



## **Tangshan Nanhu Eco-City Central Park – Tangshan City, China**

### **Methodology for Landscape Performance Benefits**

#### **Prepared by:**

Department of Landscape Architecture and Urban Planning, Texas A&M University

Research Fellow: Ming-Han Li, PhD, PLA, PE

Research Fellow: Bruce Dvorak, PLA

Research Assistant: Yi Luo, PLA, PhD Student

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#### **Environmental**

**Sequesters an estimated 2,828 metric tons (6,233,946 lbs) of CO<sub>2</sub> annually in the trees of the park, equivalent to removing 555 passenger vehicles from the road each year.**

- 1) According to the plant list provided by the designer of the park, 623,144 trees and shrubs were planted in the park, including more than 45 tree species and 42 shrub species. Carbon sequestration was calculated using the National Tree Benefits Calculator ([treebenefits.com](http://treebenefits.com), accessed on July 5<sup>th</sup>, 2012 by Yi Luo). Because the calculator has not been extended to areas outside the U.S., the South Zone was selected for calculation because of its similar climate condition with Tangshan. The result shows that 2,828 metric tons (6,233,946 lbs) of CO<sub>2</sub> can be sequestered in trees of the park, in which 158 metric tons (348,454 lbs) and 2,670 metric tons (5,885,492 lbs) are sequestered by evergreen and deciduous trees, respectively.
- 2) According to EPA, on average, a passenger vehicle emits approximately 5.1 tons of CO<sub>2</sub> per year.  
$$2828 \div 5.1 = 555 \text{ vehicles}$$

#### **Sources**

Beijing Tsinghua Urban Planning & Design Institute

National Tree Benefit Calculator <http://www.treebenefits.com/calculator/>

EPA <http://www.epa.gov/cleanenergy/energy-resources/refs.html>

**Provides habitats for 6 fish, 4 reptile, 3 amphibian, 2 mammal, and 81 bird species observed on the site. Of these, 7 are nationally-protected wildlife species.**

- 1) According to the research of “Biodiversity and Eco-planning of Tangshan Nanhu Wetland Park” (Cheng et al., 2010, Chinese Forestry Press), 6 fish species, 4 reptile species, 3 amphibians species, 2 mammal species, and 81 bird species were observed in the Nanhu Park. Of all the observed animals, 7 species are national second-class protected wildlife, including whooper swan,

northern harrier, common buzzard, common kestrel, red-footed falcon, Eurasian scops owl, and long-eared owl, and 81 species are of high economic and research values. Animals and plants receiving “first-class” protection are those which are endemic, rare, precious or threatened. Those receiving “second-class” protection are species whose numbers are declining or whose geographical distribution is becoming more restricted.

#### Source

Cheng, K.W., Zhang, T.M., Liu, J.W., 2010. Biodiversity and Eco-planning of Tangshan Nanhu Wetland Park (唐山南湖湿地公园生物多样性及生态规划). Chinese Forestry Press, Beijing, China.

**Reduces potable water consumption by 29,200,000 cubic meters (7.7 billion gallons) annually, equivalent to 11,680 Olympic-sized swimming pools, by importing reclaimed water from a nearby sewage treatment plant. The reclaimed water is further treated in a series of constructed wetlands and used for water body recharge and irrigation in the park, saving about \$15.4 million per year.**

- 1) The south lake receives about 80,000 m<sup>3</sup> reclaimed water daily discharged by a water treatment plant into a series of constructed wetlands. Hence, the reclaimed water use replaces the potable water use by 29,200,000 m<sup>3</sup> annually.

$$80,000 \text{ m}^3 \times 365 = 29,200,000 \text{ m}^3$$

- 2) A typical Olympic swimming pool is 50-meter long, 25-meter wide, and 2 meter deep.

$$50 * 25 * 2 = 2500 \text{ m}^3$$

$$29200000 \div 2,500 = 11,680 \text{ swimming pools}$$

- 3) The unit price of potable water in Tangshan is \$0.527/m<sup>3</sup>, so the cost saved by using reclaimed water is \$15,387,086 per year.

$$0.527 \times 29,200,000 = \$15,387,086 \text{ per year}$$

#### Source

Beijing Tsinghua Urban Planning & Design Institute

Tangshan Water Company <http://www.tszls.cn/page/tszzjg/index.php>

#### **Social**

**Provides park access for the 10,000 nearby residents within a 15 minute walking distance**

- 1) According to Guolin Zhao, the chief of the Nanhu Eco-City Administrative Board, the number of residents within 1 km of the park is about 10,000. The average speed of walking is about 5 km/hour, so the walking time to the park is about 12 minutes.

#### Source

Guolin Zhao, Chief of Nanhu Eco-City Administrative Board

### Economic

#### **Saved \$47,160,000 in material costs by reusing 6 million cubic meters of coal ash to produce foundations and bricks used in park construction.**

- 1) According to the designer, about 6,000,000 m<sup>3</sup> coal ash had been reused to solve the settling problem and produce bricks for the park use. If coal ash was not reused, 6 million cubic meters of earth would be needed to make bricks and mitigate settling problem. The typical price for earth in Tangshan is about \$7.86/m<sup>3</sup>, so the cost saved is about \$47,160,000.

$$7.86 \times 6000000 = \$47,160,000$$

#### Source

Beijing Tsinghua Urban Planning & Design Institute

#### **Saved \$369,000 in construction costs by recycling 133,820 trunks of dead trees to form an embankment structure to prevent erosion along the lakeshore.**

The average diameter of the reused trunks is about 0.135 m, average length is about 1.75 m, and the number of trunks reused is 133,820. So the total plant material reused is 3,352 m<sup>3</sup>.

$$(0.135/2)^2 \times \pi \times 1.75 \times 133,820 = 3,352 \text{ m}^3$$

- 1) The unit price for timber is about \$110/m<sup>3</sup>, so the cost saved is \$369,089.

$$110 \times 3,352 = \$369,088.72$$

#### Sources

Beijing Tsinghua Urban Planning & Design Institute

China Timber Network, <http://www.wood168.com/>

#### **Produces \$157,300 revenue annually from recreational and facility rental fees.**

According to Guolin Zhao, the chief of the Nanhu Eco-City Administrative Board, chargeable recreational facilities in the Nanhu Park can generate an average annual revenue of about \$157,300.

#### Source

Guolin Zhao, Chief of Nanhu Eco-City Administrative Board

### Cost Comparison Methods

**The park's lakes need to be recharged regularly to maintain the water level. Reclaimed water from a nearby waste water treatment plant is used to do this, supplying 29,2 million cubic meters (7.7 billion gallons) annually. If an equivalent amount of potable water were used instead, the cost would be \$15.4 million per year.**

As calculated in landscape performance benefit above.

**About 6 million cubic meters of coal ash was reused to form foundations and make bricks used in park construction. If coal ash had not been reused, earth would have been purchased instead, which would have cost about \$47,160,000.**

As calculated in landscape performance benefit above.

**Instead of purchasing new timber materials, the designers proposed the reuse of 133,820 trunks of dead trees to form an embankment structure along the lakeshore to prevent water erosion, saving about \$369,089. How about: The trunks of 133,820 dead trees were used to form an embankment structure along the lakeshore to prevent shoreline erosion. If an equivalent amount of timber had to be purchased, the cost would be \$369,000.**

As calculated in landscape performance benefit above.