



Value for Money in Humanitarian Wash: Lessons from a Hybrid Solar-diesel Water Intervention

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Abstract: Humanitarian WASH programmes in conflict-affected settings must make difficult choices about how to convert scarce resources into reliable water services. This Practice Note presents lessons from a three-year UNICEF-supported water-supply intervention in Saada district, Yemen, where diesel-powered pumping was combined with solarisation. The experience shows that value for money cannot be judged from expenditure alone. In Saada, reported water consumption and beneficiary reach improved while the cost performance ratio deteriorated after the first year. The case therefore points to the need to examine economy, efficiency, effectiveness and equity together, while strengthening budgeting, documentation, energy planning and beneficiary monitoring.

Keywords: Value for money, water, diesel, solar

PRACTICE INSIGHT

Humanitarian WASH programmes in conflict-affected settings must make difficult choices about how to convert scarce resources into reliable water services. This Practice Note presents lessons from a three-year UNICEF-supported water-supply intervention in Saada district, Yemen, where diesel-powered pumping was combined with solarisation. The experience shows that value for money cannot be judged from expenditure alone. In Saada, reported water consumption and beneficiary reach improved while the cost performance ratio deteriorated after the first year. The case therefore points to the need to examine economy, efficiency, effectiveness and equity together, while strengthening budgeting, documentation, energy planning and beneficiary monitoring.

WHY THIS CASE MATTERS

Conflict-affected settings place exceptional pressure on public water systems. Infrastructure may be damaged, electricity supplies may be unreliable, fuel may be expensive or difficult to obtain, and demand can increase rapidly as populations become more dependent on public or humanitarian water services. For humanitarian organisations, the challenge is not simply to finance water production, but to ensure that expenditure is translated into adequate, equitable and sustainable services.

The Saada experience is useful because it captures a complete intervention cycle rather than a short-term snapshot. UNICEF supported the National Water and Sanitation Authority-Saada (NWSA-Saada) from 2017 to 2019 through a combination of diesel support and solar water systems. The intervention covered 13 locations, had a planned beneficiary target of 145,523 and a total project budget of US\$713,855.

The original assessment was undertaken after completion of the intervention and used project documentation together with interviews with UNICEF and NWSA-Saada staff. It

applied an adapted value-for-money framework covering economy, efficiency, effectiveness and equity. This Practice Note distils the practical lessons from that experience rather than presenting it as a current assessment of Yemen's WASH situation.

THE SAADA INTERVENTION

Saada district, including the city and its suburbs, had an estimated population of 100,900 during the period covered by the assessment. The district had experienced severe conflict-related disruption and limited access to basic services. The assessment reported 22,245 cholera cases between April 2017 and December 2019, reinforcing the importance of reliable access to safe water.

UNICEF supported NWSA-Saada with both diesel and solarisation of water systems. Eleven solar systems were provided over the three years, while diesel support totalled 122,500 litres in 2017, 219,080 litres in 2018 and 193,400 litres in 2019.

Table 1: UNICEF support to NWSA-Saada

Year	Solar systems provided	Diesel support (litres)
2017	3	122,500
2018	3	219,080
2019	5	193,400

HOW VALUE FOR MONEY WAS ASSESSED

The assessment used four dimensions. Economy considered whether key inputs were obtained at an appropriate quality and price. Efficiency considered how well inputs were converted into outputs. Effectiveness considered whether the intervention achieved the intended service results. Equity considered whether benefits were distributed fairly, particularly to vulnerable beneficiaries.

Two indicators were central. The Cost Performance Ratio (CPR) combined financial and physical performance to assess efficiency. The Performance Ratio (PR) compared actual achievement with the planned target for a particular indicator. The analysis covered the full 2017-2019 implementation period.

The underlying data had limitations. Project documents and budgets were not always complete; beneficiary and water-production data were not consistently disaggregated by production system and water source; and information on pre-existing infrastructure was limited. These limitations are important when interpreting the findings and are themselves a lesson for future humanitarian programmes.

WHAT THE EXPERIENCE SHOWED

1. Procurement can be Economical, but Documentation Matters

The available evidence indicated that procurement of the solar systems followed Yemeni tendering procedures. Specifications were defined through tenders, local contractors submitted technical and financial proposals, and NWSA-Saada reviewed and selected

proposals. UNICEF monitored the process. Diesel was procured by UNICEF at a fixed rate of US\$0.875 per litre during the project period and transported to NWSA-Saada.

The original assessment therefore concluded that the project achieved economy in procurement. However, it also identified gaps in documentation, including information on pre-existing infrastructure, procurement records and project expenditure. For humanitarian programmes, good procurement practice is not enough: the evidence needed to demonstrate economy must also be retained and organised so that it can be reconstructed during later reviews.

2. Efficiency Changed Substantially Over the Three Years

Table 2: Cost Performance Ratios by water-supply modality

Beneficiary modality	2017 CPR	2018 CPR	2019 CPR
Diesel and solar	1.23	0.22	0.21
Diesel	5.81	0.54	0.80
Solar	1.56	0.38	0.29

The combined CPR was 1.23 in 2017, but fell to 0.22 in 2018 and 0.21 in 2019. The assessment attributed the decline mainly to additional spending on diesel and solar-system procurement that had not been included in the original project budget.

The fall in CPR should not be interpreted simply as programme failure. Beneficiary demand increased during the period: the assessment reported a 15% increase in beneficiaries supported in 2018 compared with 2017 and a further 31% increase in 2019 compared with 2018. In other words, the programme was operating in an environment in which demand was changing while expenditure requirements also changed.

The practical lesson is that annual budgeting is essential in protracted humanitarian operations. A three-year project budget cannot be treated as static when beneficiary numbers, infrastructure needs and operating costs are changing. Budgets and implementation plans should be reviewed and updated regularly, with changes clearly documented.

3. Solarisation Needs to be Assessed as an Investment, not Only as an Annual Cost

The solar-specific CPR was 1.56 in 2017, falling to 0.38 in 2018 and 0.29 in 2019. The original assessment associated the lower ratios with expenditure on additional solar systems in 2018 and 2019 that had not been included in the original budget.

This finding illustrates an important practical issue. A solar water system involves an investment whose costs and benefits may occur over different periods. A year in which several systems are purchased can look inefficient when assessed against annual output alone, even if the investment subsequently reduces dependence on diesel. Conversely, solarisation should not automatically be assumed to provide better value for money without evidence on production capacity, utilisation, maintenance and operating costs.

For humanitarian programmes, energy choices should therefore be linked to a clear investment plan. Where solarisation is pursued, the transition should be planned alongside

production capacity, maintenance arrangements and a realistic strategy for reducing diesel dependence.

4. Effectiveness Improved Even While Efficiency Deteriorated

Table 3: Planned and actual average water consumption

Year	Planned water consumption (litres/person/day)	Actual	Performance ratio
2017	20	22	110%
2018	22	33	150%
2019	33	38	115%

The most important lesson from the case is that efficiency and effectiveness did not move in the same direction. Average reported water consumption increased from 22 litres per person per day in 2017 to 33 litres in 2018 and 38 litres in 2019. The corresponding performance ratios were 110%, 150% and 115%.

Thus, while the CPR fell sharply after 2017, the reported level of water consumption increased. Looking only at financial performance would have missed this improvement in service delivery. Conversely, looking only at water consumption would have hidden the increased expenditure. A balanced value-for-money assessment needs both perspectives.

For humanitarian managers, the implication is straightforward: no single ratio should determine whether an intervention is judged successful. Resource use and service outcomes need to be reviewed together.

5. Equity Needs Better Beneficiary Information

Table 4: Vulnerability targeting

Year	Planned vulnerable beneficiaries	Actual	Performance ratio
2017	80%	88%	110%
2018	88%	84%	95%
2019	60%	58%	97%

Vulnerable beneficiaries constituted a large proportion of those reached. Across the project period, 133,689 of 179,489 beneficiaries were classified as vulnerable, equivalent to 77%. Project staff also reported that women appreciated improved access to water because women traditionally have responsibility for fetching water for their families.

At the same time, the assessment acknowledged that vulnerability profiling could be improved. More systematic information on gender, age and income would have allowed a stronger assessment of who benefited and whether the intervention was reaching those with the greatest need.

The lesson is that equity should be treated as a measurable programme outcome rather than a qualitative assumption. Humanitarian WASH monitoring should capture who receives services, not only how many people receive them.

WHAT SHOULD HUMANITARIAN PROGRAMMES DO DIFFERENTLY?

Maintain Competitive Procurement—but Preserve the Evidence

Procurement procedures should remain competitive and technically sound. At the same time, project teams should maintain a complete audit trail covering specifications, tenders, selected suppliers, prices, pre-existing infrastructure and actual expenditure. This makes later value-for-money assessment substantially more reliable.

Review Budgets and Plans Annually

In protracted crises, beneficiary numbers and operating requirements can change quickly. Annual review of project plans and budgets should therefore be routine. Significant deviations from the original budget should be documented with their operational rationale.

Develop an Explicit Energy Transition Strategy

Where solarisation is intended to reduce diesel dependence, programmes should define the desired transition, the required production capacity, investment needs, maintenance arrangements and indicators of progress. Solar systems should be assessed as infrastructure investments rather than as isolated annual purchases.

Disaggregate Production and Beneficiary Data

Monitoring should distinguish beneficiaries and water production by system and water source wherever possible. This would allow managers to understand which modality is generating which outputs and at what cost. Without this information, comparisons between diesel and solar systems remain difficult.

Strengthen Vulnerability Profiling

Beneficiary monitoring should include practical vulnerability variables that can be collected consistently and ethically. Gender, age and household economic characteristics can help programmes determine whether services are reaching groups facing the greatest barriers.

A Simple Management Lesson from Saada

The Saada experience can be summarised in one principle: value for money is not the same as low expenditure. A humanitarian intervention can spend more than originally planned and still generate important service benefits; equally, a programme can reach many people without using resources efficiently. The purpose of VfM analysis is to make these trade-offs visible.

For programme managers, this means using a small set of complementary questions: Were inputs obtained at a reasonable price and quality? Were resources converted efficiently into outputs? Did service delivery improve? Who benefited? And were the reasons for major deviations from the plan understood and documented?

The Saada case suggests that these questions are particularly important when humanitarian actors combine short-term operational support, such as diesel, with longer-term infrastructure investments, such as solarisation.

CONCLUSION

The Saada hybrid WASH intervention provides a practical example of the complexity of delivering water services in a conflict-affected setting. Over three years, UNICEF support combined diesel and solar systems across 13 locations. The assessment found evidence of increased water consumption and a high proportion of vulnerable beneficiaries, while the cost performance ratio declined substantially after 2017.

The principal lesson is not that diesel or solar was universally the better option. Rather, the experience demonstrates that humanitarian WASH value for money needs to be considered across economy, efficiency, effectiveness and equity. Strong procurement, realistic annual budgeting, planned energy transition, disaggregated monitoring and better vulnerability profiling can improve both programme management and the quality of future evaluations.

Although the underlying data are from 2017-2019, the case remains useful as a retrospective lesson from a completed humanitarian intervention. Its value lies in the management lessons that can be applied when humanitarian organisations are required to sustain water services while simultaneously investing in more efficient infrastructure.

Author Note

This Practice Note is based on the completed Saada Hybrid WASH Value-for-Money case study for 2017-2019. The analysis used project documentation and qualitative information from UNICEF and NWSA-Saada staff. The original assessment identified limitations in project documentation, beneficiary and water-production disaggregation, and information on pre-existing infrastructure. Those limitations have been retained rather than supplemented with new data. The views expressed in this Practice Note are those of the author and not their employer or NWSA-Saada.