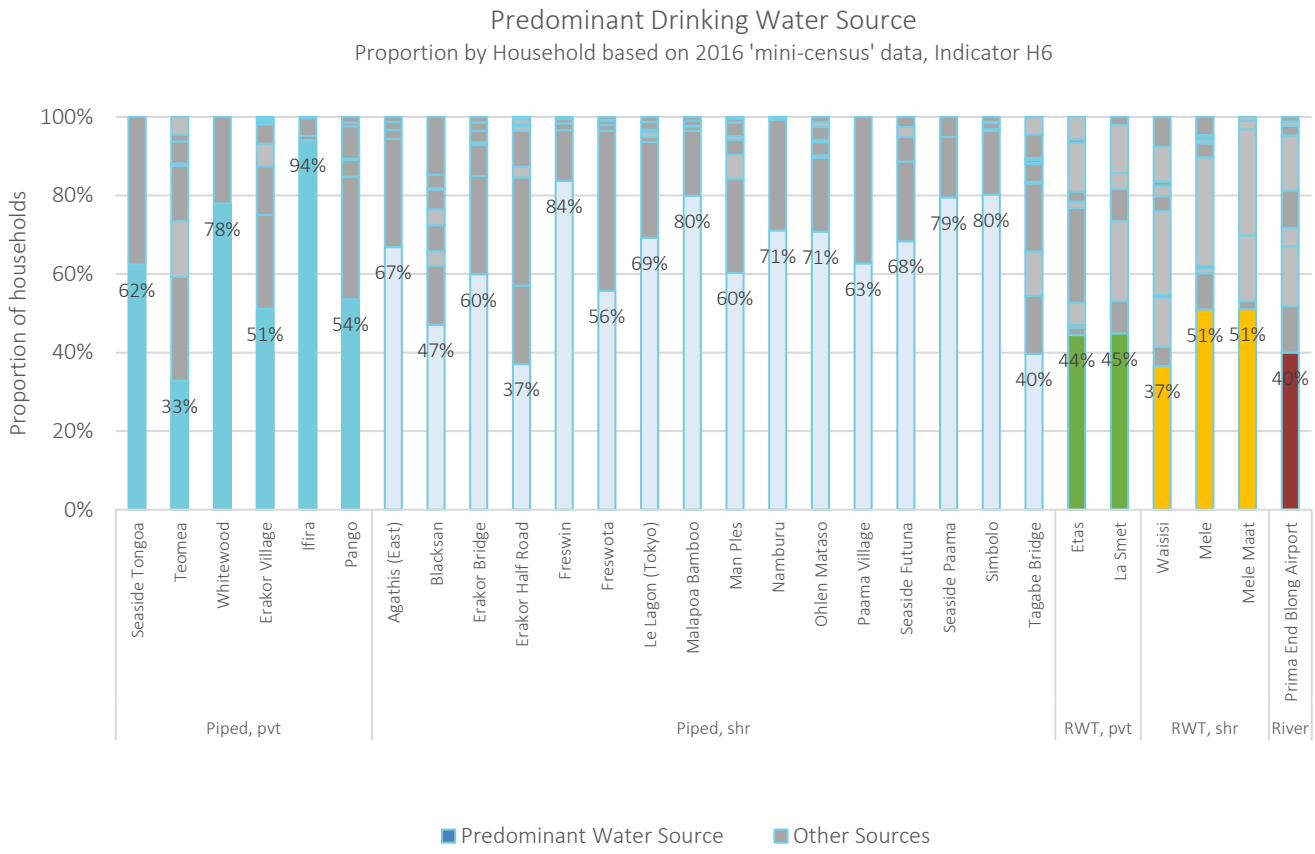

FIGURE 5: PREDOMINANT DRINKING WATER SOURCE REPORTED BY HOUSEHOLDS IN THE 2016 CENSUS

Conclusions and recommendations

Residents of informal settlements across the Port Vila region were found to have diverse access to water, sanitation and hygiene services and infrastructure, ranging from relatively adequate to substantially inadequate. The characterisation indicated that while it is commendable that WASH questions are included in Vanuatu's national censuses, additional behavioural (i.e. where people go to defecate as opposed to what toilet type the household accesses) and infrastructure (how is faecal sludge managed) would provide additional information to assist government and service providers to address WASH access across the region.

WASH access in the settlements was quantified to understand the existing faecal pathogen sources and the existing barriers to pathogen transmission. Importantly, improved sanitation facilities alone do not guarantee interruption to pathogen transmission pathways, particularly when facilities are not well maintained, unhygienic, or not used correctly. Nonetheless, sanitation options that separates faeces from the environment; a protected water source; and handwashing are all important barriers for households and communities to adopt. Recognising diversity across and within settlements is vital to ensure suitable, sustainable, inclusive and user-appropriate WASH services that can improve health and wellbeing.

Related publications

1. Sanderson, R. and Souter, R., 2020, *Shit flows matter – understanding faecal pathogen transmission in urban informal settlements in Port Vila, Vanuatu* (full report), International WaterCentre & Griffith University
2. Sanderson, R. and Souter, R., 2020 *Investigating the transmission of faecal pathogens in urban informal settlements in and around Port Vila, Vanuatu, recognising biophysical and demographic diversity – Faecal pathogen transmission exposure typologies* (Research brief), International WaterCentre & Griffith University

Literature cited

1. Satterthwaite, D., et al., *Building resilience to climate change in informal settlements.* One Earth, 2020. **2**(2): p. 143-156.
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4. Niva, V., M. Taka, and O. Varis, *Rural-Urban Migration and the Growth of Informal Settlements: A Socio-Ecological System Conceptualization with Insights Through a "Water Lens".* Sustainability (Basel, Switzerland), 2019. **11**(12): p. 3487.
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