



JAMAICA INFORMAL BUILDING SECTOR STUDY

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Abstract

The Disaster Vulnerability Reduction Project is a World Bank financed initiative with the development objective of enhancing Jamaica’s resilience to disaster and climate risk. The operation supports the Government of Jamaica in implementing a program that promotes climate and disaster risk management in the wider context of sustainable development. A strategic priority of the project is to support building code implementation with a focus on delivering training programs to a wide range of building professionals, including the staff of building authorities and private sector practitioners through specialized academic institutions.

The following analysis was commissioned by the World Bank to provide further perspective on the scale, dynamics and motivations of the “informal” construction sector, characterized by low-income households, unlicensed practitioners and unpermitted work often resulting in houses vulnerable to disaster. The analysis was completed by Build Change, a nonprofit social enterprise with extensive training and building inspection experience in informal contexts in multiple countries. It is based on results from 240 structured interviews with households and practitioners from the informal sector, conversations with a number of institutional and private sector collaborators and past Build Change experience.

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1 Acronyms

BSJ	Bureau of Standards Jamaica
CCS	HEART College of Construction Services
CRDC	Construction Resource Development Center
HAI	Housing Agency of Jamaica
HEART NTA	Human Employment and Resource Training Trust, National Training Agency
ICC	International Code Council
IMAJ	Incorporated Master Builders Association of Jamaica
IRC	International Residential Code
JIA	Jamaican Institute of Architects
JIE	Jamaica Institution of Engineers
JIP	The Jamaican Institute of Planners
JIQS	The Jamaican Institute of Quantity Surveyors
JNBC	Jamaican National Building Code
JSIF	Jamaica Social Investment Fund
KSAMC	Kingston and St. Andrew Municipal Corporation
LAMP	Land Administration and Management
LSAJ	Land Surveyors Association of Jamaica
NEPA	National Environment & Planning Agency
NGO	Non-Governmental Organization
NHT	National Housing Trust
SDC	Social Development Commission
U-Tech	University of Technology

2 Executive Summary

The “Building Act” is a legislative framework in Jamaica issued with the objective of reducing sub-standard practices that result in the construction of unsafe buildings. It officializes the adoption of a new national building code, designates Municipal Corporations as responsible for inspecting and certifying construction works, and mandates the creation of a Building Practitioners Board to develop and oversee training and licensing of tradesmen and women, henceforth “practitioners”, who currently operate without a license.

The Bureau of Standards Jamaica (BSJ), supported by professional bodies and in partnership with the International Code Council ICC, has begun the process of developing an improved Jamaican National Building Code (JNBC). The Ministry of Local Government and Community Development (MLGCD) has already completed 14 draft regulations that will be used to oversee local authority permitting and inspection activities. The development of a final draft regulation for licensing practitioners is underway, but questions remain regarding the best way to engage, support, certify and create demand for newly licensed practitioners, especially since many work in low-income neighborhoods where people are traditionally unwilling or unable to invest in the “formal” (legal) process of house construction.

In May 2018, with the aim of learning more about household-practitioner interactions and the informal construction sector in general, Build Change surveyed 240 low-income households and building practitioners in 6 geographically disperse low-income neighborhoods. Surveys were complimented with construction site visits and extended interviews were held with a number of homeowners, practitioners and institutional collaborators.

Summary of survey findings:

Some results align closely with low-income neighborhoods in other countries with medium to high levels of informal construction. Basic services exist but are usually not adequate. Many households don’t own the land they live on. Bank mortgages and loans are not widely used. Many low-income people don’t purchase homes, they build or commission their own. Construction activity is gradual and is frequently unpermitted. Construction quality is low. Household members participate in construction but outsource most work to local practitioners. These are commissioned on a project basis, usually without a written agreement. Homeowners are responsible for purchasing most of the construction materials.

Other findings are more exclusive to the Jamaican context. Most buildings in the neighborhoods surveyed are a hybrid between partially reinforced block masonry and confined masonry. They generally have two stories or less. Many are smaller than 100m². Parish to Parish and District to District migration appears common (one parish contains multiple districts). It includes rural families coming to the city, but also urban families leaving dense “downtown” areas in search of more space and cheaper living conditions. Government relocation programs have also contributed to this. Land tenure is desirable but not necessary for households to feel ownership over their home. Households invest in their homes but mostly not for speculative purposes. In fact, speculation is largely considered privilege of neighborhoods with more socio-political stability. Hurricanes are perceived as the most likely hazard, but few people take mitigation measures.

With regard to practitioners, surveys show most are not formally qualified, but many are skilled in masonry, carpentry and steel work. Most are self-employed or work in small teams. Female workforce participation is low overall, but higher than that seen in other countries with similar contexts. Their participation is generally limited to unskilled tasks. Practitioners are frequently able to find work but often need to supplement their income with other activities. Some practitioners also work for formal companies, though usually not in a salaried position. Households are in principle willing to pay more for a licensed practitioner, but this is largely due to the perception that qualified practitioners are more reliable (and end up costing less) than any potential increase in home safety. Practitioners place similar value on the license, and most are prepared to pay for obtaining one. Practitioners stress the need for a practical and flexible approach to licensing. They are interested in any opportunity to develop new skills, most are technologically adept. Nearly all prefer learning through doing.

Summary of recommendations:

Survey results suggest that carefully considered institutional training and licensing initiatives could in fact increase compliance and improve construction quality in low-income communities. Initiatives would need to take into account the very strong relation between financial, technological and social parts of the construction equation, ideally addressing all three. Specific recommendations include:

1. Increasing household access to financing and/or construction subsidies, so existing household funds can be better leveraged, and construction quality can be more tightly controlled.
2. Developing simplified construction guidelines, so homeowners and practitioners are more easily able to interpret new building code requirements.
3. Creating a competency-based qualification, so experienced practitioners are able to maximize their existing skills and the licensing process can be streamlined.
4. Maximize the use of resources from existing training courses, so new systems can be rapidly integrated and understood and opportunities for further training can be provided.
5. Building a network of training providers, so training opportunities are available throughout the Island and future demand can be more easily met.
6. Raising awareness through targeted communication campaigns, so households are more aware of the need to build safely and have the information they need to take positive next steps.
7. Exploring the use of construction resource centers, so households and practitioners can more easily access the financial, technological and social assistance they need, while private companies and institutional bodies are able to continue refining their support.
8. Leveraging technology to engage with a wider audience, so information becomes more accessible to more people at a much lower cost. This could include, among other things, the development of a mobile “app”, messaging system or online platform.

While some of these actions may require an initial level of effort, undertaking them could significantly contribute towards the institutional learning process, something that, along with implementation of the Building Act, is key in creating long term demand and consistent supply of safe construction practices.

3 Introduction

In most of the professional world, recent graduates and trade apprentices progressively build their skills under close supervision from an experienced and qualified mentor. Graduates and apprentices take on more responsibility as and when they are deemed ready, usually not before going through a rigorous training and assessment process. This is especially true in professions where other people's lives may be at stake.

In few places in Jamaica is that responsibility taken more seriously than in the Jamaica Institution of Engineers (JIE) and the Jamaican Institute of Architects (JIA), two high-level professional bodies whose members frequently lead large private and public building and infrastructure projects.

While JIE and JIA regulations are enshrined into law, other professional bodies and associations in Jamaica share an equal sense of responsibility. The Jamaican Institute of Quantity Surveyors (JIQS), The Jamaican Institute of Planners (JIP), the Incorporated Master Builders Association of Jamaica (IMAJ) and The Land Surveyors Association of Jamaica (LSAJ) among others, all include public safety and the responsible development of their profession as part of their mission or value statements. There is a good reason for this. Without a mutual acknowledgement of the importance of each profession there could be no clear division of responsibilities and everyone would suffer as a consequence.

But there is a large swath of the construction industry in Jamaica that operates outside these formal boundaries. Many undergraduate engineers, architects, drafts-people and other lower qualified people operate with little accountability, and many "informal" building practitioners take on building projects without any formal qualification at all.

In many low-income neighborhoods, word of mouth and personal recommendations are the *de facto* "licenses". Work is often unpermitted, houses are designed on the back of an envelope, and contracts between households and practitioners are sealed with a nod. Even in traditionally formal circles, such as large commercial and public properties, there are often elements that skirt the strictest application of the law.

There's a price to pay, especially in low-income neighborhoods. While many informal practitioners have significant skill and should be commended for successfully working in environments where many others would fail, the lack of accountability coupled with piecemeal construction processes often leads to houses that are vulnerable to collapse in natural events such as hurricanes and earthquakes. Since informal construction is widespread, any future event could lead to large loss of life and have significant and long lasting economic impact on the country.

The recently passed Building Act (Parliamentary law establishing a modern legislative framework for construction, including the adoption of a new National Building Code and enhanced enforcement measures) goes a long way in tackling some of these concerns, and orders the establishment of a Building Practitioners Board capable of developing training and certification programs for the progressive upskilling and "formalization" of building practitioners.

But much is still unknown, and some have expressed doubt that enforcement and training alone can put a stop to these informal, illegal and unsafe construction practices. After all, many of the challenges are as much to do with socioeconomic factors as they are with household disaster risk awareness and practitioner qualifications. In simpler, perhaps more provocative terms: If regulation has not been respected until now, is more regulation really the solution to the problem?

And who exactly are these informal practitioners anyway? What is the scale and size of the informal construction sector? What are practitioner's main motivations and priorities? What role do homeowners and tenants play in designing and building their houses, and even more importantly, what else could be done to ensure future houses are built safely?

This report aims to shed further light on these questions by outlining and discussing findings from a recent survey of 240 households and practitioners based and/or working in low-income neighborhoods. The report also includes feedback from preliminary conversations with key institutional collaborators, many of who will directly participate in future training and enforcement initiatives. This is done with the intention of sharing latest ideas and advancements, highlighting common ground and underlining remaining concerns about future implementation of activities related to the Building Act.

4 Approach

The analyses consisted of two main activities, an informal construction sector survey including site visits and one-on-one interviews, and a round of institutional collaborator discussions.

The neighborhoods selected to form part of the survey were chosen with guidance from the Social Development Commission (SDC) of MLGCD. They were considered to appropriately represent the wider, low-income, urban, peri-urban and rural contexts of Jamaica. Geographical spread, construction activity and the personal safety of surveyors were also defining factors. The six Neighborhoods selected were:

- In Kingston and St. Andrew: Bower Bank, Seaview Gardens, Bedward Gardens and low-income areas in Sandy Park and Red Hills
- In St. Thomas: Low-income areas in Mt. George, Yallahs

Households were selected based on a “systematic random sample”. One out of every 10 houses were visited starting at a point selected at random. The most senior household representative was surveyed. Practitioners were selected based on a “purposive sample”, in other words the survey team stopped at every active construction site they saw and interviewed the most senior person there. This was done because there was no feasible way of establishing beforehand how many construction sites the surveyors would come across in any given neighborhood.

Data collection tools (2 surveys) were developed by Build Change with additional guidance from SDC and the World Bank. They were completed by paid, experienced surveyors with oversight from Build Change. Some questions were single answer, and some were multiple choice. People weren’t required to answer questions they considered to be sensitive. The survey tools used can be found via link at the end of this report.

Institutional collaborators were identified through the Building Act or because they formed part of the Government of Jamaica’s (GOJ) Disaster Vulnerability Reduction Project (DVRP). Other collaborators were engaged through recommendations from these. Some collaborators could not be reached or were not available for discussion. Collaborator feedback has been incorporated in the Introduction, Discussion and Recommendations sections of this report, while survey results are listed primarily in the Findings section of this report.

5 Survey Findings

Survey findings have been compiled and organized into themes. Each theme heading is an interpretive summary of those findings. Themes are cross-referenced and expounded upon further in the Discussion and Recommendations sections of the report. Main findings include:

5.1 District migration was, and continues to be, common place

- Nearly 70% of household respondents (59% of which were women) were between the ages of 30 and 65.
- 82% of practitioners surveyed (2.5% of which were women) were between the ages of 30-65.
- Most respondents were born in the same parish they are now living (61%), but most (60%) have moved to their present home from another district.
- The slim majority (53%) of practitioners were not born in the same district they're currently working in, but the majority (65%) were born in the same parish. Bedward Gardens stands in stark contrast, as 90% of practitioners were born in another district and 70% were born in another parish.

5.2 Land security is desirable but not necessary for households to feel ownership over their home

- 56% of households consider themselves owners of the land they've built on. 18% claim to lease their land while 2% rent. 24% of respondents lived on land they didn't own for free. This was particularly the case in Sandy Park and Bower Bank, where land owned by a single family was inhabited by many extended family members, each with their own house.
- Of the 56% of households who claim to own the land, 37% claim to possess land title documents.
- The vast majority of remaining households (87%) show interest in obtaining a formal land title.
- 89% of households claim to own the building they live in. 4% lease, 2% rent and 5% live for free.
- Interestingly, of the 53 households who don't own land, 75% claim ownership over the building. This is perhaps the clearest indication of the distinction people make between land and home ownership.
- Most households (60%) who don't own the land say they're able to make modifications to the house without the land-owner's permission.

5.3 Hurricanes are perceived as the most likely hazard, but few people take mitigation measures.

- More than half of the respondents (56%) claim to have lived in houses that have been affected by hurricane winds. (17%) have been affected by floods and 12% by mudslide or landslide. 11% claim to have been affected by earthquakes. 6% have been impacted by fire. Very few houses (3%) have been impacted by vandalism (house damage caused by people).
- Most respondents (40%) perceive hurricanes as posing the highest risk to their homes. 18% believe fire is the more likely, while 17% believe earthquakes pose the most risk. Floods follow at 12%, capture or government repossession at 7% and landslides or mudslides at 4%.

- The perception of hurricane risk increases significantly with age. Less than a third (31%) of people aged 15 to 29 consider hurricanes the event most likely to damage their home. This increases to 47% for people 65 years and older. This is likely due to the fact that many older people have seen the damage caused by hurricanes in the past.
- Interestingly, this is opposite for earthquakes and floods. 25% of younger people see earthquakes and as the highest risk and 31% see flooding as the highest risk. This drops to 16% and 5% respectively for people over 65.
- The risk of fire is viewed as most significant (23%) by people between the ages of 30 and 65.
- Households do not consider vandalism a risk (2%). It's believed the strong hierarchical structure in low-income neighborhoods provides a significant measure of control over such activities.
- 50% households surveyed claim to be aware of the official hazard status of the land they live on. However, it is unclear how, since 85% are unable to say where this information can be found. It's possible the status of the land is common knowledge within the community, so this information is learned from friends or other family members.
- Less than 10% of households are insured against these hazards. Of those who are, most are National Housing Trust (NHT) mortgage recipients for who insurance is included.
- The majority of homeowners have not taken any measures to protect their house against these hazards. The most common mitigation measures undertaken (by 49% of respondents) are for hurricanes, although these mostly consist of simple measures such as battening down windows when past hurricanes have approached. Other Hurricane mitigation measures include the installation of hurricane straps and/or the addition of a concrete slab roof. Less than 15% have actively undertaken measures for earthquakes, landslides, mudslides, vandalism, fire or flood.
- Similarly, only a small number of households (26%) plan on taking future mitigation measures for hurricanes, and less than 10% for any of the other hazards listed.
- 40% of respondents say that lack of money is the main reason for not adopting disaster mitigation measures. Only 10% say they don't know of any measures they could take.

5.4 Households invest in their house but likely not for speculative purposes

- 96% of households who claim to own their home report to have built it instead of purchasing it.
- Over half of the households interviewed (55%) plan to expand their house either vertically or horizontally in the future.
- 81% of households believe they would be able to sell their house for more money if it were perceived as disaster resistant. However, respondents who were asked more about this didn't consider it reason to speculate. According to these, speculation would only be possible if the security situation (mostly related to gang activities) improved enough to create a stable real estate market. This appears to be confirmed by the very small number of people who've purchased a home in these areas. It could be taken as an indication of how households view other people's perception of disaster risk and could perhaps help convince people that investing in structural improvements need not be a sunken cost. Understandably, the large majority of households (79%) agreed that demonstrable hurricane resistance is what would add most value to their house.

5.5 Bank mortgages and loans are not widely used

- 87% of Households who consider themselves homeowners report to have become so without obtaining a formal mortgage or loan. Households were generally unwilling to discuss these and other sources of financing.
- The most common source of formal mortgages cited is the NHT.

5.6 Most buildings are a mix of partially-reinforced block-masonry and confined masonry.

- 93% of surveys were held in households that were used entirely for residential purposes. 6% doubled as commercial properties and 1% were exclusively for commercial use.
- 99% of households were either one or two stories. 69% were single story. 68% of households were single family (not attached to other buildings).
- 95% of households were less than 300m² in size. Nearly half of all households (47%) were less than 100m².
- 74% were made out of reinforced or partially-reinforced block masonry. Many also included tie columns and bond beams common to confined masonry construction. 22% were timber. The remaining percentage were brick, stone, and zinc (CGI) sheeting.
- 60% of households surveyed had a verandah.
- 57% of households had a concrete slab roof, the rest were zinc (CGI).
- A significant percentage of houses (46%) were reported as occupying the whole lot.

5.7 Basic services exist but may not be adequate

- 91% of households report to have a flushing toilet, although over half (49%) are reportedly not linked to the public sewage system.
- All households have electricity. 89% of households report to have been responsible for organizing their own electrical and water supplies.
- 70% of households use a public water supply, although less than half (44%) have access to it directly inside their dwelling. 30% of households rely on other sources such as wells, rainwater catchment and Rapid Response (Government led program aimed at alleviating water shortages).

5.8 Construction activity is frequently unpermitted

- While 47% of households claim to understand the process of construction permitting, nearly a quarter (24%) of households report they don't know what a building permit is. 34% of households state they know about permitting but are unaware of the documents they would need. Interestingly, the percentage of non-responders for the 3 questions in this section was over 30%. This is significantly higher than any other question in the survey and likely indicates that permitting (or lack of) is a very sensitive and potentially dangerous issue for households to discuss.
- Half of all practitioners reported being familiar with the permitting process. 82% believe that knowing about the permitting process makes them, or would make them, more employable.
- Of the 71 people who employed someone to build a new house, 16 (22%) say they have asked an engineer or architect to do inspection or design work. Based on informal conversations with

households this number is believed to also include draftsmen and engineering or architectural undergraduates who may not be registered professionals.

- 29% of practitioners report to have contracted the services of an engineer or architect.
- 65% of households that report to have built their own house indirectly state they didn't use construction drawings. This could in theory be considered a proxy definition for current levels of informality in the neighborhoods surveyed.
- A slim majority of households (58%) report they would be willing to pay more for a builder who knew how to apply for a building permit.
- 89% of households that have employed practitioners to build, expand, improve, retrofit or repair their house consider themselves satisfied with the work performed. For those people unsatisfied, it was construction quality that was identified as the main issue.
- Less than half of surveyed practitioners (43%) reported having any construction drawings on-site.
- 34% of practitioners reported the site being visited by the Parish council.

5.9 Households participate in construction but outsource most work to trusted practitioners

- 61% of households used a local practitioner, 21% built the house themselves and 16% received unpaid help from family or friends. Only 2% hired a formal company.
- On most occasions (77% of the time) the homeowner or tenant was not working on-site. Only on 11% of sites was the homeowner also the person leading the work.
- 98% of households who built their house claim to have participated in the design process.
- The large majority of homeowners (94%) who've hired a practitioner to do construction report to have overseen their activities. 44% report to have done so constantly.
- 93% of households report they're able to source a practitioner they trust. 53% report not having had an issue with employing practitioners from outside the neighborhood.

5.10 Most practitioners are formally unqualified but are skilled in masonry, carpentry and steel work

- 53% of practitioners report to have attended secondary school (generally interpreted as referring to lower secondary education between grades 7 and 9 (ages 11-13). Based on the age group, it's likely many left school before or directly after the Common Entrance Examination, a legacy examination system abolished by the Ministry of Education in 1998. 15% of practitioners have attended The Human Employment and Resource Training Trust, National Training Agency (HEART NTA). 8% have attended university. 14% attended primary only and 5% have no schooling at all.
- Only 17% of all practitioners interviewed had a certificate of any kind. Less than 10% described themselves as building professionals (which in the community frequently refers to engineering or architectural undergraduates).
- 69% of practitioners have been working in construction for over 10 years.
- 78% learned their trade on-site, combining self-learning and mentorship from more experienced people.
- The majority of practitioners are able to undertake practical masonry (67%), carpentry (59%) and steel detailing (53%) work.

- Less practitioners are able to perform more specialist tasks such as tiling (39%), electric and plumbing (31%), and plastering (23%).
- Even less consider themselves able to undertake “tertiary” type activities such as quantity surveying (15%) and production of construction documents (2%). In fact, only 17% report themselves able to undertake contracting services, despite the fact that, based on extensive observation, that is what many do (also, 65% of respondents report they are currently being employed on a contract basis directly by a homeowner). It’s likely practitioners consider contracting services to be defined by the activities of owners of larger formal construction firms.
- 78% of practitioners generally report no difficulty finding workers with the skills they need. Of those who do find difficulty, production of construction documents is the most sought-after skill (28%). This is followed by steel-work (17%), and masonry, electric and plumbing services (11%). The high percentage of those reporting no difficulty combined with the 2% of practitioners who consider themselves able to produce documents strongly suggests document production isn’t common in these circles.

5.11 Most agreements between households and practitioners are informal

- A clear majority of practitioners surveyed (65%) report having a working agreement directly with the household head. 13% report being hired by a building contractor or firm, while 7% report being hired by an engineer or architect.
- Only 23% of all practitioners surveyed report to have a written contract.
- On 91% of the sites surveyed, it was the homeowner who purchased the material. This is similar to low-income communities in other countries where informal construction practices are common. Only 13% of practitioners report to ever be involved in material procurement.

5.12 Most practitioners are self-employed or work in small teams

- 90% of practitioners are hired on a project-by-project basis.
- The large majority of practitioners (between 70% and 80%) report their main place of activity to be residential buildings under 300m². Most of these (61%) are houses with a maximum of 2 stories. New construction accounts for 76% of all activity, followed by repair (15%), expansion (4%), and retrofitting or home improvement (4%).
- Of the construction sites visited by surveyors, 77% were residences under 300m² and 12% were residences over 300m². The remainder were commercial or storage buildings. The vast majority (82%) were 1 or 2 stories. Over half (52%) were new construction.
- “Informal” construction enterprises are generally small. The majority of practitioners (53%) worked with between 1 and 5 employees. 20% worked with between 5 and 10 employees. Practically all (94%) have less than 40 employees.
- A large majority of sites (76%) visited by surveyors had less than 3 skilled people actively working on them.
- Most sites (53%) had less than 3 unskilled people working on them. 28% had none.

5.13 Female workforce participation is low and is generally limited to unskilled tasks

- 40 out of 120 practitioners surveyed (33%) report to have hired women to work on construction sites in the past. The main activities undertaken by women are manual labor and painting.
- A much lower percentage (2.5%) of practitioner respondents were women.
- Nearly all practitioners (93%) state a willingness to employ women if they are able to demonstrate the required skills.

5.14 Practitioners are able to find work but often need to supplement their income with other activities

- Most practitioners (56%) report margins above 20% on a good job. 33% report margins over 40%. Only 26% report margins of 20% or less. Given the informal context and practitioner's small scale and minimal overheads it's likely margins correspond with profits in most cases.
- Practitioners are regularly employed. 77% are able to work every week and practically all (96%) are able to work every month.
- However, nearly half of all practitioners (45%) claim they need to earn income from other activities. These are wide ranging. Some examples given include security, hairdressing, mechanics, taxi driving, agriculture and animal husbandry.
- 32% of practitioners don't have a bank account. This perhaps could be considered to be a proxy indicator of practitioners' level of integration within the "formal" sector.

5.15 Households are in principle willing to pay more for a licensed practitioner

- A clear majority of households (67%) report they would be willing to pay more for a practitioner with a formal certificate or license. However, multiple conversations with both practitioners and households confirms that personal recommendation and trust would likely continue to play a large part in selecting a builder.
- 35% of households report to be aware of the existence of the JNBC. Of those, 80% say they would be prepared to pay more for a builder who could meet those standards.
- More than 50% of households report they would be prepared to pay more for practitioners that could build houses resistant to natural hazards. 81% of households would be prepared to pay more for a practitioner who could ensure their house would be hurricane resistant.
- A larger percentage of practitioners (57%) report to be aware of the existence of the JNBC. Of those, 82% believe meeting those standards would make them more employable.
- 90% of practitioners surveyed believe that a printed certificate would make them more employable. 86% also believe it would enable them to get paid more.

5.16 Practitioners are interested in developing new skills and largely prefer learning through doing

- Practitioners were most interested in further developing existing carpentry, masonry and steel detailing skills. These are also considered to be the jobs that are most well-paid. Electric and plumbing skills were also cited, but less so.

- Nearly all practitioners (97%) believed additional skills in these areas would provide new employment opportunities.
- A clear majority of practitioners (66%) report they're prepared to pay for training. Only 6% report they would not pay for training. 28% were unwilling to answer the question at this point.
- Of the practitioners who are prepared to pay for training:
 - 8% would be prepared to pay over 100,000 JMD (approx. 773 USD)
 - 21% would be prepared to pay up to 100,000 JMD (approx. 773 USD)
 - 31% would be prepared to pay up to 50,000 JMD (approx. 386 USD)
 - 47% would be prepared to pay up to 25,000 JMD (approx. 193 USD)
 - 100% would be prepared to pay up to 12,500 JMD (approx. 96 USD)
- The large majority of practitioners would prefer practical training, either on-site (54%) or in a dedicated training center (38%).
- Travel distance is not considered a major problem, as 79% of practitioners report they're willing to travel more than 2 hours for training purposes. However, over 80% use public transport only, a potential limitation to training in some locations.
- Weekends in the morning are generally considered to be the best time for training (43%).

5.17 Most practitioners are technologically adept

- Nearly all practitioners (98%) have a mobile phone. 82% send and receive SMSs and 50% use WhatsApp. 76% use the internet on their phone, 75% use "apps" and 65% watch YouTube videos on their phone. Most practitioners with a mobile phone use Facebook (55%). Instagram and twitter are used but to a lesser extent (27% and 12%). 31% don't use social media at all.
- Nearly half of practitioners (48%) have access to a computer. 49% use email (phone or computer).
- Half of all practitioners that use the internet do it for professional purposes (48%), and a smaller percentage (28%) for academic or self-study purposes.

6 Discussion

Survey results, observations made during the multiple field visits and conversations with households and practitioners confirm assumptions that most low-income families in these neighborhoods don't have the means to undertake significant construction work at any given time. Very few households have access to financing so many build or expand their house gradually or "little-by-little" (the common term used in Jamaica). Some projects take months, even years. In best case scenarios houses are expanded one or two rooms at a time. It's common for foundations and floor slabs lay open for extended periods and even single walls are sometimes built progressively, as and when the family can afford them.

Despite the progressive nature of construction, completion is still prioritized over construction quality. Many households appear unable to afford the services of a registered architect or engineer and a large amount of faith is placed on local practitioners, many of whom are skilled but are unqualified. On rare occasions do households have enough expertise to evaluate the quality of the practitioner's work beyond the final finishing (plaster, paint, doors and windows). As such, bad construction practices generally go unnoticed and unchallenged. Perhaps unsurprisingly, significant construction quality issues were detected during the visits. (Please see Appendix 1 for a photo-based preliminary report on construction quality).

During interviews, very few people saw permitting and inspection as a way to protect their investment and keep their family safe. Many consider applying for a permit does little more than increase construction cost and invite unwanted government scrutiny. The need for signed and sealed construction documents was a deal-breaker for a number of households interviewed. The time it takes to get a permit was also deemed an issue, although local authorities say processing time has been drastically reduced in past years.

While, there's little doubt that an increase in building enforcement in these neighborhoods will help reduce the level of unpermitted and unsafe work, it's reasonable to assume this will be a gradual and long-term process. Survey results suggest that even with a qualified inspection and permitting team a number of financial, technological and awareness barriers may remain:

Financial

Without access to appropriate financing, savings or financial incentives many households will likely continue to build progressively, informally and unsafely. Initiatives to reduce the length and cost of the permitting process would likely be welcomed by those already planning to apply but may have a limited effect on those who don't. Government plans to develop a library of pre-approved house designs means families would only need to submit a site and foundation plan to get their permit. Furthermore, site and foundation plans wouldn't need to be signed by any professional unless they fall into an area of complexity (more on this in sub-section 6.3). Even so, the piecemeal nature of construction in the informal sector could present important challenges to the pre-approved design philosophy because very few people build whole houses. Furthermore, permitting only represents a small percentage of the cost of construction. Simplifying the permit process may help raise awareness and reduce some costs but the financial capability of a family to source enough materials and labor to build their house or expand a floor all at one time will remain a key factor.

Closely tied to finance is the issue of land security, which in many advanced economies is one of the most frequent forms of mortgage collateral. Despite spreading their financial commitment, many families appear to accept the risk of building on lands they don't formally own and there's a well-established (albeit informal) form of leasehold. Nonetheless, families who don't own land generally agree that formal tenure would significantly increase their feeling of security. Measures to further facilitate land tenure may increase homeowner's appetite to invest in their property. Either that or building inspection systems may need to be modified to cater for short bursts of construction activity interspersed with extended periods of none.

Technological

Preliminary observations suggest that many houses could have been made significantly stronger with relatively small improvements to construction practice. Informal conversations indicate many practitioners don't fully understand how buildings and their elements react to the forces felt in natural events such as earthquakes and hurricanes. Practitioners often forfeit important elements while using other materials in excess. Without more accessible guidelines and recommendations practitioners will continue facing challenges in delivering safe construction at the best possible price. Household heads likely face similar challenges. If more households had the tools to do a cost-benefit analyses of the work, the use of hurricane straps for example (which in reality represents a very small part of the construction cost) may be much more common. As of now, many homeowners prefer to invest more money in "earthquake" bars (steel reinforcement placed along block wall joints) even when, due to bad connections and lack of covering concrete, they end up serving little purpose.

To further complicate the issue, many practitioners build on top of, or contiguous to, existing structures, and often have to complete another builder's work. Without clear guidelines for housing expansion, these connections often become the building's weakest spots. Even when one practitioner does a good job it is only as good as what it's built on.

While the challenge of improving construction practices is significant, the challenge of mitigating existing risk may be even greater. Already, there are many structures that will likely not fully withstand the effects of a future hurricane or earthquake, and until full enforcement measures are put in place, that number may continue to expand. While some Jamaica specific resources on disaster preparedness and strengthening already exist, these may not meet the minimum life-safety performance levels outlined in the code, and it could be that more comprehensive seismic and hurricane housing retrofit guidelines need to be developed.

On a positive note, the skills and experience many practitioners appear to have indicate that, with the appropriate commitment, the right resources and the right training environment, practitioners can become licensed in disaster-resistant construction and retrofit techniques within a relatively short period of time. Based on Build Change experience in similar contexts, specific retrofit recommendations could be developed using existing construction materials and with only small improvements in construction practice.

Social

The publishing of the Building Act and well-publicized accounts of revisions to the code provide a great opportunity to more widely share construction related information and ensure households and builders are more informed about safe construction practices. Survey results infer a distinct need to raise disaster-risk awareness and help people become more familiar with the benefits of the inspection and permitting process. However, awareness alone seldom leads to change, and large amounts of money can be invested in campaigns without much impact. Adding in financial and technological elements to any awareness campaign may offer the best chance yet of increasing permitting and the wider adoption of disaster resistant construction practices.

That said, this should only be attempted when a deep understanding of the informal sector and its priorities is obtained. The current analyses surveyed 240 people over a wide geographical area. It provides a small window into the informal sector but should not be considered a polished policy-making tool. Testing out different initiatives, holding focus groups, conducting further surveys and generally engaging with homeowners and practitioners on a more regular basis could help institutional collaborators more deeply understand the dynamics governing the informal construction sector, leading to more effective disaster-risk reduction programs and a long-term increase in code compliance.

Overall, survey results and observations appear to confirm what many may already know. Low-income neighborhoods are becoming increasingly more vulnerable and there's a need to act upon this issue with speed if a major disaster is to be avoided in the future. Jamaica may not yet be in the position of other countries in Latin America and the Caribbean, where informal construction in low-income areas is so dense, so built up and so unsafe that the problem is rapidly becoming intractable. Nonetheless, improvements to the Building Code, the publishing of the Building Act and the ongoing willingness to invest in, and learn more about the sector could not be timelier, as measures taken now will likely save lives and greatly reduce the economic impact of future events for homeowners, the government and the country at large.

7 Preliminary Recommendations

The following recommendations are based on Build Change experience, survey results and initial discussions with collaborators listed in the Building Act, as well as others operating more widely in the construction sector. They aim to target both the supply and demand side of the household/building practitioner equation. They are provided with the best possible intentions and are meant largely as a compliment to planned government programs or initiatives that may already be underway. Please note that recommendations don't address the generally agreed upon need to support and build inspection capacity at a local authority level. A parallel World Bank commissioned study is underway, which will include its own set of recommendations specifically on this topic.

7.1 Increasing access to financing and/or construction subsidies

Survey results indicate that few low-income houses have used an NHT, HAJ or private mortgage to build their house, despite the fact The National Housing Trust (NHT) has a “build-on-your-own-land” mortgage type which could potentially be well-suited to some of the neighborhoods visited. Unsecured home improvement loans offered by NHT and other entities such as Co-operative Credit Unions are also largely unused. It's likely some low-income families don't meet NHT contribution thresholds, others may not qualify for mortgages or loans because they don't have a registered land title (only 37% of the households interviewed during this study claimed to have land title documents).

Although easier access to loans does not guarantee a significant increase in their use, further Government measures to facilitate formal land ownership may help increase demand for NHT or HAJ build-to-own mortgages overall. A potential benefit of investing in the expansion of NHT and HAJ mortgages specifically is that certain elements of inspection are included as part of the package, so some inspection costs could potentially be passed back to the homeowner and the burden on local authorities may be somewhat reduced.

Alternatively (or in addition), it may be feasible for NHT and other lending institutions to further reduce registered title requirements for certain mortgages. For example, according to the National Environment & Planning Agency (NEPA)'s Building Application Guide there are a number of simple ways households can prove land tenure other than a certified copy of registered title. This includes a copy of a will, a copy of a sales agreement or a copy of a deed of gift/conveyance. In fact, if you're not the owner of the land you can still apply for a building permit by presenting a letter of authorization from the owner, stamped and signed by a justice of the peace or a public notary. The Land Administration and Management Programme (LAMP) is often able to facilitate the process even more. Conceivably, a government protected, NHT issued loan that incorporated both land security and house construction, expansion, or strengthening funds would be well received and may encourage a transition from informality, especially if it included funds for paying property taxes in arrears.

The Government may otherwise consider increasing the level of construction subsidies available to individual low-income homeowners. Small construction or retrofit subsidies would still require households to invest, but this incentive could be used to ensure homeowners follow the permitting and inspection process more closely, which could in turn mean a closer control of all construction activities.

Whether access to finance is fully subsidized (issued directly by the Government), partially subsidized (in conjunction with or helping to guarantee a private-sector mortgage or loan) or unsubsidized, financing should always include a measure of technical assistance and should be disbursed in tranches that are conditional on construction quality, not on level of completion. Conditional tranche disbursement:

- Maintains leverage on builders and homeowners (including the proper use of their own funds)
- Maximizes the effectiveness of the quality control activities
- Minimizes the risk of loss or mismanagement of subsidy

Providing funds in installments, contingent upon compliance with standards, is one of the best ways to increase quality and leverage construction or retrofit funding to promote change in construction practices.

7.2 Developing simplified construction guidelines

JNBC code provisions are written mostly for professionals. The survey confirms that many practitioner educational levels are low, so it may be optimistic to expect all practitioners will be trained enough in future to use the code as a source document. The Bureau of Standards and other supporting institutions may choose to simplify messages so that provisions can be better understood by those who are asked to adopt them. A number of collaborators have talked about developing new “comic-book” style guidelines, and fondly remember similar materials developed in the past. These materials:

- Contain simple graphics and photos that help guide those who find it more difficult to abstract or conceptualize. Abstraction and conceptualization can be particularly difficult for those with no secondary education.
- Strip down the content to the bare minimum, outlining a series of “key messages” or main points. This removes unnecessary distractions and helps reinforce the most important things. Special cases and exceptions can be highlighted separately in high visibility boxes, which helps reinforce them too.
- Use language that’s simple and non-technical, even conversational. Cultural components are included to help people feel like the material truly does apply to their situation.
- Use commonly known units of measurement consistently throughout.
- Clearly separate the different sections and sub sections and have simple numbering.
- Include an index or table of contents so people can quickly search through the content.

In essence, simplified guidelines outline the step by step process of building a fully functional non-complex house in the simplest possible way. If done carefully, these guidelines can greatly facilitate the development of other training, awareness and inspection material, such as:

- Safe construction posters, flyers and advertising campaigns
- Training hand-outs
- Self-assessment forms
- Skills assessment/ qualification criteria
- Building inspection checklists

In fact, the more similar the content is for each of these, the more likely it is the household head, the practitioner and the building inspector will be able to productively work together. Importantly, these guidelines can also be used to create a draft outline of the minimum competencies required to become a qualified building practitioner, which will likely be the first task of the Building Practitioners Board.

There is an opportunity to start compiling existing material and reviewing advance copies of the code and application documents to better prepare for the creation of these guidelines. A list of existing training and outreach materials sourced or consulted during the analysis is also available via link at the end of this report.

7.3 Creating a competency-based qualification

The Building Act states licensed building practitioners can only be responsible for “small building work”. This is understood to be the design and construction, repair or expansion of “non-complex” buildings. Non-complex buildings are less than 3,000 square feet and don’t fall into 15 areas of complexity outlined in the upcoming code (for reference these areas or “factors” are included in Appendix 2). Consequently, the minimum criteria for becoming a licensed building practitioner can be summarized as:

- 1) The ability to determine whether a building or building project is non-complex
- 2) The ability to ensure any work follows JNBC code provisions for non-complex buildings

The 1st criterion is likely relatively easy to meet by most current practitioners. Provisions are fairly simple, and the necessary building evaluations generally don’t require a high level of technical capacity. This criterion should be met by all practitioners, independently of their background or trade of choice. Preliminary time estimates for training practitioners in the first criterion go from 1 hour (for those with a tertiary technical education) to 1 day (for those with practical experience but no qualification).

The 2nd criterion is more challenging to meet given the extensive content of the code, but also because the building practitioner designation applies to any qualified person who’s not a JIE or JIA registered engineer or architect. This currently includes people with completely different educational backgrounds, including but not limited to:

- Tertiary training but no professional training, e.g., BSE’s in Construction Technology (a non-accredited engineering program).
- Tertiary, high schools or community colleges, with a certificate course, for example City and Guilds or HEART NTA.
- Tradesmen/women and contractors with on-site learning experience but no formal qualification or certificate.

Given the variety of technical expertise and skill of the people expected to apply, it may be useful for the Building Practitioner’s Board to consider a “competency-based” qualification for building practitioners. This allows practitioners to use their existing skills to earn “credit” towards their qualification. If a person is already competent in a particular area (for example, reading a plan) they are given the opportunity to quickly demonstrate it, allowing them to rapidly move on to other areas they may find more difficult. This is different from the somewhat traditional “time-based” approach, where students have to attend classes

for a certain length of time independently of how much they already know. This approach encourages mastery of individual tasks, enabling students to focus on developing each skill to their full potential. It affords a flexibility that many low-income students or working practitioners may appreciate. Competency-based qualifications are also well known for breaking coursework into very small, independent and easy to follow “chunks” or modules. This delivers a lot of clarity and can be a very effective motivational tool, as well as the basis for a self-learning aide.

Competency-based education is enjoying great success in vocational training schools around the world and is widely thought to be the most effective and cost-efficient way of validating existing skills and building new ones. HEART NTA College of Construction services (CCS) has recently implemented a “Prior Learner” construction course partially based on the competency-based approach which has cut the time it takes for practitioners to earn a HEART Level 3 qualification almost in half. Competency-based assessment and training can happen in a variety of formats and locations, including dedicated assessment and training centers or on construction sites. This system equally benefits young people with no previous experience. Overall, competency-based education can be considered the ultimate “structuration” of traditional trade apprenticeship mechanisms, a concept that is generally well understood in the informal sector.

7.4 Maximize the use of resources from existing training courses

The Building Practitioner’s Board, with support from the Training Consortium and HEART NTA could use existing training and qualifications systems as a baseline to greatly simplify the building practitioner qualification and licensing process, in terms of content but also administration, in a way very similar to how the JNBC benefits from being based on the International Residential Code (IRC). Qualifications that could be considered or content taken from include but are not limited to:

- 1) HEART NTA’s Level 3 Qualification in “General Construction”. Composite qualification including practical skills from the masonry, carpentry and steel detailing trades. This could feasibly be expanded to include practical elements of other trades (basic elements of plumbing)
- 2) HEART NTA Level 4 Qualification in “Construction Management”. Could be used as a basis for the development of more trade specific qualifications.
- 3) HEART NTA “job certificates”. Issued for a narrower set of activities such as Painting or Plastering.
- 4) Elements from other short courses or diplomas in Construction Technology.

The National Council on Technical and Vocational Education and Training (NCTVET) has Guidelines for Customized competency-based certification that could be especially useful when considering the development of this qualification. A link to these guidelines is provided at the end of this report, as is an outline of the HEART CCS General Construction curriculum (Levels 1-4) and a sample list of competency statements used by Build Change in similar contexts.

KEY CONSIDERATIONS

- 1) KEEP IT RELEVANT. Since the building code is being revised, existing systems should be cross-referenced with new elements or changes to the code. This may be easier to do once the simplified guidelines have been complete. As with the guidelines, any competencies beyond the scope of design and construction of non-complex buildings could be removed. A minimum standard and grade could be set for becoming a licensed building practitioner (similar to HEART Level 3, which

means a person is able to independently undertake the work and has a certain ability to supervise others) while learning opportunities outside of the licensing system could continue to exist skill levels 1 and 2, and 4.

- 2) **KEEP IT SIMPLE.** The training and licensing of existing practitioners in low-income neighborhoods is considered especially important since they are thought to be responsible for a high percentage of unpermitted small building work in the country. The level of competency required from a practitioner will depend ultimately on the requirements of the code. However, it's important to recognize that if qualifications are far beyond low-income practitioner's present ability, cost too much or require too much time, the opportunity to engage with them productively may be lost.
- 3) **KEEP IT FLEXIBLE.** In addition to creating a competency-based system, the qualification may benefit from being broken down into different areas of expertise related to specific trades, primarily: Construction (masonry, steel detailing and rough carpentry), plumbing and electricity. This would enable practitioners to become licensed in both single and multiple trades as per their desire. Some collaborators suggest this approach could take the form of a "Job Card" that building inspectors could rapidly check to verify whether practitioners are qualified to do the work they are doing. The back of the card could contain a section validating the particular trade or skill the practitioner is qualified in.
- 4) **KEEP IT LIGHT.** Qualification procedures should try and minimize costs by using existing resources and infrastructure as much as possible. Construction sites may an ideal venue for training and assessment in this regard, and the value of practicing or demonstrating your skill on real life scenarios cannot be overlooked. This is also the place where practitioners would prefer to be taught by far. There must of course be balance between savings in materials and the cost of transporting trainers or assessors to any given location. HEART CCS has some experience providing on-site training and assessment for a number of construction companies and may be in the position to provide more recommendations and lessons learned in this particular area.

7.5 Building a network of training providers

A number of organizations in Jamaica already have experience training apprentices and practitioners in safe construction. These include government departments such as the Jamaican Social Investment Fund (JSIF), NGO's such as CRDC, and of course HEART College of Construction Services (HEART CCS), who already delivers general construction and construction management courses for companies, local authorities and NGO's. An increasing number of tertiary academic institutions and professional bodies have also shown interested in delivering this kind of training. The Jamaican University of Technology (U-Tech) in Partnership with the Petroleum Corporation of Jamaica is already in the process of delivering short summer training courses for youths (particularly women) in the basics of construction. Many institutions see practitioner training as a chance to have an impact on the community while engaging with a new audience and bringing in new business. At the present time, regulations largely consider HEART NTA, and particularly HEART CCS as the main provider of future practitioner training. However, HEART NTA capacity in construction training (in all accredited training centers across the island) is currently limited to between 800 and 1,200 apprentices a year, including a small number of Prior Learners. While there are preliminary plans to double capacity within a year, it is still unlikely it will meet current demand. Both MLGCD and HEART CCS have expressed interest in expanding the network of training providers. From the practitioner perspective these efforts would likely be well received. It could significantly reduce waiting and

travel time and may be of special interest if there are opportunities for further academic progress after certification.

A further angle that could perhaps be considered is the increased use of building inspectors as trainers. The inspection process itself is a great forum for training, given it always occurs in real life scenarios and training materials (and participants) are readily available. Many building inspectors have intimate knowledge of construction and are generally good communicators. Some inspectors already report spending as much time educating the population about the permitting process as they do inspecting work. In many ways, building inspectors would make the perfect trainers. However, this would be a significant additional burden, especially if current levels of enforcement are to be increased. A more realistic approach may be to consider expanding the role of inspectors, but only with regards to skills assessment and licensing, not training. At a minimum, inspectors should be well versed on building practitioner qualification requirements and be able to give guidance regarding training and certification opportunities.

Alternatively, building inspectors could be permanently accompanied by an experienced trainer. Build Change has used this model with great success in the past. The inspector (usually an engineer) is able to deal with the higher-level design and compliance related issues on-site, while the trainer (usually a local builder) is able to assist practitioners in the practical application of the techniques required. The combination of these skills can lead to a very strong team. The inspector (who sometimes lack practical skill) is empowered because he or she can rely on the practical expertise of the trainer, and the trainer is empowered because he or she can fall back on the technical expertise of the engineer.

7.6 Raising awareness through targeted communication campaigns

As previously noted, awareness alone is rarely enough to create change in construction practice, even in the richest nations. Future television or radio campaigns could potentially place more focus on the positive economic benefits of applying for a permit, hiring a licensed practitioner and investing in safe construction. Sample themes include:

- “How saving here costs you there”
- “Think you’re saving for the future? Think again”
- “What your builder didn’t tell you”
- “Be smart, invest in yourself”

There are also certain benefits to “formality” that could be further highlighted in future communications campaigns for households as well as practitioners. For example, how having a written contract with a practitioner can protect your investment and save you time.

While a number of messages and forums can be set up to discuss building a new home, it is equally important to tackle the financial, technological and awareness barriers currently limiting retrofitting (strengthening of a house to better resist natural events such as earthquakes and Hurricanes).

7.7 Exploring the use of construction resource centers

An additional layer of technical and administrative support could help reduce the burden on building inspectors and could potentially increase levels of building permitting. This could take the form of a

“technical resource center”, a physical space where households and practitioners can go with engineering and architectural queries and questions related to permitting, licensing and/or construction. These centers would differ from Local Authorities because they would also be prepared to provide information regarding training, construction or home improvement financing, land tenure and other construction related resources. The center could have basic information about government housing and mortgage services from the National Housing Trust (NHT) and Housing Agency of Jamaica (HAJ). It could also have information on the process of securing land tenure and details on the Land Administration and Management Programme (LAMP). It could have contact details for engineers, architects, quantity surveyors, planners and land surveyors. It could also be a venue for engaging with practitioners interested in the licensing process and promote the roster of licensed practitioners.

In effect, a construction resource center would be a “one stop shop” for all construction needs. It would be strategically placed and accessible on foot, preferable in the center of the targeted community. It would be significantly reinforced with resources from government institutions, but the center may benefit from not being, or not appearing to be government run. The main objective being to create a “safe space” where informal households and practitioners can anonymously request information without fear of persecution. Services provided should perhaps, at least initially, be free. Any local moratoriums on permit fees or licenses may help drive up initial demand.

Successes of the center could be measured in permits issued, houses made safe and lessons learned, and may inform a wider construction resource center strategy that could complement the roll-out of new enforcement strategies related to the Building Act.

Construction resource centers are increasingly being used by governments and agencies to manage reconstruction activities after disasters, most recently in some Caribbean islands affected by Hurricanes Maria and Irma. Build Change is currently using them very effectively in Nepal to cater for homeowners rebuilding after the 2015 earthquake.

A construction resource center could provide the ideal venue for learning more about household and practitioner priorities. It would help to see what other questions and misconceptions households and practitioners may have, which could be used to develop more relevant public awareness campaigns and safe construction initiatives. In particular, household’s financial limitations and preferences could further be explored.

7.8 Leveraging technology to engage with a wider audience

The use of technologies in Jamaica, in particular mobile technology, is expanding. Data from The Statistical Institute of Jamaica (STATIN) indicates that in 2016 over 80% of people used a mobile phone and 46% used the internet. At the time, just over a quarter of internet access was through mobile phones. Survey numbers suggest that in 2018, the adoption of mobile technologies is even higher. Practically all practitioners surveyed had a mobile phone and over three quarters used it to connect to the internet. Many Builders use “apps”, although mostly for social media and communication (WhatsApp). It is likely Technology could be increasingly leveraged to raise awareness, simplify the training and certification process and facilitate building enforcement. MLGCD could explore the development of apps or platforms that would provide households and practitioners with:

- Quick access to a library of preapproved designs and bills of quantity
- Searchable construction guidelines
- Retrofit recommendations and disaster preparedness information (incorporating or tying to content from the Office of Disaster Preparedness and Emergency Management (ODPEM))
- A roster of licensed practitioners (similar to one currently used by the National Contracts Commission)
- Information on eligibility criteria for mortgages or government construction subsidies (content can be directly sourced from lenders)
- Names and telephone numbers of inspectors and key departments in each locality
- A toll-free number for technical consultations
- A messenger feature for chatting and exchanging photos directly with an engineer/technical adviser
- General feed of Government awareness messaging
- Information on safety measures while constructing.

8 Link to Materials

Survey tools and data, samples of national, international and Build Change training and outreach materials, NCTVET competency-based customized qualification guidelines, a curriculum outline of HEART Levels 1-4, a template list of competencies frequently used by Build Change and further documents complimentary to this report are available to download for a limited time through the following link:

<https://tinyurl.com/Building-Practitioner-and-Info>

For any comments or questions about this report, or to learn more about Build Change please feel free to contact the author at michael@buildchange.org

Appendix 1: Preliminary Observations on Construction Quality

There's a belief in institutional circles that Jamaica has a tendency to over-design its buildings. This is thought to be mostly in reference to earthquake forces and the lack of damage in recent earthquake events. The earthquake event that flattened Kingston at the beginning of the last century may now be considered irrelevant due to modern day improvements in construction practice. But the limited enforcement and construction quality issues observed during this survey strongly suggests low income neighborhoods have only partially adopted these practices. After the Haiti earthquake in 2010, it was the partial adoption of confined masonry construction practices that contributed significantly to the damage. For example, similar to Jamaica, many households in Haiti consider concrete slab roofs to be an effective solution for hurricane force winds. They also provide the base for the house's future second floor. However, when concrete slabs are not well connected to the walls, it's the inertia of the heavy slab that often leads to house collapse. Tragically in Haiti, there were also many cases of slabs from one house collapsing on top of another. While the density in Haiti is not presently comparable to Jamaica, it is reasonable to assume that a similar event would lead to similar consequences. This is in fact, the main *raison d'être* of the Government of Jamaica's Disaster Vulnerability Reduction Project (DVRP), as well as this study.

The following photos were taken during visits to the neighborhoods surveyed. They convey basic observations on housing configuration and quality. A full engineering assessment was not performed.



Photos 1 and 2: These two photographs are a good example of how many low-income houses in Jamaica are progressively expanded. They show three houses (the blue house appears in both photos). The green house in the left photo has been left largely untouched since it was purchased from NHT years ago. The blue house next to it was originally the same size (they were a duplex) but has since been expanded outwards significantly. The grey house next to the blue house forms part of the next duplex along and was originally set as far back as the green house. It has now been expanded to the lot line, a practice that's not legally allowed.



Photos 3 and 4: Here is an even more extreme case of expansion. The two-story grey house in the left photo is an expansion of a unit that formed a duplex with the blue house to its right. The grey house is nearly six times its original size. Changes have been made over a number of years. The photo on the right shows some internal parts of the original house.



Photos 4 and 5: These photos show a conversion to a slab roof. The practitioner (left) proudly showed the team around. In the photo on the right you can clearly see the addition of a ring beam. You can also see the addition of columns in places where there were previously none. Adding columns like this seems quite common when houses are expanded. Corners and intersections are often cut out and a column added as a retrofit measure. Despite correctly calling them “stiffeners”, most practitioners interviewed believed their main role was to better support the slab rather than help to confine the wall.



Photos 5 and 6: Here are two more examples of single-story houses being expanded upwards in an increasingly complex way.



Photo 7: It's common to find unconfined corners (1) in many houses. Masonry is generally reinforced with vertical steel bars every other block cell, but these are usually not properly filled, negating many if not all of the benefits. It's also common to see a window lintel directly under the ring beam (known as "belt" beam in Jamaica). They can be poured separately or together. The addition of the lintel in this case may not bring great benefit. The steel and concrete could perhaps have been used in more important locations.

Photo 8: In this example, corner stiffeners are large (1) while other parts of the house go unreinforced. It's likely there are too many openings in the central front wall. The single block piers beside the door (2) would likely fall out of plane during an earthquake and the thin tie beam would be unsupported (3). Once this wall is compromised, so is the rest of the house.



Photo 9: Blockwork quality varies significantly from site to site. Here is an example of block that hasn't been interlocked.



Photo 10: This second story is extremely vulnerable. Not only do the upper walls not align with the bottom walls but construction is extremely irregular and there are very few shear walls. The wall on the right of the building could collapse in high winds if not laterally supported soon.



Photos 11 and 12: Zinc roofs were a mix of single slope, double slope and hipped frame. As seen in the picture, houses with single slopes were often very flat. Few if any galvanized hurricane straps were seen although they are reported to be more common now. Rafters are either directly placed on walls or nailed to a wooden top plate attached to the belt beam. The top plate is attached with J-bolts or rebar left over from the vertical reinforcement.



Photo 13: Less than 20% of the construction sites visited mixed their concrete mechanically. In this photo, concrete is being well compacted but is too wet. Aggregate will sink to the bottom severely affecting the final strength. There were no observed instances of concrete being cured.



Photo 14: This photo shows the common result of bad concrete compaction. From another angle it also shows the tip of what is called locally an “earthquake” bar. These are horizontal reinforcement bars running along the bond of every 4 courses of block. These are tied to the vertical bars and inserted into the stiffeners.



Photos 15 and 16: The photos above show the way concrete is most frequently mixed. Dosage is usually by rule of thumb, but the ratio of cement is generally fair. Mixing is irregular at best. Dry concrete is often reincorporated into the mix. Mixes are usually too wet.



Photos 17 and 18: There were generally few complaints about the quality of materials from either households or practitioners. Aggregates are available in a variety of qualities and prices, from unwashed river sourced material to crushed washed material. Sand and aggregate quality on site was generally appropriate. Nominal steel sizes and grading is likely sufficient for one and two-story residences. Blocks are generally of varying quality. In informal settings it is most common for households to buy materials, not the practitioner. The practitioner does however provide guidance on the quantity of materials needed.

Appendix 2: Factors that define Building Complexity

COMPLEX BUILDING SERVICES

Buildings with services that are technically complex and require Registered Building Professionals with the requisite skills to properly undertake the design. Technical services that shall cause a building to be a complex service building requiring engineering attention are as follows:

- i. Buildings having 3-phase electrical mains or single-phase system in excess of 70 Amps mains breaker.
- ii. Buildings with central air-conditioning, heating or heating/cooling systems.
- iii. Plumbing systems requiring hot and cold-water piping and have a minimum of 12 plumbing units.
- iv. Sewage systems requiring secondary and tertiary treatment

COMPLEX BUILDINGS OR STRUCTURES:

Buildings with structures that are technically complex and require Registered Building professionals with the requisite skills to properly undertake the design. Technical complexities that shall cause a building to be a complex structure and require engineering are as follows:

- i. Differences in configuration (shape) from the traditional (square or almost square) type buildings.
- ii. Complex structures such as cantilevers, spiral staircases, storeys in excess of two.
- iii. Where sections of exterior shear panels or reinforced frame are not in one plane vertically from the foundation to the uppermost storey in which they are required.
- iv. Where shear panel or reinforced frame members are not oriented in mutually perpendicular directions.
- v. Where sections of the shear panel or reinforced frame on any one storey above grade are constructed of dissimilar bracing systems.
- vi. Where a section of a floor or roof is not laterally supported by a shear panel or reinforced frame on all edges.
- vii. Where an opening in a floor or roof exceeds the lesser of 3.60 m² or 50% of the smaller dimension of the slab.
- viii. Where portions of a suspended floor are vertically offset.
- ix. Buildings on virgin slopes greater than one vertical to three horizontal
- x. Buildings in expansive soil or land slippage areas.
- xi. Retaining walls of any height that supports a surcharge or retaining walls of height 1,200 mm (4' – 0") and above measured from the bottom of the footing to the top of the wall that are not supporting a surcharge.

Appendix 3: About Build Change

Build Change is an international non-profit social enterprise founded in 2004 with the mission of greatly reducing deaths, injuries and economic losses caused by housing and school collapse in earthquakes and hurricanes in emerging nations. Its team of 180 dedicated staff designs disaster-resistant buildings, trains people to build them, facilitates access to capital for safe reconstruction and retrofitting and works with governments to enforce building standards and develop systems that promote development and progressively reduce disaster risk.

Build Change works in both post-disaster and mitigation contexts and currently has programs in Indonesia, Haiti, Philippines, Colombia, Guatemala and Nepal. Build Change has also worked in China, and Bhutan. To date, Build Change has trained over 23,000 people in disaster-resistant design and construction who in turn have built over 50,000 safer buildings. In the process, Build Change has created more than 11,000 jobs.

We pride ourselves on:

- A proven engineering and capacity building excellence in assessment, design, construction and retrofitting of low-rise buildings in challenging post-disaster and vulnerable environments.
- Being a global leader in the relief/ development world of permanent housing reconstruction after earthquakes and hurricanes, winner of numerous awards, and author of three USAID primers.
- Using a model that overcomes the barriers to development: money, technology, and people, using innovative models to leverage financing and other incentives for safe construction.
- A history of empowering women, as managers, engineers, and stewards of the safe construction of their home.
- An organizational approach based on transparency and cooperation; often working at the nexus of government, private sector, NGO, donor, and end user communities.
- Being a champion of local capacity building and job creation, recognizing these are keys to sustainable development in emerging markets.
- A record of delivering successful high impact, low cost per impact programs in partnership with institutional donors and other public, private, and NGO partners.
- Forward-looking approach to technology innovation, implementing tablet-based methods for monitoring and collecting data, limiting opportunities for corruption and error during construction.

Build Change specializes in reducing disaster risk for low-rise informal houses, settlements and schools in areas prone to natural hazards. Frequent services and activities include:

Reconnaissance Reporting, Building Damage Assessments and Housing Sub-Sector Studies. Build Change has written and contributed to a number post-disaster reconnaissance reports and housing sub-sector studies. A selection of authored and co-authored reports is available here: (<https://tinyurl.com/y32e9s9g>)

1. **Risk and Mitigation Viability Studies.** Build Change completes risk and mitigation studies for housing and schools that are frequently used to estimate the potential economic and lifesaving impact of strengthening measures. For example, we were recently contracted by the World Bank to provide expert advice on home retrofitting alternatives to mitigate earthquake risk in Indonesia and Guatemala.
2. **Structural Evaluation of Low-Rise Housing Settlements and Schools.** Build Change evaluates the structural, seismic and wind safety of houses and schools for private, government and NGO clients. Evaluations include non-structural components, such as water and sanitation, egress, and lighting and ventilation. In Haiti alone, we've structurally evaluated over 1,500 informal houses and are working with *Ministere de l'Education Nationale et de la Formation Professionnelle* (MENFP) to assess the vulnerability of and determine appropriate mitigation measures for existing school building stock.
3. **Site Hazard Assessment and Mitigation Recommendations.** Safe housing is not only about structure. Build Change performs frequent site hazard assessments, usually as the first step in wider disaster risk mitigation programs. As part of a recent partnership with Global Communities in Haiti we conducted a geotechnical study, provided recommendations for relocation of vulnerable families and designed and supervised the construction of over half a kilometer of retaining walls.
4. **Existing Building Structural Rehabilitation and Retrofit Design.** Build Change develops tailored retrofit designs and helps supervise retrofit work in both formal and informal settings. Where technically feasible, Build Change offers prescriptive and type design solutions that are easily implementable at scale. We've developed retrofit designs for six very different country contexts. In Nepal, our retrofit type design has been adopted by the National Reconstruction Authority and can help strengthen the majority of the 400,000 rural stone and mud mortar houses estimated to be at risk.
5. **Advice on Policy, Legal, and Regulatory Frameworks.** Build Change supports governments and NGO partners in the development of technically sound and economically fair post-disaster and mitigation policy with emphasis on the use of home-owner driven processes. Our policy and advocacy work includes being asked by the Mexican Secretariat of Urban Development (SEDATU) to provide Homeowner Driven Expert Advice to the Government after the September 2017 Mexico earthquake.
6. **Building Code Revision and Guideline Development.** Build Change is often consulted and frequently contributes to the development of new government guidelines. We create easy to follow, prescriptive training and reference material for officials, engineers, practitioners and homeowners. Our seismic evaluation and retrofit manuals have been adopted by the governments of Colombia, Haiti and the Seismic Engineering Association of Guatemala. The Colombian retrofit manual is available here: (<https://tinyurl.com/y4k406g7>) (Spanish). A visual guide to the execution of retrofit work in Haiti is

available here: <https://tinyurl.com/y6yk2atd> (English). A safe construction guideline for non-technical persons in Indonesia is available here: <https://tinyurl.com/y6hsqsx8> (English), a simple guidebook for low-literacy builders in Haiti is available here: <https://tinyurl.com/y5ad876w> (Creole).

7. **New Construction Design and Design Review.** Build Change develops its own designs and has performed numerous design reviews for government and NGO partners. Designs consider the local economy, local practices, materials and cultural preferences. Past designs include reinforced concrete frame and reinforced and unreinforced timber and masonry construction. One of our most recent timber frame designs is being used by Badan Penanggulangan Bencana Daerah (BPBD, Provincial Disaster Management Agency) for reconstruction after the 2016 Pidie Jaya Earthquake in Indonesia.
8. **Construction/Retrofit Program Delivery.** Build Change has supervised thousands of construction sites as technical and program lead for large and small reconstruction and mitigation programs. We provide daily, weekly and remote oversight as needed, and work directly with homeowners, practitioners, and partner agency field staff. We help ensure subsidies or loan amounts are only disbursed when quality standards are met. Some of Build Change's experience in this domain has been collected in the form of 3 Primers developed for USAID and available here:
 - [Building Back Housing in Post-Disaster Situations \(https://tinyurl.com/y3rsp8bb\)](https://tinyurl.com/y3rsp8bb)
 - [Seismic Retrofit of Housing in Post-Disaster Situations \(https://tinyurl.com/y6n7e67z\)](https://tinyurl.com/y6n7e67z)
 - [Site and Retaining Wall Hazard Mitigation in Post-Disaster Situations \(https://tinyurl.com/y3rsp8bb\)](https://tinyurl.com/y3rsp8bb)
9. **Training and Accreditation.** Build Change uses a competency-based model to build the engineering and risk reduction capacity of engineers, government officials, NGO staff, homeowners, builders and material suppliers. We recently partnered with l'Institut National de la Formation Professionnelle (INFP) and Centre de Compétence en Reconstruction (CCR) to develop Haiti's first national qualification in disaster-resistant construction. In Haiti, we've trained over 3,500 builders and block factory employees. We also run REZO, a rewards and accreditation program for informal builders and material suppliers. In Bogotá, Colombia, we've recently trained government engineers who we're now partnering with to retrofit 50 pilot homes. This initiative will be replicated in Medellín with the Resilience Office and the Administrative Department of Disaster Risk Management (Departamento Administrativo de Gestión del Riesgo de Desastres, DAGRD), as a first step in the city's new resilience strategy.
10. **Quality Control and Product Testing.** Build Change develops simple quality control guidelines and checklists that can be used by technical and non-technical parties during all phases of construction. We've developed simple solutions for product testing, including mechanized impact, compression and tension testing. In Indonesia, we've developed a brick testing machine made from a wooden frame, a scale and a car jack. Rural brick making cooperatives can now reliably test bricks at no expense and can easily maintain and repair the machine when needed. Build Change retains advanced testing machinery and partnerships where needed.
11. **Innovative Use of Technology.** Build Change uses drones and 360° cameras to map and perform building assessments in disaster affected areas or otherwise vulnerable communities. We use Revit to

develop 3D retrofit self-checking models, and a combination of images and Revit to create virtual reality and augmented reality experiences. We also use mobile applications to help develop a quick and direct line of communication with communities. In Nepal, Build Change's mobile app, "Surakshit Ghar" or "Safe House," has been developed to assist in safe reconstruction after the 2015 Nepal earthquake, and provides homeowners, builders, and government officials with access to an offline library of reconstruction resources, including house designs, bills of quantity, disaster-resistant recommendations, construction checklists and even an engineering hotline.

Please view Build Change's full Statement of Qualifications (2015) here: <https://tinyurl.com/y6a6wnjh>. For more information about Build Change please visit www.buildchange.org



As part of the Global Facility for Disaster Risk Reduction (GFDRR), the Building Regulation for Resilience Program develops and promotes activities to increase regulatory capacity to promote a healthier, safer and more sustainable built environment. By leveraging good practice in building regulation as part of a strategy to reduce both chronic risk and disaster risk, it sets low and middle-income countries on the path to effective reform and long-term resilience.

The GFDRR is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 local, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 34 countries and 9 international organizations.



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