Green Building Imperialism

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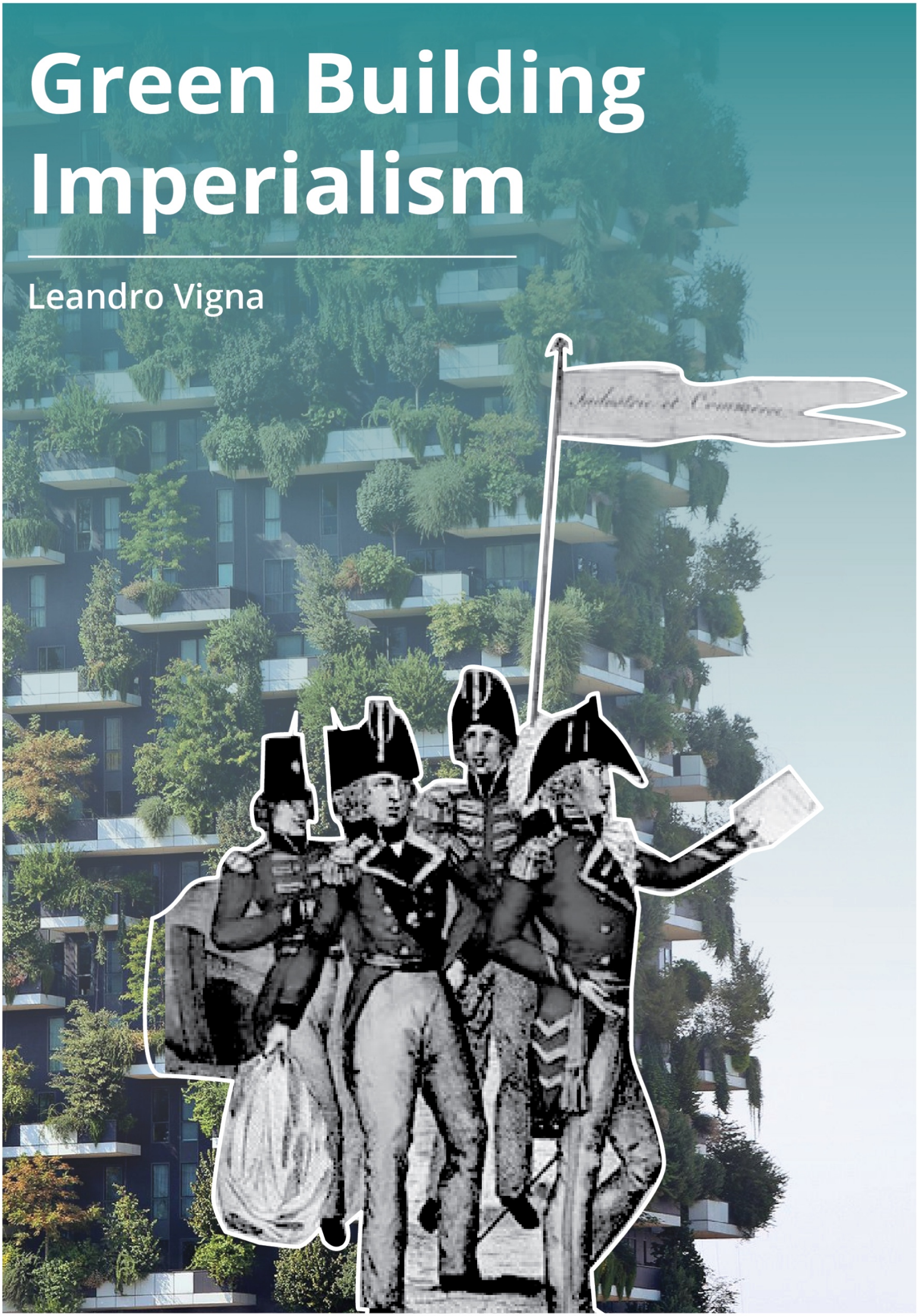


Green Building Imperialism

Over the last 20 years, we have witnessed the emergence of many Green Building Systems (GBS) around the globe, bringing a whole new set of acronyms to the construction industry, such as LEED in the United States, CASBEE in Japan, BREEAM in the United Kingdom, DGNB in Germany, and so on. Even though all these systems have minor to major differences between each other, they all share two common things: They are among the first green building rating systems ever created, and they all come from the "developed world".

These systems have a proven record of excellency in achieving reductions in the amount of emissions, water consumption and waste production that their certified buildings obtain. Even though their contribution in pushing the construction industry into a more sustainable path is undeniable, many international GBS arrive to foreign countries with the same set of standards and requirements that they have in their countries of origin, without taking into account the local climate, materials, cultural traditions and socio-economic conditions. Over the course of this article, we will discuss how these top tier systems are falling short in considering the special necessities of developing countries, and how these nations are coming up with creative and innovative solutions to solve these shortcomings.

We will first focus on the colonial way of behaving that some international rating systems have when they move into a new country. We will discuss how this behavior can bring associated negative effects, either by having the wrong priorities in place, negatively affecting the economy of the country, or by stigmatizing the word "green building". Secondly, we will talk about the creation of "syncretic" systems—or mixing processes—that have occurred in many nations where international GBS have been readjusted to local conditions.

Metropolis Systems – International Ratings

Over the course of human history, we have seen many examples of countries triumphing over others and conquering them, expanding not only their territory, but also their influence over the new land. In this system, the capital of the triumphant nation is called Metropolis, and the new addition is a Colony. The Metropolis acts as the center of innovation and development, exporting everything from manufactured goods to cultural aspects back to the colonies. Thus, the colonies become a watered-down version of the metropolis due to the strong influence that exerted over the dependent unit.

The way in which a colonialist dialect works in the world of Green Building Certification systems is related to the flow of services and the characteristics of these. In the most basic example, a developed country, acting as a Metropolis, creates a new system that works very well for their environment. After a trial period, this system is exported to other nations, among them developing countries, which have a sector of its market interested in adopting this green building practices. The motivation in here is clear and well-intentioned—implement sustainable construction practices and have a high-performing building. The problem, however, appears when the recipient country passively incorporates the practices from the developed nation without taking into account local circumstances. When this happens, the recipient acts as a colony by having aspects of its cultural identity replaced with others from the developed nation that don't fully adapt to the local needs.

Such dialect started not so long ago, given the recent history of GBSs. The first GBS ever created is the Building Research Establishment Environmental Assessment Method (BREEAM), originated in the UK in 1990. One decade later, the "Leadership in Energy & Environmental Design" arrived the market in the United States, and it has been growing ever since as to become the most widely used

GBS in the world. Nowadays, there are a number of rating tools that where created originally for one country, but that operate in many different nations. In this regard, there is a question worth asking: Are those systems international because they respond to common necessities among various countries, or are they simply *internationalized* by virtue of being used internationally?

For the purpose of this article, we will argue about the "internationalization" of systems under the subject of green buildings. Considering that the construction industry deals with aspects intrinsically particular to the local context, such as climate, socio-economic implications, traditions, available resources, landscape, etc., it is fair to reflect on how one uniform system can address the peculiarities of countries with completely different characteristics. We will focus on three main drawbacks that are consistently faced by international systems applied in developing countries, using the LEED system as a reference for being the most popular one.

Detrimental economic implications

Sustainability certifications are really good at raising the bar of the market, pushing manufacturers to produce their products with higher efficiency levels and with a less harmful footprint. LEED, for example, sets a prerequisite in the energy performance of new buildings to be a certain percentage more efficient than the minimum requirements established in the national energy standard. In doing so, manufacturers have an incentive to develop better products to satisfy the tenant's demand, which is motivated by the pursue of achieving the LEED certification. This strategy has proven extremely successful in the US, where the bar has been raised over and over with every new version of the certification.

Despite these promising results, there is a backlash effect when trying to apply the same logic in other countries without taking into consideration the local circumstances. LEED v4, for example, requires to calculate the baseline building performance according to ASHRAE 90.1-2010 (or a USGBC-approved equivalent for projects outside the US). The problem with this is that in many developing countries, the gap between the national average standard and the one required by LEED is so wide that in many cases, the only way to fill it is by importing appliances and materials. This has a detrimental effect on the national industry, where the bar is raised so high that the local manufacturers cannot afford to improve their products to keep up with the foreign standard, causing them to be displaced by international firms. If the requirements would be asking for a performance increase in a percentage that is feasible for local manufacturers to adapt, then they would be incentivized to do so. However, if the local standard is to build with single pane windows, and we require them to improve to double pane, insulated frames and argon gas-filled windows, it is unlikely that they will respond to this, questioning the overall sustainability in terms of economic development of emerging nations.

Another problem associated with the need to import products is that some countries that are undergoing a protectionist regime such as Venezuela, have strong regulations on the imports and either prohibit the introduction of foreign products in the country, or add taxes to them as to make their purchase completely unfeasible. Under the indoor water consumption prerequisite in LEED, certain low-flow appliances need to be installed in order to comply with the requirements. If those appliances are not produced in the country, and it is not allowed to bring them from abroad, then the whole idea of applying to a LEED certification might be discarded because of this particular reason.

Local priority issues

Over the last two versions of LEED (LEED v3 or 2009 and LEED v4) there has been a fair intention of making the rating system as international as possible. From creating a new category called "Regional Priority", which gives up to 4 points to projects that address issues related to its particular location, to developing the International Roundtable and allowing the adoption of international standards apart from the American ones—with certain limitations. These efforts, however, are not enough to properly weight in the national priorities of different countries in just one rating system.

Let's take the case of China: In the LEED v4 for New Constructions, 33 points are given to the Energy and Atmosphere category, the one which is concerned with energy performance. This is the most weighted category under LEED, followed by the Material and Resources category with 13 points. This makes sense for a system developed in the US, where energy efficiency is the most pressing issue. In China, however, the main priority in green buildings is not the energy performance, but rather water consumption. According to the Ministry of Water Resources, more than 400 out of the 669 main cities have insufficient water supply, and 110 of them suffer from serious water shortages[1]. In this regard, the structural design of the LEED certification, even with the new improvements to the system, cannot fully address the particularities of countries such as China with diverging priorities from the ones in the US.

A green stigma

In the early days of international GBS being first implemented in developing countries, low-tech practices and local alternatives to building green were not taken into consideration, and only foreign, high-tech practices were recognized. As a result, many projects were forced to import materials or appliances from developed countries, and also hire specialized workers to install those products. This kind of actions—directly related to the detrimental economic implications mentioned earlier—inevitably brought along incremental costs, that depending on the country and its current level of development, represented a good percentage of the project's budget. Given the economic constraints of developing countries, the access to international GBS certifications was only feasible for wealthy companies and international corporations. Such tendency tarnished the public perception of green buildings as a very expensive practice, which is a stigma that remains until the current days.

This "stigma" is so strong that not only in developing countries, but overall, higher perceived first costs account for the greatest challenge to increasing green building activity[2]. Even when local rating systems promote low-tech strategies and recognize available technologies, the public perception deters people from even thinking about building green, as they assume that the costs of it will be prohibitive. Affecting both international and national GBS, the negative influence of this stigma affects local systems much stronger as they usually have more laxed standards and are more affordable than the foreign option—as opposed to the claim that green buildings are more expensive.

A melting pot of standards – Syncretism and Mestizo systems

A great architectural example of a syncretic integration of foreign and local cultures is the Yaguaron Church in Paraguay, built in 1772. This catholic church incorporated the technologies that were known by the local inhabitants, building the structure of the building out of wood instead of the usual stone. In addition, there was another major improvement in adding eaves surrounding the entire perimeter, which is something absolutely new for this type of church. This adaptation relates directly to the local type of architecture and climate, where the native builders used to create transition spaces—indoors-outdoors—as a protection from the intense heat and the tropical rains, also accustomed to practice most of their activities outdoors.

Yaguaron Church in Paraguay (left), contrasted with the Church of Santa Maria Maggiore, in Épila, Spain, both buildings with the same typology and built in the XVIII century, but with very different results due to the local adaptations in Paraguay.

Developing countries have come up with a solution in an attempt to deal with the problems that the metropolis systems bring associated. Either by adapting an international rating tool to suffice the necessities of the country, or by creating an original one, emerging economies are proving to be taking green buildings seriously and are working towards the development of a more sustainable construction industry. This process of mixing local characteristics with foreign ones is known as syncretism, and in the world of green building, it can result in a new born “mestizo system”. Whether a country adapts a system or creates a new one, the outcome will have features and influences from the international system used as a reference, as well as from the local traditions and regional practices.

In the creation of mestizo GBS, countries have followed several paths to arrive their final product, either by having a governmental department in charge of it, or by the initiative of an independent organization. With the latter being the most common case, it is relevant to mention the role of local Green Building Councils as key players in this process. Green Building Councils are national non-profit, non-governmental organizations with the goal of promoting a transformation of the built environment towards a more sustainable one. They are all grouped in a network called World Green Building Council, which has been instrumental in the development of systems that are tailored to local contexts. This is done by primarily promoting and facilitating the exchange between different Green Building Councils, where they can share their experiences and learn from each other.

Besides the different ways in which a GBS can be created, syncretic processes can result in systems that are as diverse as the countries that originated them. In this section of the article, we will analyze different cases of locally created rating tools, with examples taken from very distinctive regions of the world. We will analyze how they were created, how they work, and what are the unique aspects of each system, putting a special emphasis on how they have addressed the particular concerns of their country and how they have reflected their national priorities in their program

Green Star South Africa – *South Africa*

South Africa created the Green Star South Africa rating system. It was developed by the Green Building Council South Africa (GBCSA), and it is based on the Australian certification "Green Star". Interestingly enough, "Green Star" is actually a re-elaboration based on BREEAM, with operational elements taken from the LEED certification. Retrofitting one system from others and vice-versa is a process that often occurs in the world of GBS, and the Green Star South Africa is a clear example.

At the moment of its creation, the GBCSA opted for this "Green Star" option among others because it was more aligned to what they needed and comparatively easier to implement. In addition, they didn't see the necessity of creating a whole new system from scratch due to the extra time that it would demand, and they wanted to start with the implementation of a system as soon as possible. According to Thulani Kuzwayo, Managing Executive, Public Sector of GBCSA and Chair of Africa Regional Network, "[our] intention is to try and get the best practice of today to be the standard practice of tomorrow".

Kuzwayo explains that there are two main differences between the Australian and the South African system. The first difference is related to its relevance, where the adapted system was tailored to address the specific conditions related to the economic development, energy and ecological responsibility and water scarcity problems of the country. The second main difference has to do with its applicability, and therefore the introduction of a national benchmark from where they could "judge" the relative performance of the buildings. Since there was no such benchmark in place, the GBCSA created its own by inviting actors from the industry and design sector to collaborate and comment on what would represent a fair criterion to follow. Kuzwayo says that by considering the national manufacturers and the local availability of technologies and materials, Green Star SA tailored its requirements to be ambitious, but yet accessible for the industry to progressively raise the bar and develop more sustainable products and services.

Green Star South Africa is composed by nine environmental impact categories, plus one pilot category called "Socio-Economic". Each category groups specific key criteria, and they are further divided into credits that address initiatives to improve a design, project or building's environmental performance. Subsequently, each credit has points that are awarded once the project meets the requirements aimed in the credit.

Socio-economic implications are particularly important to South Africa, which resulted in its pilot category that includes credits such as employment creation, economic opportunity, skills development and training, among others. This category is perhaps South Africa's most unique contribution to its system. The GBCSA recognizes that focusing only on environmental outcomes is not enough, and therefore they have worked on a framework that enables more complex socio-economic issues to be integrated in the system. In their view, it is possible to have an environmental responsible building, but unless the so called Triple Challenge that South Africa faces—unemployment, poverty, and inequality—is addressed, there won't be a sustainable building. This is also clearly stated by Kuzwayo, who further explains that "true sustainability can be expressed in a rating system by asking for local sourcing, and it is more about economic development than it is about travel carbon footprint."

BERDE - *Phillipines*

BERDE—Building for Ecologically Responsive Design Excellence—is the original Green Building Rating System created by the Philippine Green Building Council (PHILGBC), with their first version released in 2010. Its origins can be traced back to 2007, when PHILGBC was first founded. In conversation with Christopher C. de la Cruz, CEO and founder of PHILGBC, he said that one of the first decisions that the newly created green building council had to take, was to decide whether to adopt an international GBS, adapt one, or create their own tool. As we can see in the results, creating a new certification was the preferred choice, although it didn't come free from foreign influences.

Far from it, BERDE was originally inspired by the LEED system. De la Cruz explains that this was in part due to the American influence that the Philippines have—remnants from when the country was a U.S. colony—where some national regulations are based on American standards, and some buildings in the country where already LEED certified. Nonetheless, even though the first discussions gravitated towards LEED, further considerations shifted the focus towards another system. After several meetings held under a fellowship program from the WGBC in Australia, where some Asia-Pacific countries gathered to discuss about the experiences of their local Green Building Council, the PHILGBC received assistance from the Green Star Australia system, which influenced the final outcome of BERDE.

There are two main aspects that BERDE shares with the Green Star system, and those are the subdivision of its core framework into nine categories—with only a few alterations in the names—and the ratings awarded—also given in "stars" from one-star (minimum practice) to six-stars (world leader). Besides from that, the system has made adaptations and innovations that are particular to the Philippines.

First of all, the allocation of the total 100 points is distributed according to the national priorities. In this regard, the "Energy Efficiency and Conservation" and the "Use of Land and Ecology" categories are the most weighted ones, with an extra emphasis to the latter, given that the Philippines is an island country and the use of land represents a major challenge. Out of the 100 points, a minimum of 51 need to be achieved to qualify for the certification. There are no prerequisites, but there are some minimum system requirements that are mandatory. Once all the documentation is submitted, the BERDE system provides certifications for new constructions, operations, and renovations.

One interesting innovation is that the process of certification is divided in two stages. Stage one is related to the design, where the documentation of the project is assessed to see how many points can be achieved. The second stage comes after the construction has finished, and it requires an on-site assessment to verify that the design strategies submitted in stage one were thoroughly followed. "It often happens that after an original design was submitted, there are changes in the project due to budgetary constraints that usually affect the environmental performance of the building," exemplifies de la Cruz. By having the on-site assessment, the credibility of the program is reinforced as they reallocate points according to what was finally built.

From a regulatory standpoint, the main challenge was to find the commonality among regulations promulgated by the local governments—which are mandatory and different along the country—and the national ones. In this sense, the government released a baseline of the building performance in the country, and BERDE adopted it as the benchmark for their strategies. Such baseline is under constant revision by the PHILGBC, the United Nations Developing Program, and other organizations in order to keep it updated. This alignment with national regulations was well received by the Department of Energy, who recognized BERDE as the National Voluntary Rating System, and led local governments to incorporate the rating tool in the creation of investment strategies.

When asked about other unique aspects of the system, Christopher de la Cruz mentioned a local mantra that they keep in mind while developing the tool, and that is "not to miss out on opportunities on the use of low cost, or indigenous, or appropriate technologies, available in local communities, and developed by local labor". This idea is represented in BERDE by allowing room for flexibility in the certification process. One example of this is that, upon request, a professional from the PHILGBC can verify on-site that a project is implementing sustainable practices not contemplated in the system. Once approved, extra points are assigned to the project under the category that most closely relates to the improvement. This can be related to the Innovation category in LEED, but with the difference that the on-site verification replaces the need of extra documentation required in the U.S. system. In addition, PHILGBC is working in the development of an elective library, where socio-economic credits will be reflected and awarded extra points.

GBES - *China*

When it comes to construction, China is facing serious challenges of extraordinary proportions. The country has already the largest urban population in the world, with 758 million urban dwellers, and it is expected to increase that amount in 292 million by 2050[3]. Considering that it already has six "megacities", and that the energy consumption per unit construction area is two to three times of that compared with developed nations[4], there are good reasons for this nation to care about green buildings.

To face these urban challenges, China has created its own GBS called "Green Building Evaluation System" (GBES)—also popularly known as the "three-star" system. This is the third stage of a development progress, with its first product being the "Eco-House Technical Evaluation Handbook," based on LEED in 2000; and the subsequent release of the Green Building Assessment System for the Beijing Olympics, based on CASBEE in 2002. Finally, GBES arrives as the last innovation based on LEED 2006, acting as the most comprehensive certification created in China.

Unlike the Green Star South Africa or BERDE, which where both created by their respective national Green Building Councils, GBES was created and is administered by the Ministry of Housing and Urban-Rural Development (MOHURD), a governmental department of China.

When analyzing the Chinese rating system more in depth, we can see that it shares many similarities with LEED. Both systems are subdivided to address different types of buildings more specifically, and have categories and credits to allocate points for sustainable practices. GBES has two programs, one for new designs and constructions, and another one for operations. Under each of these two programs, projects are further classified into residential or public buildings, which are the two sectors having the greatest boom in the country.

Once a specific program has been selected, the GBES rating is further divided into six certification categories. Each of these categories have three types of evaluation items: prerequisite items, general items, and preferred items. Just like in LEED, prerequisites are mandatory requirements that need to be fulfilled in any certified project, and they all address priority environmental issues from China. The general and preferred items, on the other hand, are optional and serve to gain points toward the certification. These optional items, however, are innovative in the sense that there is an overall number of them required for each rating level, as well as a minimum number of preferred and optional items required in each category. Such way of allocating the requirements results in a more balanced distribution of the points, preventing the poor performance of one category to be offset by the better results from another one. After all the points achieved are assessed, GBES rates the building according to its "stars" system, ranking with one-star the minimum performance, and with three-stars the highest one.

Besides the similarities that GBES has with LEED, the Chinese certification has incorporated many innovations that respond to the specific necessities of its country. One example is the possibility of buildings under the new design program to be eligible for a pre-certification before they start with the construction. This helps to publicize the sustainable aspirations of the project to future investors, although the building cannot be officially certified until after one year of post occupancy activity, and an on-site assessment. Such requirement was particularly important to enforce in China, given that many projects change their designs once the construction phase has started, and some originally claimed environmental features may be lost in that process. Furthermore, the certification under the operations program needs to be renewed every three years and also requires a visit on-site. In order to apply for the operations program, a project must already be GBES certified.

Another peculiarity of the Chinese system is that it is based in national regulations established by government committees. Depending on the geographic or climate conditions, the standard allows for certain provincial flexibility, either by deleting items of by differing in the rigidity of the measurements. One example is the Shenyang municipality in Northwest China, where the certification requires to consider the use of a ground-source heat pump for heating in public buildings. This requirement, however, is not available in other regions with different climates[5].

The fact that the GBES is an exclusively government-led process can be seen as a statement of the strong commitment of China into the promotion of sustainable constructions. Besides its involvement in the certification system, the country has established very ambitious goals for 2020: at least 50% of all new constructions should be green building certified; Over 80% of certified projects should fulfill the two-star requirements; At least 30% should receive certification for operations[6]. In order to help with the implementation of these goals, the country provides tiered incentives for two-stars and three-stars GBES certified buildings. The incentives are offered on a per square meter basis, and they intend to alleviate the higher upfront costs of green buildings.

Given the exorbitant demand for construction that the country needs to attend, it is no wonder that green building initiatives are becoming a priority. China is committed to change its construction industry and is taking action on it through the promotion of its national certification, as a way to make green buildings more appropriate for the local conditions and available technologies.

Referencial CASA Colombia – *Colombia*

Referencial CASA Colombia is a recent system created by the Colombian Green Building Council, an organization member of the WGBC. It is inspired in the Referential CASA tool from Brazil, and it was created with the support from the Green Building Council Brazil and from the University of the Andes. During its formulation process, they studied a master thesis work that analyzed the relative weight that should be assigned to the different categories and the guidelines that conform the CASA tool. They also studied the linkage between the Colombian regulations and other international standards to be used for the guidelines. Finally, with the consensus of industry experts, they established a reference guide for the design and construction of sustainable housing, which incorporates integrative design strategies, best work practices and the articulation of Colombian regulations.

In its mission of supporting the creation and enforcement of public policies and incentives for sustainable constructions, CASA uses the Colombian environmental regulations as the reference for their standards. It also intends to act as a compliance tool of the environmental resolution 549, which became of national implementation in August 2017. This is done as opposed to international systems, where they ask to comply with foreign standards that are often not suited for the national market.

The system certifies residential projects in three different levels, ranging from exceptional, to outstanding and sustainable. There are two special certifications for social housing (VIS) and for social housing of priority interest (VIP). The certification is divided into seven different categories, and each category has mandatory and optional requirements. These requirements are called guidelines, and in total they can give up to 100 points. Two more extra points can be obtained if the project implements an integrative process during the design and construction phase.

Casa Colombia differentiates form other systems by contemplating concepts such as social inclusion and the education of workers and residents. The social responsibility category, for example, encourages both workers and residents to better understand the advantages, practices and responsibilities of sustainable projects. It also requires community participation in the preparation of the project and environmental training for residents. It also promotes the inclusion of local workers and environmental education to employees.

These aspects, in addition to the certification for social housing, and the incorporation of Colombian regulations, were all specifically created for this system after the assessment of the national circumstances. By focusing on the main priorities that the country has in regards to sustainability in the built environment, they developed a rating tool with original characteristic that can serve as an example for other nations with similar circumstances.

Edge: The absolute standard for the developing world?

We will now introduce a new system that operates outside of the spheres of metropolis and mestizo systems. This new development, EDGE—Excellence in Design for Greater Efficiencies, is a groundbreaking certification that differs from all of the rating systems that we have been reviewing so far. Its original aspects range all the way from its creation, to the standards that it uses, the additional tools that it offers, and the broad market that it is intended to serve. This system attempts to act as an *international* certification that is able to attend the *particular necessities* of more than 130 emerging economies. Now, how can a system be international and focused on particular necessities at the same time? In order to answer this question, we will first learn a bit more about this certification, and then we will compare it against the different attributes that we have been analyzing on the international and mixed systems. After that, we will be able to assess up to what point EDGE is actually an international yet adaptable system, and what role it plays in the world of green building certifications.

Unlike all the other rating tools that we talked about in this article, which were created either by a governmental agency or by the country's local Green Building Council, EDGE was created by the International Finance Corporation (IFC), an organization member of the World Bank Group. As a result, we can say that this is an international system, not by virtue of being used internationally, but rather because it was created by an entity dependent on all the nations that integrate the World Bank Group. In addition, the motivation behind its creation also differs from that of other systems. Born from a financial institution, its main objective is to stimulate the investment trends of the fast-growing urban markets into less emission-intensive constructions.

Silvia Solano Quesada, Consultant for the IFC Latin America and Caribbean Region, explains that the EDGE system consists of three different components: a free online assessment tool, a universal standard, and a certification. The online assessment tool is a free software that allows decision

makers to determine the most efficient design options based on the climatic region of the project and the related costs of each decision. Due to its intuitive interface and its powerful engine, it is very easy to use and there is no need to hire specialists to be in charge of the performance calculations. By providing some general information about the project, like its geographic locating, square footage, orientation, etc., we obtain the baseline consumption of our building. The next step is to choose from different strategies to improve our efficiency in energy, water, and energy embedded in materials. By simply checking-in boxes, the software uploads automatically a comparative chart that shows the savings that we can obtain and estimates associated incremental cost and payback period. Thus, within a few minutes of experimenting with different strategies, we can come up with a combination of strategies that satisfy our environmental ambitions and is a cost-effective solution.

The second component of the system is a universal standard that EDGE uses in every single country. It has a very straightforward rule, as it asks for a 20% reduction in the consumption of energy, water, and embodied energy in the materials. In this regard, Quesada highlights that unlike other systems, where the benchmarking is either based on foreign standards or national regulations, the baseline considered in the certification is the average consumption of each country. Therefore, even when the 20% reduction requirement remains constant worldwide, its actual output is actually a different number in each location.

Finally, the "certification" component of this system acknowledges projects that have successfully accomplished the EDGE requirements. Even though a building can have implemented all the measures that they found in the online tool, it is only through the official certification that they can brand and claim themselves as EDGE compliant. In order to be validated, the project needs to have a site audit performed by an EDGE auditor once the construction is finished. This certification can certify residences, hotels, offices, hospitals and commercial buildings.

EDGE as an international system

We have argued at the beginning of this article that international systems are not particularly good at recognizing the priorities of developing countries, in addition to setting the bar too high for their national industries, and contributing to the impression that green buildings are very expensive. Based on these downsides, we will see how the EDGE system performs in comparison with its international relatives.

In regards to the priorities, the system doesn't change its requirements from one country to the other. It keeps the 20% reduction goal overall, regardless of whether a nation struggles in one particular aspect such as water constraints, air pollution, etc. It has though two adaptable qualities, that are the baseline used for the reductions and the costs of each measure. The baseline is adjusted in each country to represent the average condition of the constructions, and the costs are based on estimations taken from the local market.

The next contentious issue from international systems has to do with the standards required. Most of these certifications are based on standards from a developed country, and they require to comply with it regardless of the location of the project. EDGE, however, does something different in here. It requires buildings to be at least 20% more efficient in three categories (water, energy, and energy embedded in materials), and this value remains always constant. The trick is that the reference point for the reduction changes in every country, with "a benchmark determined by the joint assessment of international standards, local regulations and national costs of products and services"—clarifies Quesada. As a result, by focusing on the *relativity* of the reductions instead on the absolute value of the outcomes, EDGE promotes broader participation and a better acceptance from the national industry.

Another argument against international systems is that they have stigmatized the word "green buildings" as something unfeasible. In this sense, EDGE takes the lead among all other certification systems in not only claiming, but also proving through their software, that green buildings can be affordable. The whole idea of EDGE spins around making green buildings available to the broadest audience, and they provide an online tool to provide immediate calculations on the costs and payback periods that can be incurred by following different green building strategies. Many recommendations include low-tech practices, which not only improve the efficiency of the building, but also avoid the high incremental costs associated with sophisticated systems.

EDGE as a locally adapted system

Over the course of this article, we have been highlighting the unique aspects of the GBS created in the developing countries that we have analyzed. Interestingly enough, we can hardly recognize any of those innovative solutions being implemented in the EDGE system. There are no special certifications for social housing, no extra category for social responsibility or innovative practices, no articulation with local regulations, etc. Nonetheless, it does have one major attribute that makes it relevant across all developing nations, and that is having found the *least common denominator* among all the GBS available.

This common denominator can be interpreted as the least possible things that any GBS would ask for, while keeping in mind that all developing nations share economic constraints. Put in that way, it makes sense that the EDGE system only focuses on water, energy, and materials—arguably the most basic environmental concerns. On top of that, they put the costs and money involved in green buildings right in the core of the assessment process, with its online tool displaying the flow of expenses and savings incurred in every decision that is taken towards the certification.

Such endeavors to make the system as easy and transparent as possible is based on EDGE's prerogative of having a bottom up approach, allowing access to green building certifications to the broader sector of the market. This is well reflected in the objective of the program, which according to their creators, is "to convert 20% of the new buildings being built into green buildings within seven years in rapidly urbanizing countries". With the accent put on the expected results, they have created a low complexity, high volume tool that focuses exclusively on the environmental performance of the buildings through a metric-based approach, contrasting with the views of "true sustainability" from other certifications.

Another difference that EDGE has with other certifications is associated to the sectors that it relates. We mentioned that some systems work very closely with the design and industry sector. In a similar way, EDGE works closely with developers, banks, governments, and homeowners, in an attempt to both, influence the local green building policy—if existent—and the financial institutions to support sustainable constructions. Additionally, the IFC (EDGE's creator) provides investments for financial organizations, such as banks or real state funds, to create green mortgages and green bonds. They also support green affordable homes, hotels, shopping malls, warehouses and hospitals by making direct investments to these types of buildings.

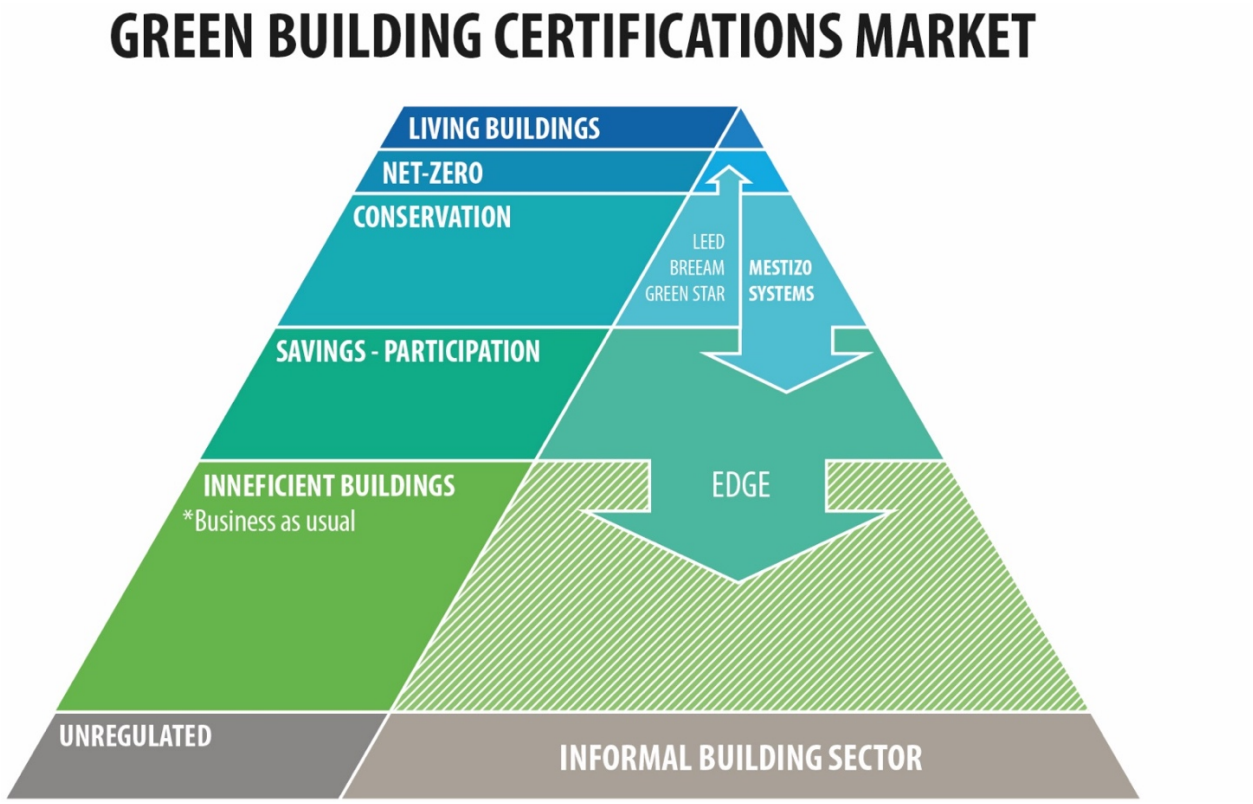
Bringing back the initial question of how can a system be international and focused on particular necessities at the same time, we can say that it comes at a price. In order to be relevant in so many countries, the price to pay is a more limited scope in its vision of sustainability. According to Quesada, the EDGE certification defines green buildings as "buildings that are more efficient in the use of resources—water, energy, and energy embedded in materials". Truthful to its definition, the system is a performance based tool that leaves aside qualitative components in order to democratize the access to green building for the masses.

CERTIFICATION SYSTEM - COUNTRY OF ORIGIN	TYPES OF CERTIFICATION - CREATOR OF THE SYSTEM	AREAS OF FOCUS	FURTHER SUBDIVISION - RATINGS	UNIQUENESS
Leadership in Energy and Environmental Design (**LEED**) - United States	Green building rating and certification system through independent third-party verification for: • New Construction • Existing Buildings, Operations & Maintenance • Commercial Interiors • Core & Shell • Schools • Retail • Healthcare • Homes • Neighborhood Development Created by the United States Green Building Council (USGBC)	**Categories** assessed in: • Sustainable Sites • Water Efficiency • Energy & Atmosphere • Materials & Resources • Indoor Environmental Quality • Locations & Linkages • Awareness & Education • Innovation in Design • Regional Priority	**Credits**: • Prerequsite (mandatory) • Credits **Rating:** • Platinum • Gold • Silver • Certified	
Building Research Establishment Environmental Assessment Method (**BREEAM**) - UK	Green building rating system for: • New construction • Communities • In-use buildings • EcoHomes Managed by BRE Global	**Categories** assessed in: • Energy and water use • Internal environment (health and well-being) • Pollution • Transport • Materials • Waste • Ecology and • Management processes	**Credits:** • Minimum standards (mandatory) • Credits **Rating:** • Pass • Good • Very Good • Excellent • Outstanding	
Excellence in Design for Greater Efficiencies (**EDGE**) - International	Universal standard and certification for: • Residential • Commercial • Hotel • Office • Retail • Hospital Created by the International Finance Corporation (IFC), a member of the World Bank Group	**Assessment** areas include: • Energy • Water • Materials	It has no “credits," but instead works on a simple pass/no pass basis without levels of achievement	• Online financial and performance assessment tool • Requires an on-site verification • Standards are constant, but adapted to the baselines of each country • Performance-based system • Ease of access • Pass/no pass basis
Green Star South Africa - South Africa	Green building rating system for: • Office • Retail • Multi-unit residential • Public and Education buildings Categories in development: • Interiors • Existing buildings performance Created by the Green Building Council of South Africa (GBCSA)	**Categories** assessed in: • Management • Indoor Environmental Quality • Energy • Transport • Water • Materials • Land Use & Ecology • Emissions • Innovation Plus one pilot category: • Socio-Economic	**Credits:** • Conditional requirements (mandatory) • Credits **Rating:** • Six Stars - World Leadership • Five Stars - South African Excellence • Four Stars - Best Practice	• Created a national benchmark • Socio-Economic category • Precertification for Design, and Certification for As-built
Green Building Evaluation System (**GBES**) - China	Green building rating system for: • Public buildings (i.e. large commercial buildings) • Residential Created by the Ministry of Housing and Urban-Rural Development (MOHURD)	**Categories** assessed in: • Land saving and outdoor environment • Water conservation and utilization of water resources • Energy saving and utilization • Material saving and utilization • Indoor environmental quality • Operation and management	**Items**: • Prerequsite items (mandatory) • General items • Preferred items **Rating:** • Three Stars • Two Stars • One Star	• Besides the mandatory prerequiste items, some optional items are required to be adquired in a balanced way. • Possibility of pre-certification • Certification awarded after an on-site assessment and a one year of post occupation measurements • Operations certification only available for GBES certified buildings • Provincial flexibility in standards
Referencial CASA Colombia - Colombia	Green building rating system for: • Residential • Social Housing and Social Housing of Priority Interest projects Created by the Green Building Council Colombia (GBCC)	**Categories** assessed in: • Sustainability with the environment • Sustainability in construction site • Water efficiency • Social Responsibility • Wellbeing • Materials efficiency • Energy efficiency	**Guidelines**: • Mandatory previous guidelines • Optional guidelines Total of 100 points, plus 2 extra points for implementing an integrative process. **Rating:** • Exceptional • Outstanding • Sustainable	• Articulation with Colombian regulations • Social responsibility category • Regional variation: some guidelines have an additional section of regional variation, where they give specific recommendations for the place in which they are located • Certification available for social housing
Building for Ecologically Responsive Design Excellence (**BERDE**) - Phillipines	Green building rating system for: • Net Zero • Existing Building Performance • Interiors • Sustainable Precincts • Public & Education Buildings • Multi Unit Residential • Retail Centre • Office Created by the Philippines Green Building Council (PHILGBC)	**Categories** assessed in: • Energy Efficiency and Conservation* • Water Efficiency and Conservation • Waste Management • Management • Use of Land and Ecology* • Green Materials • Transportation • Indoor Environment Quality • Emissions *Most weighted categories	**Credits:** • No prerequisites • Credits (all optional) **Rating:** • 1 Star - Minimum practice • 2 Stars - Good practice • 3 Stars - Exemplar practice • 4 Stars - World class • 5 Stars - World leader	• Articulation with national regulations • Socio-Economic category • Process divided in two stages, with separated certifications for Design and for Construction • On-site assessment • Adopted benchmarks provided by the government • Upon request, on-site verification to allow for innovative and low-tech strategies • Elective library (in progress) to address socio-economic credits

Coexistence in a diverse world

In conclusion, we argue that there is no perfect system, no standard that can fit all nations and excel in every aspect of sustainability as a whole. Such claim is perhaps no surprise, but should make us reflect on whether it would be even desirable to have an all-encompassing system. International certifications have done an invaluable work in leading the green building industry and have served as an example for the creation of new systems. Nonetheless, each system has its own role—lead the innovation in the market, address local priorities, increase participation, etc.—with particular strengths that are better to recognize and incentivize, rather than trying to make one system to serve every single purpose.

Sustainability is a broad term where each certification makes its own definition of it, and depending on it they address a certain sector of the market. From the bottom up, we have the EDGE system that wants to promote massive participation at the cost of less stringent targets and an exclusively quantitative focus. In the middle come all the *mestizo* systems that we have talked about, taking a huge step into putting national priorities in place and recognizing particular socio-economic aspects in their certifications. These systems, although promoting a wider participation than the international ones, are still facing challenges in granting access to lower tiers of the market.



At the top of our pyramid we can find the international certifications, or those coming from the most developed countries—*metropolis*. The focus in here is to promote efficiency through the implementation of high-technology solutions. This top tier has three stratums of sustainability, starting with buildings at increasing levels of resource conservation

(LEED, BREEAM, Green Star, etc.). Beyond this point, it is worth mentioning that by raising the bar we get to passive and net zero buildings—when the amount of energy produced by the building is equal to the amount of energy consumed. Finally, at the very top of the market, buildings are not only less harmful to the environment, but rather beneficial to it and generate a positive impact in its surroundings.

The higher we climb in the pyramid, the more challenging it is to afford and to achieve the certification. This is neither positive nor negative, as there are tradeoffs for each solution/certification being offered. The important thing to acknowledge is that the world is a diverse setting, in need of diversity in the solutions to address efficiency, cultural appropriation, socio-economic, and resource scarcity issues. As a result, we need to promote the emergence of new GBS that are specific to local conditions, thus adding more tools globally to address common but differentiated problems.

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BREEAM: https://www.breeam.com.

Green Star Australia: http://new.gbca.org.au/green-star.

Green Star South Africa: https://www.gbcsa.org.za/green-star-sa-rating-system.

BERDE: http://berdeonline.org.

Referencial CASA Colombia: https://www.cccs.org.co/wp/referencial-casa-colombia.

EDGE: https://www.edgebuildings.com.