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**Innovation Challenge New York**

SUNY Polytechnic Institute, College of Business

**ICNY 2021 Student Guide**

# **Housing, Shelter, and Technology (HST)**

**ICNY HST, 19 & 20 November, SUNY Poly Utica, Student Center MPR**



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**Our community  
is talking about  
the College of  
Business's  
InnovationChallenge  
New York (ICNY):**

*Upon returning from the first ICNY event, I noted to my colleagues and administration that I had witnessed the most effective learning experience of my career. My students reported the same to their academic advisors and major professors in fields as diverse as Physics and Art History.*

*–Dr. Carlena Cochi Ficano  
Professor of Economics and  
Business Administration and  
Accounting Department  
Chair, Hartwick College*

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*ICNY HST 2021 is  
made possible by  
generous gifts from  
NYSTEC and the  
National Endowment  
for the Humanities.*



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# **Harnessing the innovative potential of emergent technology and novel housing forms ...**

**InnovationChallenge New York:  
Housing, Shelter, and Technology (ICNY HST)**

*ICNY HST is for students from diverse disciplines and levels who want to learn about sustainable economic development practices in organizations and communities. Through immersive field expeditions and discussions with experts, participating students will learn frameworks for understanding a broad range of community building and vitality-making issues. Then these students, working in teams and using structured design approaches, will generate novel project ideas that tap into the innovative economic potential of community resources that contribute to the resiliency of any place in which stakeholders live, work, and play.*

**Given the Covid-19 pandemic's dynamic nature and uncertain development trajectories, the organizers may potentially need to cancel or reschedule ICNY HST to a future semester. Participating students are required to fully comply with all of SUNY Poly's pandemic health and safety rules in effect at the time of the event.**

# What is ICNY HST 2021 all about?



## Welcome to Innovation Challenge New York: Housing, Shelter, and Technology ... ICNY HST 2021!

Friday 19 and Saturday 20 November 2021 at  
**SUNY Polytechnic Institute**  
Student Center, MPR

**InnovationChallenge New York** is an annual student competition that generates novel ideas with the potential for greater quality of life in New York State. In particular, we are most concerned about the economic and social well-being of our greater Mohawk Valley and neighboring regions. The challenge topic for 2021 is “Housing, Shelter, and Technology”. This semester, we invite participants to explore and propose humanistic ways to solve shelter challenges through harnessing the innovative potential of emergent technology and novel housing forms. We envision enhancing and diversifying our local housing possibilities with the ultimate aim of yielding greater regional economic vitality and enhanced quality of life.

### HOUSING AS A PHENOMENON

The housing phenomenon is deeply rooted in the human experience. As the quote below reveals, shelter provides the basis for humans to both survive environmental harshness and achieve higher degrees of fulfillment:

*Shelter provides security, personal safety and protection from the weather, and prevents ill health and disease. Adequate housing provides people with dignity and the opportunity to lead a normal life. Shelter plays an essential role in reducing vulnerability*

*and building resilience. Settlements are not simply safe physical spaces, but also socially acceptable and socioeconomically viable living environments.* (European Civil Protection and Humanitarian Aid Operations, 2020, para. 1)

Moreover, economists have long regarded home ownership as a means for not only shelter, but also wealth development and fiscal security, especially for lower and middle socioeconomic groups (Goodman & Mayer, 2018). Although home ownership rates in the U.S. have increased from 61.9% in 1960 to 65.8% in 2020 (U.S. Census Bureau, 2000, row 1; 2021), those who seek to buy homes are now facing severe affordability challenges. During the past 60 years in the U.S., the price of single family homes has gone from \$11,900 in 1960 to \$309,500 in 2020 (Martin, 2017, para. 4; National Association of Realtors, 2021). Adjusted for inflation, the price in 2020 dollars during that same period went from \$104,049 to \$309,500, a **197% increase**. During the relatively comparable 1960 to 2019 period, median annual wages for households in the U.S. went from \$5,600 to \$68,703 (U.S. Census Bureau, 1960, para. 1; 2019, para. 1). Adjusted to 2020 dollars, wages went from \$48,964 to \$69,550, a mere **42% increase**. The data indicates that wages have not kept pace with the increase in home prices. For those who seek to rent, the situation is equally discouraging. Median monthly rent has gone from \$71 in 1960 (or \$621 in 2020 dollars) to \$1,104 in 2020 (iPropertyManagement, 2020, rows 1 & 53). On an adjusted basis, rent has increased by nearly **78%** which again far outpaced wage growth.

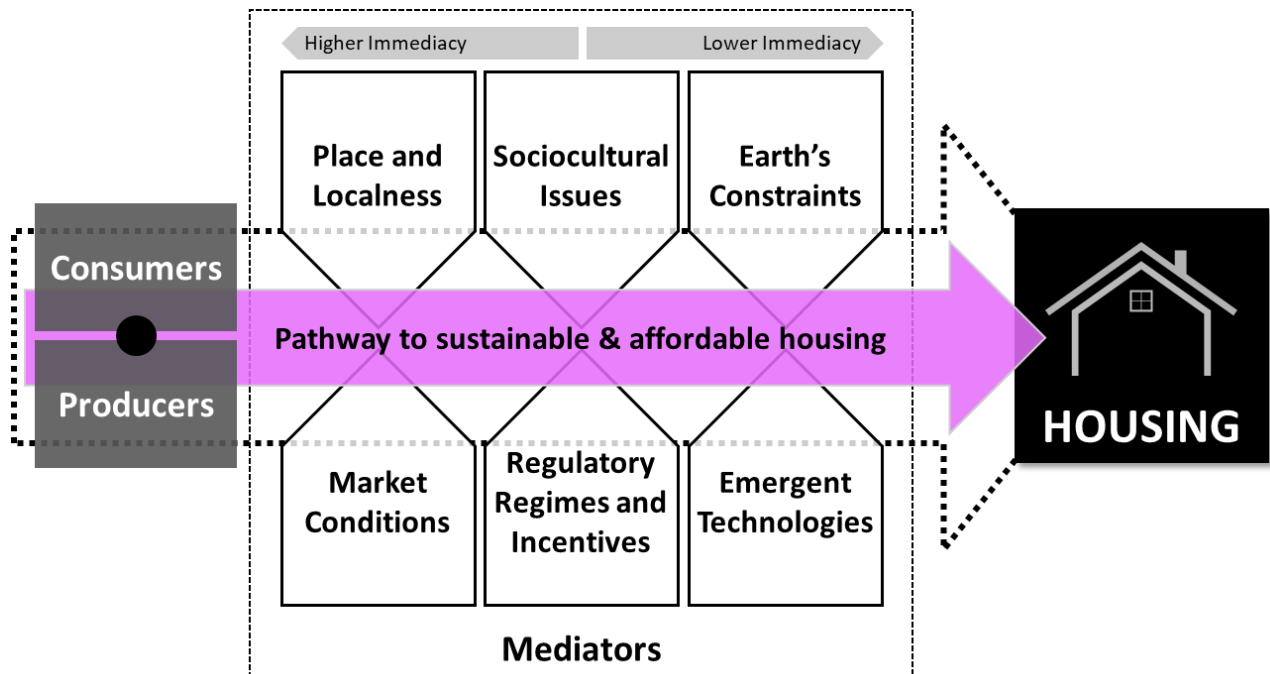
Locally, the situation is similar. Zillow's Home Value Index (HVI) (2021a, 2021c) estimate for the city of Utica was **\$153,583** and Rome was **\$153,659** as of July 2021. These figures represent **23.2%** and **25.3%** increases respectively when compared to one year earlier. Yet Utica and Rome's housing is still highly affordable when compared to Zillow's HVI July estimate of \$298,933 for the entire U.S. (2021b). Furthermore, low cost housing is a comparative advantage for cities. As the noted economist and Utica native, Paul Krugman, recently penned, "Utica is doing relatively OK. Those refugees and other immigrants, drawn in part by low housing costs, have helped generate new businesses." (Krugman, 2021, para. 3)

Recent steep increases in housing prices are primarily due to a market imbalance between consumer demand and producer supply. Campisi (2021) describes how new housing construction has not kept pace with demand for nearly a decade. The Covid-19 pandemic has forced many employees to work from home which, in turn, has further increased demand for housing. As of January 2021, the US had only a three-month supply of housing which is the lowest level since the 21st century began (Campisi, 2021, para. 4). Also, part of the surge in demand and prices arises from low mortgage interest rates since lower rates enable buyers to purchase more expensive properties for the same monthly payment (Conerly, 2021). As of early September 2021, interest rates for 15-year fixed mortgages were as low as 2.35% (2.64% APR) (Strohm, 2021, row 2).

## **A SYSTEMIC VIEW OF HOUSING**

The current demand and supply imbalance is best explained holistically by exploring the interrelated factors which mediate the relationship between producers and consumers. As **Diagram 1** below shows, we have identified six mediating factors which contribute to sustainable and affordable housing supply.

**Diagram 1: Sustainable and Affordable Housing Framework<sup>1</sup>**



Together consumers and producers co-create housing markets which, in the U.S., represents approximately five percent of the annual GDP (Thangavelu, 2020). **Consumers** have several choices regarding housing. Fundamentally, they can rent or own. For owning, they have three basic options: make (i.e., build) their own homes; buy existing homes and perform some reconditioning; or buy new homes. These options vary in levels of consumer *commitment* and *involvement*. Leasing requires the lowest level of commitment and involvement. Owning requires higher levels of commitment. However, involvement is usually the highest for making, a bit lower for buying existing and performing renovation or restoration work, and usually lowest for buying new. Factors that influence consumer housing behavior include **supply availability, preference, access to resources, and skills and abilities**. For consumers, resources of course include access to capital or mortgages. As mentioned above, relatively low interest rates give consumers more buying power. In contrast, **producers** usually make (e.g., build), recondition (e.g., renovate or restore), sell, or lease and manage housing units. Producers include individual home owners who sell their properties, contractors who build new properties or recondition existing properties, realtors who broker sales, leasing agents who rent apartments and so forth. They produce varied new and reconditioned housing types such as single family homes, condos, and apartments among others. Producers may specialize in one type or more depending on **consumer demand, their capabilities and access to resources**.

Consumer and producer choices are mediated by six factors that vary in immediacy of impact and importance. From highest to lowest immediacy, these are: *Market conditions; place and localness; regulatory regimes and incentives; sociocultural issues; emergent technologies, and Earth's constraints*.

**Market conditions** are expressed through key indicators or metrics. Thangavelu (2020, para. 3-9) notes that these include: Dollar value of construction spending; number of new residential

<sup>1</sup> This framework is based on research by Dr. Robert Edgell and colleagues.

construction projects (i.e., “housing starts”); dollar value and units of existing home sales and new home sales by type (single family, condo, etc.); number of pending home sales; NAHB’s Housing Market Index based on producers’ confidence about single-family housing; and other indices (e.g., S&P/Case-Shiller Home Price Index, Federal Housing Finance Agency’s House Price Index, etc.) that gauge market robustness. Consumers are also concerned about other related market indicators such as mortgage interest rates, employment rates, disposable income levels, consumer confidence, etc. Producers care about supply chain issues such as the cost of materials and labor. As an example, the U.S. Bureau of Labor Statistics Producer Price Index for Lumber increased by nearly 90% overall and 121% for softwood from May 2020 to April 2021 for wood (Bureau of Labor Statistics U.S. Department of Labor, 2021, para. 1 & 2). Ostrowski (2021, para. 9) reports that, “the National Association of Home Builders says soaring lumber prices caused the price of an average new single-family home to increase by \$35,872 this spring compared to spring 2020.” While the increased cost of materials are impacting housing, Ostrowski (2021) further explains that the underlying lack of any significant new land development during the past decade has contributed most to the current tight and high priced housing market.

**Place and localness** influence housing choices and costs. These primarily include local factors such as: Climate and weather patterns; density; crime and security issues; culture; history; and physical context to name a few. For our local region, the traditionally long winter seasons with heavy snowfall often call for well insulated homes with steep sloped roofs. Utica and Rome’s joint history of economic growth and dominance during the early half of the past century has left the cities with diverse collections of large historic homes--ideal dwellings for restoration and renovation work (Przybycien, 1994). However, crime is relatively high. Utica has a Crime Index Rate (CIR) of 7 which means that Utica is only safer than 7% of U.S. cities (NeighborhoodScout, 2021b). Rome has a higher CRI of 29, perhaps since it has a significantly smaller population and lower density than Utica (NeighborhoodScout, 2021a).

**Regulatory regimes and incentives** include zoning laws, building codes, scenic and historic district commissions, housing authorities, rent control boards, tax incentive schemes, and LEED incentives among several other regimes that both enable and constrain housing development. Zoning regulations constrain how real estate property is developed and used to safely optimize land use for communities. Building codes require all types of buildings to meet human health, safety, and welfare standards for users. Scenic and Historic commissions work to ensure that alterations to historic-designated buildings are compatible with the existing streetscape’s architectural character.

As an illustration of how zoning and codes work, novel forms of building such as the “tiny house” movement often encounter resistance from zoning laws. Several communities have zoning regulations that set minimums of 700 square feet for permanent legal residences which then excludes most tiny homes (Olito, 2021b, para. 6). In New York State, tiny houses were recently legitimized by Appendix Q of the 2020 Residential Code which specifies minimum dimensions and safety features (New York State, 2019). However, most local jurisdictions’ zoning laws for land use only permit tiny houses as “recreational vehicles” and require wheels for towing (Van Vactor, n.d.).

Governmental housing authorities usually function to provide low or no rent housing for citizens who are the most financially fragile and often homeless. In addition to traditional subsidized public housing, Utica is investigating other incentives and collaborative arrangements for low or moderate cost housing. Artspace, a non-profit developer, is partnering with Utica to create a \$13 million dollar development of 40 low cost live and work residential units for local artists; it will be located on Park Avenue in downtown (City of Utica, 2021). Also, a limited number of cities have rent control boards that support access to housing by establishing rent increase limits for landlords (Investopedia Team, 2021).

Incentive schemes that encourage home ownership include federal tax credits for mortgage interest and certain clean energy and efficiency measures, and local community incentives such as extremely discounted prices for purchasing highly distressed properties. Homes with LEED residential certifications yield benefits such as 30% to 60% energy savings and potential reductions for insurance, property taxes, among other incentives (U.S. Green Building Council, 2021, para. 5 & 6).

**Sociocultural issues** include trends relating to social and cultural preferences and issues. Some of the more topical trends are the pandemic and shifting housing type preferences, remote work, emergent housing arrangements and forms, growing environmental awareness and the “circular economy”, climate refugees, financial fragility and homelessness, and aging in place to name a few.

The persistent Covid-19 pandemic has driven a shift in preferences due to fear of viral exposure and to increased remote or distance work (Redfin, 2020). As a result, buyers have begun to seek lower cost yet larger suburban single family residences with room for home offices instead of expensive urban condo style housing (Rastegar, 2021). Other continuing trends that pre-date the pandemic include popular emergent housing arrangements and forms. These include co-living, tiny houses, and accessory dwelling units (ADUs). While interest in co-living with shared facilities has temporarily waned, the popularity of tiny houses and ADUs has increased during the pandemic (Sperance, 2021). These compact housing forms, usually 400 or fewer square feet, are significantly less expensive than traditional houses and, therefore, afford individuals the opportunity to live alone and more sustainably (Sperance, 2021, para. 1). Another important trend has been the growing social acceptance of alternative housing construction techniques such as additive manufacturing, modular (i.e., prefabricated), and sustainable green building approaches and materials (McConnon, 2020). Also, growing awareness and recognition of climate change and other environmental concerns has stimulated interest in changing economic practices. This phenomenon is referred to as the “circular economy” since it places greater emphasis on firms becoming regenerative by reusing, recycling, and upcycling waste and end-of-life products to reduce environmental footprints (Ellen MacArthur Foundation, 2017, para. 1).

Another important phenomenon emerging from the burgeoning climate change crisis is the mass migrations of humans across geopolitical boundaries. “Climate refugees” are driven to cross borders seeking resources and shelter due to climate disasters in their home territories. These ecological calamities usually reduce the availability of natural resources, especially food and water (Ida, 2021). In 2017 alone, between 22 and 24 million people fled “sudden onset” catastrophic climate events (Podesta, 2019, para. 5). Although climate refugees are not common now in the U.S., intensifying climate change across the southern and western regions may produce future “domestic” refugees who flee disaster states for other safer states.

The U.S. state of Arizona which is now facing record heat and drastic water reductions offers a case study in negative climate change impacts. Arizona’s largest city, Phoenix, now annually has eight more 110 degree plus days a year when compared to 50 years ago (Prociv & Lewan, 2021, para. 9). Extreme heat is not only dangerous for humans, but also for sophisticated technologies. Airplanes have difficulty gaining lift to safely depart in temperatures approaching temperatures of 120 degrees Fahrenheit or higher (Allain, 2017, para. 3). Phoenix’s Sky Harbor International Airport has experienced cancelled flights due to exceptional temperatures (BBC US & Canada, 2017). As average temperatures continue to rise, the future of air travel in and out of Arizona may be uncertain. Even more troubling is the current state of the Colorado River, a main water source for 40 million people in Arizona, neighboring states, and Mexico (Baltz & Baker, 2021, para. 1). Over the past one hundred years, the river’s flow has contracted by 20% (Ramirez, 2021, para. 17). Long term climate change induced

droughts have left Lake Mead and Lake Powell severely depleted. They are both reservoirs of the Colorado River and now stand at historic low levels of about one third full (Ramirez, 2021, para. 2 & 3). During August 2021, the federal government was forced to enact the first-ever reductions to allotments of Colorado River water. Arizona's share will be reduced by 18% starting in 2022 (Baltz & Baker, 2021, para. 10). Equally distressing, the two-decade drought has reduced hydroelectric power generation by 25% so far (Bernstein, Spring, & Stanway, 2017, para. 12). Migrating climate refugees will most likely place demands on housing systems in localities that fare better than average vis-à-vis climate change. Also, it may be that consumers are beginning to respond to mounting evidence of climate change by modifying their housing preferences.

Other sociocultural issues that are relevant for housing include financial fragility and homelessness which are persistent challenges in many of America's urban centers. Approximately one third of U.S. households are considered to be "financially fragile" (Hasler (Hasler, Lusardi, & Oggero, 2018). Currently, the bottom 50% of households control only 1% of the total U.S. household wealth (Kent & Ricketts, 2020, figure 1; Kent, Ricketts, & Boshara, 2019) and may struggle to find affordable housing to avoid becoming homeless. For those who do become homeless, life is harsh. As of The 2020 Annual Homeless Assessment Report (AHAR) to Congress, the U.S. had over 580,000 homeless individuals (Henry, Sousa, Roddey, Gayen, & Bednar, 2021, p. 1). The country's two largest cities had the largest homeless populations. New York City had 77,943 individuals while Los Angeles City and County had 63,706 individuals (Henry et al., 2021, p. 16). Cities struggle to address these issues. As an example, Austin recently voted to ban camping on public lands which effectively made homelessness illegal (City of Austin, 2021). Locally the homeless population has become more visible in Utica, especially in the Oneida Square neighborhood (Ferris, 2021). Some estimates place the homeless population at about 1,000 in Utica (Baldwin, 2021, para. 6). Tensions have arisen between constituents who compassionately seek to assist the homeless and others who are concerned about social problems associated with the presence of homeless populations. Furthermore, others are concerned that the recent end of the pandemic's federal eviction moratorium might cause increased homelessness (Reed, 2021).

Another trend impacting housing is "aging in place" or the phenomenon of senior citizens remaining in their homes longer than was historically the case. This is due to longer life spans, health care advancements, and improved home care (Freddie Mac, 2019). As of 2019, Freddie Mac (2019, p. 4) estimated that approximately 1.6 million homes were kept off the market due to this trend. As this trend continues, it will act to constrain housing availability.

**Emergent technologies** include additive manufacturing (i.e., 3D printing), modular (i.e., prefabricated) construction, novel housing forms, and sustainable green construction among several others. As mentioned elsewhere, these technologies are gaining social acceptance due to their benefits which include lower costs, greater efficiencies, lower environmental footprints, and overall ease of use. Homes built using additive manufacturing or "3D printing" are slowly gaining popularity as the technology becomes better understood (Keighran, 2021). New York State boasts one of the first-ever permitted homes that was built using on-site 3D printing (Rutherford, 2021). The home is 1,400 square feet, has three bedrooms, two bathrooms, and a garage, and was listed for \$300,000 which is exceptionally reasonable given its location on Long Island's North Shore (Rutherford, 2021, para. 4). At approximately half the cost of a comparable house built using traditional stick-built approaches, this house exemplifies affordable housing (Hickman, 2021). The home was constructed using ARCS (autonomous robotic construction systems) technology and should be highly durable since its walls are double the strength required (Hickman, 2021, para. 2).

Modular construction is growing in popularity since it offers several benefits which include reduced construction durations, higher quality control, reduced waste, and smaller carbon footprints (McConnon, 2020, para. 3). Modular construction yields savings of up to 20% and reduces construction durations by as much as 50%. By 2030, this form of prefab-construction may reach \$130 billion (McConnon, 2020, para. 10). It relies on first making the building components in a factory then shipping them to the construction site where they are quickly assembled by teams. This is similar to the IKEA approach wherein furniture components are manufactured and packaged as kits then efficiently shipped to stores in flat packaging. Consumers then purchase the kits and assemble the furniture at home.

Tiny houses and accessory dwelling units (ADUs) are two examples of novel housing forms with low carbon footprints and costs. Tiny houses usually have 400 or fewer square feet, are often built in factories then transported to parking sites, and are ideal for single adults or couples without children (Sperance, 2021, para. 1). In Nashville, homes as small as 60 square feet and costing only \$6,000 were used to help alleviate homelessness (Olito, 2021a, para. 28). Although zoning and codes often do not officially recognize small structures as homes, in 2020 Los Angeles changed its ordinance to allow tiny homes to be classified as ADUs and, therefore, be parked on zoned properties (Olito, 2021a, para. 11). Following Los Angeles's success, San Jose and San Diego are now permitting tiny houses (Olito, 2021a, para. 11). The Tiny House Society has given New York State a "tiny house friendly" score of 2 out of 10 wherein 10 is the friendliest score possible (McGee, 2018, section 36).

The World Green Building Council defines sustainable green construction as buildings that are designed, constructed, and operated to reduce their environmental footprints, save natural resources, and improve human health, safety, and welfare (World Green Building Council, n.d.-b, para. 1). Important environmental, economic, and social aspects of green buildings include a focus on optimizing users' experiences, non-carbon based energy sources, efficient resource utilization, upcycling and reuse, waste and pollution elimination, low or no volatile organic compound (VOC) materials, ethical and sustainable sourcing to name a few (World Green Building Council, n.d.-a).

**Earth's constraints** include population capacity, density, and climate change (Edgell & Olney, 2021). The Earth's population is expected to grow from 7.7 to an anticipated 8.5 billion by 2030 (United Nations, 2019a, p. 1). Even more concerning, most studies place the Earth's maximum carrying capacity at eight billion people (Pengra, 2012, p. 3). The Earth's total population is likely to reach this threshold as early as 2025 (United Nations, 2019b). Over the past 2,000 years, Earth's land density has gone from a comfortable one human to more than 50 humans per square km in 2020 (Population Education, 2020; Sharp, 2017, para. 8). This increase in density accompanied by the growth of carbon-emitting technologies has not only exhausted Earth's open space, but also stimulated dangerous climate change. As a result, ecological disasters are yielding an estimated annual \$520 billion decline in consumption and, without mitigation, might impoverish an estimated 100 million people by 2030 (Hallegatte, Vogt-Schilb, Bangalore, & Rozenberg, 2017, p. 3). Replacing dirty technologies and toxic materials with clean substitutes may catalyze economic growth while protecting Earth's fragile ecosystems (Posen, 2015). Annually, U.S. households create about 5.43 gigatons of carbon dioxide equivalent emissions. Of that amount about 34% or 1.8 gigatons are attributable to housing (Taiebat & Xu, 2019, section 1). However, producers could use new innovative designs and novel forms, emergent technologies, and practices to create sustainable housing solutions that are carbon-neutral or carbon-negative. In a relatively short time period, such a transformation would significantly reduce global carbon emissions.

## CONCLUSION

Despite the challenges and complexity of ensuring sustainable and affordable housing discussed above, approaching housing issues through the transformative lens of design might result in compelling and humane visions that ethically provide vitality for a vast majority of if not all constituents.

For this innovation challenge, participants should contemplate the following questions:

- 1. Who do you want to help with their housing issues? What are the housing problems that they face? How do you plan to solve their problems?*
- 2. What are the most important and urgent housing issues faced by the Mohawk Valley region? Why are these issues important and urgent? How might they be solved? Who would benefit if they are solved?*
- 3. Across the Mohawk Valley region what sorts of coalitions might be formed to act upon the housing issues described above? Who would be members of the coalitions? Which issues would the coalitions address? How would the coalitions address those issues?*
- 4. Which emergent technologies and novel housing forms might be best suited for enhancing the Mohawk Valley housing situation? What other changes might be necessary to fully realize the full benefits of these technologies and housing forms?*
- 5. How might entrepreneurs and others collaborate to bring new affordable and sustainable housing solutions to the local and national markets? Are there ways in which private industry could work with governments through Public-Private Partnerships (PPPs) to address housing challenges? How would a PPP for local housing be developed?*
- 6. Are there concepts that might help remediate homelessness, especially for the most vulnerable populations who are challenged by mental health issues and substance dependencies? How might those concepts be implemented? Who would lead the implementations?*
- 7. In which ways might SUNY Poly assist the region and local community to develop more affordable and sustainable housing capacity? What are the local impediments to these changes? How might these challenges be overcome?*

Potential solutions may include products, services, processes, or systems that manifest in non-profit, for profit (commercial), or governmental forms. Winning teams will receive prizes, recognition, and have their ideas reviewed by local governing bodies for potential implementation. In addition, all teams should consider developing a business plan pitch for their solutions and compete in the New York State Business Plan Competition.

*September 2021 in Utica, Written by Dr. Robert Edgell*

## REFERENCES

- Allain, R. (2017, June 28). Why Phoenix's airplanes can't take off in extreme heat. *Wired*. Retrieved from <https://www.wired.com/story/phoenix-flights-canceled-heat/>
- Baldwin, D. (2021, May 6). Is the population of homeless people in the Mohawk Valley increasing? In *Good Health, MV's Healthcare Newspaper*. Retrieved from <http://www.mvhealthnews.com/features/is-the-population-of-homeless-people-in-the-mohawk-valley-increasing/>
- Baltz, T., & Baker, D. R. (2021, August 16). Colorado river water rationed for first time amid drought. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2021-08-16/colorado-river-water-cut-for-first-time-as-drought-grips-west>
- Bernstein, S., Spring, J., & Stanway, D. (2017, August 13). Droughts shrink hydropower, pose risk to global push to clean energy. *Reuters*. Retrieved from <https://www.reuters.com/business/sustainable-business/inconvenient-truth-droughts-shrink-hydropower-pose-risk-global-push-clean-energy-2021-08-13/>
- Bureau of Labor Statistics U.S. Department of Labor. (2021). *The Economics Daily: Producer prices for lumber up 89.7 percent for the year ended April 2021*. Retrieved from <https://www.bls.gov/opub/ted/2021/producer-prices-for-lumber-up-89-7-percent-for-the-year-ended-april-2021.htm>
- Campisi, N. (2021, January 4). The U.S. faces a housing shortage. Will 2021 be a turning point? *Forbes Advisor*. Retrieved from <https://www.forbes.com/advisor/mortgages/new-home-construction-forecast/>
- City of Austin. (2021). City of Austin shifts to phase 3 of camping ban implementation [Press release]. Retrieved from <https://www.austintexas.gov/news/city-austin-shifts-phase-3-camping-ban-implementation>
- City of Utica. (2021). Mayor Palmieri announces Artspace proposal [Press release]. Retrieved from <http://www.cityofutica.com/newsroom/press-releases/2021/mayor-palmieri-announces-artspace-proposal>
- Conerly, B. (2021, July 27). The end of the housing boom will be when mortgage rates rise in 2022. *Forbes*. Retrieved from <https://www.forbes.com/sites/billconerly/2021/07/27/the-end-of-the-housing-boom-will-be-when-mortgage-rates-rise-in-2022/?sh=3c84ebec6770>
- Edgell, R., & Olney, J. (2021). Interplanetary institutionalization: Should humans become space faring? *Academia Letters, Article 531*, 1-10.
- Ellen MacArthur Foundation. (2017). The circular economy in detail. Retrieved from <https://archive.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>
- European Civil Protection and Humanitarian Aid Operations. (2020). Shelter and settlements. Retrieved from [https://ec.europa.eu/echo/what/humanitarian-aid/emergency-shelter\\_en](https://ec.europa.eu/echo/what/humanitarian-aid/emergency-shelter_en)
- Ferris, J. (2021, June 11). City, agencies address homelessness on Utica's Oneida Square. *WKTV News Channel 2*. Retrieved from <https://www.wktv.com/content/news/City-agencies-address-homelessness-on-Uticas-Oneida-Square-574615321.html>
- Freddie Mac. (2019). *While seniors age in place, Millennials wait longer and may pay more for their first homes*. Retrieved from <http://www.freddiemac.com/fmac-resources/research/pdf/201901-Insight-02.pdf>:  
<http://www.freddiemac.com/fmac-resources/research/pdf/201901-Insight-02.pdf>
- Goodman, L. S., & Mayer, C. (2018). Homeownership and the American Dream. *JOURNAL OF ECONOMIC PERSPECTIVES*, 32(1), 31-58.
- Hallegatte, S., Vogt-Schilb, A., Bangalore, M., & Rozenberg, J. (2017). *Unbreakable: Building the resilience of the poor in the face of natural disasters*. Washington, DC: The World Bank.
- Hasler, A., Lusardi, A., & Oggero, N. (2018). *Financial fragility in the US: Evidence and implications*. Retrieved from Washington, DC: <https://gflec.org/wp-content/uploads/2018/04/Financial-Fragility-Research-Paper-04-16-2018-Final.pdf>
- Henry, M., Sousa, T. d., Roddey, C., Gayen, S., & Bednar, T. J. (2021). *The 2020 annual homeless assessment report (AHAR) to Congress*. Retrieved from <https://www.huduser.gov/portal/sites/default/files/pdf/2020-AHAR-Part-1.pdf>:
- Hickman, M. (2021, February 2). 3D-printed home on Long Island's North Shore hits the market for \$300,000. *The Architect's Newspaper*. Retrieved from <https://www.archpaper.com/2021/02/3d-printed-home-on-long-islands-north-shore-hits-the-market/>
- Ida, T. (2021). Climate refugees – the world's forgotten victims. *World Economic Forum*. Retrieved from <https://www.weforum.org/agenda/2021/06/climate-refugees-the-world-s-forgotten-victims/>
- Investopedia Team. (2021, March 22). Rent control. *Investopedia*. Retrieved from <https://www.investopedia.com/terms/r/rent-control.asp>
- iPropertyManagement. (2020). *Average Rent by Year*. Retrieved from: <https://ipropertymanagement.com/research/average-rent-by-year>
- Keighran, M. (2021, August 31). America's first development of 3D-printed homes hits the market in Austin, Texas. *Dwell*. Retrieved from [https://www.dwell.com/article/east-17th-street-3d-printed-housing-development-icon-3strands-7eb006ac?utm\\_source=Dwell&utm\\_campaign=fa5db2e59b-EMAIL\\_DAILYDOSE\\_20210901&utm\\_medium=email&utm\\_term=0\\_4c4807afd1-fa5db2e59b-170427426](https://www.dwell.com/article/east-17th-street-3d-printed-housing-development-icon-3strands-7eb006ac?utm_source=Dwell&utm_campaign=fa5db2e59b-EMAIL_DAILYDOSE_20210901&utm_medium=email&utm_term=0_4c4807afd1-fa5db2e59b-170427426)

- Kent, A., & Ricketts, L. (2020). Has wealth inequality in America changed over time? Here are key statistics. Retrieved from <https://www.stlouisfed.org/open-vault/2020/december/has-wealth-inequality-changed-over-time-key-statistics>
- Kent, A., Ricketts, L., & Boshara, R. (2019). What wealth inequality in America looks like: Key facts & figures. Retrieved from <https://www.stlouisfed.org/open-vault/2019/august/wealth-inequality-in-america-facts-figures>
- Krugman, P. (2021, June 25). Working out: What New York could learn from Utica. *New York Times*. Retrieved from <https://www.nytimes.com/2021/06/25/opinion/new-york-real-estate.html>
- Martin, E. (2017, June 23). Here's how much housing prices have skyrocketed over the last 50 years. *CNBC*. Retrieved from <https://www.cnb.com/2017/06/23/how-much-housing-prices-have-risen-since-1940.html>
- McConnon, A. (2020, December 15). Modular construction meets changing needs in the pandemic. *New York Times*. Retrieved from <https://www.nytimes.com/2020/12/15/business/modular-construction-pandemic-coronavirus.html>
- McGee, M. (2018, December 13). Tiny house laws in the United States; states that allow tiny houses. *Tiny House Society*. Retrieved from <https://www.tinysociety.co/articles/tiny-house-laws-united-states/>
- National Association of Realtors. (2021). *Median Sales Price of Existing Single-Family Homes [HSFMEDUSM052N]*. Retrieved from: <https://fred.stlouisfed.org/series/HSFMEDUSM052N>
- NeighborhoodScout. (2021a). Rome, NY crime analytics: Crime Index. Retrieved from <https://www.neighborhoodscout.com/ny/rome/crime>
- NeighborhoodScout. (2021b). Utica, NY crime analytics: Crime Index. Retrieved from <https://www.neighborhoodscout.com/ny/utica/crime>
- New York State. (2019). *2020 Residential Code of New York State: Appendix Q Tiny Houses [NYSRC2020P1]*. Albany, NY: State of New York Building Standards and Codes. Retrieved from <https://codes.iccsafe.org/content/NYSRC2020P1/appendix-q-tiny-houses>
- Olito, F. (2021a, January 11). After a year of booming tiny-house sales, experts say the movement is at a turning point. *Insider*. Retrieved from <https://www.insider.com/tiny-house-movement-future-2021-1>
- Olito, F. (2021b, January 4). Tiny-house owners must adhere to strict and often confusing zoning laws — here's what you need to know. *Insider*. Retrieved from <https://www.insider.com/tiny-house-zoning-laws-what-you-need-to-know-2020-12>
- Ostrowski, J. (2021, June 22). High lumber prices ease: Here's what it means for homeowners and homebuyers. *Bankrate*. Retrieved from <https://www.bankrate.com/mortgages/lumber-prices-sky-high-what-it-means-for-you/>
- Pengra, B. (2012). *One planet, how many people? A review of Earth's carrying capacity*. Retrieved from New York, NY: [https://na.unep.net/geas/archive/pdfs/GEAS\\_Jun\\_12\\_Carrying\\_Capacity.pdf](https://na.unep.net/geas/archive/pdfs/GEAS_Jun_12_Carrying_Capacity.pdf)
- Podesta, J. (2019). *The climate crisis, migration, and refugees*. Retrieved from <https://www.brookings.edu/research/the-climate-crisis-migration-and-refugees/>
- Population Education. (2020). World population history (Online Database). Retrieved from <https://worldpopulationhistory.org/map/1/mercator/1/0/25/>. Retrieved December 20, 2020, from Population Connection <https://worldpopulationhistory.org/map/1/mercator/1/0/25/>
- Posen, A. (2015, July 1). Slower growth-disaster or blessing? A debate. *The Economist*. Retrieved from <http://worldif.economist.com/article/12121/debate>
- Prociw, K., & Lewan, J. (2021, June 17). Heat wave in West enters Day 6 as entire state of Arizona soars to record highs. *NBC News*. Retrieved from <https://www.nbcnews.com/news/weather/heat-wave-west-enters-day-6-entire-state-arizona-soars-n1271166>
- Przybycien, F. E. (1994). *Utica, a city worth saving*. Utica, NY: Dodge-Graphic Press.
- Ramirez, R. (2021, August 17). First-ever water cuts declared for Colorado River in historic drought. *CNN*. Retrieved from <https://www.cnn.com/2021/08/16/us/lake-mead-colorado-river-water-shortage/index.html>
- Rastegar, K. (2021, June 1). How remote work is rearranging renter priorities: What investors need to know. *Forbes*. Retrieved from <https://www.forbes.com/sites/forbesrealestatecouncil/2021/06/01/how-remote-work-is-rearranging-renter-priorities-what-investors-need-to-know/?sh=39fb4ebb2a0e>
- Redfin. (2020). Sales of large homes up 21% as people seek more space amid pandemic [Press release]. Retrieved from <https://www.prnewswire.com/news-releases/sales-of-large-homes-up-21-as-people-seek-more-space-amid-pandemic-301119506.html>
- Reed, R. (2021, July 30). Eviction moratorium's end could cause homelessness or housing insecurity for 'millions of families'. *Harvard Law Today*. Retrieved from <https://today.law.harvard.edu/eviction-moratoriums-end-could-cause-homelessness-or-housing-insecurity-for-millions-of-families/>
- Rutherford, S. (2021, January 29). A real 3D-printed home listing just popped up on Zillow for a cool \$300,000. *Gizmodo*. Retrieved from <https://gizmodo.com/a-real-3d-printed-home-listing-just-popped-up-on-zillow-1846159158>
- Sharp, T. (2017, September 15). How big is Earth? *Space.com*. Retrieved from <https://www.space.com/17638-how-big-is-earth.html>
- Sperance, C. (2021, March 24). Despite pandemic and close quarters, tiny homes are more popular than ever. *Boston.com*. Retrieved from <http://realestate.boston.com/buying/2021/03/24/despite-pandemic-tiny-homes-more-popular/>

- Strohm, M. (2021, September 2). Compare current mortgage rates. *Forbes Advisor*. Retrieved from <https://www.forbes.com/advisor/mortgages/mortgage-rates/>
- Taiebat, M., & Xu, M. (2019, September 10). 5 charts show how your household drives up global greenhouse gas emissions. *The Conversation*. Retrieved from <https://theconversation.com/5-charts-show-how-your-household-drives-up-global-greenhouse-gas-emissions-119968>
- Thangavelu, P. (2020, September 1). Top U.S. housing market indicators. *Investopedia*. Retrieved from <https://www.investopedia.com/articles/personal-finance/033015/top-us-housing-market-indicators.asp>
- U.S. Census Bureau. (1960). *Income of Families and Persons in the United States: 1960 [P60-37]*. Retrieved from: <https://www.census.gov/library/publications/1962/demo/p60-037.html>
- U.S. Census Bureau. (2000). *Homeownership Rates*. Retrieved from: <https://www2.census.gov/programs-surveys/decennial/tables/time-series/coh-owner/owner-tab.txt>
- U.S. Census Bureau. (2019). *Income and Poverty in the United States: 2019 [P60-270]*. Retrieved from: <https://www.census.gov/library/publications/2020/demo/p60-270.html>
- U.S. Census Bureau. (2021). *Homeownership Rate in the United States [RHORUSQ156N]*. Retrieved from: <https://fred.stlouisfed.org/series/RHORUSQ156N>
- U.S. Green Building Council. (2021). LEED certification for residential. Retrieved from <https://www.usgbc.org/leed/rating-systems/residential>
- United Nations. (2019a). *World population prospects 2019: Highlights*. Retrieved from New York, NY: [https://population.un.org/wpp/Publications/Files/WPP2019\\_10KeyFindings.pdf](https://population.un.org/wpp/Publications/Files/WPP2019_10KeyFindings.pdf)
- United Nations. (2019b). World population prospects 2019: World total population (Online Database). Retrieved from <https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/900>. from Population Division of the United Nations Department of Economic and Social Affairs <https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/900>
- Van Vactor, W. (n.d.). Can I put a tiny house in my backyard in New York? How land use laws apply to building tiny houses in New York. *Nolo*. Retrieved from <https://www.nolo.com/legal-encyclopedia/can-put-tiny-house-backyard-new-york.html>
- World Green Building Council. (n.d.-a). The benefits of green buildings. Retrieved from <https://www.worldgbc.org/benefits-green-buildings>
- World Green Building Council. (n.d.-b). What is green building? Retrieved from <https://www.worldgbc.org/what-green-building>
- Zillow. (2021a). *Zillow Home Value Index: Rome Home Values*. Retrieved from: <https://www.zillow.com/rome-ny/home-values/>
- Zillow. (2021b). *Zillow Home Value Index: United States Home Values*. Retrieved from: <https://www.zillow.com/us/home-values/>
- Zillow. (2021c). *Zillow Home Value Index: Utica Home Values*. Retrieved from: <https://www.zillow.com/utica-ny/home-values/>

# How do I participate?

Students from diverse backgrounds and schools can participate in three easy steps as follows:

- **Step One, Complete Pre-InnovationChallenge Preparation**
- **Step Two, Attend ICNY HST 2021 on Friday 19 and Saturday 20 November 2021**
- **Step Three, Complete Post-InnovationChallenge Followup**

See the following sections for additional detail and explanations for each step. **Student expenses for event food and site tour transportation among other costs are paid by generous gifts from NYSTEC and the National Endowment for the Humanities.**

## 1. STEP ONE Complete Pre-InnovationChallenge Preparation:

- a) **Complete the required online participant registration form as soon as possible but no later than 5:00pm on Sunday 3 October 2021.** Register using the following link:  
<https://forms.gle/QWYEnPp2iFti3sgCA>
- b) **Complete the required pre-challenge survey by no later than 5:00pm on Sunday 31 October 2021.** After registering per 1.a, the ICNY leaders will email students invitations and instructions for completing the survey.
- c) **Read required background literature no later than 5:00pm on Sunday 14 November 2021.** After registering, the ICNY leaders will email students with instructions for accessing the ICNY Blackboard site and all the required readings.

## 2. STEP TWO Attend ICNY HST 2021:

- a) **Attend the required first full day of the InnovationChallenge at SUNY Poly (Student Center, MPR) on Friday 19 November 2021. The focus will be on Phenomenon Immersion as follows:**
  - **8:30 am Students Check-In at the Student Center MPR (see map below).**
  - **9:00 am-12:00 pm Kickoff with Expert Panel Discussions.** Students meet with subject experts to learn about various aspects of the InnovationChallenge topic. This is an essential and required information session about the InnovationChallenge that provides participants with access to stakeholders and information experts. Students will learn about resources available and the qualities and characteristics that define the InnovationChallenge process and proposals. Students should dress comfortably since the immersion site tours will require walking and meeting with diverse community constituents.
    - Introduction to the competition process
    - Presentation of the InnovationChallenge topic brief
    - Expectations for research (field expedition tours)
    - Overview of tours
    - Overview of resources & distribution of immersion site guide
    - Speed dating with experts
    - Lunch

- **1:00-6:00 pm Phenomenon Immersion Expeditions.** Students participate in tours for "phenomenon immersion" and collect ethnographic data. These excursions are informal bus tours led by experts, residents and community members or others with knowledge about the area and the local economic and urban challenges. This is an opportunity to experience and observe different areas of the region firsthand with other participants.
  - The goal is to take notes, photos and videos to share with your team the next day.
  - All participants must bring the immersion site guide, smart phones, tablets, etc. to photograph and video document their immersion experiences.
  - All guided bus tours will depart promptly at 1:00pm from the Student Center's parking lot.
- **6:00pm Ethnographic Studies.** At locations of their choice, students should individually prepare for Day Two by summarizing their ethnographic findings using the immersion site guide.

**b) Attend the required second full day of the InnovationChallenge at SUNY Poly (Student Center, MPR) on Saturday 20 November 2021. The focus will be on Ideation as follows:**

- **8:30 am-5:00 pm Parts One and Two of the Official ICNY Core Process.** Students are placed onto highly diverse teams. Arrive in the morning fresh with ideas then we place you in a diverse team, lead you through a structured work process and at the end of the day you present your BIG IDEAS to the group. It is an exciting day of organized chaos, frenetic energy, and intense cognitive exercise as many people work together to create meaningful and satisfying change for our greater region.

**Arrive at 8:30 am for onsite check-in and team formation.** The actual competition begins promptly at 9:00 am and runs till 5:00 pm. Please remember to bring the following:

- Your completed immersion site guide, pictures and videos, and other notes from research
- Laptops, tablets, and phones (photographs and videos) and any cords or accessories needed to connect or download files (such as additional pictures and videos, etc.)

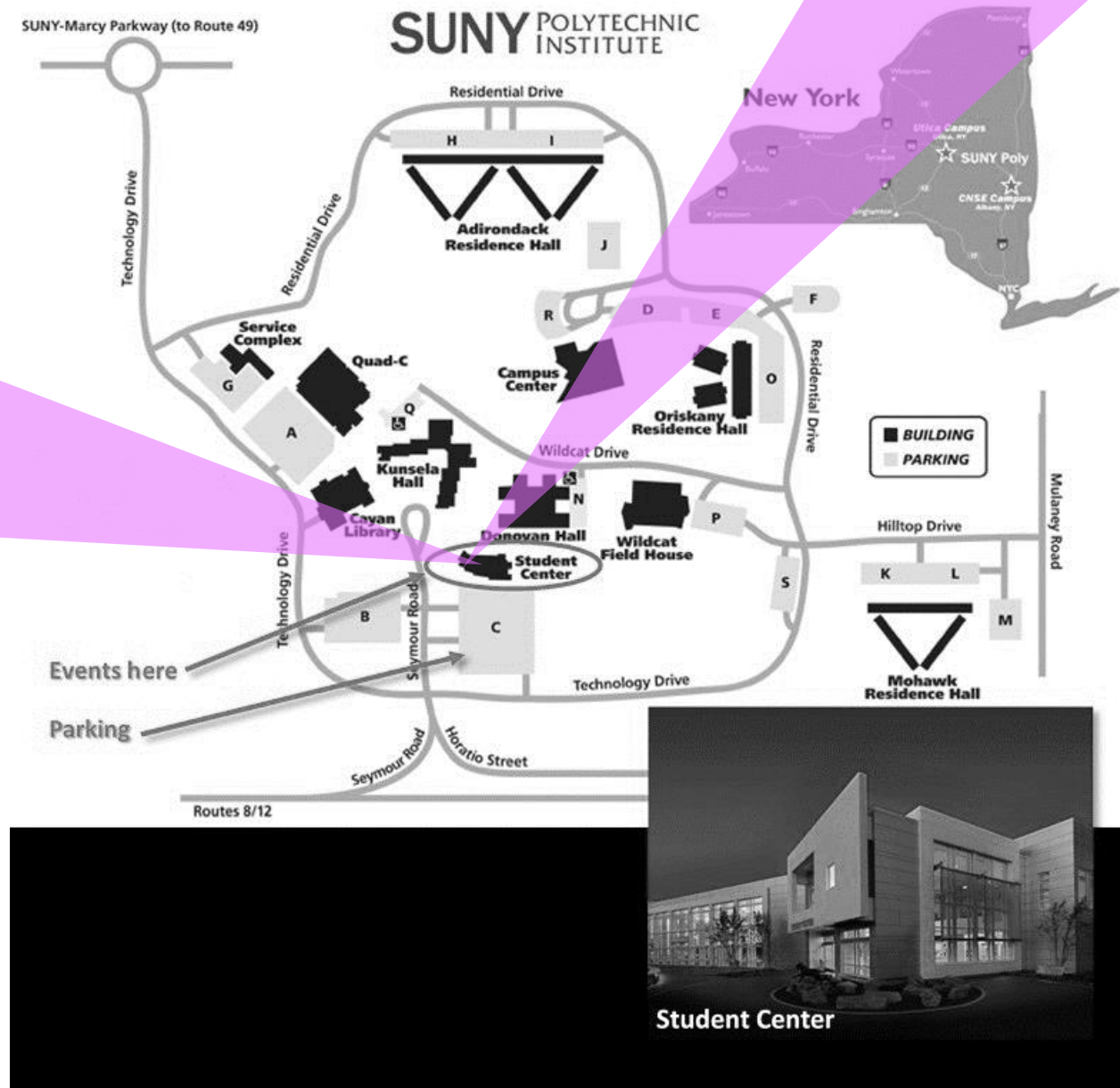
We provide the rest—all materials, work spaces, food and drinks. Dress comfortably—it's an active, hectic, and exciting workday! Here are a few other useful notes:

- Teams are formed to distribute participants by various diversification factors
- This is a daylong charrette—from opportunity identification to idea generation and concept proposal
- Each team will create and deliver a presentation of their proposed concept
- Each proposed concept will be judged—top teams will receive awards
- **5:00-6:00 pm Closing Reception.** Announcement of awards at closing reception with light refreshment.

### **3. STEP THREE Complete Post-InnovationChallenge Followup:**

- Complete the required post-challenge survey by no later than 5:00pm on Wednesday 24 November 2021.** ICNY leaders will email participating students with instructions for completing the survey.
- Craft and submit brief descriptions of teams' presented concepts by no later than 5:00pm on Friday 26 November 2021.** Each team (one per team) must submit a half to one page (2 pages maximum) description of their concept via the drop box on the ICNY Blackboard site.

As a reminder, all primary InnovationChallenge 2021 events will be held at **SUNY Polytechnic Institute, 100 Seymour Ave, Utica, NY 13502.**



# *Who are the organizers of ICNY?*

## **Dr. Robert Edgell, Professor and ICNY Director**



Dr. Edgell is currently a Professor of Technology Management, Co-Director of the Joint Center for Creativity, Design, and Venturing, and had volunteered for one year to be the Interim Dean of the College of Business Management at SUNY Polytechnic Institute. During May 2019, he received the Chancellor's Award for Excellence in Teaching. He has been a Visiting Professor at the Swiss Business School in Zurich and has delivered research papers and lectures at Stanford University's Law School, the University of California San Francisco's School of Dentistry, the California College of the Arts, and the University of St. Gallen. Previously, he was an Assistant Professor at American University's Kogod School of Business where he was named Outstanding Faculty. Also, he has taught at San Francisco State University's College of Business.

Dr. Edgell has served in various leadership capacities as a department chair, interim dean, and on several committees. He was a former board member of the Cyber Security Institute at Griffiss Institute and currently serves as a board member of Sculpture Space. He has presented his scholarship, reviewed papers, and chaired sessions at the Academy of Management and the International Atlantic Economics Society among others.

Dr. Edgell earned his PhD in international multicultural management with magna cum laude distinction from the University of St. Gallen in Switzerland. He holds an MBA from Columbia University Business School in the City of New York and a five-year Bachelor of Architecture from Kent State University, College of Architecture and Environmental Design. Through Columbia University's Chazen Institute of International Business, he studied at Erasmus University's Rotterdam School of Management in The Netherlands. He is a registered Architect and has studied advanced architectural topics at Harvard University's Graduate School of Design.

## **Sudheer Kumar Chandra, ICNY Graduate Assistant**



I am Sudheer Kumar Chandra and am currently studying at the State University of New York Polytechnic Institute's Master in Computer and Information Sciences. I received my undergraduate degree in computer science and engineering from RVR & JC College of Engineering in India. I am a Graduate Assistant on the ongoing project, ICNY, for Professor Robert Edgell. I am very much thankful for this opportunity. I am interested in playing tennis and reading novels.

## David Peterson II, SUNY Poly Alumni and ICNY Advisor



As a Contract Specialist for the Air Force Research Laboratories, David Peterson collaborates daily as a business advisor to provide essential guidance and assistance to technical personnel who are involved in providing the Air Force with emerging air, space and cyberspace technologies. David graduated as Valedictorian of his class from Remsen CSD and earned his BS in Business Administration from SUNY Polytechnic Institute in June 2018. During his undergraduate career he was an active member of several clubs and organizations, in which he held numerous leadership positions. These leadership positions included College Council Representative, Senator for the Student Government at Utica, founding Treasurer of the Stock Market Analysis Club, and President for 2 years of the student club Duel Academy. In his senior year he pursued an independent study project in which he proposed and created a LinkedIn University page for the College of Business Management. Additionally, he assisted with project management for the Mohawk Valley Mini Maker Faire and participated in planning the Innovation Challenge of New York. David was awarded the SUNY Polytechnic Institute President's Award and the College of Business Management Dean's Award. In 2018, David had the honor of being the Master of Ceremonies for the School and Business Alliance Breakfast (SABA). David pursued his MBA in Technology Management from SUNY Polytechnic Institute, graduating in May 2020. While in his graduate studies, he worked with the College of Business faculty and participated in the Transfer of Training research committee. David was a coauthor for their publication titled "Design Culture, Immersion, and Visuo-Spatial Learning: Re-envisioning Training", which appeared in the December 2019 volume of Business Education Innovation Journal. He greatly enjoyed his time and experiences at SUNY Poly and remains involved with the campus community. In addition, David is also a proud Eagle Scout, having received his Bronze, Silver, and Gold Palms.

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