



# Sustainable Air-Conditioning and Water Heating/Cooling Systems of Seaside Commercial Buildings Using Seawater



## Sustainable Development Goals Addressed



**Organization, Institution or Company**

The Victoria and Albert Waterfront (V&A) is jointly owned by Growthpoint Properties Limited and the Government Employees Pension Fund (GEPF), represented by the Public Investment Corporation Limited (PIC).

**Location of project site, Country**

Cape Town, South Africa

**Brief narrative description of objective/project/activity/initiative**

The Victoria and Alfred Waterfront along the old harbor of Cape Town is one of South Africa's most visited destinations. It attracts some 24 million people every year. The V&A Waterfront is a 123-hectare mixed-use residential and commercial property development which caters to both local and international visitors. It includes hotels, retail districts, and extensive dining, leisure and entertainment facilities, as well as several heritage sites and tourism landmarks. The area includes the recently opened Zeitz Museum of Contemporary Art Africa (MOCAA) and the newly upgraded Cape Town Cruise Terminal.



Enhancing sustainability is an important goal at V&A Waterfront. International and national experts were commissioned to design and build a seawater district heating and cooling system for several commercial buildings, including the Museum, hotels and luxury apartment and office buildings. The innovative air and water cooling and heating system uses the seawater of the Atlantic Ocean as heat source and heat sink. During hot summer months, pre-cooled water is created by pumping filtered sea water through plate heat exchangers to a primary pre-cooling water circuit. This water is then pumped on to the various buildings. Separate buildings use their own secondary pumps to pump the pre-cooled water to pre-cooling coils in the air-handling units. High efficiency variable speed and variable flow chillers are used to produce chilled water. The chillers can also produce hot

water for winter heating and pre-heated domestic water for washing. Some chillers are designed to produce both chilled and hot water simultaneously. This results in significant electrical savings when both hot and chilled water are required.

**Economic, environmental and climate benefits, challenges and lessons learned**

Seawater-based cooling and heating systems may be costly in their installation. However, overall operational costs are comparatively low and fossil fuel-based energy otherwise needed for cooling or heating can be saved by using heat exchangers, condensers, and chillers. Seawater cooling/heating systems vary in their designs. They use seawater either in open loop or refrigerants in closed loop systems. Seawater can serve as heat source and/or heat sink.

Three quarters of the world's megacities are located at or near the seaside. Greater use of seawater for cooling and/or heating of buildings can greatly help reduce GHG emissions. Other projects using seawater for heating or cooling of seaside commercial or residential buildings are in operation in Denmark, Hong Kong (China), Singapore, Sweden, Hawaii (United States), and several of the countries in the Caribbean.

**Additional information: website addresses and contacts**

Sources: Information on V&A Waterfront: [https://www.waterfront.co.za/wp-content/uploads/2019/08/1804460\\_VA-\\_-EIS-Booklet-2018\\_Digital\\_Final-1.pdf](https://www.waterfront.co.za/wp-content/uploads/2019/08/1804460_VA-_-EIS-Booklet-2018_Digital_Final-1.pdf)

Information on seawater-based cooling and heating systems: <http://www.improvair.co.za/index.php/2015/12/13/new-district-cooling-plant-for-va-waterfront-silos/>

*Photo of Aerial View of Cape Town by V&A Office of Tourism Office*