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Participatory sustainable infrastructures: case studies in community-based environmental systems planning and implementation in Rio de Janeiro's *favelas*

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Patterns of increased global urbanization and a rise in precarious urban settlements have exacerbated trends towards substandard and unsustainable living conditions for billions around the Developing World. In Brazil, and specifically Rio de Janeiro, favelas have embodied this dual struggle to improve the livelihoods of citizens, while diminishing their negative impacts on the environment. Since the award of the 2016 Olympic Games, increased investment has led to numerous projects in these neglected communities. Urbanization programs such as Morar Carioca and Minha Casa Minha Vida have given residents glimpses of inclusive and sustainable development strategies, but ultimately failed to provide a continuous and stable vehicle for infrastructural improvement and related social, economic, and environmental benefits. As these communities have come under increasing international scrutiny,

favelas have become a laboratory for scholars, planners, scientists, nonprofits and community organizers, leading to a variety of infrastructural projects that can provide an counterpoint to the abandoned top down approaches by local government programs. To overcome their principal infrastructural deficits, favela communities are creatively and directly collaborating with these outside parties to leverage their environmental and community assets and advance natural systems through participatory processes. This partnership between creative professionals, advocates, and local residents bridges knowledge gaps and broadens the scope of each approach, propagating more cohesive and holistic projects. These projects are typically locally developed in close coordination with resident's needs, and at a smaller scale that is more readily deployable and easily replicable. Engaged with the project from the beginning, residents learn about systems thinking, natural processes, and technological solutions. Just as crucially, they provide intimate knowledge of the community's climate, terrain, and socioeconomic systems that inform the implementation of a design. Such active inclusion fosters educational experiences and dissemination of an environmental consciousness. By encouraging community-driven, interdisciplinary collaboration, citizens, planners and technical consultants can help generate Participatory Sustainable Infrastructures that empower communities and enhance ecosystems. This panel comprises some of these collaborators, who will describe and compare their projects encompassing a variety of infrastructural systems, scales, and intervention models. What approaches are most effective when proposing and project to a community? How does community education and engagement improve the chances of lasting impact for sustainable infrastructure projects? What are the potential social, economic, and environmental co-benefits of infrastructural solutions that are inclusive of existing grassroots efforts? How can favela residents and organizations position themselves to procure partnerships and projects with local and foreign academic and professional institutions? Can scaled up participatory sustainable infrastructure projects provide an empowering blueprint for bottom-up and governmental interventions, and not merely struggle to fill gaps in investment by the public sector? Informal community resident Otávio Alves Barros will chronicle the development of Vale Encantado's sustainable tourism co-operative, which provides

employment for residents, environmental education for local and international visitors, and opportunities for infrastructural improvements for the community. This organization is the culmination of decades of collaboration with international non-profit organizations, local academic institutions, and regional environmental advocacy groups. Vale Encantado provides a laboratory for the dissemination of innovative infrastructure technologies, financing models, and co-benefit generation. Dr. Thomas Henry Culhane will outline the implementation model undertaken by his Solar Cities initiative, which has utilized an international nonprofit model and scientific network to build numerous biodigesters to treat waste and generate energy locally in Rio's informal communities. Dr. Culhane consults his networks to improve on sustainable infrastructural technology, integrating their discoveries into a dynamic commons of knowledge. The group can then develop implementable solutions for communities that demonstrate the need and desire to become models for sustainable development. Leonel Lima Ponce will present the methodology of his graduate thesis at Pratt Institute, a participatory infrastructure planning project for green sewage and water infrastructure in Cordovil. Through a series of participatory processes, including transect mapping, city as play modeling, and visioning sessions, Mr. Ponce and community members produced a survey of infrastructural deficits and assets, challenged community assumptions, and shared potential improvements that could be implemented in individual projects or incorporated into publicly funded capital improvement projects. Local advocate and organizer Gabriel Neira Voto will explain the inception and growth of his Favela Verde organization, which has established a long-term relationship with resident groups in Rocinha that is leading to comprehensive sustainability education and development programs. Favela Verde utilizes art, culture, and other pre-existing community dynamics to engage residents in bottom-up environmental stewardship and project development. Projects follow a local sustainable development methodology, and include reforestation, community garden planting, and solid waste management. Catalytic Communities Executive Director, Dr. Theresa Williamson, will illustrate her organization's role in the identification of potential partnerships for sustainable development projects in favelas. As a liaison between underserved favelas and the international stage, Catalytic Communities leverages

social media, provide community training, and advocate for participatory planning and pro-favela policies with the long term goal of realizing the potential of Rio de Janeiro as a true example of inclusive urban integration. Following this mission, the organization has provided a platform and logistical support for numerous researchers pursuing sustainable development projects in Rio's favelas.