Water Resource Strategy: 2020 - 2050

St Helena Government

Final Draft - October 2020

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Abbreviations

CSH	Connect Saint Helena
GDP	Gross Domestic Product
NTU	Nephelometric Turbidity Unit
SEDP	Sustainable Economic Development Plan
SHG	Saint Helena Government
UKAS	United Kingdom Accreditation Service
UN	United Nations
URA	Utilities Regulatory Authority
WRMP	Water Resources Management Plan

1. Introduction

Water sector policies

This Water Resource Strategy sets out the St Helena Government's (SHG) intentions in relation to water resource planning and management.

Low rainfall as a result of dryer climes and warmer average temperatures have an important impact on St Helena's raw water resources and thus, most critically, the ability to supply clean drinking water to residents and water supply for agriculture and businesses. This strategy addresses the need to reduce the risk of water shortages, and the associated impact on livelihoods, the economy, and the environment.

Water restrictions were imposed in June 2019, November 2016, and March 2013, each of which remained in place for many months. The immediate supply-side response was to transport water between various catchment and distribution areas. Longer-term responses have included investments in reservoirs and borehole exploration. Each time the restrictions occurred there was a setback in both the agriculture and construction sectors, amongst others. An internal study undertaken by SHG estimated that the total cost of drought in 2016 and the prolonged drought in 2017 was £1.5m-£2.2m, which is 4%-6.5% of St Helena's Gross Domestic Product (GDP).

Links between a Water Resource Strategy and International Goals

Utilities provision, in particular the access to water, is recognised by the United Nations as a human right, reflecting the fundamental basic need for water in every person's life. The right to water entitles everyone to have access to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use.

- "Sufficient": The water supply for each person must be sufficient and continuous for personal and domestic uses. These uses ordinarily include drinking, personal sanitation, washing of clothes, food preparation, personal and household hygiene.
- "Safe": The water required for each personal or domestic use must be safe, therefore free from micro-organisms, chemical substances and radiological hazards that constitute a threat to a person's health. Measures of drinking-water safety are usually defined by national and/or local standards for drinking-water quality.
- "Acceptable": Water should be of an acceptable colour, odour and taste for each personal or domestic use. All water facilities and services must be culturally appropriate and sensitive to gender, lifecycle and privacy requirements.
- "Physically accessible": Everyone has the right to a water and sanitation service that is physically accessible within, or in the immediate vicinity of the household, educational institution, workplace or health institution.

- "Affordable": Water, and water facilities and services, must be affordable for all.(UN Water, Human Rights to Water and Sanitation, 2020[1])

In addition to addressing the impact on livelihoods, as outlined by the United Nations, a water resource strategy for St Helena must take account the impacts on the economy and the environment.

Government's role in protecting such an important resource is to facilitate or incentivise water resource planning, management and investment, to ensure sufficient quantity and quality of water is available, and to ensure that basic water needs are physically accessible and affordable by all.

Links between a Water Resource Strategy and SHG's Policies and other Strategic Plans

SHG's 10 Year Plan: 2017-2027 is the highest level policy document that guides all development initiatives towards a Vision 2030. The overall aim of the 10-Year Plan may be summarised as:

"To make St Helena a wonderful place to live, work, raise children, visit and to do business"

The purpose of this Water Resource Strategy is to contribute to the achievement of this vision, by ensuring that there is sufficient quantity, quality and affordability of water to enable people to live, work, raise children, visit and do business on St Helena at standards described in the respective supporting policy documents.

The national goals of the 10-Year Plan include becoming 'Altogether Greener' which 'not only focuses on the preservation of our land, wildlife, marine and built heritage, but also how we can advance in terms of renewable power and utilising technology to deliver improved green social economic outcomes'. The 2018 Sustainable Economic Development Plan (SEDP) elaborates on this with goals to 'sustain and improve our natural capital' and 'improve infrastructure'. These policy goals provide direction for the Water Resource Strategy.

St Helena's 2019 Climate Change Policy outlines objectives to 'ensure energy and water use per capita is maintained at baseline levels or better' and to 'Identify and prioritise current and future risks to St Helena from weather related hazards, through consultation and regular environmental monitoring'. The Renewable Energy Strategy ensures that there is an increase in renewable energy penetration from existing 24.28% levels.

The 2019 Climate Change Policy states that 'the St Helena approach is to raise general awareness and gain commitment to monitor, manage and adapt to the challenges of Climate Change for the benefit of the people of St Helena. This will be achieved by:

[1] https://www.unwater.org/water-facts/human-rights/

- Embedding sustainability in the exploitation or use of our ecosystems and natural resources, as a driver for economic development

- Establishing coordination and leadership for effective decision making and action at all levels to ensure the Climate Change Policy is mainstreamed throughout the Island

- Ensuring we have the information and knowledge needed to effectively participate in mitigating and adapting to Climate Change

- Ensuring we work collaboratively with the international and local community, to share the responsibility of delivering the Climate Change solution, for present and future generations

Other relevant Policies and Plans include the Land Development Control Plan and National Agriculture Policy.

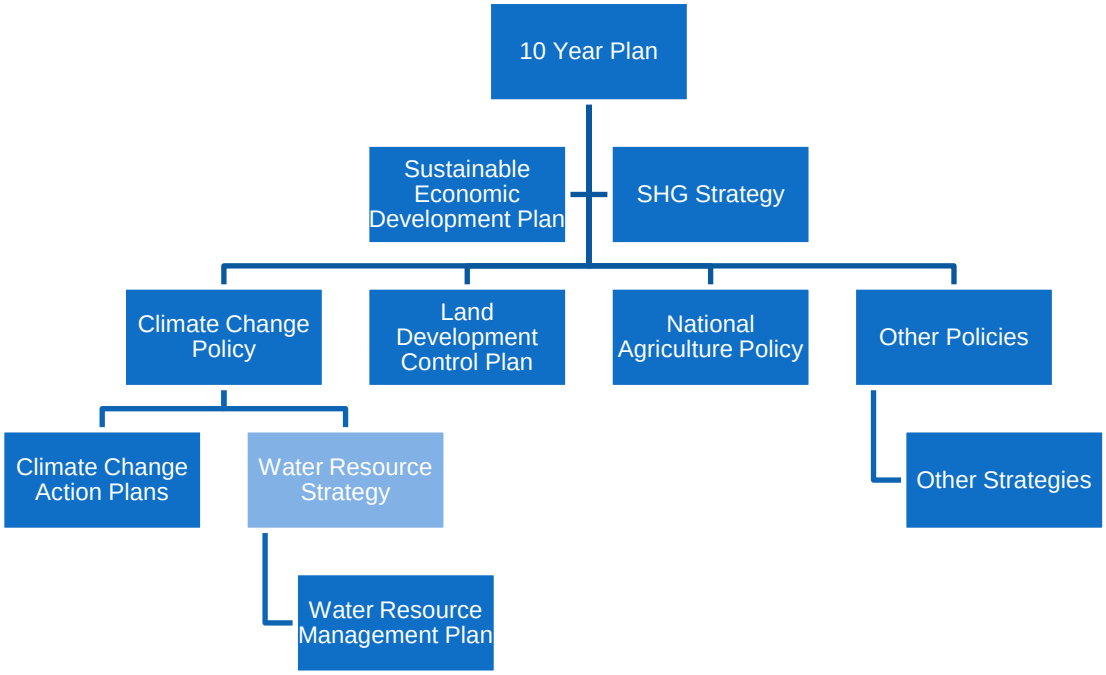
The Land Development Control Plan sets the parameters to which development can occur in which areas and under what conditions.

National Agriculture Policy sets out the policies in relation to irrigation for agriculture. The key activities of the National Agriculture Policy include the need to:

- improve irrigation water conservation and management in order to mitigate risks related to climate variability
- to invest in improved rain-water collection and supporting storage systems in key production locations to increase capacity for un-treated irrigation supplies in these areas,
- To integrate agriculture and environmental management policy in practice, through encouraging production methods that mitigate and adapt to the risks of climate variability and promote soil and water conservation.

Figure 1 summarises the linkages between the Water Resource Strategy and SHG's other policy documents and strategic plans.

Figure 1: Hierarchy of Plans and Strategies relative to SHG's 10-Year Plan



2. Strategic Aims and Objectives

Aims

The overall aims of this Water Resource Strategy are as follows:

i. Ensure that sufficient quality and quantity of water is available to **support healthy living**

ii. Ensure that sufficient quality and quantity of water is available to **sustain economic activity**

iii. Ensure that sufficient quality and quantity of water is available to **sustain food security**

iv. Ensure that sufficient quality and quantity of water is available to **sustain environmental and ecosystem functions**

Principles

The Water Resource Strategy has been developed to describe the means by which St Helena will achieve the following principles:

1. Ensure adequate access to safe drinking water;
2. Ensure availability of water of required qualities to sustain and develop agricultural production;
3. Provide continuity of water supplies required for economic activity (e.g. food processing, construction, tourism, etc.)
4. Ensure that water resources and associated infrastructure assets are managed efficiently to minimise the cost of water to all consumers
5. Improve behaviours associated with the efficient use of water
6. Encourage the sound management and protection of freshwater resources
7. Protect of the island's environment and ecosystems:

Strategic Objectives

The aims and principles can be addressed via four clear strategic objectives:

1. Water security
2. Drinking water quality
3. Water affordability
4. Water sustainability

Each of these strategic objectives is addressed in the following four sections of this Water Resource Strategy.

3. Strategic Objective 1: Water Security

Strategic considerations

The first priority is to achieve a detailed understanding of how water resources may be secured in the immediate term to ensure adequate supplies year round to meet current demand and to reduce the risk and impacts of drought.

The Peaks Implementation Plan is currently being developed by SHG, Connect, and National Trust etc. It aims to follow on from the Darwin Plus funded research project and implement many of its recommendations for water security and climate change resilience, as part of a wider habitat restoration programme which includes conservation of invertebrates. Further work will be required to ensure that water security is future proofed, and this will be developed in the Water Resource Management Plan.

Considerations for achieving water security include:

a. increasing access to safe water for domestic use
b. increasing availability of water to support and develop agricultural production
c. Providing continuity of water supplies required for economic activity (e.g. food processing, construction, tourism, etc.)
d. improving consumers' behaviours associated with the efficient use of water

These points are elaborated below:

a. Increase access to water for domestic use

With three droughts in the last seven years in St Helena (at the time of writing) and climate change expected to increase the unpredictability and dryness of weather patterns, it is crucial to take measures to ensure adequacy of clean water and to ensure regular, reliable supply.

b. Increase availability of water to sustain and develop agricultural production

Provision of water for agricultural use is the next top priority after provision of water for domestic use. Food security is of significant value in St Helena, and the utilities company should support sustainable agriculture where possible.

c. Provide continuity of water supplies required for economic activity (e.g. food processing, construction, tourism, etc.)

It is crucial to increase the provision of water to ensure that the supply-demand balance is configured in such a way as to avoid water restrictions to business. Whilst water restrictions provide one way of managing demand when supplies are low, they

have an economic cost. Should water restrictions become a commonplace occurrence, this is signal to the entrepreneurs that there are longer term supply issues.

d. Improve behaviours associated with the efficient use of water

One of the cheapest ways to ensure a sustainable supply-demand balance is to ensure that residents and businesses are being economical with their water use throughout the year. Whilst the drought in 2016/17 prompted residents and businesses to change their behaviours concerning water use, water use increased significantly during the two years thereafter; water consumption in 2018/19 had risen by 8% on the previous year. St Helena needs to make considerable progress on the application of best practices on water efficiency and can learn from elsewhere. All organisations should be encouraged to retrofit water saving appliances, including water taps and showers, appropriate white goods, and toilets. It is the role of the utility company to incentivise and implement this as a way of managing demand.

Proposals will be considered to promote water efficiency in both SHG buildings through use of a Key Performance Indicator (KPI) and within the wider community through incentives or pilots supplementary to the existing lower tax rate and existing building regulation requirements.

Challenges in achieving water security include:

- Rainfall, weather and climate change;
- Population growth and consumption habits;
- Business demand for water.

Water Security Objectives

The table represents targets to ensure water availability that customers are connected promptly and the number of disruptions to supply are minimised.

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
The frequency of drought incidents should be minimised	Water resource management should be planned such that Stage 4 Severe Water Shortage and Stage 5 Critical Water Shortage should never be reached. *(ref. Annex C of this*	Implementation of 30 year WRMP The WRMP should be reviewed at least every five years, or earlier if triggered by such a water shortage situation. Such an event should result in actions that avoid Stage 3 within	Weekly review by Management Team, Quarterly review by Board of Directors	Water Supply Statistics Reservoir Levels

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
	Water Resource Strategy)	the following ten year period (unless an exceptional climatological or similar unforeseeable event occurs).		
If drought occurs there should be minimal impact to business	The occurrence of Stage 3, whereby a formal 'Notice Limiting the Use of Water' is issued, should not be more than once in ten years. *(ref. Annex C of this Water Resource Strategy)* Where affordable, these targets should be exceeded to reduce the frequencies and severity of drought, subject to value for money exercises.			
The Water Network should be efficient	Reduction in water leakage from the Water Network	Water leakage reduction programmes	Weekly review by Management Team, Quarterly review by Board of Directors	% water losses

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
There should be increased take up of water efficiency and water storage measures amongst homes and businesses	Estimated Treated and Untreated water use reductions as a result of CSH funded efficiency initiatives.	Water efficiency incentive programmes	Weekly review by Management Team, Quarterly review by Board of Directors	Uptake by Number of persons/ businesses Data on water use reductions as a result of CSH funded efficiency initiatives.
There should be continuity of water supply	Overall Reliability of Water Network	Implementation of 30 year WRMP supplemented with a proactive maintenance program and a regular review of priorities and targeted interventions based on performance data	Weekly review by Management Team, Quarterly review by Board of Directors	Collation of data from callout contractor and staff callouts. (Less than 1,000 per annum)
Access to water supply shall be assured for all	Time taken to perform water connection	Adherence to agreed procedures, adequate levels of stock available	Weekly review by Management Team, quarterly review by Board of Directors	Number of CSH 'process days' in the overall connection % of connection requests performed within 5 days
The customer experience shall be improved	Total customer complaints handled within code of practice parameters	Adherence to agreed procedures	Weekly review by Management Team, quarterly review by Board of Directors	Received complaints and resolution analysis

4. Strategic Objective 2: Drinking Water Quality

Strategic considerations

Drinking water is expected to meet safe drinking standards. It is expected not to be discoloured, with a neutral taste and odourless smell.

To achieve the drinking water quality expectations it is envisaged that there will be a proactive maintenance and improvement programme and a regular review of priorities and targeted interventions. Additionally, there will be a mechanism for receiving and logging consumer complaints and, where appropriate, responding to complaints within 24 hours of reports being received. Complaints and response actions will be suitably recorded to enable performance assessment of water quality measures.

Drinking Water Quality Objectives

Drinking water quality expectations are summarised in the following table. The table represents targets to ensure that water quality is appropriate to meet consumers' needs, is safe to consume (as per WHO guidelines), and has an acceptable taste and odour (as measured through complaint monitoring).

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
Drinking water quality expectations with regards to health (compliance with WHO guidelines), appearance, taste and odour, shall be achieved	Appearance of Treated Water in CSH Network Redhill (NTU)	Implementation of 20 year water resources plan supplemented with a proactive maintenance program and a regular review of priorities and targeted interventions informed by consumer feedback and CSH responses CSH to respond, wherever possible, to consumer complaints within 24 hours of reports being received. All	WM002 E.coli & Coliforms Reported 'Not Detected'. CSH management review weekly, quarterly review by CSH Board of Directors	Appearance - Samples taken and analysed at CSH water treatment works. (Should be NTU 4-5 or better) Microbiological Integrity - Samples Collected by CSH and analysed by CSH laboratory to meet appropriate UKAS standards (Should be greater than 95.5%)
	Appearance of Treated Water in CSH Network Hutts Gate (NTU)			
	Appearance of Treated Water in CSH Network Levelwood (NTU)			
	Appearance of Treated Water in CSH Network Jamestown (NTU)			
	Microbiological Integrity of Treated Water in CSH Network			

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
	Microbiological Integrity of Treated Water at Consumer Meter	consumer complaints to be logged and form a structured approach to addressing water quality issues.		Microbiological Integrity of Treated Water at Consumer Meter. (Should be greater than 95.5%) Samples Collected by Environmental Health and analysed by suitable laboratory to meet UKAS standards (Should be greater than 95.5%)
	Total number of customer complaints about taste and odour	Conservative use of chlorine which is the source of taste and odour complaints.	Weekly review by Management Team, quarterly review by Board of Directors	Received complaints and resolution analysis (Should reduce year on year)

5. Strategic Objective 3: Water Affordability

Strategic considerations

It is important for Governments to regulate monopolies to ensure that there is a fair and affordable pricing structure in place. Where there are substantial cases of affordability issues, SHG can intervene to provide support. For example, providing social security benefits for low income persons that includes a component to cover water costs, or providing sector wide subsidy to incentivise agricultural production. Subsidy could be targeted to vulnerable groups or sectors.

SHG has been providing an untargeted subsidy to its utility company which has been used to cover the costs of water because the unit price of water does not cover the unit cost of supply. When divestment occurred in 2013 and the utility company was created, the intention was to reduce the untargeted subsidy to zero. This intention is still relevant for the purposes of the Water Resource Strategy. However, reducing the untargeted SHG subsidy to zero may require increases in the price of water. An expectation of this Water Resource Strategy is that the Water Resource Management Plan will contain suitable measures by which the subsidy can be reduced to zero in the minimum reasonable time.

The URA is obligated to ensure that consumers are protected from unreasonable prices and also must ensure that the prices charged do not create unreasonable hardships for households or unreasonable hindrance to commercial and economic development in St Helena (ss. 4(1)(a)&(b) of the Utility Services Ordinance). The URA sets the maximum tariffs that may be charged having regard to these obligations.

Water Affordability Objectives

The affordability expectations are summarised in the following table

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
Water bills should be affordable	Customers are protected from unreasonably high prices, as regulated by the URA	Annual Tariff Reviews subject to endorsement by the URA who undertake a period of public consultation.	Annual statement provided to Executive Council.	Published Tariffs Tariff proposal papers
CSH should reduce reliance on SHG	It should be planned so that untargeted subsidy from SHG reduces year on year.	Reduction in SHG untargeted subsidy to CSH each year.	Annual Budget provided to SHG Finance Department	Connect Budget Subsidy proposal papers
	There should not be cross subsidy	Profit from electricity not used to	Annual Budget provided to	Connect Budget

	from electricity revenues to cover water costs.	subsidise water operations.	SHG Finance Department	Subsidy proposal papers

6. Strategic Objective 4: Water Sustainability

Strategic considerations

Raw water on St Helena, groundwater and surface water, also feeds flora and fauna. In the 2016/17 drought, areas such as Deadwood Plain became particularly barren and grass did not grow fast enough to feed livestock. When this occurs, food from elsewhere needs to be imported.

St Helena has more endemic species than any other part of the United Kingdom and its territories. It is paramount to ensure that the environment is not harmed without mitigation. Sustainable water resource management should ensure that freshwater sources are not exploited to the extent that they 'dry up', causing both a risk to domestic/commercial supplies as well as to the many plants and animals which rely on it. Desalination, powered by renewable energy, could be a potential alternative to using freshwater sources, for example.

Water Sustainability Objectives

The following table summarises the performance expectations with regard to sustainability.

Target	Performance Measure	How do we get there?	Method of Monitoring	Collection & Analysis Process
Environment and Ecosystems should be preserved *(Ref. Environmental Protection Ordinance)*	Actions taken must not cause extinction (and should promote the recovery) of threatened species;	The actions taken to manage water resource supply or demand must not disturb, damage or destroy the habitat of any protected plant and must not disturb any protected animal, during the period of breeding, incubation, estivation or migration.	Weekly review by Management Team, quarterly review by Board of Directors	Environmental Assessments related to infrastructure developments ANRD environmental statistics

7. Summary of Targets

Objective	Target	Performance Measure
Water Security	The frequency of drought incidents should be minimised	Water resource management should be planned such that Stage 4 Severe Water Shortage and Stage 5 Critical Water Shortage should never be reached. *(ref. Annex C of this Water Resource Strategy)*
	If drought occurs there should be minimal impact to business	The occurrence of Stage 3, whereby a formal 'Notice Limiting the Use of Water' is issued, should not be more than once in ten years. *(ref. Annex C of this Water Resource Strategy)* Where affordable, these targets should be exceeded to reduce the frequencies and severity of drought, subject to value for money exercises.
	The Water Network should be efficient	Reduction in water leakage from the Water Network
	There should be increased take up of water efficiency and water storage measures amongst homes and businesses	Estimated Treated and Untreated water use reductions as a result of CSH funded efficiency initiatives.
	There should be continuity of water supply	Overall Reliability of Water Network
	Access to water supply shall be assured	Time taken to perform water connection
	The customer experience shall be improved	Total customer complaints handled within code of practice parameters
Drinking Water Quality	Drinking water quality expectations with regards to health (compliance with WHO guidelines), appearance, taste and odour, shall be achieved	Appearance of Treated Water in CSH Network Redhill (NTU)
		Appearance of Treated Water in CSH Network Hutts Gate (NTU)
		Appearance of Treated Water in CSH Network Levelwood (NTU)
		Appearance of Treated Water in CSH Network Jamestown (NTU)
		Microbiological Integrity of Treated Water in CSH Network

		Microbiological Integrity of Treated Water at Consumer Meter
		Total number of customer complaints about taste and odour
Water Affordability	Water bills should be affordable	Customers are protected from unreasonably high prices, as regulated by the URA
	CSH should reduce reliance on SHG	It should be planned so that untargeted subsidy from SHG reduces year on year.
		There should not be cross subsidy from electricity revenues to cover water costs.
Water Sustainability	Environment and Ecosystems should be preserved	Actions taken must not cause extinction (and should promote the recovery) of threatened species;

A number of the water quality targets were sourced from the Public Utilities Development Plan. The targets and performance measures therefore may be refined from time to time during the lifetime of this strategy as per an update of the Public Utilities Development Plan targets and considering Service Level Agreements as per SHG's Subsidy Policy.

The URA have obligations regarding such things as Water Network Efficiency. Where the URA have obligations which are consistent with the Water Strategy targets, the Water Strategy targets should be taken into account by the URA in their reporting.

8. Key Players in the Water Sector

The hierarchy for managing each sector of the economy comprises policy, strategy and management/implementation plans. To avoid conflicts of interest, there must be a separation of roles between the parties responsible for setting standards of supply and those responsible for achieving the standards. Politicians usually specify policy intentions on behalf of the citizens and business community. Strategy provides the detail of policy statements and is produced by the respective government departments. In the case of utilities, sector management (implementation) plans are produced by utility companies to state how they will achieve the strategic objectives and policy goals. The plans may be developed in-house or with assistance from external specialists.

In St Helena, policy and strategic documents are often combined and these are the responsibility of SHG. SHG sets the standards to be achieved on behalf of consumers. These are described in the strategy documents. The entity responsible for achieving water supply standards is the government-owned utility company, Connect Saint Helena (CSH). To regulate the development and provision of water supply services there is an additional role of a utilities regulator. Independence of this role is ensured via the membership of the Utilities Regulatory Authority, which may not include and member of the Legislative Council or director or employee of the utility company.

The primary responsibilities of each of the key players in the water sector are outlined below. A fourth key player comprises consumers (domestic, commercial and government). Their responsibilities are also outlined in this section.

St Helena Government

With respect to water resources management, SHG will be responsible for:

1. Setting the framework and objectives for water resource management through development of the Water Resource Strategy, legislation and regulations, including but not limited to:
    a. indicating population projections for the duration of the strategy and water supply expectations
    b. setting water quality standards
    c. describing price and subsidy expectations
    d. setting environmental standards and other sustainability expectations
2. Reviewing and recommending for endorsement the Water Resources Management Plan and its recommendations by ensuring it complies with the guidance set out in the Water Resource Strategy. This includes oversight of the preparation and completion of the Water Resources Management Plan. It also includes oversight of the terms of reference for consultancy services and the

resulting reports to ensure relevance and consistency with the Water Resource Strategy objectives.

3. To achieve these objectives, St Helena Government (SHG), through the Environment and Natural Resources Committee, will set the agenda for Water Resource Management Planning on St Helena.

The regulator

The responsibilities of the Utilities Regulatory Authority are stipulated in the Authority's establishment legislation. The legislation states: "The objective of the Authority is to regulate the development and provision of public utility services in a manner which-

a) ensures that users of such services are protected from both unreasonable prices and unreasonably low levels of service

b) ensures that the prices charged for services do not create unreasonable hardships for households or unreasonable hindrance to commercial and economic development in St Helena

c) motivates Utilities Providers to improve the quality of the service they provide

d) ensures stability and predictability on the public utilities industry in the medium and long term

e) Supports a progressive reduction in levels of subsidy from public funds; and has regard to any other regulatory objectives prescribed."

The regulator is responsible for ensuring that utility company provides suitable levels of service, which includes technical standards and promptness of service.

The utility company

St Helena's utility company, Connect Saint Helena Ltd (CSH) will be responsible for drafting and delivering the Water Resource Management Plan which, as outlined in this document, will determine supply-demand deficit scenarios, identify an unconstrained list of supply and demand reduction options and undertake a cost effectiveness assessment to recommend preferred investment options. It is noted that the solutions are likely to come from a combination of options such as demand reduction measures, storage, groundwater/borehole extraction, desalination and water re-use measures.

In support of CSH developing and implementing the Water Resources Management Plan, SHG will provide (or mobilise financial resources) for environmental science and economic technical assistance with regard to the development of socio-economic scenarios; setting the context of how climate change and economic growth could affect the landscape in the future. SHG will also provide, or mobilise financial resources, for appropriate technical studies including, but not limited to: hydrogeology, extraction and storage technologies, water treatment solutions, the monitoring of precipitation and aquifer discharges, and cost effective management of water utility assets.

Consumers

In the interests of sustainability, each consumer has a responsibility to use water responsibility. While various demand management measures can be implemented to minimise unnecessary water use, each consumer must take it upon themselves to use water sensibly. The capital costs of water supply infrastructure are high and must be shared among all consumers. Each addition to the network (e.g. boreholes, reservoirs, desalination plants, water treatment works, pipe network, etc.) results in a step increase in the related part of the water tariffs. Subsidies from government do not solve the problem; they merely redirect monies from other budgets that could be used for important projects to support social development and economic growth of St Helena. Minimisation of water costs is strongly related to responsible use by each and every consumer: domestic, agricultural, industrial and commercial. People involved in tourism have an additional responsibility to encourage visitors to use water wisely.

9. Water Resource Management Plan

Key Features of the Water Resources Management Plan (WRMP)

Effective water resource planning and management is essential to ensure that the long-term balance between supply and demand is maintained. Water Resource Management Planning is a process used to understand[2]:

- Future supply and demand balance challenges
- Environmental challenges – especially water scarcity and environmental quality. Climate change and population growth are expected to increase these pressures in the future
- Maintaining and improving resilience of systems and services
- Customer bills and affordability

These items and the guidance provided by OFWAT[2] are relevant in developing a WRMP that responds appropriately to the four strategic objectives contained in the Water Resource Strategy. However, a WRMP for St Helena must be directly relevant and proportional to the circumstances pertaining in St Helena.

A number of Water Resource Management Plans have been developed for St Helena in the past. In 1990, Mathieson et alia developed the St Helena Water Plan 1990 – 2010 and in 2011, consultants Fairhurst, on behalf of SHG, developed a 20-Year Water Resources Plan. Now that more is known about tourism growth in the early years of air service and more data is available on water resources (including the impact of droughts in 2013, 2016-17 and 2019-20), there is a need to update the WRMP.

In order to plan and manage the water supply-demand balance appropriately, CSH will lead the development of a Water Resource Management Plan for 2020-2050, which may include consultancy support, that will:

1. Outline existing water resources in St Helena by catchment
2. Outline existing water demand in St Helena by catchment (from residents, business, government and leakage)
3. Identify existing capacity and limitations for transfers between catchments and storage.
4. Assemble climate change and population scenarios.
5. Assemble and present demand forecasts for each relevant scenario.

[2] OFWAT, Water Resource Planning https://www.ofwat.gov.uk/regulated-companies/resilience-2/water-resource-planning/

6. Assemble and present supply forecasts for each relevant scenario.

7. Estimate target headroom (the amount by which supply exceeds demand during the planning period).

8. Report any supply-demand balance issues under each relevant scenario for each catchment.

9. Identify the unconstrained list of options (a long list of supply and demand reduction options)[3]

10. Identify the feasible list of options (after technological feasibility is taken into account)

11. Quantify the financial cost of the feasible list of options, alongside environmental and social costs and benefits. Calculate the average incremental cost of each option.

12. Undertake a modelling exercise. Identify the most cost effective option bundles to balance supply and demand under each scenario. Identify what year each preferred option would need to come online to fulfil demand needs.

13. Identify where uncertainties exist and run sensitivity analysis to understand which uncertainty can cause the biggest impact on the cost of the programme.

14. Considering the probability of each scenario, make a recommendation of a preferred option bundle.

15. Consider tariffs and affordability of implementation.

Water Resource Management Planning is an in-depth activity which should use existing studies and data where possible and relevant. The England and Wales' 'Final Water Resources Planning Guideline' document (Environment Agency and Natural Resources Wales, 2016), or similar relevant planning framework, may be used to guide the process and detail of the water resource planning and management work.

Responsible parties

As described in Section 7, St Helena's water utilities company, CSH, will be responsible for preparing a WRMP that responds to the objectives described in this Water Resources Strategy. Upon approval of the WRMP by SHG, CSH will be responsible for the timely and cost efficient implementation of the plan using relevant best practices.

[3] Guidance on how to do develop options plus a list of generic options can be found within the report 'A framework for the production of Drainage and Wastewater Management Plans' (Water UK, 2018) http://www.water.org.uk/wp-content/uploads/2018/12/Water-UK-DWMP-Framework-Report_APPENDIX-D.pdf

Whilst the process to develop the WRMP will be owned by CSH, as a result of the water engineering, project management, modelling and data resources which CSH already has in house, SHG will adopt a reviewer role. This will be done through the Water Resource Strategy Group. SHG's objectives will be to ensure that the WRMP complies with the requirements set out in this Strategy and that the final recommended actions in the WRMP meet the objectives set out in this Strategy. This mirrors the process in the UK whereby the water company undertakes the drafting of the Water Resource Management Plan and the Environment Agency and OFWAT undertake the review and sign off functions.

Tenure and updates of the Water Resource Strategy

This strategy is intended to cover the period 2020 to 2050. Reviews should be undertaken prior to the development of a Water Resource Management Plan if there are required changes to objectives or approach. The Strategy should not need to be adjusted until something significant comes about, but this can be considered light touch every 5 years.

The Water Resource Management Plan will similarly have a tenure of thirty years. It is intended to be reviewed at five-year intervals, unless some incident occurs that dictates an earlier review.

Annex A: Links to Further Information

Arctium, 2019, DPLUS051 Report. The report develops sub-catchment scale water balances to understand the relationship between the cloud forest, mist capture and the impact of invasive species in the cloud forest on St Helena's water supply. https://www.arctium.co.uk/dplus051-report/

Brown, L. (1982) 'Rainfall Hydrology and Soil Analysis Data St Helena'

Brown, N. 2008. Climate Change in the UK Overseas Territories: An overview of the science, policy and you. Peterborough, UK: Joint Nature Conservation Committee.

Fairhurst, 2011, 20 Year Water Resources Plan

Gunston, H. . and Rosier, P. (1997) A Hydrological Catchment Management Consultancy for St Helena. IH Report DFID 97/8.

IMC Worldwide Ltd. 2012. Addressing Climate Change by promoting low carbon-climate resilient development in UK Overseas Territories. East Kilbride: DFID.

IMC Worldwide Ltd. 2014. Climate Change Factsheet: Climate data and requirements for St Helena. St Helena: Environment and Natural Resources Directorate.

Mathieson, I. K. (1990) The St Helena Water Plan 1990 – 2010

Mathieson, I. K. (1988) An Estimate of Annual Stream Discharge on St Helena.

Mathieson, I. K. (1990) Irrigation Advisor to the St Helena Government End of Tour Report.

Rosier, P. (2001) Saint Helena Catchment Management Study Visit Report CEH April 2001.pdf

Sir William Halcrow and Partners (1969) 'Report on the Water Resources of St Helena'.

St Helena Government, 2013, Utility Services Ordinance. https://www.sainthelena.gov.sh/wp-content/uploads/2020/03/Utility-Services-Ordinance-2013-Uploaded27032020.pdf

St Helena Government, 2016, St Helena 2016 Population & Housing Census, St Helena Statistics Office. http://www.sainthelena.gov.sh/wp-content/uploads/2016/06/Census-2016-summaryreport.pdf .

St Helena Government, 2017, St Helena's 10 Year Plan. This is the overarching Strategy for St Helena https://www.sainthelena.gov.sh/government/public-information/

St Helena Government, 2018, St Helena's Sustainable Economic Development Plan. This is the Strategic Document outlining St Helena's goals in relation to Economic Development. https://www.sainthelena.gov.sh/government/public-information/

St Helena Government, 2018, St Helena's Climate Change Policy. This is the Strategic Document outlining St Helena's goals in relation to Climate Change https://www.sainthelena.gov.sh/government/public-information/

St Helena Government, 2020, 2030 Vision & Infrastructure Plan (SHG Capital Programme (2020-2030)). This is the Plan which informs the Economic Development Investment Programme and outlines immediate water resources needs in St Helena.

UN, Sustainable Development Goals. Goal 6 Water and Sanitation. https://www.un.org/sustainabledevelopment/water-and-sanitation/

University of Cape Town, 2018, Future Climate Projections -St Helena, http://cip.csag.uct.ac.za/webclient2/datasets/africa-merged-cmip5/#nodes/cmip5-anomalies?folder_id=33&extent=99983

UKWIR (2002) An Improved methodology for assessing headroom – Report Ref No. 02/WR/13/2

Various, 2019, DPLUS052 Mapping St Helena's Biodiversity and Natural Environment. The project produced a series of high-detail island-wide maps and datasets, showing a baseline of habitat types, soils and other associated environmental information. https://www.sainthelena.gov.sh/directorates/environment-natural-resources-planning/darwin-initiative/dplus052-mapping-st-helenas-biodiversity-and-natural-environment/

Wade, S et al. 2015. Assessing Climate Change and its likely impact on selected UK Overseas Territories: Inception report. UK: Met Office.

The World Bank Group (2016) High and Dry: Climate Change, Water, and the Economy.

WSP (2017) Deep Aquifer Exploration Drilling Feasibility Study St Helena Island.

Annex B: Situational Analysis

This section outlines some of key statistics considering St Helena's socio-economic status and its water resources, which can be used to signpost development of climate change and population scenarios required for Water Resource Management Planning.

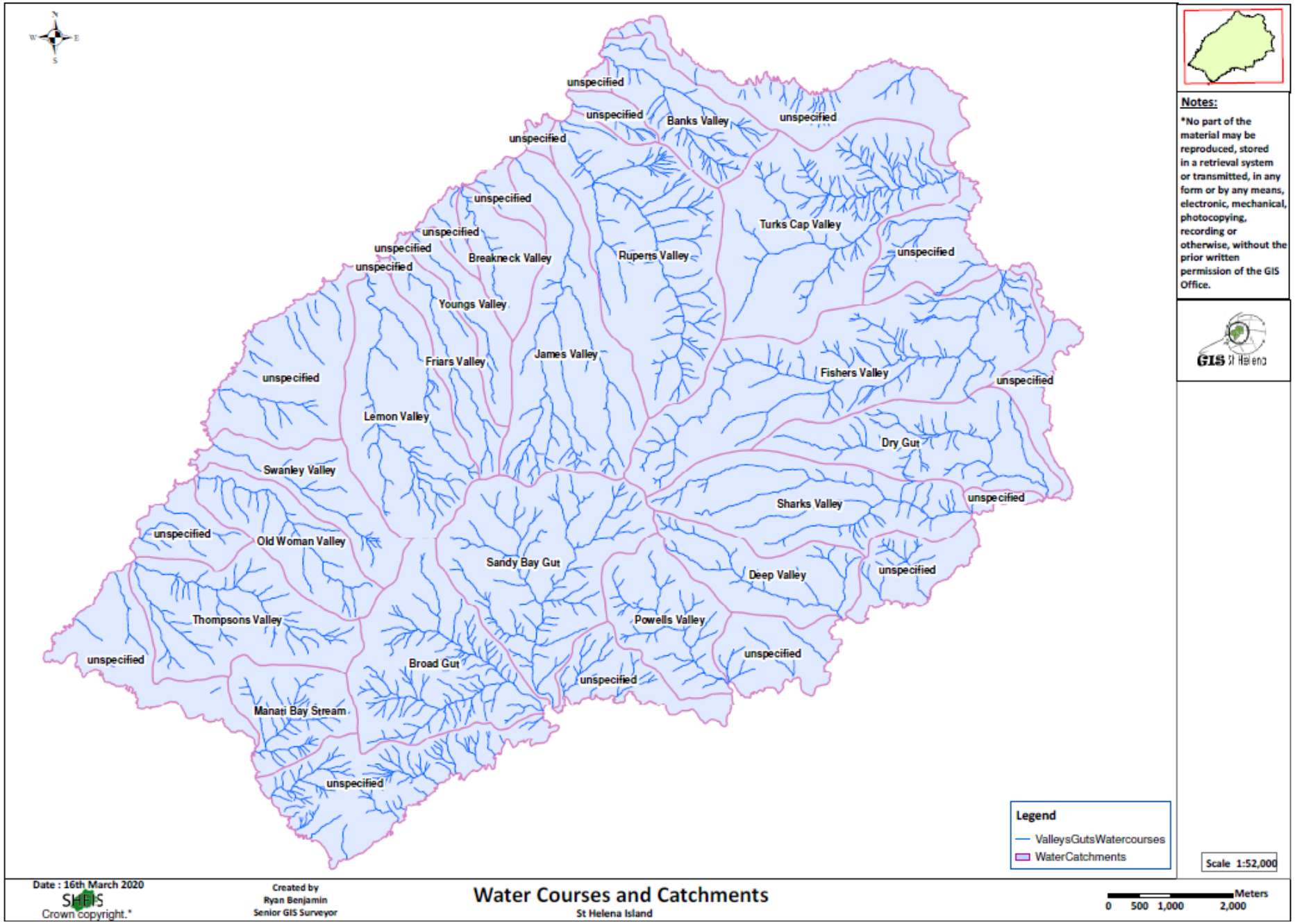
This section has been developed as a summary of key aspects of Water Resources, Climate, and Population; more information can be found in specific studies and up to date published statistics.

Water Catchments

Catchment Descriptions and Watercourses

St Helena has 36 catchments, of which 19 are inhabited; these are Lemon Valley, Friars Valley, Youngs Valley, Breakneck Valley, James Valley, Rupert's Valley, Banks Valley, Turks Cap Valley, Fishers Valley, Dry Gut, Sharks Valley, Deep Valley, Powell's Valley, Sandy Bay Gut, Broad Gut, Manati Bay Stream, Thompsons Valley, Old Woman Valley, and Swanley Valley.

Using sub-catchments (grouping catchments together) is an approach which can be used for Water Resource Management Planning.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Banks Valley
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Ryan Benjamin
Senior GIS Surveyor
Water Courses and Catchments
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More detail is available on the hydrology of St Helena in referenced texts. Ian Mathieson completed a Water Plan for St Helena, a hydrology study and evaluation of agro-ecology. His activities were summarised in an end of tour report (Mathieson, 1990). Furthermore, during October 2016, a project team comprising staff from Connect and Arctium completed a walkover to identify water features (springs, streams, boreholes) and to scout potential monitoring locations in central locations within the Island within the Grapevine Gut and Wells Gut catchments. Furthermore, drone images were processed and the orthomosaic was used to complete a vegetation survey of the study area and to create a Digital Elevation Model. The results are summarised in the DPLUS051 Project Report (Arctium, 2019).

There are transfers of water which exist between each catchment. For example the main transfers are from Jamestown to Redhill, Hutts Gate to Redhill vie Grapevine Gut and Levelwood to Hutts Gate. It is noted that water should ideally be sourced as close as possible to where it is needed.

Climate

The following is an extract from the DPLUS051 Project Report (Arctium, 2019).

St Helena enjoys a mild sub-tropical climate due to the South Atlantic Anticyclone (SAA) which controls weather and climate over the central South Atlantic. The resulting wind-stress causes the anticyclonic gyre circulation in the Ocean, the South East Trade Winds, where the Benguela Current conveys relatively cold water from high to low latitudes along Namibian and South African west coasts. The latter continues westward to form the South Equatorial Current (Feistel, Hagen and Grant, 2003). St Helena's sub-tropical latitude affords it fairly constant temperatures; the average annual temperature range at sea level is 21-28°C, this reduces by about 1.3 degrees every 100 m rise in elevation. Rainfall is often extremely localised, creating desert-like conditions of the outer part of the island where 175mm of rain falls per year, compared to the Peaks where cloud and mist accumulate bringing 290 days of overcast conditions and 1050mm of rain each year (Kew et al., 2017). Mean monthly temperatures since 1893 have rarely been below 15°C or above 22°C (iMC Worldwide, 2014).

The Agricultural and Natural Resource Directorate (ANRD) of Saint Helena Government monitor all of the outlying climate stations across the island. ANRD currently record rainfall at 20 locations across the island.

Mathieson (1990) estimated the annual rainfall on the island as 54 million cubic metres.

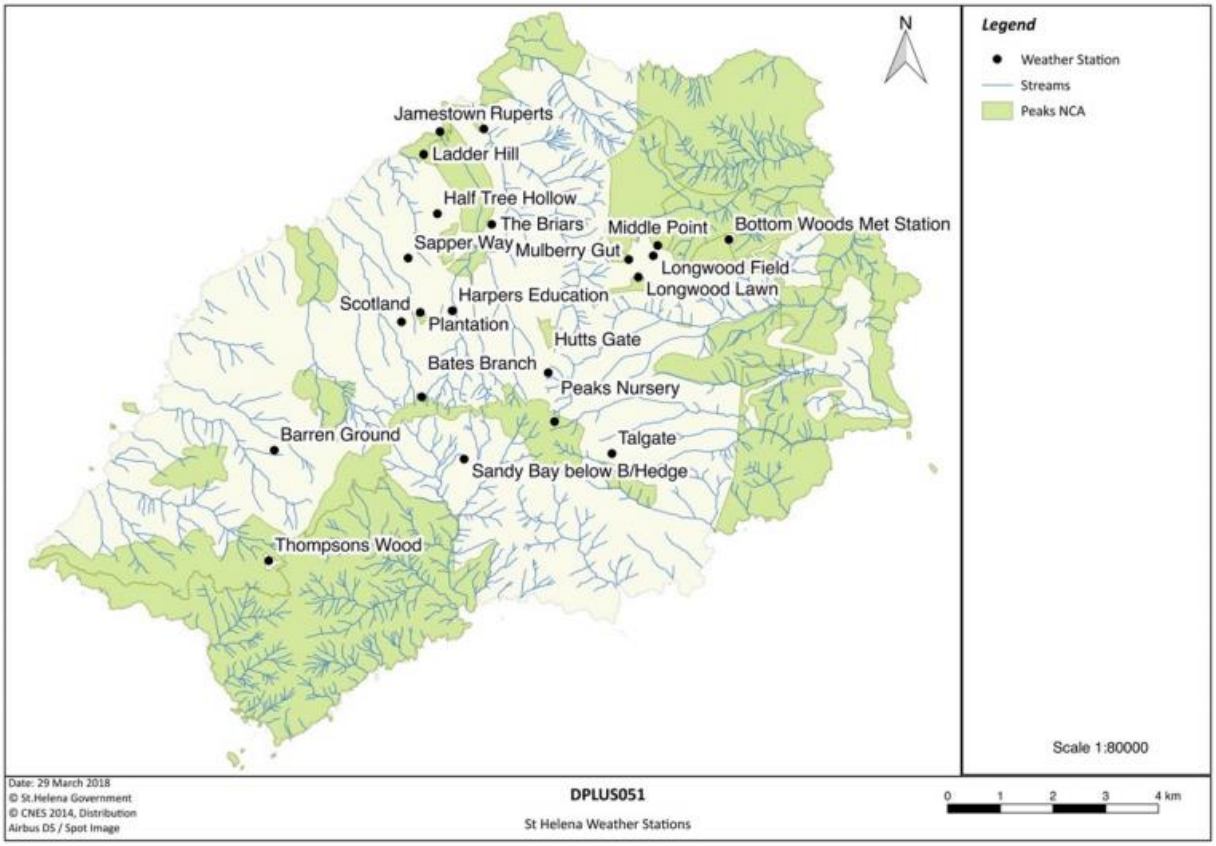


Figure 2. Weather Stations in St Helena

The DPLUS051 Project Report (Arctium, 2019) report also outlines Evaporation and Potential Evapotranspiration rates. At the Bottom Woods MET Station, rates of evaporation average 2.4 times higher than rainfall, resulting in a net rainfall deficit. However, the weather station is located in the drier north east of the island at an elevation of 436mASL. The highest rate of evaporation was 9.1mm, recorded on the 25th March 2018. Potential Evapotranspiration is defined as the amount of water used by a freely transpiring short grass crop. The average Potential Evapotranspiration for Bottom Woods was recorded as 1312mm for a 10-year record between 1978 and 1988 (Figure 7). The average Potential Evapotranspiration at Hutts Gate was recorded as 862mm for a 22-year record between 1953 and 1975 (Mathieson, 1988).

Existing Infrastructure

Currently St Helena's water needs are served by reservoirs, spring collection and borehole extraction.

Connect monitors raw water volumes from abstraction points at several spring and stream sources at Hutts Gate, Levelwood, Chubbs Springs and Red Hill. Water is treated at Levelwood, Hutts Gate, Red Hill and Jamestown. Red Hill Water Treatment Works provides around 30% of the Island's water on an annual basis whilst Hutts Gate Water Treatment Works provides around 25% of the Island's water. Jamestown treatment works provides around 20% of the Island's water.

Table 1: Annual Volume of Water Supply by Source

Source		2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	Catchment
Redhill	m^3	127,597	159,343	167,896	148,480	165,065	166,061	
Hutts Gate	m^3	103,968	110,399	120,490	122,722	128,144	136,799	
Jamestown	m^3	71,645	91,271	91,205	100,631	105,571	90,419	James Valley
Levelwood	m^3	19,599	24,919	25,982	34,356	50,340	50,340	
Untreated	m^3	63,310	45,582	68,567	43,762	70,601	73,388	
Total	m^3	386,119	431,514	474,140	449,951	519,721	517,007	
Supply % by Source								
Redhill	%	33.0%	36.9%	35.4%	33.0%	31.8%	32.1%	
Hutts Gate	%	26.9%	25.6%	25.4%	27.3%	24.7%	26.5%	
Jamestown	%	18.6%	21.2%	19.2%	22.4%	20.3%	17.5%	
Levelwood	%	5.1%	5.8%	5.5%	7.6%	9.7%	9.7%	
Untreated	%	16.4%	10.6%	14.5%	9.7%	13.6%	14.2%	

Demographics

St Helena has a total on-Island population of about 4,500, of which 63% are economically active. The population has grown slightly over the last 10 years but has fallen from the peak seen during construction of the airport. St Helenians make up the large majority of the population on St Helena. (See Figure 3.)

The monthly population statistics include both residents and visitors. As a result, the data display a seasonal pattern where the total population typically[4] peaks in December or January as visitors arrive for the holiday season, declines through the winter and early spring and then increases again as summer approaches.

[4] Visitor patterns can be impacted by other factors, such as special occasions. In 2015, the highest monthly population was reported in March, coinciding with the launch of events commemorating the bicentenary of Napoleon's arrival on St Helena.

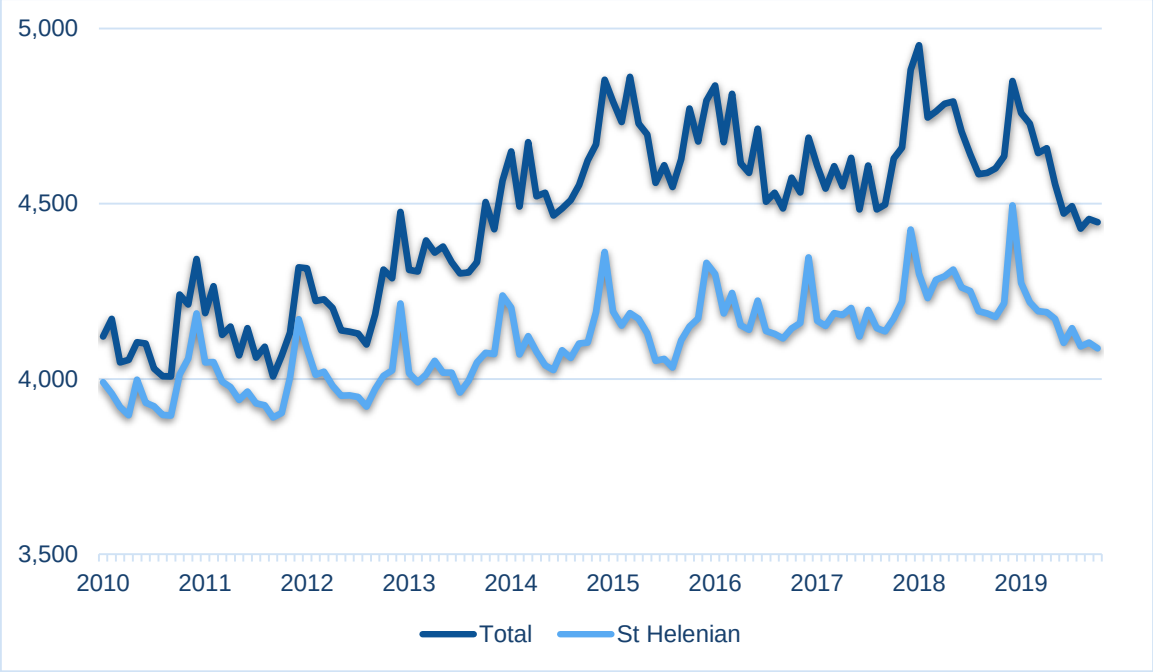


Figure 3. Population of St Helena (2010 – 2019), St Helena Statistics Office

The demand for water in each catchment is related to the number of people who live within those catchments and the economic activity within the catchments. The Census data shows the distribution of people, outlining that the areas requiring the largest water supply for residents are Half Tree Hollow in the (RH) catchment, St Pauls, in the (RH) catchment, Longwood in the (HG) catchment and Jamestown in the (CS) catchment. When considering catchment demand, scenario modelling must include projected changes due to developments envisaged across the Island. It is expected that the demand on Hutts Gate treatment plant will increase by approximately 50% within the next 5 years. Likewise the demand will also increase on the Red Hill treatment plant which is the only treatment plant supplying the western side of the island.

Administrative District	Catchment	Number of People	Number of Occupied Dwellings	Average (mean) household size
Jamestown	(CS)	629	282	2.2
Half Tree Hollow	(RH)	984	409	2.4
St Pauls	(RH)	843	363	2.3
Blue Hill	(FG)	158	73	2.2
Sandy Bay	(LW & SB)	193	82	2.4
Levelwood	(LW)	369	154	2.4
Longwood	(HG)	790	319	2.5
Alarm Forest	(HG)	383	163	2.3
Total		**4,349**	**1,845**	**2.4**

Table 1. Household Population and Dwellings by Administrative District, 2016

St. Helena's birth rate (births per 1,000 people) is lower than St Helena's death rate (deaths per 1,000 people), meaning that, without allowing for migration, St Helena's population would be falling.

Table 2. Comparison of Birth and Death Rates in 2017, St Helena Statistics Office and World Bank

	Birth Rate	Death Rate
St Helena	8.7	12.3
United Kingdom	11.4	9.2
Euro Area	9.5	10.1

Source: World Bank Crude Birth Rate and Crude Death Rate data

Annual deaths have regularly exceeded births on St Helena for nearly two decades. Figure 4 shows the difference in births and deaths each year since 1970. The shaded area represents years when there were more deaths than births. An aging population will perpetuate this trend because the number of women of child-bearing age will decrease.

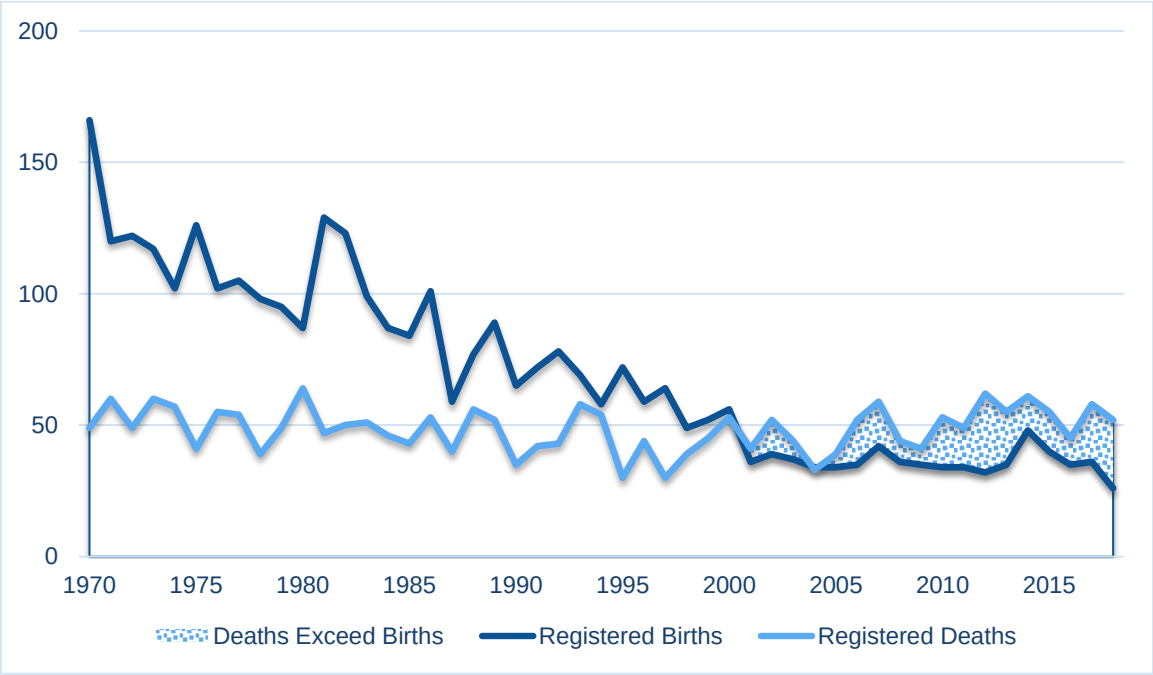


Figure 4. Difference between Births and Deaths by Year (1970 – 2018), St Helena Statistics Office

Population Projections

As noted above, demographic trends mean that the population on St Helena will continue to decrease without inward migration. The dark blue solid line in Figure 6 shows the projected resident population if there were no net migration between 2019 and 2050 and all other demographic trends remained unchanged (e.g., deaths continued to exceed births). In other words, this illustrates the population on-Island if no one were to leave or if each person who left was replaced by someone arriving. This is an optimistic scenario given recent trends.

Population Projection A

The SHG 2050 strategy looks towards long term growth of the island. In order to achieve this there will need to be ambitious positive developments in growth infrastructure, trade and industry, exports and population growth. And aspiration of a population of 8,000 in 2050 has been quoted by consultant David Marlow as both a sign and a contributor of success. How this growth could occur was not specifically modelled by David Marlow, i.e. whether it would be straight line growth to 8,000 population, logistic growth (S shaped) or exponential growth (J shaped). For the purposes of water resource management scenario planning, a logistic growth scenario would be best modelled for this population projection.

In St Helena Government's 2030 Vision & Infrastructure Plan, 2020, John Cox plots the logistic growth scenario.

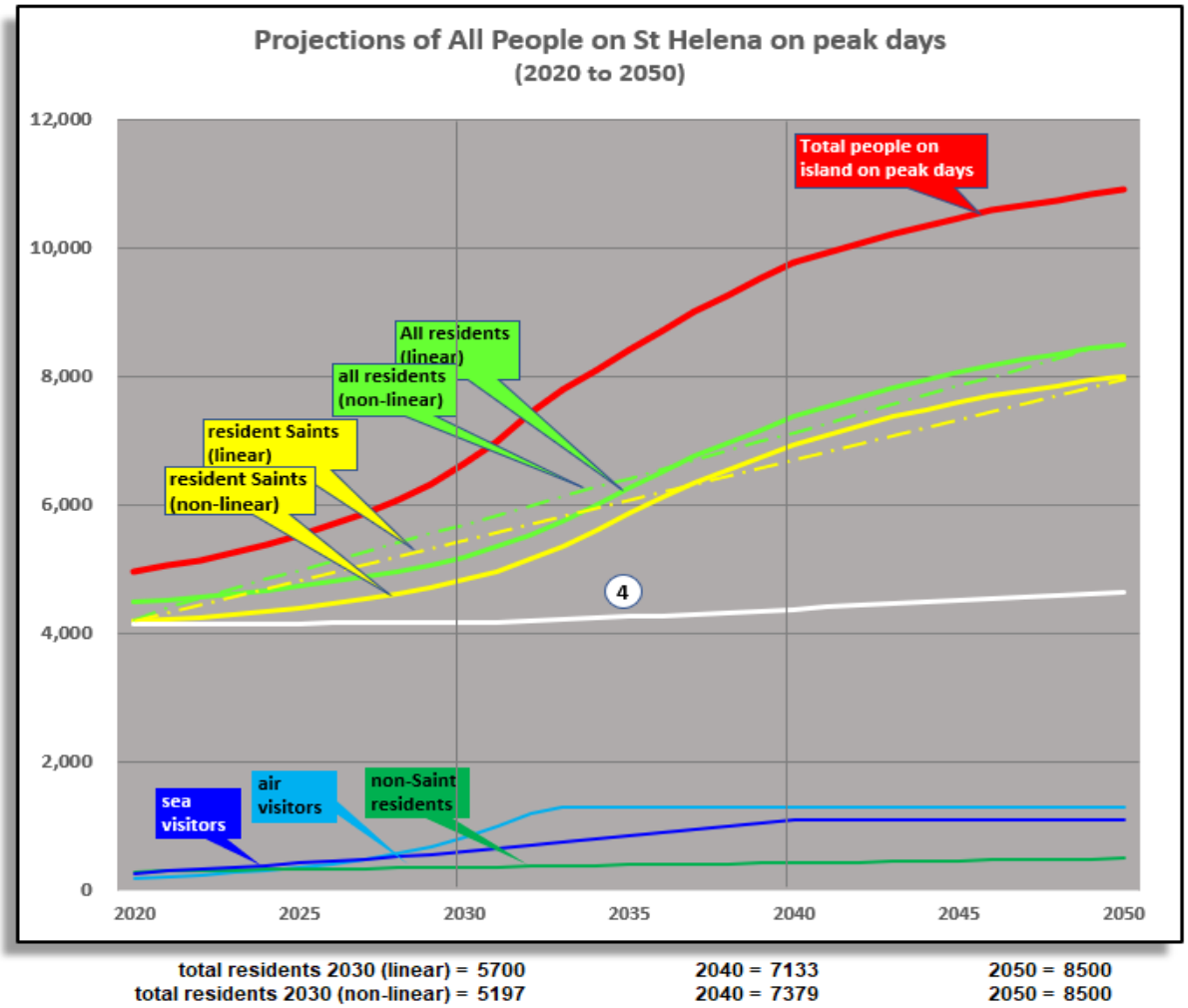


Figure 5: 2030 Vision & Infrastructure Plan's projections for all people on island up to 2050

Population Projection B

The Labour Market Strategy uses a bottom up approach to population predictions. It considers the reforms required to attract workers to emigrate and stay in St Helena. While it is difficult to determine the resident population on-Island in the absence of a full census, a provisional estimate suggests the resident population may have decreased by approximately 130 people per year since the 2016 Census. This figure includes both St Helenians and foreign workers departing the Island. If a net outward migration of this scale were to occur indefinitely into the future, there could be fewer than 1,500 residents on St Helena by 2050, as reflected in the light blue solid line in Figure 6.

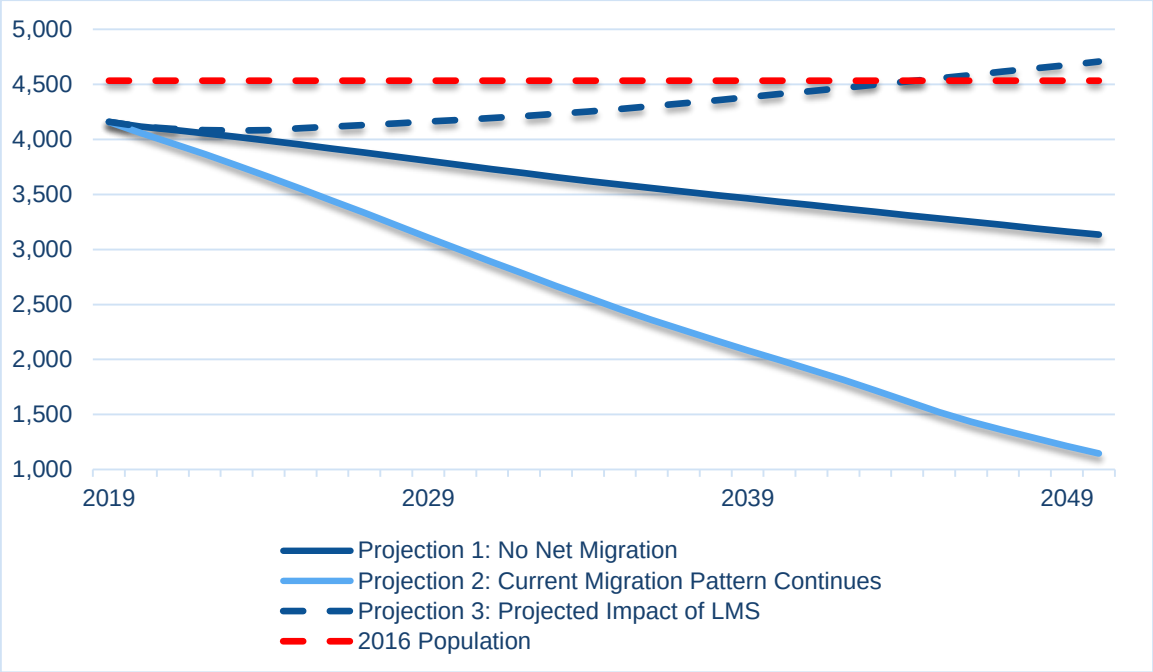


Figure 6. Population Projections 2019 – 2050, St Helena Statistics Office

It is noted that implementation of a capital programme and other economic development projects should organically slow the pace of net outward migration. However, as noted above, the population is expected to decline even if outward migration is completely offset by inward migration. Policies and programmes to retain St Helenians on-Island, attract inward migration and stimulate economic growth will be critical to correct this pattern. For the purposes of the Water Resource Management Plan Population Projection B3: Projected impact of LMS should be used.

Guidance on how to do develop options plus a list of generic options can be found within the report 'A framework for the production of Drainage and Wastewater Management Plans' (Water UK, 2018)[5]

[5] http://www.water.org.uk/wp-content/uploads/2018/12/Water-UK-DWMP-Framework-Report_APPENDIX-D.pdf

Options appraisal should be undertaken for each of the two population scenarios. Whilst the baseline scenario for the WRMP'21 can use Projection A, sensitivity testing must be undertaken to understand what the recommended options are under Projection B. Since the implementation of some of the Water Resource Management Infrastructure Options to service a higher population can be delayed until a later date, the recommendations should indicate the triggers (such as dates or reaching early population growth statistics) as to when the decisions should be made to bring online the delayed options. Such an approach is called Real Options Analysis.

St Helena Government's 2030 Vision & Infrastructure Plan summarises the demand projections in relation to the population predictions up to 2050.

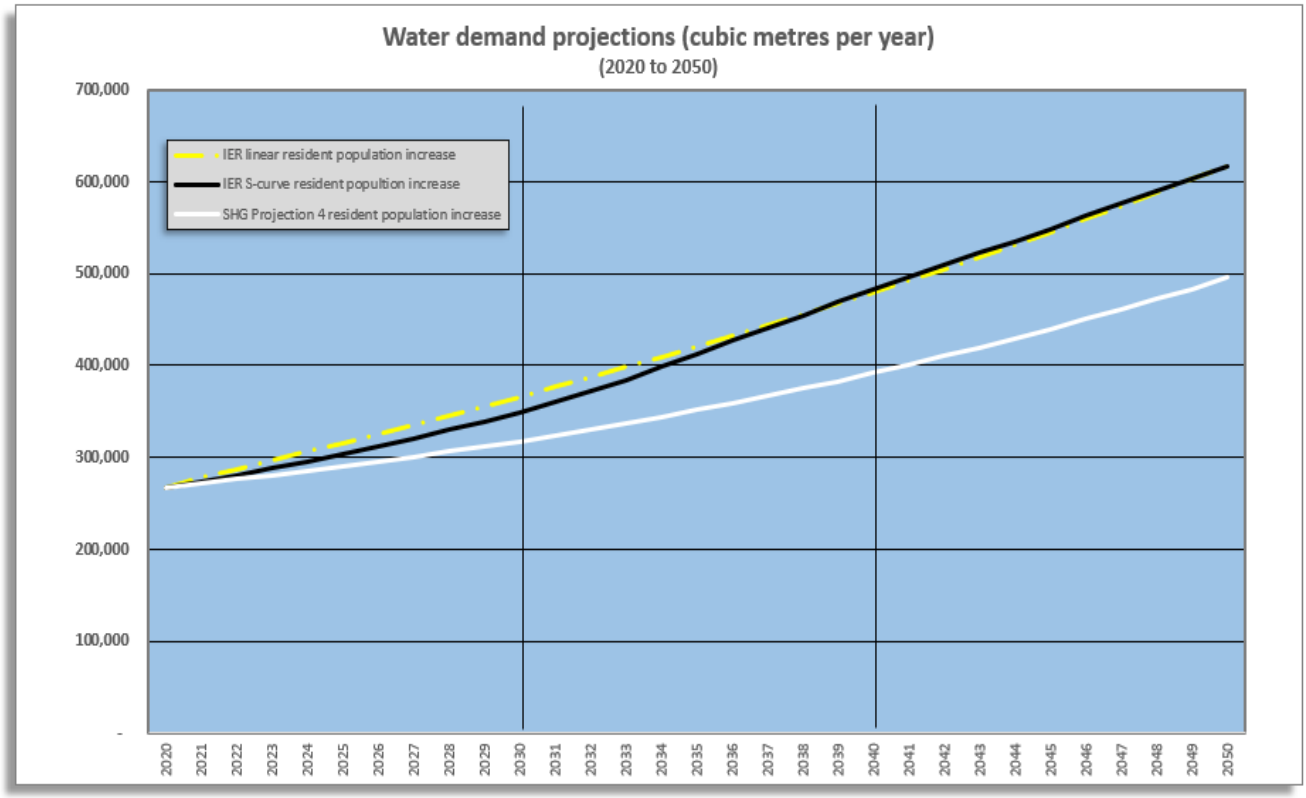


Figure 7: Projections of annualised water demand to 2050

The 2030 Vision & Infrastructure Plan Interpolated the three demand curves at 2030:

Type of population projection	Projected water consumption in 2030	Projection as % of the S-curve demand
A: IER linear increase in resident population	366,000 m^3	105%
A: IER linear increase in resident population	350,000 m^3	100%
B: SHG Labour Market Strategy Projection increase in resident population	317,000 m^3	90%

The table assumes the numbers of air and sea tourists remain the same regardless of the size of resident population. On this basis, the water demand associated with the SHG Projection B population increase is about 90% of the IER S-curve demand. An upper-level estimate using a linear population increase would suggest only an additional 5% water demand in 2030 compared to the S-curve demand.

Economic Expectations

In terms of business requirements, the following assumptions should be used in Water Resource Management Planning:

- 12% growth in visitor numbers per annum
- Increase in fish processing requirements compared to SHFC levels.
- Increase in water use for agriculture, coffee production
- Development of drinks industry; expansion of distillery business and new bottled water business sets up
- Increase in construction

Construction of the airport required a large amount of water (mostly for compaction of earthworks and for production of concrete) and this demand was met largely from a borehole of about 70 metres depth located near the airport site. This was one of several boreholes produced from the airport programme and was labelled “Borehole No.5”.

The 20-Year Water Resources Master Plan (Fairhurst, 2011) developed predictions for water demand. Table 3 shows green for those zones that are within the predicted demand levels, amber for those close to the predictions, and red for those zones above predictions.

Table 3: Treated Water demand (ADD – Average Daily Demand)

Water Supply Zone	Reservoir Capacity	ADD 2015/16	ADD 2018/19	ADD 2019/20	Predicted 2020	Predicted 2030
Redhill	64,800	430	455	381		
Hutts gate	13,900	300	375	336		
Levelwood	3,900	60	248	209		
Chubb’s Spring	None	250	187	215		
	32,900					
Totals (m3)	**115,500**	**1,040**	**1,265**	**1,141**	**1,530 – 1,580**	**1,860 – 2,030**

The average daily demand (ADD) for 2018/19 is higher than 2019/20. This is due to the drought that has caused Connect to impose island-wide restrictions on water use, hence the reduction in consumption.

Interim Investment

The Water Resource Management Plan is a long term planning process. It considers the water resource needs over a 30 year period. In the time that it takes to develop a Water Resource Management Plan, there may be infrastructure developments to meet short term needs.

The 2030 Vision & Infrastructure Plan was developed to inform the Economic Development Investment Programme (the Capital Programme funded by aid from the UK Government). This Plan provides some quick win solutions to bridge immediate needs.

The Plan notes 'The recent island-wide consumption of treated water in non-drought conditions is approximately 1,400 m^3 per day. Current demand (early 2020) with drought restrictions in place is about 1,000 m^3 per day. There is currently a deficit of 500 m^3 per day. It is possible that the demand by 2030 could be as much as 2,100 m^3 per day. In order to help meet demand, a programme could be considered that would make better use of harvested rainwater.'

It is prudent to bridge the 500 m^3 per day gap whilst the planning process is ongoing, to reduce the risk of the next drought which would otherwise be expected in 2-3 years. The Water Resource Management Plan will need to take into account any supply side improvements in infrastructure which are being implemented whilst the plan is being drafted.

Annex C: Drought Management Responses

The following information outlines the existing management responses when each trigger stage is reached. These management responses are reviewed from time to time. The latest process is outlined in Connect's Drought Management Plan (DMP).

Stage 1: Minor Water Shortage
This would constitute a collective raw water stock level of less than **60 days**, if referenced against the total daily consumption levels across Island, without taken into consideration any daily recharge or replenishment of raw water resources, or borehole recovery rates.

A Minor Water Shortage Event trigger shall include the following actions:

- Connect as utility service provider, to formally advise the Emergency Planning Manager of the St Helena Resilience Forum (SHRF) on the water shortage event trigger reached.
- The SHRF to confirm receipt of the notice and document the event as first trigger of a likely drought event.
- Connect to introduce as part of its operations the drought management tools applicable to this drought event.

Stage 2: Moderate Water Shortage
This would constitute a collective raw water stock level of less than **45 days**, if referenced against the total daily consumption levels across Island, without taken into consideration any daily recharge or replenishment of raw water resources, or borehole recovery rates.

A Moderate Water Shortage Event trigger shall include the following actions:

- Connect to formally advise the Emergency Planning Manager of the SHRF on the water shortage trigger reached for recordkeeping and monitoring.
- Connect to place notifications in the media, advising the general populace of the water situation and requesting them to reduce their water consumption.
- A briefing meeting to be scheduled with the SHRF Warning and Informing Group on the water situation, with the view to strategize and formulate an event-specific communication strategy to be implemented.
- Further notifications of the water situation across Island should be placed in the media on a fortnightly basis.
- Connect to forward weekly water monitoring data to the Emergency Planning Manager of the SHRF, thus ensuring the SHRF and SHG are fully appraised on the water shortage situation.
- Connect to continue the use of the drought management tools introduced under the first stage of the water shortage event.
- Depending on the circumstances, the introduction of formal water restrictions – aimed at water usage reduction in specific districts across Island or which would target high-end users – might be considered under this trigger event.

Stage 3: Serious Water Shortage
This would constitute a collective raw water stock level of less than **30 days**, if referenced against the total daily consumption levels across Island, without taken

into consideration any daily recharge or replenishment of raw water resources, or borehole recovery rates.

A Serious Water Shortage Event trigger shall include the following actions:

- Connect to formally advise the Emergency Planning Manager of the SHRF on this water shortage trigger reached - for his recordkeeping and monitoring, including the extent and date on which formal water restrictions are to be introduced.
- Connect to formally introduce water restrictions in the areas affected by the drought event, by placing a formal 'Notice Limiting the Use of Water' in the media.
- The above should be accompanied by all relevant information being communicated to the general populace via the media by Connect, advising all stakeholders and consumers of the water situation.
- Connect should - in collaboration with the SHRF Warning and Informing Group, place further relevant information on the water shortage in the media on a fortnightly basis to ensure the general populace remain informed about the water situation across Island.
- Connect to continue forwarding weekly water monitoring data to the Emergency Planning Manager of the SHRF, thus ensuring the SHRF and SHG are fully appraised on the water shortage situation experienced.
- Connect to continue the use of the initial drought management tools introduced at the outset of the drought event, and to further expand those tools applicable to this stage of the drought event, where needed.

Stage 4: Severe Water Shortage

This would constitute a collective raw water stock level of less than **20 days**, if referenced against the total daily consumption levels across Island, without taken into consideration any daily recharge or replenishment of raw water resources, or borehole recovery rates.

A Severe Water Shortage Event trigger shall include the following actions:

- Connect to formally advise the Emergency Planning Manager of the SHRF on this water shortage trigger reached - for his recordkeeping, monitoring and further action.
- The Emergency Planning Manager and Connect to schedule a meeting, with the objective to derive an action plan – considering the specific dynamics of the water shortage situation, for presentation and further consultation with ExCo, Corporate Services within SHG, and other key stakeholders.
- Connect to forward daily water monitoring data to the Emergency Planning Manager of the SHRF, thus ensuring the SHRF and SHG are fully appraised on the water shortage situation.
- The above should also be accompanied by further information being placed in the media on a weekly basis by Connect through the SHRF Warning and Informing Group, ensuring the general populace remain fully informed of further developments relating to the severe water shortage situation experienced.

- Connect to continue the use of the initial drought management tools introduced at the outset of the drought event, and to further expand those tools applicable to this stage of the drought event, where needed.

Stage 5: Critical Water Shortage Emergency
This would constitute a collective raw water stock level of less than **10 days**, if referenced against the total daily consumption levels across Island, without taken into consideration any daily recharge or replenishment of raw water resources, or borehole recovery rates.

A Critical Water Shortage Emergency Event trigger shall include the following actions:

- Connect to formally advise the Emergency Planning Manager of the SHRF on this water shortage trigger reached - for his recordkeeping, monitoring and further action.
- Following this trigger event, the SHRF Gold Command Group shall assume full managerial control of the situation.
- Connect to assume the role of technical advisors to the SHRF – assisting in the formulation of action plans to mitigate against the situation, with its technical operations' teams to lead in the implementation of such action plans on the ground.
- Connect to forward daily water monitoring data to the Emergency Planning Manager of the SHRF, thus ensuring the SHRF and SHG are fully appraised on the water shortage situation.
- The above should also be accompanied by further information being placed in the media on a weekly basis by Connect through the SHRF Warning and Informing Group, ensuring the general populace remain fully informed of further developments relating to the critical water shortage situation experienced.
- Connect to continue the use of the initial drought management tools introduced at the outset of the drought event, and to further expand those tools applicable to this stage of the drought event, where needed.

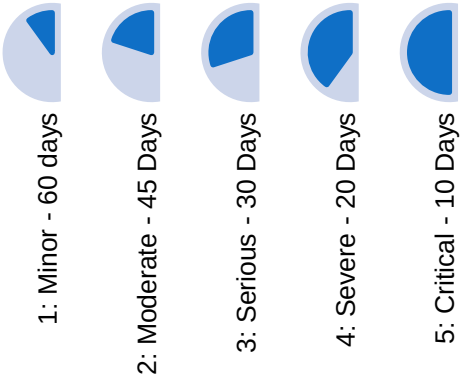
Drought Incident Management

Whilst the Water Resource Management Plan is being developed, and until the risk of drought can be fully mitigated, a process for drought management will be in place to restrict demand and conserve supply particularly at critical times.

Connect's Drought Management Plan (DMP) and SHG's Drought Major Incident Plan outlines the approach to dealing with drought conditions. The purpose of the DMP is to identify suitable measures in maximising the efficient use of water resources during periods of water shortages to ensure the health and safety of the public, as well as to ensure the environment in general is optimally protected. The DMP would aim to achieve optimisation in respect of public benefit in domestic water usage, sanitation and fire protection, while still providing water to all users across Island in an equitable manner. The DMP outlines the framework for which the

collective water systems across Island would be managed as part of a holistic approach to water shortage mitigation management.

The following stages are considered for the outlining of water shortage events and the parameters to be used to define them:



It is recognised that water reduction and banning the use of water in certain situations are management responses to water shortages, and it would be unreasonable to expect never to use these tools whilst managing water in St Helena, because demand management is often more cost effective than building new water resource infrastructure. For example, should St Helena never want to experience event a stage 1 Minor Water Shortage event, huge investment in water resource infrastructure would be needed to cover even the very driest of scenarios. Unfortunately, affordability and other constraints means that small islands cannot eliminate the risk of drought without significantly increasing tariffs. Acknowledging that some water shortages are to an extent likely in St Helena both now and in the future, this Strategy sets reasonable targets to mitigate the risk.

This Strategy sets out the following targets:

- **It should be planned so that Stage 4 Severe Water Shortage and Stage 5 Critical Water Shortage should never be reached.**
- **The frequency of entering the Stage 3 Serious Water Shortage, whereby a formal 'Notice Limiting the Use of Water' is issued should reduce from a baseline probability of 1 in every 2 years to a target of 1 in 10 years.**
- **Where affordable, these targets should be exceeded to reduce the frequencies and severity of drought, subject to value for money exercises.**

When drafting the Water Resource Management Plan, therefore, the preferred options should never result in a predicted supply of less than 20 days under any modelled population or climate scenario.

The supply-demand balance analysis in the Water Resource Management Plan should also include a 'headroom', which is the 'minimum buffer that a prudent water company should allow between supply and demand to cater for specified uncertainties (except for those due to outages) in the overall supply-demand balance'[6].

[6] UKWIR (2002) An Improved methodology for assessing headroom – Report Ref No. 02/WR/13/2