

**Formative Evaluation of the
UNICEF WASH Programme in DPR Korea
with a focus on Gravity-Feed Water Systems**

Final Report

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Executive Summary

Background

The Democratic People's Republic of Korea (DPRK) continues to be affected by an ongoing complex emergency that has a severe impact on the nutrition, health and well-being of children. The frequency of floods, droughts and other seasonal and climate-change related disasters is increasing, and national coping capacity is low. Food shortfalls, a weak health system and poor water, sanitation and hygiene are the major causes of child malnutrition, respiratory infections and high incidences of diarrhoea.

Since the late 1990s UNICEF has worked in DPRK in response to this ongoing crisis through a multi-sectoral programme including nutrition, health and WASH interventions. Within WASH, most emphasis has been on support to re-build the national water system network – which has fallen into disrepair – through support for the construction of gravity-feed water systems (GFS), a technology that draws water from mountain water sources and delivers it to towns and villages using gravity alone through a pipeline and distribution network. GFS are a good fit to the challenges of the national context (limited electricity for pumping, limited spares for pumps, limited options for alternative water supply systems) while capitalizing on the opportunities provided by topography and the availability of protected water sources.

Evaluation Structure and Methodology

This evaluation, conducted from October to December 2016, is the first for UNICEF in the WASH sector in ten years in DPRK. It reviews the UNICEF-supported GFS interventions supported by UNICEF since 2006. As a formative evaluation, the evaluation process focused on collecting and analysing information to inform recommendations to aid decision-making for planning and implementing future UNICEF cooperation with the Government of DPRK. The evaluation was participatory, involving the ministry responsible for water supply in the country (the Ministry of City Management, MoCM), the Central Bureau of Statistics (CBS) and other key stakeholders including sub-national government officials, GFS managers, partner agencies and beneficiaries.

The evaluation used mixed methods to capture and synthesize both qualitative and quantitative data. This included a desk review of existing programme-related documents and monitoring data, semi structured interviews with stakeholders and beneficiaries, and semi-structured observations at programming sites. Observations and interviews were carried out over three field visits covering over 25 percent of the GFS and counties supported by the UNICEF programme, in five of the country's eight provinces. A total of 12 water systems were visited, and interviews conducted in 10 counties, 22 households and 11 education and childcare facilities (schools, kindergartens and nurseries).

Limitations, some of which are specific to the DPRK context such as issues of access, were identified during the inception phase and addressed through the triangulation of information and other means to make findings and reach conclusion at high confidence levels.

The evaluation is structured under the OECD/DAC criteria of relevance, effectiveness, efficiency, sustainability and impact, as well as the criteria of equity and gender. A set of 22 specific questions were used to assess findings within these criteria and conclusions and lessons drawn from them.

Findings, Conclusions and Lessons

The UNICEF-supported GFS interventions in DPRK are relevant to national priorities and to people's lives, are cost-efficient and have had a substantial positive effect on beneficiary communities, especially on women and children. There is also evidence to suggest that the GFS have had some impact on child diarrhoea prevalence and thus on child health. However, this impact has been largely limited to the beneficiary communities themselves: government is willing but largely unable to replicate the GFS model on a larger scale and international actors – including UNICEF – have limited funds to expand programmes. The GFS have also not fulfilled their full potential: health and gender-related impacts would be greater if the GFS supplied continuous and fully-safe water to consumers 24-hours a day as they were designed to do.

The commitment and ingenuity of local authorities and beneficiaries have managed to keep the systems operational for as long as ten years, despite daunting challenges in the national programming environment. However, to be sustainable over their design lifespan of 20 years, the GFS require new investment, renewed capacity building and other support from UNICEF and MoCM. Such support must address the fact that the GFS are at significant risk from flooding and drought – the incidence of which is increasing – and are also vulnerable to the effects of deforestation on water catchments.

Moving forward, the GFS continue to be UNICEF's best available option for water-related interventions within the national programming context and thus should continue to be at the core of the WASH programme in the future. The design and construction of the new GFS should address the shortcomings identified in this evaluation, which will require more support, capacity building and supervision from UNICEF and MoCM as well as a somewhat higher investment per beneficiary in the systems themselves for quality assurance.

Several key lessons were learned from the evaluation process, applicable both to the DPRK programme and to UNICEF WASH programming in other countries:

Lesson 1: The findings show that while there is significant room for improvement, it is possible to successfully construct economical and sustainable piped water systems, even in a highly challenging programming environment. This is an important lesson in the context of the Sustainable Development Goals, which call for the delivery of safe water into households for all by 2030.

Lesson 2: GFS are at a high risk from the impact of floods and droughts, and this risk will likely increase in DPRK and elsewhere due to climate change.

Lesson 3: While GFS require fewer inputs for operation and maintenance than most other water technologies, regular support is necessary to maintain adequate functionality and to ensure continuing benefits for children and women.

Lesson 4: Staff turnover in UNICEF can have significant negative repercussions on programming in the absence of a robust system to ensure an adequate institutional memory in country offices.

Lesson 5: Capacity building must be a continuous process and not just limited to the short-term periods of emergency and development projects. This implies that UNICEF has a responsibility to ensure that some regular resources are devoted to basic continuing capacity building programmes, even in the absence of donor funding.

Recommendations

The findings, conclusions and lessons learned from the evaluation, lead to eight recommendations, listed below.

Repair and rehabilitate the existing GFS: Relatively modest short-term investments in the existing GFS will help to ensure that the systems are sustainable over their design 20-year lifespan and will maximize the health benefits by applying quick-fixes to critical components

Improve routine maintenance of the existing GFS: UNICEF and MoCM should put greater emphasis on regular support for the management and maintenance of existing GFS including through the annual replenishment of critical spare parts at county level.

Reinvigorate capacity building for GFS: A renewed capacity building programme will improve the management and maintenance of existing systems and improve the design and construction of new systems.

Improve supervision and support from the national level: For improved results, UNICEF and MoCM should increase the frequency of their visits and other support to counties, which will require higher staffing levels and better protocols for continuity within UNICEF.

Develop systems to address high staff turnover rates in UNICEF: UNICEF should address high staff turnover rates with more rigorous handover protocols, more timely recruiting of international staff and other measures as appropriate to improve programme continuity and institutional memory.

Construct new high-quality GFS at both village and county level: The evaluation findings show that the GFS model is still the best option for water supply in the DPRK, and GFS construction should continue to be the core WASH intervention for UNICEF.

Update GFS designs to reduce risk from flooding, drought, climate change and deforestation: Disaster and climate change risk reduction should be core components of feasibility studies and system design.

Address water quality in existing and new GFS: In both existing and new GFS, water quality should be more comprehensively addressed by re-emphasizing the need for a fully functional physical and biological water treatment system.

In addition to these recommendations, the evaluation goes on to provide a set of recommendations for the broader UNICEF DPRK WASH programme. As detailed in the report, these include recommendations on programme focus, sanitation, WASH in schools and household water quality.

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All photographs taken by Ri Nam Hyen, UNICEF/MoCM

Acronyms and Terms

\$	\$US
AES	Anti-Epidemic Stations
CBS	Central Bureau of Statistics
CC	Climate Change
CP	Country Programme
CPD	Country Programme Document
CPC	County People's Committee
DPRK	Democratic People's Republic of Korea
DRR	Disaster Risk Reduction
EPANET	public domain software for modelling water distribution piping systems
EU	European Union
GFS	Gravity-Feed water System
HH	household
IFRC	International Federation of Red Cross and Red Crescent Societies
MICS	Multiple Indicator Cluster Survey
MoCM	Ministry of City Management
MoPH	Ministry of Public Health
NCC	National Coordinating Committee
OR	Other Resources (funding source)
Ri	village (in Korean)
RR	Regular Resources (funding source)
SCI	Save the Children International
SDC	Swiss Agency for Development and Cooperation
SDHS	Socio-Economic, Demographic and Health Survey
SSF	slow sand filter
ToC	Table of Contents
ToR	Terms of Reference
UNICEF	United Nations Children's Fund
Up	town (in Korean)
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme

1 Background: Country Context and Programme Description

1.1 Country Context

The development programming context in the Democratic People's Republic of Korea (DPRK) continues to be defined by an ongoing complex emergency that has a severe impact on the nutrition, health and well-being of children. The risk of humanitarian crises and disasters in DPRK is now among the highest in the world (30th of 191 countries)¹ and has been increasing over the last three years due to high levels of vulnerability, low national coping capacity and an increase in the frequency of floods, droughts and other seasonal and climate-change related disasters.

Stunting and wasting due to long-running food production shortfalls and resulting chronic and acute malnutrition is the most serious consequence of the crisis, with major implications for children's physical, cognitive and social development. Child and maternal health service delivery is inadequate, with many areas of the country not equipped with sufficient facilities, equipment or medicines to meet basic health needs. Lack of access to safe drinking water and adequate sanitation and the unsafe handling of human excreta contribute to a high incidence of diarrhoea and respiratory tract infections and to malnutrition.

Aggravating this situation is the inability of the United Nations and other actors to mobilize significant humanitarian or development funding due to the effects of international sanctions, despite the fact that humanitarian relief is exempt from sanctions. In addition to limited funding, these effects include problems with banking channels, a ban on imports from many countries and significant procurement delays due to heightened customs scrutiny and logistical complexities. Raising funds for non-emergency development programming is even more problematic, limiting the kind of longer-term programmes of cooperation that could help to address underlying causes of the humanitarian crisis, and improve resilience.

1.1.1 Water and Sanitation in DPRK

The domestic water needs of DPRK were largely met through the large-scale construction of piped water supply systems and tubewells by the government from the 1960s to the early 1990s. This is reflected in the latest available official coverage data that shows 89% of the population served by piped water on the premises, and the remainder served by protected tubewells and dug wells.²

Now, however, many of these systems have fallen into disrepair due to insufficient investments in maintenance and rehabilitation, and the lack of pumping equipment and spare parts. The pumped systems that are still functional run only sporadically due to electricity limitations, and the water sources these older systems draw on are now often contaminated. Many people now rely on unsafe water sources including unprotected dug wells and rivers to replace or supplement water from the piped systems. It is not possible to precisely quantify the scale of this problem, but data from a recent water assessment survey show that the majority of water systems are not fully functional.³

¹ INFORM Global Risk Index for 2017. <http://www.inform-index.org/Results/Global>

² DPRK Multiple Indicator Cluster Survey (MICS), 2009. The MICS report acknowledges that this very high coverage figure is the result of householders identifying piped water as their source of water even in cases where other sources are used, and notes that the questions should be more nuanced in future surveys to more accurately reflect the situation.

³ The Water Assessment Survey conducted by the Ministry of City Management and the Central Bureau of Statistics in 2013 and 2014 is unpublished (and incomplete), but it provides new information on the extent to which systems are not fully functional.

The only available data on sanitation coverage indicates that most people have access to a sanitation facility but that 42% use pit latrines or household septic tanks.⁴ These facilities are generally unsafe in DPRK because they are designed for ease of access to excreta, which is used for fertilizer (most pit latrines and septic tanks are regularly emptied, two to four times a year). This is true both for domestic facilities and for school and child care institution facilities. Additionally, the practice of spreading fresh, un-composted human excreta on fields results in a situation of “virtual open defecation” that is particularly dangerous for children. It is also very likely that the 58% of households with access to flush toilets are not all using them due to the lack of regular water supplies in households, and thus latrine use is higher than the figures suggest.

1.2 The UNICEF WASH Programme

The WASH programme is part of UNICEF’s overall Country Programme for children in DPRK, contributing in particular to planned outcomes in the areas of health, education and nutrition along with emergency response. WASH support at the county level has generally been part of a broader UNICEF convergent approach integrating multi-sectoral interventions in focus counties to reduce high rates of mortality and morbidity, promote early childhood development, address undernutrition, and build community resilience. During the current Country Programme (CP) period (2011-2016) the WASH interventions were the entry point for other sectoral interventions in many of the focus counties covered by the CP. In the next CP period, WASH continues to be one of three core components (along with nutrition and health) for interventions in a new set of nine convergence counties.

UNICEF has provided support for WASH programmes in DPR Korea (DPRK) since 1999 in the areas of water well drilling, piped water systems, sanitation and hygiene, and emergency WASH. This support has been provided at the city, town, village levels in counties in eight of the country’s nine provinces; as well as in schools, nurseries and health care facilities. Over the last six years, UNICEF expenditure on WASH averaged \$2.5 million annually.⁵

The bulk of this UNICEF expenditure has been used for the construction of gravity-feed water systems (GFS), a technology that draws water from mountain water sources and delivers it to lower-elevation towns and villages using gravity alone through a pipeline and distribution network. GFS are used in DPRK because they are a good fit to the challenges of the programming context (limited electricity for pumping, limited spares for pumps, non-existence of a robust water well drilling industry) and to the opportunities of the programme context (the suitability of GFS in many parts of the country due to topography and water resources availability, limited availability of the sophisticated water treatment systems and consumables that would be required if less safe sources of water are used).



Running water in a GFS household, Tongrim County

⁴ DPRK MICS, 2009

⁵ UNICEF WASH expenditure data is available only for this period (not earlier). Data quantifying the precise proportion of expenditure on service delivery and on GFS is not available.

In total, UNICEF has supported the construction of a total of 38 GFS in DPRK since 2002, which together provide water to over three-quarters of a million people across a wide geographic area (see Table 1). Most of these systems, 33, were constructed in the last ten years (the period of consideration for this evaluation), and two of these are still under construction. Over 70% of the GFS serve county towns or cities, the rest serve rural areas (some GFS serve multiple villages).

Table 1: UNICEF-Supported Gravity-Feed Systems Summary

Parameter	Quantity	Notes
Number of GFS constructed with UNICEF support	38	33 in the last 10 years, 2 under construction (the other five systems in the 2002 to 2005 period)
Population served	756,343	
UNICEF expenditure on the 38 systems	\$13.3 million	Estimated
Total cost of the 38 systems	\$23.0 million	Including government contributions (estimated)
Number of counties/cities reached	33	
Number of provinces	8	Of 9 total
Percentage GFS serving urban areas (county towns/cities)	71%	The remainder serve rural areas

2 Evaluation Objectives and Scope

The UNICEF DPRK WASH programme was last reviewed in 2006.⁶ Since that time no substantive reviews have been conducted. A review is required now both to assess progress and constraints over the last ten years and to provide UNICEF and its government partners with information and recommendations to adjust and improve future programming, with specific reference to the implementation of the WASH component of the new Country Programme for 2017 to 2021.

2.1 Objectives

This formative evaluation reviews WASH programming progress since 2006, focusing in particular on GFS interventions, which comprise the greatest portion of the UNICEF level of effort in the WASH sector in DPRK. The evaluation has two specific objectives:

1. Review the WASH programme over the last 10 years, with a focus on GFS, identifying good practices and lessons learnt in the implementation of the programme as well as barriers and bottlenecks;
2. Formulate recommendations to assist UNICEF and its government partners to develop and improve WASH strategies and methodologies for the 2017-2021 period and beyond.

The recommendations are informed by evaluation findings along with regional and global UNICEF WASH strategies and norms (including the new Global WASH Strategy for 2016-2030), taking into account the particular circumstances of the programming environment in DPRK. The recommendations are also guided by UNICEF evaluation findings and reviews in other similar countries, especially with respect to measures and methodologies for assuring the sustainability of water supply systems.

2.2 Scope

The evaluation focuses on UNICEF-supported interventions to construct and support GFS in DPRK at the county town and rural levels.

The evaluation covers GFS projects implemented in the 10-year period of 2006 to 2016. This timeframe was chosen for two reasons: one, it is ten years since the previous comprehensive review of the UNICEF DPRK WASH programme and two, the evaluation must cover older GFS in order to assess sustainability, a key criteria for WASH programming. As such, focus was on completed systems that have been in operation for up to 10 years, but also included newer systems and systems under construction to assess how UNICEF and Government have adjusted designs approaches over the period. The evaluation also included a visit to a GFS supported by another agency, Save the Children International – SCI (known in DPRK as by EUPS Unit 2).

Geographically the evaluation assessed GFS throughout the areas of the country where GFS have been supported by UNICEF in significant numbers, as detailed in Section 3.2.3. The GFS visited include both town systems and village systems.

The evaluator also observed other aspects of the UNICEF WASH programme over the same period, including in the areas of sanitation, non-GFS water supply, hygiene promotion and emergency preparedness and response. These are not formally part of the evaluation, but a set of supplementary recommendations based on these observations are included in Annex 9.

⁶ Keast, 2006, *Programme Review of the UNICEF-Supported Water, Sanitation and Hygiene Programme in the Democratic People's Republic of Korea*.

3 Evaluation Approach, Methodology and Limitations

3.1 Approach

As a formative evaluation, the evaluation process focused on collecting and analysing information to inform recommendations that will aid decision-making for planning and implementing future UNICEF cooperation with the Government of DPRK in the area of GFS. The evaluation was participatory, involving all key stakeholders including managers and other actors currently involved in the implementation of the programme, as well as beneficiaries. The Ministry of City Management (MoCM) and the Central Bureau of Statistics (CBS) participated in all phases of the evaluation, including planning, stakeholder interviews, field visits and the de-briefing session.

The evaluation is structured using the five criteria defined by OECD/DAC⁷ as well as the criteria of equity, as per the ToR (Annex 1). In the inception phase of the evaluation, all six of these criteria were judged to be appropriate to both the sectoral and country context of the evaluation. A seventh category, Gender, was added by the evaluator in consultation with the evaluation reference group (see Section 3.2.4) given its importance in the context of WASH programming. The evaluation ToR includes additional specific questions that have been incorporated into the seven criteria, below, used to structure the findings.

Relevance: the extent to which the programming is suited to the priorities and policies of the target group, recipient and donor;

Effectiveness: the extent to which the programming attains its objectives;

Efficiency: comparison between time, effort, knowledge, money invested (cost benefit analysis) and the results achieved;

Sustainability: whether the benefits of the programming are likely to continue after donor funding has been withdrawn

Impact: the positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended;

Equity: the extent to which the programme has reached hard-to-reach, disadvantaged and vulnerable communities, and the degree to which the convergent approach has incorporated an equity approach and contributed to a reduction in national and sub-national disparities for children based on geography, gender and disability;

Gender: the extent to which the UNICEF interventions have reduced gender-based inequalities related to WASH, and the extent to which UNICEF has encouraged the meaningful participation of women in programme-related activities.

A set of 22 specific questions were used to assess findings within these criteria and conclusions and lessons drawn from them (Table 2).

⁷ OECD DAC Criteria for Evaluating Development Assistance, www.oecd.org/dac/evaluation/

Table 2: Evaluation Criteria Questions

Relevance Q1:	Are the GFS interventions relevant to the national WASH policy and programming context?
Relevance Q2:	Are the GFS interventions relevant to the current (2011-2016) and upcoming (2017-2021) UNICEF Country Programmes?
Relevance Q3:	Are the GFS meeting a priority need of households and institutions?
Effectiveness Q1:	Is the water supply status in households and institutions served by the GFS an improvement over the pre-GFS situation?
Effectiveness Q2:	Are the GFS delivering water in sufficient quantities to meet the basic domestic requirement of households and institutions?
Effectiveness Q3:	Is the water delivered through the GFS systems safe?
Effectiveness Q4:	Has the GFS programme has improved over the years? Are good practices being integrated into the newer projects?
Effectiveness Q5:	Are the new water systems also improving hygiene and sanitation?
Efficiency Q1:	Were the GFS completed in a reasonable amount of time?
Efficiency Q2:	Are the GFS cost efficient?
Sustainability Q1:	Is there ownership of the GFS on the part of county officials and beneficiaries?
Sustainability Q2:	Are the GFS sustainable over their planned service life?
Sustainability Q3:	Are the GFS at risk from disasters, climate change and environmental degradation?
Sustainability Q4:	Is the GFS approach being replicated in the country?
Impact Q1:	Have the GFS had an impact on child health?
Impact Q2:	Have the GFS had an impact on child nutrition?
Impact Q3:	Have the GFS had unintended negative effects?
Equity Q1:	Are the UNICEF-support GFS covering the regions of the country that have the greatest need?
Equity Q2:	Does the entire population of the beneficiary towns and villages have access to water?
Gender Q1:	Have the new water systems reduced WASH-related time burdens on women?
Gender Q2:	Have the new water systems reduced WASH-related risks to women's health, security and dignity?
Gender Q3:	Are women participating in a meaningful way in the planning and management of the water systems?

3.2 Methodology

The evaluation used mixed methods to capture and synthesize both qualitative and quantitative data. This included a desk review of existing programme-related documents and monitoring data; semi structured interviews with stakeholders and beneficiaries; and semi-structured observations at programming sites including GFS, communities, households and education and childcare institutions (schools, nurseries and kindergartens) as detailed in the sub-sections below. These are adequate as they allowed the evaluator to collect information from diverse perspectives, ensure data quality and accuracy and overcome data limits.

An Evaluation Matrix (Annex 4) that was developed during the inception phase details the indicators, data sources, data collection methods and analysis methods employed to assess the evaluation criteria. These are also summarized below.

3.2.1 Desk Review

The evaluation consulted all available documentation and databases sourced from UNICEF, MoCM and other national stakeholders, along with relevant documents from the global and regional level (59 separate documents were reviewed – see Annex 2 for listing). Key documentation includes:

- the database of UNICEF -supported GFS with technical data and data on costs and beneficiaries;
- the results from the MoCM/UNICEF Water Assessment Survey;
- the 2006 review of the UNICEF WASH programme, plus other evaluations and reviews;⁸
- the UNICEF Country Programme Document for 2017-2022 and other strategic planning instruments;
- SDHS-2014, MICS 2009 and other surveys and data on the situation of children and women in DPRK;
- technical documentation including GFS feasibility studies;
- documents related to capacity building efforts.

3.2.2 Semi-Structured Interviews and Observations

The evaluator completed interviews and discussions with a total of 89 stakeholders as summarized in Table 3, below, by constituency and listed in Annex 3. As shown, most interviews were conducted at the sub-national level, during the evaluation field trips.

Interviews with stakeholders were semi-structured, following a core set of standard questions for each constituency. In most cases the interviews were one-on-one (through translation), in other cases (national and sub-national government officials) group discussions were used to interview stakeholders.

Of the stakeholder groups interviewed, women were the majority among householders, education and childcare institution directors and national government officials, and the minority among sub-national government interviewees, UNICEF and other support agencies as shown in Table 3 below. In total 41 of the 89 interviewees were women.

⁸ In addition to the 2006 review (and a follow-up 2008 visit) there has been one evaluation of one aspect of the UNICEF WASH programme (*Evaluation of the pilot DEWATS projects in DPRK, 2010*) and several evaluations of NGO WASH projects over the last ten years (see list of documents reviewed in Annex 2).

Table 3: Stakeholders Interviewed⁹

Stakeholder Group	Institutions/Groups	Number Consulted
Government, national	MoCM, CBS, NCC	9 (including 5 women)
Government, sub-national	Provincial officials; County People's Committee (CPC) officials; Ri People's Committee officials; GFS managers and operators	32 (2 women)
Education and childcare institutions	Directors and principals	11 (11 women)
Householders	Household members	21 (20 women)
UNICEF	UNICEF-DPRK: management, section chiefs, WASH staff UNICEF-EAPRO: WASH and evaluation advisors	10 (2 women) (UNICEF WASH section: 3 men, 1 woman)
Other WASH Support Agencies in DPRK	SDC, SCI, IFRC, Concern, Deutsche Welthungerhilfe, Wellspring	6 (1 woman)

See Annex 3 for the complete list of stakeholders met.

Structured observations were conducted at 12 water systems. The observations were used to systematically assess common elements of each system including system structure (e.g. the existence of water treatment systems), functionality and construction quality. Structured observations were also conducted in 11 education and childcare institutions and schools, and in 21 households. These observations assessed a range of parameters including access to water, existence of soap, water storage practices and others.

See Annex 4 for the set of evaluation instruments used for the evaluation, including the interview questions for all stakeholders and the observation checklists. They are based on instruments used globally in the WASH sector and instruments used previously by the evaluator in DPRK. They were further adjusted based on the results of an initial three-day field trip conducted at the beginning of the evaluation period.

The evaluation instruments focus on the primary evaluation focus: GFS and their beneficiaries. The evaluator also endeavoured – through less formal discussion and observations – to assess other aspects of the UNICEF WASH programme and include such information in the recommendations as per the ToR.

Data analysis on the structured observations and interviews (and other datasets, including financial information) was conducted by the evaluator with inputs and assistance from CBS, MoCM and UNICEF DPRK.

⁹ Numbers listed in this table refer to the people interviewed (individually and in some cases in groups). Other people met include teachers and staff at institutions, additional WASH Sector Group members, household cluster leaders, other UNICEF staff, etc.

3.2.3 Field Visits and Sampling

The choice of county and GFS visits was made jointly by Government, UNICEF and the evaluator. The visits included GFS in all regions of the country where UNICEF interventions were carried out, with more weight given to older GFS to ensure that the sustainability evaluation criteria was adequately assessed (average age of GFS visited: 6 years). The selection also included GFS known by UNICEF and MoCM to be underperforming to ensure that the evaluator had the opportunity to see and assess problem areas. The field visits covered:

- 10 of the 38 UNICEF-supported GFS (26%), including completed and under-construction;
- 9 of the 33 counties (27%) in which UNICEF-supported GFS have or are being built;
- 5 of the 8 provinces (63%) in which UNICEF-supported GFS have or are being built (the three provinces not visited each have just one UNICEF-supported GFS; the bulk of UNICEF GFS support has been in the five provinces visited).

Figure 1 and Table 4 detail the counties and GFS visited during the three field visits. Annex 6 details the travel itinerary.

The GFS visited included nine completed UNICEF-supported GFS, one UNICEF-supported GFS under construction, one GFS supported by another agency (SCI) and one non-GFS (solar pumping) UNICEF-supported system. The non-UNICEF GFS was visited to help assess differences and similarities in approaches and results between UNICEF and other external support agencies. The non-GFS system was visited to assess alternative water supply systems.

The choice of education and childcare institutions (schools, kindergartens, nurseries) and household visited was made primarily by county-level officials in consultation with national-level authorities. A total of 11 institutions and 21 households were visited. See Section 2.4 below for more information on the limitations of sampling with respect to institutions and households.

Table 4: Locales Visited

Province	County	System
North Pyongan	Tongrim	Tongrim town GFS
North Pyongan	Jongju	Jongju city GFS (under construction)
South Hamgyong	Kumya	Kumya town GFS; Jiyin Ri solar system
South Hamgyong	Sinhung	Sinhung town GFS (non-UNICEF)
Kangwon	Tongchon	Tongchon town GFS; Songjon Ri GFS
North Hwangae	Sinpyong	Sinpyong town GFS
South Hwangae	Pyoksong	Pyoksong town GFS
South Hwangae	Unchon	Unchon town GFS
North Hwangae	Yontan	Yontan town GFS
North Pyongan	Unsan	Unsan town GFS

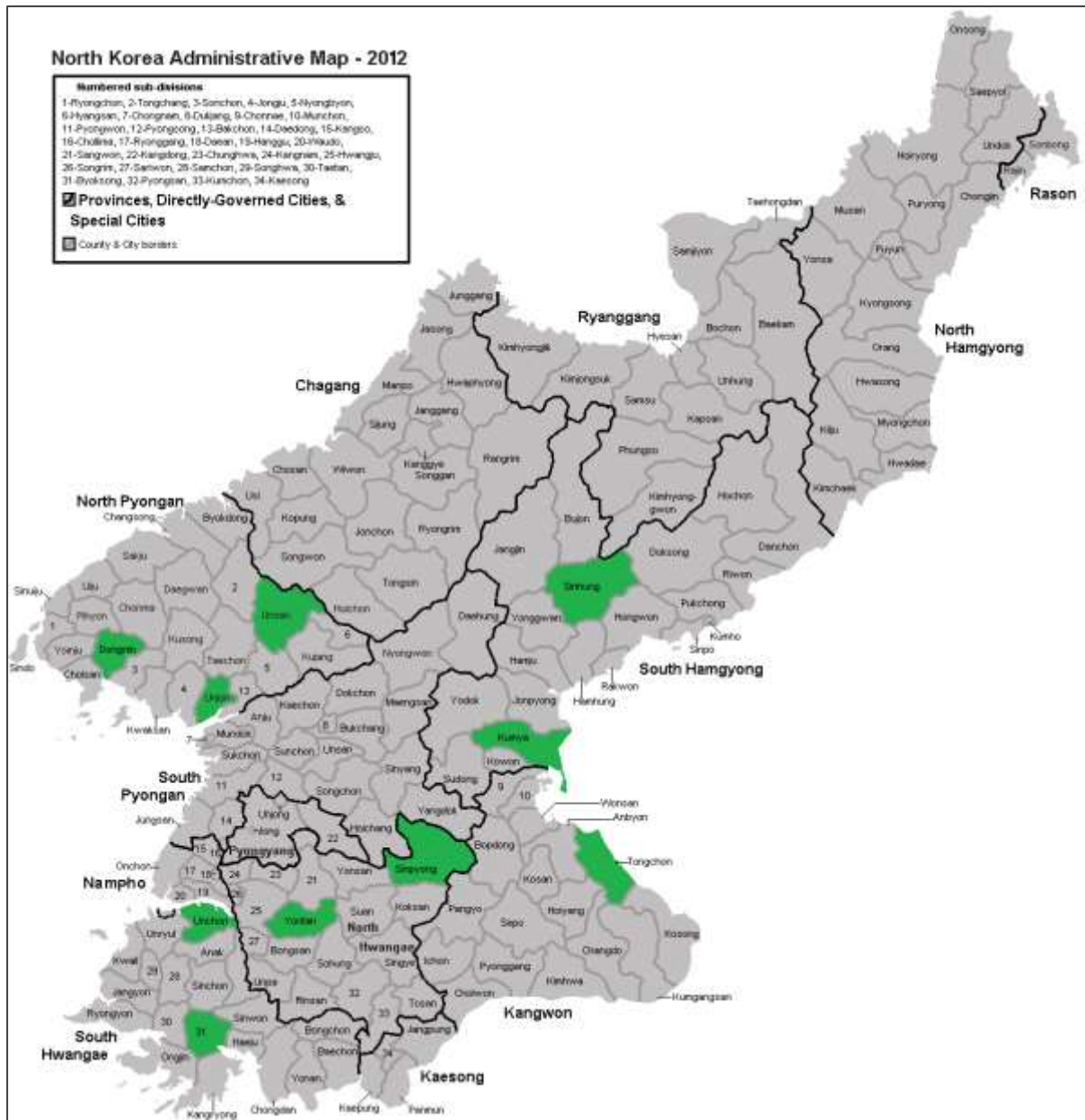


Figure 1: Counties Visited

3.2.4 Evaluation Management

The evaluation was conducted by Greg Keast, consultant (referred to as the evaluator in this report), in conjunction with stakeholders from MoCM, CBS and UNICEF. It was carried out in three stages: an off-site desk review, in-country field work and stakeholder consultations, and off-site report writing.

The evaluation was managed by Murat Sahin, Deputy Representative, UNICEF, DPRK and guided by a reference group, which was additionally tasked with quality assurance of products. The reference group is composed of:

- Anil Pokhrel, WASH Specialist, UNICEF DPRK (reference group coordinator)
- Oyunsaihan Dendevnorov, Representative, UNICEF DPRK
- Murat Sahin, Deputy Representative, UNICEF DPRK
- Chander Badloe, UNICEF Regional Advisor, WASH, UNICEF EAPRO

- Riccardo Polastro, UNICEF Regional Adviser (Evaluation), UNICEF EAPRO
- Mubeen Aslam, TB and Malaria Programme Manager, UNICEF DPRK

3.3 Limitations

The inception phase of the evaluation identified four potential limitations that could have had a negative impact on the evaluation outputs. Two of these potential limitations did not become significant factors; two were factors but were addressed successfully.

One of the potential limitations that ended up not being significant was field trip limitations due to travel restrictions, infrastructure issues or weather. This was not a factor: a wide range of counties were visited over three separate field trips due to successful NCC planning efforts and good logistical support from UNICEF (this kind of access to field sites is unusual in DPRK, and access to long-completed projects is highly unusual).

The second potential limitation that was not a factor was access to government stakeholders during a very busy period that included ongoing emergency response (to the flooding in the north of the country) and the then-ongoing national 200-day campaign for economic development. Despite these draws on their time, the evaluator was provided good access to officials at the national level (including multiple meetings with vice-ministerial level directors in two ministries) and at the county level (including during a national holiday in one county).

A limitation that did have some impact on the evaluation was that sites visited were not selected randomly by the evaluator (as discussed in Section 3.2.3, they were selected during joint consultations involving the evaluator, UNICEF and government). The use of a specific set of criteria to ensure that different GFS typologies were included in the visits (older GFS, GFS across a wide geographic area, GFS that were identified as poor performers – see Section 3.2.3) helps to mitigate this. Similarly, the education and childcare institutions and households visited by the evaluator were pre-selected by county officials, in-keeping with national norms, instead of being chosen randomly by the evaluator. This was addressed in two ways: one, a set of criteria was used to help ensure that a range of institution and household typologies were covered in each case; and two, the use of triangulation to supplement the information gathered in the institutions and households (see below).

The following set of institution/household selection criteria was agreed on in advance, and these were largely met by the county officials during the visits:

- two types of houses (single story dwelling, apartment building flats) to enable an assessment of the different types of WASH-related issues in each type of dwelling;
- households at both the centre of the town/village and on the outskirts to assess the reach of the water network and differences in WASH-related practices and facilities in each type of locale;
- higher-story flats (to better assess water pressure);
- a range of education and childcare institutions (day nurseries, boarding nurseries, kindergartens, schools).

The other limitation that had some impact on the evaluation was the limited availability of information and data on the GFS and the WASH programme in general. Much of this was due to high staff turnover rates, gaps between international staff postings and the related issue of poor record keeping within UNICEF.¹⁰ This limitation was addressed mainly by working with technical staff from

¹⁰ UNICEF DPRK has problems maintaining an institutional memory because, unlike in most other UNICEF offices, the government-appointed national staff have limited tenure and high turnover rates.

MoCM (two of whom are based within UNICEF on a rotating basis, and thus easily accessible) to reconstruct key pieces of information such as a list of GFS-related trainings supported by UNICEF and a full listing of GFS and other water systems supported by UNICEF (neither of which was available within UNICEF). Similarly, support from UNICEF staff proficient in UNICEF's financial management system helped to compile some information on expenditure. At county level, the issue of staff turnover within the CPCs also limited information availability, especially in counties with older GFS, but this was successfully addressed by bringing longer-term technical staff into discussions.

Data on the functionality and performance of the GFS were also very limited due to the absence of any monitoring system accessible to the evaluator. This was addressed by using the field trips to build a set of basic information on the systems visited and compile it into a snapshot of functionality that was then used as an input to the evaluation findings (see Section 4.1), along with triangulation.

Triangulation was the key technique used to address limitations. It was used to overcome limitations in data availability through the use of multiple information sources and their cross-validation. It was also used to mitigate the lack of full control over the selection of locales to visit and people to interview. For example, whether or not the quantity of water was sufficient for household and institution needs (an interview question in the pre-selected households and institutions) was cross-checked with observation data including the actual amount of water available in storage tanks, and evidence that non-GFS water was being used for domestic needs (such as in the case of Sinpyong county where residents were washing clothes in rivers). Another example was the question of whether or not the GFS are providing 24 hour water to residents, which was determined only after cross referencing the (differing) answers from a wide range of respondents (county officials, technicians, householders, directors and staff of institutions) coupled with observations.

On the whole, the methodology used and the techniques employed to address limitations were generally sufficient to make findings and reach conclusion at high confidence levels. Where they were not, they are noted in the discussion.

4 Evaluation Findings

4.1 GFS Snapshot

In the absence of accessible national monitoring data on GFS and other water systems, the evaluator used the field trips to construct a functionality snapshot of the status of the GFS visited (Table 5, below). The purpose of this exercise was twofold: one, it provided a set of basic data on system functionality necessary for assessing the GFS interventions against the evaluation criteria; and two, it served as a useful tool when discussing GFS status and related issues with national government stakeholders.

The snapshot uses three categories to assess the status of systems:

- basic functionality – whether or not the system was functioning at the time of the visit;
- water quantity – whether or not the GFS is delivering water 24 hours a day to consumers (as designed), and an assessment of whether the system was meeting the basic domestic needs of consumers (taking into account on-site water storage tanks);¹¹
- water quality – including an assessment of the safety of the water catchment and the existence and functionality of the water treatment system, together with a risk assessment of contaminated water reaching consumers (risk increases if the catchment is not protected, if the water treatment system is not functioning, and if the system is not pressurized 24 hours a day).¹²

The rating assessment – the meaning of terms like ‘partially’ and ‘moderate’ – is explained in detail in Annex 7.

In terms of system performance, the result of this exercise is mixed. On one hand all of the GFS visited are functional and water quantity is generally sufficient to meet basic domestic and institutional needs (drinking, cooking, hygiene, laundry). This is a positive finding given that the systems visited are relatively old (average age of 6 years). On the other hand few systems are providing 24 hour water to consumers as they were designed to do, and there is moderate risk of contaminated water reaching consumers.



Household Water Storage Tank, Unsan County

Additional analysis of these initial findings can be found throughout this Findings section of the report.

¹¹ Most households, nurseries and kindergartens (but not necessarily schools) in DPRK have large water storage tanks. In many situations, this allows the storage of enough water for domestic needs even when water systems do not deliver water 24 hours a day.

¹² If distribution pipes are not pressurized, there is a risk of secondary contamination from polluted groundwater and other contaminants entering the pipes through cracks or gaps, ultimately reaching water consumers in institutions and households.

Table 5: GFS Snapshot: Functionality, Water Quantity, Water Quality

System	Functionality	Water Quantity		Water Quality		
	Functioning (at time of visit)	24hr water in system	Sufficient water in HHs and institutions (taking into account storage)	Protected catchment & intake	Functioning water treatment system	Risk of contaminated water reaching some HHs

Completed UNICEF-supported Systems

Tongrim	Yes	No	Yes	Yes	Partially	Moderate
Kumya	Yes	No	Yes	Yes	Yes	Moderate
Tongchon	Yes	No	Yes	Yes	Partially	Moderate
Songjon Ri	Yes	Yes	Yes	Yes*	No	Moderate
Sinpyong	Partially	No	No	No	No	Moderate-High
Pyoksong	Yes	No	Yes	No	Partially	Moderate
Unchon	Yes	No	Yes	Yes	Partially	Moderate
Yontan	Yes	Yes	Yes	Yes	Partially	Moderate
Unsan	Partially	No	Yes	Yes	No	Moderate-High**

Other GFS Systems

Jongju				Partially	(under construction)	
Sinhung***	Yes	Yes	Yes	Yes	No	Moderate

* did not see intake ** blended water ***Non-UNICEF (SCI)

4.2 Relevance

Relevance Q1: Are the GFS interventions relevant to the national WASH policy and programming context?

Detailed government policy documents are unavailable in DPRK, but discussions with senior government officials both during this evaluation and previously (e.g. during planning discussions for UNICEF's Country Programmes) make it clear that GFS fit into the MoCM policy framework. This was also made clear at the provincial and county levels through discussions with stakeholders.

The GFS are also highly relevant to the national programming context in DPRK. The country's mountainous topography and relatively abundant higher-elevation streams and springs make it an ideal candidate for the GFS technology. While not all people can be served with GFS, many can, and often the more isolated communities are the best candidates for GFS. GFS can be constructed with mainly manual labour; mechanized excavation equipment is generally not required. And once the initial investment has been made, GFS have much lower requirements for imported spare parts and require no fuel or electricity.

In the current national programming context, GFS is more appropriate than alternative technologies (Table 6).

Table 6: Alternatives to GFS

Water Supply Alternatives to GFS	Relevance to Programming Context
Electric pump-based piped systems	<ul style="list-style-type: none"> not currently appropriate in DPRK due to the severe shortage of electricity (and of diesel or petrol) and lack of access to pump spare parts
Solar pump-based piped systems	<ul style="list-style-type: none"> more appropriate than other pumped systems, but availability of spare parts for electronic controllers, panels and submersible pumps a major concern (as highlighted in the visit to the Jiyin Ri solar pumped water system – which was broken at the time of the visit)
Drilled wells with handpumps	<ul style="list-style-type: none"> there is no drilling industry in DPRK and government-owned drilling rigs do not have the capacity to meet requirements there is limited access to the imported spares and consumables necessary for a drilling programme continued support to government drilling programme (UNICEF has supported it in the past) would be expensive due to the need for new rigs and annual inputs for spares and consumables
Dug wells with handpumps	<ul style="list-style-type: none"> shallow dug wells are susceptible to contamination especially in the relatively densely populated towns and villages in DPRK handpumps are have less acceptance by the public in societies where piped water into homes had been the norm

Relevance Q2: Are the GFS interventions relevant to the current (2011-2016) and upcoming (2017-2021) UNICEF Country Programmes?

Both of the Country Programme Documents (CPDs) focus on the need for UNICEF support to contribute to the survival and development of children while reducing underlying vulnerabilities for the most disadvantaged children and communities.¹³ The two CPDs (and other sources) note that WASH-related diarrhoea is the second leading cause of children under five in the country, and note the link between WASH and the other major causes of child morbidity and mortality in the country (acute respiratory infection and malnutrition). Both the CPDs consequently include WASH as a core programme component and the 2017-2021 CPD increases the size of the WASH core budget in relation to the health and nutrition budgets. Finally, both CPDs note that GFS is a core sub-component of the WASH programme.

In a country with a very limited capacity to construct or expand water supply systems with its own resources it is appropriate – and in-line with global practices – that UNICEF includes support for the sector through GFS interventions. This is also consistent with the new UNICEF Global WASH Strategy, which emphasizes UNICEF’s core accountability for the provision of basic drinking water services (along with other inputs) in situations where government and other stakeholders are unable to do so.¹⁴

¹³ UNICEF DPRK Country Programme Document 2011-2016 (2010) and 2017-2021 (2016)

¹⁴ UNICEF Strategy for Water, Sanitation and Hygiene, 2016–2030 (2016)

Relevance Q3: Are the GFS meeting a priority need of households and institutions?

Interviewees in the 21 households and 11 education and childcare institutions visited, most of whom are women, unanimously agreed that having water available on the premises was and is a priority. Most of the interviewees could describe the situation in their towns and villages before the GFS were completed, including the need to collect water from a variety of unsafe sources outside their homes, and noted how the new water system has enhanced their lives. Many interviewees also cited a lower incidence of child diarrhoea after the GFS were constructed (although non-anecdotal supporting evidence of this is limited – see Section 4.6).

A second priority identified by women interviewees was to have toilets inside their homes. In some cases the water provided by the new GFS enabled people to start using existing pour-flush toilets again (see 4.3 for further discussion on this), but in other cases the only option remains outdoor toilets, in most cases shared with their neighbours.

4.3 Effectiveness

Effectiveness Q1: Is the water supply status in households and institutions served by the GFS an improvement over the pre-GFS situation?

As per the findings detailed in the GFS Snapshot (Table 5), in seven of the nine UNICEF supported GFS visited by the evaluator the water system is functional, in eight of nine the GFS is providing water in sufficient quantities for domestic needs (see Q2, below, for more discussion on quantity standards).

In terms of water quantity and availability, this is a significant improvement over the pre-GFS situation¹⁵, which can be characterised as follows:

- limited water availability due to intermittent functionality of older electricity-dependant piped systems and the need to use supplemental outside water sources (usually dug wells, and sometimes rivers and other surface water sources); or
- the use of outside sources exclusively in towns and villages where older systems were completely non-functional or non-existent¹⁶ some of which were distant from households (see Section 4.8 on Gender).

In terms of water quality, there is also an improvement over the pre-GFS situation. Although the evaluation findings show that there is a moderate risk of contaminated water reaching consumers in seven of nine visited GFS, this is an improvement over the previous situation in which there was a high risk of contaminated water reaching consumers due to unsafe sources (the river flowing through the town was the water source for older piped systems in most cases, plus unsafe supplemental sources) and the absence of functional water treatment systems.

Effectiveness Q2: Are the GFS delivering water in sufficient quantities to meet the basic domestic requirement of households and institutions?

Although the GFS are an improvement over the previous situation, to be assessed as effective they must also meet the original objectives of the interventions. One of the most important of these

¹⁵ The pre-GFS situation was assessed through interviews (county officials, GFS technicians and managers, householders, institution directors), documentation (including the feasibility studies for individual systems) and by visiting an existing partially functional water supply system in JongJu City (which will be replaced by a new UNICEF-supported GFS that is under construction). Other pre-GFS systems were also visited by the evaluator on previous trips to DPRK, including for the 2006 review.

¹⁶ In some cases (e.g. Kumya County, Songjon Ri) the UNICEF-supported GFS were the first water systems ever constructed.

objectives is that the new water systems should provide water in sufficient quantities to meet domestic needs of households (drinking, cooking, toilet flushing, hygiene, laundry) and the needs of education and childcare institutions (drinking, toilet flushing and hygiene, and in some cases cooking and laundry). The design standard for the quantity of water per person per day varies from project to project, but is commonly set at between 50 and 100 l/p/d for households¹⁷ and 25 l/p/d for childcare and education institutions.

The field visits showed that in all but one case (see Table 5) the systems generally do deliver enough water for basic domestic needs. This is achieved through the use of on-site water storage: all of the childcare institutions and households visited had ample on-site storage, with enough stored water to meet requirements (as estimated during the visits – see Annex 7).

However, most GFS are not delivering 24-hour water supplies to consumers as they were designed to do. In fact, only two of the GFS visited achieve this, with most providing water for far fewer hours (Figure 2).¹⁸ This is a problem from a public health perspective for three reasons:

- handwashing is known to be more effective when running water is used (some of the storage tanks in the households and institutions provide running water, but in most cases the water must be ladled manually from the tanks);
- hygiene standards tend to go up when water availability exceeds minimum basic standards;
- when water flow in water networks is non-continuous, the risk of water contamination rises.

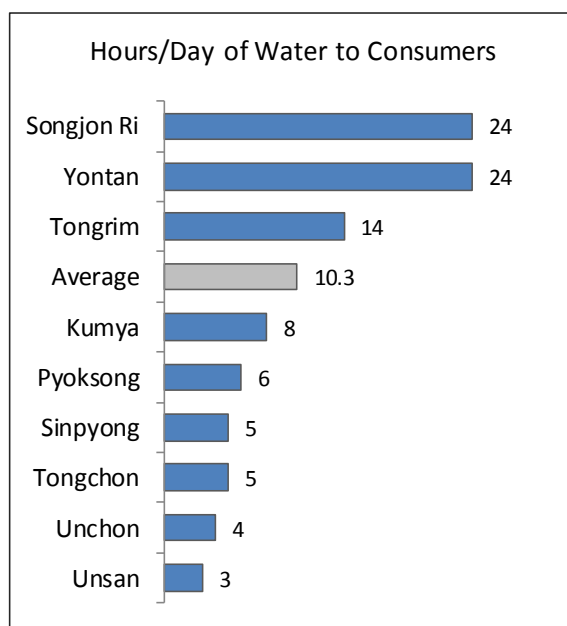


Figure 2: Hours/Day of Water to Consumers by System Visited

The most common reason why the GFS are not delivering 24-hour water to consumers relates to problems with the quantity of water available from the source. In all cases the volume of water available should be sufficient to meet the water demand (this is a key part of the design process: a project is feasible only if the volume of water in the source is sufficient to meet the calculated water demand of consumers), but in some of the GFS it clearly is not sufficient now (e.g. Unchon, Unsan). Exactly why this is so is unclear, but likely due to one or both of the following factors:

- water flow rates from the source are temporarily or permanently reduced due to drought, deforestation and/or the impact of climate change (see Section 4.5 on Sustainability for more discussion on this);
- the volume of water in the source was over-estimated during the design phase due to a failure to adequately assess seasonal and multi-year fluctuations, or to inaccurate measuring techniques.

¹⁷ The domestic water supply national standard in DPRK of 400 l/p/d, set in the 1970s, is unrealistic in the current context and thus design standards are set lower for GFS projects (both for UNICEF-supported and those supported by other agencies).

¹⁸ The number of hours per day was estimated during field trips by triangulation of information from county officials, discussions with householders and childcare and education institution staff, and observation.

In addition to water source problems, other factors that may be affecting water quantity in the GFS include design decisions and errors (see the Kumya example, below), leakage due to deteriorating system components (e.g. failing valves and cracked concrete structures – both of which were noted during the visits), and the intentional control of water flow by system managers for a variety of possible reasons (including to reduce waste-water runoff caused by leakage and by the tendency of households to never shut off taps).¹⁹

Effectiveness Q3: Is the water delivered through the GFS systems safe?

The water provided by GFS is safer than the previous situation because the sources tapped are generally much less contaminated than the sources used in the past. However, as shown in Table 5, in seven of the nine systems visited there is a moderate risk of contaminated water reaching consumers and in two of the systems that risk is moderate to high.

Contamination is a risk in the GFS for three reasons: catchments are not well protected from sources of pollution and/or water treatment systems are not fully functional and/or there is a risk of secondary contamination.

All but three systems have well-protected catchment areas (Sinpyong, Pyoksong and Jongju, the system under constructed). In these GFS there are clear signs of farming activity, habitations or significant foot traffic upstream of the source and/or the water intake is not fully protected.

More widespread are non-functional or semi-functional water treatment systems (in only of the systems visited was the system fully functional). In the GFS design, the water treatment system includes a physical filter (a horizontal roughing filter, which uses gravel and coarse sand to filter the raw water) and a slow sand filter (SSF) which combines physical filtering through sand and a natural bacteriological process to further remove pathogens from the water stream. These systems are not fully operational in the GFS visited because of design errors in a few cases (such as in Sinpyong where the roughing filter design is incorrect) and construction quality issues in a few cases (mainly due to concrete quality). But the most common issue is that in most GFS the treatment systems are not being correctly operated by system managers. For example, chambers are left to dry on rotation schedule, which results in the killing off of the active biological filter layer (e.g. in Unchon County, see photo). This and similar examples in other counties appears to be mainly due to a lack of understanding on the function of the SSF by GFS managers.²⁰



Incorrect SSF Operation, Unchon County

¹⁹ This was cited by several stakeholder interviewees and noted by the evaluator (taps left on even in households where water was not running at the time of the visit). This practice can become a kind of vicious circle in these situations: because water is not provided 24-hours a day so people leave the taps on to ensure their storage tanks get filled, but the overflow from tanks causes excessive wastage and so system managers limit the hours of water per day).

²⁰ The SSF are operated in such a way that the layer of beneficial bacteriological organisms that forms naturally in the filter is being scraped away in far too-frequent cleaning operations or allowed to dry up and die due to non-standard rotation schedules. In some cases these incorrect operation regimes are being used due to water source flow reductions, and are thus not fully due to operator error.

Also widespread is the risk of secondary contamination due to unpressurized pipes in the majority of GFS that are not providing 24-hour water. This is the case in all but two of the systems, and is the result of a variety of factors as discussed in Q2, above.

Secondary contamination is recognized as a risk the Ministry of Public Health (MoPH), which has instituted a new policy making chlorination obligatory for piped water systems in the country (including GFS). As seen during the field trips, electrolysis-based chlorination systems²¹ are being installed by county officials on the GFS. However, these systems appear to be undersized with respect to system water flows, and there appears to not yet be a viable system in place to measure and regulate dosing.

Effectiveness Q4: Has the GFS programme has improved over the years? Are good practices being integrated into the newer projects?

All other factors being equal, one would expect older piped water systems to be performing worse than newer systems due to the inevitable deterioration over time. This effect should be even more pronounced in DPRK given the significant national maintenance and repair challenges. However, among the GFS visited during the evaluation, there is no clear pattern showing such a trend. There are well-functioning older systems (Yontan, 10.9 years old) and newer systems (Kumya, 1.2 years old); and poorly functioning older systems (Unsan, 8.9 years old) and newer systems (Sinpyong, 1.9 years old). This finding is reinforced by specific observations that show design and construction quality problems with newer GFS (e.g. Sinpyong, Kumya and Jongju).



Failing Valve, Yontan County (see Section 4.5)

There is, however, one specific area where lessons learned have been incorporated into the GFS: the protection of pipeline river crossing structures from flooding (see Section 4.5 for more discussions on this). Some counties have changed the design of these crossings based on the experiences in their own counties and in other counties (however, others, who know of the improved design, are unable to implement it due to a lack of specialised supplies).

MoCM and UNICEF have tried to maintain GFS quality over the years by organizing training courses on GFS design, construction and operation and maintenance (Table 7) but the number of these courses are relatively few, amounting to just one course every 1.5 years. Given the number of GFS in operation (38), this is not enough; a sentiment echoed by the majority of county-level interviewees and by the recorded comments of course participants.²²

²¹ These systems use sea salt and electricity to manufacture sodium hypochlorite that is in turn used to chlorinate water and minimize secondary contamination. This means that there is no reliance on imported chlorine products, but an electricity supply is needed.

²² The 2016 course was a departure for MoCM and UNICEF – it was held in a county and stressed practical and hands-on learning through site visits and the sharing of experience among counties. According to a range of interviewees, it is a good model to replicate for future trainings.

Table 7: MoCM/UNICEF GFS Training Courses

Year	Training	Group	No. of Participants
2005	GFS Design and Construction	Provincial and county level managers/technicians	n/a
2008	GFS Feasibility and Design (including EPANET)	Provincial and county level managers/technicians	30
2009	GFS Feasibility and Design (including EPANET)	Provincial and county level managers/technicians	50
2010	GFS Operation and Maintenance	Provincial, county and village level managers/technicians	50
2011	GFS Feasibility and Design (including EPANET)	Village level managers/ technicians	30
2014	GFS Operation and Maintenance	Provincial, county and village level managers/technicians, eastern counties	40
2014	GFS Operation and Maintenance	Provincial, county and village level managers/technicians, western counties	40
2016	GFS Operation and Maintenance (in Tongrim county)	Provincial, county and village level managers/technicians	60

Insufficient capacity building at county level is just one of the factors behind the absence of a clear trend of improving quality GFS. Other factors include the related issue of high staff turnover rates in UNICEF and at county level, and the difficulty in securing donor funding, which in some cases has resulted in shortcuts in GFS design.

Effectiveness Q5: Are the new water systems also improving hygiene and sanitation?

There is a substantial body of international evidence showing that water availability is one of the most important determinants of whether or not handwashing is practiced in homes and institutions, often more important than hygiene knowledge.²³ The evidence also shows that water should be available near kitchens and near toilets to influence the most critical behaviour: handwashing with soap before preparing food and eating, and after defecation. Since the GFS have improved water

²³ Hirai *et al.* "Exploring Determinants of Handwashing with Soap in Indonesia: A Quantitative Analysis." *International Journal of Environmental Research and Public Health* 13, no. 9 (September 1, 2016): 868.; Luby *et al.* "Household Characteristics Associated with Handwashing with Soap in Rural Bangladesh." *The American Journal of Tropical Medicine and Hygiene* 81, no. 5 (November 2009): 882–87; Schmidt *et al.* "Determinants of Handwashing Practices in Kenya: The Role of Media Exposure, Poverty and Infrastructure." *Tropical Medicine & International Health: TM & IH* 14, no. 12 (December 2009): 1534–41.

availability in homes and childcare and education institutions, it is reasonable to assume that this has had an impact on handwashing behaviour.

To further assess this possibility, the evaluation used the standard proxy indicator for assessing handwashing practices in household surveys: direct observation of whether or not there is a place for handwashing near kitchens and toilet areas with the presence of both soap and water at the time of visit.²⁴

As shown in Figures 3 and 4, the results of this exercise were mixed. In the kitchens of most households and institutions there was a place for handwashing with both water and soap at the time of the visit, but not in the toilet areas. This is mainly because many households and institutions have only outdoor pit latrines with non-existent or non-functional handwashing facilities.

Observations and discussion with stakeholders shows that soap availability does not appear to be a problem in households, but may be a problem in some institutions.

Putting together the global evidence with the proxy indicator results, it is likely that handwashing practices associated with food preparation and eating have improved, but not handwashing after defecation. It is also likely that the main limiting factor for this is that outdoor latrines are still in wide use, but few have handwashing facilities.

There is also evidence that sanitation practices have improved in some GFS counties with the delivery of water into houses. In apartment blocks built with indoor water-flushed toilets, the breakdowns of the piped water systems over the last two decades forced people in some cases to switch to outdoor latrines. When the new GFS were built and water was again piped into households, people were able use indoor toilet facilities again (e.g. Pyoksong, Yontan). It is not possible, however, to assess the extent to which this has occurred.

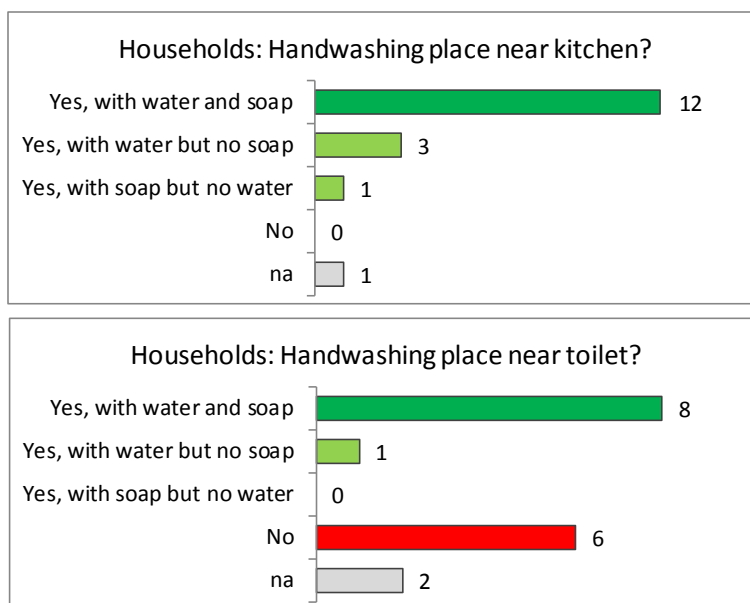


Figure 3: Handwashing in Households Visited, completed GFS areas (n=17 households)

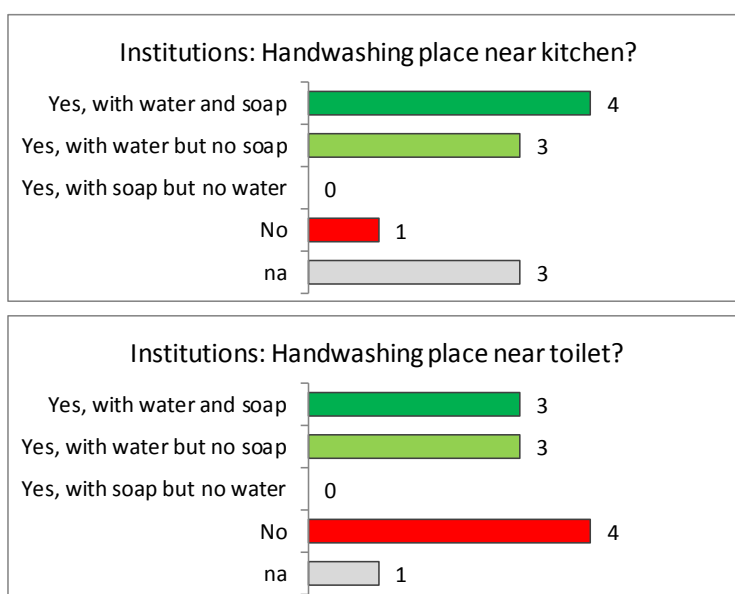


Figure 4: Handwashing in Education and Childcare Institutions Visited, completed GFS areas (n=11 institutions)

²⁴ This is the standard proxy indicator for handwashing with soap used both in MICS and DHS household surveys.

4.4 Efficiency

Efficiency Q1: Were the GFS completed in a reasonable amount of time?

According to UNICEF and MoCM figures, the project cycle from initiation to completion for GFS interventions average about 2.5 years (all GFS systems with available data). This is long by international norms of one to 1.5 years for projects of this nature.

Discussion with county officials during the field visits indicates that actual GFS construction – after materials and equipment arrive in-county - takes only about half of this time. Thus the other half is used for project administration on the part of UNICEF (and MoCM).

Some of the reasons for these project administration delays are country-specific. These include limits on UNICEF business procedures in DPRK (e.g., banking restrictions), high staff turnover rates in UNICEF of both international and national staff, the absence of local suppliers for most supplies and burdensome customs clearance procedures. Other reasons relate to standard UNICEF practices not specific to DPRK, including time-consuming supply procurement procedures.

A common way to reduce project completion times in context where construction cannot be carried all year long (in DPRK because of winter, in other countries because of rainy seasons) is to time project administration cycles so that tools and supplies are ready to go on site when the construction season starts. This practice does not appear to have been followed for the GFS projects, although due to the reasons cited above this may largely out of the hands of UNICEF WASH staff in DPRK.

Efficiency Q2: Are the GFS cost efficient?

The estimated capital cost of the GFS²⁵ supported by UNICEF is \$38 per beneficiary. Of this, the UNICEF contribution is just under 60 percent – \$22 per person – and the government contribution is just over 40 percent, or \$16 per person.

These estimates are based on MoCM summary figures for direct costs of the GFS projects at country level, with an additional overhead component added to account for UNICEF and MoCM programme management costs at the national level.²⁶ It should be emphasized that these figures are only estimates; detailed financial figures for the GFS projects are not available in UNICEF, and thus the estimates are not cross-checked with actual costs for a sample of the projects. The estimate is low compared to the capital cost estimates from another support agency in DPRK, SDC, of approximately \$70 per person.²⁷

A total capital cost of \$38 per person (or even \$70 per person) for piped water systems is low by regional and global standards. For example, in Cambodia capital costs for piped water into homes is \$132 per person, in Indonesia it is \$161 and in Mongolia it is \$159.²⁸

The UNICEF component of this cost – \$22 per person – is also low by UNICEF standards: a 2014 internal study estimated the UNICEF costs for water supply projects at \$46 per person.²⁹ Over the

²⁵ 37 of the 38 UNICEF-supported GFS are included in these calculations. The other GFS – Hyesan City – does not have full beneficiary information.

²⁶ A standard overhead estimate is 20%, but 25% is used here to take into account the more difficult operating environment for UNICEF in DPRK.

²⁷ Based on the SDC estimate of the their per capita direct cost of water (\$32 per person) within an integrated WASH, GFS and health project; which is approximately \$70 per person when government costs is factored in. SDC is the only agency that could provide per capita cost estimates.

²⁸ World Bank. *The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene*. 2016.

20-year lifespan of GFS system the UNICEF cost is just \$1.4 per person per year, even when substantial repair costs (an estimated \$100,000 per system) are factored in.

Thus, the available evidence shows that GFS costs are low and represent very good value for money.

The reasons behind these low costs are in part related to the nature of the contribution of government and the beneficiary community. It is difficult to assess this contribution in monetary terms in the context of the DPRK economic system (the 40% figure for government contribution to GFS projects is an estimate) but it is clear that it is significant: including supervision from national level, all construction costs at county level, and the substantial labour inputs involved the laying of pipeline (almost all of which is done manually by the beneficiary population).

There is also reason to believe that these capital costs are too low: there are some cases where too little has been spent on the GFS by UNICEF and it has comprised quality. One example of this is the Kumya County GFS where the diameter of the transmission main was reduced to cut costs, but this resulted in a undersized piped system that will never be able to provide 24-hour water to consumers (and wasted, in part, a very substantial effort by the beneficiary community to dig the long trench in difficult terrain). Another example is the use of lower cost valves and fittings in the GFS, which was cited by the many county-level technicians as a significant problem affecting operation (this evaluation did not assess material quality and so cannot cross-check this assertion).

4.5 Sustainability

Sustainability Q1: Is there ownership of the GFS on the part of county officials and beneficiaries?

The evaluation clearly shows that the GFS are highly valued by government stakeholders and by beneficiaries.

Government stakeholders at the county level have demonstrated this through their leadership in the construction of the systems, and more notably, by their ongoing efforts to operate and maintain the systems. As discussed in Q2 and Q3 below, these operation and maintenance efforts are very substantial give that they are carried out with very limited resources, including the almost complete

lack of spare parts. They are also carried out over a relatively long period of time: the average age of the systems visited is six years (Figure 5) and all but one of the GFS were fully or partially functional at the time of the visit.

There is also continuing ownership on the part of MoCM, which provides some support to the counties for operation and maintenance (including capacity building) although resources to do this are limited.

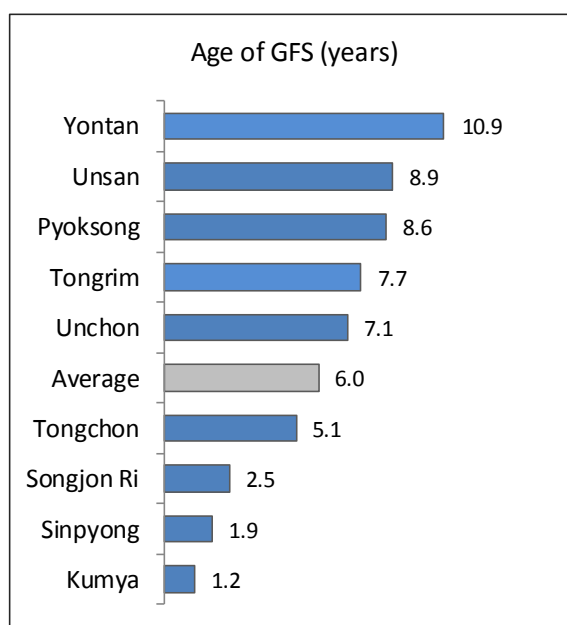


Figure 5: Age of Systems Visited

Beneficiaries interviewed were unanimous in their appreciation of the GFS and have shown

²⁹ UNICEF. WASH Costs 2014: UNICEF Costs for Water, Sanitation and WASH in Schools November, 2014 (presentation).

this through substantial labour contributions to the construction of the systems. In some cases, householders also contribute to maintenance efforts (such as sand cleaning and replacement operations for the SSF) and repairs.

Sustainability Q2: Are the GFS sustainable over their planned service life?

The GFS used in DPRK are inherently sustainable: unlike other piped water system technologies they require no electricity or fuel to operate, and expensive spare parts and replacement equipment for pumping systems are not required. Additionally, purification chemicals are not necessary since sources are safe and water treatment systems use simple and natural processes. However, the GFS still require some inputs for operation, maintenance, and repairs over their planned service life of 20 years.

In fact, due to their age, their vulnerability to natural disasters (see Q3, below) and other factors, the GFS require a substantial amount of repairs. As shown in Figure 6, most GFS have had a serious breakdown in the 12-month period preceding the visit by the evaluator. In most cases these breakdowns have been addressed with relatively short system down-times, usually within 72 hours (according to GFS managers, and to householder and institutional interviewees).

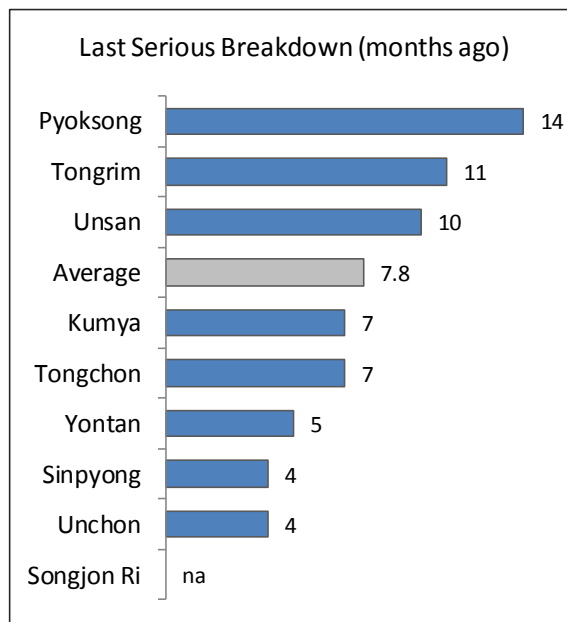


Figure 6: Last Serious Breakdown

However, these repairs are increasingly difficult due to the complete lack of spare parts for all the GFS visited. One of the reasons there are no spare available is because UNICEF generally did not provide them. Although information is incomplete, it appears that UNICEF did not provide an initial stock of spares for most systems (which is generally standard practice) and has subsequently provided spare parts for existing systems only sporadically (a \$50,000 order of spare parts for multiple GFS was procured in 2016, the first such order in at least five years). This is at least partially due to a lack of funds for the WASH programme because of the difficulty in securing donations for DPRK.

There is also very limited availability of spares on the local market. Some components are available, but quality can be sub-standard, and many critical components (such as large diameter PCV pipes and valves) are not available at all. MoCM also has no stock of spares, and no mechanism for obtaining them.

In this environment, county system managers have to be very creative when carrying out repairs. Examples include the use of sheet metal and rubber to repair broken PVC pipe (something that is likely done nowhere else in the world), the use of wooden stoppers in lieu of valves, and the cannibalization of components from less-critical parts of the system to make repairs to more-critical parts of the system. These efforts are admirable and have kept the GFS operational up until now, but they are not sustainable for much longer: it is clear that an influx of spare parts is needed to keep the systems running.

There is also a need for additional capacity building at the county level. As systems age and staff are transferred or retire, there are fewer technicians and managers who are familiar with the systems. This is beginning to be seen in the operation and maintenance of the systems (such as the incorrect operation of SSFs, as discussed in Section 4.3).

Sustainability Q3: Are the GFS at risk from disasters, climate change and environmental degradation?

The frequency of floods and droughts is increasing in DPRK, and the country is highly vulnerable to the impacts of climate-change.³⁰ Water systems are affected by all of these factors, and GFS are at particular risk, especially in the context of DPRK where response capacity is limited.

Flooding poses the greatest seasonal risk to the GFS mainly because transmission mains (the pipelines from the source to the distribution system) are quite long and cross flood-prone rivers and streams multiple times (Figures 7 and 8). In fact, transmission main breaches in floods are the most common cause of major system breakdowns cited by county system managers. Over the last three years alone, transmission mains were breached by floods in five of the nine UNICEF-supported GFS visited by the evaluator. For smaller flood events such breaches are preventable through the use of a more robust design for river crossing structures, but only some counties have adopted the new design.³¹

In three counties – Pyoksong, Unchon and Unsan – flow rates from water sources appear to be diminishing. This may be due to the lingering effects of the severe droughts in the country in 2014 and 2015, and/or to the effects of deforestation³² and/or to the impact of climate change on rainfall patterns.

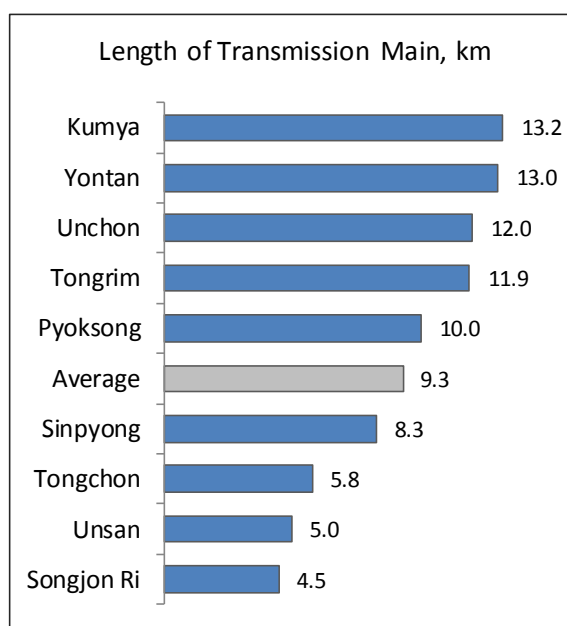


Figure 7: Length of GFS Transmission Mains

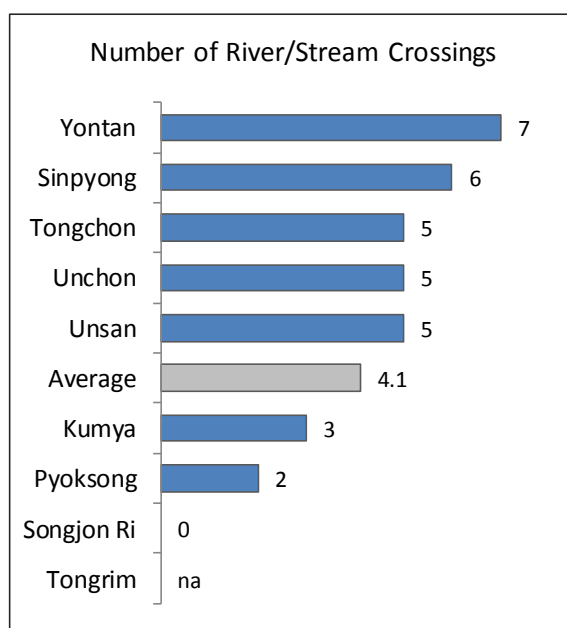


Figure 8: Number of River/Stream Crossings

³⁰ INFORM Global Risk Index for 2017. <http://www.inform-index.org/Results/Global>

³¹ In the majority of crossings the transmission main passes underneath the river or stream, and can be protected through the use of well-positioned stone-filled wire boxes (known as gabions). In some cases GFS managers know about improved designs but do not have access to gabions (in one case, gabions were made locally).

³² Deforestation affects spring and stream flows because diminished root systems do not adequately retain water in catchment basins. Deforestation due to steep-slope farming and tree-cutting was evident in several of

If droughts are indeed becoming more common and severe, and deforestation is not addressed, some GFS are at risk of drying up, at least partially.

Reduced flow rates from springs and streams may also have an impact on future GFS projects since adequate water sources may be harder to find.

Sustainability Q4: Is the GFS approach being replicated in the country?

The GFS approach has been replicated by other external support agencies, specifically the EU Project Support Units, including SCI, Concern and others. The number of systems built through this support is not known, but it is on a lesser scale than the UNICEF programme, limited to a relatively small number of counties.

While MoCM is supportive of the approach it has not been able to replicate it widely in the country. This is primarily due to lack of resources for the procurement of supplies and equipment. Some counties that have received GFS support from UNICEF have replicated the approach locally, usually on a small scale to serve villages. In most cases this was done using reserve or supplemental supplies not used in the original UNICEF-supported project, and thus had the negative effect of using up supplies that could have been used to maintain and repair the original system.



Low Water Flow from Catchment, Unsan County

In main impediment to wide-scale replication and national scale-up is the lack of government resources to do so, along with severe limitations on the availability of supplies. A secondary impediment is the fact that the GFS approach is not feasible in all parts of the country.

4.6 Impact

Impact Q1: Have the GFS had an impact on child health?

As discussed in Section 4.3, the GFS have increased water availability in households and in education and childcare institutions, and this has likely improved handwashing practices. This effect is strongest where indoor toilets are in-use. Since international evidence shows that improved handwashing practices are strongly associated with reductions in diarrhoea rates, it is likely that the GFS has had some impact on diarrhoea rates.³³ And since diarrhoea is the second leading cause of under-five child mortality in DPRK, the GFS have likely improved overall child health among the beneficiary communities.

the GFS catchment basins visited (although some county officials stated that this is diminishing due to a national re-forestation campaign, an assertion that is not possible to confirm through this evaluation).

³³ Ejemot-Nwadiaro *et al.* "Hand Washing Promotion for Preventing Diarrhoea." In Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd, 2015.

To confirm this likely impact - and to assess its extent – it is necessary to examine actual diarrhoea prevalence rates from periods before and after the GFS were constructed. This is always a difficult exercise in any country – accurate diarrhoea prevalence data are often not readily available – and this is especially the case in DPRK where data availability is generally more limited than elsewhere. However, some data has been provided by the Central Bureau of Statistics for the GFS towns and villages visited during the evaluation and it shows that child diarrhoea rates have dropped in all of the towns and villages after the construction of the new system (Table 8).

Table 8: Diarrhoea Prevalence Before and After GFS Construction³⁴

County Town/ Village	Data year			Annual cases of diarrhea in children under five		
	Before construction (data year)	After construction (data year)	Present (data year)	Before construction (cases)	After construction cases	Present (cases)
Tongrim	2006	2010	2015	1,283	1,039	912
Unsan	2007	2010	2015	1,034	847	733
Pyoksong	2003	2010	2015	872	695	638
Unchon	2008	2011	2015	820	662	584
Sinpyong	2011	2015		551	427	
Yontan	2004	2008	2015	789	656	633
Kumya	2012	2015		1,248	926	
Tongchon	2009	2013	2015	949	782	714
Songjong Ri	2011	2015		191	152	

While these data do show a clear trend, they are not sufficient to confirm a causal link between GFS and diarrhoea rates because:

- the data are from health units and thus captures only reported diarrhoea cases, not all cases of diarrhoea;
- the data are annual averages from just two years: monthly trends over multiple years would provide a better picture of actual trends;
- all of the GFS visited were constructed in focus counties, which had other child health-related interventions that may have also had an impact on health (and thus the extent of the impact of the water interventions is not known),³⁵
- the accuracy of the data could not be verified.³⁶

Thus, while global evidence linking water availability and child health is clear, there is insufficient evidence to confirm that this is also the case with respect to the GFS in DPRK, even though there is some evidence of a trend. This does not mean that there is no impact, just that it is unconfirmed (which, should be noted, is usually the case for WASH evaluations conducted in other countries as well).

³⁴ Data provided by CBS for this evaluation

³⁵ This data may have more bearing on the multi-sectoral

³⁶ For example, diarrhoea data in Table 8 does not match data quoted by UNICEF over the same period for one county – Yontan – in its review of the focus county approach (The Focus County Approach: A Rapid Assessment, UNICEF DPRK, June 2013).

It should also be noted that the GFS have the potential to generate greater impacts on child health than they do now. Studies show that safe and continuous (24-hour) piped water into homes has a much greater impact on diarrhoea rates than does non-continuous and untreated piped water.³⁷ Since few of the GFS provide continuous water and there is a risk of contaminated water reaching consumers, they currently fall more into the second category than the first. However, there is scope for upgrading the GFS into the first category with modest investments (see Recommendations, Section 7).

Impact Q2: Have the GFS had an impact on child nutrition?

Improved WASH is also linked to child nutrition, both through diarrhoea (multiple diarrhoea episodes weakens children making them more susceptible to malnutrition) and through environmental enteropathy (the inability to efficiently absorb nutrients from food, caused in part by poor sanitation). However, the international evidence for this – while growing – is not yet as strong as for the link between WASH and child health.³⁸ There are also suggestions from the evidence that for WASH interventions to have a significant impact, they should be targeted at children under two. Since the GFS has improved water availability in nurseries and has likely improved hygiene practices of young child caregivers (in nurseries and in households), it is possible that the interventions have had an impact on child nutrition. However there is no local data on nutrition from the beneficiary communities or the nurseries to corroborate this.

Impact Q3: Have the GFS had unintended negative effects?

A common negative side effect from the construction of new piped water systems internationally is that greater amounts of wastewater are produced, creating new health and environmental hazards, especially if waste water systems (sewer systems) are inadequate.

This risk was identified early on by UNICEF and MoCM, and addressed through a pilot project to construct a decentralised wastewater treatment system (DEWATS) in Yontan county in 2008, with the expectation that it could be replicated in other GFS sites. The pilot was completed in 2009 and the DEWATS technology has since been replicated at other sites in Yontan, and in other counties by MoCM and other support agencies. An evaluation of the DEWATS pilot in 2010³⁹ showed that while the system was functioning, the costs were very high (the Yontan DEWATS was visited briefly during this evaluation, and was apparently still functional). No sewage systems have been constructed in any of the other of the 37 UNICEF-supported GFS.

Despite this, the evaluator noted no instances of excessive wastewater in the visited systems. However, this is at least partially due to the fact that most of the systems do not provide a 24-hour water supply to consumers (Figure 2). It is also possible that a reason for not providing continuous water is to limit water wastage (in several counties the problem of households wasting water by never turning off taps was raised by officials).

³⁷ Wolf *et al.* "Assessing the Impact of Drinking Water and Sanitation on Diarrhoeal Disease in Low- and Middle-Income Settings: Systematic Review and Meta-Regression." *Tropical Medicine & International Health*, May 1, 2014.

³⁸ Esteves Mills and Cumming. "The Impact of Water, Sanitation and Hygiene on Key Health and Social Outcomes: A Review of the Evidence." London School of Hygiene and Tropical Medicine, (SHARE consortium for UNICEF and UKAID), 2016.

³⁹ Paradigm Environmental Strategies Pvt. Ltd. *Third party evaluation of the pilot DEWATS projects in DPRK.* October 2010.

Thus while excessive wastewater is not a major problem at the moment, it will become one if counties move towards providing more hours per day of water to consumers in the future (see Recommendations in Section 7).

4.7 Equity

Equity Q1: Are the UNICEF-support GFS covering the regions of the country that have the greatest need?

Although the GFS interventions cover a relatively wide geographic area and some reach isolated communities, the evaluation shows that equity was not the most important criteria in the choice of intervention locales.

Most (68%) of the GFS were constructed in UNICEF multi-sectoral focus counties, but that does not mean that they are serving areas with the greatest inequities because equity was not the most important criteria used in the choice of these counties (where UNICEF's non-humanitarian efforts have been concentrated since 2004).⁴⁰

The fact that the GFS approach is not technically feasible everywhere (it is only feasible where appropriate water sources are available) is an inherent limitation of GFS interventions with respect to equity. This factor has been identified by other support agencies and used to justify the use of other water supply technologies, including solar pumping.⁴¹ This has also been a factor in UNICEF's use of other technologies in the past (including support to water well drilling) and must be taken into account in discussions over the replicability of the approach (see Section 5, Conclusions for additional discussion on this). In counter balance to this, it should be noted that often the more isolated communities in higher elevation valleys are the best candidates for GFS, and thus GFS is "inherently equitable", at least to some degree.

Equity was also not a key factor in the choice of rural vs. urban communities for GFS locations. Generally equity indicators are less favourable for rural populations and thus an equitable approach would emphasize interventions in rural areas.⁴² This was not the case here: only 30 percent of GFS interventions were in villages. In discussions on this issue, MoCM interviewees stated that towns were favoured over villages because of economies of scale and because MoCM targets public health interventions in more densely populated communities to prevent epidemics. Also noted is the fact that water sources are often closer to homes in villages than in towns, and thus there is an equity-based argument for this focus.

With respect to geographic coverage, the GFS are widespread in the country but some provinces – notably in the north of the country (N. Hamgyong, Ryanggang, Changang) – have not been well covered. According to UNICEF, this is mainly due to limited access for international aid organizations in these areas.

Equity Q2: Does the entire population of the beneficiary towns and villages have access to water?

County data, interviews and documentation (donor reports, feasibility studies) indicate that where possible the entire population of the GFS town and village receives water. However it is clear that counties are not managing to keep up with population growth through system expansion. In some counties systems have been expanded, but limited resources and a lack of supplies have prevented this in other counties.

⁴⁰ UNICEF DPRK. *The Focus County Approach: A Rapid Assessment*. June 2013.

⁴¹ McGrath. "Lessons Learned by Concern Worldwide over 16 years of WASH programmes in North Korea". *39th WEDC Conference Paper*. 2016.

⁴² This was also pointed out in the 2006 review of the UNICEF WASH Programme in DPRK.

When water supplies are limited, counties prioritise distribution on the basis of need. For example, in Sinpyong, where design problems have resulted in limited supplies (see Section 4.3) water is distributed to households but not offices. In other counties with limited supplies, water is delivered to childcare institutions for more hours per day than to households.

A water-specific equity indicator is whether or not villages that are situated along a pipeline serving a town also benefits from the new water system. According to available information this is not generally the practice for the GFS interventions.

4.8 Gender

Gender Q1: Have the new water systems reduced WASH-related time burdens on women?

In almost all the sites visited the GFS have eliminated the need to haul water, which like in other countries, is a task that mainly falls to women. Before the GFS were constructed, UNICEF had to haul water from outside sources either part-time (where the old piped system was semi-functional) or fully time (where no piped systems existed).

The importance of this improvement to beneficiaries' lives was noted by most household and education and childcare institution interviewees, the vast majority of who were women. Several of these interviewees described the extent of this burden including the difficulty of hauling water up to upper-story flats and the walking distance to the water sources (usually rivers or dug wells)⁴³ and all were appreciative of the convenience of having running water at home.

If the frequency of child diarrhoea cases has indeed been reduced (see Section 4.6), then time spent on child-care may also have been reduced for mothers and institutional care givers. This was noted, but only by a small number of the female interviewees.

Gender Q2: Have the new water systems reduced WASH-related risks to women's health, security and dignity?

The need to go out of the house to use latrines is a risk to women's health (mainly related to high incidences of urinary tract infections caused by having to "hold it in" for long periods of time), security (in a number of countries women are particularly vulnerable to assault) and dignity (for a variety of reasons). There is no evidence of the first two risks being factors in the DPRK context, although it is reasonable to expect that health factors may be an issue, especially in winter when the use of outdoor latrines is especially difficult. Several household interviewees – all women – stated that an indoor toilet is a priority for them, mainly citing inconvenience as the reason why (not dignity *per se*), especially in winter.

As discussed in Section 4.3, there is some evidence that the delivery of water into flats with the new GFS allowed some people to switch from outdoor latrines to indoor toilets, which would have had clear benefits for women. However, the number of women impacted is not possible to determine with available evidence.

Gender Q3: Are women participating in a meaningful way in the planning and management of the water systems?

WASH benefits and shortfalls impact women most of all, yet in most countries women are grossly under-represented within the management and technical cadre of sectoral agencies. And even

⁴³ Some system feasibility studies document these distances, such as in Kumya county where distances to sources exceeded two kilometers before the GFS was constructed.

though women are more knowledgeable about water and sanitation issues, they are routinely not consulted in the planning stages of sectoral projects.

This evaluation has not found evidence that the situation is any better in DPRK, at least in the context of the GFS interventions. County officials, managers and technical staff responsible for GFS are mainly male (just 6% women in counties visited, see Table 2 in Section 3.2.2) as are UNICEF WASH staff (one of four WASH staff is a woman). At the national level, most MoCM staff met are male. There is also no evidence from discussions or documentation that women had any defined role during the planning stages of the GFS.

5 Conclusions

5.1 Criteria-Specific Conclusions

5.1.1 Relevance

Given the connection between water child health, the high diarrhoea rates in the country and the poor state of water supply systems in the country, water supply interventions are highly relevant to the needs of women and children in DPRK, and are a core prerequisite for the achievement of UNICEF and government goals in DPRK. In DPRK GFS is currently the most appropriate technology for delivering improved water supply to communities: the country's mountainous topography and relatively abundant higher-elevation streams and springs make it an ideal candidate for the GFS technology. And because GFS require no electricity, fuel or imported pumping equipment, it is the most appropriate technology in the current context in DPRK, where these inputs are in short supply.

5.1.2 Effectiveness

The UNICEF-supported GFS have been effective in improving the water supply situation for the beneficiary communities: the availability, quantity and quality of water delivered by the new systems represent a significant improvement over the previous situation. However, the interventions have only been partially effective in meeting the goals of the GFS programme and of international standards with respect to water quantity and quality. The systems provide enough water for basic domestic needs but generally fail to deliver water 24 hours a day to consumers. In addition there is a moderate risk that water delivered to consumers is contaminated due to partially functional water treatment systems and intermittent water pressure.

The evaluation has found no evidence that the GFS programme is improving over time, a finding related to staffing turnovers in UNICEF and at county level, not enough capacity building over the years and a lack of resources for incorporating good practices into new GFS interventions.

Although the GFS interventions did not directly address hygiene or sanitation, it is likely that they have resulted in some improvement in handwashing practices in households and education and childcare institutions. It is also likely that sanitation has improved, but only in a limited number of households.

5.1.3 Efficiency

The UNICEF-supported GFS take a long time to complete, averaging about two and half years. This is due to a range of factors, some of which are related to the specific challenges of the programming context in DPRK (such as banking restrictions and lack of national suppliers) and some to broader systemic issues such as time-consuming UNICEF supply procurement processes.

The GFS are highly cost-efficient on a per-capita basis. Total capital cost of the systems are estimated to be \$38 per person served, much lower than regional standards. The UNICEF proportion of these costs are just \$22 per person – or \$1.44 per person per year over the design lifetime of the system – significantly lower than UNICEF costs in other countries. The reasons for these low UNICEF costs are mainly related to the high contributions from government partners and especially from the beneficiaries themselves in the form of labour. However, low costs are also due to the cutting of corners on the design of some systems due to funding issues, which limits functionality in some cases.

5.1.4 Sustainability

The UNICEF-supported GFS in DPRK are inherently sustainable because they require no electricity or fuel to operate, they do not rely on pumps, and no imported purification chemicals are needed. This is the main factor behind the fact that the GFS are still largely functional, even after more than ten years of operation in some cases. Contributing to the sustainability of the GFS is the high degree of government and beneficiary ownership of them, as demonstrated most clearly by local efforts to keep the systems running despite the lack of spare parts in the country and other significant challenges. However, it is clear that there are limits to these local efforts –however impressive – and that most GFS will not last their 20-year lifespan without additional inputs in the area of spare parts, capacity building and other support from UNICEF and MoCM.

The frequency of floods and droughts is increasing in DPRK and this is threatening the long-term viability of the GFS. Flooding is one of the most common causes of system breakdowns due to the vulnerability of the lengthy water supply pipelines, and drought is affecting water availability in some systems: to ensure sustainability these issues must be addressed, both through repairs and adjustments of existing systems, and design changes in new systems.

Despite the suitability of the GFS approach within the national context and their relatively low cost, the approach is not being widely replicated by government. The main impediment for wide-scale replication and national scale-up is the lack of government resources to do so, along with severe limitations on the availability of supplies.

5.1.5 Impact

Based on the likelihood that increased water availability has improved handwashing practices, it is also likely – based on strong international evidence linking improved handwashing to reductions in diarrhoea rates – that the GFS have had some effect on diarrhoea rates in the beneficiary communities. This would consequently have an impact on child health since diarrhoea is the second leading cause of under-five child mortality in DPRK. But while there are national data showing dropping diarrhoea prevalence rates in beneficiary communities, for a variety of reasons this data is not robust enough to definitively confirm that this drop has actually occurred (this is usually the case in other countries as well: outside of formal longitudinal studies it is difficult to obtain data of sufficiently quality to confirm a causal link between WASH interventions and diarrhoea rates).

There is also a possibility that the GFS contribute to improved nutrition among children – due to the connection between water and diarrhoea and environmental enteropathy – but there is no local evidence to support such a conclusion.

The evaluation has also shown that the water systems could potentially have a greater impact on child health than they do currently, if they can be upgraded to provide continuous 24-hour water and a lower water contamination risk.

5.1.6 Equity

Although GFS have been constructed over a wide geographic area across much of the country, equity was not a significant criterion in the choice of counties or communities served. This is mainly due to limits on access to data on indicators of inequity, which affected the choice of the UNICEF focus counties (and thus affected UNICEF interventions in other sectors as well).

There has also not been a significant shift in focus to rural areas, despite recommendations to do this from previous assessments.

The GFS do not appear to leave anyone out in the communities that are served: all but a small number of households and education and childcare institutions in beneficiary communities have benefited from the new water systems.

5.1.7 Gender

The evaluation has shown that the new water systems have reduced WASH-related time burdens on women. In most households – and in some education and childcare institutions – the GFS have eliminated the need for women to haul water from neighbourhood wells and more distant sources. In fewer cases the new systems have also reduced WASH-related health and dignity burdens for women through the re-introduction of indoor toilets.

There is no evidence, however, that the GFS interventions have had any impact on increasing the meaningful participation of women in the planning and management of water supply systems, either in the beneficiary communities or more broadly within the national sector.

5.2 Overall Conclusions

The UNICEF-supported GFS interventions in DPRK are relevant to national priorities and to people's lives, are cost-efficient and have had a substantial positive effect on beneficiary communities, especially on women and children. There is also evidence to suggest that the GFS have had some impact on child diarrhoea prevalence and thus on child health. However, this impact has been largely limited to the beneficiary communities themselves: government is willing but largely unable to replicate the GFS model on a larger scale and international actors – including UNICEF – have limited funds to expand programmes. The GFS have also not fulfilled their full potential: health and gender-related impacts would be greater if the GFS supplied continuous and fully-safe water to consumers 24-hours a day as they were designed to do.

The commitment and ingenuity of local authorities and beneficiaries have managed to keep the systems operational for as long as ten years, despite daunting challenges. However, to be sustainable over their design lifespan of 20 years, the GFS require new investment, renewed capacity building and other support from UNICEF and MoCM. Such support must address the fact that the GFS are at significant risk from flooding and drought – the incidence of which is increasing – and are also vulnerable to the effects of deforestation on water supplies.

Moving forward, the GFS continue to be UNICEF's best available option for water-related interventions within the national programming context and thus should continue to be at the core of the WASH programme in the future. The design and construction of the new GFS should address the shortcomings identified in this evaluation, which will require more support, capacity building and supervision from UNICEF and MoCM as well as a somewhat higher investment per beneficiary in the systems themselves.

6 Lessons Learned

The following are the key lessons learned from the evaluation process and findings. They stress lessons that are applicable both in DPRK and in other countries.

Lesson 1: The findings show that while there is significant room for improvement, it is possible to successfully construct economical and sustainable piped water systems, even in a highly challenging programming environment. This is an important lesson for all developing countries in the context of the higher sectoral standards of the Sustainable Development Goals, which call for the delivery of safe water into households (not just near households) for all by 2030.

Lesson 2: GFS are at a high risk from the impact of floods and droughts, and this risk will likely increase in DPRK and elsewhere due to climate change. It is thus an imperative to ensure that feasibility studies and system designs incorporate the predicted impacts of climate change as a core design criterion.

Lesson 3: While GFS require fewer inputs for operation and maintenance than most other water technologies, regular support is necessary to maintain adequate functionality and to ensure continuing benefits for children and women.

Lesson 4: Staff turnover in UNICEF can have significant negative repercussions on programming in the absence of a robust system to ensure an adequate institutional memory in country offices. While this is more of an issue in the DPRK context, it does apply to other countries as well.

Lesson 5: Capacity building must be a continuous process and not just limited to the short-term periods of emergency and development projects. This implies that UNICEF has a responsibility to ensure that some regular resources are devoted to basic continuing capacity building programmes, even in the absence of donor funding.

7 Recommendations

The recommendations on the GFS programme detailed below emerge from the finding and conclusions, and have been discussed with stakeholders, including during three de-briefing sessions with MoCM and CBS, with partner agencies, and with the evaluation reference group (see Annex 8 for the presentation used in the de-briefings).

The recommendations are all to be implemented within the new Country Programme period (2017-2021). The specific timeframe within this period are indicated for each recommendation.

Ongoing and new GFS programming will be funded through a mix of UNICEF core funding (regular resources, RR) and additional funding from donor partners (other resources, OR). OR funding may be either emergency (ORE) or regular (ORE). The source of funding for each of the recommendations is also detailed below.

Recommendation 1: Repair and rehabilitate the existing GFS ***[Timeframe: 2017-2018] [Funding: RR and new OR]***

Relatively modest short-term investments by UNICEF and MoCM in the existing GFS will achieve two goals: one, they will help to ensure that the systems are sustainable over their design 20-year lifespan (and beyond), and two, they will maximize the health benefits by applying quick-fixes to critical components (to improve water treatment and to increase the number of hours of water supplied per day to consumers). This re-investment programme could be conducted on a campaign basis, and fund-raising efforts to finance the campaign would stress that the initiative would be a highly cost effective way to benefit children and women over a ten-year period, while also addressing the impacts of climate change.

This re-investment campaign would involve the following steps:

- on-site assessment of needs by UNICEF and MoCM [RR in 2017];
- donor proposal development and fund raising [RR in 2017];
- procurement and delivery of spare parts and components [OR in 2017-2018];
- on-site refresher training for system managers and technicians [RR in 2017];
- simple inexpensive system fixes where possible (such as adding an additional water source to address water availability problems, break-pressure tanks to fix design-related pressure problems, and SSF repairs to improve water quality) [OR in 2017-2018]

Recommendation 2: Improve routine maintenance of the existing GFS ***[Timeframe: annually, 2017-2021] [Funding: RR]***

In addition to the repair and rehabilitation campaign, UNICEF and MoCM should put greater emphasis on regular support for the management and maintenance of existing GFS. This would involve, one, the design of a system for the annual identification and prioritisation of spare parts for GFS (including the development of a template of standard spare parts, which would be completed and submitted annually by each GFS manager, and then prioritised and compiled into a master procurement list by MoCM and UNICEF) and two, the use of RR funding to procure the parts annually and distribute them to counties. The reinvigoration of capacity building for GFS (Recommendation 3) will include support for this programme.

Recommendation 3: Reinvigorate capacity building for GFS ***[Timeframe: annually, 2017-2021] [Funding: RR]***

The reinvigoration of UNICEF and MoCM GFS capacity building efforts is needed both to improve the management and maintenance of existing systems and improve the design and construction of new systems. The frequency and design of training programmes should recognize the fact that there is frequent staff turnover at county level. The main components of the re-vamped training programme should include:

- more frequent training opportunities for county and village level system managers and technicians;
- a mix of training subject areas including regular sessions on operation and maintenance, design and construction; as well as special trainings on identified areas of weakness such as water treatment systems operation, concrete construction techniques, etc.
- an emphasis on practical hands-on training techniques (similar to the recent training in Tongrim county, which was universally appreciated by interviewed county officials);
- improving the availability of reference and training materials (including the latest versions of the EPANET system design software and manuals)

Recommendation 4: Improve supervision and support from the national level
[Timeframe: annually, 2017-2021] [Funding: RR]

A key element in the success of the (non-UNICEF) Sinhung GFS and some older UNICEF-supported GFS (e.g. Yontan) was more frequent support and supervision visits at the design, construction and operation phases. UNICEF and MoCM should thus increase the frequency of their visits and other support to counties. Given the large number of GFS to maintain and construct, this means more staff are required for GFS in UNICEF and MoCM.

Recommendation 5: Develop systems to address high staff turnover rates in UNICEF
[Timeframe: 2017] [Funding: RR]

Related to Recommendation 4, it is imperative that UNICEF maintains a continuous presence in the sector and an adequate institutional memory in WASH (and other sectors). To achieve this, UNICEF should address high staff turnover rates with more rigorous handover protocols, more timely recruiting of international staff and other measures as appropriate (to be assessed in-house).

Recommendation 6: Construct new high-quality GFS at both village and county level
[Timeframe: annually, 2017-2021] [Funding: RR (for feasibility studies) and OR (for system construction)]

The evaluation findings show that the GFS model is still the best option for water supply in the DPRK, and GFS construction should continue to be the core WASH intervention for UNICEF. More effort should be made to construct GFS at village level, especially in the context of the county-wide convergence design of the new Country Programme. New GFS designs should put more stress on quality over value to ensure sustainability while incorporating risk reduction and improvements to water quality assurance (Recommendations 6 and 7), and thus unit per-capita costs may increase over current levels. Funding for new GFS will be from OR sources with proposals for funding based on high-quality system feasibility studies that will be funded from RR.

Recommendation 7: Update GFS designs with a focus disaster and climate risk reduction to reduce impacts from flooding, drought, climate change and deforestation
[Timeframe: annually, 2017-2021] [Funding: RR (for feasibility studies) and OR (for system construction)]

Disaster and climate change risk reduction should be core components of feasibility studies and system design, with special reference to flood protection and the need to ensure an adequate quantity of intake water over the life-span of the system in an environment of periodic or permanent reduction in source waters. GFS designs should also stress the need to fully protect system water catchments from deforestation and other potential environmental degradation.

***Recommendation 8: Address water quality in existing and new GFS
[timeframe: annually, 2017-2021 / funding: OR (for new systems) and RR (for support to chlorination and household water treatment)]***

In both existing and new GFS, water quality should be more comprehensively addressed by re-emphasizing the need for a fully functional physical and biological water treatment system. The GFS designs should also re-emphasize the need for continuous 24-hour water delivery to households as a critical measure to reduce the risk of secondary contamination within the distribution network.

UNICEF and MoCM should also provide technical support to counties for the implementation of the new MoPH policy on electrolysis-based chlorination of systems.

See also Annex 9 for a set of additional recommendations for the UNICEF WASH Programme that go beyond GFS. These recommendations stem from the evaluator's discussions and observations on the broader WASH programme during the course of the GFS evaluation process, and while they are not based on a rigorous set of data and findings - they may be a useful starting point for planning discussions for the UNICEF WASH programming over the next five years.

Annex 1: Evaluation ToR

[PDF file, attached]



ToR for WASH
Evaluation DPRK 2016.

Annex 2: Documents Reviewed

Author	Scope	Year	Title
MoCM, UNICEF	National	2014	DPRK Water Assessment Final Report, 2013-14
CBS, UNFPA	National	2015	Socio-Economic, Demographic and Health Survey 2014 (SDHS-2014)
UNICEF	National	2010	UNICEF DPRK Country Programme Document 2011-2016 (ExBoard version)
UNICEF	National	2016	UNICEF DPRK Country Programme Document 2017-2021 draft 18 July 2016 (ExBoard version)
UNICEF	National	2016	UNICEF DPRK CPD Costed Evaluation Plan 2017-2021
UNICEF	National	2015	Strategic Plan for WASH Programme in the DPRK 2017-2021 Country Programme
UNICEF	National		UNICEF DPR Korea Country Office Annual Reports, 2006-2015
UNICEF	National	2015	Concept Note - PR Korea Country Programme Development
UNICEF	National	2015	CPD Conceptual Framework ver 4, presentation
UN, Gov't DPRK	National	2015	Strategic Framework for Cooperation Between the United Nations and the Government of the Democratic People's Republic of Korea, 2011-2015
CBS	National	2013	DPRK National Nutrition Survey 2012
UNDP/UNOCHA	National	2015	DPR Korea Humanitarian Needs and Priorities 2015
UNDP/UNOCHA	National	2016	DPR Korea Humanitarian Needs and Priorities 2016
UNICEF	National	2013	The Focus County Approach Rapid Assessment
UNICEF	National	2014	Focus County Geographical Focus for CPD 2015 Presentation
CBS, UNICEF	National	2010	Multiple Indicator Cluster Survey MICS 2009
MOPH	National	2013	National Nutrition Strategy 2014-18 DPRK
UNICEF	National	2015	Strategic Plan for WASH Programme in the DPRK 2017-20
UNICEF	National	2015	UNICEF 2016 Humanitarian Action for Children, HAC Appeal
UNICEF	National		UNICEF DPRK Submissions for Global WASH Annual Report: 2008, 09,11,12,13
UNICEF	National	2015	DPRK Humanitarian Situation Report SitRep July 2016
UNICEF	National	2013	UNICEF DPRK Factsheet 2013
UNICEF	National	2015	WASH Bottleneck Analysis
UNICEF	National	2014	WASH Briefing for new Representative (4 Sept 2014)
UNICEF	National	2015	WASH Proposal to RoK-MoU by UNICEF DPRK
WFP	National	2016	WFP DPR Korea Country Brief
Keast	National	2006	Programme Review of the UNICEF-Supported Water, Sanitation and Hygiene Programme in the Democratic People's Republic of Korea
Keast	National	2008	UNICEF-Supported WASH Programme in the DPR Korea Programme Review and Rural Water Supply Programme Component Design
Pravinjith	National	2010	Third party evaluation of the pilot DEWATS projects in DPRK

Author	Scope	Year	Title
McGrath	National	2016	Lessons Learned by Concern Worldwide over 16 years of WASH programmes in North Korea (39th WEDC Conference Paper)
SDC	National	2016	SDC in DPR of Korea, 2015–2016 WASH Programme
MoCM	National	2007	Feasibility Study Report, Tongrim County GFS
MoCM	National	2009	Feasibility Study Report, Tonchon County GFS
MoCM	National	2012	Feasibility Study Report, Kumya County GFS and Jiyin Ri GFS
MoCM	National	2016	Feasibility Study Report, Jongju City GFS
UNICEF	National	2015	Donor Report: Support to WASH Sector Capacity Strengthening , SDC
MoCM	National	2016	UNICEF-Supported GFS Database
UNICEF, Suk Ran Kim	National	2016	Training Report, Operation & Maintenance of GFS
UNICEF, Prashant Malla	National	2011	Rural Water Supply Feasibility Study, Design and Construction Manual
Alan Etherington	National	2014	End of Programme Assessment Report Of The WASH Component of the Integrated Health Programme in Sinpo City, South Hamgyong Province, DPRK (SIDA & SCI Supported)
Alan Etherington	National	2011	Europe Aid Special Measures Support to Water & Sanitation Projects in DPRK, Programme Assessment and Opportunities for Further Support: Draft Report plus Extract on sustainability findings
Alan Etherington	National	2014	End of Project evaluation, Multi Sector Nutrition & Food Security (MSNFS) project
UNICEF	National	2016	Convergence County consultative meeting- programs 26th August 2016 (presentation)
UNICEF	National	2016	UNICEF DPR Korea: Programme Strategy Notes, Country Programme 2017 – 2021, WASH
UNICEF	Regional	2015	EAPRO Sanitation Snapshot 2015
UNICEF	Regional	2015	EAPRO Water Snapshot 2015
UNICEF	Regional	2016	Second Review of Community-Led Total Sanitation in the East Asia and Pacific Region
UNICEF	Global	1980	Handbook of Gravity Flow Water Systems
Gov't India	Global	2013	Manual for Operation and Maintenance of Rural Water Supply Schemes
UNICEF	Global	2016	UNICEF Global Strategy for Water, Sanitation and Hygiene 2016-2030
UNICEF	Global	2013	UNICEF Strategic Plan 2014-2017
WHO, UNICEF	Global	2016	Progress on sanitation and drinking water – 2015 update and MDG assessment, JMP
UNICEF	Global	2015	Advancing WASH in Schools Monitoring, 2015
UNICEF	Global	2011	How to design and manage equity-focused evaluations
UNICEF	Global	2010	UNICEF-Adapted UNEG Evaluation Reports Standards
UNICEF	Global	2004	UNICEF Evaluation Report Standards
Performance Pipe	Global	2015	Technical Note PP 841-TN Pressure Capability of HDPE PE4710 and PVC Pipe

Author	Scope	Year	Title
Guy Hutton and Mili Varughese (World Bank)	Global	2016	The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene
UN	Global	2016	INFORM Global Risk Index for 2017 (Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness)

Annex 3: Stakeholders Consulted

National Level

Stakeholder / Title	Location	Level	Organization	Gender
Kim Chol Man, Director, External Economic Cooperation Department	Pyongyang	National	MoCM	M
Cheo Un Sun, Senior Officer, External Economic Cooperation Department	Pyongyang	National	MoCM	F
Kim Yon Ho, Officer, External Economic Cooperation Department	Pyongyang	National	MoCM	M
Ri Nam Hyen, WASH Consultant	Pyongyang	National	MoCM/UNICEF	M
Kim Suk Ran, WASH Consultant	Pyongyang	National	MoCM/UNICEF	F
Chang Myong Son, Head, Dept. of Database	Pyongyang	National	CBS	F
Ri Un Hui, Officer, Dept. of Database	Pyongyang	National	CBS	F
Kim Sol Rim, Officer	Pyongyang	National	CBS	F
Peter Michel, Deputy Head/Chief WASH	Pyongyang	National	SDC	M
Purushottam Timilsina, WASH Focal Point	Pyongyang	National	SCI	M
Alexander Szabo, WASH Delegate	Pyongyang	National	IFRC	M
Olivier Hariot, WASH Project Manager,	Pyongyang	National	Deutsche Welthungerhilfe	M
Siobhan McGrath, WASH Programme Manager	Pyongyang	National	Concern	F
James Linton, Executive Director	Pyongyang	National	Wellspring	M
Oyunsaihan Dendevnorov, Representative	Pyongyang	National	UNICEF-DPRK	F
Murat Sahin, Deputy Representative	Pyongyang	National	UNICEF-DPRK	M
Anil Pokhrel, WASH Specialist	Pyongyang	National	UNICEF-DPRK	M
Kim Kwang Hyok, WASH National Officer	Pyongyang	National	UNICEF-DPRK	M
Wisam Hazem, Chief, Nutrition	Pyongyang	National	UNICEF-DPRK	M
Mohammad Younus, Chief, Health	Pyongyang	National	UNICEF-DPRK	M
Mubeen Aslam, TB and Malaria Prog. Manager	Pyongyang	National	UNICEF-DPRK	M
Shailesh Kumar, M&E Specialist	Pyongyang	National	UNICEF-DPRK	M
Song Xiao Bing, Supply and Logistics Specialist	Pyongyang	National	UNICEF-DPRK	M
Carol Kungu, Supply and Logistics Officer	Pyongyang	National	UNICEF-DPRK	F
Other UNICEF officers	Pyongyang	National	UNICEF-DPRK	
Chander Badloe, Regional WASH Adviser	Pyongyang	National	UNICEF-EAPRO	M
Riccardo Polastro, Regional Evaluation Adviser	Pyongyang	National	UNICEF-EAPRO	M

Sub-national Levels

Stakeholder / Title	Location	Level	Organization	Gender
Kim In Pom, Director	Tongrim County	County	CPC	M
Mun Jong Chol, GFS Manager	Tongrim County	County	CPC	M
Kim Chol, Director, City Management	Tongrim County	County	CPC	M
Director (and staff)	Tongrim County	County	Tong Nim Kindergarten	F
Householders	Tongrim County	County		F x 2
Kim Byong Chol, Head Officer, People' s Committee	Jongju County	County	CPC	M
Rym Chol Ho, Division of City Management	Jongju County	County	CPC	M
Ri Jin Yong, Division of Foreign Affairs	Jongju County	County	CPC	M
Director (and staff)	Jongju County	County	City Nursery	F
Householders	Jongju County	County		F, M
Pak Won Jun, Officer, Dept. of External Affairs	South Hamgyong Province	Provincial	PPC	M
Kim Ha Ryong, Vice Chair	Kumya County	County	CPC	M
Kim Won Jun	Kumya County	County	CPC	M
Householders	Kumya County	County		F x 2
Kim Bong Nyo, Chair, Jyin Ri Peoples Committee	Jyin Ri, Kumya County	Ri	Ri GFS Management Board	F
Principal (and staff)	Jyin Ri, Kumya County	Ri	Jyin Primary/Sec School	F
Sin Mun Chung, Vice Chair (construction)	Sinhung County	County	CPC	M
Kim Chang Jin, Vice Chair (city management)	Sinhung County	County	CPC	M
Principal (and staff)	Sinhung County	County	Sinhung Secondary School	F
Director (and staff)	Sinhung County	County	Sinhung City Nursery	F
Householders	Sinhung County	County		F x 3
Officer, Dept. of External Affairs	Kangwon Province	Provincial	CPC	M
Kim Song Chan, Vice Chair	Tongchon County	County	CPC	M
Pak Song Taek, Director of City Management	Tongchon County	County	CPC	M
Kim Sung Gi, Designer, GFS	Tongchon County	County	CPC	M
Principal (and staff)	Tongchon County	County	Tongchon Primary School	F
Householders	Tongchon County	County		F

Stakeholder / Title	Location	Level	Organization	Gender
Kim Jong Sik, Chairman, Songjong Ri Management Board	Songjong Ri, Tongchon	Ri	Ri GFS Management Board	M
Director (and staff)	Songjong Ri, Tongchon	Ri	Songjon Ri Kindergarten	F
Householders	Songjong Ri, Tongchon	Ri		F
Kim Sok Un, Chairman	Sinpyong County	County	CPC	M
Song Yong Su, Director of City Management	Sinpyong County	County	CPC	M
Ri Myong Son, Head, Design Unit	Sinpyong County	County	CPC	M
Householders	Sinpyong County	County		F x 2
Ko Jun Sik, Vice Chair	Pyoksong County	County	CPC	M
Kim Yong Ho, Director, Division for City Management	Pyoksong County	County	CPC	M
Kim Jong Nam, GFS Manager	Pyoksong County	County	CPC	M
Director (and staff)	Pyoksong County	County	Tagaso Nursery	F
Householders	Pyoksong County	County		F x 2
Chong Ho Sun, Vice Director	Unchon County	County	CPC	M
Kong Hyon Suk, Officer	Unchon County	County	CPC	M
Choe Yin Chol, External Affairs	Unchon County	County	CPC	F
Director (and staff)	Unchon County	County	Unchon Nursery	F
Householders	Unchon County	County		F x 2
Choe Jae Hwan, Vice Chair	Yontan County	County	CPC	M
Ri Myong Su, Director, City Management	Yontan County	County	CPC	M
Kim Yong Chol, Officer	Yontan County	County	CPC	M
Director (and staff)	Yontan County	County	Yontan Nursery	F
Householders	Yontan County	County		F x 2
Choe Han Yil, Vice Chair	Unsan County	County	CPC	M
Kim Yil Nam, GFS Manager	Unsan County	County	CPC	M
Kim Kwang Chol, Officer	Unsan County	County	CPC	M
Director (and staff)	Unsan County	County	Unsan Tool Factory Kindergarten	F
Householders	Unsan County	County		F x 2

Annex 4: Evaluation Matrix

Evaluation Criteria	Key Evaluation Questions	Measure or Indicator	Data Sources	Data Collection Methods	Analysis Methods
Relevance	To what degree have the UNICEF-supported interventions conform and contribute to the priorities and policies of 1) the beneficiaries and 2) the local and national governments?	Stakeholders perspectives; policy benchmarks	1)householder opinions; institution (schools/nurseries/health clinics) staff opinions 2)Gov't policy/strategy documents (subject to availability)/UNICEF programme documents; gov't stakeholders perspectives	Interviews; document review	Synthesis of interview records; document content analysis
Effectiveness	To what extent have the WASH interventions attained their objectives?	1) Existence of GFS 2) Quality of GFS construction 3) Functionality of GFS 4) Use of GFS by beneficiaries	Project progress reports; donor reports; national and international norms; stakeholder opinions; field observation	Structured observation; interviews; document review	Synthesis of interview records; synthesis of structured observations; tabulation of data; triangulation of tabulated results
Efficiency	How do the beneficiary unit costs compare with national alternatives and with regional and global norms?	Budgets and expenditures per unit of output	Project progress reports and financial records; donor reports; reports and evaluations from other development partners in DPRK; global and regional cost per beneficiary figures; perspectives of development partner representatives	Document review; budget analysis; interviews	Comparative cost analysis (nationally, regionally, globally)

Evaluation Criteria	Key Evaluation Questions	Measure or Indicator	Data Sources	Data Collection Methods	Analysis Methods
Sustainability	Are the benefits from the GFS likely to continue over the operational life-span of the systems? Is the GFS approach replicable beyond areas of UNICEF support?	1) Functionality of older systems (>5 years) 2) Replication of GFS technologies and approaches by governments and other development partners	Field observation; stakeholder opinions; UNICEF and development partner reports	Structured observation; interviews; document review	Synthesis of interview records; synthesis of structured observations; tabulation of data; triangulation of tabulated results; time-line analysis of technology introduction
Impact	What are the positive changes produced by the new/rehabilitated GFS? Are there any negative changes?	1) Child health benefit indicators (diarrhoea/severe diarrhoea/nutrition indices) 2) Indices of other benefits (education/productive use of water/others) 3) Evidence of negative environmental impact	County AES health records, historical and current; views of child caregivers (parents/teachers/health staff); structured observation; views of AES staff; views of county officials	Structured observation; interviews; document review	Diarrhoea incidence analysis; synthesis of interview records
Equity	To what extent has the programme reached hard-to-reach, disadvantaged and vulnerable communities, and addressed gender and disability?	1) Child survival and related development/deprivation indicators in GFS counties 2) Extent of GFS coverage within counties (rural/urban) and within towns (central/periphery) 3) Design standards (litres of water/person/day) and actual water delivery across all geographic divisions	SDHS, 2014; DPRK National Nutrition Survey 2012; project reports; views of county officials; system observation	Document review, structured observation; interviews	Document analysis; synthesis of tabulated data; synthesis of interview records

Evaluation Criteria	Key Evaluation Questions	Measure or Indicator	Data Sources	Data Collection Methods	Analysis Methods
Gender	<p>Have the UNICEF interventions reduced gender-based inequalities related to WASH?</p> <p>Has UNICEF encouraged the meaningful participation of women in project-related activities (trainings, staffing, etc.)?</p>	<p>1) Time savings for women and girls (from water hauling, sick child care, etc.) pre- and post-GFS</p> <p>2) Other indices of improvement identified by beneficiaries (e.g. dignity/security-related improvements linked to indoor toilets)</p> <p>No. of women participants in training programmes; no. of female staff at various levels</p>	<p>Opinions of women householders; opinions of female institution staff; views of county officials; estimates of time savings for water hauling</p> <p>Training records; staffing records; interviews with female staff</p>	<p>Interviews</p> <p>Document analysis; interviews</p>	<p>Synthesis of interview records; average estimate of time savings</p> <p>Synthesis of interview records; tabulation of data</p>

Annex 5: Evaluation Instruments

Checklists for observation and questions for semi-structured interviews for:

- visits to County and Ri-level Water Supply Systems
- visits to households and education and childcare institutions (schools, kindergartens, nurseries) served by systems
- discussions with system managers, system operators and county officials
- discussions with beneficiaries
- discussions with national-level stakeholders

Checklist for Evaluation Visits to GFS

Officials to meet (at County and Ri levels):

- Officials from People's Committee involved in water system management
- Technical managers of water systems/work team leader for O&M
- Anti-Epidemic Station staff and/or Public Health officials

Documentation to see

- Schematic/map of GFS
- Data from AES on water quality testing
- Local data on diarrhoea prevalence
- Log books or similar related to O&M

Beneficiaries/Water Users to meet and have discussions with

- Householders from at least 2 houses, chosen randomly (discussions in houses)
- Managers/child care workers/teachers of education and childcare institutions (discussions in institutions)

Systems Components to see

- Intake/catchment
- Main reservoir
- Water treatment plants
- Chlorination equipment
- Pressure release valves/junction boxes
- Solar pumping equipment
- Pipeline river crossings
- Alternative water sources if used
- Parts/tools warehouse/shop

(see detailed evaluation instruments for full list of questions and observations)

1/ GFS System Visits

A. Basic System Data

Province: _____ County: _____

Town/Up: _____ Village/Ri: _____

Name of system managers: _____

Year/month construction activities started: _____

Year/month completed and put into operation: _____

County town population (data year): _____ child population (data year): _____

No. of system users: _____ (households/people)

System components

UNICEF Inputs (mains, treatment plants, distribution pipes, household connections, household latrines, etc.)	Notes

B. System Survey

(in all cases provide more info as necessary)

1. Is water system functional at time of visit? Y / P / N / na
2. Is water source adequately protected (fencing, berms, signage, erosion control, etc.)? Y / P / N / na
3. Water treatment plant exists? (roughing / SSF / other / none)
4. Water treatment plant functional at time of visit? Y / P / N / na
5. Is chlorination being used? (full-time, seasonal, occasional, none)
6. Are there signs of leaks and/or significant cracks at any part of the system visited? Y / P / N / na
7. Are there significant surface water / other contaminants near system components Y / P / N / na
8. Are the vents and access covers on tanks closed and sealed at time of visit? Y / P / N / na
9. Are there signs of DRR measures at intake/ along main (erosion control, fortified river crossings, etc.)? Y / P / N / na
10. Are there any signs of poor construction quality (concrete structures, fittings placement, etc.)? Y / P / N / na
11. Are there indications of design problems? Y / P / N / na
12. Are there signs of excessive/uncontained wastewater? Y / P / N / na

Other notes on system:

C. Household observations and questions for discussion with householder(s)

Note: can be meetings with a single householder, or a small group of community members.

Household 1 (*name of interviewees*): _____
(*use separate sheets for Household 2*)

Household type: house/flat/other

Number of adults__ Number of children__ resident in household

Part I: Questions on water

1. Before the system was constructed/rehabilitated, where did you get your water? (or if system is not yet completed, where do you get your water now?)
2. When is water generally available? (every day, 24 hours a day, only part of day, only certain days a week, how many times a day, etc.)
3. When was the last time that the water was running (if it is currently not running)?
4. When was the last time water was off (if it is currently running)?
5. When there is no water available at home (from taps or storage containers) where do you collect water from: tubewell / dug well / spring / surface water source / other
6. How far away is it?
7. Who's responsibility was it/is it to fetch water? women/man/girl/boy
8. What are you using water for in the house besides drinking/cooking/bathing/laundry? (e.g. for garden, livestock, productive activities, etc.)
9. Is there enough water for everything?
10. Is the quality of the water generally good? If not, what is the problem? (smell, bad colour, bad taste, turbid, sediment, etc.)
11. How do you treat the water? no treatment / boil / filter / chlorinate / other
12. Are you /have you been involved in the construction or operation and maintenance of the system in any way?

Part II: Questions on sanitation and hygiene

13. Which toilet(s) do you and your family use? Indoor toilet / family outdoor toilet / shared toilet / other
14. Which toilet(s) did you use before the GFS was constructed. Indoor toilet / family outdoor toilet / shared toilet / other

15. Has there been any change in the frequency of diarrhoea cases of your children since the new system was constructed/rehabilitated? How much difference? (for HHs with younger children)
16. Do you use faeces from your latrine on your home garden? How often do you do this (how often do you empty your latrine: e.g. every day? every week? only once in the spring?, etc.) Who does this (man/woman/girl/ boy?) Who works in the garden (man/woman/girl/ boy?)
17. Is there anything that could be improved about your water and sanitation situation?

Part III: Household observations

18. What is the water point for the household? tap(s) inside home / tap(s) inside yard / public standpipe / other
19. Is there running water at the time of the visit? Y / N / na
20. Is the pressure adequate? Y / N / na
21. Are there obvious water quality problems at the time of the visit? Y / N / na
22. Is water being stored in the kitchen/bathroom? Y / N / na
23. Do water storage/handling facilities/practices appear to be hygienic? Y / N / na
24. Is there a place in/near the kitchen for handwashing with both water and soap at the time of the visit? Yes / Water but no soap / Soap but no water / na
25. Is there a place in/near the bathroom (or latrine) for handwashing with both water and soap at the time of the visit? Yes / Water but no soap / Soap but no water / na
26. Type of toilet? water-flushed toilet in the house/in the yard/latrine in yard/latrine outside of home or yard
27. Is the toilet shared with other families? Y / P/ N / na
28. Does the household toilet appear to be in use? Y / N / na
29. Is the toilet clean? Y/ P/ N / na

D. School/Nursery/Health Care Facility observations and questions for discussion with facility directors and teachers *[if possible visit institutions that were supported by UNICEF]*

People met

Part I: Questions for institution directors and/or teachers on water and sanitation

1. When is water generally available? (every day, 24 hours a day, only part of day, only certain days a week, how many times a day, etc.)
2. When was the last time that the water was running (if it is currently not running)?
3. When was the last time water was off (if it is currently running)?
4. When there is no water available at the institution, where do you collect water from: tubewell / dug well / spring / surface water source / other
5. How far away is it?
6. What are you using water for besides drinking/cooking/bathing? (e.g. for school garden)
7. Is there enough water for everything?
8. Is the quality of the water generally good? If not, what is the problem? (smell, bad colour, bad taste, turbid, sediment, etc.)
9. How do you treat the water? no treatment / boil / filter / chlorinate / other
10. Are the toilet facilities for children adequate? For teachers?

Part II: Structured observations

11. Is there running water at the time of the visit? Y / N / na
12. Is the pressure adequate? Y / N / na
13. Are there obvious water quality problems at the time of the visit? Y / N / na
14. Is water being stored in the kitchen/bathroom? Y / N / na
15. Do water storage/handling facilities/practices appear to be hygienic? Y / N / na
16. Is there a place in/near the kitchen for handwashing with both water and soap at the time of the visit? Yes / Water but no soap / Soap but no water / na
17. Is there a place in/near the bathroom (or latrine) for handwashing with both water and soap at the time of the visit? Yes / Water but no soap / Soap but no water / na
18. Type of toilets for girls? water-flushed toilet /latrine For boys? water-flushed toilet /latrine
19. Are the toilets clean? Y/ P/ N / na

2/ Meetings at County Level

A) Questions for Country-level officials responsible for GFS administration and WASH generally

People met (gender noted) _____

Technical Questions

[ask to see map/schematic for the system]

1. What is the daily operation schedule for the system (__ hours AM, __ hours PM/24 hrs per day)
2. Is this the same schedule for all parts of the system? (including areas away from the centre, areas at higher elevation)
3. Is it the same every day in all seasons? (winter, summer)
4. Is the system shut down to perform maintenance? How often, how long? Last time?
5. Are the beneficiaries informed about water supply interruptions before maintenance?
6. How often is the SSF sand scraped? When was the last time it was scraped?
7. How often is the SSF sand removed and washed? When was the last time?
8. What other form of water treatment is used in the system? locally-produced sodium hypochlorite/other
9. What and when were the last three system breakdowns?

1/Breakdown _____ Duration offline: _____ Date: _____

2/ Breakdown _____ Duration offline: _____ Date: _____

3/ Breakdown _____ Duration offline: _____ Date: _____

10. Do you have any spare parts in stock (pipes, fittings)?
11. Where will you go for parts when needed? (MoCM, other)
12. When was the last time you obtained parts in this way?
13. What could be improved with the system?

General Questions

14. Has the UNICEF support been valuable in improving the water and sanitation situation in the county? What more could UNICEF do?
15. What is the role of the County/Ri in the construction and O&M of the water system(s)? What did the country provide (labour / equipment / materials / parts/ other)?
16. What are the water and sanitation priorities in the county (e.g. 24-hour system operation, more systems, improvements in alternative sources such as tubewells, reaching low-coverage areas, etc.)?

17. Which parts of the county have more problems/requirements in the area of water and sanitation? What is the county plan for reaching these areas?
18. Do you communicate with counterparts in other counties on issues related to water systems?
19. Please describe the technical and other support received from the central level.
20. Have you/your team participated in training programmes in the last 2 years? Which ones?
21. Have you used the approaches/technologies/training from the UNICEF-supported programme to construct/rehabilitate other systems without the support of UNICEF?
22. Are the UNICEF-supported approaches and technologies replicable for other systems in the county (or province)? What is required to replicate the approach on a larger scale?
23. What do you think would be the capacity building and/or other needs required to further improve the programme?

B) Questions for country level health authorities/AES staff

24. What was/is the role of the health authorities in the monitoring and management of the GFS?
25. Who is responsible for water quality monitoring? What are the WQ monitoring processes? Tools?
26. What kind of water purification activities are undertaken by AES?
27. Are the indications that new systems have had an impact on child health? What evidence do you have showing this? *[ask for diarrhoea stats]*
28. From a public health perspective within the WASH sector, what are the priorities for the town/county?
29. What are the gaps and needs to further strengthen water quality surveillance?

3/ Meetings at National Level

A) Questions for MoCM and other National Level Government Stakeholders

1. What is your overall assessment of UNICEF support to WASH? Is it considered a successful partnership by the Government DPRK (in broad terms)?
2. Is the programme design (technology choice, degree of capacity building, choice of project area, etc.) appropriate?
3. Does the Government of DPRK participate fully in the design/management/oversight of the programme components?
4. To what degree does the UNICEF programme of support conform to Government policies, strategies, guidelines and norms? Are there any serious differences?
5. Is the programme demonstrating new/improved methodologies/technologies that have been used to revise Government policies/guidelines?
6. To what extent has MoCM been able to replicate the programme? Where have GFS been built based on the UNICEF-introduced approach? What are the plans for scaling up?
7. Has the programme been successful in promoting and building capacity at provincial level? At county level?
8. What have been the key lesson(s) learned, from the point of view of Government, from the UNICEF programme?
9. What if anything should be changed for any future projects?

B) Questions for other Development Partners involved in WASH

[note that responses are confidential, interviewees will not be identified with comments in report]

1. What is your agency's involvement in the WASH Sector? Do you support similar programmes to UNICEF's in DPRK? Please describe them.
2. Have you or any of your staff/colleagues been involved in the UNICEF-supported WASH programme? How?
3. Has there been any coordination at national level on WASH involving your agency, UNICEF and Government stakeholders? (beyond WASH Sector Group)
4. Have you any views on how well the UNICEF WASH programme has been performing?
5. In your view, how could UNICEF improve its support to WASH in DPRK?
6. What has been your approach to WASH programme in DPRK? In what respect it is different from UNICEF approach?
7. Can you provide unit cost data (per beneficiary) for your agency's WASH projects in the country?

Annex 6: Detailed Field Trip Itinerary

First Field Trip

Date: Wednesday, 2 Nov 2016

Places: Tongrim County, N. Pyongan Province

Purpose:

- To observe GFS for water supply in UP town

Itinerary:

9:00 – 12:00 Travel to Tongrim county,

12:00-4:30 Meeting with county officials, visit to complete system, kindergarten, household

Overnight in Tongrim

Travelers;

UNICEF: Greg, Ri Nam Hyon, MoCM ; Kim Yong Ho

Date: Thursday, 3 Nov 2016

Visit:

Place: Jongju County, N. Pyongan Province

Purpose:

- To observe GFS under-construction for water supply in UP town, and visit components of old system

Itinerary:

9:00 – 13:00 Meeting with county officials, visit to filter under construction, nurseries, households

13:00-16:30 Travel to Pyongyang

Travelers;

UNICEF: Greg, Ri Nam Hyon, MoCM ; Kim Yong Ho

Second Field Trip

Date: Monday, 14 Nov 2016

Place: Kumya County, S. Hamgyong Province.

Purpose:

- To observe GFS for water supply in UP town and Jyin Ri completed water supply system by the support of UNICEF

Itinerary:

8:00 – 12:00 Travel to Kumya county,

12:00-12:30 Meeting with county officials

12:30- 16:00 Visit to Water Resource area, distribution tank, Primary School, kindergarten, household

16:00-16:30 Travel to Jyin Ri

16:30- 17:30 Water supply project by Solar and GFS in Jyin Ri

17:30- 18:30 Travel to Hamhung

Overnight in Majon Hotel

Travelers;

UNICEF: Anil, Greg, KKH, Ri Nam Hyon, Kim Sol Rim

MoCM ; Kim Yong Ho

Date: Tuesday, 15 Nov 2016

Places: Sinhung County, S. Hamgyong Province.

Purpose:

- To observe GFS for water supply in UP town
Day & Date: (Tuesday) 15th, November, 2016.

Itinerary:

8:30 – 10:00 Travel to Sinhung county,
10:00-10:30 Meeting with county officials
10:30- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten,
household

15:00-18:30 Travel to Wonsan

Overnight in Tongmyong Hotel

Travelers;

UNICEF: Anil, Greg, KKH, Ri Nam Hyon, Kim Sol Rim
MoCM ; Kim Yong Ho

Date: Wednesday, 16 Nov 2016

Visit:

Place: Tongchon County, Kangwon Province.

Purpose:

- To observe GFS for water supply in UP town and Songjon Ri supported by UNICEF

Itinerary:

8:30 – 10:00 Travel to Tongchon county,
10:00-10:30 Meeting with county officials
10:30- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten,
household

15:00- 15;30 Travel to Songjon Ri

15: 30- 18:30 Visit to water resource area, household, kindergarten

18:30- 19:30 Travel to Wonsan

Overnight in Tongmyong Hotel

Travelers;

UNICEF: Greg, Ri Nam Hyon, Kim Sol Rim
MoCM ; Kim Yong Ho

Date: Thursday, 17 Nov 2016

Visit:

Place: Sinpyong county, N. Hwanghae Province.

Purpose:

- To observe GFS for water supply in UP town supported by UNICEF

Itinerary:

8:30 – 10:30 Travel to Sinpyong county,
10:30-11:00 Meeting with county officials
11:00- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten,
household

15:00- 17;30 Travel to Pyongyang D5

Travelers;

UNICEF: Murat, Gregory KKH, Ri Nam Hyon, Kim Sol Rim
MoCM ; Kim Yong Ho

Third Field Trip

Place: Pyoksong County, S. Hwanghae Province.

Purpose:

- To observe GFS for water supply in UP town and Sokdong Ri completed water supply system by the support of UNICEF

Itinerary:

8:30 – 12:00 Travel to Pyoksong county,

12:00-12:30 Meeting with county officials

12:30- 17:00 Visit to Water Resource area, distribution tank, Primary School, kindergarten, household

17:30- 18:30 Travel to Haeju

Overnight in Haeju Hotel

Travelers;

UNICEF: Greg, KKH, Ri Nam Hyon, Kim Sol Rim

MoCM ; Kim Yong Ho

Places: Unchin County, S. Hwanghae Province.

Purpose:

- To observe GFS for water supply

Itinerary:

8:30 – 10:00 Travel to Unchon county,

10:00-10:30 Meeting with county officials

10:30- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten, household

15:00-18:30 Travel to Sariwon

Overnight in March 8th Hotel

Travelers;

UNICEF: Greg, KKH, Ri Nam Hyon, Kim Sol Rim

MoCM ; Kim Yong Ho

Place: Yontan County, N. Hwanghae Province.

Purpose:

- To observe GFS for water supply

Itinerary:

8:30 – 10:00 Travel to Yontan county,

10:00-10:30 Meeting with county officials

10:30- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten, household

15: 30- 18:30 Visit to water resource area, household, kindergarten

18:30- 19:30 Travel to Hyangsan County

Overnight in Chongchongang Hotel

Travelers;

UNICEF: Greg, Ri Nam Hyon, KKH, Kim Sol Rim

MoCM ; Kim Yong Ho

Place: Unsan county, N.Pyongan Province.

Purpose:

- To observe GFS for water supply

Itinerary:

8:30 – 10:30 Travel to Unsan county,

10:30-11:00 Meeting with county officials

11:00- 15:00 Visit to Water Resource area, distribution tank, Primary school, kindergarten, household

15:00- 17;30 Travel to Pyongyang

Travelers;

UNICEF: Gregory, KKH, Ri Nam Hyon, Kim Sol Rim

MoCM ; Kim Yong Ho

Annex 7: Criteria Used for System Status Table 5

The criteria used for the Yes, Partially and No ratings for each of the status table's columns are described below.

System	Functionality	Water Quantity		Water Quality		
	Functioning (at time of visit)	24hr water in system	Sufficient water in HHs (taking into account HH storage)	Protected catchment & intake	Functioning water treatment system	Risk of contaminated water reaching some HHs

Completed UNICEF-supported Systems

Tongrim	Yes	No	Yes	Yes	Partially	Moderate
Kumya	Yes	No	Yes	Yes	Yes	Moderate
Tongchon	Yes	No	Yes	Yes	Partially	Moderate
Songjon Ri	Yes	Yes	Yes	Yes*	No	Moderate
Sinpyong	Partially	No	No	No	No	Moderate-High
Pyoksong	Yes	No	Yes	No	Partially	Moderate
Unchon	Yes	No	Yes	Yes	Partially	Moderate
Yontan	Yes	Yes	Yes	Yes	Partially	Moderate
Unsan	Partially	No	Yes	Yes	No	Moderate-High**

Other GFS Systems

Jongju				Partially	(under construction)	
Sinhung***	Yes	Yes	Yes	Yes	No	Moderate

* did not see intake ** blended water ***Non-UNICEF (SCI)

Functionality Column

Yes – water available at time of visit (water running in taps, or water from system stored in HHs and education and childcare institutions and recent availability from system confirmed by multiple stakeholders) plus confirmation of functionality of system through observation and interviews with system managers, including in dry season

Partially – observations and discussion indicate that system is not functional for periods of time and/or is delivering water in insufficient quantities to meet basic domestic needs, plus observations of other sources of water being used for domestic purposes (e.g. clothes washing in rivers)

No – above criteria not met

Water Quantity Columns

24 hour water in system

Yes – all-day flow every day verified through observation and discussion with all stakeholders

No – any stakeholder (including householders and childcare institution staff) stating that water is not available for 24 hours along with discussions and follow-up discussions clarifying this with system managers

Sufficient water in households (taking into account HH storage)

Yes – sufficient water (50 to 100 l/p/d) available in household storage tanks (and institution tanks) for domestic needs of family (institution) along with confirmation through interviews and discussion that source of the water in the tanks is the GFS

No – the above criteria is not met

Water Quality Columns

Protected catchment and intake

Yes – the catchment area for the water source (spring/stream/reservoir) appears to have restricted access (including fencing and signage), no habitations, no farms, no farm animals, no industry and no other potential sources of contamination as assessed through observation of the visible area and discussion with GFS managers, operators and caretakers; and the intake structure itself is protected from potential contamination

Partially – one of the above criteria is not met (e.g. signage, some farming activity) but other criteria are met

No – two or more of the above criteria are not met and/or signs of potential contamination is clearly visible (e.g. clothes washing in stream upstream of the intake)

Functioning water treatment system

Yes – both the physical and biological treatment processes are present and functioning at time of visit, as assessed through observation and discussion with GFS managers (a complete treatment system in this context includes a roughing filter for physical filtering and a slow sand filter for biological filtering and physical filtering)

Partially – one component of the treatment system is not fully functional due to operation error, breakdown or poor initial design (in most cases here, a Partially rating is because the slow sand filter is either broken or not operated correctly)

No – no effective physical or biological treatment processes exist or are operational

Risk of contaminated water reaching some households

Low – all three design elements for preventing water contamination exist and are fully functional, as follows: (1) the catchment area and intake are fully protected, (2) the water treatment systems exists and is fully functional, and (3) there is 24 hour water supply and thus 24 hr pressure in the system, which minimizes the risk of secondary contamination (contaminated groundwater or sewage seeping into supply pipes through cracks or loose connections)

Moderate – one of the three design elements is not in place or not functioning adequately

High – no protection from contamination

Explanation of Notes

* did not see intake: the evaluator was not able to visit the intake but made an assessment through discussion with several stakeholders (e.g. for Sinhung system, discussion with UNICEF Staff Member who had visited the system)

** blended water: in Unsan system, the operators were augmenting GFS water with contaminated water via the old (partially-functional) pumped system

*** non-UNICEF (EUPS 2): this GFS was supported by EUPS 2, SCI, and visited for comparison purposes

Annex 8: PowerPoint Presentation of Findings and Recommendations

This presentation imbedded below was used for three de-briefing sessions with MoCM and CBS, with partner agencies, and with the evaluation reference group. Note that since this was a presentation of preliminary findings and recommendations, it differs in some areas from the final version of these presented in the report. Note also that some figures quoted in the presentation have also changed.



Formative Evaluation
of UNICEF GFS in DPRK

Annex 9: Beyond GFS: Additional Recommendations for the UNICEF WASH Programme

The recommendations below stem from the evaluator's discussions and observations on the broader WASH programme during the course of the GFS evaluation process. While less formal than the GFS recommendations - since they are not based on a rigorous set of data and findings - they may be a useful starting point for planning discussions for the UNICEF WASH programming over the next five years.

WASH Recommendation 1: GFS should continue to be the main focus of the UNICEF WASH programme

As a relatively small WASH programme with limited staff and funding, the DPRK WASH team must limit itself to a small number of interventions to ensure effectiveness. The GFS programme, including support for existing GFS and the construction of new GFS, will require the bulk of the attention of staff and of funding resources to be successful. Additional activities should thus be chosen with care.

WASH Recommendation 2: Proceed with caution on solar pumping

As the visit to Jiyin Ri solar pumping visit highlighted (the electronic control panel and/or the solar pump were broken at the time of the visit), solar systems are highly dependent on in-country solar pumping expertise and spare parts, both of which are limited. Thus UNICEF should limit its involvement in solar pumping. In cases where solar systems are already in place or planned (e.g. Jongju City), they should be treated as pilot projects with an emphasis on learning.

WASH Recommendation 3: Restrict sanitation programming to efforts to address unsafe handling of human excreta

It is likely that the greatest sanitation-related threat to the health of children in DPRK is the widespread practice of using relatively fresh human excreta as fertilizer for agriculture and gardening, which exposes children to faecal pathogens in households, in education and childcare institutions, and in fields and gardens. UNICEF efforts in the area of sanitation should focus on addressing this issue, with a strong focus on research (e.g. in the area of cold weather composting) and efforts to promote behaviour change. Investments in household sanitation hardware, on the other hand, should be curtailed.

WASH Recommendation 4: Restrict WASH in Schools programming to limited, low-cost interventions

Considerable effort and funds have been invested in the construction of WASH infrastructure in schools, kindergartens and nurseries by UNICEF in DPRK over the years, with limited success with respect to scaling up beyond the beneficiary institutions, and likely very high unit costs per child. If continuing to engage in WASH in Schools, UNICEF should focus on low-cost interventions such as the promotion of group hand-washing, latrine cleanliness or on-site water treatment. The UNICEF field guide "Three Star Approach for WASH in Schools" can be used as a reference for this.

WASH Recommendation 5: Promote household water treatment and safe water storage through both emergency and development programming

Household water treatment programming is a good fit for the UNICEF WASH programme in DPRK. It is low cost, it is appropriate for both humanitarian and development programming, it can help to address a key finding of the GFS evaluation (that water reaching consumers is not necessarily safe)

and it would be a good fit with the new UNICEF county-wide convergent approach by providing a cost-effective WASH input in areas where GFS do not reach. Household water treatment programming can also promote the use of locally-manufactured ceramic filters, which increases the likelihood of replication beyond UNICEF programming areas. Efforts in this area can be combined with initiatives to improve the water storage practices in households, which would be low-cost quick-win intervention since water storage is very widespread, but practices are not fully hygienic (most storage tanks are uncovered and are hard to clean).