ecoMOD is a research and design / build / evaluate project that is creating a series of ecological, modular and affordable housing units. Since 2004, the ecoMOD project has built a total of five units for Piedmont Housing Alliance (PHA) and Habitat for Humanity (HFH) over the course of three projects. The housing units are designed and built by interdisciplinary teams of students, working closely with faculty and outside experts. Once occupied, student evaluation teams monitor and evaluate them carefully, with the results guiding subsequent designs. The ecoMOD project (www.ecomod.virginia.edu) is a partnership of the UVA School of Architecture and School of Engineering and Applied Science. The goal of the project is to provide a valuable educational experience, while demonstrating the environmental and economic potential of prefabrication, and therefore challenging the housing industry in the U.S. to more fully explore this potential.

The ecoMOD project strives to address the two most important challenges facing the next generation of designers: the significant environmental impact of the buildings, and the growing economic divide between high-income and low-income individuals. The ecoMOD curriculum has been recognized nationally and internationally as a model for sustainable architectural and engineering education, including three U.S. architectural education awards in 2007. In the context of this multi-year project, teams of architecture, engineering, landscape architecture, historic preservation, planning, business, environmental science, economics and high school vocational education students and faculty are participating in the project.

ecoMOD works directly with affordable housing organizations to ensure sustainable housing is no longer a luxury reserved for the wealthy. ecoMOD1, 2 and 3 are all located in racially mixed areas facing gentrification, giving low-income people a chance to fight this gentrification and invest in their communities. (continued)
ecoMOD is embedded in UVA’s curriculum and is structured to maximize the educational opportunities. In the three and a half years since the start of ecoMOD, over 180 students have participated in at least one phase of the project. The teams work with faculty and outside advisors – including architects, engineers, contractors, fabricators, prefabrication experts, landscape architects, affordable housing developers, housing counselors, planners, historic preservationists, environmental scientists, building department officials, business people, and sustainability experts on daylighting, material selection, indoor air quality, energy efficiency and renewable energy.

The ecoMOD project is structured to monitor and analyze each completed prototypical housing unit. The evaluation phase of the project is essential because as an educational project, our goal is to build both confidence and humility in our students. The ecoMOD evaluation teams assess the environmental impact, efficiency, affordability, occupant satisfaction and production readiness of each housing unit. The monitoring systems designed by the ecoMOD engineering teams measure indoor and outdoor air temperature; relative humidity; CO2 levels; and electricity, gas and water usage.

The University of Virginia Patent Foundation has registered the copyrights for the drawings of the completed homes. They have also licensed the designs to a modular marketing company to make them available to modular builders, individuals and affordable housing organizations – although this is in the early stages. By taking the ecoMOD designs into production, we intend to give affordable housing organizations quick, low-cost and sustainable infill housing options that cost less to operate. Estimates from modular builders show the prototypes can be replicated at a lower cost than site-built housing. In addition to the designs, the ecoMOD engineering team intends to commercialize the ecoMOD wireless monitoring system, and make it available to affordable housing organizations and individuals.

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design
The goal of the design phase is to foster integrated and interdisciplinary collaboration throughout. The process is iterative and multi-faceted. The participants are required to synthesize complex information, and effectively collaborate to make decisions.

build
Each ecoMOD team has the opportunity to build the prototype they design. In order to mimic factory production, the prototypes are fabricated at a decommissioned airfield hangar owned by the University of Virginia, and shipped either as modules or panels to their final destination.

evaluate
The ‘evaluating ecoMOD’ process is built on emerging strategies and protocols for the analysis of a completed building. Each evaluation process may include analysis into environmental impact of the systems and materials; energy performance; affordability; human comfort; constructability; and thoughtful placement within a community.
ecoMOD awards

2009 WORLD HABITAT AWARD FINALIST
International award given by the U.K. based Building and Social Housing Foundation; winners to be announced in summer 2009.

2008 AWARD OF MERIT, INFORM DESIGN
AWARD PROGRAM
From the Virginia Society of the American Institute of Architects; given for ecoMOD3.

2008 VSBN GREEN INNOVATION AWARD FOR BEST GREEN RESIDENTIAL PROJECT
Virginia Sustainable Building Network, the ecoMOD Project.

2007 GRAND PRIZE FOR CREATIVE INTEGRATION OF PRACTICE AND EDUCATION IN THE ACADEMY
National Council of Architectural Registration Boards, $25,000 Grand Prize given in recognition of efforts to creatively link education and practice.

2007 AIA EDUCATION HONOR AWARD
American Institute of Architects, to honor exceptional and innovative courses, initiatives, or programs that deal with broad issues, particularly in cross-disciplinary collaboration.

2006 ACSA COLLABORATIVE PRACTICE AWARD
Association of Collegiate Schools of Architecture, to honor the best practices in school-based community outreach programs.

2006 ECOLOGICAL LITERACY IN ARCHITECTURE EDUCATION
AIA Committee on the Environment, Special Recognition, the Tides Foundation’s Kendeda Green Fund.

P3 AWARDS, U.S. ENVIRONMENTAL PROTECTION AGENCY
Phase 1 grant recipient (2005), and Phase 2 Honorable Mention (2006), Evaluation Phase of ecoMOD project.

2007 GO GREEN HONOR AWARD
James River Green Building Council, the top design award in the built project category.

2007 GRANT AWARD
James River Green Building Council, to support green upgrades for ecoMOD project.

2006 VSBN GREEN INNOVATION AWARD FOR BEST GREEN RESIDENTIAL PROJECT
Virginia Sustainable Building Network, the ecoMOD Project.

FINALIST, PRESIDENT'S HIGHER EDUCATION AWARD FOR EXCELLENCE IN GENERAL COMMUNITY SERVICE
One of the initiatives at the UVA recognized for this national award program sponsored by the Federal Corporation for National and Community Service, the U.S. Department of Education and Housing and Urban Development, USA Freedom Corps, and the President’s Council on Service and Civic Participation.

webpage: www.ecomod.virginia.edu

awards and comments

"Being part of the ecoMOD team is incredibly exciting because it allows me to integrate my love of construction with my love of design. I believe that learning how to build things is integral to an architecture student’s education, and as designers it is our responsibility to understand how the construction world works. ecoMOD gives me the chance to see a design to completion as well as understand the process of how architecture is realized in the real world.”

Kristin Hennings, graduate architecture/architectural history student

"The ecoMOD project enables architecture and engineering students to collaborate in a hands-on, practical design project. The goal of attractive, energy-efficient, low-cost housing forces us to consider a wide variety of the implications of our designs. Addressing the issues of energy efficiency, an aging population, and low-income housing not only educates students within their majors but also prepares them to address a number of cultural and socio-political topics that will be prevalent in the coming years."

Mike Pilat, undergraduate engineering student

"Being on the ecoMOD3 team has challenged me to push my architectural thinking beyond theoretical to a more practical use. The collaborative work environment has allowed me to get a sense of the ‘real world’ of architectural office—like experience, which will be beneficial in the years to come. Most importantly, ecoMOD3 has made me rethink my goals and responsibilities to society as an architect."

Mario Moore, undergraduate architecture student

"ecoMOD places the concepts of green design and interdisciplinary collaboration in our own neighborhood. I have grown from the learning experience and the opportunity to work with students and faculty across several fields; doing so in neighborhoods near UVA has also helped me to understand and appreciate Charlottesville more than anything else that I have done while in school."

Brooke Yamakoshi, graduate engineering student

"For me, ecoMOD is about progress. We are beginning to see the consequences of our dependency and exploitation of non-renewable resources. This project is a chance to move the building industry in a more sustainable and ecologically-responsive direction. Despite its small scale, I truly believe this project can inspire a re-evaluation of the manner in which we conceive of building and dwelling. Sustainability does not have to be expensive; there are many small moves we can make to reduce our ecological footprint."

Chris Fano, undergraduate architecture student

The first prototype, ecoMOD1: the OUTin house, was completed in the Fifeville neighborhood of Charlottesville, Virginia. The house, a two-unit condominium, was constructed as eight small modules from structural insulated panels, during the summer of 2005.

The features include a potable rainwater collection system (the first in the city), a solar hot water panel, low impact finishes and sustainably forested wood flooring. The primary design strategy of the OUTin house is to make the entire site habitable and usable. Rather than a rectangular box without functional outdoor spaces, the OUTin house is placed to merge outside and inside places. Sunlight, breezes, vegetation, the earth and the surrounding context are brought into the house through passive design strategies and shifted modules that define outdoor / indoor spaces. OUTin’s design strategies are grounded philosophically and formally in our ecological mission, making ecology legible for the inhabitant.

ecoMOD 1
the OUTin house

The first prototype, ecoMOD1: the OUTin house, was completed in the Fifeville neighborhood of Charlottesville, Virginia. The house, a two-unit condominium, was constructed as eight small modules from structural insulated panels, during the summer of 2005. The features include a potable rainwater collection system (the first in the city), a solar hot water panel, low impact finishes and sustainably forested wood flooring. The primary design strategy of the OUTin house is to make the entire site habitable and usable. Rather than a rectangular box without functional outdoor spaces, the OUTin house is placed to merge outside and inside places. Sunlight, breezes, vegetation, the earth and the surrounding context are brought into the house through passive design strategies and shifted modules that define outdoor / indoor spaces. OUTin’s design strategies are grounded philosophically and formally in our ecological mission, making ecology legible for the inhabitant.
In response to the devastation of Hurricane Katrina, ecoMOD2 -- the preHAB house -- was installed in Gautier, Mississippi in 2006. The goal was to demonstrate how contemporary design and sustainable prefabrication are compatible with the construction methods of Habitat for Humanity.

The team created a house that is adjustable to the climate of southern Mississippi. Contained, exterior spaces are an integral element of the design, expanding the apparent size of the house, while simultaneously helping to passively cool it. These spaces incorporate elements that are able to both shade harsh sunlight and adapt to become hurricane protection devices. The house incorporates a photovoltaic solar panel array and a heat pump / heat recovery system that will provide domestic hot water. The house is built from an innovative steel and foam panel system (Thermasteel of Radford, Virginia), which is highly energy efficient, and resists hurricane force winds, as well as mold.

The SEAM house addresses both the need for housing for an aging population, and the renovation of a mid 19th-century historic property. The project includes two housing units: the historic house with a modular addition; and behind it a detached accessory rental unit comprised of two modules.

It is very likely the historic house was built as a slave quarters. After extensive historic analysis it was carefully stabilized and renovated. The front unit includes highly energy-efficient foam insulation; reconditioned historic wood flooring; evacuated tube solar hot water system coupled with on-demand water heating, and modular green roof system above modular bedroom addition. The rear accessory unit has super insulated wall and roof panel construction; low impact materials; modular green roof system; large deck with trellis / shade device; a rain garden / courtyard space. The sustainable landscape and green roof mitigate the stormwater on the site, which over the years had damaged the foundation of the historic house. The team strived for full accessibility throughout the two units, and is aiming for a LEED Gold or Platinum rating for the detached rear unit within the U.S. Green Building Council’s LEED for Homes certification program.