

Market Readiness Analysis of Sustainable Construction Materials

*In three pilot OECS countries: Antigua and Barbuda, Dominica
and Grenada*

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ABBREVIATIONS

Abbreviation	Full Name
BCAD	Builders and Contractors Association of Dominica
CROSQ	CARICOM Regional Organization for Standards and Quality
CUBiC	Caribbean Uniform Building Code
CARICOM	Caribbean Community and Common Market
CREEBC	CARICOM Regional Energy Efficiency Building Code
OECS	Organization of Eastern Caribbean States
GCF	Global Climate Fund
LEED	Leadership in Energy and Environmental Design
BREEAM	Building Research Establishment Environmental Assessment Method
EPA	United States Environmental Protection Agency
FSC	Forest Stewardship Council
PEFC	Programme for the Endorsement of Forest Certification
SFI	Sustainable Forestry Initiative
CSI	Cement Sustainability Initiative
ILO	International Labour Organization
ISO	International Organization for Standardization
SPP	Sustainable Public Procurement
EPD	Environmental Product Declaration
UFP	Universal Forest Products
TCL	Trinidad Cement Limited

1. Introduction

1.1 Background and project overview

The importance of sustainable public procurement (SPP) has been recognized at the highest political levels in Latin America and Caribbean. Earlier this year, at the XXII Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean, governments endorsed Decision 2 on “Sustainable Consumption and Production and circular economy – key drivers for post COVID-19 sustainable recovery,” which included a “call to expand the implementation of sustainable public procurement practices as an important policy tool for increasing resource efficiency and guiding post COVID-19 economic recovery.”

Infrastructure will likely be at the heart of many countries’ post-COVID-19 recovery packages, as an effective means of creating jobs. However, the current stock and use of the world’s infrastructure is associated with over 60% of global greenhouse gas emissions. It is therefore imperative that governments leverage their purchasing power in a strategic manner to deliver public works projects that not only provide jobs and drive economic growth, but also that generate the lowest possible environmental impacts consistent with the Paris Agreement and Sustainable Development Goals.

In an effort to mainstream SPP practices in the area of civil works contracting, the United Nations Environment Programme’s (UNEP) Regional Office for Latin America and the Caribbean (ROLAC) entered into a partnership with the Organization of Eastern Caribbean States (OECS) Commission to develop and implement the “Strengthening Sustainable Public Procurement in the OECS” project. This initiative supports the larger US\$20 million Global Climate Fund (GCF) Enhancing Direct Access (EDA) pilot project, better known as the “EDA project”. The objective of this initiative is to promote awareness, build capacity, and develop policies and tools for successful implementation of SPP practices in the area of civil works contracting, with a focus on sustainable construction materials, in three OECS pilot countries – Antigua and Barbuda, Dominica and Grenada. The main outputs of this initiative will be the development of an OECS Model Policy, action plan(s), as well as SPP guidelines and sustainability criteria for the procurement of sustainable construction materials.

In order to support the fulfilment of these activities, a market readiness analysis of sustainable construction materials in the three pilot countries was undertaken.

1.2 Objectives

The objective of this consultancy is to carry-out a market readiness analysis for the sustainable public procurement of construction materials in three pilot OECS countries (Antigua and Barbuda, Dominica and Grenada). The following specific objectives have been defined:

- Assess the existing productive capacities for sustainable construction materials;
- Analyze the potential responsiveness and competitiveness of the market and the national business sector to public tenders inclusive of sustainability considerations for construction materials;
- Help define sustainability criteria for the procurement of sustainable construction materials and identify the corresponding certification or verification instruments and tools, as well as gaps; and

- Provide recommendations for the progressive introduction of sustainability criteria in the public procurement of construction materials, based on market readiness.

1.3 Methodology

The market readiness analysis follows UNEP’s Sustainable Public Procurement Implementation Guidelines approach¹ and entailed the following activities:

- Review of local and regional building codes;
- Review of internationally-recognized sustainable construction standards;
- Review of internationally-recognized labels associated with sustainable construction materials;
- Review of secondary sources of information, such as websites and reports of local and regional construction companies and associations;
- Identification of stakeholders; and
- Interviews with key stakeholders.

1.4 Review of building codes and sustainable construction standards

The following local and regional building codes, together with internationally recognized sustainable construction standards, were reviewed:

1. OECS Building Code 7th Edition, 2016²
2. CARICOM’s Regional Energy Efficiency Building Code, 2018³
3. Green Building Procurement Manual for Public Managers (Version 1)⁴
4. LEED v 4.1, 2019⁵
5. BREEAM International New Construction, 2016⁶

Even though the standards specified in the OECS Building Code relate more to quality than sustainability, it can be argued that a well-built high-quality structure is more durable and therefore more “sustainable” in the longer-term. In the case of the Eastern Caribbean, quality becomes even more important given the need for resilience to common extreme hazardous events (e.g., hurricanes and earthquakes). In addition, it should be noted that these standards refer at some point to environmental attributes of the products used or the building process.

OECS Building Code 7th Edition, 2016

¹ <https://www.oneplanetnetwork.org/resource/sustainable-public-procurement-implementation-guidelines>

²

<https://www.oecs.org/en/our-work/knowledge/library/sustainable-energy/oecs-building-codes/oecs-building-code>

³ <https://codes.iccsafe.org/content/document/1335>

⁴

https://secureservercdn.net/198.71.233.44/u1y.854.myftpupload.com/wp-content/uploads/2021/04/GreenBuildingsProcurement-Manual_Final.pdf

⁵ <https://www.usgbc.org/leed/v41>

⁶ <https://www.breeam.com/BREEAMInt2016SchemeDocument/>

The OECS Secretariat, with assistance of the United Nations Development Programme (UNDP) and United Nations Center for Human Settlements (UNCHS) through the UNCHS /UNDP Project for Programme Support to the Human Settlements Sectors in the OECS, developed standard building codes and guidelines which speak directly to the specific requirements of each OECS country. Its principal reference is the Caribbean Uniform Building Code (CUBiC) published by the CARICOM Secretariat, Georgetown, Guyana. The codes and guidelines should become part of each country's regulatory mechanisms for ensuring adequate building standards.

Scope: This Code applies to the “design and construction of new buildings, and the alteration, reconstruction, demolition, removal, relocation, maintenance and occupancy of existing buildings or any appurtenances connected or attached to such buildings or structures. It is recognized that the large amount of informal housing present in most countries will be outside of the regulatory stream, and that other mechanisms must be devised to improve such housing.”

Intent: The types of construction, materials and methods of design referred to in this Code shall be considered as standards of **quality and strength**. New types of construction, materials and methods of design shall be at least equal to these standards for the corresponding use intended. A good quality construction will be more resistant to the event of damage by hurricane, flood or earthquake. The Governments of the OECS have recognized that the damage caused by these extreme natural events affect the poor to a significant extent and have placed emphasis on the development of building standards which would prevent or mitigate such damage.

CARICOM Regional Energy Efficiency Building Code, 2018

In April 2013, the CARICOM Regional Organization for Standards and Quality (CROSQ), commenced the development of the CARICOM Regional Energy Efficiency Building Code (CREEBC), with support from UNEP and other organizations. CREEBC is an adaptation of the International Energy Conservation Code, 2018 Edition, published by the International Code Council. CREEBC is meant to specifically meet the needs of the Caribbean and other countries in tropical locations.

Scope: This Code regulates minimum energy conservation requirements for **new buildings**. CREEBC addresses energy conservation requirements for all aspects of energy use in both commercial and residential construction. It does not include low-rise residential buildings (lower than three stories), manufactured or mobile homes, and buildings that use neither electricity or fossil fuels. It includes heating and ventilation, lighting, water heating, and power usage for appliances and building systems.

CREEBC is a **design** document. This means before one constructs a building, the designer must determine the relevant minimum values like insulation R-values and fenestration U-factors for the building exterior envelope.

This standard shall not be used to circumvent any safety, health or environmental requirements.

Intent: To establish the minimum energy efficiency requirements of buildings other than low-rise residential buildings for: 1) Design, construction and a planning of operation maintenance; and 2) Utilization of on-site, renewable energy sources.

Green Buildings Procurement Manual for Public Managers (Version 1)

Scope: It surveys national frameworks for procurement for five CARICOM member states. (Antigua and Barbuda, Belize, Grenada, Saint Lucia and Saint Vincent and the Grenadines). The scope of application of Green Public Procurement (GPP) is narrowed to “green buildings”. The Manual offers the following operational definition of “Green Building Procurement”: “The energy, product safety, and recyclability aspects of the public procurement process for sustainable energy systems in buildings which achieve the goal of ‘value for money’ on a life cycle basis”.

Intent: To allow an easy comparison of national procurement frameworks across five CARICOM member states. It also presents life cycle analysis methods, online software tools, benchmark product pricing databases, and product specifications that would allow national technical staff to support procurement officials as they implement the recommendations of the Manual.

LEED v. 4.1 Building Design and Construction, based on LEED v4.0

LEED is an international rating system for the design, construction and operation of high-performance green buildings. Since 1998, various versions of LEED have pushed the global green building market forward progressively, with more than 93,000 registered and certified projects and more than 19 billion square feet of space worldwide.⁷ Through its standards, the transformation of the way buildings and communities are designed, built and operated are promoted, enabling an environmentally and socially responsible, healthy and prosperous environment.

Scope: LEED is for all building types and all building phases including new construction, interior fit outs, operations and maintenance and core and shell. Specifically building design and construction (BD+C) applies to buildings that are being newly constructed or going through a major renovation. Some of the rating systems and certifications specified under this standard are new constructions, core and shell, data centers, healthcare, hospitality, retail, schools, warehouses and distribution centers, homes and multifamily midrise.

Intent: Provide verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

BREEAM International New Construction, 2016

⁷ LEED v 4.1

BREEAM is a leading sustainability assessment method for master planning projects, infrastructure and buildings. It recognizes and reflects the value in higher performing assets across the built environment lifecycle, from new-construction to in-use and refurbishment.

Scope: The BREEAM International New Construction 2016 scheme can be used to assess the environmental life cycle impacts of new buildings at the design and construction stages. “New Construction” is defined as development that results in a new standalone structure, or a new extension to an existing structure, which will come into operation or use for the first time upon completion of the works. The list of building types covered under BREEAM International New Construction 2016 is wide and includes residential dwellings, offices, industrial units, retail, educational, hotels and residential institutions, and non-standard building types like community centers, town halls and libraries.

Intent: Provide an assessment of an asset’s environmental, social and economic sustainability performance, using standards developed by Building Research Establishment (BRE). This means BREEAM rated developments are more sustainable environments that enhance the well-being of the people who live and work in them, help protect natural resources and make for more attractive property investments.

1.5 Identification of construction materials

The following steps were taken in order to define a select set of construction materials that would be suitable for sustainable public procurement. First, diverse construction materials were identified and then a shortlist was prepared, containing 13 commonly used construction materials, defined as follows:

1. Cement: is a binder, a substance that sets, hardens, and adheres to other materials to bind them together. Cement is rarely used on its own, but rather to bind sand and gravel to produce concrete.
2. Sand: is a granular material composed of fine rock and material particles. Sand has different compositions but is defined by its grain size.
3. Gravel: is a loose aggregation of rock fragments, classified by particle size. It is an important commercial product, with a number of applications like roadways and concrete production.
4. Concrete and concrete blocks: is a composite material composed of fine and coarse aggregate bonded together with a fluid cement (cement paste) that hardens (cures) over time. Concrete blocks are made from cast concrete in standard rectangular sizes.
5. Steel reinforcements for concrete: steel bar or mesh of steel wires are used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and aid the concrete under tension.
6. Lumber for wood framed walls and roofs: is a type of wood that has been processed into beams and planks, a stage in the process of wood production. Lumber is mainly used for structural purposes but has many other uses as well.
7. Ties, straps and clips: these elements are used commonly in roof joints for reducing the damage caused by natural catastrophic events like hurricanes and earthquakes.
8. Steel roofing material: Stamped sheet roofing panels.

9. Fasteners (nails and screws): Used to attach materials, for example a metal roof to its wooden structure.
10. Paint: any pigmented liquid, liquefiable, or solid mastic composition that, after application to a substrate in a thin layer, converts to a solid film. It is most commonly used to protect, color, or provide texture to objects.
11. Windows: is an opening in a wall, door, roof, or vehicle that allows the passage of light and may also allow the passage of sound and sometimes air. Commonly used materials for windows manufacturing nowadays include glass and metal and PVC frames.
12. Asphalt: is a sticky, black, highly viscous liquid or semi-solid form of petroleum. Its main use is road construction, where it is mixed with aggregate particles to create asphalt concrete.
13. Pipes: are a tubular section or hollow cylinder, usually, but not necessarily, of circular cross-section, used mainly to convey substances which can flow — liquids and gases (fluids), slurries, powders and masses of small solids. It is made from many types of materials including ceramic, glass, fiberglass and metals.

After interviews with stakeholders and discussions with counterparts, we decided to focus our study on lumber and concrete blocks and its aggregates (cement, sand and gravel) based on:

1. Amount of use of the materials in new projects;
2. Local expert's views on the most commonly used construction materials in the pilot countries; and
3. Development of internationally-recognized sustainability standards and eco-labels.

1.6 Stakeholder interviews

We identified a total of 116 stakeholders in the three countries of study, from public ministries and departments, to local construction companies, chambers of commerce and trade associations, universities, civil society and NGO's, distributors and retailers and international suppliers. For a list of the interviews held with key stakeholders see **Annex A**. For a list of stakeholders identified by country see **Annex B**.

2 Lumber for wood-framed walls and roofs

Lumber has been used for thousands of years as a construction material, and still is used widely in the construction sector. It is easy to work with and versatile, also renewable and recyclable. We will focus on lumber used as a construction material for wood framing and roofing, accounting for 25% of the wood harvested on a universal scale.⁸ In Latin America and the Caribbean, imports of wood in 2018, according to The World Bank⁹, totaled US\$ 5,685,532 and represented an import product share of 3,84%.

⁸ Marzouk, M., Abdelhamid, M., & Elsheikh, M. (2013). Selecting sustainable building materials using system dynamics and ant colony optimization. *Journal of Environmental Engineering and Landscape Management*, 21(4), 237-247.

⁹<https://wits.worldbank.org/CountryProfile/en/Country/LCN/Year/2018/TradeFlow/Import/Partner/LCN/Product/All-Groups>

2.1 Sustainability topics

The world's natural forests are of critical importance to the planet's climate, food supply, species habitat, and indigenous people. Half of the world's forests have already disappeared, and only 20 percent of what remains is intact. As it stands, the world loses more than 23 million acres of forest area every year.¹⁰

Forests are being exploited for lumber, cleared to make room for livestock or mono-crop plantations like soy and palm oil, and wither from the impacts of climate change.

The main sustainability impacts of lumber production are related to deforestation, and can be summarized as follows:

- Climate change and global warming: Trees cool the atmosphere and “store” greenhouse gases, known as carbon sequestration. It is estimated that 15% of all greenhouse gas emissions are the result of deforestation.¹¹
- Loss of biodiversity: Human occupation and logging destroys forests. Forests are home to over 80% of the world's terrestrial biodiversity.¹²
- Food insecurity: 1.6 billion people living in poverty depend on forests for their food, fuel and livelihoods.¹³
- Loss of natural resources: Flooding and soil erosion can result from deforestation.

In addition, implicit in the transport of lumber from forests to processing sites and construction locations is the consumption of fossil fuels, which contributes to climate change and global warming. Sourcing lumber from nearby sources increases efficiency and lowers carbon emissions. The OECS Building Code recommends sourcing from nearby sources wherever possible.

Another important sustainability impact is linked to lumber processing and the use of chemical treatment compounds - preservatives with high toxicity profiles could damage health of users.

Sustainable or appropriate forest management practices in the production of lumber can be applied by companies committed to addressing some of sustainability issues in the industry, while also satisfying the increasing consumer demand for responsible sources.

- The OECS building Code includes a recommendation on sustainable timber: “Timber must be specified from an appropriate source to be categorized as renewable.”
- LEED and BREAM protocols give higher marks for those buildings which use lumber from sustainable certified sources like FSC, PEFC and SFI.

¹⁰ <https://www.greenpeace.org/usa/forests/issues/>

¹¹ <https://www.worldwildlife.org/habitats/forest-habitat>

¹² <https://www.worldwildlife.org/habitats/forest-habitat>

¹³ <https://www.worldwildlife.org/habitats/forest-habitat>

2.2 Lumber chemical treatment

Wood preservative products are those that control wood degradation problems due to fungal rot or decay, sapstain, molds, or wood-destroying insects. Both the treatment process and the use of treated products can result in risks to human health and the environment. Treated wood is most commonly used outdoors.

The United States Environmental Protection Agency (EPA) recommends newer wood preservatives for residential uses that have lower toxicity profiles when compared to older ones. The following chemical wood preservatives are registered for treatment of lumber to be used in the residential lumber and timber market:

- Alkaline copper quaternary (ACQ)
- Borates
- Copper azole
- Copper naphthenate
- Copper-HDO (Bis-(Ncyclohexyldiazeniumdioxy-copper))
- Polymeric betaine

Of these chemicals, ACQ is the most widely used wood preservative for residential applications and has been identified through interviews carried out with stakeholders as being sold in the pilot countries.

The OECS Building Code also provides some guidance on the chemical treatment of wood products: *“Select timber products with volatile organic compound limits, e.g., wood products that do not contain urea-formaldehyde resin”.*

2.3 Lumber grade marks

Lumber grade marks help: buyers identify what they are buying and its recommended use; designers to specify appropriate lumber in their plans and specifications; building inspectors to check on site that the product in use is proper for its purpose; and lumber manufacturing facilities to meet requirements in regulations and in their delivery contracts. This must be understood as a quality mark, rather than a sustainability label. As defined by OECS Building Code 2016:

“All lumber, including end-jointed lumber, used for load supporting purposes shall be identified by Grade Mark of a Lumber Grading or Inspection Bureau or Agency approved by the Authority. All lumber and plywood required to be treated shall bear an approved AWPB Quality Mark or that of an inspection agency approved by the Authority, that maintains continuing control, testing and inspection over the quality of the products.”



Figure 1. Example of grade mark, with mill identification, grade designation, species, seasoning and moisture content. It can also include a trademark.

2.4 Sustainability sub-categories and means of verification

Certified Wood is a timber product approved by a recognized third-party certifying organization as being obtained from a responsibly managed forest anywhere in the world. **Forest certification** is a voluntary procedure by which an independent third party (the “certifier”) assesses the quality of forest management and production against a set of requirements (“standards”) predetermined by a public or private certification organization. With forest certification, and associated labelling, consumers are informed about the sustainability of the forests from which wood was produced.

There are two types of forest certifications: **certification of forest management**, which assesses if forests are being managed according to a specified set of standards; and **certification of the chain of custody** (CoC certification), which verifies that certified material is identified and separated from non-certified or non-controlled material through the production process, from forest to final consumer. Both management certification and chain-of-custody certification are required to label a final product.

Most of the certifications address a wide range of economic, social, environmental and technical aspects of forest management. The three largest international certification programs are the following: Forest Stewardship Council (FSC), Programme for the Endorsement of Forest Certification (PEFC), and Sustainable Forestry Initiative (SFI).

2.4.1 Forest Stewardship Council (FSC)¹⁴

When the 1992 Earth Summit in Rio failed to produce an agreement to stop deforestation, a group of businesses, environmentalists and community leaders came together to create the Forest Stewardship Council (FSC). Gathered in the first FSC General Assembly in 1993 in Toronto, Canada, the group set out to create a voluntary, market-based approach that would improve forest practices worldwide. At the time, FSC represented an alternative to boycotts of forest products, which were shown to be counter-productive since they devalued forest land.

Forest management certification: FSC forest management certification confirms that the forest is being managed in a way that preserves biological diversity and benefits the lives of local people and workers,

¹⁴ <https://fsc.org/en>

while ensuring it sustains economic viability.¹⁵ FSC defines ten principles¹⁶ that any forest operation must adhere to before it can receive FSC forest management certification. These principles cover a broad range of issues, as listed below:

1. Compliance with laws;
2. Worker's rights and employment conditions;
3. Indigenous people's rights;
4. Community relations;
5. Benefits from the forest;
6. Environmental values and impacts;
7. Management planning;
8. Monitoring and assessment;
9. High conservation values; and
10. Implementation of management activities.

Chain of Custody certification: FSC chain of custody certification provides credible confirmation for products with environmentally and socially responsible sources to access the market. FSC chain of custody certification verifies that FSC-certified material has been identified and separated from non-certified and non-controlled material as it makes its way along the supply chain, from the forest to the market.¹⁷ All sizes and organizational structures are possible for chain of custody certification, including single-site, multi-site, and groups of organizations, enabling certification cost optimization.

On-products labels: FSC labels can be found on a variety of products. Each of the three existing labels provides information about the origin of the materials used to make the finished and labeled product.

- **FSC 100%:** Products manufactured with 100 percent FSC-certified virgin fiber from FSC-certified forests. Of all the FSC labels, FSC 100% contributes most directly to FSC's objective—forests for all, forever—and is therefore the highest mark of distinction for certified products.
- **FSC Recycled:** Products that bear this label have been verified as being made from 100% recycled content (either post-consumer or pre-consumer reclaimed materials). The use of FSC Recycled products can help to alleviate the pressure of demand on sources of virgin material, thereby helping to protect the world's forests.
- **FSC Mix:** Products manufactured with a combination of FSC-certified virgin fiber (from FSC-certified forests), controlled sources and/or recycled wood or fiber. While **controlled wood** is not from FSC certified forests, it mitigates the risk of the material originating from unacceptable sources. FSC allows businesses to source-controlled wood to make up a limited percentage (30%) of the total manufactured product. Controlled wood provides for an acceptable option for those businesses that cannot procure themselves enough FSC-certified material and still offer consumers the possibility of purchasing products from certified and controlled sources.

¹⁵ <https://fsc.org/en/forest-management-certification>

¹⁶ FSC-STD-01-001 V5-2 EN

¹⁷ <https://fsc.org/en/chain-of-custody-certification>

Under FSC's controlled wood standard, organizations must commit to obtaining their raw materials from low-risk sources which excludes five unacceptable categories:

1. Illegally harvested Wood;
2. Wood harvested in violation of traditional and human rights (for example forced or child labour);
3. Wood harvested in forests in which high conservation values are threatened by management activities;
4. Wood harvested in forests being converted to plantations or non-forest use; and
5. Wood from forests in which genetically modified trees are planted.¹⁸



Figure 2. Examples of FSC on-product labels

2.4.2 Programme for the Endorsement of Forest Certification (PEFC).¹⁹

The Programme for the Endorsement of Forest Certification (PEFC) is a leading worldwide alliance of national forest certification systems. It is an international non-profit, non-governmental organization, dedicated to promoting sustainable forest management through independent third-party certification. Its history began in 1999 when small and family forest owners from Europe came together to create a forest certification system that would enable them to demonstrate their excellence in sustainable forest management. Twenty years on, PEFC is one of the largest forest certification system in the world. Their most relevant standards are described as follows:

Sustainable Forest Management (PEFC ST 1003): This benchmark lays out the international requirements for sustainable forest management. Developed by a working group with representation of all relevant stakeholders, it describes the criteria and indicators believed as vital for the sustainable management of a forest. Every national forest management standard must address these requirements to achieve PEFC endorsement. On the ground, this benchmark is the basis for the requirements that forest owners or managers must meet to achieve PEFC certification at local level.

Chain of Custody, (PEFC ST 2002): This standard lays out the requirements for chain of custody certification for forest and tree-based products. During the certification process, the certification body

¹⁸ <https://fsc.org/en/controlled-wood-FSC-MIX>

¹⁹ <https://www.pefc.org/standards-implementation/standards-and-guides>

will assess the company against the requirements set out in this document. If the company complies, they will receive their PEFC chain of custody certificate. PEFC chain of custody establishes the link from the forest to the market, tracking forest and tree-based products from sustainable sources to the final product. In addition, this standard includes management requirements, including on health, safety and labor issues.



Figure 3. Example of PEFC label

2.4.3 Sustainable Forestry Initiative (SFI)²⁰

The Sustainable Forestry Initiative (SFI[®]) program was launched in 1995 as a voluntary code of conduct for the members of the American Forest & Paper Association (AF&PA) of the United States.

SFI Forest Management Standard: Includes measures to protect water quality, biodiversity, wildlife habitat, species at risk, and forests with exceptional conservation value. More than 370 million acres/147 million hectares are certified to the SFI Forest Management Standard.

SFI Chain-of-Custody Standard: Tracks forest fiber through harvesting to manufacturing and to the end product. It helps businesses prove to customers that their products are made using certified forest content, certified sourcing or recycled content.



Figure 4. Example of SFI label

2.5 Local market capabilities assessment

There are no major lumber producers in the countries of study and in the Caribbean region. Lumber building materials are mainly sourced from North, Central and South America. Hard wood is commonly sourced from Guyana, Brazil, Chile and Honduras and soft wood from USA.²¹ The price of lumber

²⁰ <https://www.forests.org/>

²¹ Wiles, Barnaby (June 2018). Use of Framework agreements to Improve Disaster preparedness and response in the Caribbean. The World Bank.

building materials is heavily affected by the commodity price of lumber. As of Feb 3, 2020 the price was \$884 USD per 1.000 board feet.

2.5.1 Antigua and Barbuda

- There are no existing productive capacities in the country to provide this material; the forest cover of Antigua and Barbuda is limited since most of the original forests were cleared to establish sugar plantations during the early colonial settlement of the islands. Additionally, this island state is relatively dry and flat, therefore lush tropical rainforests are not common.²²
- Most of the lumber is imported.
- From national trade data 2017, we identified the main sources of lumber as the United States and Third Countries (see Table below).

Product	Source	Value of imports 2017 (in EC\$)	%
Lumber	USA	13,067,727	85.5
	Third Countries ²³	1,771,639	11.6
	Rest of CARICOM	374,755	2.5
	EU	54,772	0.4
	UK	13,371	0.1
	Total	15,282,263	100

- There is no local availability of sustainable lumber alternatives, and also no awareness of these alternatives, as we noted from interviews with local stakeholders.
- There are no local companies certified with FSC, PEFC or SFI.
- The main distributors of lumber are hardware stores: DEWS Pro building Ltd in Saint Johns. Also VEG International, North Coast Hardware and Antigua Plumbing and Hardware.
- International suppliers identified through stakeholders' interviews include: Universal Forest Products Inc (UFP Industries Inc.).
- It is possible to introduce certified lumber in public procurement. Certified wood is readily available in the USA market, one of the most relevant sources. Also, Guyana has certified FSC companies. Public FSC certificates can be found on <https://info.fsc.org/certificate.php>
- UFPI, through its subsidiary UFPI Purchasing Inc., has a public FSC certificate. Their wood for construction (W11) product has FSC Mix or FSC 100% labels. Wood for construction (W11) species considered are: *Abies alba*, *Betula maximowicziana*; *Dipteryx odorata*; *Larix occidentalis*; *Manilkara bidentata* (A. DC) A. Chey; *Picea abies*; *Picea spp*; *Pinus radiata*; *Pinus strobus*; *Pinus taeda*; *Pseudotsuga menziesii*; *Quercus rubra*; *Sequoia sempervirens*; *Tabebuia heptaphylla* (Vell.) Toledo (Syn: T, ipe (Mart) Standl, *Tecoma ipe* Ma; *Thuia plicata*; *Tsuga heterophylla* (Raf.) Sarg.

²² <http://www.fao.org/3/ca9849en/ca9849en.pdf>

²³ Countries outside CARICOM, and different from those listed in the Table.

2.5.2 Dominica

- There are no large-scale forest timber-based industries on the island. For its domestic needs, today, Dominica depends to a very large extent on imports of lumber and small, cottage size chainsaw operations to supply raw materials for the furniture and construction industries.²⁴
- The Island has varied and abundant flora and fauna, which are influenced by its geography and history. It hosts the most extensive natural forests in the entire Eastern Caribbean. Dominica has the potential for a lumber industry, which should be in accordance with a “green” development path in keeping with the government’s pronouncement that declared Dominica the “Nature Isle”. Consequent upon this aspiration, Dominica is aligning its development agenda and biodiversity conservation strategy with the global biodiversity objectives.²⁵ In this context, deforestation has been defined as a major threat. There is some use of lumber for the local market, and also wood for fuel and charcoal, this netted an average of \$3.67 million per year for the ten-year period 2002 to 2012.
- Most of the lumber is imported. From national trade data 2017, we identified the main sources of lumber as the United States and Third Countries (see Table below):

Product	Source	Value of imports 2017 (in EC\$)	%
Lumber	USA	7,110,425	79.6
	Third Countries ²⁶	1,516,303	17.0
	Rest of CARICOM	234,347	2.6
	OECS	54,950	0.6
	EU	20,423	0.2
	UK	525	0.0
	Total		8,936,974

- There is no local availability of lumber sustainable alternatives, and also no awareness of these alternatives, as we noted from interviews with local stakeholders.
- There are no local companies certified with FSC, PEFC or SFI.
- The main distributors of lumber are hardware stores, such as E.H Charles and Company Limited, Maxroy Trading, Do It Center Dominica, and ACE Engineering Ltd.
- It is possible to introduce certified wood in public procurement. Certified wood is readily available in the USA market, one of the most relevant sources. Also, Guyana, has certified FSC companies. Public FSC certificates can be found on <https://info.fsc.org/certificate.php>

²⁴ <http://www.fao.org/3/x6689e/X6689E13.htm>

²⁵ <https://sustainabledevelopment.un.org/content/documents/1446dominica.pdf>

²⁶ Countries outside CARICOM, and different from the above mentioned. Grouped.

2.5.3 Grenada

- Trees and forests in Grenada are economically important for their role in ecotourism and recreation. They supply forest products such as timber, posts, poles, split fencing, wildlife, dyes, honey, wax, gums and resins, and create direct and indirect employment.²⁷
- The Forest Department facilitates the harvest of wood from government plantations. Blue mahoe is harvested for timber, split fence and post production. Several blue mahoe plantations have been replaced with pines.²⁸
- Most lumber for construction is imported. From national trade data 2017, we identified the main countries from which lumber is sourced, as shown in the following Table:

Product	Source	Value of imports 2017 (in EC\$)	%
Lumber	USA	6,178,313	81.0
	Third Countries ²⁹	1,102,208	14.5
	Rest of CARICOM	251,289	3.3
	EU	55,175	0.7
	OECS	37,141	0.5
	UK	424	0.0
	Total		7,624,551

- There is limited local availability of sustainable lumber alternatives, with chain of custody certification. L.A. Purcell Lumber and Hardware Company declares in their webpage that their lumber/timber products come from certified chain of custody sources.
- From interviews with stakeholders, we found that there is low awareness of sustainable lumber alternatives.
- Main distributors are hardware stores, such as M&N Hardware, ACE Hardware and L.A. Purcell.
- It is possible to introduce certified wood in public procurement. Certified wood is readily available in the USA market, one of the most relevant sources. Also, Guyana, has certified FSC companies. Public FSC certificates can be found on <https://info.fsc.org/certificate.php>

2.6 Recommendations

- Quality - All lumber used for load supporting purposes should be identified by Grade Mark (according to the OECS Building Code).
Means of verification: Grade Mark visible in lumber.

²⁷ <http://www.fao.org/forestry/country/57478/en/grd/>

²⁸ <http://www.fao.org/forestry/country/57478/en/grd/>

²⁹ Countries outside CARICOM, and different from the above mentioned. Grouped.

- Lumber chemical treatment - Procure lumber that has been treated with newer and greener wood chemical preservatives (according to Environmental Protection Agency). “Select timber products with volatile organic compound limits, e.g., wood products that do not contain urea-formaldehyde resin” (according to OECS Building Code).
Means of verification: Producer’s declaration of chemicals and preservatives used on lumber.
- Transport - Minimize the negative impacts of transportation of materials by choosing alternatives from nearby sources (according to OECS Building Code).
Means of verification: Origin certificate.
- Legal sources - Procure lumber coming from legal sources operations.
Means of verification: Legal source certificate or FSC controlled wood standard.³⁰
- Certified wood – Procure certified wood with forest management and sustainable chain of custody certifications, such as FSC, PEFC or SFI.
Means of verification: Certificates of FSC, PEFC or SFI.

3 Cement

Cement is the largest manufactured product on Earth by mass. Combined with water and aggregates it forms cement-based materials like concrete. These materials make up a substantial proportion of the built environment. Private and public buildings, and public infrastructure use these materials; from single family homes to high-rise apartments, roads, railways, ports and bridges.

Modern developed societies require a built environment that is unimaginable without the widespread use of cement-based materials that allow construction anywhere, at low cost, of complex and massive shapes. The larger per-capita availability of cement is related to discernably improved living standards in most of the world.³¹

3.1 Sustainability topics

Environmental impacts:

- Climate change: cement production releases 5–6% of all carbon dioxide generated by human activities, accounting for about 4% of global warming.³²
- Air quality: it can release huge amounts of persistent organic pollutants, such as dioxins and heavy metals and particles. Also, dust.³³
- Energy: consumption is considerable. For example, cement production uses approximately 0.6% of all energy produced in the United States.³⁴
- Noise and vibration: cement production facilities produce noise and vibration, that can be a problem for local communities, and other living beings.

Social and economic impacts:

³⁰ <https://us.fsc.org/en-us/certification/controlled-wood>

³¹ https://wedocs.unep.org/bitstream/handle/20.500.11822/25281/eco_efficient_cements.pdf

³² <https://link.springer.com/article/10.1007/s10311-010-0302-2>

³³ <https://link.springer.com/article/10.1007/s10311-010-0302-2>

³⁴ <https://link.springer.com/article/10.1007/s10311-010-0302-2>

- Public health and safety: local communities can suffer health problems derived by the deteriorated air quality, dust and noise from cement production.

3.2 Quality standards

Cement standards are instrumental in the evaluation and testing of cement. ASTM standards for cement³⁵ are used as a reference by the OECS Building Code. Some of the most relevant international and Caribbean standards for Portland Cement (the most common type of cement) are listed below.

- ASTM C150 / C150M - 20 Standard Specification for Portland Cement.
- CROSQ has defined a regional standard for cement: CR5 54:2014 Cement – Specifications.
- The Antigua and Barbuda Bureau of Standards has adopted the regional standard for cement – CR5 54:2014 Cement – Specifications. (CROSQ standard).
- The Dominica Bureau of Standards (DBOS) is working on the adoption of regional CROSQ standard for cement.
- The Grenada Bureau of Standards has a cement standard that is currently under revision and adoption of regional CROSQ standard.

3.3 Sustainability sub-categories and means of verification.

Even though there are **no** sustainability standards for cement, different approaches towards a more sustainable cement have been made; primarily from the CO₂ emissions mitigation perspective, and, more recently, through the investigation of alternative materials use.

In 2009, the World Business Council for Sustainable Development (WBCSD) and the International Energy Agency (IEA), together with the Cement Sustainability Initiative (CSI) defined a roadmap for mitigation³⁶:

- Energy efficiency: Modern kilns reduce energy use up to 50%, this strategy would require heavy investments but since it reduces energy costs, it should not increase the cost of cement.
- Fuels: Modern cement kilns are very flexible machines, which allow the cement industry to change fuels relatively simply. This flexibility is an opportunity to reduce CO₂ intensity through expanding the use of biomass and alternative fuels.
- Clinker substitutes: Is a well-established strategy that has the advantages of reducing energy consumption without changing kilns. Clinker is a solid material produced for the fabrication of Portland Cement (the most common type of cement), made by heating a homogenous mixture of raw materials in a rotary kiln at high temperature. The most common clinker substitutes are reactive by-products from other industries: granulated blast furnace slag, a by-product of iron production and fly-ash generated by burning coal to produce electricity.
- Carbon capture and storage or use (CCS/CCU): Technologies for scrubbing and concentrating the CO₂, their limitations are that is not ready yet for large scale industries and it is estimated to increase the cost of clinker 2-3 times. There also technologies for alternate carbon use, that transforms CO₂ in chemical commodities or construction materials, that prove to be less expensive.

³⁵ <https://www.astm.org/Standards/cement-and-concrete-standards.html>

³⁶ https://wedocs.unep.org/bitstream/handle/20.500.11822/25281/eco_efficient_cements.pdf

Then, in 2017, the United Nations Environment Program Sustainable Building and Climate Initiative (UNEP-SBCI) put the focus on increasing the range of clinker substitutes and other technologies, as opposed to carbon capture and storage or use due to the higher cost. The most common clinker substitutes were slag and fly ash, some alternatives materials have been proven like calcined clays, vegetable ashes, and other reactive products.

3.4 Local market capabilities assessment

3.4.1 International and Regional

There is no cement production in the three-pilot countries, so all the cement is imported. The main producer of cement in the region is Trinidad and Tobago, through Trinidad Cement Limited (TCL), which is one of the largest providers of cement in the Caribbean. The other large cement manufacturer that supplies the region is Cementos Argos S.A, a Colombian company.

- **Trinidad Cement Limited – TCL Group³⁷**: Is the leading producer and marketer of cement, ready-mix concrete and aggregates in the Caribbean. TCL declares to have a sustainability approach to cement production, which is detailed on their webpage and annual reports. For instance, some aspects of their approach include the health and safety of their workers, water usage reduction, dust control and modernization of kilns. The company is based in Trinidad with operations in Jamaica and Barbados as well.
- **Cementos Argos³⁸**: Grupo Argos S.A. is a Colombian conglomerate with large investments in the cement and energy industries. Its cement company Argos has operations in Colombia, the United States, Panamá, Honduras and the Caribbean. Argos built a sustainability strategy based on 1) Environmental stewardship, 2) Health and Safety, and 3) Community Engagement. The company also received sustainability distinctions: Argos participated in the Dow Jones Sustainability Index, Argos received the Gold Class distinction in the RobecoSAM yearbook and is included in the FTSE4Good and the Vigeo Eiris indexes.
- **Rock Hard Cement³⁹**: Established in 2015, with a homebased in Barbados, Rock Hard Cement has a presence in Trinidad, Dominica, Guyana, St. Marteen, St. Vincent, St. Lucia, Antigua and Grenada. It distributes cement in the Caribbean region, which is made in Turkey.

3.4.2 Antigua and Barbuda

- Cement is imported and then distributed across the island.
- From national trade data 2017, we identified the main countries from where cement is sourced, as showed in the following table:

Product	Source	Value of imports 2017	%

³⁷ <https://www.tclgroup.com/>

³⁸ <https://argos.co/en>

³⁹ <https://www.rockhard-cement.com/>

Cement	Bi-Lateral Partners ⁴⁰	8,548,180	98,3
	USA	142,863	1,6
	Third Countries ⁴¹	1,272	0,0
	Rest of CARICOM	1,228	0,0
	EU	42	0,0
	Total	8,693,586	100

- Bi-Lateral partners countries include: Dominican Republic, Cuba, **Colombia**, Costa Rica and Venezuela.
- Distributors: Cement is commonly distributed through construction companies as a concrete aggregate, in forms of pre-casted concrete (blocks) or ready-mixed concrete. Also, there are wholesalers that sell bulk cement, and retailers that sell cement in bags for use in smaller batches.
- A list of construction companies, distributors and retailers can be found on Annex B.
- As there is no specific standard for “sustainable cement”, there is no local or international availability of alternatives. The industry, however, has been working towards making cement production more sustainable as detailed in point 3.3.
- Other sustainability attributes and standards available, that are not for a specific product category are detailed in section 6.

3.4.3 Dominica

- Cement is imported and then distributed across the island.
- From national trade data 2017, we identified the main countries from where cement is sourced, as showed in the following table:

Product	Source	Value of imports 2017 (in EC\$)	%
Cement	Bi-Lateral Partners ⁴²	9,567,293	98,3
	OECS	4,685	1,6
	Third Countries ⁴³	2,690	0,0
	Rest of CARICOM	1,881	0,0

⁴⁰ Bi-Lateral partners countries include Dominican Republic, Cuba, Colombia, Costa Rica and Venezuela.

⁴¹ Countries outside CARICOM, and different from the above mentioned. Grouped.

⁴² Bi-Lateral partners countries include Dominican Republic, Cuba, Colombia, Costa Rica and Venezuela.

⁴³ Countries outside CARICOM, and different from the above mentioned. Grouped.

	USA	1,308	0,0
	UK	630	0,0
	Total	9.578.489	100

- Distributors: Cement is commonly distributed through builder or concrete companies, as a concrete aggregate, in forms of pre-casted concrete (blocks) or ready-mixed concrete. Also, there are cement wholesalers, and retailers that sell cement in bags for use in smaller batches.
- A list of construction companies, distributors and retailers can be found on Annex B.
- As there is no specific standard for “sustainable cement”, there is no local or international availability of alternatives. The industry, however, has been working towards making cement production more sustainable as detailed in point 3.3.
- Other sustainability attributes and standards available, that are not for a specific product category are detailed in Chapter 6.

3.4.4 Grenada

- Cement is imported and then distributed across the island.
- From national trade data 2017, we identified the main countries from where cement is sourced, as showed in the following table:

Product	Source	Value of imports 2017 (in EC\$)	%
Cement	Rest of CARICOM	19,806,959	93.4
	Bi-Lateral Partners ⁴⁴	672,146	3.2
	USA	560,078	2.6
	Third Countries ⁴⁵	170,897	0.8
	EU	3,838	0.0
	UK	400	0.0
	Total	21,214,320	100

- Distributors: Cement is commonly distributed through builder or concrete companies, as a concrete aggregate, in forms of pre-casted concrete (blocks) or ready-mixed concrete. Also, there are cement wholesalers, and retailers that sell cement in bags for use in smaller batches.
- A list of construction companies, distributors and retailers can be found on Annex B.

⁴⁴ Bi-Lateral partners countries include Dominican Republic, Cuba, Colombia, Costa Rica and Venezuela.

⁴⁵ Countries outside CARICOM, and different from the above mentioned. Grouped.

- As there is no specific standard for “sustainable cement”, there is no local or international availability of alternatives. The industry, however, has been working towards making cement production more sustainable as detailed in point 3.3.
- Other sustainability attributes and standards available, that are not for a specific product category are detailed in point 6.

3.5 Recommendations

- Quality - Incentivize a better quality cement used in construction.
Means of verification: CROSQ quality standard for cement (CR5 54:2014 Cement – Specifications or similar).
- Transport - Minimize the negative impacts of transportation of materials by choosing alternatives from nearby sources.
Means of verification: Origin certificate
- Climate action - Select products and services from organizations that manage and reduce their Greenhouses Emissions (GHG).
Means of verification: Self-declaration of Greenhouse gases reduction compromise or third-party verification of Greenhouse Gases reduction by X%.

4 Sand and Gravel

Sand and gravel uses are ubiquitous in construction and industrial production because these products are cheap, versatile and easy to acquire. The three pilot countries have economic activity linked to these mineral resources, which are used in construction, infrastructure and urbanization. In the Caribbean, sand and gravel are a foundation for local economies, while the construction, mining and transport sectors account for 35% of GDP in average.⁴⁶

Sand and gravel can be classified by its properties, with each type used in different industries for different purposes (Gavriletea, 2017). Distinguishing between mineral sands and aggregates is a useful beginning since the materials and volumes involved, extraction impacts and solutions are quite different for these two sand resource types.

- Mineral sand: contains metals and minerals such as Ilmenite, rutile and zircon that are used in the industrial production of ceramics, pigments, plastics and other products. The original source is a hard rock, which is mined, or following a long erosion process, is deposited on and mined from river banks and coasts on beaches.
- Aggregates is a generic term for crushed rock, sand and gravel, which can be sub-categorized by formation process (natural or manufactured), composition, and grain size distribution (Gavriletea, 2017). For the purposes of this report, three aggregates groups are defined:
 - **Primary Aggregates** - crushed rock, extracted in hard rock quarries by blasting and crushing; and sand and gravel extracted from pits by excavation, crushing, screening and

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<https://www.undp.org/content/brussels/en/home/presscenter/pressreleases/2016/12/02/sand-and-gravel-lay-the-foundation-of-domestic-economies-in-africa-the-caribbean-and-the-pacific-.html>

washing; excavated or pumped from lakes and rivers; removed from coastal beaches; or sourced from the sea bed.

- o **Recycled Aggregates** - crushed rock, sand and gravels produced by sorting, crushing and screening of construction and demolition materials.
- o **Manufactured Aggregates** - Crushed rock, sand and gravel substitutes produced from wastes from other industries.

We know that, with some exceptions, most sand and gravel extracted from natural environments are consumed regionally because of the **high costs of transport**.

4.1 Sustainability topics

We are approaching a future where access to this resource is a critical barrier to sustainability. The environmental and socioeconomic impacts of sand and gravel extraction is an issue of global significance.

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Environmental impacts:

- Extraction rates exceed natural sand replenishment rates.⁴⁸
- Coastal erosion - threats to freshwater and marine fisheries and biodiversity. (World Wide Fund for Nature [WWF], 2018a).
- Extreme events - decline of protection against extreme events (floods, drought, storms)⁴⁹
- Hydrological function - change in water flow, flood regulation and marine currents⁵⁰

Social and economic impacts:

- Labor conditions, health and safety of workers - The people who work in unregulated extraction and those living in and around these sites risk their safety; even their lives when they seek to stop uncontrolled extraction (Awaaz Foundation, 2017).
- Cultural heritage and archeology - could be affected in quarry zones.
- Beach tourism - a strong industry in the Caribbean region, could be affected by sand extraction. Eco tourism could also be affected in zones near a quarry.
- Local communities - In most cases the community living in close proximity to a quarry will be affected by poor engagement practices of that quarry. The community can play an important role in quarry monitoring and should look for the signs of poor quarry management practices.

⁴⁷ https://d2ouvy59p0dg6k.cloudfront.net/downloads/1_sand_and_sustainability_unep_2019.pdf

⁴⁸ John, E., 2009. The impacts of sand mining in Kallada river (Pathanapuram Taluk), Kerala, Journal of basic and applied biology, 3 (1&2), 108-113

⁴⁹ https://wedocs.unep.org/bitstream/handle/20.500.11822/8665/GEAS_Mar2014_Sand_Mining.pdf?sequence=3&isAllowed=y

⁵⁰

https://wedocs.unep.org/bitstream/handle/20.500.11822/8665/GEAS_Mar2014_Sand_Mining.pdf?sequence=3&isAllowed=y

4.2 Quality standards

- Aggregate standards by ASTM⁵¹ are used as a reference in the OECS Building Code; some of the most relevant are listed below. No regional (CROSQ) or national quality standards for aggregates were identified.

Also state of the regional (CROSQ) and pilot countries standards adoption is listed:

- ASTM C33 / C33M – 18 Standard Specification for Concrete Aggregates.
- ASTM C144 – 18 Standard Specification for Aggregate for Masonry Mortar.
- Dominica’s Bureau of Standards is in the process of adoption of a modified version of ASTM C33.

4.3 Identification of available sustainable sub-categories and means of verification

- There are no sustainability standards available for sand and gravel aggregates.
- Exploring the use of recycled materials and manufactured aggregates from waste could be an alternative instead of using virgin material. Quality criteria must be met though.
- Exploring alternative construction methods that use less sand and gravel could be explored.
- Transport impact of aggregates is significant, as these products need to be transported to concrete-production facilities, which means loading these resources onto vehicles that emit greenhouse gases. Employing readily available local or recycled materials can help to cut down emissions and expenses.
- Preferring quarries with sustainable extraction process, that respect legal work agreements and cultural heritage.

4.4 Local market capabilities assessment

4.4.1 International and Regional

Most aggregates that are extracted from natural environments are consumed locally or regionally, due their **elevated transportation costs** (large volumes and weight). When sand or gravel is scarce locally, it is sourced from neighboring OECS countries (Dominica), CARICOM countries (Guyana), third countries and/or the United States. Hurricanes often change the landscapes and condition of beaches, impacting the availability of sand.

4.4.2 Antigua and Barbuda

- The mains quarries in Antigua and Barbuda are Bendals and Burma quarries.
- Bendals quarry is located near Greencastle Hill National Park, known for the presence of megaliths, and is also next to Antigua Masonry Products Ltd. (AMP), one of the main companies that produces and supplies aggregates and concrete.
- Antigua and Barbuda’s construction sector has some, but not very significant, imports of sand and gravel. This is probably because the existence of some unsatisfied demand for building and infrastructure projects.
- National trade data 2017 shows the origin and values of imported sand and gravel:

⁵¹ <https://www.astm.org/Standards/cement-and-concrete-standards.html>

Product	Source	Value of imports 2017 (in EC\$)	%
Sand	OECS	288,016	53.3
	USA	252,788	46.7
	Total	540,804	100

Product	Source	Value of imports 2017 (in EC\$)	%
Gravel	OECS	190,313	70.4
	USA	80,187	29.6
	Total	270,500	100

- There are no sustainability standards for sand or gravel, so there is no local or international availability of “sustainable sand”.
- But sand and gravel extraction does have important environmental and socioeconomic impacts that should be addressed, as explored in Section 4.1.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 6.

4.4.3 Dominica

- Aggregates are readily available in Dominica. Since Tropical Storm Erika (2015), the amount of sand available on the island has increased and Dominica is now an exporter of sand.⁵²
- Mining and quarrying of sand, gravel and other minerals grew after Hurricane Maria (2017) for reconstruction purposes.
- According to the Government’s Physical Planning Division, there are nine approved quarries in Dominica.⁵³ The Physical Planning Division is responsible for the periodic monitoring of quarry operations in the country.
- National trade data 2017 shows the origin and value of imported sand:

Product	Source	Value of imports 2017 (in EC\$)	%
Sand	USA	883	91
	Third countries ⁵⁴	83	9

⁵² Wiles, Barnaby (June 2018). Use of Framework agreements to Improve Disaster preparedness and response in the Caribbean. The World Bank.

⁵³ <http://physicalplanning.gov.dm/applications/planning-approved/approved-quarries>

⁵⁴ Countries outside CARICOM, and different from the above mentioned. Grouped.

	Total	967	100
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- National trade data 2017 shows that Gravel has not been imported (value of imports 2017: 0 EC\$),
- From the above data we conclude there is little import of sand and no import of gravel, so probably the local demand is supplied with the production of local quarries.
- There are no sustainability standards for sand or gravel, so there is no local or international availability of “sustainable sand”.
- Sand and Gravel extraction has relevant environmental, social and economic impacts to be addressed, some of these issues were explored in Section 4.1.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 6.

4.4.4 Grenada

- Grenada’s main quarry is at Telescope, located in the parish of St Andrew’s. The operation is run by the state-owned Gravel, Concrete and Emulsion Corporation⁵⁵. The common raw material currently mined are basalt rocks, a high-quality durable rock used for high-strength concrete and asphalt road surfaces.
- Sand had long been mined from beaches in Grenada, but this has had adverse effects on the environment and was banned in January 2009. However, illegal sand mining continued, usually on a small-scale basis, for small scale construction activities. In 2013, the Ministry of Works allowed sand mining in three locations on mainland Grenada and at another location in Carriacou and Petite Martinique.⁵⁶
- National trade data 2017 show the origin and value of imported sand and gravel:

Product	Source	Value of imports 2017 (in EC\$)	%
Sand	Rest of CARICOM	2.186.480	98.8
	Third Countries ⁵⁷	25.162	1.1
	USA	1.248	0.1
	Total	2.212.889	100
Product	Source	Value of imports 2017 (in EC\$)	%
Gravel	OECS	131,940	90.7
	Third Countries	12,865	8.8

⁵⁵ http://www.gravel.gd/mining_telescope.htm

⁵⁶ www.gravel.gd/sand.htm

⁵⁷ Countries outside CARICOM, and different from the above mentioned. Grouped.

	USA	632	0.4
	Total	145,438	100

- While gravel imports are not significant, sand imports are more relevant due the banning of beach sand extraction. Sand is imported primarily from Guyana.
- There are no sustainability standards for sand or gravel, so there is no local or international availability of “sustainable sand”.
- But sand and gravel extraction has relevant environmental, social and economic impacts to be addressed, some of these issues were explored in Section 4.1.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 6.

4.5 Recommendations

- Incentivize the use of better-quality aggregates in construction.
Means of verification: ASTM C33 standard for aggregates or similar.
- Promote legally established local producers.
Means of verification: National or governmental certification.
- Reduce environmental and social impacts in local quarries.
Means of verification: Self-declaration and/or an Environmental Impact Plan with management objectives.
- Incentivize suppliers that work in favor of gender equality and no discrimination.
Means of verification: Policy on gender equality.
- Incentivize suppliers that respect labor regulations and promote healthy and safe work spaces.
Means of verification: National or governmental certification or a self-declaration.

5 Concrete and concrete blocks

Concrete is a composite material composed of a mix of cement, sand, gravel and water. Concrete is the most widely used material in existence and is behind only water as the planet's most-consumed resource.⁵⁸

There are mainly two types of concrete use options; pre-cast (concrete blocks, for example) and cast in-place concrete (“poured” concrete).

Pre-cast concrete (blocks): The production of concrete blocks consists of four basic processes: mixing, molding, curing, and cubing. Some manufacturing plants produce only concrete blocks, while others may produce a wide variety of precast concrete products including blocks, flat paver stones, and decorative landscaping pieces such as lawn edging.

⁵⁸ Rodgers, Lucy (17 December 2018). ["The massive CO2 emitter you may not know about"](#). BBC News. Retrieved 17 December 2018.

Cast in-place concrete (ready-mixed or poured): This type of concrete is formed, poured and cured in its permanent position, using formworks. When it is mixed in a batch plant and transported to a construction site in its liquid form in a truck, it is known as “ready-mixed”.

5.1 Sustainability topics

Environmental impacts:

- Environmental impacts of concrete ingredients were previously discussed in Sections 3 and 4 of this report. Cement production and aggregates extraction processes have relevant environmental, social and economic impacts that are part of the whole concrete supply chain.
- Transport impacts of the raw materials to the concrete-production facilities and then to construction sites as finished product in form of pre-cast concrete like concrete blocks or ready-mixed concrete in a truck to be poured in formworks.
- Water usage: Apart from cement and aggregates, concrete needs a lot of water. It is estimated that in 2012, concrete production was responsible for 9% of global industrial water withdrawals. In 2050, 75% of the water demand for concrete production will likely occur in regions that are expected to experience water stress.⁵⁹
- Water disposal: Discharges of wastewater to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria, or in their absence, other recognized ambient water quality criteria. Discharges into public or private wastewater treatment systems should meet the pre-treatment and monitoring requirements of that sewer treatment system.⁶⁰
- Storm water management: Pervious concrete could provide environmental and economic advantages as it reduces storm water runoff and minimizes the amount of land needed for retention ponds.⁶¹
- Energy performance: Use of concrete in buildings has energy benefits thanks to its high thermal mass which leads to thermal stability.

Social and economic impacts:

- Durability and resistance to natural disasters: The use of concrete provides durable structures that offer resilience against natural hazardous events. This is especially relevant in the Caribbean where hurricanes and earthquakes are common. Governments should encourage builders to use materials that last, even if the initial cost seems to be higher, especially for the poor. That’s why quality is also a sustainability aspect to be considered.
- Small concrete block producers create jobs, but they are also prone to illegal or unregulated employment, that could affect worker’s health and safety.
- Tourism could be affected as concrete-production facilities interfere with the landscape. This is relevant as the countries in study have a significant proportion of their GDP related to tourism and travel.

⁵⁹ <https://www.nature.com/articles/s41893-017-0009-5>

⁶⁰ <http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/cement/tg-cement-e.pdf>

⁶¹ <https://www.us-concrete.com/specialty-product-pervious-concrete>

5.2 Quality standards

The OECS Building Code 7th edition (2016) offers quality standards for concrete blocks, masonry units and plain and reinforced concrete. Concrete blocks standards by ASTM⁶² are used as a reference in the Code; some of the most relevant ones are listed below.

- ASTM C90, Standard Specification for Load-Bearing Concrete Masonry Units.
- ASTM C129, Standard Specification for Non-Load-Bearing Concrete Masonry Units.
- ASTM C55, Standard Specification for Concrete Building Brick
- ASTM C 94 “Standard Specification for Ready Mixed Concrete”

The European concrete standard (EN 206-1 Concrete) can also be used as a reference: “Specification, performance, production and conformity” applies to concrete for structures cast in situ, precast structures, and precast structural products for buildings and civil engineering construction.

The three pilot countries are at various stages of development and adoption of national standards for concrete and/or concrete blocks:

- Antigua and Barbuda’s Bureau of Standards does not have a standard for concrete or concrete blocks, however they can develop or adapt standards if required.
- Dominica’s Bureau of Standards is working on the development of a national concrete standard.
- Grenada’s Bureau of Standards has a national concrete blocks standard.

5.3 Identification of available sustainable sub-categories and means of verification

Sustainable concrete is defined as concrete that uses less energy in its production and produces less carbon dioxide than normal concrete. It is also known as green concrete or eco-friendly concrete. Unfortunately, there are no widespread certification options or standards for “sustainable concrete”. Reducing the use of Portland Cement and using recycled aggregates could contribute to creating more sustainable concrete, but quality specifications must be met. For example, the OECS Building Code includes the following recommendations:

- Reduction of Portland cement content: *“Reducing the Portland cement content of the concrete mix is a significant contribution to the mitigation of climate change. Cement replacement materials have been found within the OECS and used to make Portland-pozzolanic blended cements. Their use depends on the lifespan and exposure conditions of the structural element. When combining Portland cement with cement substitutes, designers shall be guided by test results from an approved research laboratory. Almost all concrete properties are affected by the combination of Portland cement with a cement substitute. Designers shall optimize their choice in view of the fact that the strength class is typically lowered and early strength gain is typically hindered by reduction of the Portland cement content.”*
- Use of recycled concrete aggregates: *“(a) The use of natural aggregates for normal structural concrete shall be in accordance with Appendix F of CUBiC Part 2 Section 6 and with ASTM C33 “Specification for Concrete Aggregates”. The grading of aggregates is particularly important*

⁶² <https://www.astm.org/Standards/cement-and-concrete-standards.html>

since loose dust in significant proportions can be detrimental. The use of recycled concrete aggregates in concrete mixes, whether for structural purposes or not, shall be in the proportions stated in BS 8500-2 or a later version of the same code. They should only be used if the material is locally available, and if the cement content does not have to be increased to compensate for the use of recycled material. The use of recycled aggregates in concrete mixes is for non-structural concrete only, and shall be in accordance with BS 8500-2 or a later version of the same code. (b) Aggregates failing to meet the specifications listed in 1603.3 (a), but which have been shown by special tests or actual service to produce concrete of adequate strength and durability may be used where authorized by the Director. This includes the use of secondary aggregates Concrete produced with some regionally occurring aggregates has deteriorated due to alkali-silica reaction. The accelerated mortar bar test ASTM C1567, or the mortar bar test ASTM C1260, shall be used whenever the potential for alkali-silica reactivity must be investigated.”

5.4 Local market capabilities assessment

5.4.1 Antigua and Barbuda

- Concrete and concrete blocks are manufactured on the island, while cement is imported, most of the aggregates are available locally.
- Concrete is distributed as ready-mixed in special trucks and also as pre-cast concrete blocks. There are several local construction companies that provide these services, one of the main ones is Antigua Masonry Products. A complete list of distributors identified is presented in Annex B.
- From information of national trade 2017, we conclude that there are some imports of concrete blocks:

Product	Source	Value of imports 2017 (in EC\$)	%
Concrete Blocks	USA	28,986	92.5
	UK	2,364	7.5
	Total	31,350	100

- There are no sustainability standards for “concrete blocks”, so there is no local or international availability of “sustainable concrete blocks”.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 7.

5.4.2 Dominica

- Concrete and concrete blocks are manufactured on the island, while cement is imported, most of the aggregates are available locally.

- Concrete is distributed as ready-mixed in special trucks and also as pre-cast concrete blocks. There are several local construction companies that provide these services. A complete list of distributors identified is presented in Annex B.
- From information of national trade 2017, we conclude that there are some imports of concrete blocks:

Product	Source	Value of imports 2017 (in EC\$)	%
Concrete Blocks	Rest of CARICOM	12,000	75.4
	USA	2,665	16.7
	OECS	1,257	7.9
	Total	15,923	100

- There are no sustainability standards for “concrete blocks”, so there is no local or international availability of “sustainable concrete blocks”.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 7.

5.4.3 Grenada

- Concrete and concrete blocks are manufactured in the island, while cement is imported, most of the aggregates are available locally.
- Concrete is distributed as ready-mixed in special trucks and also as pre-cast concrete blocks. There are several local construction companies that provide these services, one of the main ones is Antigua Masonry Products. A complete list of distributors identified is presented in Annex B.
- From information of national trade 2017, we conclude that there are some imports of concrete blocks:

Product	Source	Value of imports 2017 (in EC\$)	%
Concrete Blocks	Rest of CARICOM	438,774	64.5
	USA	241,262	35.5
	Total	680,036	100

- There are no sustainability standards for “concrete blocks”, so there is no local or international availability of “sustainable concrete blocks”.
- Non-product-specific attributes and sustainability standards which can apply to aggregates are explored in Section 7.

5.5 Recommendations

- Incentivize the use of better-quality concrete blocks in construction.

Means of verification 1: Self declaration which specifies that concrete blocks followed the OECS Building Code 7th edition.

Means of verification 2: ASTM C90, C94, C55, C129 or similar.

- Promote legally established local producers:

Means of verification: National or governmental certification.

- Reduce environmental and social impacts in local quarries.

Means of verification 1: Self-declaration.

Means of verification 2: Environmental Impact Plan with management objectives.

- Incentivize suppliers that work in favor of gender equality and no discrimination.

Means of verification: Policy on gender equality.

- Incentivize suppliers that respect labor regulations and promote healthy and safe work spaces.

Means of verification 1: National or governmental certification.

Means of verification 2: Self-declaration.

6 Non-product specific sustainability sub-categories and means of verification

The following sustainability considerations and standards can apply to different kinds of products and construction materials. These considerations can be integrated into the public procurement process, delivering environmental, social and economic benefits.

6.1 Regionally sourced/harvested/extracted

Most materials, goods and products travel a far distance via ship, train or truck before arriving at their final destination. The impacts associated with transporting these items can be significant – added traffic congestion, increased greenhouse gas emissions, and air pollution. By selecting products that are locally sourced, the impacts of transportation are minimized. Additionally, choosing local or regional materials supports the local economy.⁶³

Between two similar alternatives, preference can be given to products that are produced locally or regionally. For example, LEED gives credit for products sourced within a range of 160 kilometers.

6.2 Sustainability reports

Companies may have their own sustainability reports, corporate responsibility reports, or environmental and socioeconomic commitments available as public information. These demonstrate an effort towards more sustainable business practices and products, and also can be a useful tool for smaller companies that cannot afford the cost of expensive certifications or verifications.

⁶³ <https://sftool.gov/learn/about/43/materials-resources>

6.3 Third party Corporate Sustainability Reports (CSR)

Companies may have third party CSR reports that include Environmental, Social and Economic Impacts, such as the Green Reporting Initiative (GRI) standards, the Organization for Economic Co-operation and Development Common Reporting Standard (OECD CRS), UN Global compact and ISO 26.000:2010. These third-party reports are stronger than self-made reports and show that the company is interested in following a path towards sustainability.

6.4 Type III Environmental Product Declaration (EPD)

An Environmental Product Declaration (EPD) is an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products in a credible way. It is based on a lifecycle assessment (LCA), which evaluates the product's environmental performance over its entire life-cycle. LCAs typically take into consideration the full value chain, from material extraction to manufacturing, usage and disposal/end of life.

An EPD is a so-called type III environmental declaration that is compliant with the ISO 14.025⁶⁴ standard. A type III environmental declaration is created and registered in the framework of a programme, such as the International EPD[®] System. EPDs registered in the International EPD System are publicly available and free to download through the EPD Library.⁶⁵

Type III has been growing a lot in the construction sector, as LEED gives additional points for buildings that include materials with this declaration.

As an example, the Chilean steel company AZA has type III EPD for their recycled steel reinforcement bars.⁶⁶

6.5 Life Cycle Assessment (LCA)

Products may also have a publicly available, critically reviewed life-cycle assessment, conforming to ISO 14044 that has at least a cradle to gate scope.

The CARICOM green building procurement toolkit⁶⁷ offers two different approaches varying in ambition and level of difficulty:

- 1) Simple Payback for Renewable Energy and Energy Saving Product and Services
- 2) Life Cycle Assessment

6.6 Gender equality

Gender equality is a key component of social responsibility, and the empowerment of women and their equality in society is underlined in ISO 26000, Guidance on Social Responsibility. This standard aims to eliminate bias and promote parity through recommending that organizations have a balanced mix of men and women in governing structures and management, ensuring that both sexes are treated equally

⁶⁴ <https://www.iso.org/standard/38131.html>

⁶⁵ <https://epdweb3.azurewebsites.net/library>

⁶⁶ <https://www.aza.cl/wp-content/uploads/2019/12/DAP-Perfiles-Laminados-2019.pdf>

⁶⁷ CARICOM green building procurement toolkit.

when it comes to recruitment, career opportunities and pay, and making sure that the needs of men and women are given equal consideration in company decisions and activities.

6.7 International Labour Organization Standards (ILO)

Since 1919, the International Labour Organization has maintained and developed a system of international labour standards aimed at promoting opportunities for women and men to obtain decent and productive work, in conditions of freedom, equity, security and dignity. In today's globalized economy, international labour standards are an essential component in the international framework for ensuring that the growth of the global economy provides benefits to all.

The three study countries, Antigua and Barbuda, Dominica and Grenada have ratified to the following conventions⁶⁸:

1. Forced Labour Convention, 1930 (No. 29)
2. Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
3. Right to Organise and Collective Bargaining Convention, 1949 (No. 98)
4. Equal Remuneration Convention, 1951 (No. 100)
5. Abolition of Forced Labour Convention, 1957 (No. 105)
6. Discrimination (Employment and Occupation) Convention, 1958 (No. 111)
7. Minimum Age Convention, 1973 (No. 138)
8. Worst Forms of Child Labour Convention, 1999 (No. 182)

6.8 Carbon emissions management and optimization

Companies may quantify and mitigate their Greenhouse Gases impact, following international or governmental guidelines, for example GHG Protocol for organizations or PAS 2050 for products. Corporations that manage their carbon emissions contribute to the achievement of SDG 13 Climate Action, which aims to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels. SPP can leverage this impact by preferring companies and products with a carbon management strategy. In the absence of such a strategy document, verification tools can include self-declarations, governmental programs or greenhouse gases inventory declarations verified by a third party.

7 Other relevant information

7.1 Design of construction projects

Sustainable design intends to reduce the negative impacts on the environment, and improve the health and comfort of building inhabitants, thus improving building performance. Sustainable design principles include the ability to:

⁶⁸ <https://www.ilo.org/dyn/normlex/en>

- optimize location potential;
- diminish non-renewable energy consumption;
- use environmentally preferable products;
- protect and preserve water;
- increase indoor environmental quality; and
- optimize operational and maintenance practices.

Its integrated approach positively impacts all phases of a building's life-cycle, including design, construction, operation and decommissioning.

The reviewed standards CREEBC, LEED and BREEAM offer guidelines for achieving sustainable design in construction. Integration of these standards is carried-out during the design phase and before public procurement, so there is clarity that the required materials are already optimized in function of the design.

7.2 Construction waste management

The general application of a construction waste management plan is to minimize the number of materials going to landfills during construction by diverting the construction waste and demolition and land clearing debris from landfill disposal. It also helps redirect recyclable recovered resources back to the manufacturing process and redirect reusable materials to appropriate sites.

The plan should show how the required recycling rate is to be achieved, including materials to be recycled or salvaged, cost estimates comparing recycling to disposal fees, materials-handling requirements, and how the plan will be communicated to the crew and subcontractors. The premise is that waste management is a part of materials management, and the recognition that one project's waste is material available for another project leads to an efficient and effective waste management process.

To be successful, waste management requirements should be spelled out early in the design process and be the topic of discussion at both preconstruction and ongoing regular job meetings, to ensure that contractors and subcontractors are fully informed of the implications of these requirements on their work prior to and throughout the construction process.

8 Conclusions and recommendations for SPP and contracting

8.1 Conclusions

- Pilot countries are characterized by small populations - Grenada (111,500 approx.), Dominica (71,600 approx.) and Antigua and Barbuda (96,300 approx.) - totaling 279,000 (approx.) and limited markets. This affects their ability to bring change to big/international construction materials companies (lumber, cement, steel, among others) through the public purchasing of more sustainable materials or civil works contracting that support such materials.
- There are, however, trade agreements between OECs countries, that allow materials imported or produced in one country, to be traded with the other members without extra taxes or requirements. This may present an opportunity for increasing the purchasing power of member states, if countries

procure sustainable construction materials as a group in bulk, thereby having more influence over large/international construction materials companies and possibly leading to lowered costs.

- The construction industry in the countries of study is relatively small, with few actors. It is due of the economic size of the pilot countries.
- There is a lack of awareness of sustainability among local construction companies and construction materials distributors and retailers.
- Access to certifications and verifications may be difficult for smaller businesses.
- The integration of non-product specific sustainable considerations for construction materials in public procurement in the countries of study is possible.

8.2 General recommendations

- Sustainable Public Procurement (SPP) may support to national social, environmental and economic objectives and programs. SPP can be a tool to achieve improvements in these three dimensions.
- Before sustainability considerations are integrated into public tendering, budgets and national procurement processes should reviewed. In some cases, sustainability may represent a higher initial cost, which may be compensated in materials life and usage (circular economy). In other cases, public buyers may need additional technical knowledge to achieve sustainability objectives.
- The integration of sustainability considerations in public tendering should be considered in steps. SPP cannot be applied fully as a first step. There are market capabilities, budgets and buyers experience and knowledge that must be considered in its integration.
- Education and increasing awareness of sustainability topics in the countries is a priority. Sustainability is a complex subject with many dimensions to consider - a systemic approach is needed. This could be a good starting point for improving not only the public procurement of sustainable construction materials, but also society in general.
- Including sustainability considerations of lumber in public tendering could be a quick-win, as the markets from which this product is sourced is already fit with these certifications. Further analysis, however, should be carried-out in order to determine if this would affect the prices.
- The integration of non-product specific sustainability considerations of construction materials in public tendering in the countries of study should be gradual.
- There is a difference between materials produced locally (aggregates, concrete blocks) and those that are imported (lumber, cement, steel, glass, among others) in the context of SPP. In the case of those produced locally, the three sustainability dimensions (environment, social and economic) can be applied more readily and the benefits will be more directly evident. For imported materials, benefits are related to global problems and may not be seen in pilot countries in the short term. Despite of the above, as we operate in a global environment and economy, collaboration among all countries is key to promoting sustainability.
- Circular economy, or closed loop, approach to construction materials might also be considered in public tendering. For instance, concrete might be salvaged and grinded to produce aggregates or glass could be grinded to sand and used in concrete block production.

ANNEX A: Stakeholder Interviews held

Country	Name	Organization	Category	E-mail or contact
Antigua and Barbuda	Clarence Pilgrim	Ministry of Works	Public Ministers and departments	Clarence.Pilgrim@ab.gov.ag; clarencepilgrim@gmail.com
Antigua and Barbuda	Sean Cenac	Ministry of Finance, Corporate Governance & Public Private Partnerships	Public Ministers and departments	Sean.Cenac@ab.gov.ag
Antigua and Barbuda	Camaria Holder	Department of The Environment	Public Ministers and departments	Camaria.holder@ab.gov.ag
Antigua and Barbuda	Nicholas Hadeed	Contractors Association	Chambers of commerce, trade associations	hnh@candw.ag
Antigua and Barbuda	Colin Harrigan	Harrigan Building Construction	Local Construction companies (A&B)	harrigan100@hotmail.com, colin@hbc.ag
Antigua and Barbuda	Christopher Williams	DEWS Pro Builders (they sell lot of lumber)	Distributors and retail (Construction materials)	chriswilliams@dewspro.com
Dominica	Anthony E. Le Blanc	Ace Engineering	Local Construction companies (Dominica)	aeleblanc@ace-engineering-ltd.com; secretariatbcad@gmail.com
Dominica	Egbert Charles	E.H Charles and Company Limited	Distributors and retail (Construction materials)	ehcharles@cwdom.dm
Grenada	Marie Ewys	ACE Hardware (Tool Provider)	Distributors and retail (Construction materials)	14734405090

ANNEX B: Detailed distributors list by country

B.1 Detailed stakeholders list of Antigua and Barbuda

Country	Category	Organization Name	Contact name	Position	Mail
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Antigua & Barbuda Chamber of Commerce Limited	Martin Cave	Executive Director	chamcom@candw.ag; antiguabarbudachamber@gmail.com
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractor's Association of Antigua & Barbuda	Laurent Gilkes	President	lagikes@gmail.com
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Architect Association	Alex Pigott	(ABIA) President	alexpigott@hotmail.com
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Nicholas Hadeed	Secretary	hnh@candw.ag
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Zenworth Davis	Public Relations Officer	davis.builders@gmail.com
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Haynes Browne	NIA	haynesbrowne@gmail.com
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Vernon Challenger	NIA	vernonchallenger@gmail.com.
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Lauchland Thomas	NIA	int86@hotmail.com.
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Krishna Ramharack	NIA	lintonmark@candw.ag.
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Contractors Association	Bengt Bernstein	NIA	benitoantigua@hotmail.com.
Antigua and Barbuda	Chambers of commerce and trade associations related to construction.	Engineers Association	Trevor Gonzales	President	gonsalvestre@gmail.com
Antigua and Barbuda	Civil society organizations such as non-profits, NGOs active in the area of sustainable development.	Antigua and Barbuda Institute of Continuing Education (ABICE)	NIA	NIA	NIA
Antigua and Barbuda	Civil society organizations such as non-profits, NGOs active in the area of sustainable development.	Antigua State College - Engineering Dept.	NIA	HoD	albert.collins@asc.edu.ag

Antigua and Barbuda	Civil society organizations such as non-profits, NGOs active in the area of sustainable development	Contractors Association	Laurent Gilkes	President	lagilkes@gilcononlin e.net
Antigua and Barbuda	Civil society organizations such as non-profits, NGOs active in the area of sustainable development	HALO Foundation	Michael Joseph	NIA	michaeljoseph.anu@gmail.com
Antigua and Barbuda	Civil society organizations such as non-profits, NGOs active in the area of sustainable development	National Housing Authority	Curlson James	Architect	NIA
Antigua and Barbuda	Distributors and retail (Construction materials)	Antigua Plumbing and Hardware	Sir George Ryan	Managing Director	antiguaplumbing@candw.ag
Antigua and Barbuda	Distributors and retail (Construction materials)	Caricement Antigua limited (wholesaler)	NIA	NIA	NIA
Antigua and Barbuda	Distributors and retail (Construction materials)	DEWS Pro Builders (lumber)	Christopher Williams	Director	chriswilliams@dewspro.com
Antigua and Barbuda	Distributors and retail (Construction materials)	Kennedy Hardware	NIA	NIA	NIA
Antigua and Barbuda	Distributors and retail (Construction materials)	North Coast Hardware	Jason and Nicole Holowchak	Owners	jason@northcoasthardware.com
Antigua and Barbuda	Distributors and retail (Construction materials)	VEG International	Claude Weaver	Managing Director/CEO	veg.int@hotmail.com
Antigua and Barbuda	International Construction companies	BHM (Bahama Hot Mix)	Sean Geiser		sgeiser@bhmgrou p.com
Antigua and Barbuda	International Construction companies	Blue Ocean Marine	Conley Browne	General Manager	conleybrowne@blueoceanmarine.com
Antigua and Barbuda	International Construction companies	Meridian Construction Company Ltd.	Percy Rhoden	NIA	percyrhoden@meridianbvi.com
Antigua and Barbuda	Local Construction companies (A&B)	Antigua Concrete Services	NIA	NIA	NIA
Antigua and Barbuda	Local Construction companies (A&B)	Antigua Masonry Products Limited	NIA	NIA	mfare@amt.com pa ny
Antigua and Barbuda	Local Construction companies (A&B)	Caribbean Concrete PO Box W1089, St. Johns, Antigua & Barbuda	NIA	NIA	NIA

Antigua and Barbuda	Local Construction companies (A&B)	CO Williams (Barbuda based)	Alan Ian Deane	NIA	rentals@cow.bb; alandeane@hotmail.com
Antigua and Barbuda	Local Construction companies (A&B)	George and George Construction	Dave George	NIA	georgeandgeorgeconstruction@gmail.com
Antigua and Barbuda	Local Construction companies (A&B)	Harrigan Building Construction	Colin Harrigan	NIA	harrigan100@hotmail.com, colin@hbc.ag
Antigua and Barbuda	Local Construction companies (A&B)	Lingies Antigua (windows)	NIA	NIA	NIA
Antigua and Barbuda	Local Construction companies (A&B)	Midland Building Supplies	NIA	NIA	NIA
Antigua and Barbuda	Local Construction companies (A&B)	Royal Design and Project Management	Anas Horani	NIA	anas@royaldesignanu.com
Antigua and Barbuda	Public Ministers and departments	Department of The Environment	Helena Jeffery-Brown	Procurement Officer	Helena.Jeffery-Brown@ab.gov.ag
Antigua and Barbuda	Public Ministers and departments	Department of The Environment	Camaria Holder	Deputy Project Coordinator Green Climate Fund – EDA	Camaria.holder@ab.gov.ag
Antigua and Barbuda	Public Ministers and departments	Ministry of Education	Chad Knight-Alexander	Project coordinator /civil works BEPII Projects (CDB)	knightalexander@yahoo.com
Antigua and Barbuda	Public Ministers and departments	Ministry of Finance, Corporate Governance & Public Private Partnerships	Sean Cenac	Permanent secretary	Sean.Cenac@ab.gov.ag
Antigua and Barbuda	Public Ministers and departments	Ministry of Housing, Lands and Urban Renewal	Robelto Issac	Permanent Secretary	Robelto.Issac@ab.gov.ag
Antigua and Barbuda	Public Ministers and departments	Ministry of Works	Clarence Pilgrim	Permanent secretary	Clarence.Pilgrim@ab.gov.ag ; clarencepilgrim@gmail.com
Antigua and Barbuda	Public Ministers and departments	Ministry of Works	Aldin Crump	Acting director	Aldin1961@yahoo.com

Antigua and Barbuda	Public Ministers and departments	Ministry of Works	Denis Cudjoe	Project coordinator (CDB Projects)	Projectcoordinator.works@ab.gov.g
Antigua and Barbuda	Universities, research centers, think tanks.	Antigua Barbuda Institute of Continuing Education (ABICE)	Arlene Weste	Acting Director	arlene.weste@ab.gov.ag; aweste@gmail.com
Antigua and Barbuda	Universities, research centers, think tanks.	National Office of Disaster Preparedness (NODS)	Mr. Philmore Mullin	Director	Phimore.mullin@ab.gov.ag
Antigua and Barbuda	Universities, research centers, think tanks.	UWI Five Islands Campus	Prof. Densil Williams	Principal	Densil.Williams@uwimona.edu.jm

B.2 Detailed stakeholders list of Dominica

Country	Category	Organization Name	Contact name	Position	Mail
Dominica	Chambers of commerce, trade associations related to construction sector.	Builders and Contractors Association of Dominica	NIA	NIA	NIA
Dominica	Chambers of commerce, trade associations related to construction sector.	Dominica Association of Industry and Commerce	Lizra Fabien	Executive Director	daic@cwdom.dm
Dominica	Chambers of commerce, trade associations related to construction sector.	Dominica Association of Professional Engineers	Dr. Genora Joseph	President	NIA
Dominica	Chambers of commerce, trade associations related to construction sector.	Dominica Business Forum	NIA	NIA	dbfinc2020@gmail.com
Dominica	Chambers of commerce, trade associations related to construction sector.	Dominica Manufacturing Association	NIA	NIA	dmamay2010@yahoo.com
Dominica	Civil society organizations such as non-profits, NGOs active in the area of sustainable development.	Dominica Youth Environment Organisation	NIA	NIA	NIA
Dominica	Distributors and retail (Construction materials)	Astaphans Home & Building	J. Astaphan	NIA	NIA
Dominica	Distributors and retail (Construction materials)	Do It Center Dominica	Evadney Esprit	Manager	eesprit@doitcenterdominica.com
Dominica	Distributors and retail (Construction materials)	E.H Charlres and Company Limited	Egbert Charles	Owner/Manager	ehcharles@cwdom.dm
Dominica	Distributors and retail (Construction materials)	Maxroy Trading	Clement Royer	Owner/Manager	maxroy@cwdom.dm

Dominica	International Construction companies	Emile Garddarkhan et Fils (Guadeloupe, France)	NIA	NIA	NIA
Dominica	International Construction companies	NSG Management Technical Services Ltd (Barbados)	NIA	NIA	NIA
Dominica	International Construction companies	Rayneau Construction Industrial Equipment (Santa Lucia)	NIA	NIA	NIA
Dominica	International Construction companies	Uneca (Cuba)	NIA	NIA	proyecto@uneca.co.cu
Dominica	Local Construction companies (Dominica)	Ace Engineering	Anthony E. Le Blanc	President	aeleblanc@ace-engineering-ltd.com
Dominica	Local Construction companies (Dominica)	Caribbean Concrete Ltd,	NIA	NIA	caribbeanconcrete.dm@gmail.com
Dominica	Local Construction companies (Dominica)	George Trucking and Excavation Services	NIA	NIA	NIA
Dominica	Local Construction companies (Dominica)	Offshore Civil & Marine Inc.	Francisca Emanuel	NIA	francisa.emmanuel@gmail.com
Dominica	Local Construction companies (Dominica)	Public Works Corporation	Roland Royer	Permanent Secretary	NIA
Dominica	Local Construction companies (Dominica)	Regional contractors Ltd	NIA	NIA	NIA
Dominica	Local Construction companies (Dominica)	SOTRADOM	NIA	NIA	NIA
Dominica	Local Construction companies (Dominica)	Stewco Construction Co. Ltd	NIA	NIA	767-235-7433
Dominica	Local Construction companies (Dominica)	William P H & Co Ltd Rock (Concrete Blocks producer)	NIA	NIA	NIA
Dominica	Local construction companies (Dominica)	Green-Roz Demolition and Construction Co. Ltd, Brumant Equipment Services,	NIA	NIA	NIA
Dominica	Public Ministers and departments	Dominica Bureau of Standards,	Median LaRoque	Director	directotr@dominicastandards.org
Dominica	Public Ministers and departments	Ministry for Finance, Economic Affairs, Investment, Planning, Resilience, Sustainable Development, Telecommunications and Broadcasting	Denise Edwards	Ag. Financial Secretary	
Dominica	Public Ministers and departments	Ministry for Finance, Economic Affairs, Investment, Planning, Resilience, Sustainable Development, Telecommunications and Broadcasting	Mr. Oscar Seaman	Chief Procurement Officer	seamano@dominica.gov.dm

Dominica	Public Ministers and departments	Ministry for Finance, Economic Affairs, Investment, Planning, Resilience, Sustainable Development, Telecommunications and Broadcasting	Mrs. Gloria Joseph	Permanent Secretary	NIA
Dominica	Public Ministers and departments	Ministry of Blue and Green Economy, Agriculture and Food Security	Reginald Thomas	Permanent Secretary	agriculture@dominica.gov.dm; pssecagriculture@dominica.gov.dm
Dominica	Public Ministers and departments	Ministry of Environment Rural Modernisation and Kalinago Upliftment	Mandra Fagan	Permanent Secretary	psenvironment@dominica.gov.dm
Dominica	Public Ministers and departments	Ministry of Housing and Urban Development	Lucien Blackmore,	Permanent Secretary	housing@dominica.gov.dm pssehousing@dominica.gov.dm
Dominica	Public Ministers and departments	Ministry of Public Works and the Digital Economy	Roland Royer	Permanent Secretary	NIA
Dominica	Public Ministers and departments	Ministry of Public Works and the Digital Economy	Emile Lancelot	Chief Technical Officer	cto@dominica.gov.dm
Dominica	Public Ministers and departments	Ministry of Trade, Commerce, Entrepreneurship, Innovation, Business and Export Development	Esther Thomas	Permanent Secretary	NIA
Dominica	Universities, research centers, think tanks.	Climate Resilience Agency of Dominica (CREAD)	Dr. Randy Peters	President	NIA
Dominica	Universities, research centers, think tanks.	Climate Resilience Agency of Dominica (CREAD)	Ms. Francine Baron	CEO	NIA

B.3 Detailed stakeholders list of Grenada

Country	Category	Organization Name	Contact name	Position	Mail
Grenada	Chambers of commerce, trade associations related to construction.	Chamber of Industry and Commerce	NIA	NIA	gcic@grenadachamber.org
Grenada	Distributors and retail (Construction materials)	ACE Hardware (Tool Provider)	Marie Ewys	store manager	NIA
Grenada	Distributors and retail (Construction materials)	L.A. Purcell	NIA	NIA	NIA
Grenada	Distributors and retail (Construction materials)	M & N Hardware	NIA	NIA	info@mahonhardware.com
Grenada	Local Construction companies (Grenada)	Bhagwans concrete products	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Caribbean Construction Grenada LTD	NIA	NIA	NIA

Grenada	Local Construction companies (Grenada)	Clintonn Whiteman Blocks Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Daphne & Sons Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Diamond Concrete Works	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Gertrude Thomas Blocks Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Gravel Concrete & Emulsion Production Corporation (state owned)	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Grenada Pavement Construction	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Housing Authority Grenada	NIA	NIA	info@hag473.com
Grenada	Local Construction companies (Grenada)	Irvin & Jasmin Cornwall Blocks Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Jennie Samuel Blocks Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Kenny's Ready-mix	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Kerry Alexander Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Krishna Elahi Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Leonard Thomas Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Patrick Hastick	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Seethal Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Shears Brothers Blocks	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Sherman Alexis Block Plant	NIA	NIA	NIA
Grenada	Local Construction companies (Grenada)	Telesford's Block Plant	NIA	NIA	NIA
Grenada	Public Ministers and departments	Ministry for Finance, Economic Development, Physical Development, Public Utilities and Energy	Mr. Terrence Victor	Chief Procurement Officer	terrsvictor@gmail.com
Grenada	Public Ministers and departments	Ministry of Infrastructure Development, Public Utilities, Energy, Transport & Implementation	Najar Andall (Ms.)	Chief Technical Officer	cto@moiid.gov.gd
Grenada	Universities, research centers, think tanks.	Universidad de Saint George	NIA	NIA	NIA

B.4 Detailed International stakeholders list

Country	Category	Organization Name	Contact name	Position	Mail
International	International suppliers	Cementos Argos S.A.(Colombia)	NIA	NIA	lintransparencia@cementosargos.com.co
International	International suppliers	Aljoma (US)	NIA	NIA	NIA
International	International suppliers	BRC West Indies (Barbados)	NIA	NIA	NIA
International	International suppliers	Hardwood Lumber Suppliers (Guyana)	Emran Ally	NIA	emranyally@gmail.com
International	International suppliers	Parika Saw Mills (Guyana)	NIA	NIA	NIA
International	International suppliers	Rock Hard Cement	NIA	NIA	NIA
International	International suppliers	Trinidad Cement Limited (Trinidad)	NIA	NIA	tclmktg@tclgroup.com