

# Mapping service provision at the local level in Yemen

Dr. Ahmed Almaweri

RESEARCH REPORT

A case study of Taiz city, Mukalla, Seiyun, Aden and Al-Ghaydah



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## EXECUTIVE SUMMARY

This report maps the provision of electricity, water and cleanliness (street cleaning and solid waste management) services in five areas under the Internationally Recognised Government (IRG) in Yemen: Taiz City, Mukalla, Seiyun, Aden and Al-Ghaydah. It examines how more than a decade of conflict, fiscal collapse and fragmented authority have reshaped local service systems.

The study combines a structured desk review with semi-structured interviews conducted in late 2025 with managers of electricity, water and cleanliness utilities, local authorities, civil society representatives and service users. It treats each city as a distinct case embedded in a wider national political economy and then compares patterns across cases. For each sector, it assesses current status, the main factors affecting performance and the key stakeholders who enable or block restoration.

Three core findings emerge.

- First, performance diverges sharply across cities and is driven more by governance and conflict geography than by “technical” constraints alone.
  - Taiz and Aden sit at the extreme end of fragility. In Taiz, the public electricity grid has entirely collapsed, and water production is constrained by armed control over key wellfields, while cleanliness services operate with a gutted fleet and a hazardous dumpsite. In Aden, installed electricity capacity and well numbers look large on paper, yet fuel politics, dual authority and decayed assets translate into long blackouts, major water shortfalls and only partial waste collection.
  - Mukalla and Seiyun occupy an intermediate position. Both maintain functioning public electricity and water utilities and operational Cleaning Funds, but under strict load-shedding, growing shortages and only partial waste capture; Mukalla is sliding under the weight of under-investment and weak revenue collection, while Seiyun remains relatively stable thanks to more coherent local governance, better cost recovery and deliberate institutional reforms.
  - Al-Ghaydah shows comparatively high coverage across sectors, but this rests on ageing diesel-based infrastructure, heavy local subsidies and weak regulation of private alternatives. It is closer to an outdated fragile “island of functionality” than a robust model for the future.

- Second, all three services are being run on structurally unsustainable financial and operational bases.
  - Tariffs in electricity and water are far below cost, collection rates are highly variable and often low, and a large share of real operating costs is displaced onto the central budget, local authorities or donors. In all cities, electricity and water utilities cannot cover the cost of inputs (like fuel) and basic maintenance from user revenues.
  - Cleaning Funds in all locations report that their main income sources, small levies on electricity bills, business licences or governorates' entry points fees<sup>1</sup>, are "symbolic" relative to inflation and waste volumes. In Taiz, household-level cleaning revenue has largely disappeared with the collapse of public billing systems.
  - Over the last five years, donors have become de facto financiers of essential services, especially in electricity solar stations, fuel grants, emergency water support and solid waste machinery. This has helped prevent outright collapse but has also entrenched projectised short-term logics and delayed politically difficult reforms to tariffs, enforcement and infrastructure.
- Third, service systems have been partially re-ordered around informal markets, armed actors and ad hoc local fixes, with a fractured social contract.
  - In Taiz, unregulated private diesel mini-grids and informal waste haulers operate largely outside public control, with rents shared with armed and political elites. The state's role is reduced to partial mediation without real enforcement capacity.
  - In Aden, control over fuel and contracts for rented power and waste services is concentrated in narrow networks connected to political factions, while the formal utilities struggle to impose payment discipline on consumers who receive irregular, low-quality services.
  - In Mukalla and Seiyun, private actors are less important and more closely regulated. To the extent that they are active, they tend to operate with government contracts or under formal supervision.
  - Across cities, the collapse or erosion of predictable, decent-quality service has undermined citizens' willingness to pay and their perception that fees correspond to a public good. Non-payment, illegal connections and informal dumping are rational responses in this environment and not simply due to "lack of awareness".

At the same time, the report finds that local institutional choices still matter. Seiyun and, to a lesser degree, Al-Ghaydah show that where local authorities protect utilities from overt political capture, maintain basic wage discipline, invest modestly in solar back-up and network rehabilitation, and engage with civil society, it is possible to sustain a minimal, predictable level of service even under severe macro-economic stress. Conversely, where armed actors and political elites treat utilities

and Cleaning Funds as revenue sources, as in Taiz and Aden, collapse or permanent crisis becomes the equilibrium.

The implications are clear. Restoring and stabilising local services in IRG-held areas is not only a question of “more projects” or more fuel; it requires:

- Insulating core service institutions from armed and political interference;
- Rebuilding credible, cost-reflective but socially sensitive local revenue systems;
- Shifting external support from short-term gap-filling toward investment in long-lived assets and institutional capacity; and
- Rebuilding a basic social contract in which citizens see a reason to pay, and authorities have both the mandate and the means to deliver.



## LIST OF ABBREVIATIONS

DFA	De Facto Authorities
INGO	International Non-governmental Organisation
IRG	Internationally Recognised Government
LWSC	Local Water and Sanitation Corporations
MoPIC	Ministry of Planning and International Cooperation
MW	Megawatt(s)
NGO	Non-governmental Organisation
NWRA	National Water Resources Authority
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PEC	Public Electricity Corporation
PLC	Presidential Leadership Council
STC	Southern Transitional Council
UNDP	United Nations Development Programme
WB	World Bank



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# 1 Introduction

Electricity, water supply, and cleaning, including street cleaning and solid waste management, are critical services. They are both flashpoints for public discontent when they are not provided and they are key enablers of local development when they are (Basalamah, 2018), with multiplier effects for the ability of local businesses to operate and for public health.

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**Electricity, water, and cleaning, are flashpoints for public discontent when they are not provided and key enablers of local development when they are.**

These services have come under tremendous strain since the outbreak of war in Yemen. In 2014, the country's negotiated transition from rule by former President Ali-Abdullah Saleh collapsed. In March 2015, a Saudi-led coalition intervened to restore the government, and the conflict evolved into a proxy war primarily involving Saudi-, Emirati- and Iranian-aligned actors (Lubczynski & Matusitz, 2023; Karakir, 2018). The country fragmented into territories controlled by the Houthi-led authorities in the north, the Recognised government in the south, and numerous militias and factions with localised areas of control (Eleftheriadou, 2023).

## 1.1 Services under strain

Under these conditions, once-central public services for electricity, water and cleaning disintegrated and central state revenues collapsed in the early war years (Almawari, 2023). Local authorities that had depended on central transfers for up to ninety percent of their funding saw that lifeline cut (AlMawari, 2018; Rogers, 2019). Without approved budgets, local councils could only deliver services if they succeeded in mobilising alternative income sources, such as local fees or oil and gas revenues. Some governorates, especially those less exposed to direct violence, expanded their role in providing electricity and water, while others failed to deliver critical services (Almawari & Alawami, 2025; Jautz, Basalma, & Rogers, 2022). Non-governmental organisations and international donors stepped in sporadically to stabilise essential functions, but their interventions often remained short term or were constrained by ongoing conflict. The crisis in basic services contributed

significantly to the unprecedented humanitarian emergency Yemen is facing: an estimated 18.2 million people, over half the population, require urgent assistance

### MAP OF YEMEN HIGHLIGHTING RESEARCH LOCATIONS BY CITIES AND GOVERNORATES



SOURCE: BERGHOF FOUNDATION, MARCH 2026.

and social protection (OCHA, 2024).

Heightened insecurity, economic collapse and the cessation of oil and gas production in many regions have further weakened local revenue-raising capacity (Almaweri, 2022), deepening the erosion of service provision.

One of the starkest illustrations of this collapse is the electricity sector. Before 2015, installed capacity of about 1,519 MW already fell far short of peak demand above 3,000 MW, causing frequent

blackouts (Al-Wesabi et al., 2022). With the escalation of conflict, bombing and ground fighting damaged transmission lines and generation sites across multiple governorates, and the national grid lost over 80% of its capacity within months. In many areas, the public grid collapsed entirely. Most Yemenis now endure long daily blackouts or resort to expensive and uneven private supply (Human Rights Watch, 2023a; World Bank, 2020).

Water and sanitation systems have likewise deteriorated. Over half the population lacks access to safe drinking water, and more than eighty percent remain unconnected to sewer networks (OCHA, 2024). By 2024, 17.4 million Yemenis required water, sanitation and hygiene (WASH) support, a twelve-percent increase from 2023 (OCHA, 2024). Local authorities in many areas cannot repair damaged pipelines because of insecurity and scarce financial resources. Humanitarian organisations have tried to fill these gaps, but institutional weaknesses and security and logistical constraints limit sustainable improvements (Almaweri & Alawami, 2025).

Solid waste management and street cleaning in IRG-controlled areas are strained, with partial coverage and ongoing capacity and financing gaps that heighten environmental and public health risks (UNDP, 2020a; UNDP, 2020b; Pax for Peace, 2025; Lackner, 2021).

## 1.2 Purpose and methodology

This paper examines how protracted conflict has shaped the delivery of these local services in areas under the internationally Recognised government (IRG) of Yemen. It focuses on five cities: Taiz City, Mukalla, Seiyun, Aden and Al-Ghaydah. It traces where services are functioning or failing, how they are financed, why services function in some places and fail in others, who maintains them under which governance arrangements, and what local authorities and international partners can do to restore and stabilise provision. It takes a comparative approach, treating each city as a discrete case reflecting different conflict exposure, resource endowments and administrative arrangements.

Data are drawn from a desk review of local administrative records (e.g., budgets/tariffs), utility/department reports, donor/INGO documents, credible media reports, and prior research, complemented by semi-structured interviews (in person) with key stakeholders. In each location, 6–8 key informant interviews spanning electricity, water, and cleanliness were conducted, including government officials, civil society actors, and service beneficiaries. Where feasible, interviewers' claims are verified through data from desk research.

## 2 Electricity services

### 2.1 Current status of electricity services

Electricity service across the assessed cities is characterised by severe supply deficits, high dependence on expensive diesel generation, and uneven institutional performance. In Taiz City, the public grid has completely collapsed, leaving

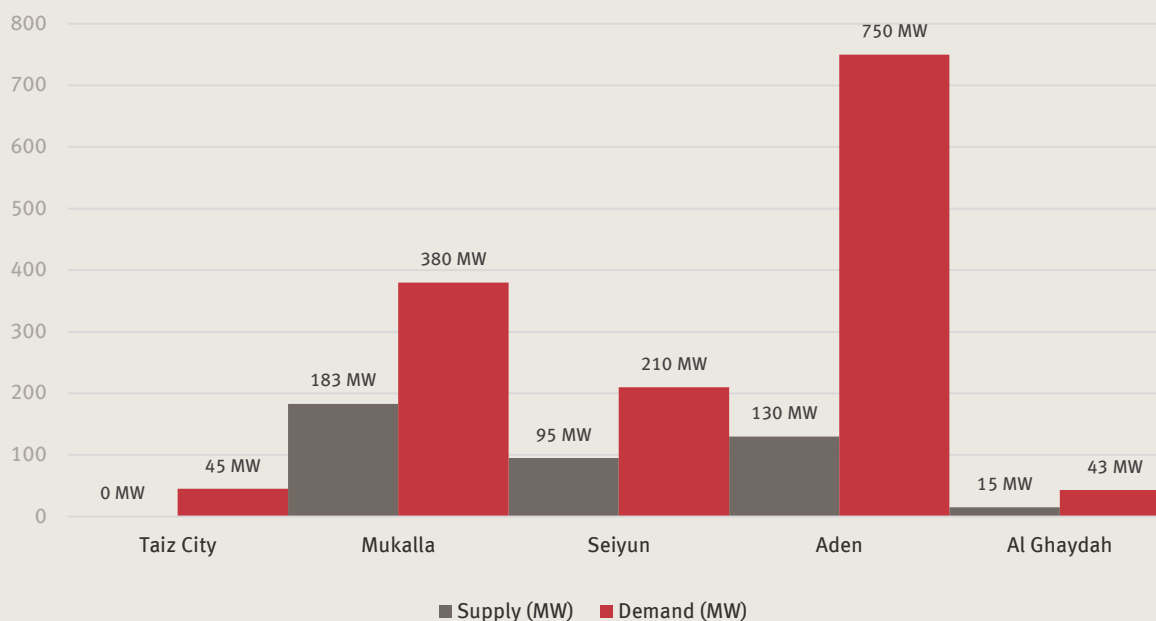
consumers reliant on unregulated private mini-grids, while in Mukalla and Seiyun public and rented generation partially meet demand but under strict load-shedding regimes. Aden faces the largest absolute gap between demand and

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**Ageing assets, fuel shortages and fragmented governance are driving blackouts of up to 20 hours per day.**

effective supply, with ageing assets, fuel shortages and fragmented governance driving blackouts of up to 20 hours per day, despite substantial installed capacity and growing solar inputs. In Al-Mahra, the grid remains publicly managed but is constrained by chronic fuel shortages and deteriorating network assets and overall lacking generation capacity, forcing households to increasingly fall back on small-scale solar. Across all locations, cost recovery is weak, service quality is highly variable, and the system remains structurally dependent on fuel availability.

**FIGURE 1: ELECTRICITY SUPPLY VERSUS DEMAND (2025) IN SELECTED CITIES – MIDPOINT VALUES (MW)<sup>2</sup>**



SOURCE: INTERVIEWS WITH PUBLIC ELECTRICITY CORPORATION OFFICIALS IN EACH GOVERNORATE, OCTOBER – NOVEMBER 2025.

In Taiz City, public electricity generation is nonexistent due to extensive infrastructure destruction, looting, and fuel shortages. The Public Electricity Corporation (PEC) reports zero megawatts of output, and all public infrastructure, including transformers, substations, and transmission lines, has been rendered inoperable or looted for scrap material (Improve Your Society Organisation, 2022a). As a result, the electricity supply is fully dominated by unregulated diesel mini-grids operated by private actors, with users charged between 800 and 1,000 YER per kilowatt hour (Interview with PEC-Taiz, 2.11.2025). These prices reflect a slight improvement compared with early 2025, driven by change in the exchange rate, when private suppliers reportedly charged around 1,500 YER per kilowatt hour. Public utilities reportedly collect no fees. Private operators only provide services to fee-paying customers, however, according to a private operator interviewed for this paper, approximately 30% of collected fees need to be passed on to local power holders and armed groups (Interview with private electricity provider-Taiz, 2.11.2025).

In Mukalla, public and rented generation together supply around 183 MW, against a demand of 380 MW. PEC produces between 66 and 83 MW locally, while an additional 100 MW is rented from private sources (large diesel and mazut generators). Together, these sources provide 100% coverage for the city (Interview with PEC-Mukalla, 4.11.2025). Power is typically provided on a 2-hours-on, 4-hours-off schedule. Despite this supply gap, tariff collection remains relatively regular due to widespread metering, institutional oversight and consumer discipline. No significant private generator market exists in the city outside of the public electricity supply, as PEC buys electricity directly from private actors, therefore, the system remains publicly managed (Interview with PEC-Mukalla, 4.11.2025).

In Seiyun, electricity services are comparatively stable. Public generation ranges from 70 to 120 MW, supplemented by an additional 31 MW from rented power, against a peak demand of 170–250 MW (Interview with PEC-Seiyun, 6.10.2025). Load-shedding is routine, with average cycles of 3-hours-on and 6-hours-off, and peak periods of up to 12–16 hours without service. However, metering is widespread, coverage reaches 98% of the city, and fee collection is reported at 90%, the highest among the cities under investigation. The service has improved significantly since September 2025 as a result of development work in the network of transmission lines, transformer stations, voltage reduction transformers and ground voltage rise transformers,<sup>3</sup> and also as a result of the operation of diesel electric generation stations such as Qaryo station, Badra station, and Room station (Interview with PEC-Seiyun, 6.10.2025).



A POWER STATION IN ADEN, YEMEN, WHERE A SCORCHING HEAT WAVE AND PROLONGED ELECTRICITY OUTAGES HAVE PLUNGED RESIDENTS OF THE SOUTHERN PORT CITY INTO A STRUGGLE FOR SURVIVAL. © PICTURE ALLIANCE / XINHUA NEWS AGENCY | MURAD ABDO. 2023.

In Aden, the installed capacity is approximately 400 MW, supplemented by 120 MW in solar generation. However, actual production is much lower, averaging between 90 and 165 MW, due to ageing infrastructure, insufficient maintenance, and persistent fuel shortages (South 24, 2024; Interview with PEC-Aden, 10.11.2025). Major facilities such as the PetroMasila (Al-Raees) plant and Mansoura station face recurring shutdowns. Blackouts average 18–20 hours per day. The city's electricity demand stands at approximately 700–800 MW,<sup>4</sup> leaving an unmet gap of 585–655 MW. Tariff collection is weak, with recovery rates around 70% (Interview with PEC-Aden, 10.11.2025). Parallel governance structures complicate fuel procurement and operational oversight.

In Al- Ghaydah, electricity services are delivered entirely by the Public Electricity Corporation (PEC), without private-sector involvement. Demand varies seasonally, ranging from 30 MW in winter to 55 MW in summer, but supply remains capped at 15 MW due to persistent fuel shortages, despite a generation capacity of 27 MW (Interview with PEC Almahra, 13.11.2025). The generation system relies on 30 diesel-powered units, all operational but underutilised due to limited fuel. The public electricity network covers approximately 95% of the city, though only 80% of this network is considered to be in good condition. The remaining 20% require urgent maintenance or replacement (Interview with PEC Almahra, 13.11.2025). Approximately one-quarter of the total network is flagged as deteriorated, needing structural upgrades and new line installations to meet load demand and reduce losses. With no private generators or formal alternative energy providers in operation, the population increasingly depends on household-level solar solutions. Beneficiaries and civil society respondents confirmed frequent outages, averaging over 18 hours daily, with complete cuts sometimes lasting 36 hours (Interview with Almahra Beneficiary, 7.11.2025; Interview with Almahra Civil Society, 7.11.2025). On average, only 20–35% of daily electricity needs are met through the public grid. Solar energy serves as the primary supplementary source, particularly in residential areas. Collection rates for electricity tariffs are variable. Occasional campaigns to disconnect the lines of non-payers have pushed compliance rates close to 100% during enforcement periods. However, they drop to around 75% when such efforts are paused (Interview with PEC Almahra, 13.11.2025). Still, tariff revenues remain insufficient to recover real costs.

## 2.2 Factors influencing electricity service provision

Years of conflict have devastated electricity infrastructure across the country. In Taiz, transmission lines and transformers have been destroyed or stripped for scrap. Similarly, in Aden, damage to power stations and transmission lines has reduced production capacity. Moreover, electricity losses, driven by technical faults and illegal consumption, reached 44% of total energy produced in 2023, more than double the pre-conflict 2015 level (South 24, 2024; Almohamadi et al., 2021). Physical damage is less of a concern in relatively stable cities like Seiyun, Al-Ghaydah and Mukalla, but lack of investment and deterioration of the grid infrastructure is a concern here too. (Interview with PEC-Seiyun, 6/10/2025; Interview with PEC Mukalla, 4.11.2025, Interview with PEC Almahra, 13.11.2025).

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**Beyond physical damage, militarisation and armed group interference play a direct role in destabilising electricity provision.**

Beyond physical damage, militarisation and armed group interference play a direct role in destabilising electricity provision. In Taiz, operational power stations have been occupied by armed groups, obstructing repairs and looting of critical equipment. Some private providers reportedly share profits with influential military and

civilian figures, effectively placing the entire sector in the hands of informal networks that resist public control (Taiz Today, 2020; Marsad, 2023; Yemen Eco, 2024). On the positive side, Osifra Power station was handed over to PEC-Taiz in November 2025, and the military groups withdrew from the station and handed it over to Engineer Rani Al-Aghbari, the director of Osifra station (Interview with PEC - Taiz, 2.11.2025). In Aden, electricity service was nearly halted in early 2025 when the Hadramaut Tribal Alliance blockaded oil shipments to protest unfulfilled demands. The Petro Masila power plant, Aden's primary energy source, narrowly avoided shutdown after Saudi-mediated negotiations temporarily lifted the blockade (Al-Masdar Online, 2025; Barran Press, 2025). These examples show how electricity generation is shaped by the actions of armed groups, and at least in Aden, is subject to being used as a bargaining tool in broader political struggles.

Governance fragmentation further compounds these problems. In Aden, fuel procurement has become politicised, with accusations of monopolisation and inflated costs, exacerbating blackouts (Yemen Eco, 2025). Meanwhile, short-term funding from Saudi Arabia remains the only stopgap preventing total collapse (SPA, 2021). While such fragmentation in Aden is particularly severe, similar fragmentation is visible in Hadramaut, where coastal (Mukalla) and inland (Seiyun) authorities compete for oil revenues needed to fund diesel purchases. Recurrent fuel shortages and blockades by tribal actors have triggered blackouts and political standoffs, including threats of “full self-rule” by the Hadhrami Tribal Alliance in late 2024 (AlQuds Alarabi, 2024).

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## In Aden, monthly electricity revenues reportedly fall short of even one day of operating costs.

Severe institutional deficiencies undercut the capacity of utilities to respond effectively. Tariffs are below production costs and have not been updated despite the collapse in the value of the Yemeni Riyal. Tariffs remain as low as 6–19 YER per kilowatt hour in many cities. In Aden, monthly electricity revenues reportedly fall short of even one

day of operating costs (nearly 2 million USD per day) (Yemen Future, 2023). Overall, the government reportedly spends 31% of its overall revenues on the electricity sector (Attaqa, 2024). Manual billing systems, limited metering, and widespread illegal connections make cost recovery nearly impossible. Staffing shortages are acute: for instance, Taiz lost many trained engineers during the war (Interview with PEC - Taiz, 2.11.2025). In Al-Ghaydah, payment compliance fluctuates depending on enforcement campaigns, though tariff levels remain heavily subsidised and well below actual production costs (Interview with PEC-Almahra, 13.11.2025).

## 2.3 Key stakeholders in the electricity sector

Electricity service provision in Yemen is embedded within a contested and fragmented governance landscape where control over infrastructure is both a source of revenue and political leverage. In Taiz, formal institutional actors such as the Public Electricity Corporation are operationally present but structurally incapacitated. Despite nominal authority, the PEC lacks the basic conditions to function: its facilities have been looted, its assets misappropriated, and its operational space obstructed by wartime damage. Armed groups have occupied and looted power infrastructure and rerouted generators and materials for private benefit. The Osifra station, for instance, while finally returned to PEC control, through directives of the Chairman of the Leadership Council, saw only partial repairs using leftover spare parts, while the remaining 30% of its restoration has become contingent on the Saudi Development and Reconstruction Programme (Interview with PEC-Taiz, 2.11.2025). While this intervention happened after many years, it is clear that weakened local authorities avoid reclaiming looted equipment to prevent clashes with powerful local actors, effectively conceding control of the electricity sector to armed patrons and private suppliers (Interview with PEC-Taiz, 2.11.2025).

Private commercial operators now dominate electricity provision in Taiz, functioning largely unregulated and beyond formal price controls. Their growing role is not simply economic but political: several reports indicate that these providers share revenues with military and civilian elites, turning electricity into a parallel revenue stream protected by influence rather than governed by law. In this context, local authorities appear less like regulators and more like brokers attempting to mediate prices without enforcement capacity. Recent attempts to standardise pricing, such as the proposed tariff of 800 YER for residential use and 950 YER for commercial purposes, have been stalled pending the governor's directive (Interview with PEC - Taiz, 2.11.2025), highlighting the extent to which even basic regulatory decisions hinge on elite consensus rather than institutional procedures. However, from another point of view these occurrences represent a rare, concrete step toward re-establishing state control over a previously militarised asset, potentially paving the way for limited restoration and future public oversight.

In Hadramaut, including Mukalla and Seiyun, PEC branches retain a formal role in electricity distribution and have preserved some administrative coherence. In Mukalla, for example, private providers supply electricity through institutional channels and under fixed agreements with the PEC. However, their operations remain vulnerable to political disruptions, particularly from the Hadramaut Tribal Alliance (HTA). Although some of the issues were mediated/temporarily resolved, fuel blockades exemplify how tribal actors can exert strategic control over energy flows and disrupt service at scale. In Seiyun, the utility cannot meet electricity demand, so households rely on battery systems. When grid power returns, simultaneous battery charging adds a surge load that strains the network and contributes to overload and equipment damage (Interview with PEC - Seiyun, 6.10.2025).

Aden presents a different, but equally problematic, stakeholder landscape for electricity provision, shaped less by outright militarisation than by fragmented

authority between local and central-level institutions and elite competition (Yemen Eco, 2025). Large UAE-backed solar investments have added about 120 MW of capacity, with a second 120 MW phase underway, but even 240 MW will not close the 585–655 MW deficit between supply and demand that currently exists. Saudi Arabia has acted as a de facto service provider by funding fuel shipments, a role that is stabilising but temporary and politically contingent, deepening Aden’s dependence on external actors rather than functioning local institutions. No single actor has full control: governance is split between politically-appointed officials, residual government structures and informal elite networks of politicians and traders, so fuel allocation, revenue collection and network maintenance are governed by bargaining and delay rather than technical planning or public accountability. Aden’s problem is not total collapse, as in Taiz, but paralysis rooted in institutional duplication and elite capture, making meaningful reform dependent on resolving broader questions of political legitimacy and power sharing, not just on technical fixes or additional donor projects.

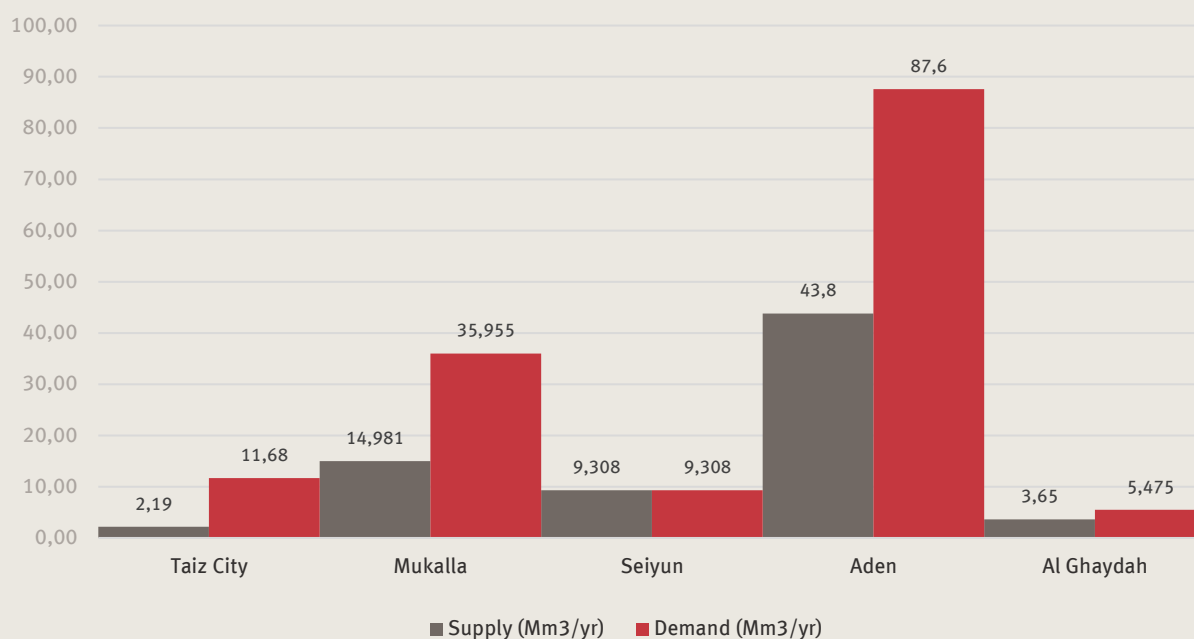
Al-Ghaydah presents a rare case of fragile but relatively consistent public electricity provision. Notably, unlike most other cities, there is no formal private electricity market in Al Mahra. The absence of private competitors means the PEC maintains a monopoly over service provision. Therefore, it appears that improving service provision ‘only’ requires local government support from donors and transparent and real intent from the authorities to improve existing infrastructure.

## 3 Water services

### 3.1 Current status of water services

Water service provision across cities remains deeply constrained, with access varying drastically depending on conflict exposure, institutional control, and infrastructure degradation.

**FIGURE 2: WATER SUPPLY VERSUS DEMAND (2025) IN SELECTED CITIES – MIDPOINT VALUES (Mm<sup>3</sup>/yr)<sup>5</sup>**



SOURCE: INTERVIEWS WITH LOCAL WATER AND SANITATION CORPORATIONS OFFICIALS IN EACH GOVERNORATE, OCTOBER–NOVEMBER 2025.

In Taiz, public water provision remains severely dysfunctional, though limited recovery is evident. As of November 2025, 32 of 94 wells are operational, up from 18 two years earlier, following the reactivation of four wells (three in Al-Dhubab and one in Al-Noor), which helped raise production to 6,000 m<sup>3</sup> per day (Interview with LWSC-Taiz, 2.11.2025; Improve Your Society Organisation, 2022b). Key sources

such as Al-Hyma and Habir remain under Houthi control, restricting access to over half the city's water capacity and reducing supply by an estimated 77% compared with pre-blockade levels before 2015 (Human Rights Watch, 2023b). Armed interference continues, including incidents such as the military seizure of the Al-Sawani well, with no effective institutional response (Al-Omana, 2025). Solar systems have been installed on most wells, but 5–6 hours of peak solar-powered output cannot substitute the roughly 22 hours per day of diesel-based pumping required (Interview with LWSC-Taiz, 2.11.2025). UNOPS fuel support provides 50,000 litres of diesel fuel per month, which remains well below the 122,000 litres needed to reach full operational capacity.

In Mukalla, water services function but are under increasing strain. Daily demand rose from 92,717 m<sup>3</sup> in 2024 to 98,509 m<sup>3</sup> in 2025, driven by population growth (Interview with LWSC-Mukalla, 3.11.2025). Government supply fell from 56,185 m<sup>3</sup> per day in 2024 to 41,045 m<sup>3</sup> per day by September 2025 due to falling groundwater levels, ageing infrastructure, electricity blackouts and fuel shortages. Of 56 wells, 53 remain operational; three went offline because of falling water levels, mechanical failures and power cuts. Officially, network coverage is 92%, though field observations suggest this is overstated (Interview with LWSC-Mukalla, 3.11.2025). There are no private wells. Residents outside the grid, or poorly served areas, rely on trucked private water, which is weakly regulated. Water quality is generally safe, though some wells, particularly in Fuwah, show elevated salinity and iron. Supply is broadly stable but below demand. Cost recovery is minimal: collection rates dropped to 11.31% in 2025 due to widespread poverty and unpaid public sector wages.



A YOUNG YEMENI CARRIES A JERRYCAN FULL OF CLEAN WATER FROM A DONATED SOURCE AMID ONGOING WIDESPREAD DISRUPTION OF WATER SUPPLIES, IN SANA'A, YEMEN. © PICTURE ALLIANCE / DPA | YAHYA ARHAB. 2015.

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## In Seiyun, public water delivery is largely stable and considered functional. Households receive municipal water through a largely intact grid and billing is functional.

In Seiyun, public water delivery is largely stable and considered functional. Summer demand has reached approximately 25,500 m<sup>3</sup>/day because of population growth and internal displacement (Interview with LWSC-Seiyun, 6.10.2025). The city meets this level using 16 wells in the Jathmah field, backed by

eight major reservoirs and a solar-powered system for critical wells. Coverage exceeds 90% of the city, and about 70% of the network has been upgraded to plastic pipes (Interview with LWSC-Seiyun, 6.10.2025). No private wells operate. Households receive municipal water through a largely intact grid. Water quality complies with WHO and national standards verified through regular testing. Billing is functional, with payment compliance around 90%, though tariffs remain below cost.

In Aden, public water supply continues but meets only about half of demand. Annual demand for 2025 is estimated at 87.6 million m<sup>3</sup>, while actual supply is 43.8 million m<sup>3</sup> (GSMR, 2025). Of 113 wells, 90 remain operational and 23 are out of service (GSMR, 2025). Aden's system is structurally dependent on groundwater abstracted outside the governorate, particularly from the Tuban Delta (Lahj) and the Abyan/Bana Delta. This inter-governorate supply chain includes wellfields such as Bir Nasser (Lahj) and the Al-Ruwa (Rowa) wellfield in Abyan, which has historically supplied a substantial share of Aden's domestic water (Haidera & Noaman, 2008). Network coverage is officially 69%, based on 2021 data that likely overstates current realities (GIZ, 2021). Residents in several districts report water only once or twice per week, often with low pressure. Frequent power cuts and diesel shortages disrupt pumping and treatment. Cost recovery is weak: only about 20% of billed charges are collected, and tariffs of 110–250 YER/m<sup>3</sup> in residential blocks are far below production costs. Informal vendors, largely unregulated, supply areas not connected to the grid or facing prolonged outages. While more functional than the water system in Taiz, Aden's system is deteriorating under chronic underinvestment, ageing infrastructure and weak governance.

In Al-Ghaydah, daily demand is estimated at 15,000 m<sup>3</sup>, while LWSC supplies around 10,000 m<sup>3</sup>/day, leaving a deficit of roughly 33% (Interview with LWSC-Almahra, 3.11.2025). Water comes from two main wellfields: Al-Juz'a (20 wells, 7 operational) and Fuwari (13 wells, 8 operational), with Fuwari as the primary source. Fuwari water meets drinking standards; lower-quality Al-Juz'a water is blended into the system during shortages (Interview with LWSC-Almahra, 3.11.2025). The formal network covers about 80% of the city, but service is intermittent and flow is weak; piped water is generally available only two days per week, so households rely heavily on rooftop tanks (Interview with Civil Society-Almahra, 8.11.2025; Interview with Beneficiary-Almahra, 5.11.2025). The network is approximately 75% functional, requires annual maintenance and has sections needing urgent rehabilitation. Cost recovery remains partial. The standard residential tariff is 186

YER per 1,000 liters, while rates for commercial and governmental users are set at 500 and 700 YER respectively. These rates are far below cost-recovery levels. Even so, payment compliance is reported at only around 50%, (Interview with LWSC-Almahra, 3.11.2025). In areas where the piped network does not reach or when service is interrupted, residents resort to private sector alternatives, including trucked water and mosque-based community wells. These alternatives are unregulated, and private water is expensive at about 4,000 YER/m<sup>3</sup> (Interview with Civil Society-Almahra, 8.11.2025; Interview with Beneficiary-Almahra, 5.11.2025).

## 3.2 Factors influencing water service provision

The provision of public water services in the selected governorates is shaped by a convergence of structural constraints, operational bottlenecks, governance fragmentation, and volatile fuel supply, all unfolding within highly divergent conflict geographies.

In Taiz, the collapse of water infrastructure has been driven primarily by conflict-related control of key assets and persistent fuel scarcity. Over half of the city's strategic wells remain under Houthi control, significantly limiting production capacity and exposing operations to political conditions outside the jurisdiction of

the local authority (Interview with LWSC Interview, 2.11.2025). Attempts to supplement water supply by piping water from the Hawban area, which is under Houthi control, demonstrated the fragility of donor-dependent interventions: temporary diesel supply from UNICEF briefly allowed daily production to increase by 3,000 m<sup>3</sup>. However, UNICEF's operations were

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**The provision of public water services is shaped by a convergence of structural constraints, operational bottlenecks, governance fragmentation, and volatile fuel supply.**

suspended following a raid on UNICEF's office and staff arrests in Sana'a, bringing production back to pre-intervention levels. Donor support at times also comes up against local community and political concerns. For instance, the UAE-supported Sheikh Zayed bin Sultan water project in the Taluq wellfield, have been opposed by communities fearful that they will not benefit and local political actors concerned about a perceived outside agenda, paralysing implementation (Interview with LWSC-Taiz, 2.11.2025).

In Mukalla, control is not contested, but infrastructural ageing and lack of revenues strain water services. Water supply declined in 2025 despite rising demand, a result of pump failures, falling groundwater levels, and erratic energy provision. Nearly 69

of 175 wells across the Hadramaut Coast region are out of service, primarily due to obsolescence and reduced yields. Solar installations do not appear to be in widespread use, leaving the system highly vulnerable to electricity cuts and diesel shortfalls. Revenue recovery is poor (11.31%), and official coverage rates (92%) are widely acknowledged to be overstated. The large gap between user blocks fees (100-160 YER/m<sup>3</sup>) and production costs (408 YER/m<sup>3</sup>) is bridged only through sporadic government allocations and donor assistance, which lack predictability and sustainability (Interview with LWSC-Mukalla, 3.11.2025).

In contrast, Seiyun demonstrates that relatively stable governance, consistent maintenance, and active community engagement can yield resilient outcomes. The city meets its daily demand of 25,500 m<sup>3</sup>, even amid increased population pressures. Key enabling factors include: the presence of a solar-backed pumping system and an updated distribution networks (70% of which have transitioned to plastic piping). Moreover, a 90% tariff collection rate supports operational expenses. Still, challenges persist in the form of high-water loss (40%) due to illegal connections, funding gaps for major expansions, and the complete suspension of central government capital investment (Interview with LWSC- Seiyun, 6.10.2025).

Aden's water services are hampered by conflict-related damage, technical constraints and institutional disarray. Despite a relatively high number of functional wells (90 out of 113), only 50% of the demand estimated at 87.6 million m<sup>3</sup> annually is currently met (GSMR, 2025). The city's network coverage sits at 69% (GIZ, 2021). Beyond in-city infrastructure constraints, Aden's water availability is shaped by its reliance on wellfields located in neighbouring governorates, which expose supply to disruptions and bargaining dynamics (World Bank, 2024). Fragmented authority affects everything from diesel procurement to the allocation of external assistance. Cost recovery is severely undermined by a near-total failure in billing: tariff collection remains at 20%, and fees do not reflect the actual cost of water production. Without structural reform and coordinated oversight, existing infrastructure alone is unlikely to yield better outcomes.

Al-Ghaydah has largely avoided direct war damage seen in Taiz or Aden, but service provision is held back by decaying infrastructure, weak oversight, limited technical capacity and fragmented cost-recovery mechanisms. Of the 33 wells supplying the city, just 15 remain operational. The network's condition continues to deteriorate, and no systematic rehabilitation has occurred. Routine leaks, sedimentation and sporadic chlorination undermine trust in public supply and push users toward expensive private alternatives. The Local Water and Sanitation Corporation (LWSC) in Al-Ghaydah suffers from insufficient staff, technical skills and operating budget. Cost recovery is partial: with residential tariffs, compliance is around 50%. The utility cannot fund major upgrades or expansion (Interview with LWSC-Al Mahra, 3.11.2025).

### 3.3 Key stakeholders in the water sector

Water service provision in the assessed cities is not simply a technocratic function of local water corporations; it is the outcome of contested relationships between utilities, armed actors, political authorities, donors, private vendors and communities. Who controls wells, diesel, tariff decisions and project approvals

matters at least as much as the technical condition of the networks. The same formal institution – the Local Water and Sanitation Corporation (LWSC) – appears across all locations, but its real bargaining power, its room to operate, and the number of actors it must appease differs sharply between Taiz, Mukalla, Seiyun, Aden and Al-Ghaydah.

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**Water service provision is not just about the technical condition of the networks. It is also about who controls wells, diesel, tariff decisions and project approvals.**

In Taiz, the LWSC branch is formally responsible for urban water provision but operates in a landscape where effective authority over key sources and assets lies elsewhere. Strategic groundwater basins, including Al-Hyma and Habir, remain under Houthi control, and access to these sources is negotiated through intermediaries rather than governed by sector policy (Human Rights Watch, 2023b; Improve Your Society Organisation, 2022b). Local armed units and individual commanders have also seized or interfered with wells inside IRG held areas, as illustrated by the takeover of the Al-Sawani well, where an officer seized the well and halted its operation, with no response from security authorities despite formal complaints (Al-Omana, 2025). This turns specific wells into fiefdoms, with their operation contingent on the consent of actors who sit entirely outside the formal water governance framework. Donors and UN agencies are de facto stakeholders as well: UNOPS and UNICEF provide fuel and emergency support that determine whether pumps run at all, while large-scale initiatives such as the Sheikh Zayed bin Sultan project in Al-Dhubab have become sites of political contestation inside Taiz (Aljadeed Press, n.d.; Interview with LWSC-Taiz, 2.11.2025). In practice, the LWSC spends much of its time mediating between these competing centres of power, attempting to keep a minimum flow running rather than planning or enforcing service standards.

Mukalla's water sector is more clearly structured but no less politically loaded. The LWSC branch retains operational control over wellfields, networks and billing, yet its dependence on public transfers and donors for both capital and recurrent costs gives external financiers substantial leverage over priorities (Interview with LWSC-Mukalla, 3.11.2025; Bashantov et al., 2024). Local authorities in the Hadramaut coast, including the governor's office, act as gatekeepers for budget allocations, tariff adjustments and hiring, and therefore shape the corporation's capacity to

respond to rising demand. At the same time, the Hadramaut Tribal Alliance has demonstrated, in the electricity sector, its capacity to weaponise control over oil and fuel flows to pressure the Presidential Leadership Council, with clear spill-over risks for water pumping where diesel is needed (Al-Masdar Online, 2025; Barran Press, 2025). Private actors are most visible not inside the network but at its edges: tanker operators supplying unserved neighbourhoods or high-lying buildings that do not receive adequate pressure. These vendors are effectively unregulated and can set prices well above public tariffs, but they also form an indispensable part of the city's water economy, especially during outages (Interview with LWSC-Mukalla, 3.11.2025).

In Seiyun, the stakeholder configuration tilts more clearly in favour of formal institutions. The LWSC enjoys comparatively strong administrative coherence and regular engagement with the local authority, which has supported network rehabilitation, solar pumping investments, and tariff enforcement (Interview with LWSC-Seiyun, 6.10.2025). While tribal and community structures in the valley still affect the fuel dynamics as discussed earlier, water service provision remains resilient—although it should be noted that interviews for this study were conducted before territorial control in Seiyun changed hands in early December 2025. The absence of private wells or large-scale tanker markets within the urban core further reinforces the central role of the LWSC as the main service provider; households relate to a single institution for connection, billing and complaints. At the same time, the corporation's dependence on diesel and the national macro-fiscal environment leaves it vulnerable to decisions taken far outside the governorate, including national fuel pricing, currency depreciation and the near-total suspension of central capital investment.

Aden's water stakeholders are embedded in a much more fragmented and politicised governance landscape. The LWSC Aden branch operates under dual political oversight: on paper it answers to the line ministry and central government, but in practice competing political factions wield decisive influence through their control over the local executive and security apparatus (Almaweri & Alawami 2025). Fuel procurement for pumping stations and treatment facilities is channelled through networks of politically connected traders who have been accused of profiteering and manipulating supply, directly affecting the continuity of water service (Yemen Eco, 2025). Saudi fuel grants and other external support act as lifelines, making Riyadh and other donors de facto stakeholders whose disbursement schedules and political calculations by extension shape whether water flows to the city (SPA, 2021). Alongside this formal–informal elite nexus, a diffuse network of private tanker operators and small-scale vendors delivers water to neighbourhoods with no or irregular network service. These actors fill a real gap but also anchor a parallel water economy that the LWSC does not regulate and from which it collects no revenue, further weakening its financial position. Ordinary consumers, for their part, have limited trust in the utility, weak incentives to pay for unreliable service, and few effective channels to push for accountability in the context of overlapping authorities.

Al-Ghaydah offers a contrasting case where the LWSC retains a central, if fragile, position within a relatively coherent local governance framework. The water corporation is the primary provider of piped water and the main institutional interlocutor for households, but it operates with constrained staffing and budget, heavily dependent on support from the local authority (Interview with LWSC-

Almahra, 3.11.2025). Private sector actors in the Al Mahra water sector are concentrated in trucking and small mosque-linked wells. When network service fails or does not reach an area, households resort to these alternatives, paying prices many times higher than LWSC tariffs (Interview with Civil Society-Almahra, 8.11.2025). These vendors and well owners operate almost entirely outside formal regulation: there is no functioning laboratory or routine testing of private supplies, and no mechanism to enforce quality or price standards (Interview with LWSC-Almahra, 3.11.2025; Interview with Civil Society-Almahra, 8.11.2025). Civil society actors and individual beneficiaries report limited structured channels to raise complaints. Communication with LWSC staff tends to occur through personal networks, which favours those with connections and undermines the perception of the utility as an impartial public service provider (Interview with Beneficiary-Almahra, 5.11.2025; Interview with Civil Society-Almahra, 8.11.2025).

## 4 Cleanliness services

### 4.1 Current status of cleanliness services

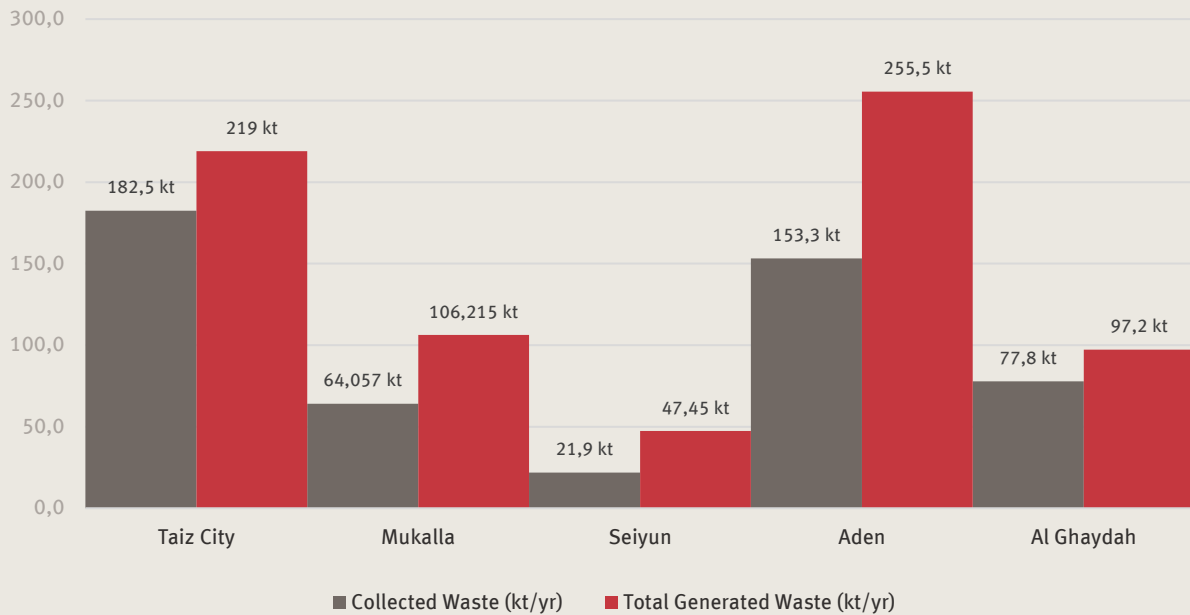
Across the five cities, cleaning services operate under severe capacity constraints, but with starkly different levels of coverage and effectiveness. Using 2025 Cleaning Fund data, the share of generated municipal waste actually collected ranges from roughly 46% in Seiyun, to about 60% in Aden and Mukalla, an estimated 83% in Taiz, and close to 86% in Al-Ghaydah (Interviews with Local Cleaning Funds, 8.11.2025; 12.11/2025; 13/11/2025;12.11.2025; 12.11.2025). Taken at face value, this suggests Taiz and Al-Ghaydah perform “best” in terms of tonnage captured. However, once spatial coverage, fleet condition, financing, and disposal

practices are considered, Taiz and Aden remain the most fragile and high-risk sanitation environments, while Al-Ghaydah and, functionally, parts of Seiyun and Mukalla are much closer to what could be called a minimally reliable municipal service.

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Cleanliness services in Al-Ghaydah, parts of Seiyun and Mukalla are close to what could be called a minimally reliable municipal service.

**FIGURE 3: COLLECTED WASTE VERSUS GENERATED WASTE (2025) IN SELECTED CITIES<sup>6</sup>**



SOURCE: INTERVIEWS WITH LOCAL CLEANING FUNDS OFFICIALS IN EACH GOVERNORATE, NOVEMBER 2025.

In Taiz, the Cleaning and Improvement Fund estimates that 500–700 tons of waste are generated daily. Existing equipment cannot move even 500 tons, and only 40–45% of the urban area can be covered each day, on a rotating basis (Interview with Taiz Cleaning Fund, 8.11.2025). The pre-war fleet of 200–270 vehicles has shrunk to 24 ageing trucks operated at maximum load (Interview with Taiz Civil Society, 5.11.2025). The main former dumpsite lies in Houthi-controlled territory. The Al-Dabab site that is currently in use, is located near residential and agricultural land and water sources, with open dumping, burning and crude burial, creating environmental and health risks (Interview with Taiz Cleaning Fund, 8.11.2025). Revenue from households has largely vanished because cleaning fees were embedded in now-defunct electricity and water billing, while collection of fees from commercial customers faces resistance and embezzlement. Civil society and service users point to chronic equipment shortages, low pay, weak complaints channels and corruption, even as they acknowledge some improvement under new leadership and thanks to limited new equipment (Interviews with Taiz Civil Society and Beneficiary, 5.11.2025).

In Mukalla, waste services function but are uneven and widely rated as mediocre. Around 291 tons of waste are generated daily, of which about 174.5 tons (ca. 60%) are collected using 45 trucks (“zafat”) (Interview with Mukalla Cleaning Fund, 12.11.2025). Sixty-three main streets (ca. 200 km) and six zones with 60 blocks require regular service, but some neighbourhoods are serviced daily while others see monthly or no municipal collection, relying instead on residents and informal tuk-tuk operators (Interview with Mukalla Cleaning Fund, 12.11.2025; Interview with Mukalla Civil Society, 6.11.2025). Staffing is sufficient but weak in skills and training; equipment is old and incomplete, especially for medical and fish waste, bins, PPE and mechanised sweeping. Fees embedded in electricity bills plus manual

collection of fees from commercial users do not approach real service costs. Interviewed civil society actors and beneficiaries rated services 2–3 out of 5, citing corruption, ad hoc campaigns, poor coordination with communities and NGOs, and limited public awareness (Interviews with Mukalla Civil Society and Beneficiary, 6.11.2025).

In Seiyun and the wider Wadi/Desert Hadramaut, the Cleaning Fund provides more regular service but leaves a majority of waste unmanaged. Across 16 districts, total daily waste is estimated at 586 tons, with Seiyun city producing about 130 tons; only around 252 tons are collected valley-wide (ca. 43%) (Interview with Seiyun Cleaning Fund, 13.11.2025). The fund employs 871 workers but estimates it needs more than 2,000 staff plus additional machinery to match demand (Interview with Seiyun Cleaning Fund, 13.11.2025). The fleet includes 29 tippers (5 out of service), 15 compactors (3 out of service), 5 rented loaders and three water tankers, supported by three leased dump trucks that do not meet health standards. Revenues are largely consumed by operating costs, limiting investment in sanitary landfills or fleet renewal. Cleaning fees (5% of residential and 3% of commercial electricity bills) are described as symbolic given, inflation and non-payment of electricity bills (Interview with Seiyun Cleaning Fund, 13.11.2025). Despite this, interviewed civil society actors and beneficiaries rated city cleanliness as good to very good, stressing regular daily operations, timely wages, internal reforms and outreach campaigns as key to avoiding the strike-driven collapses seen elsewhere (Interviews with Seiyun Civil Society and Beneficiary, 10–11.10.2025).



A GIANT TRASH PILE SITS IN THE MIDDLE OF A BUSY MAIN STREET IN TAIZ, YEMEN, WHERE WAR SINCE MARCH 2015 HAS DESTROYED INFRASTRUCTURE, WORSENEH HYGIENE AND SANITATION CONDITIONS, DISRUPTED WASTE COLLECTION, AND DEEPENED A HUMANITARIAN CRISIS. © PICTURE ALLIANCE / ZUMAPRESS.COM | ABDULNASSER ALSIEDDIK. 2017.

In Aden, cleaning services are heavily strained and fragmented. Estimated daily waste is 600–800 tons, of which about 60% is collected, with large pockets of unserved informal and newly urbanised areas (Interview with Aden Cleaning Fund, 12.11.2025). The Fund has no precise mapping of areas requiring daily service and estimates that roughly 60% of streets and neighbourhoods receive regular cleaning. Staff numbers are described as very small relative to needs, many on insecure contracts and subject to frequent wage delays, prompting strikes and service interruptions (Interview with Aden Cleaning Fund Interview, 12.11.2025). The main dumpsite at Bir al-Na‘ama, 32 km from central Aden, covers about 4 km<sup>2</sup> and receives waste also from neighbouring areas; disposal is spread in thin layers in a pit and covered with sand, offering basic containment but falling short of sanitary landfill standards. Funding from small surcharges on electricity bills, direct levies and occasional civil society support is “very little” and insufficient even for wages (Interview with Aden Cleaning Fund Interview, 12.11.2025). Some better-served districts report daily collection and morning sweeping, highlighting how localised effort and personal ties to staff can secure decent service in specific areas, while city-wide provision remains highly uneven (Interview with Aden Beneficiary, 12.11.2025).

In Al-Ghaydah, cleaning services combine regular daily operations and high coverage with an ageing fleet and structural under-funding. Officials estimate coverage at about 80% of the streets, which is achieved by thirty trucks, each making three trips per day at around 4 tons per trip, serving approximately 40 main streets organised into 18 cleaning blocks. Additionally, three vehicles are dedicated to litter picking (Al Mahra Cleaning Fund Interview, 12/11/2025). The main dumpsite behind the airport is reasonably located away from residential areas and does not rely on open burning but lacks basic infrastructure such as perimeter fencing. Most vehicles are over 13 years old, with frequent breakdowns, and are described as nearing end-of-life (Interview with Al Mahra Cleaning Fund, 12.11.2025). Financially, the Fund depends almost entirely on local authority transfers that cover only about 70% of operating costs. Fee collection via Shahn border revenues, electricity bills and charges on large waste producers is weak and poorly quantified (Interview with Al Mahra Cleaning Fund, 12.11.2025). Interviewed civil society actors and beneficiaries rated services at 3.5–4.5/5, praising consistency but noting shortages and breakage of street bins, under-staffing, old equipment and low public awareness (Interviews Al Mahra Civil Society and Beneficiary, 10–15.11.2025).

## 4.2 Factors influencing cleaning service provision

First, in all locations waste volumes have outpaced available staff and equipment. In Taiz, the gutted fleet and broken containers mean only a minority of neighbourhoods can be serviced daily despite high staffing on paper (Interview with Taiz Cleaning Fund, 8.11.2025). Mukalla has adequate headcount but lacks specialised skills and modern equipment, leading to daily service in some areas and reliance on informal tuk-tuks elsewhere (Interview with Mukalla Cleaning Fund, 12.11.2025). Seiyun’s Fund openly states that current workers and vehicles can handle only a little over half of actual waste loads and would need around double

the staff plus additional machinery to keep pace with demand (Interview with Seiyun Cleaning Fund, 13.11.2025). Aden’s small, partly temporary workforce and overstretched fleet, limit regular coverage to part of the city, despite door-to-door collection in selected districts, while Al Ghaydah’s relatively high coverage is strained by rapid urban expansion and vehicles that have been run continuously for more than a decade (Interviews with Aden and Al Mahra Cleaning Funds, 12.11.2025).

Second, financing is structurally inadequate. All funds stress that current revenues are far below actual costs. Taiz collects almost nothing directly from households because cleaning fees were historically embedded in electricity and water bills that are no longer paid; manual collection from traders is limited and prone to rent-seeking and political interference (Interview with Taiz Cleaning Fund, 8.11.2025). Mukalla, Seiyun and Aden characterise their surcharges on electricity bills or business licences as “symbolic” and not cost-reflective, while Al Mahra’s Fund relies mainly on local authority transfers that cover only part of operating costs and leave no fiscal space for fleet renewal (Interviews with Mukalla, Seiyun, Aden and Al Mahra Cleaning Funds, 12–13.11.2025).

Third, governance and security heavily condition what can be done with limited capacity. In Taiz, insecurity and armed influence distort both operations and finance: the assassination of Cleaning Fund manager Iftehan al-Mashhari in Taiz, after she attempted to curb corruption,

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## The assassination of Cleaning Fund manager Iftehan al-Mashhari in Taiz, after she attempted to curb corruption, illustrates how political violence directly undermines service provision.

illustrates how political violence directly undermines service provision (Sana’a Center, 2025). Some areas near front lines remain unreachable, collection is shifted into daytime congestion due to safety concerns, and armed individuals have threatened crews to prioritise specific neighbourhoods (Interviews with Taiz Civil Society and Beneficiary, 5.11.2025). Efforts to improve revenue have been marked by abrupt and very large fee hikes that prompted a popular backlash and are blocked by powerful actors and undermined by petty corruption within manual collection chains (Interview with Taiz-Cleaning Fund, 8.11.2025). In Aden, fragmented authority, weak public finances and prolonged crisis limit predictable budget support and capital investment (Aden Cleaning Fund Interview, 12/11/2025). In Mukalla, respondents highlight internal governance problems, corruption and poor coordination with communities, as the main cause of patchy service (Interview with Mukalla Civil Society, 6.11.2025; Interview with Mukalla Beneficiary, 6.11.2025).

By contrast, Seiyun benefits from relatively coherent local administration and a functioning relationship between the fund, workers and local authority. The activities of the Cleaning Fund seem more effective than others due to the partnerships with other entities such as universities, media outlets, and other government service offices. The Fund also invests in raising awareness for citizens

through visual and audio media, through awareness flash clips that are broadcast daily on Sayoun Radio and many local television channels (Interview with Seiyun Civil Society, 11.10.2025). The regular payment of entitlements has helped avoid strikes and keep daily cleaning going, even as rising inflows of displaced people add pressure (Interview with Seiyun-Cleaning Fund, 13.11.2025). Al-Ghaydah represents another case of relatively coherent governance: stakeholders consistently describe the Cleaning Fund as one of the best-performing public services in the governorate, even though its budget is still set against an outdated baseline and it struggles to enforce contributions from commercial establishments (Interview with Almahra Civil Society, 15.11.2025).

Fourth, infrastructure, urban form and dumpsite conditions shape coverage and environmental risk. Taiz's current al-Dubbab dumpsite is widely recognised as environmentally hazardous, located in agricultural land and threatening water sources, but remains in use because the main pre-war site lies in Houthi-controlled territory. Peripheral areas with narrow or damaged roads are systematically underserved (Interview with Taiz Cleaning Fund, 8.11.2025). Seiyun relies on several rented dumpsites that do not meet health standards, while informal dumping points outside planned routes increase operating costs per ton. In Aden, the long haul to Bir al-Na'ama elevates fuel and maintenance costs and competes with limited resources for urban collection; informal expansion creates dense areas that large trucks cannot easily reach (Interview with Aden Cleaning Fund, 12.11.2025). Mukalla's collection points are often defined reactively by resident practice, producing daily collection in some zones, sporadic service elsewhere, and neglected pockets. In Al Ghaydah, the airport-adjacent dumpsite is better located and avoids open burning, but remains a basic disposal site without perimeter works, sorting or processing (Interview with Al Mahra Cleaning Fund, 12.11.2025).

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**Weak public compliance takes different forms: many households dump bags next to containers. Others throw waste into gullies and stormwater channels, and construction debris is routinely mixed with household garbage.**

Finally, resident practices and perceptions shape both the volume and distribution of waste and the funds' ability to mobilise revenue and cooperation. In Taiz, the Cleaning Fund, civil society and beneficiaries all emphasise weak public compliance: many households dump bags next to, rather than inside, containers; others throw waste into gullies and stormwater

channels when formal points are too far; and construction debris is routinely mixed with household garbage. At the same time, many residents view cleaning fees as arbitrary extraction in a context where electricity and water are not reliably provided, and resist payment accordingly (Interview with Taiz-Cleaning Fund, 8.11.2025; Interview with Taiz Civil Society, 5.11.2025; Interview with Taiz Beneficiary, 5.11.2025). In Mukalla, respondents judge popular awareness to be relatively better, but institutional failures, economic deterioration and delayed

salaries have begun to undermine timely payment of bills (Interview with Mukalla Civil Society, 6.11.2025; Interview with Mukalla Beneficiary, 6.11.2025). In Seiyun, fees embedded in electricity bills are widely seen as affordable, and there are active youth and neighbourhood initiatives supporting citywide cleaning; yet both civil society and beneficiaries argue that in the absence of real penalties, awareness campaigns alone are not enough to prevent littering and informal dumping (Interview with Seiyun Civil Society, 11.10.2025; Interview with Seiyun Beneficiary, 10.10.2025). In Al Ghaydah, interviewed users and civil society actors rated service quality relatively highly yet underlined the absence of community initiatives, low awareness of proper dumping practices and weak payment culture, signalling that current performance rests more on local government transfers and committed staff than on a robust mutual contract between citizens and the fund (Interviews with Almahra-Cleaning Fund, 12.11.2025; Almahra Civil Society, 15.11.2025; Almahra Beneficiary, 10.11.2025).

### 4.3 Key stakeholders in the cleaning sector

Urban cleanliness in the five cities is shaped by a dense web of actors rather than a single municipal provider. Cleaning and Improvement Funds form the formal core, but their capacity is mediated by local authorities, security actors, private haulers, communities, civil society and donors. They operate within a national legal framework (Laws No. 39 and 20 of 1999) that was designed for a peacetime, fiscally functioning state and functioning local councils (Republic of Yemen, 2016).

Across Taiz, Mukalla, Seiyun, Aden and Al-Ghaydah, the Cleaning Funds are the only bodies with a city-wide mandate for street cleaning, primary collection and disposal. They plan routes, operate fleets, manage dumpsites and collect fees, yet their real leverage varies sharply. In Taiz, the Fund is constrained by insecurity, decades-old fleets, equipment stranded in Houthi-held areas and a revenue base gutted by the collapse of electricity billing. Management spends most of its time crisis-managing rather than planning improvements (Interview with Taiz Cleaning Fund, 8.11.2025). Seiyun's Fund, despite coverage gaps, has maintained regular wage payments, avoided strikes and institutionalised worker unionisation and inter-departmental coordination, giving it comparatively greater operational authority (Interview with Seiyun Civil Society, 11.10.2025; and Interview with Seiyun Beneficiary, 10.10.2025). Al Ghaydah's Fund occupies a middle ground: it performs relatively well but operates on an outdated, inflation-eroded budget and is heavily dependent on governorate transfers that cover roughly 70% of needs (Interview with Al Mahra Cleaning Fund, 12.11.2025).

Local authorities (governors, district directors, municipal councils) are the second decisive stakeholder layer. Legally they supervise Cleaning Funds and control tariffs, staff hiring and capital investments (Republic of Yemen, 2016). In practice, they can act as either sponsors or bottlenecks. In Taiz, the governor's office has at times underwritten equipment and backed enforcement, but powerful figures within the same structure block fee collection from "sovereign" entities and influential businesses or divert revenues (Interviews with Taiz Cleaning Fund, 8.11.2025; and Beneficiary, 5.11.2025). In Mukalla and Seiyun, local authorities function more as

strategic partners, negotiating donor projects, co-chairing planning and controlling land allocations for dumpsites and transfer stations (Interviews with Mukalla Cleaning Funds, 12.11.2025; and Seiyun Cleaning Funds, 13.11.2025). In Aden, dual authority between the central ministries and the STC creates a fragmented chain of command: formally the Cleaning Fund is municipal, but fuel allocations and key revenues are centrally brokered, exposing the sector to elite bargaining and delaying reforms (Interview with Aden Cleaning Fund, 12.11.2025).



A SANITATION WORKER SWEEPING A STREET AT AN INTERSECTION IN CRATER DISTRICT. © AAD NUMAN. 2026.

Households, neighbourhood committees and small businesses form a third stakeholder block, as both clients and co-producers of fiscal and operational conditions. In Taiz, households no longer pay direct cleaning fees because these were tied to electricity bills that have effectively collapsed; a narrow base of commercial and institutional users is billed, with low compliance due to weak trust and economic hardship (Interviews with Taiz Cleaning Fund, 8.11.2025; Civil Society, 5.11.2025; and Beneficiary, 5.11.2025). In Mukalla, respondents consider cleaning charges embedded in electricity bills relatively small, but economic deterioration and delayed salaries have begun to undermine timely payment of electricity and thus cleaning bills (Mukalla Civil Society Interview, 6/11/2025; Mukalla Beneficiary Interview, 6/11/2025). In Seiyun, fees embedded in electricity bills are widely seen as affordable, and there are active youth and neighbourhood initiatives supporting citywide cleaning; however, civil society and beneficiaries argue that in the absence of real penalties, awareness campaigns alone are not enough to prevent littering and informal dumping (Seiyun Civil Society Interview, 11/10/2025; Seiyun Beneficiary Interview, 10/10/2025).

Civil society organisations, unions and media form a fourth layer. In Taiz, local NGOs and youth groups organise cleaning campaigns, provide garbage containers and

lobby for alternatives to the hazardous Al-Dabab dump; CARE and Jam'iyat Binaa are cited as among the few with tangible impact (Interview with Taiz Civil Society, 5.11.2025). In Seiyun, a workers' union within the Fund has stabilised labour relations and reduced disruption (Seiyun Civil Society 11/10/2025; and Beneficiary Interviews, 10/10/2025). In Mukalla, CSOs both criticise corruption and support the Fund through awareness campaigns and small-scale inputs (Interview with Mukalla Civil Society, 6.11.2025).

Private sector actors are present in all cities but play different roles. In Taiz and Mukalla, micro-contractors operating tuktuks or small trucks have effectively become a parallel collection system for unserved or hard-to-reach neighbourhoods, financed directly by residents and sometimes organised through informal agreements with local committees (Taiz – Cleaning Fund Interview, 8/11/2025; Mukalla – Cleaning Fund Interview, 12/11/2025; Mukalla – Civil Society Interview, 6/11/2025).

Donors and international agencies are now indispensable. Across the five cities, Cleaning Funds expect external actors to provide trucks, compactors, loaders, bins, safety gear and sometimes wages or fuel. UNDP's "Crisis Support to Solid Waste, Water and Sanitation Services in Aden and Mukalla" and the World Bank/UNOPS

YIUSEP project are prominent examples of external financing for equipment and landfill or transfer-station upgrades (UNDP, 2021; DARPE, n.d.). National assessments note that such support has become critical as Cleaning Funds' own revenues have collapsed

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## There is a risk that heavy reliance on donors has replaced sustainable municipal finance, rather than complementing it.

while fuel, spare-parts and wage costs have surged (Republic of Yemen, 2016). However, this dependence also reinforces a projectised logic: in Taiz, Aden and Al Ghaydah, many strategic solutions (sanitary landfills, mechanised sweeping, recycling pilots) are framed as contingent on donor funding, which can delay underlying tariff, enforcement and land-use plans or reforms. Short-term cash-for-work cleanup campaigns were also seen as mixed blessings, since they do not address underlying issues and may disincentivise needed reforms (Interview with Taiz Civil Society, 5.11.2025; Interview with Mukalla Beneficiary, 6.11.2025). Similar concerns appear in national assessments, which warn that heavy reliance on donors has "replaced sustainable municipal finance rather than complementing it," leaving Cleaning Funds vulnerable to abrupt funding cuts (Republic of Yemen, 2016).

Finally, security actors and landowners exert significant but often opaque influence, especially in contested or rapidly urbanising zones. In Taiz, front lines and the risk of armed intimidation limit operations in certain districts; cleaners report threats at gunpoint to prioritise particular areas, and insecurity has forced a shift away from night-time collection into congested daytime hours (Interviews with Taiz Cleaning Fund, 8.11.2025; Civil Society, 5.11.2025; and Beneficiary, 5.11.2025).

## 5 Conclusion and recommendations

The mapping across Taiz City, Mukalla, Seiyun, Aden and Al Ghaydah confirm that local service systems in IRG-held Yemen are not simply “damaged” versions of pre-war infrastructure. They have been structurally reconfigured. Across sectors, three structural features repeat:

- **Fragmented and politicised authority.** Utilities and Cleaning Funds operate in environments where multiple centres of power claim influence over tariffs, staffing, fuel and project decisions. In some cities, armed actors directly occupy or sabotage assets; in others, dual or overlapping political structures complicate coordination and dilute accountability.
- **Collapsed or distorted local finance.** Tariffs are outdated and not adjusted to inflation or cost. Collection is undermined both by economic hardship and by poor service quality. Donor grants and fuel support substitute for a functioning municipal finance system but cannot replace it.
- **A frayed social contract.** Citizens and small businesses increasingly see service charges as arbitrary extractions, rather than as part of a mutual obligation in which payment yields predictable, minimum-standard services. Where utilities perform comparatively well and communicate clearly (notably Seiyun), compliance remains high; where collapse or chronic crisis dominates, as in Taiz, large parts of Aden and in the case of water services in Mukalla, non-payment and informal coping mechanisms become the norm.

The result service provision that is deeply unequal and highly vulnerable to further shocks. Yet the cases also show that even under current conditions, policy choices and institutional design make a measurable difference. The gap between Taiz and Seiyun, or between the worst-affected districts of Aden and the better-served ones, is not explained by war alone. It is also the outcome of how local authorities, utilities, Cleaning Funds, donors and communities have negotiated control, money and risk over the last decade. In this context, as the paper has argued, understanding the political economy of service provision failures is central to understanding what can be done to address them.

In the electricity sector, the interplay between war-induced destruction, political rivalries, tribal interference, and administrative dysfunction has created a self-reinforcing cycle of fragmentation and collapse. Where institutions are fragmented

or dual in nature, as in Aden and Taiz, challenges are particularly acute. Where authority is less contested, more stable service provision is possible. However, electricity provision remains vulnerable to spillover effects from political and tribal disputes. Recovery cannot occur without simultaneous attention to governance reform, institutional rebuilding, and the depoliticisation of essential service provision. Electricity stakeholders in Yemen include technocrats and engineers as well as armed commanders, tribal leaders, oil barons, and political operatives. In this context, electricity provision is not a neutral good, but a contested asset.

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## Service provision is deeply unequal and highly vulnerable to further shocks. Yet even under current conditions, policy choices and institutional design make a measurable difference.

In the water sector, the degree of territorial control over water assets and their insulation from armed interference, the availability and sustainability of fuel (diesel and electricity) for pumping, and the functionality and autonomy of local water utilities in managing operations and mobilising financial resources, determines outcomes. Where control is

uncontested, a minimum of fuel is available, and institutions remain functional, as in Seiyun, service continuity is possible even under economic stress. Where political divisions, sabotage, or weak cost recovery predominate, service delivery remains vulnerable, intermittent, and dependent on external actors. Donors, international agencies and national-level decision-makers emerge as critical stakeholders in the sector. Whether through emergency diesel deliveries to Taiz and Aden, network rehabilitation in Seiyun, or institutional support to LWSC, they determine which systems are kept alive and which are allowed to deteriorate. Their priorities do not always align with local needs, and their interventions are sometimes short-term and projectised. At the same time, communities and households are not passive recipients: patterns of non-payment in Mukalla and Aden, and relatively high compliance in Seiyun, directly shape utilities' financial space to maintain infrastructure.

In cleaning services, weak, structurally insufficient revenue streams, combined with decaying equipment and inadequate staffing, mean that services are consistently operating below need. Any additional shocks, whether political, economic or security-related, rapidly translate into visible waste accumulation and heightened public health risks. System capacity, governance and security, infrastructure and spatial access, and citizen behaviour largely determine cleaning service outcomes. The sector is at once highly institutionalised on paper and deeply informal in practice. Cleaning Funds hold the legal mandate and technical know-how; local authorities control access to land, budgets and enforcement; donors provide critical capital and recurrent subsidies; private haulers and waste pickers fill spatial and economic gaps; communities both generate waste and provide the social labour that can either support or sabotage municipal efforts. Any attempt to stabilise or expand cleanliness services needs to engage with this full range of stakeholders and to reshape the incentive structures, accountability channels, and revenue arrangements that currently bind or free each stakeholder to act.

Based on this analysis, the recommendations below focus on what can realistically be done in the short to medium term to move from emergency patching toward more stable, accountable and financially viable service provision.

- Centre Services in institutional reform and stabilisation measures.
  - Restoring services can restore trust in institutions and strengthen cost-recovery and the sustainability of services, but only if they are understood as political, not purely technical interventions, by all concerned stakeholders.
  - Infrastructure investment and rehabilitation need to be accompanied by reforms to funding and cost recovery, negotiations with armed actors to support service restoration, and the restoration of accountability mechanisms and public willingness to pay for services.
  - Broader exchanges on successful local reform efforts and service provision models are needed to support peer learning and the eventual reintegration of different local models and realities into an overarching framework.
- Rebuild realistic, socially sensitive local revenue systems.
  - Tariffs in electricity, water and cleanliness need gradual adjustment toward cost-reflective levels, combined with explicit lifeline blocks or targeted subsidies for poor households.
  - Simply raising nominal fees without visible service improvement will fail. Key internal and external stakeholders need to be convened and brought on board, for example through dialogues, to build understanding and support for envisaged changes.
  - Local authorities and utilities should aim to diversify away from single, fragile revenue streams (e.g. electricity-only surcharges) toward a broader mix that could include modest property- or business-based fees, fees from border checkpoints/entry points, and structured transfers from governorate—and eventually central—budgets tied to performance indicators.
- Standardise basic accountability and complaint mechanisms and strengthen the social contract.
  - Each utility and Cleaning Fund should be required to maintain at least one accessible, publicised complaint channel (hotline, office, or digital form) and log responses and resolution times.
  - Civil society and user committees should be formally recognised in at least a consultative role on service priorities, tariff changes and major projects.

- Civil society and utilities should raise awareness about options to reduce electricity and water use and to reduce the amount of residential solid waste.
  - Donor-funded programmes should include support to these accountability mechanisms and awareness efforts, not just to infrastructure.
- Shift external support from short-term gap-filling to durable assets and capacity.
  - Donors should progressively reduce short term campaigns and fuel subsidies, and instead prioritise:
    - Upgrading generation capacity and rehabilitation of electrical transmission and distribution networks and investing in digital metering and billing systems.
    - Upgrading and rehabilitating water mains and networks; and using solar energy for pumping water.
    - Construction and upgrading of controlled landfills and upgrading cleaning vehicles and equipment. Special attention should be given to dealing with environmentally hazardous (chemical and medical) waste and to finding alternatives to landfills located near residential areas.
    - Exploring the possibility of establishing water desalination plants alongside the required energy-generation capacity in coastal cities.
  - All such investments need to be based on a solid understanding of the conflict and political economy contexts in each specific location and may require preparatory consultations to ensure support from the wide range of stakeholders that determine outcomes in each location, as well as agreement on institutional reforms (e.g. tariff policy, enforcement rules) to increase sustainability and local ownership.
- Plan for gradual integration of small-scale private providers and seek to make them part of the solution.
  - Private sector actors are playing an important and largely unregulated role in providing these basic services. Central and local authorities should review and adapt policies that regulate the partnership with the private sector with a view to registering and lightly regulating private actors such as private water tankers, small waste haulers and, where feasible, private mini-grid operators.
  - Simple licensing, route and disposal rules, and quality standards can reduce environmental harm and extend effective coverage without large public outlays, while also creating a basis for modest fee capture.
- Protect core service institutions from armed and partisan interference.

- Central and governorate authorities should clarify expectations and codes of conduct for security actors and armed groups to prevent the occupation of public buildings, diverting or looting of public resources, and the weaponisation of services.
- Where such interference has already taken place, negotiated withdrawals and asset returns need to be prioritised. Given the role of these assets and revenue streams in the political economy of armed groups in Yemen, external support and guarantees for such negotiation processes may be necessary for agreement to be reached. Consultative and participatory mechanisms can help ensure that access to services is provided in an inclusive way and perceived as such by communities.
- Local mediators can play a key role in unblocking disputes over services, mediating inclusive access and negotiating the return of utilities into public hands and should be supported in this capacity.



## ENDNOTES

<sup>1</sup> In areas like Al Mahara, local authorities take fees from travellers at the governorate border checkpoints/entry points (منفذ) and a portion of the revenue is allocated to support the Cleaning Fund.

<sup>2</sup> Source: Interviews with Public Electricity Corporation officials in each governorate (2/11/2025; 4/11/2025; 6/10/2025; 10/11/2025; 13/11/2025). It is unclear why PEC estimates for electricity demand in Taiz are significantly lower per capita than in other assessed locations.

<sup>3</sup> These improvements were funded by local authorities and the PEC with revenues from local oil revenues.

<sup>4</sup> Before the war, Aden provided neighbouring governorates with electricity. Today, however, while transmission lines are still intact, only the new solar plant provides some electricity beyond the governorate limits for a maximum of one hour per day.

<sup>5</sup> Source: Interviews with Local Water and Sanitation Corporations officials in each governorate (2/11/2025; 3/11/2025; 6/10/2025; 17/11/2025; 3/11/2025).

<sup>6</sup> Source: Interviews with Local Cleaning Funds officials in each governorate (8.11.2025; 12.11.2025; 13.11.2025; 12.11.2025; 12.11.2025).

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