



OKINAWA PREFECTURAL ENTERPRISE BUREAU

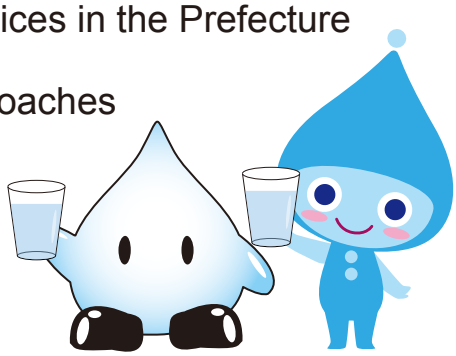
PAMPHLET








Table of Contents



We provide safe water to residents of the prefecture.

The enterprise bureau is engaged in "tap water supply services," in which tap water is supplied to municipalities including cities, towns and villages, and "industrial water supply services," in which industrial water is supplied to companies and other entities mainly in the manufacturing sector. The bureau is determined to make continuous efforts to ensure a stable supply of safe water through various measures.

The Water Situation on the Main Island of Okinawa

(Photo) The area near the midstream of the Henan River running through the village of Ohgimi.

Compared to the rivers in other prefectures, the rivers running in Okinawa are steeply sloped and the watershed areas are relatively small.

Okinawa is a reef-fringed prefecture consisting of some 160 small islands without any abundant source of fresh water like large rivers or lakes. In addition, the amount of precipitation varies widely by season and by year. Due to such an environment, Okinawa has historically been a difficult region to secure a stable supply of fresh water.

The population of Okinawa Prefecture was around 510,000 right after the war (1946). It grew to approximately 960,000 by the year Okinawa was returned to Japan (1972). By 2016, the population surpassed around 1.43 million, which was approximately 1.5 times the number of people immediately after the handover.

The water sources on the main island of Okinawa are located in the northern and central regions. The largest source is in the north. What is noteworthy is that the majority of the river water and dam water in this region are fed to the central and southern regions where approximately 80% of the entire population of Okinawa live and consume the delivered water.

Okinawa is located in a sub-tropical zone where the average temperature is 23.1 degrees Celsius and enjoys a moderate oceanic type of climate all year round.

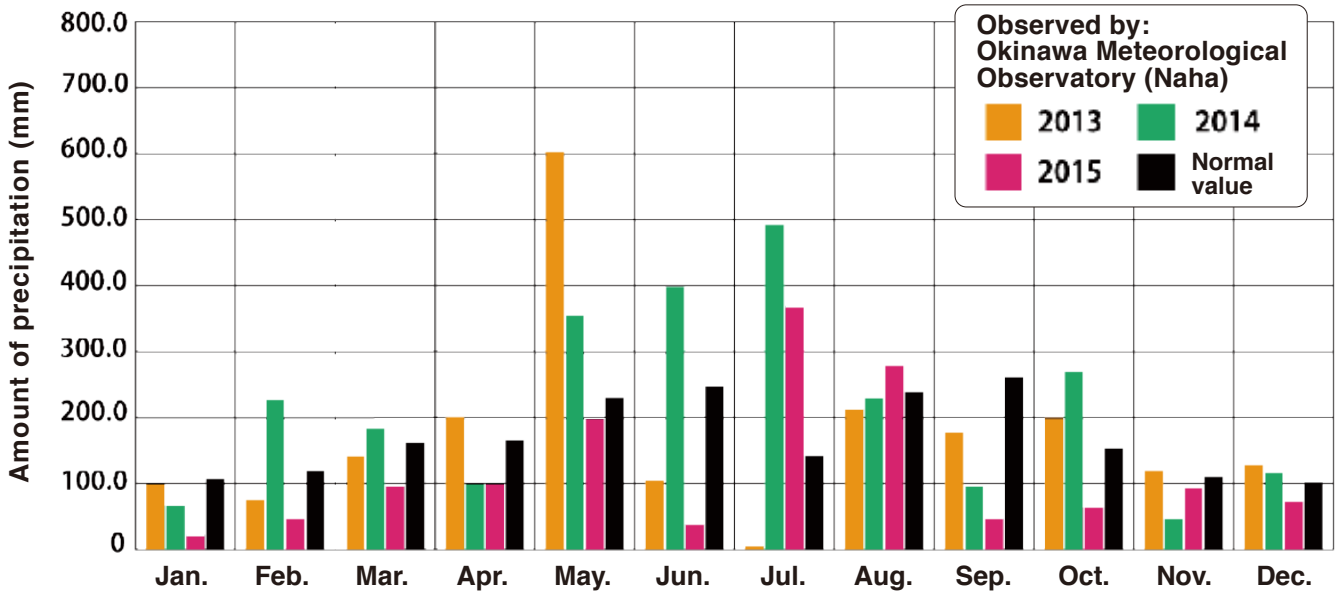
The annual amount of precipitation is approximately 2,207 millimeters (in Naha). Compared to other parts of Japan where the nationwide average is 1.604 millimeters, Okinawa is blessed with quite a lot of rainfall.

However, since Okinawa is a densely populated prefecture, the potentially usable quantity of stored water resources per capita is merely around 1,800 m^3/ person per year, which is only about 56% of the national average (3,223 m^3/ person per year).

Moreover, much of the annual amount of precipitation is accumulated during the rainy season in May and June, and when typhoons hit the islands on an irregular basis. These environmental conditions make it difficult for Okinawa to secure a stable source of ample fresh water almost every year.

(Note) The potentially usable quantity of stored water resources is calculated by multiplying the total area of the given location by the amount of precipitation remaining after evaporation, and represents the maximum amount of water that can theoretically be used as the water resource. The usable amount of water in each region varies according to the conditions of the natural environment. The potentially usable quantity of stored water resources is an index used to indicate this difference.

Monthly amount of precipitation



Information source

*Population of Okinawa Prefecture: Official website of Okinawa Prefecture
*Temperature: Japan Meteorological Agency
(Average temperature in the Okinawa region in 2015)
*Annual amount of precipitation: The 2015 edition of Water Resources in Japan (Secular changes in the annual amount of precipitation in the last ten years)
*Potentially usable quantity of stored water resources: The 2015 edition of Water Resources in Japan (Amount of precipitation and potentially usable quantity of stored water resources by region)
*Graph data on monthly amount of precipitation: Okinawa Meteorological Observatory of the Japan Meteorological Agency (Normal values indicate the mean values in Naha from 1981 through 2010)

What Does the Enterprise Bureau Do?

Tap water supply services

he bureau is responsible for supplying tap water widely to most cities, towns and villages in Okinawa Prefecture. In other words, the bureau serves as the wholesaler of water. The direct supply of water to the local communities (homes, schools, hospitals, etc.) is carried out by the public authorities in each city, town or village.

Since most of the cities, towns and villages on the main island of Okinawa do not have their own water resources, the bureau provides tap water to these municipalities after purifying the raw water collected from dams and rivers.

In 2015, the bureau supplied a total of approximately 423,200 m^3 of tap water per day to 22 cities, towns and villages on the main island of Okinawa and the village of Ie. The exceptions were Kunigami, Ohgimi, Higashi, and Ginowan villages in the northern region of the main island of Okinawa, which are relatively fortunate with their own water sources.

Furthermore in fiscal 2016, the bureau started a facility development project to supply tap water in eight villages located on remote islands near the main island of Okinawa, and tap water supply is expected to start with a phased approach from some villages where the development of facilities is completed.

*The 22 cities, towns and villages on the main island of Okinawa include the Nanbu Water Supply Authority which is composed of the towns of Yaese and Haebaru.

Industrial water supply services

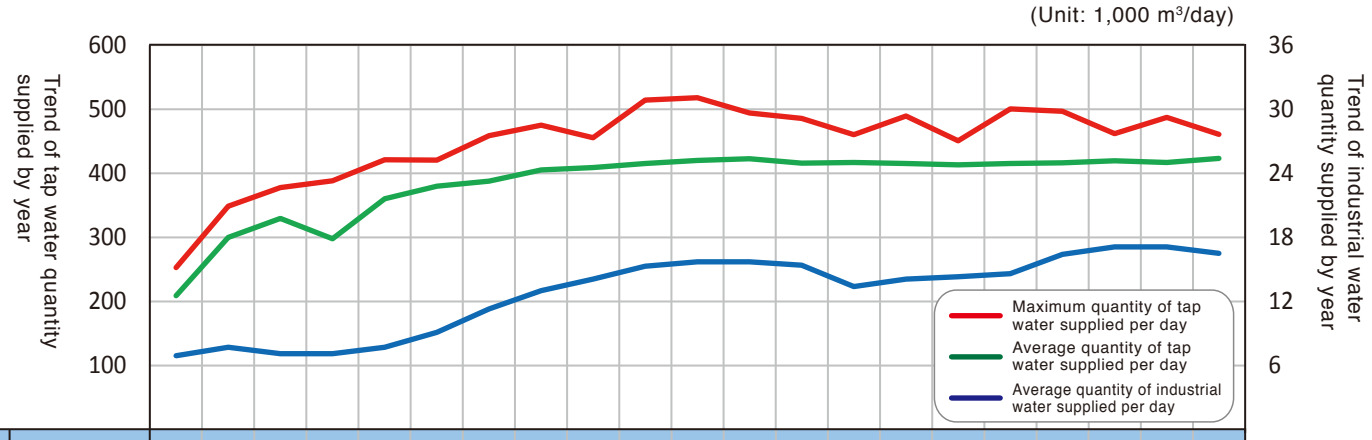
The bureau is also engaged in industrial water supply services as a part of its efforts to promote industrial activities in Okinawa by providing industrial water to local firms that mainly belong to the manufacturing sector.

More specifically, the bureau indirectly supports production at the business facilities mainly based in the central and southern regions by supplying them with the water collected from the dams located in the north of the main island after removing the sediment (primary treatment) at the Kushi Water Purification Plant.

In 2015, the bureau supplied a total of approximately 16,508 m^3 of industrial water per day to 99 business establishments located in the industrial complexes near Kin Bay, within the Nakagusuku New Port District, and in Itoman.

*In the two water supply businesses, the bureau is currently charging 102.24 yen per cubic water (m^3) as the basic rate of tap water, and 35 yen per m^3 as the basic rate and 70 per m^3 as the excess fee for industrial water, plus consumption tax.

Changes in Water Supply Quantity



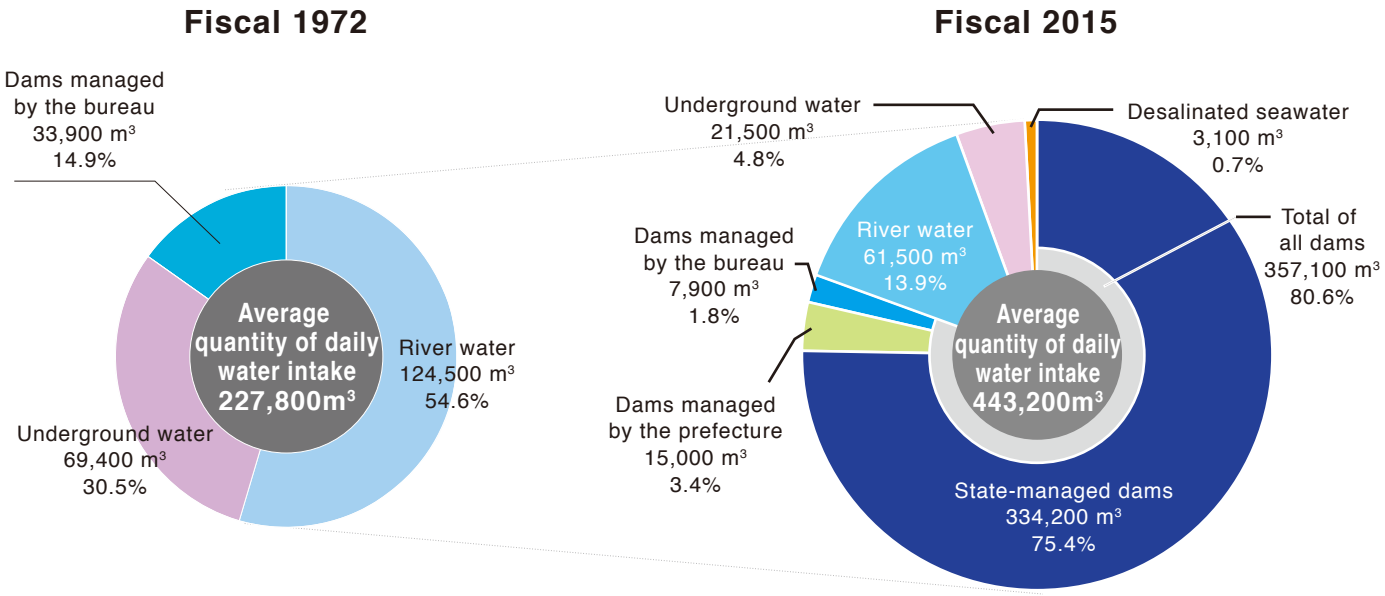
	Year	1972	1975	1978	1981	1984	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2012	2013	2014	2015
Tap water	Maximum quantity of tap water supplied per day 1,000 m³/day	253	348.6	377.5	388.5	421.2	420.4	458.9	474.9	455.7	514	517.7	494.1	485.4	460.2	489.4	450.9	500.6	496.6	461.7	487	460.9
	Average quantity of tap water supplied per day 1,000 m³/day	208.8	300	329.5	297.6	360.4	380	387.5	405.3	408.8	415.4	420.1	422.5	416	416.8	415.4	413.1	415.1	416.2	419.4	416.8	423.2
Industrial water	Average quantity of tap water supplied per day 1,000 m³/day	6.9	7.7	7.1	7.1	7.7	9.1	11.3	13	14.1	15.3	15.7	15.7	15.4	13.4	14.1	14.3	14.6	16.4	17.1	17.1	16.5
	Number of business establishments	1	1	10	14	18	26	34	37	50	61	64	69	78	85	90	90	93	93	94	95	96

* The number of business establishments where industrial water is supplied indicates business entities that provide water as of the end of each fiscal year.

Quantity of Water Intake by Source

There are four types of water sources managed by the bureau: dam water, river water, underground water and desalinated seawater.

Compared to the total amount of daily water intake from all the four sources in 1972, when Okinawa Prefecture was returned to Japan, the amount nearly doubled by 2015, while the composition ratio of the water sources also have changed drastically over this period. In 2015, the total amount of daily water intake was 443,200 m³ from all four sources, of which dam water comprised a majority of the 357,100 m³ (approximately 80.6%).



* Since the fractional portions of the respective values have been rounded, the total value may not represent the calculation of the actual sum.

Quantity of Water Supplied to Each City, Town and Village

(Unit: 1,000 m³/year)

Items / Name of city, town or village	Amount of supply in fiscal 2015	Composition ratio (%)	Water supply commencement date
Naha	39,117	25.7%	May 15, 1972
Okinawa	21,191	13.9%	Same as above
Ginowan	10,519	6.9%	Same as above
Urasoe	13,451	8.8%	Same as above
Yomitan	4,810	3.2%	Same as above
Nanbu Water Supply Authority	6,470	4.3%	Same as above
Kadena	1,560	1.0%	Same as above
Chatan	4,268	2.8%	Same as above
Kita-Nakagusuku	3,151	2.1%	Same as above
Tomigusuku	6,437	4.2%	Same as above
Yonabaru	1,956	1.3%	Same as above

Items / Name of city, town or village	Amount of supply in fiscal 2015	Composition ratio (%)	Water supply commencement date
Nakagusuku	2,140	1.4%	May 15, 1972
Nishihara	4,256	2.8%	Same as above
Nago	2,165	1.4%	Same as above
Itoman	6,498	4.3%	Same as above
Motobu	500	0.3%	June 10, 1975
Nakijin	503	0.3%	July 12, 1975
Ie	619	0.4%	February 1, 1977
Onna	3,041	2.0%	July 20, 1977
Kin	1,249	0.8%	October 1, 1989
Uruma	13,692	9.0%	May 15, 1972
Nanjo	4,540	3.0%	Same as above
Subtotal	152,132	100.0%	

Note 1) The Nanbu Water Supply Authority is composed of Yaese (formerly the separate municipalities of Kochinda and Gushikami) and Haebaru. (*Excluding Nanjo (formerly Ozato) from April 2008)
Note 2) The water supply commencement dates of Uruma and Nanjo described here are respectively the starting dates after the merger.
Note 3) Since the fractional portions of the respective values were rounded, the subtotal may not represent the sum of the values in the table.

Water Sources and Water Service Facilities Managed by the Bureau

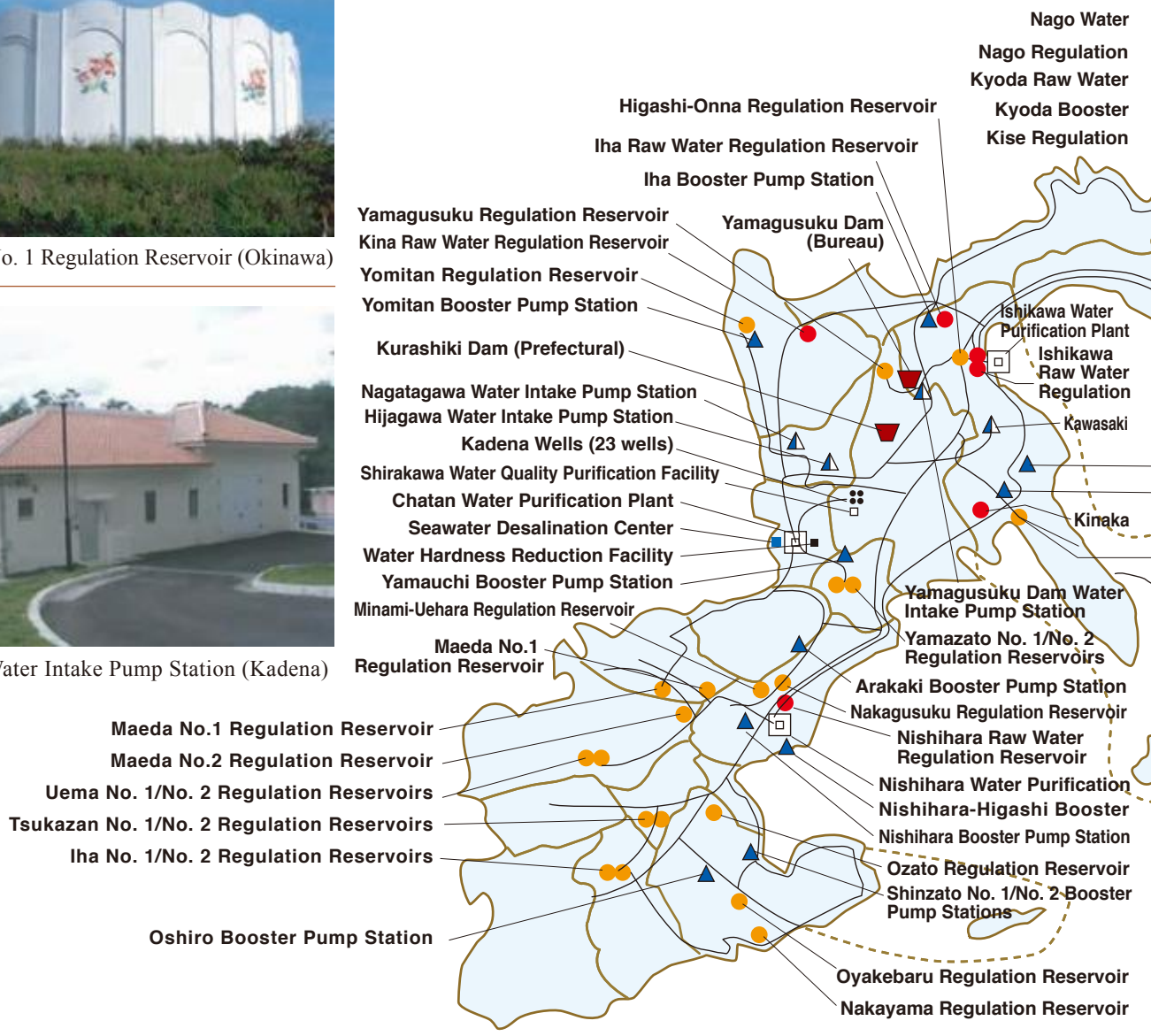
The main island of Okinawa is long and narrow, stretching from north to south. Since the water sources in the northern region are located far away from the central and southern consumption regions, the total length of the piping routes is longer compared to other prefectures. Moreover, in Okinawa, there is a need to place a large number of booster pump stations and regulation reservoirs between the water sources and the destinations to supply the water. Furthermore, since the water sources are relatively small in size, numerous pump stations to take in the river water and underground water also have to be set up.

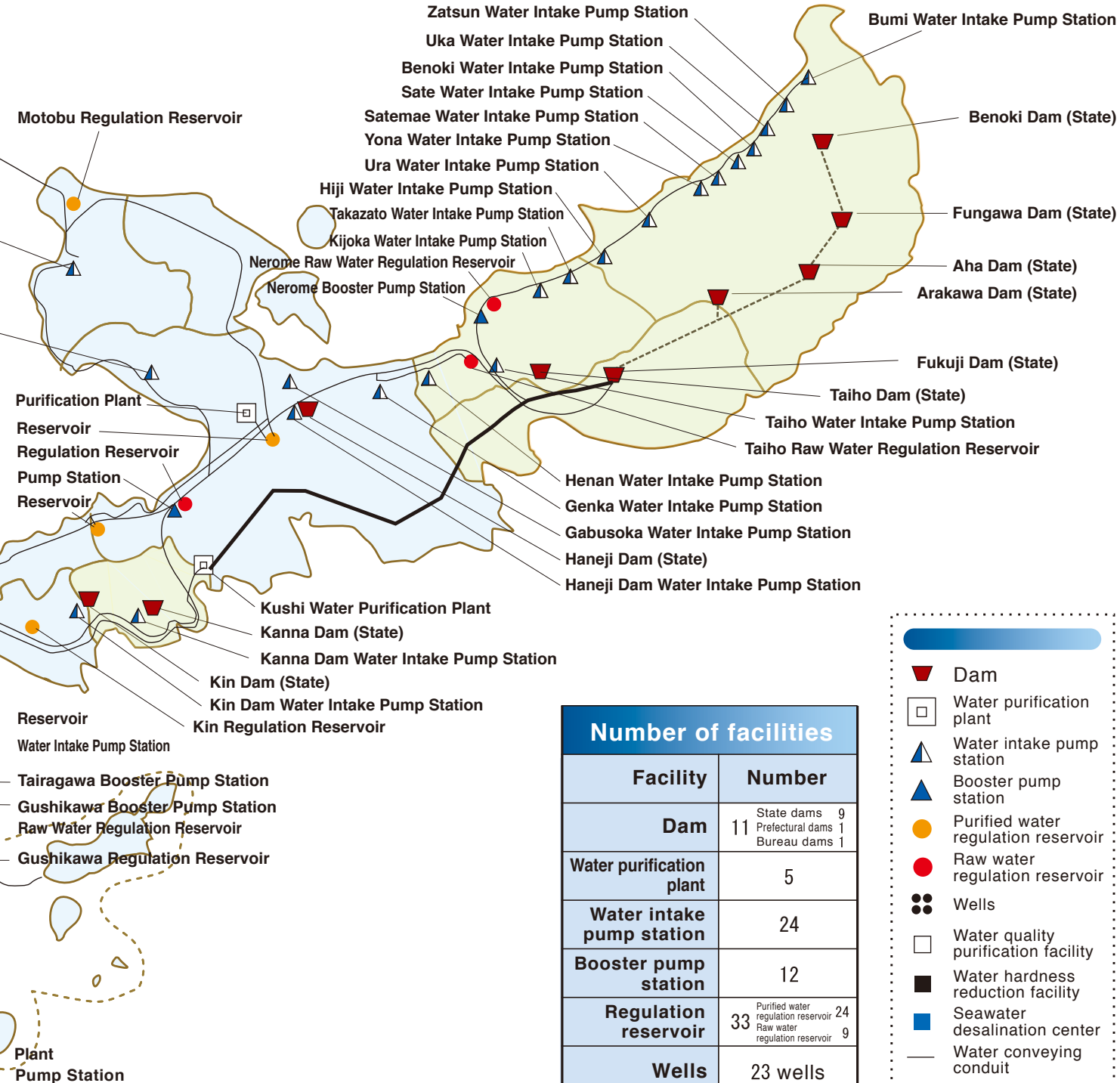
Gushikawa Regulation Reservoir (Uruma)

The Gushikawa Regulation Reservoir is within the premises of a park. The upper side of the regulation reservoir has been deliberately opened to create pleasant scenery that can be enjoyed by the local visitors of the park.

Yamazato No. 1 Regulation Reservoir (Okinawa)

Hijagawa Water Intake Pump Station (Kadena)





Number of facilities

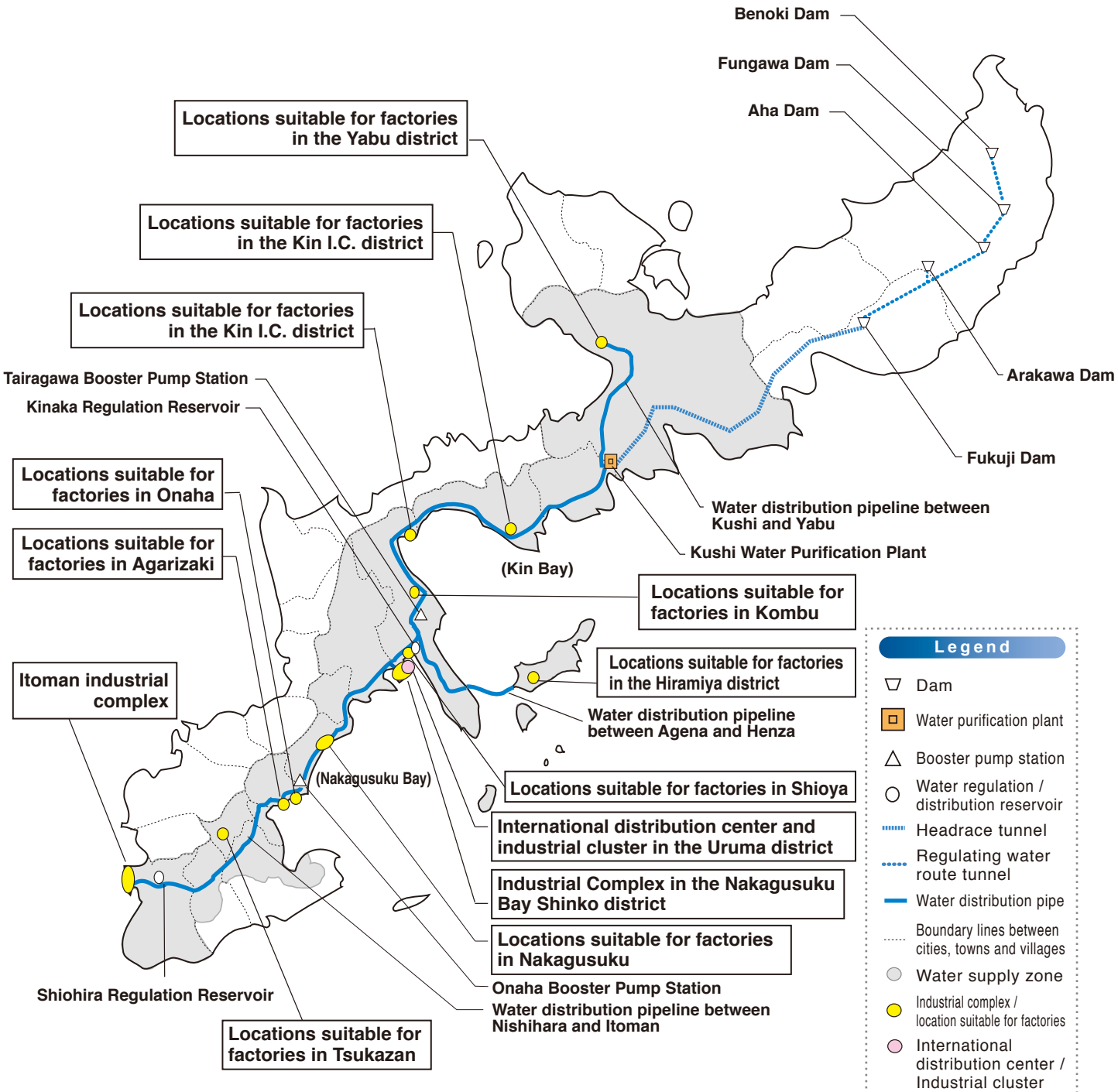
Facility	Number
Dam	11 (State dams 9, Prefectural dams 1, Bureau dams 1)
Water purification plant	5
Water intake pump station	24
Booster pump station	12
Regulation reservoir	33 (Purified water regulation reservoir 24, Raw water regulation reservoir 9)
Wells	23 wells
Seawater desalination center	1
Water quality purification facility	1
Water hardness reduction facility	1

- Dam
- Water purification plant
- Water intake pump station
- Booster pump station
- Purified water regulation reservoir
- Raw water regulation reservoir
- Wells
- Water quality purification facility
- Water hardness reduction facility
- Seawater desalination center
- Water conveying conduit
- Headrace tunnel
- Regulating water route tunnel
- Boundary line between cities, towns and villages
- Water supply zone

Facilities for Industrial Water Works in Okinawa

Nakagusuku Bay Port Industrial Complex

The Okinawa industrial water works enterprise supplies industrial water collected from a group of multi-purposed dams in the northern region of the main island of Okinawa to the facilities located in the water supply zone, which is comprised of 13 municipalities: Nago, Ginoza, Kin, Uruma, Okinawa, Kita-Nakagusuku, Nakagusuku, Nishihara, Haebaru, Yonabaru, Nanjo, Yaese and Itoman.



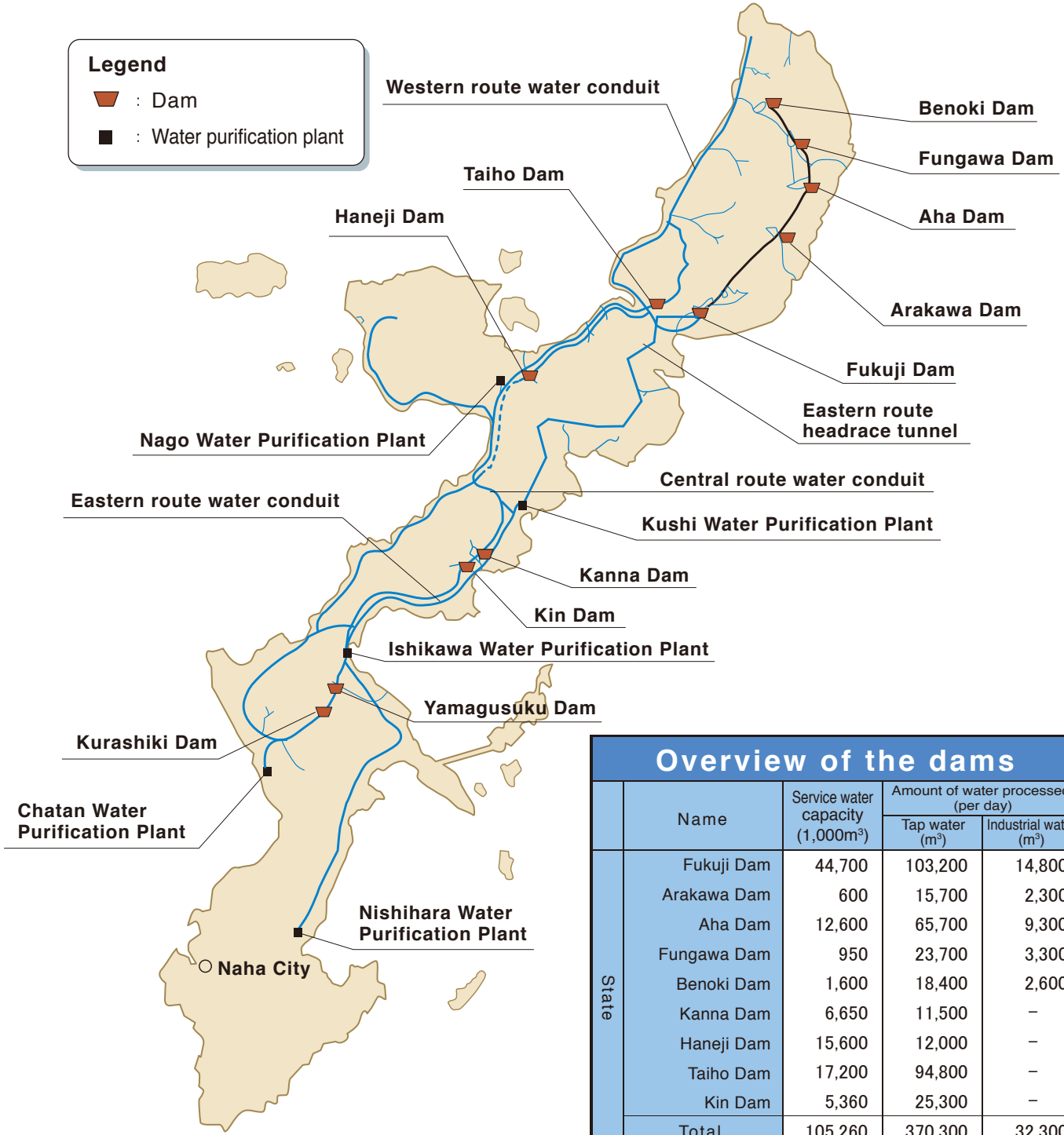
*The water supply zones in Nanjo are limited to the areas that were formerly Sashiki and Ohzato, and the water supply zone in Yaesu is limited to the district that was formerly Kochinda.

*Locations suitable for factories indicate sites that have been listed in the factory location survey log as suitable land for plant construction as a result of factory location surveys conducted under the Factory Location Act.

Dams on the main island of Okinawa

To improve the severe water supply situation faced by Okinawa Prefecture, the national and municipal governments have been investing in dam construction.

To date, 11 dams have been completed, including Fukuji Dam, Arakawa Dam, Aha Dam, Fungawa Dam, Benoki Dam, Kanna Dam, Haneji Dam, Taiho Dam, Kin Dam, Kurashiki Dam (prefectural) and Yamagusuku Dam (enterprise bureau).



Overview of the dams

	Name	Service water capacity (1,000m³)	Amount of water processed (per day)	
			Tap water (m³)	Industrial water (m³)
State	Fukuji Dam	44,700	103,200	14,800
	Arakawa Dam	600	15,700	2,300
	Aha Dam	12,600	65,700	9,300
	Fungawa Dam	950	23,700	3,300
	Benoki Dam	1,600	18,400	2,600
	Kanna Dam	6,650	11,500	–
	Haneji Dam	15,600	12,000	–
	Taiho Dam	17,200	94,800	–
	Kin Dam	5,360	25,300	–
	Total	105,260	370,300	32,300
Prefecture	Kurashiki Dam	5,900	50,600	–
Enterprise bureau	Yamagusuku Dam	1,190	7,600	–
State dams, prefectural dams and bureau dams Total		112,350	428,500	32,300

Main Facilities of the Enterprise Bureau

Kushi Water Purification Plant

The Kushi Water Purification Plant is the largest water treatment center in Okinawa Prefecture. Located on the eastern coast of Nago in the northern region of the main island of Okinawa, it has a maximum capacity of processing 351,400 m^3 of water per day and has facilities to process fresh water and waste water, as well as industrial water.

It commenced its services in 1975. Its water sources are the state-managed dams and rivers in the northern region. Part of the water collected from these sources is fed to the factories as industrial water, after removing the sediment at this plant. The rest is conveyed to the water purification plants in Ishikawa, Chatan and Nishihara as raw water to be purified in these facilities for use as tap water.

Nago Water Purification Plant

The Nago Water Purification Plant is located in the northern city of Nago in the northern region of the main island of Okinawa. It was built in 1975 as a water treatment facility that can process 14,000 m^3 of water per day. In 1995, the capacity was expanded to 27,000 m^3 per day to respond to growing demand.

Its main water sources are the Henan and Genka Rivers. The water purified in this plant is supplied to five municipalities in the northern region, including Nago.

Cities, towns and villages to which water is supplied:

Nago, Motobu, Nakijin, Onna, Ie

Ishikawa Water Purification Plant

To address deterioration of facilities after long service life of the former Ishikawa Water Purification Plant and to respond sufficiently to growing demand, the newly constructed Ishikawa Water Purification Plant commenced operations in December 2011 with a water processing capability of 165,600 m^3 of tap water per day.

In addition, full operations started in June 2015 at its state-of-the-art facilities that can reduce the rate of trihalomethane (THM) content and perform advanced water treatment processes to be well prepared to meet the quality standards applied to water sources that are likely to get increasingly scarce in the future.

In order to alleviate the environmental burden, hydroelectric equipment was installed to produce hydroelectricity using the energy generated from dropping the raw water from a great height, which is then used on the premises as an auxiliary energy source.

This plant sources its water from Fukuji Dam and various other dams in the northern region. It receives raw water from the Kushi Water Purification Plant where the sediment is removed, and also from Kanna Dam, Kin Dam and Yamagusuku Dam, purifies it in its own facilities, and delivers the purified water to 14 cities, towns and villages in the central and southern regions including Uruma.

Cities, towns and villages to which water is supplied:

Uruma, Kin, Onna, Yomitan, Kadena, Okinawa, Kita-Nakagusuku, Nakagusuku, Nishihara, Naha, Tomigusuku, Itoman, Haebaru, Yaese

(Of these municipalities, water is supplied to the Nanbu Water Supply Authority for the two towns of Haebaru and Yaese.)

*Depending on the pre-arrangements, some districts in each city, town, or village may receive water from different water purification plants.

Water Quality Management Office

The Water Quality Management Office is located on the premises of the Ishikawa Water Purification Plant. Its purpose is to ensure that the water supplied to the intended destinations is safe and can be consumed without concern about its quality. This is done by inspecting the quality of water processed in the plant, as well as the raw water (dam water, river water, etc.) found in the water sources.

The staff members of this office are also assigned to work as on-site inspectors at the water purification plants in Nago, Chatan and Nishihara to test the quality and confirm the safety of water purified at each facility.

Chatan Water Purification Plant

The Chatan Water Purification Plant, situated in a town called Chatan in the central region of the main island of Okinawa, commenced its services in 1987. With a maximum tap water conveying capacity of 247,300 m^3 per day, it is currently the largest water purification plant in Okinawa Prefecture in terms of tap water production. It is also equipped with an advanced water treatment facility where treatment with ozone and activated carbon is conducted.

Meanwhile, in order to further facilitate the stable supply of tap water, the Seawater Desalination Center began operations in April 1997 as the largest desalination facility in Japan, with a maximum capacity to desalinate 40,000 m^3 of seawater per day.

Moreover, as part of the measure to level the hardness of the water, the Water Hardness Reduction Facility started operations in June 2003.

The plant collects water from the rivers flowing through the western route and central region, as well as from Kurashiki Dam and the group of wells in Kadena. All the water collected from these sources goes through various stages of purification, is blended with the seawater turned into fresh water through the desalination process, and supplied to seven cities, towns and villages in central and southern regions including Chatan.

Cities, towns and villages to which water is supplied:

Chatan, Okinawa, Kita-Nakagusuku, Nakagusuku, Ginowan, Urasoe, Naha

*Depending on the pre-arrangements, some districts in each city, town, or village may receive water from different water purification plants.

Nishihara Water Purification Plant

The Nishihara Water Purification Plant started operating in June 1977 with a capacity of 40,100 m^3 per day, in a town called Nishihara located in the central region of the main island of Okinawa. Through four additional phases of expansion, the plant was able to purify 160,500 m^3 of water per day by March 1980.

This plant sources its water from Fukuji Dam and various other dams in the northern region. It receives raw water from the Kushi Water Purification Plant where the sediment is removed, and after purifying it in its own facilities, delivers the purified water to nine cities, towns and villages in the central and southern regions including Nishihara.

In June 2005, a small hydroelectric power generation system was introduced to produce hydroelectricity using the energy generated by dropping the raw water from a great height at the Kinaka Regulation Reservoir. The plant currently makes effective use of this hydropower to run its purification facilities, cutting electricity costs and alleviating the environmental burden.

Moreover, the plant is equipped with a pumping station exclusively used for industrial water, with a maximum pumping capacity of 8,000 m^3 per day. The industrial water processed in this plant is fed mainly to the factories in the Itoman industrial complex.

Cities, towns and villages to which water is supplied:

Nishihara, Naha, Urasoe, Yonabaru, Nanjo, Tomigusuku, Itoman, Haebaru, Yaese

(Of these municipalities, water is supplied through the Nanbu Water Supply Authority in the two towns of Haebaru and Yaese.)

*Depending on the pre-arrangements, some districts in each city, town, or village may receive water from different water purification plants.

Water Management Center

The Water Management Center was established on the 12th floor of Okinawa Prefectural Government Building in fiscal 1992.

The center plays a key role in managing the various sets of information on water managed by the Okinawa Prefectural Enterprise Bureau and coordinating with the respective water purification plants so that the necessary amount of water is supplied efficiently to each city, town and village. In addition, it plays a central role as an information hub in emergencies and disasters.

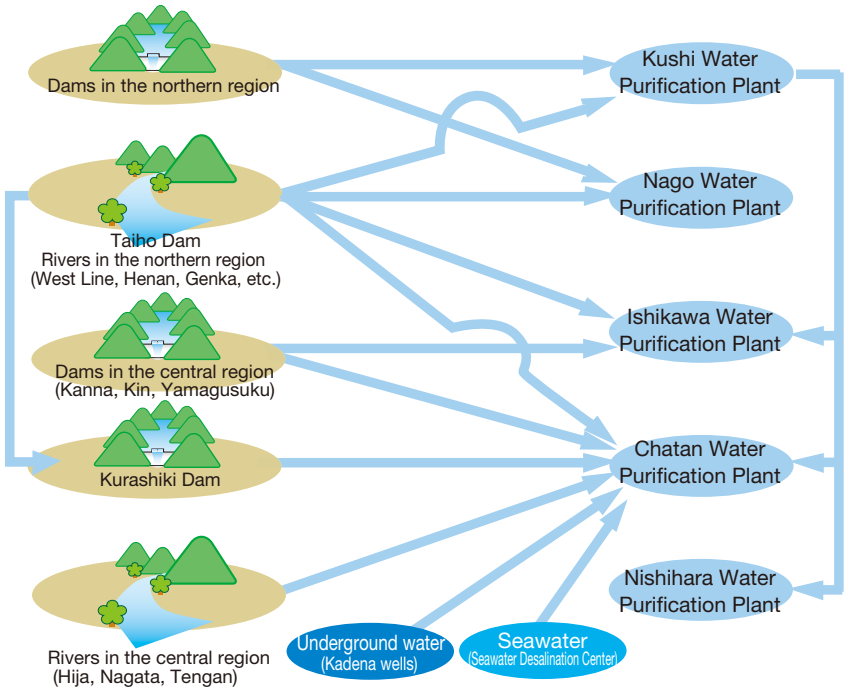
How Water Travels from Water Sources to Your Towns

While major water sources of the main island of Okinawa are dams and rivers located in the northern and central regions, these water sources and main consumption destinations in the central and southern areas are physically distant because the island is long-shaped and stretches from north to south.

A majority of tap water used in the main island is distributed to consumption destinations through a long water conduit and via a number of facilities.

In cooperation with people in the reservoir areas, the bureau collects precious water from the dams and rivers, purifies it at water purification facilities and delivers it as tap water to many Okinawa residents via specified cities, towns and villages.

From water sources to water purification plants



Topics

A total of 1,130 days of water supply restriction

Owing to relatively scarce water resources, Okinawa Prefecture used to suffer from drought almost every year, with a total of 1,130 water supply restriction days being enacted from 1972 to 1994.

Today, we are able to use clean water freely by just opening the faucet.

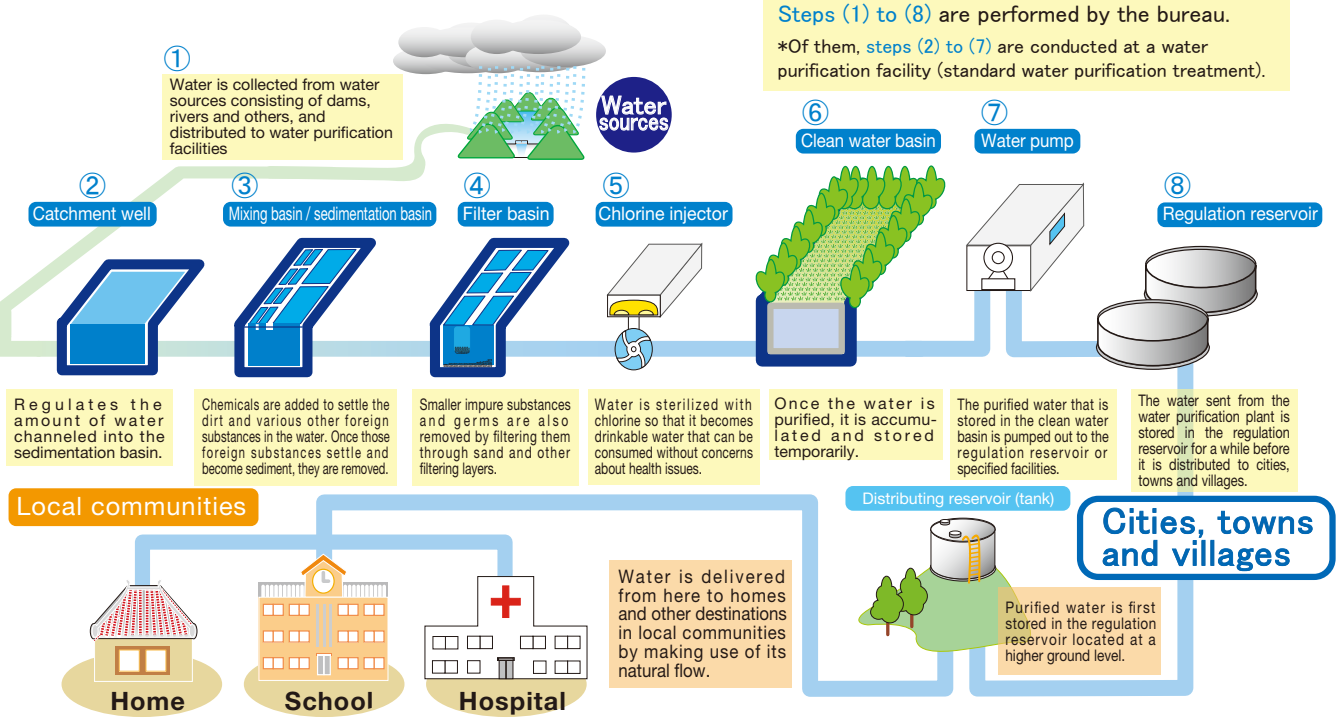
But we must not forget the fact that it is a product of endless efforts and cooperation among many of our predecessors.

Water is a limited, precious resource. Please use water in a conscious manner.

From water purification facilities to your towns

Steps (1) to (8) are performed by the bureau.

*Of them, steps (2) to (7) are conducted at a water purification facility (standard water purification treatment).



Making the Water Safe and Good to Drink

In order to supply safe and tasty water, the bureau has been working on implementing an advanced water treatment that can drastically reduce the amount of trihalomethane that is generated as a by-product in the chlorine treatment process. In addition, the bureau has built a water hardness reduction facility. The advanced water treatment processes have been confirmed to be effective in eliminating unpleasant odors and tastes, like the mold odor occasionally found in tap water.

Regarding residual chlorine, it is a necessary byproduct to a certain degree in ensuring that tap water is safe and hygienic. However, when the concentration is high, the taste may become unpleasant due to the chlorine odor. The bureau is working collaboratively with the waterworks departments in the relevant municipalities to lower the level of residual chlorine in tap water as much as possible.

Results of the water quality inspection carried out at the water purification plant

(they all conform to the criteria stipulated by laws and regulations)

Items	Criterion value	Nago Water Purification Plant	Ishikawa Water Purification Plant	Chatan Water Purification Plant	Nishihara Water Purification Plant
Common bacteria (count per ml)	100 bacteria/ml or less	0	0	0	0
Coliform bacillus	Must not be detected	Negative	Negative	Negative	Negative
Total trihalomethane (mg/L)	0.1 mg/L or less	0.016	0.015	0.010	0.022
Sodium and its chemical compounds (mg/L)	200 mg/L or less	20.8	19.6	30.8	18.7
Chloride ion (mg/L)	200 mg/L or less	33.1	31.7	34.5	29.5
Calcium, magnesium, etc. (hardness) (mg/L)	300 mg/L or less	48	37	92	30
pH value	Between 5.8 and 8.6	7.4	7.4	7.3	7.4
Odor	Must be within normal range	No apparent abnormalities	No apparent abnormalities	No apparent abnormalities	No apparent abnormalities
Chromaticity (degree)	5 degrees or lower	Under 0.5	Under 0.5	Under 0.5	Under 0.5
Turbidity (degree)	2 degrees or lower	Under 0.1	Under 0.1	Under 0.1	Under 0.1

*The Kushi Water Purification Plant is excluded since it only handles primary treatment of sediment removal.

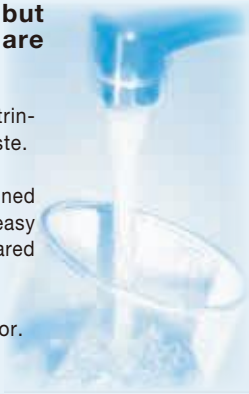
*The figures shown here represent the mean values at the exit of each water purification plant in 2015.

The water quality inspection results are published every year in the Water Quality Annual Report, which is distributed to relevant public institutions including public libraries and waterworks department offices in governing cities, towns and villages. The detailed information can be accessed through the official website of the bureau.

Topics

What do we mean by delicious water?

The definition of "good-tasting" water may vary with individual preferences, but generally speaking, from the standpoint of water quality, the following attributes are considered relevant in determining the taste of water:



Residue on evaporation This mainly refers to the mineral content. The more minerals, the more bitter and astringent the taste. When the mineral content is adequate, the water has a deep mild taste.

Hardness This mainly refers to the amount of calcium and magnesium, which are normally contained in higher concentrations than other minerals. Water with low hardness is smooth and easy to drink, while water that is harder tends to be less popular among consumers. Compared to calcium, water becomes bitter when the concentration of magnesium is higher.

Residual chlorine When the concentration is high, the taste may be unpleasant due to the chlorine odor.

Water temperature Water tastes better when it is adequately chilled.

Water quality criteria for industrial water

Currently, industrial water is supplied to the factories and other industrial sites from the Kushi Water Purification Plant after the sediment in raw water is removed. The following table shows the criteria currently applied to acceptable industrial water (excerpted from the regulations for industrial water supply in Okinawa).

Water temperature	Turbidity	pH	Alkalinity	Hardness	Residue on distillation	Chloride ion	Iron
Ambient temperature	20 degrees or lower	6.5~8.0	75 mg/L or less	120 mg/L or less	250 mg/L or less	80 mg/L or less	3.0 mg/L or less

Advanced Approaches in Water Production

Advanced Water Treatment Facility

Chatan Water Purification Plant &
Ishikawa Water Purification Plant

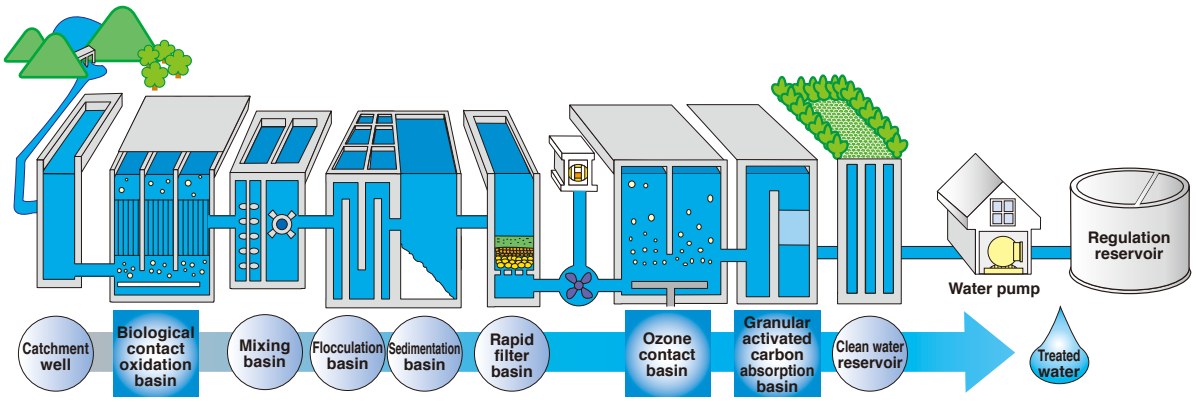
Chatan Water Purification Plant

Due to increasing deterioration year by year of the water quality of the three river sources of Hija, Nagata and Tengan from which the Chatan Water Purification Plant collects part of its raw water, the plant became increasingly less equipped to address the matter with its normal water treatment processes.

To address the situation, the Chatan Water Purification Plant has been intent on introducing new advanced water treatment processes that would effectively help it produce safer and better-tasting water. In addition to the normal purification process consisting of sediment removal, filtering and chlorine treatment, the Chatan plant began running a set of three new processes at the newly established Advanced Water Treatment Facility, which consists of a biological purification process (*1) that applies the natural purification mechanism active in rivers, an ozone treatment process that uses the oxidation effect of ozone to decompose the organic substances that cause the generation of trihalomethane (*2), and a granular activated carbon treatment process that leverages the superior absorption capability of activated carbon to absorb organic substances.

(*1) The blower of the biological contact basin has been halted since 2004.
(*2) A very small amount of organic substances is present in the raw water used for processing tap water. By adding chlorine as the disinfectant, the chlorine reacts with the organic substances and generates trihalomethane.

Flow of advanced water treatment (Chatan Water Purification Plant)

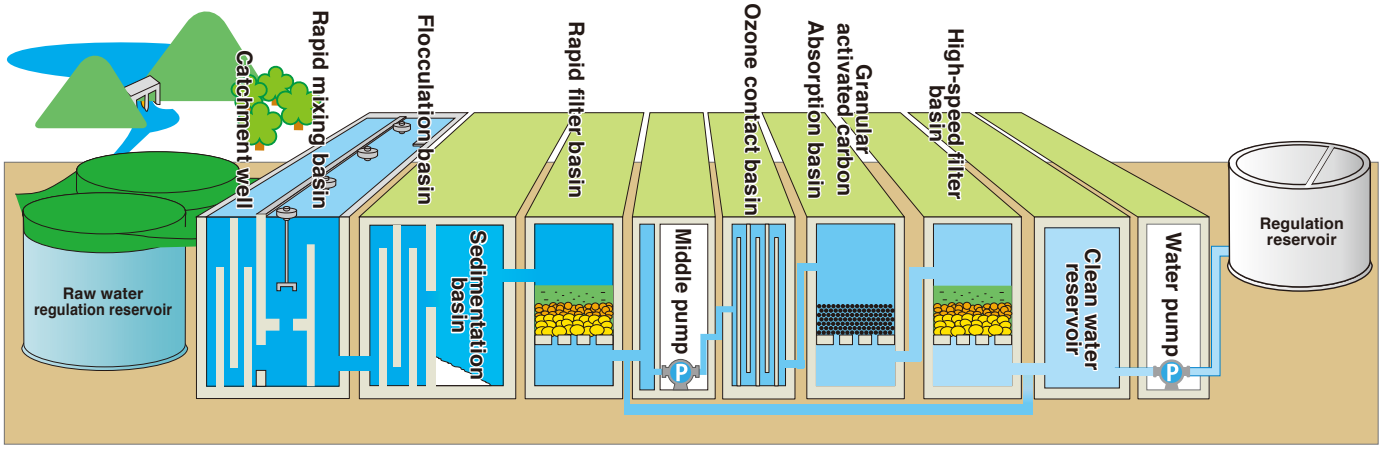


Ishikawa Water Purification Plant

The Ishikawa Water Purification Plant has introduced advanced water treatment for the reduction of trihalomethane in order to address the water quality of water sources.

In addition to the standard water purification treatment steps of sedimentation, filtering and chlorine treatment, the Ishikawa plant employs advanced water treatment processes with ozone and granular activated carbon that eliminate the precursors of trihalomethane and unpleasant odors and tastes (such as mold odor) and then remove smaller impurities by filtering them through sand and other filtering layers.

Flow of advanced water treatment (Ishikawa Water Purification Plant)



Water Hardness Reduction Facility

Chatan Water Purification Plant

The level of hardness of water collected from the water sources in the central region of the main island of Okinawa, such as from Kadena wells, Tengan River and the Hija River, is higher than that of the water in other regions, due to the effect of the lithological character of the coal zone throughout the central region.

As the raw water collected from these sources is sent to the Chatan Water Purification Plant, the hardness of the treated water delivered from the plant to specified destinations tends to be high compared to the water processed at other purification plants.

As part of the measures to even out the level of hardness of water supplied throughout the prefecture, the bureau established a new facility called the Water Hardness Reduction Facility, and began supplying water with reduced hardness in June 2003 when the facility became operational.

(Photo) Reactive tower

Seawater Desalination Center

Chatan Water Purification Plant

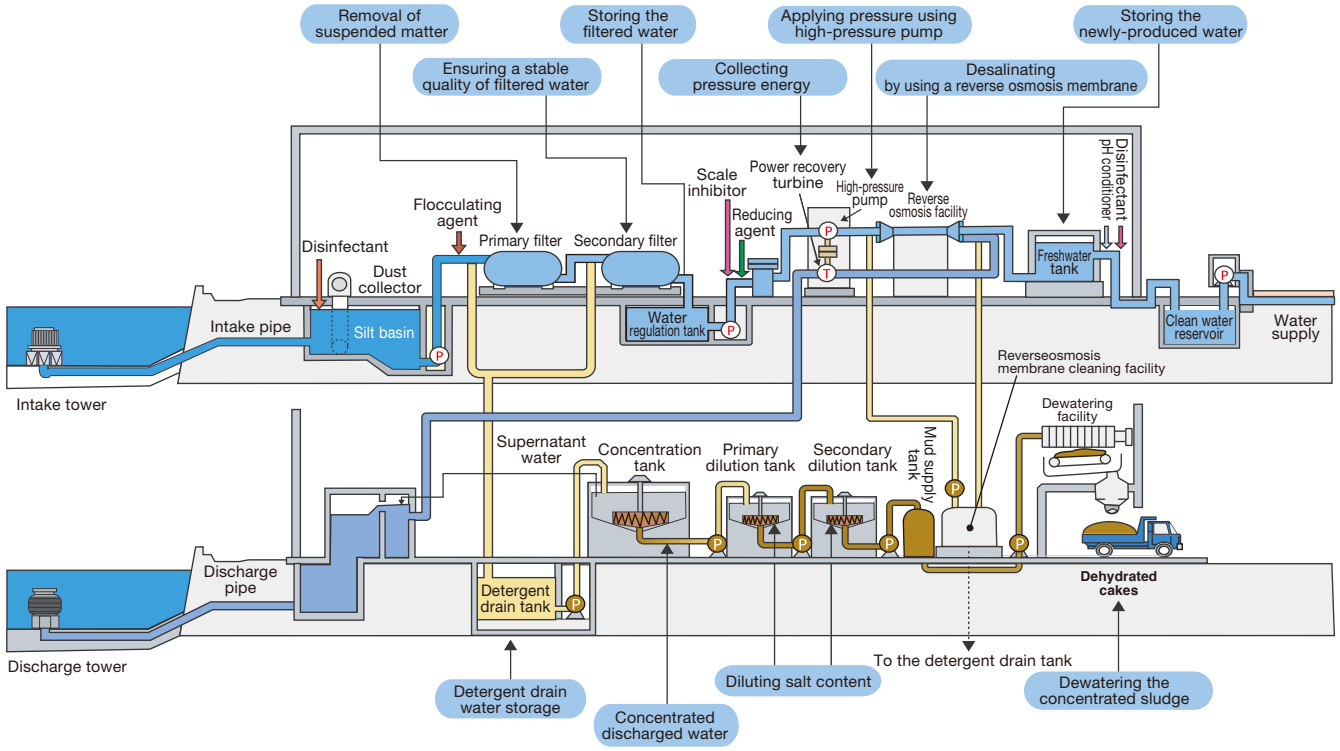
Despite the continuous efforts in Okinawa Prefecture to secure abundant water sources by constructing dams, along with other developments, the prefecture is still frequently faced with water shortages due to the increase in population and tourists and climate change.

As an innovative solution that can effectively address this issue, the bureau has been actively engaged in the construction of seawater desalination facilities that are capable of producing fresh water from the inexhaustible water source Okinawa is blessed with—the beautiful sea that surrounds the prefecture.

The seawater desalination facilities are currently capable of producing 40,000 m^3 of fresh water per day.

(Photo)
Reverse osmosis facility that functions as the heart of the Seawater Desalination Center

Seawater desalination process flow



Main projects of the bureau

Facility improvement project at the Chatan Water Purification Plant

The Chatan Water Purification Plant commenced its regular treatment services in fiscal 1987 as a core water purification site that supplies tap water to the central and southern regions of the main island of Okinawa. Subsequently, the plant has been promoting the installation of an advanced water treatment facility (in fiscal 1994) to address the deterioration of water quality of the existing water resources and the construction of a water hardness reduction facility (in fiscal 2003) to lessen the hardness of underground water.

Since the commencement of its water supply services, various issues have been arising, such as a decreased water treatment capability due to operational changes and tightened management of water purification treatment in accordance with revisions to water quality criteria, aging of facilities, and the necessity of introducing disaster measures. In order to respond to these situational changes, the bureau initiated a facility improvement project at the Chatan Water Purification Plant in fiscal 2009, which is expected to be completed in fiscal 2020.

Main details of the facility improvement project at the Chatan Water Purification Plant

○ Improvement of the drainage basin and sludge basin:	Enhanced cleaning and drainage treatment capabilities of the sedimentation basin and the filtering basin
○ Improvement of the water pump:	Enhancement of the water supply capability for tap water and implementation of an anti-deterioration measures
○ Improvement of the sedimentation basin:	Enhancement of the treatment capability of the sedimentation basin and implementation of an anti-earthquake measures
○ Review of the flow of water purification treatment:	Introduction of a more efficient method for water treatment

*The items described above are just a part of the project, which is intended to improve the overall facilities of the Chatan Water Purification Plant.

After the improvement of sedimentation basin

The status of construction work at the high-voltage electricity ward

Facility improvement project at the Nago Water Purification Plant

The Nago Water Purification Plant commenced its operation in fiscal 1975 as a core water purification site that supplies tap water to the northern region of the main island of Okinawa.

After more than 40 years of operation, various issues have arisen, such as deterioration of machinery and electric equipment, as well as the need for earthquake-resistant measures.

Along with the improvement project, the bureau plans to expand facilities to respond to future water demands or renew them in order to address such issues as deteriorating water quality of existing water sources.

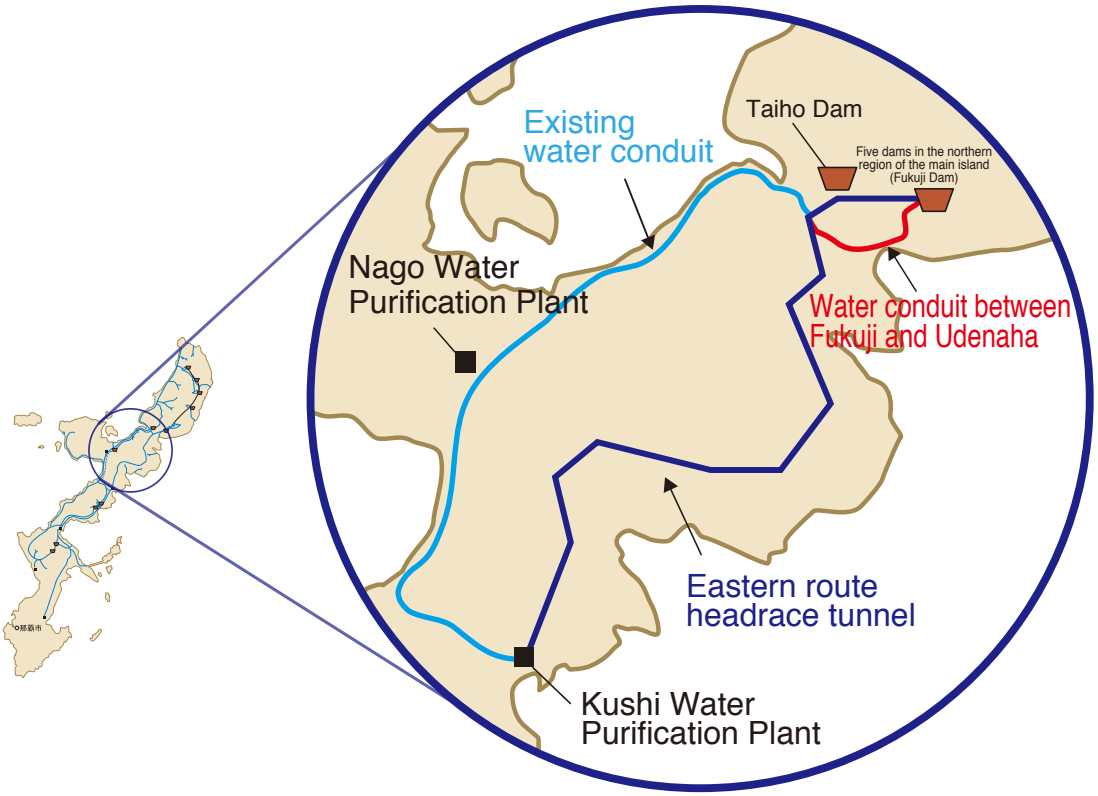
Main details of the facility improvement project at the Nago Water Purification Plant

- ○ Development of an activated carbon treatment facility to lessen mold odor
- ○ Updating electrical equipment and machinery
- ○ Facility expansion of the sedimentation basin and filter basin

Development of an activated carbon treatment facility (newly constructed)

Renovation project of the eastern route headrace tunnel

Total length of extension: approximately 27,500 meters (between the Fukuji inverted siphon and Kushi combination well)



The headrace tunnel was constructed from 1972 to 1975 with the aim of supplying raw water collected from five dams, including the Fukuji Dam in the northern region of the main island, to the Kushi Water Purification Plant for processing into tap water. The headrace tunnel supplies approximately 50% of the total raw water that is used by the bureau to produce tap water.

Since more than 40 years have passed after its construction and there was an increasing need for addressing the deterioration of the headrace tunnel, the bureau launched a project in fiscal 2016 to reinforce the interior surface of the tunnel.

Moreover, because a sufficient amount of water needs to be secured from water sources via a different route during the renovation of the headrace tunnel, another project is currently ongoing to improve the water conduit between Fukuji and Udenaha, so raw water collected from the five dams in the northern region will be delivered by a roundabout route along the western coast of the main island.

Interior surface of the eastern route headrace tunnel

Inspection survey of the interior surface of the eastern route headrace tunnel

Construction of the water conduit between Fukuji and Udenaha

In Pursuit of Improved Water Services in the Prefecture

Water supply expansion project

Since a majority of the private water-supply systems used on small remote islands of Okinawa Prefecture are managed by fragile entities in terms of the management base and technology platform, it is difficult for them to continue providing a stable supply of tap water. Particularly in private water-supply systems located on the outlying islands near the main island of Okinawa, a series of problems have surfaced, such as aggravated quality of water sources, water supply restrictions due to drought, more expensive water bills than the main island, and chronic deficit operations, resulting in regional discrepancies in water supply services in terms of the quality, quantity, and cost. These issues require an urgent response.

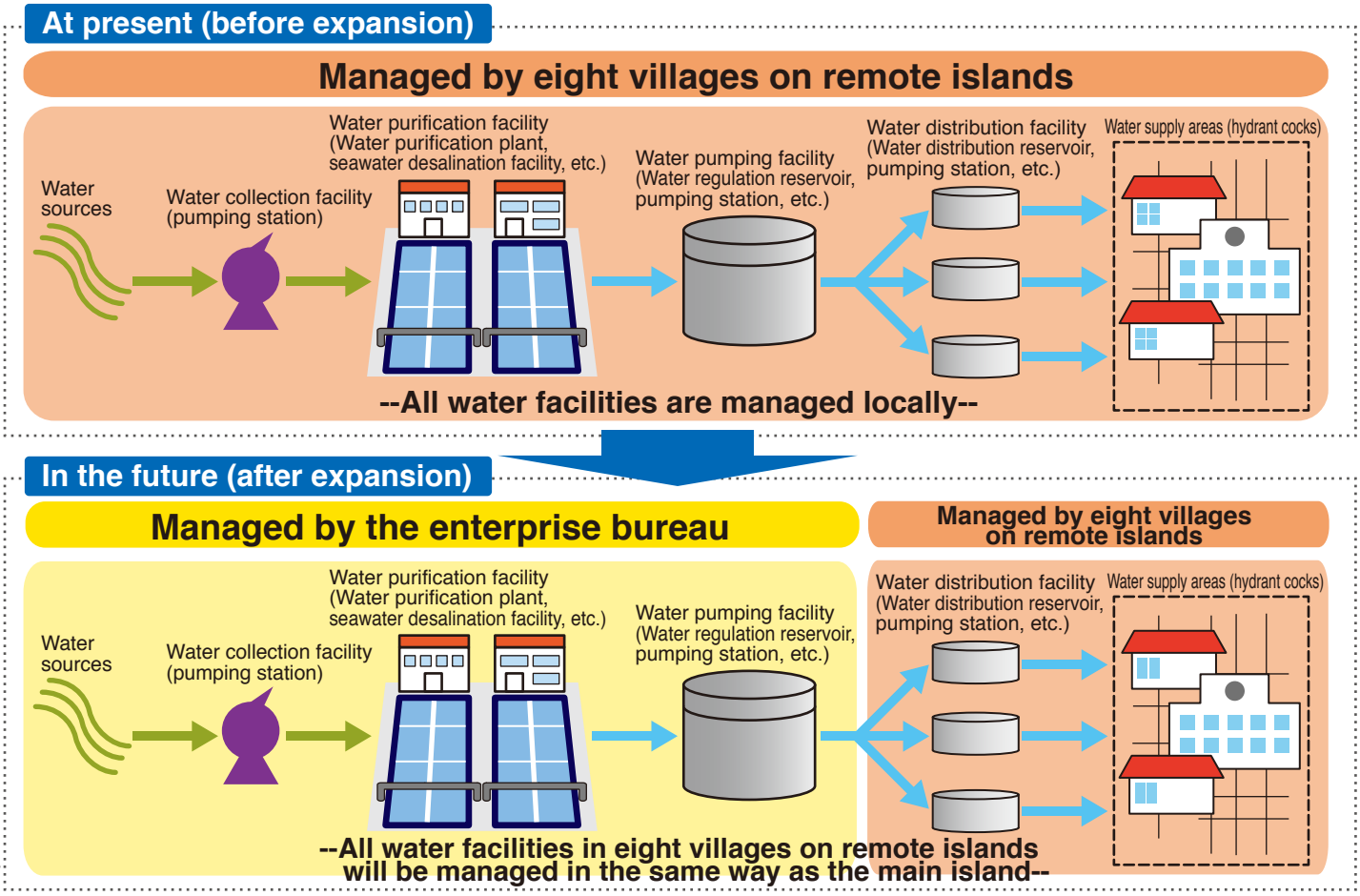
While the Okinawa Prefectural Government is determined to ensure universal services in the infrastructure of living environments in order to improve conditions for permanent settlement on remote islands, the Okinawa Prefectural Enterprise Bureau decided to facilitate a water-system expansion project in which tap water supply enterprise business would be deployed in eight villages (Aguni, Tonaki, Minami-Daito, Kita-Daito, Tokashiki, Zamami, Iheya and Izena) on outlying islands near the main island of Okinawa in order to improve water supply services there. With the completion of the project, water collection from water sources, water purification treatment and water distribution will be carried out under the responsibility of the bureau, while water distribution and water supply, the remaining two steps of water systems in the eight villages, will be managed by each village.

To implement the water system expansion project, the prefectural government received approval for an 11th change in the tap water supply services in Okinawa Prefecture from the Health, Labour and Welfare Minister in fiscal 2015, and revised the ordinance on the establishment of public enterprises in Okinawa Prefecture. Both of these items were required to change a water supply service plan, and initiated the construction of facilities and equipment in fiscal 2016. Tap water supply is expected to start with a phased approach from some villages where the development of facilities is completed, with fiscal 2021 being the projected date for finishing the expansion project in all eight villages.

In the development of facilities, the bureau has been doing its utmost to produce innovative ideas for promoting a stable supply of safe tap water. These ideas would be customized to address issues peculiar to remote islands, such as by attempting to reduce the costs through the continuous usage of existing facilities whose condition is relatively good, and the introduction of the concept of generalization and standardization to newly constructed facilities for rapid recovery with regard to disaster management.

It should be noted that in other regions in addition to the eight villages on remote islands near the main island of Okinawa, the bureau has been extending a wide range of technical support, including a proposal on the current water purification treatment method and advice on the planning of business projects, by making use of the bureau's extensive know-how and experience.

Image of expansion of water supply service



Environmental Conservation Approaches

The tap water and industrial water supply services that the bureau provides, with the main objective being to deliver a stable supply of safe and good-tasting water, are actions made possible by the gifts provided from our natural surroundings, thus they should be closely aligned with the natural environment of the Earth.

Nonetheless, providing a stable supply of water requires a tremendous amount of energy. In the current situation, a lot of electricity is consumed to power pumps in order to deliver water over the long distance on the main island of Okinawa, where water sources are located far away from consumption destinations.

In order to reduce the environmental impact, the bureau has implemented a wide variety of eco-friendly management approaches. Furthermore, the bureau is also promoting other activities by deeming “environmentally friendly management” as one of the driving measures in its 9th management plan.

Environmental preservation of water resources

Since rivers house a variety of life, the bureau has made efforts to preserve the fluvial environment by cleaning the surrounding areas of water collection pumps, promoting installment and renovation of fishways and performing monitoring surveys of the fishways. In addition, the bureau takes its own measures to preserve the aqueous environment of water resources, such as by the removal of earth and sand accumulated in the intake weirs, clearance of intrusive vegetation and driftwood from the water surface of dams and rivers, and maintenance of the water quality of water resources, in order to efficiently manage the rivers from which water is collected and to protect the natural environment of the water source sites.


Fishways in rivers

Effective use of resources

Since fiscal 1992, the bureau has promoted the effective use of soil displaced in the course of water treatment at water treatment plants by selling this soil as raw material for playgrounds and garden soil.

Moreover, the bureau has also been making efforts to facilitate the active utilization of used products and by-products by selling the pellets generated in the process of water hardness reduction, the granular activated carbons used in the advanced water purification processes, and the reverse osmosis membranes used in seawater desalination facilities.

Furthermore, the bureau is promoting recycling of construction byproducts to lessen the environmental impact.


Soil for playgrounds

Effective utilization of renewable energy

In the Nishihara Water Purification Plant and the Ishikawa Water Purification Plant, we have introduced a small-sized hydroelectric power generation system which can produce electricity with a relatively small volume of water and a small difference in water level. Both plants use the electricity generated from the system, which contributes greatly to the reduction of carbon dioxide emission and electricity costs.


Small-sized hydroelectric power generation systems

Masctos of the enterprise bureau

SUIDOUMAN

Suido-man was created for the purpose of boosting the image of the water system in Okinawa Prefecture.

As his main job is to make the daily rounds and inspect facilities, he always wears a helmet.

MIZZY

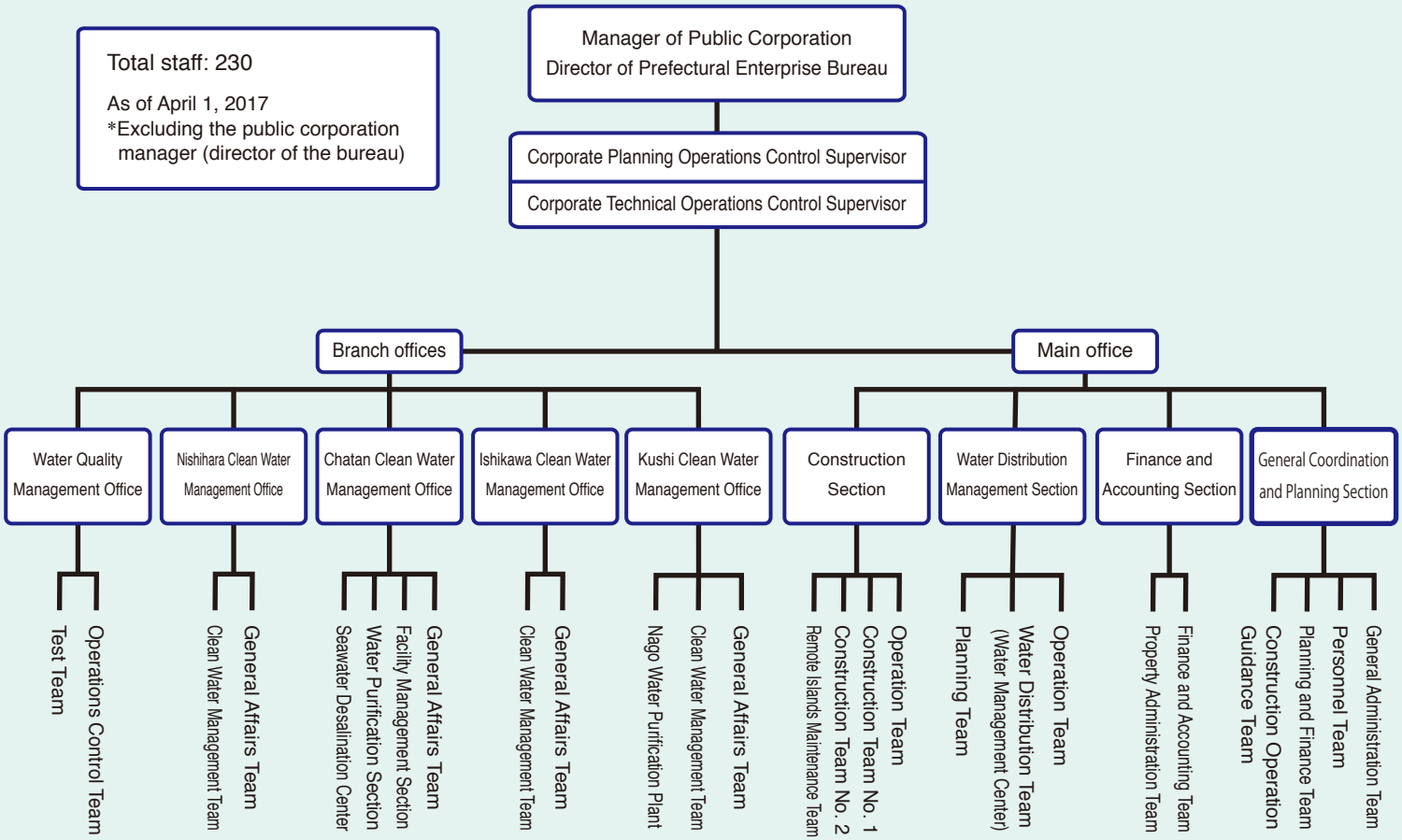
Mizzy is a new character created at the time of the revamping of our website.

As a friend of Suidouman, her task is to explain, mainly to kids, how the water system works in Okinawa.

Organizational Chart of the Enterprise Bureau

Total staff: 230

As of April 1, 2017
*Excluding the public corporation manager (director of the bureau)



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Finance and Accounting Section	Same as above	098-866-2154	098-866-2805
Water Distribution Management Section (Water Management Center)	Same as above	098-866-2810	098-866-2811
Construction Section	Same as above	098-866-2814	098-861-5799
Kushi Clean Water Management Office (Kushi Water Purification Plant)	〒905-2173 1100 Aza-Kushi, Nago	0980-55-2742	0980-55-2925
Nago Water Purification Plant	〒905-0019 3-28-36 Okita, Nago	0980-53-2633	0980-52-6214
Ishikawa Clean Water Management Office (Ishikawa Water Purification Plant)	〒904-1108 1 Ishikawa Higashi-Onnazaki, Uruma (2nd floor)	098-964-3257	098-963-0173
Chatan Clean Water Management Office (Chatan Water Purification Plant)	〒904-0113 1-27 Aza-Miyagi, Chatan-cho	098-936-7796	098-926-1591
Seawater Desalination Center	Same as above	098-936-5257	098-936-5276
Nishihara Clean Water Management Office (Nishihara Water Purification Plant)	〒903-0103 1336 Onaha, Nishihara-cho	098-945-4404	098-945-4455
Water Quality Management Office	〒904-1108 1 Ishikawa Higashi-Onnazaki, Uruma (1st floor)	098-989-1012	098-989-1013

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