

The Sustainability Challenges of Green Building in the Construction Industry in St. Vincent and the Grenadines (SVG) focusing on the Green Building Material of Structural Concrete Insulated Panels' (SCIPS) Benefits and Constraints.

What is Green Building?

According to (United States Environmental Protection Agency), "green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction." Thus, green building is designed with the intentions of conserving our natural resources as well as enhancing our quality of life for both present and future generations. Additionally, green buildings vary by country or region as they are centred on climatic conditions, differing cultures, diverse building types and the environmental, economic, and social urgencies within the given framework.

The (World Green Building Council) states that any building can be designed and constructed as a green building given that it includes specific features that are considered making a building 'green'. Such features include but not limited to efficient use of energy, water, and other resources, use of renewable energy, pollution and waste reduction measures, quality indoor environmental air, use of non-toxic and sustainable materials, a design, construction, and operation with scrutiny concerning the environment along with attention to the quality of life of its occupants, and a design that allows for the adaptation to a changing environment.

(Doan, 2017) points out that globally, the construction industry has been severely criticized as being a prominent exploiter of energy and natural resources as it is accountable for consuming just about 30% of the earth's resources. This trade contributes to 30 % of the earth's greenhouse gases, approximately 40 to 50 % of water pollution globally and around 40% of total solid waste in developed countries (Zhang, Wang, Gao, Zhou, Kammen & Ying, 2019). Therefore, moving towards green buildings can directly lessen environmental challenges with the integration of more sustainable materials, improving water quality and conservation, improving energy efficiency, reduction in waste generation and in carbon emissions. Moreover, green buildings incorporate pioneering technologies and design, which can ultimately lead to not only environmental but also economic and socio-cultural benefits.



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The Role of the Construction Industry in St. Vincent.

The government has always advocated for the construction industry as a major economic sector and its potential for being a significant driver of economic activity. (Gonsalves) at a conference stated, “This construction industry has a critical role to play in our quest to build a modern, competitive, many-sided post-colonial economy which is at once local, national, regional and global.” His call for an increase in physical infrastructure projects such as international airports, hotels, mariners, entertainment facilities, schools, hospitals, and clinics etc. are necessary to accelerate the country’s economy with regards to quality of life and a more sophisticated population. Yet, most of the financial resources to the construction industry’s expansion comes from outside through foreign direct investments, remittances, grants, and

external commercial loans contracted mainly by the State. St. Vincent has come to embrace the construction industry especially in times of economic downturn as it is perceived as an advantageous boost for the economy. Consequently, in 2009 the government legislated important laws and regulations to provide a more efficient and competitive public sector construction industry. The country enacted the Bridges, Roads, and General Services Act (BRAGSA), a reformed and enhanced Housing and Land Development Corporation (HLDC) also the establishment of the National Properties Limited. In 2014, St. Vincent boasted its first international airport, which exemplified the government’s pledge in supporting infrastructure development while facilitating job creations and boosting the tourism sector.

“This construction industry has a critical role to play in our quest to build a modern, competitive, many-sided post-colonial economy which is at once local, national, regional and global. “ Dr. Hon. Ralph E. Gonsalves, SVG’s Prime Minister.

Challenges in Building a Sustainable, Resilient Economy in St. Vincent.

With the government’s inclination towards infrastructure development, urbanization too was taking place. Statistics show that in 2020, 53.03 percent of St. Vincent and the Grenadines’ total population resided in urban areas and cities (O’Neil). Urbanization has led to a significant increase in quantity and diversity of buildings in St. Vincent. Even though buildings offer amenities that are important to quality of life, such as employment, education, housing, commerce, and entertainment, they characteristically hold a substantial environmental footprint through damaging impacts on air, soil and water quality, biodiversity, as well as natural resources.

The (National Adaptation Plan for St. Vincent and the Grenadines) emphasizes that the island’s central infrastructures such as the main communication and emergency response structures like roads, airports, financial institutions, telecommunications etc. are located on a narrow coastal belt and that many of the coastal protection ecosystems such as mangroves and reefs have been removed or are degraded. The report also highlights that the country’s coastal areas are becoming increasingly vulnerable to storm surges. This is due to the continuing practices of several quarry mining of rocks for construction purposes as well as the mining venture of sand from the beaches that support local construction. Such methods of obtaining building materials for the construction industry in St. Vincent are leading to negative environmental impacts and ultimately adverse effects on the country’s social and economic development.

The (Caribbean Centre for Renewable Energy & Efficiency) specifies the challenges to sustainable green building within St. Vincent. These include a lack of the following: a green building certification program, energy efficiency building codes, renewable portfolio standard and quotas for set asides, tax credits, appliance labeling standards, minimum energy performance standards and energy efficiency loan programs.

Nonetheless, the government has stated its intentions to develop urban resilience strategies, policies and plans to tackle these challenges. The (National Adaptation Plan for St. Vincent and the Grenadines) features a Climate Change Adaption portfolio for 2024 to 2030 and these plans incorporate updating building codes to avoid discharge of wastewater in the coast and protecting reefs, increasing the resilience of powerlines, and constructing small resilient hospitals and a national green hospital.



Home construction in USA using green building material, SCIPS (Photo by MotarSprayer.com)

Green Building Material Opportunities- Structural Concrete Insulated Panels (SCIPs).

Still, there are groundbreaking green building materials technology that can add value to the construction industry in St. Vincent. Green buildings should not only incorporate sustainable siting and design but also ought to include green design elements, green materials along with green fixtures. Green design elements range from the shape and form of buildings, daylight application, alignment of the facades, and indoor acoustic design (Ragheba, El-Shimy and Ragheb). Green materials and fixtures consist of solar panels, dual flush toilets, automated shutoff taps, use of phase change material in building materials and concrete etc. The focus here, however, is on a relatively new and innovative technology that is being used in more developed countries but is still a comparatively small-scale industry within the wider scope of the construction industry- Structural Concrete Insulated Panels (SCIPS).

(The Federation of American Scientists) report offers a brief history about structural insulated panels (SIP) which were created about seventy-five years ago by the Forest Products Laboratory, established by the U.S Department of Agriculture. The first SIP house was built in 1935 in Madison, Wisconsin. These panels were used to construct test homes and were continuously tested and examined for a subsequent thirty-one years. Following this experiment, the first foam core SIP was created in 1952 by Alden D. Cow and a student Frank Lloyd Wright. After that, by the 1960s rigid foam insulating panels became easily accessible which led to the production of structural insulated panels today. Common SIP materials include Oriented Strand Board, Metal, Cement Fiber, and others. However, cement fiber SIPs, otherwise known as SCIPS is the main component of green building material in this article.

SCIPS are a green building material that has three layers. Two of which are concrete and are of varying thickness on the outer sides of a layer of polyurethane or polystyrene foam. The concrete and insulating layers are connected via a steel wire mesh. This three-layer panel is employed for both exterior and interior walls while ordinary reinforced concrete structures and cold-formed steel structures are utilized in parts of the building that are deemed necessary. All panels are attached by using dowel bars. The panel system is casted together by using the method of spraying mortar or concrete with temporary support. The picture on the right illustrates these characteristics of the SCIPS green building material (BRANZ Appraisals).

#GreenBuildingMaterials

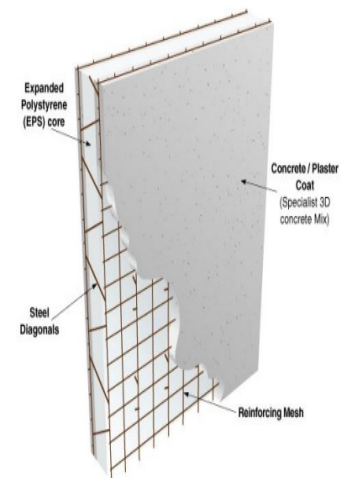
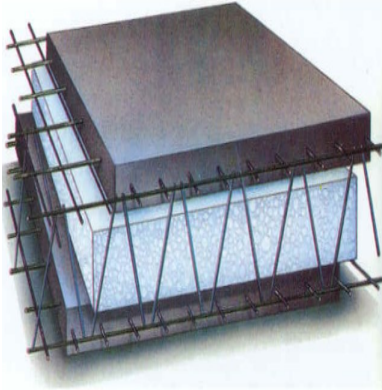


Photo by BRANZ
Appraisals



Structural Concrete Insulated Panel

Benefits of SCIPS Vs. Traditional Building Materials in St. Vincent.

Speaking to (Fraser), a local Vincentian Construction Project Manager and qualified Architect with Fraser Construction Company Limited, took the time to explain the numerous benefits that structural concrete insulated panels would offer as a green building material within the context of the local construction industry. "Structural concrete insulated panels will provide quality construction to the Caribbean due to its many advantages like decreased construction time, increased comfort, sustainability, energy savings, lightness and decreased job site waste." He also indicated that this building method is fit for taking on the forces exerted by hurricanes and tornadoes as well as earthquakes. Thus, he recommends the utilization of SCIPS for new homes, commercial buildings, and hotels in St. Vincent and by a larger extent the Caribbean region given the predisposed nature to these islands

to storms, hurricanes, and earthquakes.

SCIPS have an environmentally sustainable advantage over the traditional building materials used in St. Vincent and many other surrounding islands in the region. SCIPS is well-known for its considerable energy savings and grave reductions in greenhouse gas emissions when compared to the traditional method of block and board framing. A building constructed using SCIPS has high levels of insulation and is particularly airtight. Therefore, this implies cost effectiveness for homeowners and a smaller contribution to energy use and carbon emissions from the building. SCIPS tightness allows for remarkable indoor air quality for residents as well. This better ventilation helps ward off mold issues as mold and dust mites cannot endure in low-humidity conditions.



Image courtesy the Argyle International Airport Development Company Limited showing Traditional Construction Building Method in St. Vincent.

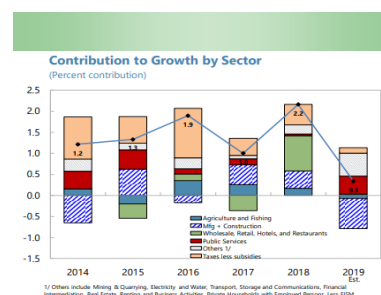
Furthermore, by utilizing SCIPS much of the waste that construction generates from building renovation and demolition is avoided. This is because SCIPS is designed and prefabricated in a factory which allows for precision of shape and size for the building. Consequently, this contributes to the minimization of excess material wasted from on-site construction projects. Factories also recycle any scrap to make other foam products, which cannot be accomplished using traditional building materials such as blocks, sand, gravel, and steel.

Lastly, a major advantage of building with SCIPS compared to building the traditional method in St. Vincent is the speed in which any building can be constructed. Building with SCIPS is much faster and has proven to shorten the construction time by sixty percent compared to those carried out with traditional systems. In St. Vincent, a single-story family home with maximum of three bedrooms would take about five to six months to construct and this results in high labour costs. However, if SCIPS system is employed this will drastically reduce the construction process and reduce labour cost for homeowners.

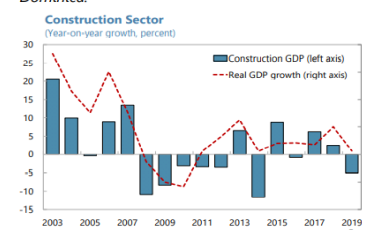
Barriers Facing St. Vincent's Construction Industry

SCIPS offer several qualities that are becoming progressively more desirable within current and new markets worldwide. The rapid increases in energy and construction costs along with the ever-expanding interest in green building technology internationally and moreover in St. Vincent permits for immense opportunity for this green building material. Yet, there are several barriers to adoption of SCIPS for home and commercial construction in St. Vincent. St. Vincent's economic, and social urgencies do not make way for the advancement of this green building material within the given current framework.

These barriers to adoption include 1) there is no robust legislation advocating energy efficiency, 2) there is no building codes incorporating green building materials and technology, 3) a lack of education and training about alternatives to traditional construction building materials and 4) a lack of government support for change to the construction industry. Additionally, two more recent and critical barriers to adoption must be taken into consideration with regards to sustainable challenges of green building design and construction in St. Vincent. They are 5) the impact of the Covid-19 pandemic, and 6) the impact of the April 2021 volcanic eruption in St. Vincent. These last two barriers to adoption are the country's foremost social and economic urgencies within St. Vincent currently as of November 2021.



...construction fell significantly in 2019, primarily due to reduced demand for reconstruction materials from Dominica.



GDP growth slowed in 2019, as the manufacturing and construction sectors contracted. Construction fell significantly in 2019, primarily due to reduced demand for reconstruction materials from Dominica.— IMF Country Report May 2020

(CARICOM and United Nations World Food Programme) summary report survey suggests that many Vincentians have undergone “a deterioration of their employment and income situation, an increase in food prices, and concerns about their future livelihood”. Thus, the government must now cope with a drastic increase in spending on social protection programmes and interventions. The Covid-19 pandemic led to the closure of schools, closure of small-businesses, restaurants etc. The construction industry was no different than any other sector and suffered too as construction materials such as steel and lumber along with shipping costs increased. Furthermore, the construction industry was already experiencing a decline since 2017- See graph (International Monetary Fund Country Report). This graph illustrates the decline in GDP growth in 2019, as the manufacturing and construction sectors contracted. Construction fell significantly in 2019, primarily due to reduced demand for reconstruction materials from Dominica.

Nevertheless, before the April 2021 volcanic eruption in St. Vincent there was an anticipated surge in the construction industry. Outlined in the (Budget 2021 Saint Vincent and the Grenadines) are the plans for the construction and maintenance of modern infrastructure, which is

viewed as critical to improved productivity and sustainable development. The 2021 Budget prioritizes projects that would create a positive local economic or employment impact and that can be executed quickly. These infrastructure and housing projects include a Modern Cargo Port at Kingstown, regional disaster vulnerability reduction project, Marriott Resort and Holiday Inn Express and Suites Hotel, road repairs and construction, affordable housing projects, the Pedestrian Access for Village Enhancement (PAVE) programme, a modern Parliament and modern Halls of Justice and community improvement projects.

After the April 2021 volcanic eruption, there has been further economic, social, and political downturn. As a result, the adoption of sustainable green building materials like SCIPS is pushed further away from the agenda than before given the economic and social constraints. The benefits that SCIPS provide like less construction time on sites are not accommodating with the requirements to drive economic growth and job creation for a better livelihood of the people of this developing country. Ceteris paribus, SCIPS may one day be considered for its sustainable green building benefits for construction buildings in St. Vincent.



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