

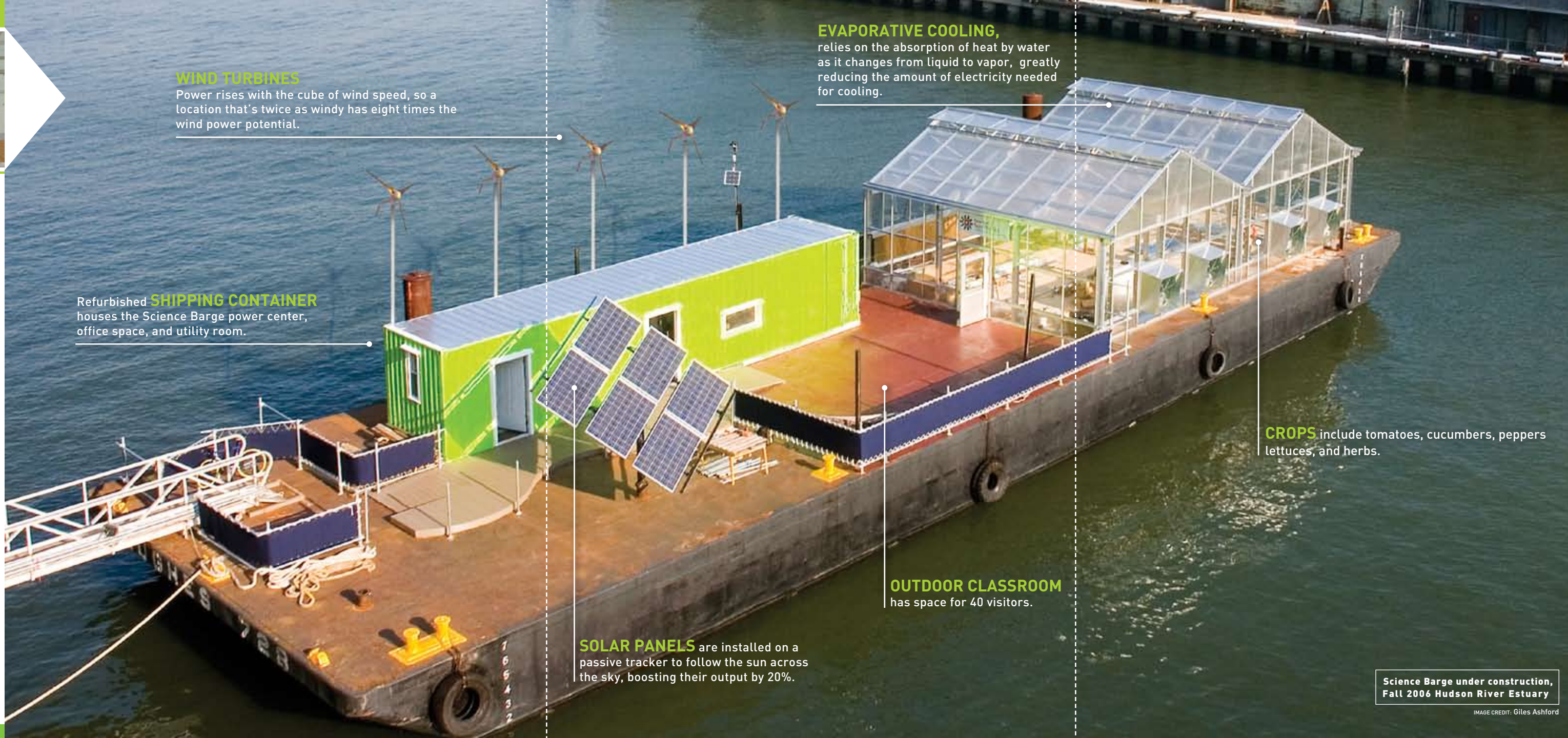


WELCOME TO

THE SCIENCE BARGE

- ▶ **The Science Barge** is a sustainable urban farm designed by New York Sun Works, an environmental nonprofit organization. The Science Barge tours New York City's public waterfront parks, offering sustainability education programs to wide audiences.
- ▶ **Relying on sunlight**, wind, and efficient design, the Science Barge produces food using a fraction of the resources consumed in conventional agriculture, with greatly reduced emissions of carbon dioxide and other pollutants.
- ▶ **The goal of the Science Barge** is to stimulate the sustainable development of New York City. A city that can generate its own power, grow its own food, and recycle its own wastewater helps secure our common future and sets the standard for other cities around the world.

Visit www.sciencebarge.org



WIND TURBINES

Power rises with the cube of wind speed, so a location that's twice as windy has eight times the wind power potential.

Refurbished **SHIPPING CONTAINER** houses the Science Barge power center, office space, and utility room.

EVAPORATIVE COOLING,

relies on the absorption of heat by water as it changes from liquid to vapor, greatly reducing the amount of electricity needed for cooling.

CROPS include tomatoes, cucumbers, peppers, lettuces, and herbs.

OUTDOOR CLASSROOM

has space for 40 visitors.

SOLAR PANELS are installed on a passive tracker to follow the sun across the sky, boosting their output by 20%.

Science Barge under construction, Fall 2006 Hudson River Estuary

IMAGE CREDIT: Giles Ashford

The **Cost** of a Tomato

...in terms of resource consumption rather than dollars. On the left, an average American tomato. On the right, a tomato grown using Science Barge methods.



▶ Average **American** Tomato



▶ **Science Barge** Tomato

CO₂ EMISSIONS →	3/4 lb.	none!
FRESH WATER →	8 gallons	2 gallons
LAND →	0.7 square feet	0.1 square feet
PESTICIDES →	300 mg	none!
FUEL →	1/2 ounce (diesel)	1/2 ounce (biodiesel)

Please see www.sciencebarge.org for details. All figures are approximate.

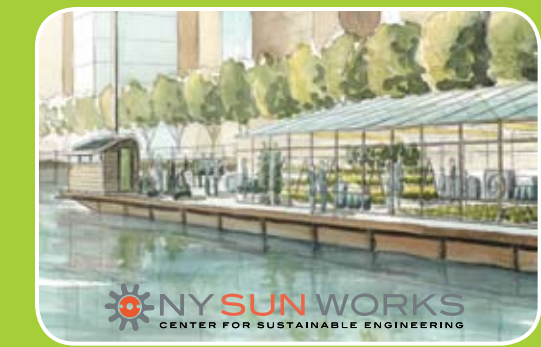


THE SCIENCE BARGE



BOARD OF DIRECTORS
 Daniel Arshack *Arshack & Hajek, PLLC*
 William H. Bohnett *Fulbright & Jaworski, LLP*
 Ted Caplow, Ph.D. *New York Sun Works*
 Ariane de Vienne *David J. Greene & Co.*
 Nicholas Eisenberger *GreenOrder*
 Christopher Maxey *The Island School*
 Vijay Modi, Ph.D. *Columbia University*

ADVISORY COMMITTEE
 Nada Assaf-Anid, Ph.D. *Manhattan College*
 Elliot Berman, Ph.D. *Solar Power Corporation*
 Frieda Bradlow *Manhattan Community Board 2*
 Andy Danylchuk, Ph.D. *Cape Eleuthera Institute*
 Dickson Despommier, Ph.D. *Columbia University*
 Strachan Donnelley, Ph.D. *Center for Humans & Nature*
 Tom Fox *New York Water Taxi*
 Ross Graham *Friends of Hudson River Park*
 Merle Jensen, Ph.D. *Department of Plant Sciences, University of Arizona*
 John Lipscomb *Riverkeeper, Inc.*
 Jeff Pertman *Bright Power, Inc.*
 Jean Preece *NY Windstar Connection*
 Megan Roberts *NYC Dept. of Education*
 Howard Resh, Ph.D. *Resh Hydroponic Services*
 David Sharps *The Waterfront Museum*
 Donald Sunderland *Education Executive*
 Stephen Sunderland *Optimal Spaces*
 Bill White *Intrepid Sea, Air & Space Museum*



Food

The Science Barge showcases hydroponic vegetable production, a form of greenhouse agriculture that offers strong environmental benefits:

CONSERVING LAND AND WATER
 Greenhouse hydroponic systems can reduce agricultural land and water use by a factor of five to ten. Hydroponic production is soil-free, maximizes vertical space, and makes it possible to recycle irrigation water.

REDUCING EMISSIONS
 Urban hydroponic systems minimize the farm-to-table distance, which translates into far lower fuel use for food transport. Local food means lower carbon, particulate, and nitrogen and sulfur oxide emissions.

ELIMINATING POLLUTANTS
 The modern agricultural sector relies on intensive use of fertilizers and pesticides, methods which contaminate lakes and rivers, degrade soil quality, and threaten biodiversity. The Science Barge greenhouse uses beneficial insects in place of pesticides. Fertilizer is contained for re-use.

Food Production on the Science Barge:

- ▶ Minimizes land and water use
- ▶ Replaces pesticides with beneficial insects
- ▶ Emits no waste stream
- ▶ Is protected from extreme weather



Water

Agriculture accounts for more than two-thirds of global fresh water consumption, which often exceeds natural replacement rates. The Science Barge conserves water in three ways:

RECIRCULATING HYDROPONICS
 In many watersheds, chemicals in agricultural runoff contaminate ground water, further constricting supply. No water is discharged from the Science Barge's urban farm...every drop is consumed in the greenhouse.

DESALINATION
 The Science Barge does not use the city's drinking water. Our reverse osmosis system converts small quantities of brackish river water to fresh water.

RAINWATER CATCHMENT
 The Science Barge catches rainwater for beneficial re-use, a water conservation technique with implications for a major urban challenge: the contamination of waterways through stormwater and sewage overflows.

Water conservation on the Science Barge

- ▶ Highly water-efficient food production
- ▶ No agricultural runoff
- ▶ Rainwater catchment on the greenhouse roof
- ▶ Desalination of water from New York Harbor



Energy

The three renewable energy technologies demonstrated on the Science Barge are of vital importance in reducing carbon emissions:

SOLAR
 The Science Barge uses photovoltaic panels to directly capture the sun's energy. Studies show that New York City has the potential to meet more than half its peak electricity demand using today's solar technology on existing buildings.¹

WIND
 The wind turbines selected for the Science Barge are appropriate for urban settings, where noise concerns and fluctuating winds are challenges. New York State has a very significant wind resource: 10 Gigawatts, enough to supply one-fifth of all the electricity used in the state. Only 3% of this resource has been developed to date.²

BIOFUELS
 The Science Barge runs a generator exclusively on biodiesel and waste vegetable oil, sharply reducing net carbon emissions. Biofuels can be made from agricultural and food industry byproducts. New York City restaurants generate enough waste oil to supply 10 million gallons of biodiesel fuel annually.³

The Science Barge renewable energy system:

- ▶ Solar arrays
- ▶ Wind turbine
- ▶ Biofueled generator
- ▶ Battery bank
- ▶ Power electronics
- ▶ Result: highly reliable green power supply with no CO₂ emissions.



¹ Urban Energy Policy Workshop, School of International and Public Affairs, Columbia University, May 2006.
² Alliance for Clean Energy New York, Jan 2007.
³ Cornell Cooperative Extension New York City, Oct 2005.