Sewage Management in Northeast Syria

February 2023

Introduction

Improving sanitation systems in Syria is essential in light of ongoing health concerns

There are inumerable problems with sanitation systems in Syria, causing serious public health concerns.[i] This issue has received increased attention since the declaration of a cholera outbreak in Syria in September 2022.[ii] Cholera is spread through the faecal-oral route, meaning that it spreads when people consume water or food which is contaminated with faeces infected with cholera.[iii] Hence, **problems with sanitation systems pose a major risk factor for the spread of cholera** (see REACH's brief). However, **even beyond cholera, rates of waterborne diseases are high.** In Northeast Syria (NES), almost 170,000 people were recorded to have suffered from acute diarrhoea in 2022, with a peak of 25,000 in June.[iv] Diarrhoea in children can cause serious and persistent health concerns, including malnutrition and stunting, impaired cognitive development, and increased risks of ill health in later life.[v] However, in adults too diarrhoea can have concerning consequences – cholera specifically can lead to fatality rates of up to 50% due to dehydration if left untreated.[iii]

The current report had a twofold motivation. On the one hand, it helps to inform the ongoing efforts to eliminate cholera and prevent further outbreaks. On the other hand, the sanctions waivers authorised by the US in May 2022 (titled General Licence 22) provide exemptions for activities in water and waste management in NES,[vi] improving the scope of action for necessary structural amendments in the WASH sector. Hence, **this report focuses on problems surrounding sewage management in NES**. This includes looking into the type and prevalence of sewage management systems currently used, while also highlighting problems and vulnerabilities of these systems.

Methodology

The data used here was collected specifically for this report and can be accessed upon request. Data was collected between November 20 and December 19, 2022. In total, **1,258 communities[1] were assessed**; no data was collected in Ain al-Arab (Kobani) due to security concerns at the time of data collection. **In each community, three key informants (KIs) were interviewed** (3,774 interviews) using a structured questionnaire. The community-level data uses the three responses to improve the accuracy of the data, generally focusing on the most-reported responses for single-choice questions or, for multiple choice questions, any answers given by at least one of the KIs.

Please note that information provided by KIs is indicative of the situation and may not represent the situation of the entire population. **Where data is reported as a percentage of assessed communities, please note that population size is not taken into account**, so that a very large community is taken into account equally to a very small community.

The population counts used here were collected by the Humanitarian Needs Assessment Programme (HNAP).[vii] For 27 communities, REACH's community definitions did not accord with HNAP's, hence population sizes for these communities were estimated either based on the geographic population size, or, in the case of city neighbourhoods, based on the average neighbourhood size. For a complete overview of estimates, please see the endnotes.

1. Communities are villages or neighbourhoods of cities (admin 4). This excludes camps for internally displaced people.

Classification of Sewage Management Systems

For the purposes of this assessment, the relevant sewage management systems were defined in collaboration with REACH's field team as follows[2]:

- **Sewage network** (شبكة الصرف الصحي): A network of underground pipes that convey sewage and other wastewater from individual households to a centralised treatment facility or disposal site.
- **Onsite septic systems**:
  - **Household septic tank** (خزان الصرف الصحي المنزلي): A watertight underground chamber through which sewage flows for primary treatment. This treatment is moderate – solids settle down to the bottom and are slowly degraded. Solids must be removed regularly while the fluids (effluent) either flow directly out of the tank (e.g. into a leach field) or are removed and transported elsewhere.
  - **Household underground holding tank or "cesspit"** (خزان منزلي تحت الارض /حاوية): A watertight underground container in which sewage is stored but receives no treatment. This needs to be emptied regularly.
  - **Soak pit** (فنية جورة): An underground chamber with porous walls (walls which liquids can pass through) that allows liquids to slowly soak into the soil. The remaining solids can either be emptied once the soak pit is full, in which case the soak pit can be reused, or it can be covered and a new soak pit can be dug.
  - **Surface run-off** (الجريان السطحي): No sewage infrastructure is present, and excreta are disposed of directly on the ground (for instance through open defecation).

Key Take-Aways

This assessment shows that most assessed communities in Northeast Syria do not have functioning sewage networks, despite the large benefits to public health these can achieve. It is predominantly the larger communities that have sewage networks, with smaller communities relying heavily on soak pits. This is problematic because soils tend to not be absorptive enough for soak pits, because they have problems with flooding, and because decommissioned soak pits are not safely covered and thus become a safety hazard for people and animals.

While this report highlights problems with existing sewage management systems, further research would be needed to better understand which solutions are financially viable, culturally acceptable, context appropriate, and bring the largest benefit to public health.

Sewage Network

Only larger communities were connected to the sewage network

Installing functional sewage networks is one of the most effective sanitation interventions for reducing diarrhoea.[viii] While only 22% of assessed communities were reported to have a sewage network, communities with at least 5,000 inhabitants were mostly connected. This becomes evident when looking at map 1, which shows the size of communities and the percentage of households reportedly connected to the network. Particularly in outside of Deir-ez-Zor governorate, larger communities saw a large proportion of households reportedly serviced by the network. Thus, **despite the relatively low number of communities with sewage networks, roughly 1.1 million out of 2.1 million households in assessed communities are estimated to have been connected.** Further details on this are provided in figure 1.

2. Please note that these definitions were constructed to be most relevant to the NES context. Definitions may differ from other sources.

Map 1: Proportion of Households Connected to the Sewage Network

as reported by KIs in assessed communities

February 2023

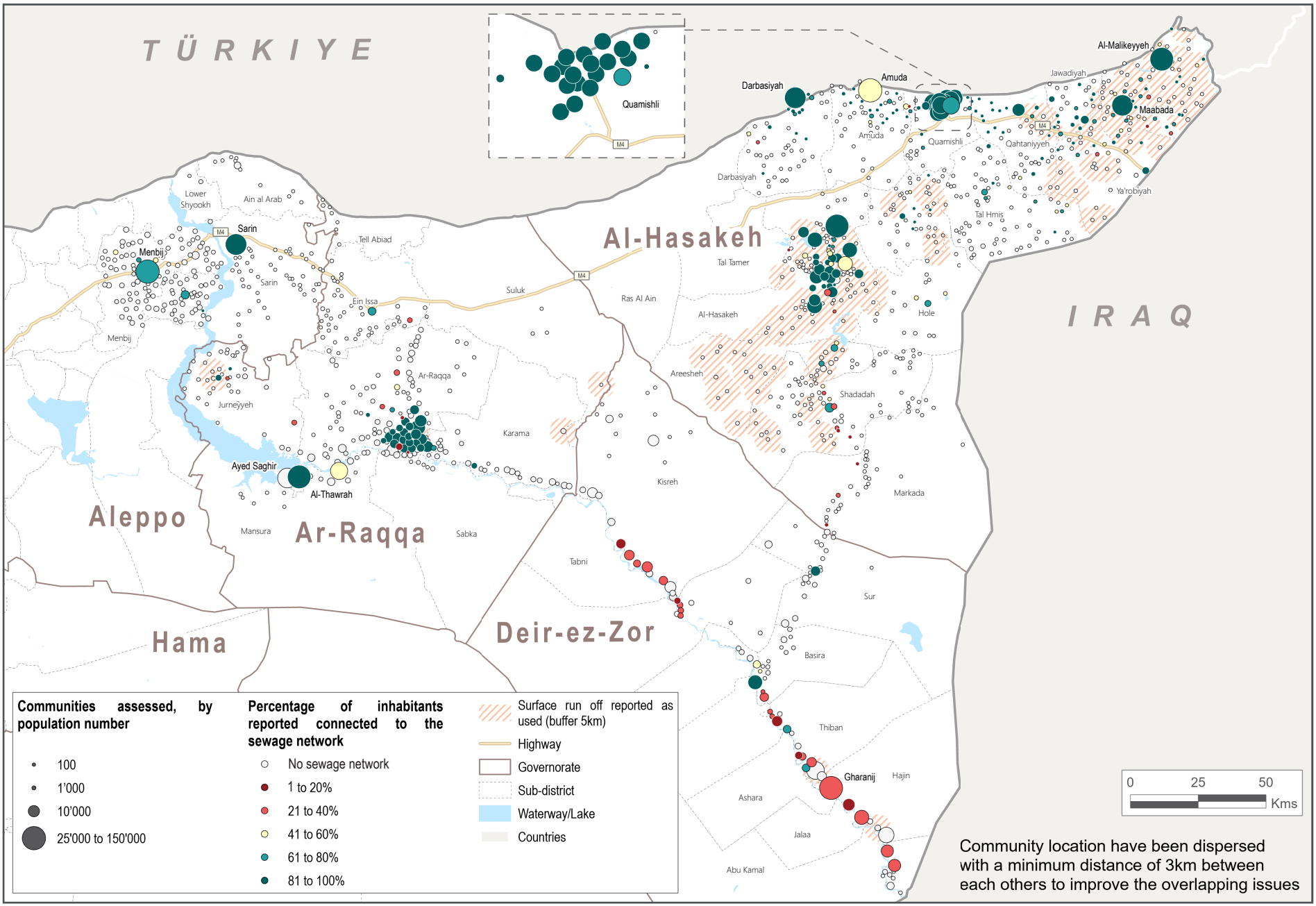


Figure 1: Proportion of Assessed Communities and Estimated Population Within Assessed Communities Reportedly Connected to a Sewage Network

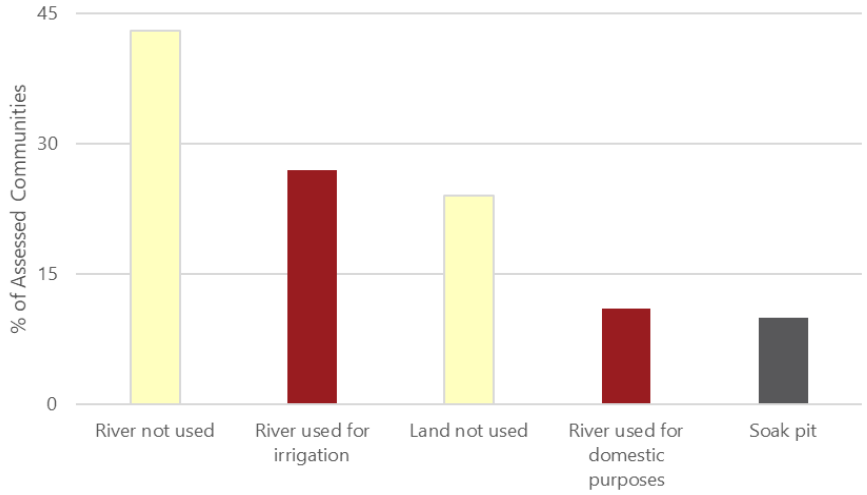
Community Size	Unit	Aleppo	Ar-Raqqa	Deir-ez-Zor	Al-Hasakeh	All governorates	Est. population connected	Est. total population
<5000 people	Communities	2%	8%	12%	24%	16%		
	People	2%	11%	7%	38%	17%	140,000	820,000
≥5,000 people	Communities	75%	81%	63%	98%	83%		
	People	75%	80%	26%	93%	74%	1,000,000	1,330,000

While sewage networks can be hugely beneficial to sanitation and public health, the absence of sanitation networks in smaller communities is not necessarily a problem. Research highlights that centralised sewage networks are extremely costly in areas with low population density, making decentralised systems far more cost effective.[ix,x] Furthermore centralised systems rely heavily on a constant supply of energy and may be damaged through conflict or natural hazards,[ix] both of which are relevant in the Syrian context.

Sewage remained untreated and was discharged directly into the environment, at great risk to human and environmental health

Concerningly, none of the KIs reported any treatment of sewage from the network, and the WASH working group noted that only one wastewater treatement facility in NES is currently (partially) operational. Hence, **raw sewage apparently was directly discharged into the environment**. In 43% of communities*, KIs reported that sewage was discharged into rivers or streams that the community did not rely on for water (see figure 2). This however creates problems for downstream users, as well as for the environment.[xi] Similar issues arise for the quarter of communities* that reportedly dispose of sewage on land not used by the community. **In addition, in a third of communities*, KIs reported sewage from the network being used for irrigation and fertilisation or being disposed of in rivers or streams used for irrigation.** Wastewater has a high concentration of minerals that can benefit crop growth. However, the use of untreated wastewater for irrigation could also negatively affect plants through toxins and salts in the sewage,[xii] and risks the spread of diseases to the farmer and consumers. Lastly, the most direct route of faecal-oral transmission comes from the **11% of communities* that reportedly discharged sewage into rivers or streams from which water is used for domestic purposes** (e.g. for drinking, cleaning, cooking; est. 375,000 people).

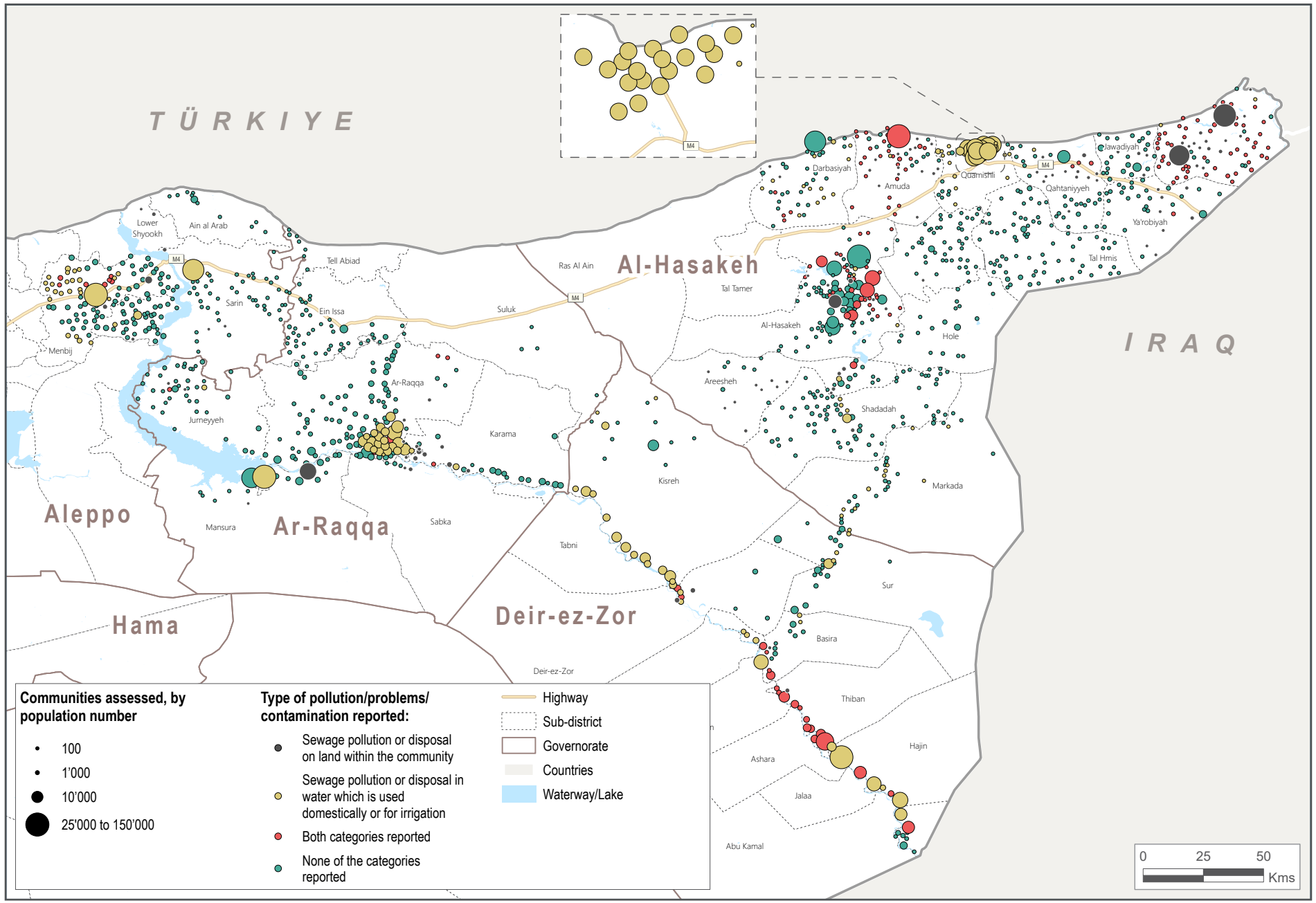
Figure 2: Locations to Which Sewage Networks Were Discharged



* This symbol indicates where "assessed communities" refers to the 22% of communities in which KIs reported that there was a sewage network present.

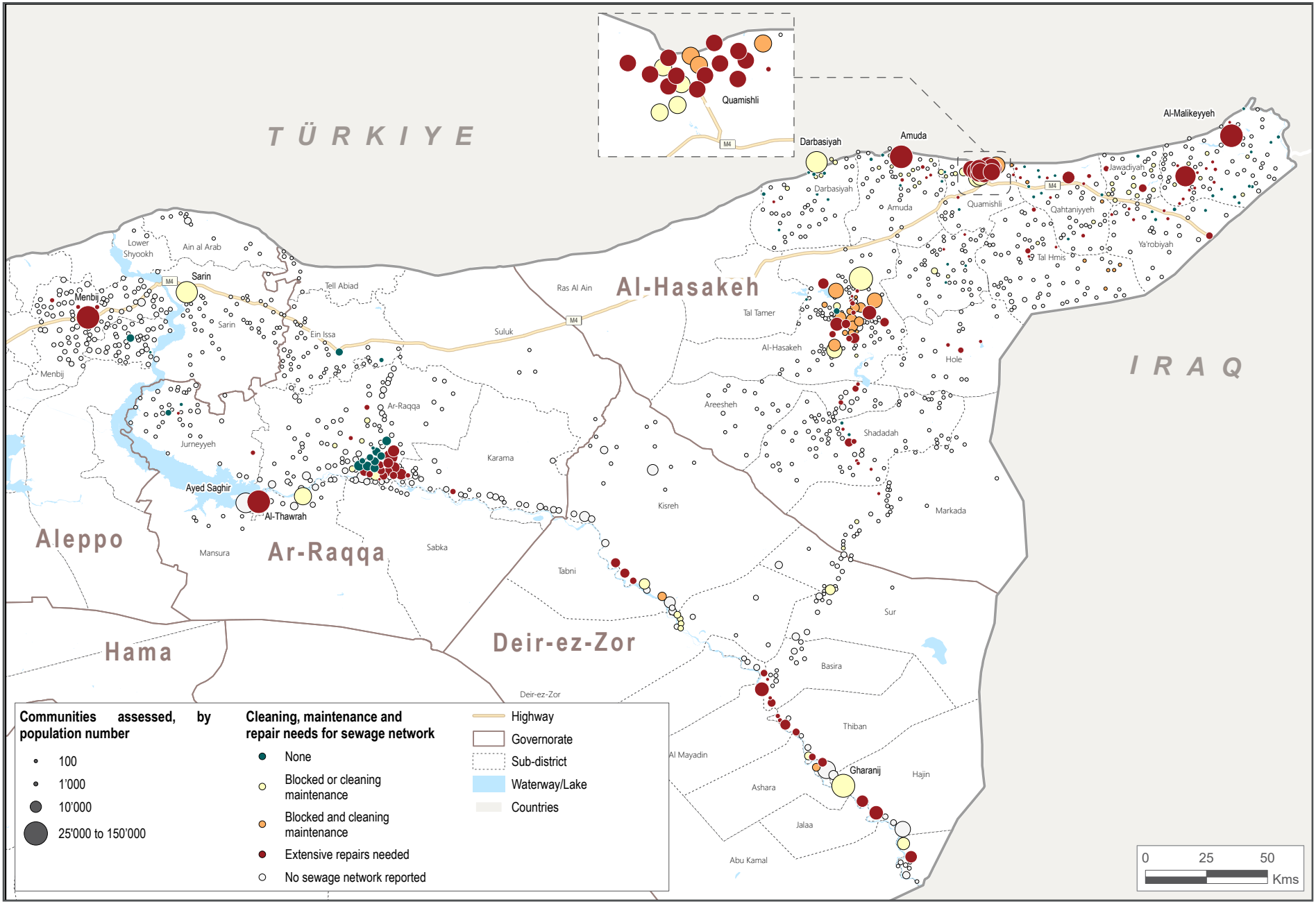
Map 2: Sewage Pollution in Sensitive Areas

as reported by KIs in assessed communities



Map 3: Select Maintenance Needs of Sewage Networks

as reported by KIs in assessed communities



Additional risks come from pollution caused by the sewage network. This includes not only unused bodies of water and land, but also public spaces (6% of communities*), rivers or streams which the community relies on for water, and fields. Map 2 gives a partial overview of sewage disposal and pollution sites. The map shows clearly that many communities along the Euphrates, particularly in Deir-ez-Zor governorate, have issues with contamination of water bodies which the communities rely on for domestic or irrigation water.

Maintenance needs were widespread

The most common problem with the sewage network was a need for cleaning and maintenance, reported by KIs in 75% of assessed communities* (see map 3). Furthermore, **in 44%* they reported the need for extensive repairs.** A report published before the onset of the crisis highlighted problems the sewage networks faced due to a lack of qualified personnel which could conduct maintenance activities. This was noted particularly in Deir-ez-Zor, where the sewage infrastructure had strongly degraded due to its age and the lack of technical capacity for maintenance.[xiii] These problems are likely to have become worse since the onset of the crisis.

Onsite Septic Systems

Soak pits were the most commonly used onsite septic system despite site-specific problems

The most commonly used septic system are soak pits, used in 90% of assessed communities by an average of 89% of households in those communities, according to KIs. In total, soak pits are estimated to have been used by 1 million people, around half of the population in assessed communities.

Soak pits suffer from several problems. They rely on soils that have good absorptive properties so that wastewater can slowly soak into the earth. This way, small particles are filtered by the soil and organic materials are digested by microorganisms. Where soils are too porous, pathogens and toxins can trickle into the groundwater. Where soils are not absorptive, wastewater is added more quickly than it can drain.[xiv] This appears to have been a common issue, with KIs in 30% of assessed communities using soak pits having reported that **there were problems with soils not being absorptive** (particularly in Aleppo and Ar-Raqqa governorates). Furthermore, where groundwater levels are quite high, wastewater can contaminate groundwater. **In 26 of the communities that had soak pits, KIs reported that groundwater was less than 5 meters below the surface** (mainly in Al-Malikeyyeh and Menbij subdistricts). The minimum recommended distance between the base of the soak pit and the groundwater table is two meters,[xiv] making these areas are more likely to suffer from groundwater contamination. KIs in 16% of communities reported groundwater contamination as a problem related to onsite septic systems. **Soak pits are also prone to flooding,[xiv] as is evidenced by the 45% of communities using soak pits in which KIs reported this problem, which can lead to sewage overflowing.**

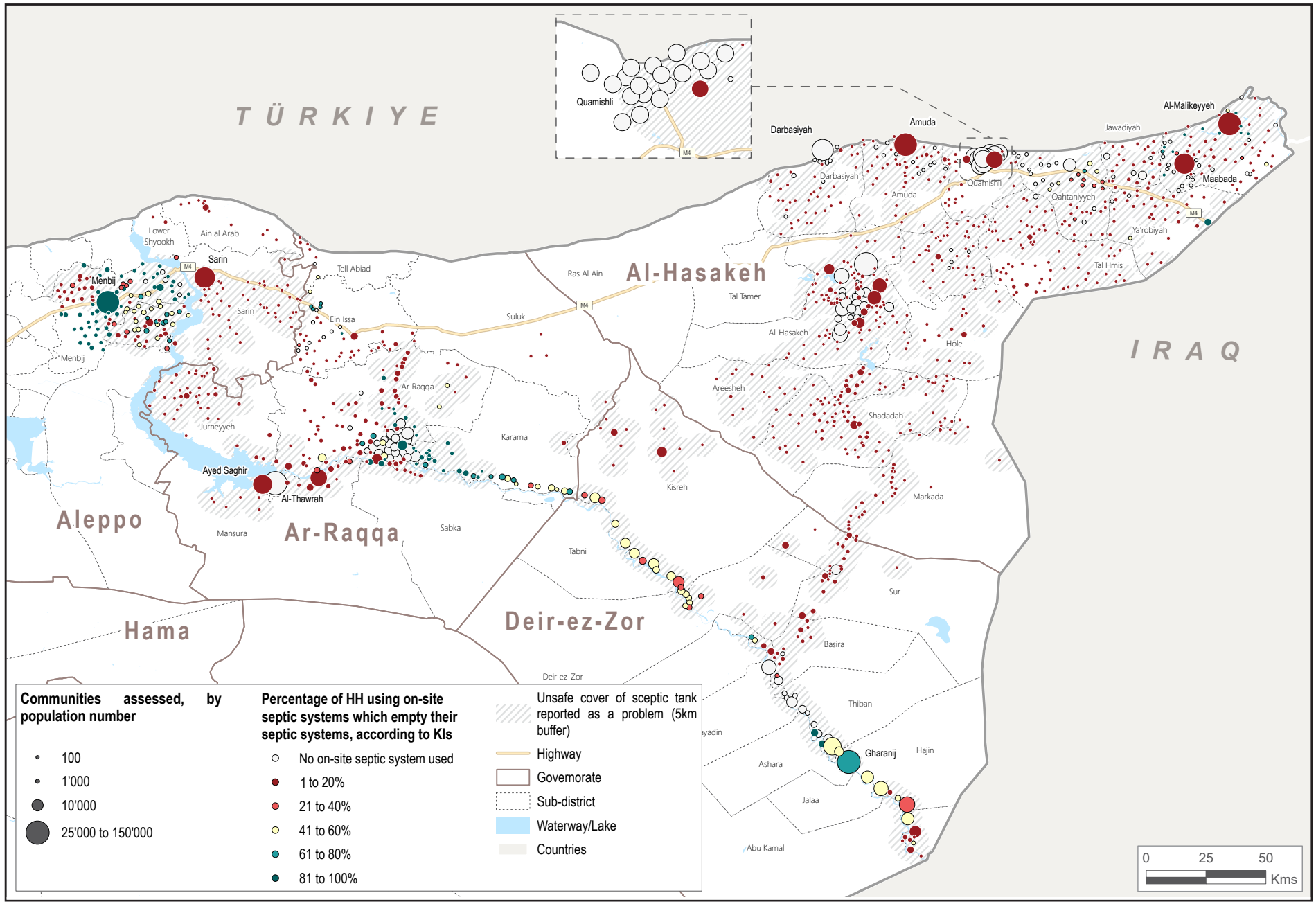
Most households do not use desludging services due to low availability and high costs

However, **the single most commonly reported issue was that the covers of out of use soak pits were unsafe.** This problem arises because emptying onsite septic systems is very uncommon, with households instead opting to cover old soak pits and construct new ones. In only a quarter of assessed communities•, KIs reported that desludging occurred. Even within these communities, only a portion of households empties their septic systems. Much more commonly, households that used soak pits chose to cover their full pits and dig new ones. Hence, two thirds of communities• reportedly had problems with unsafe covers. One KI in particular highlighted a child that was admitted into intensive care after having fallen into an unsafely covered soak pit.

• This symbol indicates where "% of communities" refers to those communities in which KIs reported that onsite septic systems were used.

Map 4: Proportion of Households Relying on Onsite Septic Systems Which Empty their Septic Systems February 2023

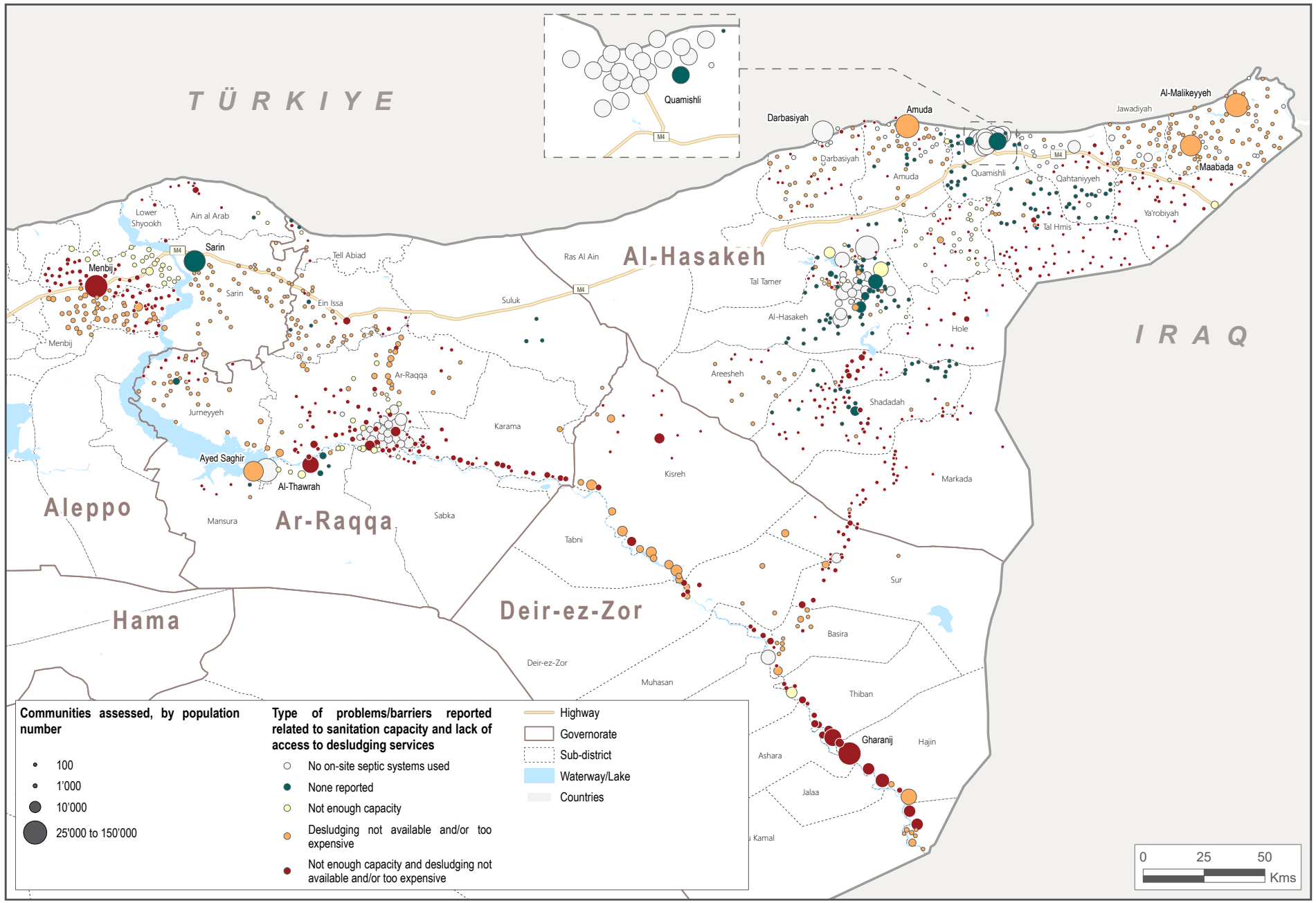
as reported by KIs in assessed communities



Map 5: Lack of Onsite Septic System Capacity and Barriers to Desludging

as reported by KIs in assessed communities

February 2023



Map 6: Reliance on Manual Desludging

as reported by KIs in assessed communities

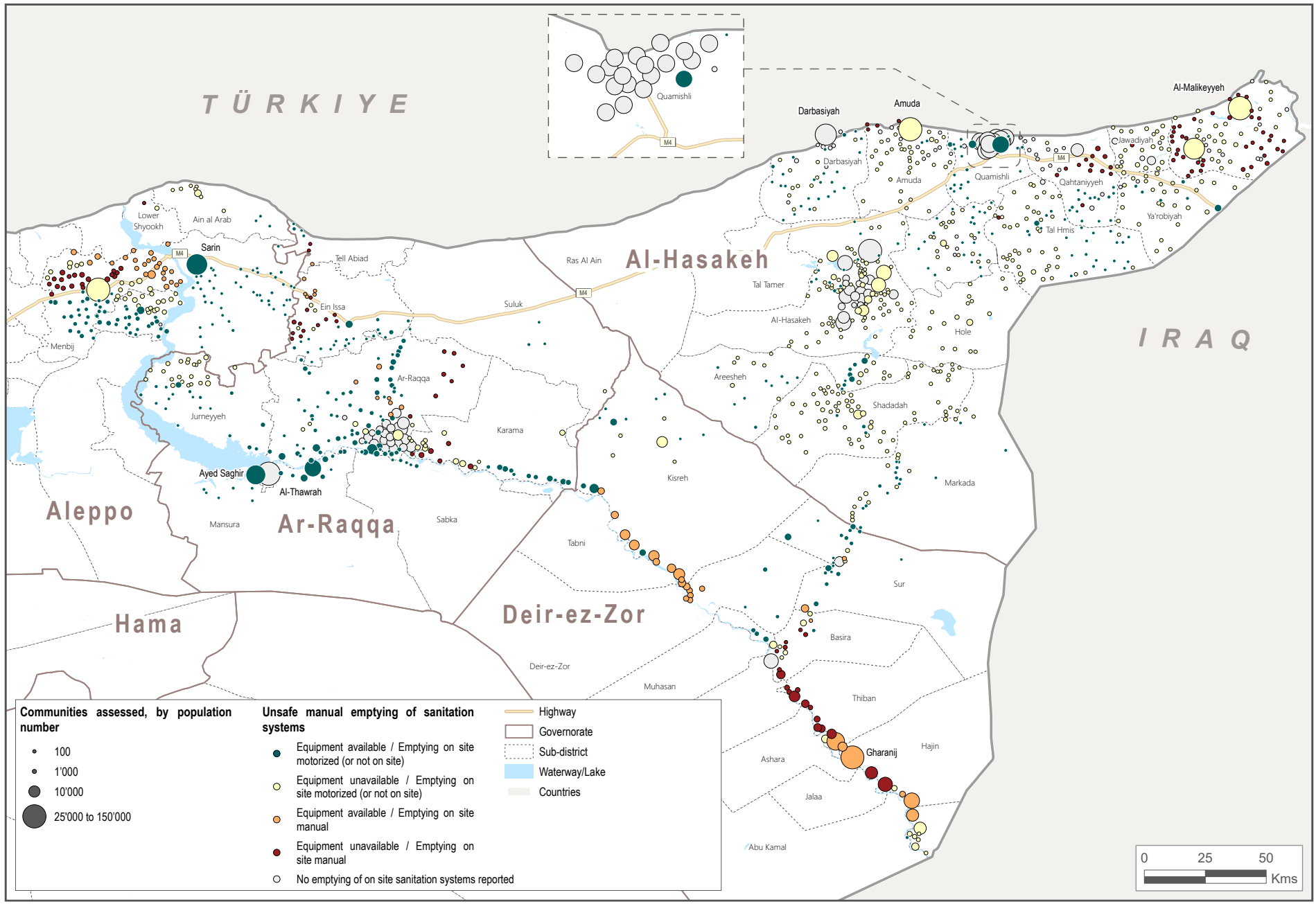
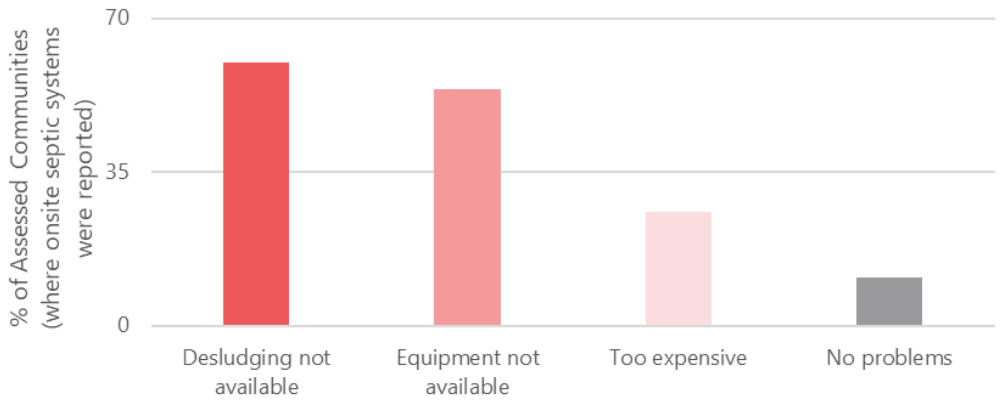


Figure 3: Barriers to Desludging



The need for desludging is clear, with KIs in half of all communities• noting the lack of capacity of the systems (i.e. fill up too quickly). However, **KIs in 60% of communities• reported that desludging services were unavailable** and in 54%• that desludging equipment was unavailable (see figure 3). Map 4 shows the proportion of households with onsite septic systems that reportedly desludging their septic systems. Map 5 shows communities that struggle with the lack of capacity in their septic systems and those where desludging services or equipment were unavailable.

Desludging is commonly done manually (see map 6). Manual desludging could include the use of hand pumps, diesel pumps, buckets and shovels. With motorised desludging, pumps connect directly to a truck so that workers do not come in contact with sewage. Since manual desludging does not have this separation, workers are required to wear extensive personal protective equipment.[xiv] However, **in 79% of communities where manual desludging happens, KIs reported that not everyone wears sufficient protective clothing** (gloves, boots, overalls, AND face masks). In the absence of such safety measures, an assessment by the World Bank and others found that, "Sanitation workers who are not protected by adequate health and safety measures risk injury, infection, disease, mental health issues, and death."[xv]

In a third of all communities in which desludging occurred, all sewage was transported away from the households. For the rest, at least some of the sewage was pumped directly to an area around the households. When it was transported away, it is most commonly reported to have been disposed of on empty land farther from the household (78% of communities•). Again, no KIs reported that sewage was transported to a wastewater treatment facility.

Endnotes

1. Population sizes for neighbourhoods in Quamishli were estimated using the average population size of neighbourhoods assessed by HNAP (13,195). For seven communities in Deir-ez-Zor, the population size was estimated based on the size of the community on satellite images. For the 12 communities which REACH assessed for which HNAP reported a population size of 0, the maps show the communities as having less than 100 people while calculations using population size use the 0 value.

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• This symbol indicates where "% of communities" refers to those communities in which KIs reported that onsite septic systems were used.

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