# ENVIRONMENTAL ECOLOGY – ECON 2505

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# WHAT DOES IT MEAN TO BE SUSTAINABLE?

1. *The ability to be sustained, supported, upheld, or confirmed.*
2. *Environmental Science. the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance: The committee is developing **sustainability** standards for products that use energy.*

www.dictionary.com/browse/sustainability

# HOW DO WE MEASURE SUSTAINABILITY?

## How is an Ecological Footprint calculated?

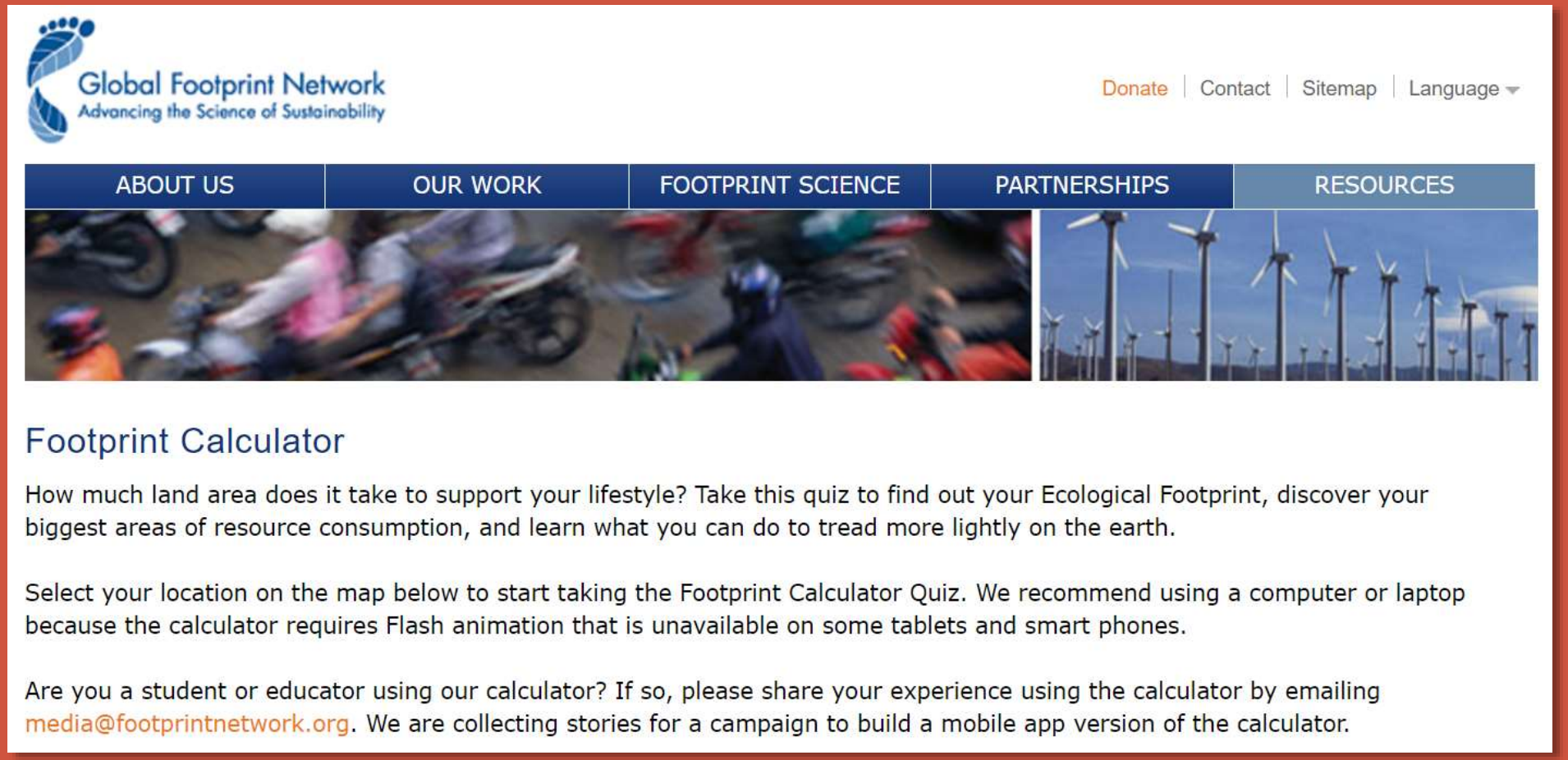
Ecological Footprints can be calculated for individuals, groups of people (such as a nation), and activities (such as manufacturing a product).

The Ecological Footprint of a person is calculated by considering all of the biological materials consumed and all of the carbon dioxide emissions generated by that person in a given year. All these materials and emissions are then individually translated into an equivalent number of global hectares.

www.footprintnetwork.org/en/index.php/GFN/page/frequently_asked_questions/#method1

# FOOTPRINT CALCULATOR

## WWW.FOOTPRINTNETWORK.ORG/EN/INDEX.PHP/GFN/PAGE/CALCULATORS/



# FOOTPRINT CALCULATOR

## SELECT YOUR LOCATION (USA)

- What is sustainability?
- Ecological Footprint
  - Location
  - Food
  - Home Habits
  - Your Home
  - Mobility
- A Sustainable City
- A Sustainable home – the Solar Decathlon
  - The competition
  - Definitions
  - Judging
  - DURA Concept
  - Wall Section
  - R Values
- Construction Photos
- Sustainable Challenge
- Story of Stuff

# FOOTPRINT CALCULATOR

## BEGIN CALCULATOR

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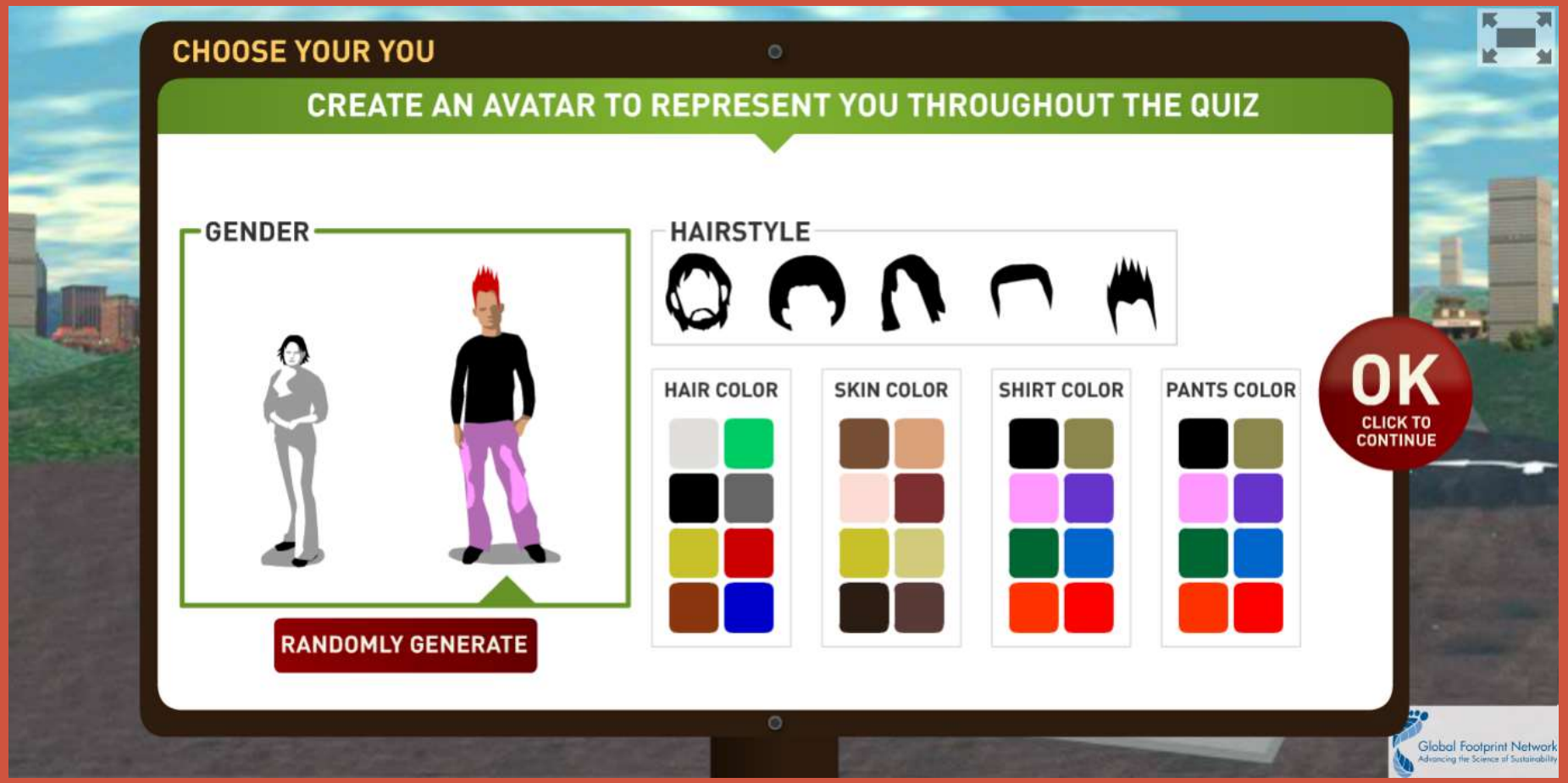
# FOOTPRINT CALCULATOR

## CREATE A NEW USER AVATAR



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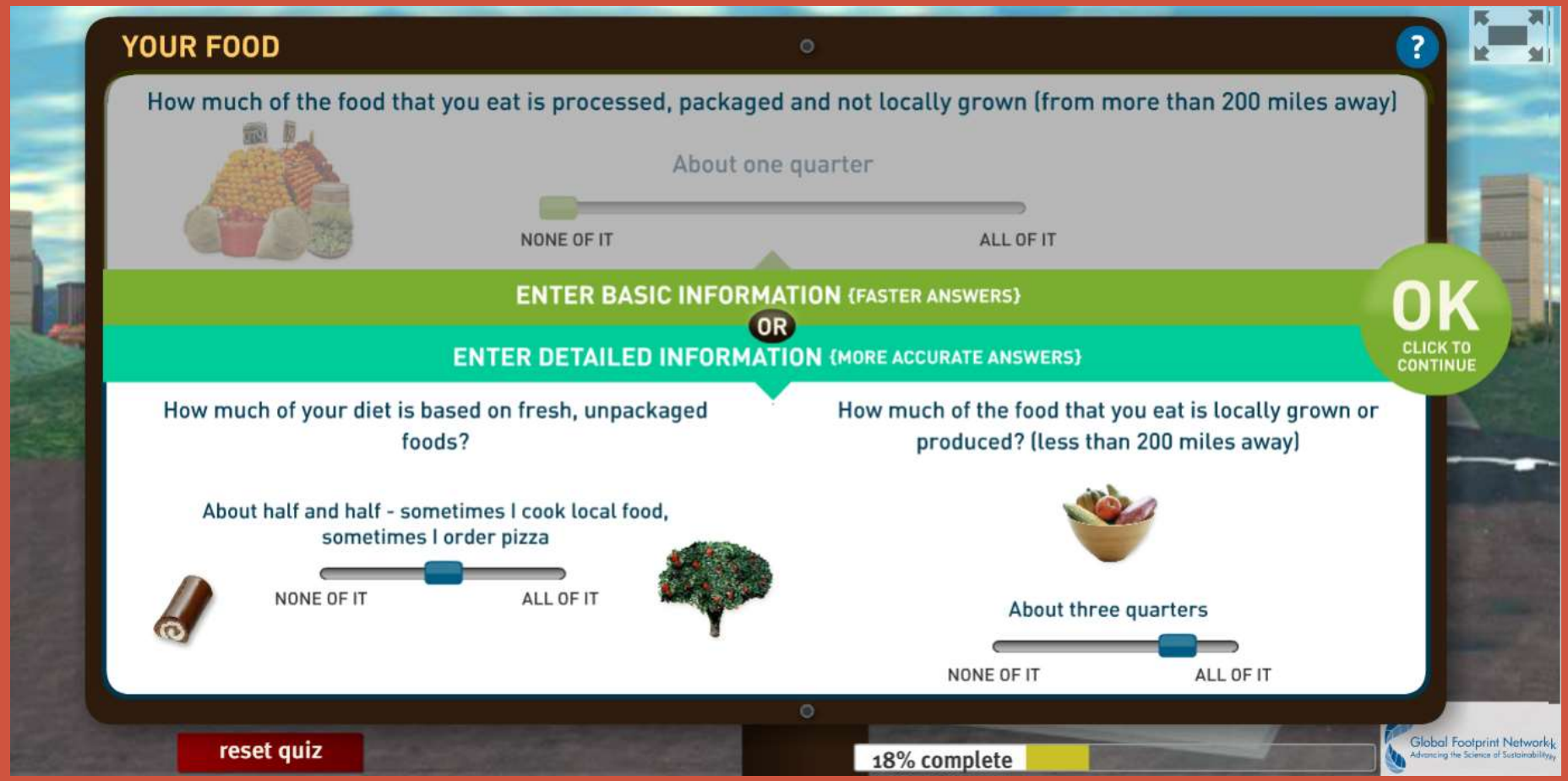
# FOOTPRINT CALCULATOR

## YOUR FOOD CONSUMPTION



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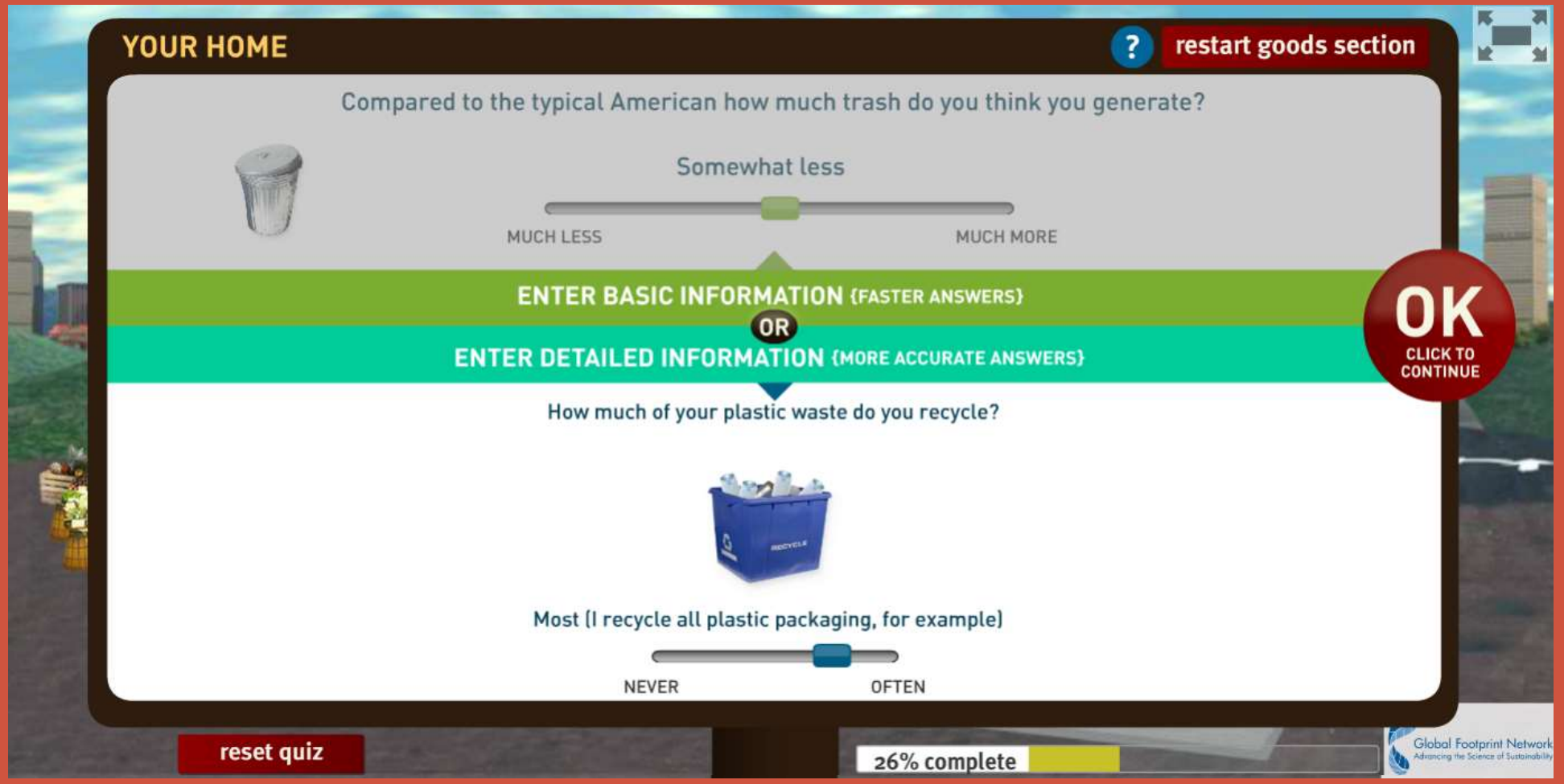
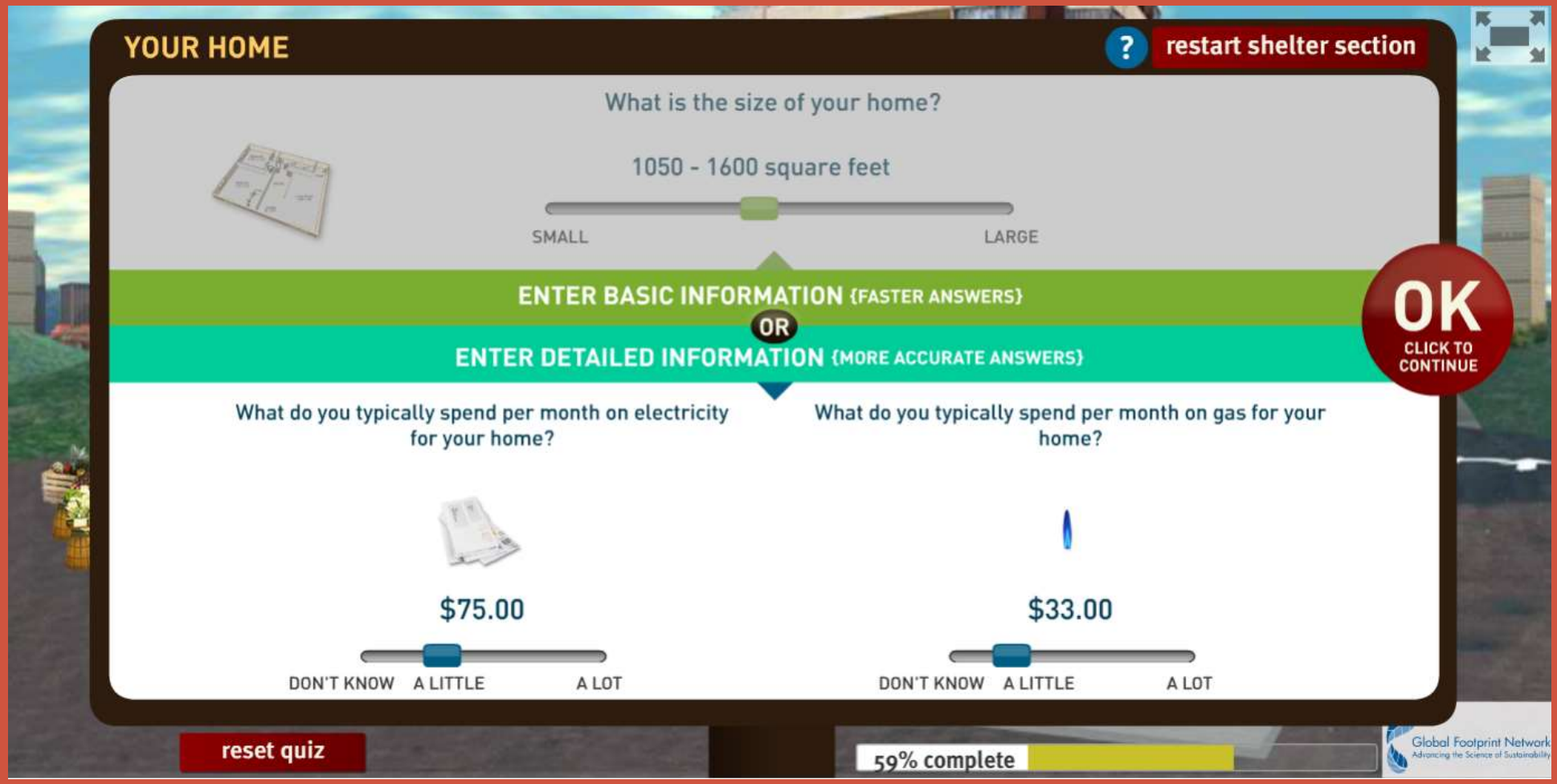
# FOOTPRINT CALCULATOR

## YOUR HOME HABITS



# FOOTPRINT CALCULATOR

## YOUR HOME



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- What is sustainability?
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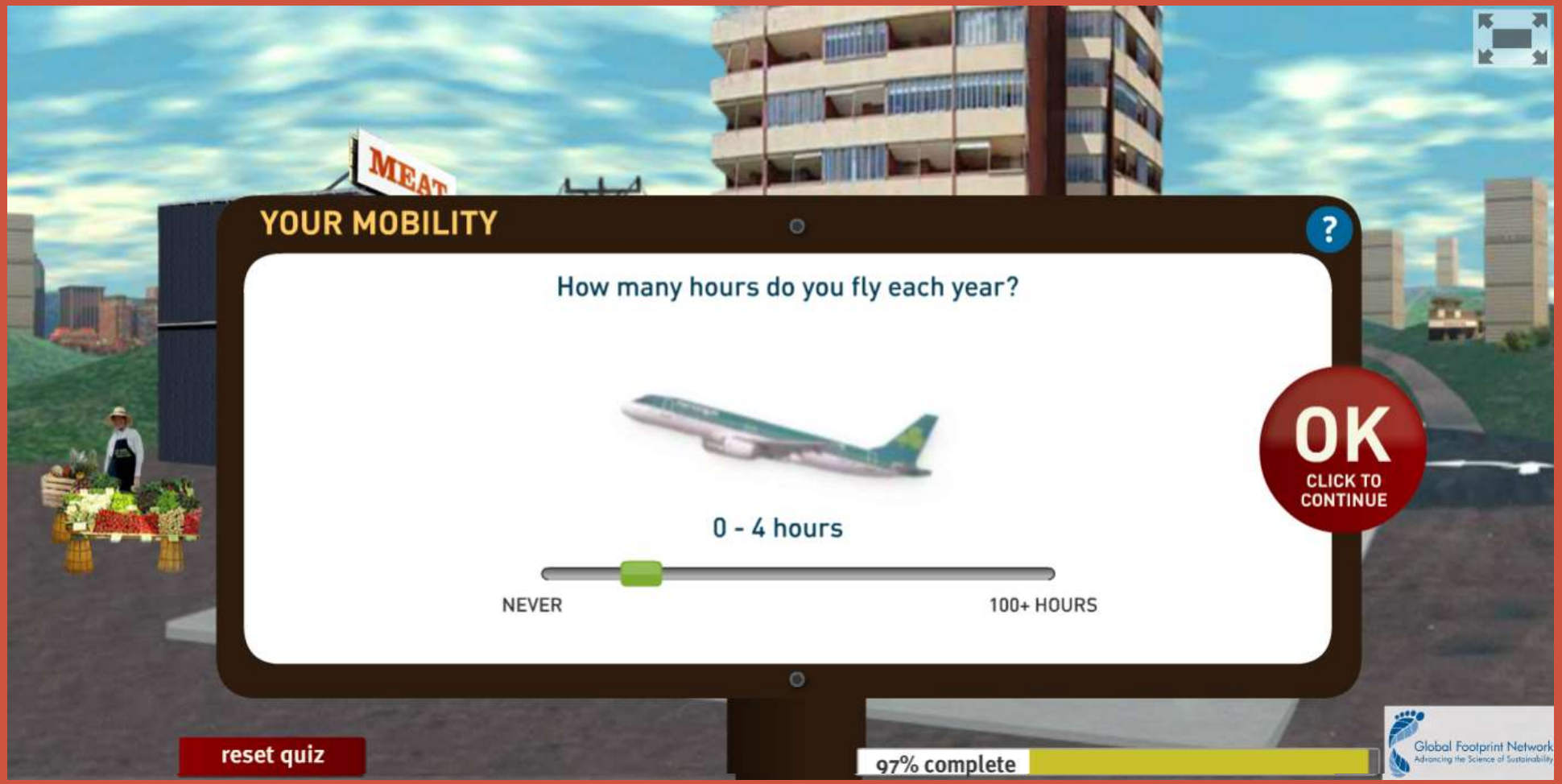
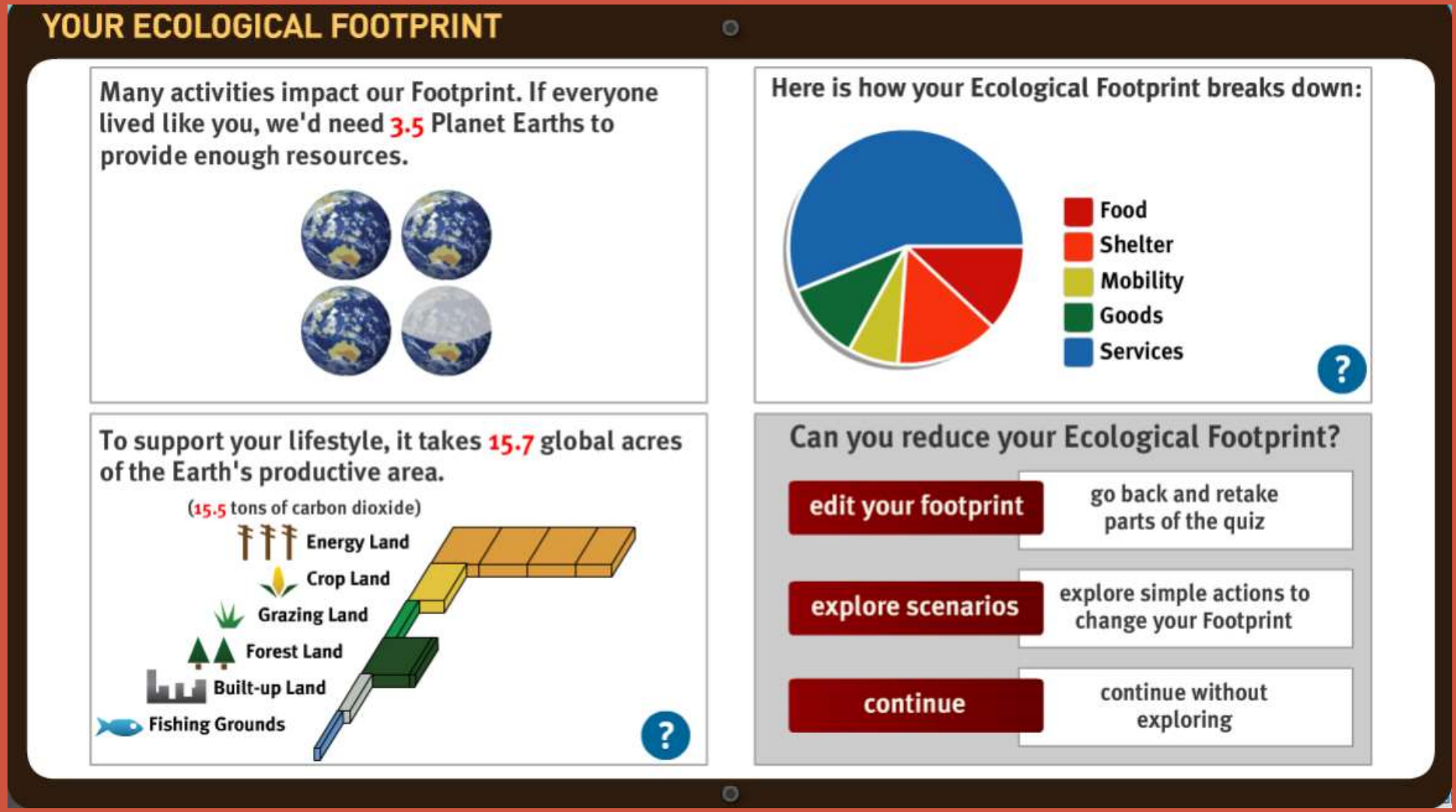
# FOOTPRINT CALCULATOR

## YOUR MOBILITY



# MY ECOLOGICAL FOOTPRINT (3.5 PLANETS!)

## WHAT'S YOURS?



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# CALCULATE YOUR ECOLOGICAL FOOTPRINT

*Many of CityTech's students are from other countries*

*If this applies to you calculate your footprint twice, once based on how you live here in the USA while in school and again based on how you live in your home country.*

*How to they compare?*

*Do you live a more sustainable life here or at home?*

*Send us your calculations –*

Prof.paul.king@Gmail.com

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# HOW CAN WE DESIGN A SUSTAINABLE CITY?

- What is sustainability?
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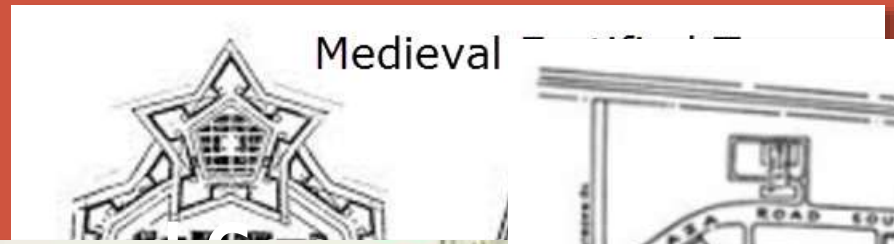



# THE SOLAR DECATHLON *BUILDING A SUSTAINABLE HOME IN THE CITY*

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*NEW YORK CITY COLLEGE OF TECHNOLOGY*

BROOKLYN NAVY YARD
SEPTEMBER 11 2015

# THE SOLAR DECATHLON 2016

*"I'm overwhelmed by the sprit we exhibited and the great contribution to the acknowledgement that our school participated in the 2015 Solar Decathlon"*

*Citytech Decathlete 2016*

# CITYTECH SOLAR DECATHLON TEAM

The team was led by Professor Alexander Aptekar the project director, Professor Paul King as Construction Manager, Moses Grubb a master carpenter and Amanda Waal an experienced decathlete.

*"I have learned from this (I thought it was impossible) project, that the Professor's along with all my other student Decathletes and I can do anything we set our minds out to."*

Over two years a group of students and faculty from a wide range of disciplines including Architecture, Construction Management & Civil Engineering, Environmental Control, Electrical Engineering, Computer Engineering, Hospitality Management and Communication Design were taken from the design process in the classroom, to the environment of an active construction site at the Brooklyn Navy Yard, to the competition site in Irvine, California where our students spoke of their experiences and defended their ideas to a professional jury and to the public.

# MEET THE TEAM

Meet the Team Video


# THE SOLAR DECATHLON

## THE TEAMS

### 14 OF 18 TEAMS MADE IT TO CALIFORNIA

Crowder College & Drury University

California State University, Sacramento

Texas/Germany

New York City College of Technology

Clemson University

California Polytechnic State University

Missouri University of Science and Technology

Stevens Institute of Technology

University of California, Davis

Mass/Central America

Team Orange County

University at Buffalo SUNY

West Virginia / Rome

Team NY Alfred

# THE SOLAR DECATHLON

*What is it ?*

↑ *originally a national competition started in 2002 it is now a bi-annual event that has spawned additional competitions in Europe, China, Latin America and the Middle East*

*Who sponsors it ?*

↑ *the U.S. Department of Energy as well as direct team sponsors who provide additional funding and building products for use in the competition*

*Who competes ?*

↑ *up to 20 schools of architecture are accepted into each bi-annual competition. Teams first compete to have their proposals accepted by the competition. Since it began over 130 teams and 20,000 students have competed*

*What is the goal ?*

↑ *to promote public and professional awareness of residential solar energy solutions and to educate students as future members of the work force*

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# THE SOLAR DECATHLON KEY TERMINOLOGY

*What is a Net Zero house ?*

↑*creating a house that is net zero is a combination of creating an energy efficient building envelope, reducing the energy needs of the building through the selection of energy efficient appliances and supplying power through a solar powered array*

*What is a Solar Array ?*

↑*a group of solar panels or an array produces direct electrical current that is converted to alternating current for residential use*

*What is a Building Envelope?*

↑*the building envelope includes the floors, walls & windows and roof and encloses the interior living spaces. By developing assemblies with high R values with proper water and vapor barriers one can create an energy efficient enclosure*

# THE 10 COMPETITIONS
# THE SOLAR DECATHLON FRAMEWORK

- Architecture (7)
- Market Appeal (12)
- Engineering (T5)
- Communications (13)
- Affordability (10)
- Comfort Zone (11)
- Appliances (14)
- Home Life (14)
- Commuting (3)
- Energy Balance (5)



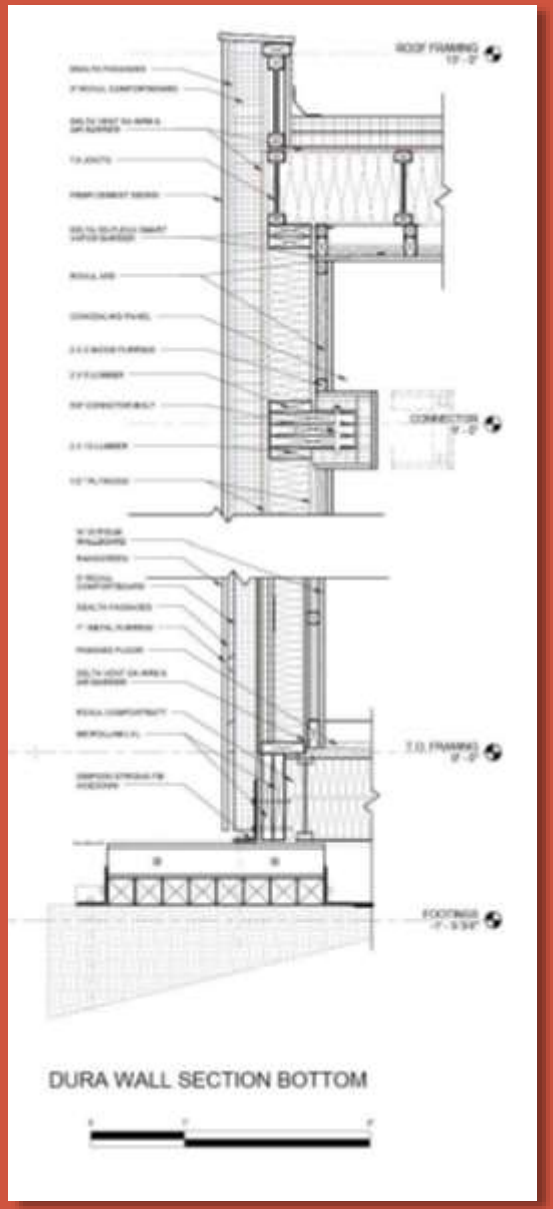
# THE DURA CONCEPT


DURA is a response to the impact of Superstorm Sandy which hit the coast of NYC in October 2012, flooding the city and taking large sections of the city off the power grid for weeks.

A unique urban solution that can be adapted to multiple site configurations, our competition entry called for the development of a low scale 4 story building of four to eight apartment units each independently powered by a vertical solar array erected on the south facade

DURA Concept Video

# OUR HOUSE BY THE NUMBERS




## *Wall Section – 13" thick with a total 44 R value*

## *Wall assembly from inside to outside:*

- *½ gypsum wall board*
- *1 ½" R 6* ROXUL brand Acoustical Fire Batt in a 2 x 2 frame*
- *Cosella-Dorken brand DELTA continuous air tight barrier with taped seams*
- *½" plywood sheathing*
- *2 x 6 wood stud frame with R 23 ROXUL brand batt insulation*
- *½" plywood sheathing*
- *Exterior Cosella-Dorken brand DELTA weather vapor barrier*
- *3" rigid ROXUL brand Comfortboard insulation*
- *Cosella-Dorken weather barrier*
- *1" metal furring strips mounted to underlying plywood & studs*
- *½" Hardie brand cement board rain screen facade*

# OUR HOUSE BY THE NUMBERS

## *Square Footage*

↑*Interior spaces 897 sq feet*

↑*Outdoor decks 660 sq feet*

## *Windows & Doors*

↑*Klearwall Triple Glazed (6 windows and 2 doors)*

## *RAB Lighting*

↑*RAB indoor and outdoor LED lighting*

## *RESOURCE Furniture*

↑*including dining table, coffee table and convertible "murphy bed" desks and bed furniture*

## *R-Value Summary*

↑*Walls R44*

↑*Floors R46*

↑*Roof R58*

## **Typical Residential R-Values*

*Walls *R13*

*Floors *R25-R30*

*Roof *R38-R49*

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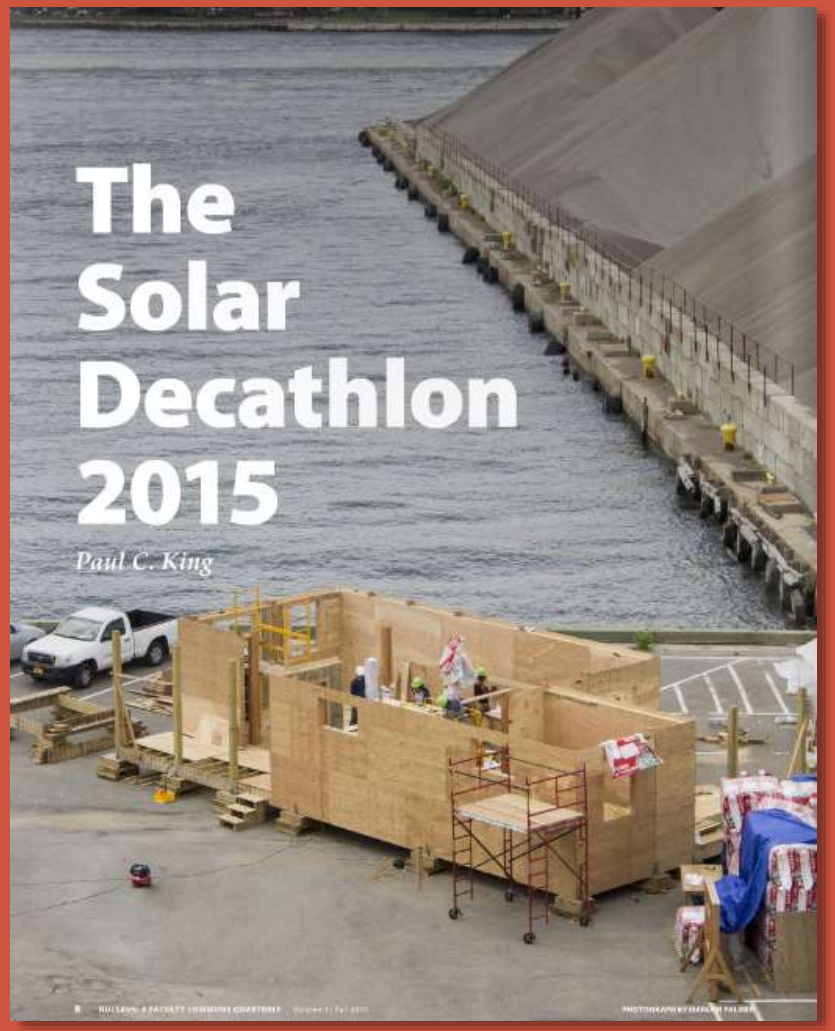
# CONSTRUCTION PHOTOS

## Summer 2015 – Brooklyn Navy Yard




PHASE 2 –CONSTRUCTION

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# CONSTRUCTION PHOTOS

## Summer 2015 – Brooklyn Navy Yard

Placement of footings framing the floor, adding columns and building exterior 2x6 stud walls

# CONSTRUCTION PHOTOS

## Summer 2015 – Brooklyn Navy Yard

Exterior plywood sheathing of lower sections with openings for doors and windows

# CONSTRUCTION PHOTOS

## Summer 2015 – Brooklyn Navy Yard



Interior and exterior stud wall framing and assembly

# CONSTRUCTION PHOTOS

## Summer 2015 – Brooklyn Navy Yard

TGI & Joist Hangers – Roof Framing

The Caps

The house consisted of six parts, three (3) 8’ wide x 50’ long x 10’ high lower modules and three (3) 8’ wide x 50’ long x 4’ high upper modules which included the roofs

# COMPETITION PHOTOS

## October 2015 – Irvine California

While the typical solution was a single family detached house with a solar array often hidden on the roof, our multi-story urban solution featured a set of vertical steel fins supporting an array of 19 solar panels visible along the south façade.

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# A SUSTAINABLE CHALLENGE

*First – do not change your current habits – just become a better observer – then select one simple habit and track it.*

*How much garbage do you produce in a week? Keep a plastic bag and toss in all your weekly garbage and tally it at the end of the week – or just keep a log as you go.*

*Next – try to change this habit and see if you can live a more sustainable life by the end of the semester.*

*Ask yourself – what is the economic cost of not living sustainably?*

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# THE STORY OF STUFF

## YOUTUBE - THE STORY OF STUFF