

Zero Emission Neighbourhoods Case Study Dongtan, China

An eco-city showcasing sustainable urban development

Summary

Project benefits

Energy consumption savings per annum	66%
Load supplied by renewable energy	100%
Recycled solid waste	up to 80%
Transport system	pollution free fuel cell and other zero carbon technologies

Location

Dongtan Eco-City will be located 15km north of Shanghai on the eastern tip of Chongming Island, China's third largest island, at the mouth of the Yangtze River.

Overall size

Dongtan Eco-City will be developed on approximately 8,600 hectares of land which is adjacent to a wetland of global importance.

Residential

Dongtan Eco-City is expected to house around 500,000 residents upon completion in 2040.

Commercial

Dongtan Eco-City will be made up of low rise, mixed use residential, commercial and retail areas.

Project partners

Shanghai Industrial Investment Corporation and Arup International.

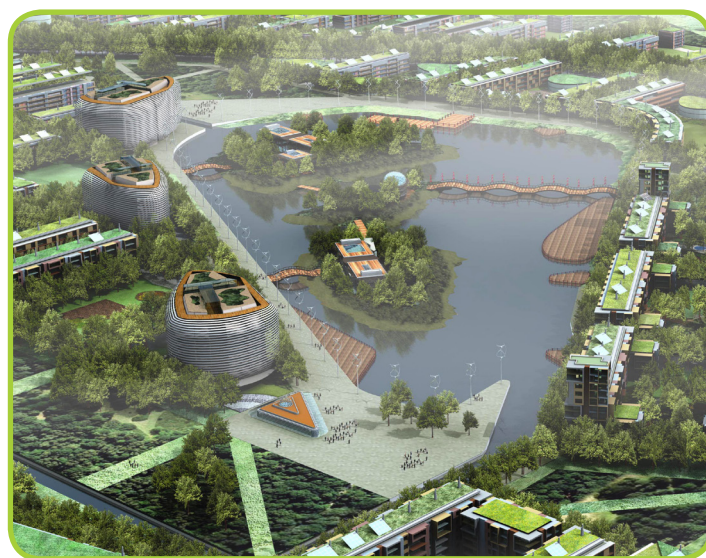
Project status

Dongtan Eco-City is a long term development with completion set for 2040. Dongtan is expected to have 20,000 inhabitants by 2010, up to 80,000 inhabitants by 2020 and 500,000 inhabitants by 2040.

What is it?

Dongtan Eco-City is an ambitious and innovative new development with the potential to showcase advanced sustainable technology and new modes of urban development and living to the world. Dongtan aims to be the world's first sustainable city with zero greenhouse gas emissions. China decided to embark on this revolutionary project when faced with a rise in city population and an increase in environmental pressures. In August 2005 the Shanghai Industrial Investment Corporation contracted Arup International, a British-based engineering consultancy, to design the world's first eco-city.

The vision of Dongtan is to create a city with an ecologically sensitive design that provides modern living conditions for up to 500,000 people. Dongtan has been designed to function so that the elements of organic waste, biomass, water and energy technology work with building design and urban layout to create an ecologically progressive development.



Above Artist's impression of Dongtan eco-city, designed by Arup
Credit Arup



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Credit Arup

Energy conservation

Energy efficiency

Dongtan Eco-City acknowledges the mounting environmental pressures and rising utility costs that are changing the designs and infrastructure of urban developments. Dongtan will utilise energy efficient design and technology to provide electrical security and a reduction in overall energy consumption.

Orientation

Further reductions in energy consumption will be achieved by understanding the microclimates created by urban development and utilising the buildings' orientation. Double glazed windows will be installed in buildings, particularly in the north facing buildings where glazing will reduce cooling requirements.

Dongtan aims to reduce annual energy consumption by 66% when compared with standard new buildings in Shanghai.

Renewable energy supply

The main energy system at Dongtan will be powered by solar panels, wind turbines and the burning of biomass, which collectively will produce 100% of electricity for the city. An 'Energy Centre' will manage the distribution and incoming energy from the energy production sources and should produce a higher level of energy efficiency.

Solar

Most buildings will have photovoltaic solar panels attached to the roof that capture the energy from the sun. The heat captured can be used to generate electricity and heat the buildings' hot water.

Wind

A range of wind turbines will be used to produce electricity that is expected to contribute to at least 20% of Dongtan's energy needs.

A wind farm will be located on the outskirts of the city where large wind turbines, powered by the sea breeze, will produce energy for Dongtan. Further energy will be produced from smaller wind turbines placed along the roadside and fitted to each building.

Waste to energy

Dongtan aims to produce a large portion of its electricity through biomass energy production, a system that converts organic waste into fuel. Rice husks, which are plentiful in China and usually discarded as waste, and organic waste will undergo thermochemical gasification – which means they will be collected and incinerated in large burners and turned into gas. The resulting product will then fuel the engines of Dongtan's heat and power generator, where clean electrical energy and heat is produced. This system will provide heating, hot water and power for much of Dongtan and help reduce greenhouse gas emissions.

The biomass, solar and wind energy will help provide energy efficiency at Dongtan and provide residents and businesses a further reduction in operation and maintenance costs.

Pollution free transport system

Dongtan Eco-City will be linked by a network of pedestrian walkways.

Only zero-carbon vehicles will be allowed to drive within the city and an intranet service will connect people who want to share a car and forecast travel times.

Pollution-free buses, trams or water taxis, powered by fuel-cells or other zero-carbon technologies will run between neighbourhoods.

Traditional motorbikes will be forbidden, replaced by electric scooters or bicycles.

Local economy

The city will be socially, environmentally and financially sustainable. Currently there is a population of around 500,000 people in and around the district of Chongming. A majority of this population already travels to Shanghai for employment and recreational activities. To ensure that it is not dependant on Shanghai, Dongtan will have a diverse population with affordable housing, schools, hospitals, and outer agricultural districts providing job security. Consultants have anticipated strong economic growth and employment opportunities in eco-industries including education. Eco-industry, waste management, wind and solar technology, will be a major component of Dongtan's economy, generating job opportunities and financial security.

Along with employment opportunities for the local community, Dongtan will act as a template for sustainable energy technologies, and food research and production that can be sold worldwide for future developments.

The creative design of Dongtan will contribute to the populations' well being with efficient public transport cutting commuting time and costs, and a variety of wetland and green areas in close proximity to all areas of the city.

Dongtan will benefit the broader communities by supporting local product innovation where possible and using locally sourced products and labour for the manufacturing of materials and overall construction.

Environmental achievement

Dongtan Eco-City has attracted wide spread media attention for its eco-friendly design and technological approach to carbon neutrality. Conceptualised as a zero waste city, Dongtan aims to turn waste products into fuel for continual sustainability.

Developers are committed to returning the agricultural land around the city to its original wetland habitat. Farmland will be created outside of the city where food will be grown for the residents of the city. Organic waste produced by the city will be composted and returned to the farmland to assist in soil fertility and continual agricultural production. Water will be collected, treated and recycled within Dongtan and then used to irrigate surrounding farmland. Up to 80% of solid waste will be recycled, helping to contribute to the biomass energy produced to power the city.

A new program called the Resources and Energy Analysis Program will measure the resources consumed by the Dongtan inhabitants and measure it against the environment and land needed to counteract the demand. The eco-friendly design of Dongtan has already been praised worldwide and looks set to achieve a sustainable ecological footprint.

Further information

www.nycclimatesummit.com/casestudies/building/build_dongtan.pdf

www.arup.com/eastasia/project

www.arup.com/planningpolicyandeconomics/project.cfm?pageid=11409

www.arup.com/integratedurbanism/project.cfm?pageid=8020

www.wbcscd.org/plugins/DocSearch/details.asp