

Implementing more sustainable building technologies to the Philippines



Gene Carlsson

1 Introduction

Technologies has always had an important part in socio-economic development and its modernization has lead to much of the social progress in the past centuries. A great deal of developing countries, including the Philippines, are currently undergoing a rapid urbanization and struggle keeping up with the intensified housing demands. More and more people are tending to move to urban centers to pursue an enhance life-style with greater opportunities and as this progression grows in pace, the mass production of housings has devastating impacts on the global climate. In developed countries, sustainable technologies has always played a central role in construction while developing countries are lacking behind with conventional methods.

This paper aims to discuss the importance of adapting modern building technologies to the urbanizing Philippines as a sustainable strategy for dealing with the climate change and also what challenges can be encountered along the way.

2 Literature Review

2.1 The effects of climate change

The whole world is today battling climate change. The enlarged human activity on this earth have pushed up the global temperatures which is correspondingly shocking the climate in negative ways. These changes are threatening the future health of the world's people, and particularly compromising the safety of the poor - therefore being an even bigger issue in developing countries.

The Philippines is one of the countries that are the most at threat. Not only because of the fact that it is heavy populated, but also because of its fully coastal geography that makes it extra vulnerable to natural disasters. These disasters are frequently afflicting the country in forms of floodings, storm, earthquakes and eruptions, however in the recent times the climatic changes have made the weather patterns more and more unpredictable and in 2013, the record-breaking typhoon Yolanda, devastated the whole nation causing 6,300 to lose their lives and millions to lose their homes. The cause to this climatic stress is excessive levels of greenhouse gases, such as carbon dioxide and methane, which are preventing heat from leaving the atmosphere. These gases are usually a waste-product when you burn fossil fuels and since the fuels happens to be the most common tool in the process of obtaining energy - this sector is responsible for about half of the greenhouse gases. (Chi-Nguyen Cam, 2012)

"The building sector globally currently consumes more energy (34%) than the transport sector (27%) or the industry sector (28%). It is also the biggest polluter, with the biggest potential for significant cuts to greenhouse gas emissions compared to other sectors, at no cost." (Manley, 2015)

Looking closer at the energy sector, it becomes clear what components are the guiltiest of polluting the earth; the building sector takes the first place as the biggest polluter. As previously mentioned, the devastating effects of climate change can cause millions to lose their homes and as the community starts regenerating itself with new buildings - it continues to worsen the environment. Therefore, it is an inevitable issue to consider the innovation and technology management in construction and transcend into a greener line of action, with the pure concept of striving towards minimum energy consumption and minimizing the building negative affect on the climate change by altering its design, construction, operation and demolition. With green buildings becoming a critical part of today's world, more and more new construction technologies are being developed to keep up with this escalating shift to sustainability.

But how does the current housing situation actually look in the Philippines? (Chi-Nguyen Cam, 2012)

2.2 Housing situation in the Philippines

Today there are 101 millions of people living in the Philippines, whereof 44% live under urban circumstances. Almost 13 million of these people live in the capital region of Metro Manila and it continues to increase as more people move in from the outer provinces. The city's population has exploded in the past decades - expanding from 5.93 million in 1980, 9.93 million in 2000 and it is estimated that there will be almost 20 million residents in 2020. In fact, Metro Manila is already not capable to house all of these people and starting to lose control of the urban growth. (M. Ragragio, 2003)

Leni Robredo, the head of the Housing and Urban Development Coordination Council (HUDCC) has projected an estimation of the housing backlog as of right now and says that it has reached the height of 5.7 million. She urgently emphasized that in the next 6 years, 2,600 housing units have to be built every day in order to solve the expansive backlog.

Urbanization cannot be solely blamed as the main reason for the shortage, another major cause is the risk of calamities. By cause of the surrounding bodies of water, big portions of the metropolis lands are restricted from being built upon considering the high exposure it has to being affected by one of the reoccurring weather disturbances. Consequently, this is a big concern for the city, although these vulnerabilities to natural threats does not stop the urban immigrants from moving in. This leaves Metro Manila in a complicated situation, not only are they facing the rapid urban growth, nor the escalating demands that comes with it, but they are also under the pressure of keeping their citizens safe from environmental hazards while maintaining a proper sustainability plan. So as the urbanization reaches its peak the metropolis is slowly running out of space. This have forced the citizens to find their own solutions to the issue - paving the way for the rise of a unique social phenomena of informal settlements. (Franta et al., 2016)

”In the light of the restricted capacity for formal (administrative or market) land allocation for the growing numbers of urban poor, the majority of this group were accessing land informally, and this was becoming a major feature of urban land use.” (Jenkins et al., 2007)

These settlements are unofficial self-governing territories where people have claimed a part of the state's land as a piece of their own. They dwell, sleep and work together in an area of self-build

shacks without any basic services like water, electricity, health or other essential infrastructures. However, the absence of control from the state deprives them from having to admit to any governmental obligations, "mostly ignoring established planning and land use regulations". (Jenkins et al., 2007) As of 2014, the amount of informal households was estimated to be 1.5 million in the Philippines. (HUDCC, 2014) This is problematic for the Metro Manilan cities, not only because of the fact that the freeloaders are detaching themselves from all the public commitments, but also because they face immediate danger by living in the hot-spots of disasters while clogging the streams and waterways that are supposed to help in preventing floods - therefore being a danger to not only themselves but also the nearby neighborhoods.

One of the key housing agencies that are administratively supervised by HUDCC is the National Housing Authority (NHA). Their sole task is to engage in the housing production for low income families and to provide more suitable living conditions for the informal settlers. The agency has been taking quick actions in fixing the critical situation of the informal settlers and resorted to either slum-upgrading the current territories or simply relocating the settlers to safer sites - with the idea to give the "squatters" an alternative place to live where they are not risking their lives to the disasters.

3 Argument, Critique or Discussion

3.1 Governmental visions on green-design

Based on observations from a 3-week long study trip to the Philippines, it is certain that a great deal of environment-conscious adjustments could be considered as a substitute to the prevailing methods of construction. According to the *Housing Sector Year-End Report* issued by the HUDCC in the year 2015, NHA accounted for having completed 528,500 units in the period between July 2010 and December 2015. Bearing in mind that their program mainly involves construction of low-rise buildings (5 stories with 60 units) leaves them with having finished approximately 8800 buildings under the period of 5 years. Annually that sums up to the erection of 1760 buildings, whereof majority of them are constructed with the use of conventional systems and routinely involves the use of concrete hollow blocks, steel reinforcements, cement, galvanized roofing sheets, gravel, sand and plywood. Hence, it is important to emphasize that even a slight reconsideration of the technological aspects or material choices could lead to a more gentle impact on the environment, especially when you are dealing with such a grand scale of production. Unfortunately, in these governmental housing projects it is hard to introduce new innovative materials and technologies.

Every system requires to be accredited by the HUDCC prior to its appliance and its expensiveness are generally frowned upon by the low-income group. (Cocjin, 2008)

Architect Daniel R. Cocjin expresses this problem in his paper *Optimizing the Design of Starter/Core Houses* with the following words: *"..adoption of these technologies in massive socialized housing projects are very limited. In fact, NHA still adopts the conventional system due to the issue on the target beneficiaries' acceptability of the same and also to the issue of transparency as no monopoly of the adoption any system is allowed."* (Cocjin, 2008) Architect Cocjin is a proponent for the use of accredited innovations in projects government-operated projects. He claims that it generally requires more expensive materials and heavier equipment but finds its profitability in the lesser time it takes for the building to be completed. On the other side, he fears that the commercial unavailability and the restricting patents may turn unsuitable for a mass housing development and therefore promotes to continue the conventional methods on the basis of the following considerations:

- "1) The innovative system is not yet generally accepted by the intended market*
- 2) Materials to be used in the conventional system are locally available*
- 3) General contractors and developers may be commissioned to implement the project*
- 4) Since the construction would not require special skills, the contractors may hire workers from the prospective project beneficiaries"* (Cocjin, 2008)

His over-all conclusion is that the use of green-technologies is yet to be publicly accepted as universal method. Ramon Rufino at the Philippine Green Building Council (PhilGBC) have expressed the desire of implementing tax deductions as an incentive to encourage more companies in environment-friendly constructions. He illustrates Great Britain as a role model for their huge research-based fund assistances in this matter and suggests similar actions to be implemented in the Philippine country. Today, there's on only one city in the Filipino metropolis that have adopted this tactic, and it's Quezon City. They are currently administrating a 20% decrease in tax for developers that use green-technologies in their real estates and Rufino has devout wishes for more cities to catch the spirit. (Asia Green Buildings, 2012)

Another important aspect to why green-buildings are lacking behind in the Philippines is the inadequate education. To be able to construct a building using any new technology it is important to have a man-power with proper education to execute it in a correct way. According to the paper

Managing Innovation and Technology in Developing Countries there is a clear relation between educational needs and the different phases of industrialization:

”Due to unavailability of technology executives and managers, companies often failed to develop local technological infrastructure and environment for assimilation of imported technology.”(Ali et al, 2008)

Therefore, it is essential to have a continuous human resource development in order to fully apply to any appropriate technology. Architect Cocjin ends up with the conclusion in his paper that governmental projects should keep on building conventionally due to the unnecessariness of special skills, however it’s possible to spot a trend inside private businesses where they provide the necessary education to their employees to secure the availability of expertise needed to assimilate an imported technology and fully *”account for the aesthetic and cultural aspects of a building’s design, in response to the unique ecological characteristics of the Philippines”*. (TREES, 2016) Climate-conscious buildings are slowly rising in the Philippines as these companies starts to apply the green line of thinking to their management.

3.2 Potential for green-technologies in the private sector

”Going green brings in a host of advantages that businesses simply cannot ignore. While some green construction technologies cost more upfront, companies reap benefits in the long run. What’s more, sustainable construction technologies are constantly being developed for wide-scale and more affordable distribution, what with the increasing demand for green buildings that underpin the optimistic outlook for the future of green building.” (TriplePundit, 2015)

It is possible to say that going green is a proven long-time investment that starts profiting you after a certain period. In Europe and other western countries, the private companies have realized the importance of shrinking energy consumption and carbon footprint in the construction business and the help from tough EU guidelines it is nowadays a top priority. A great deal of the modern technologies have been developed in the occidental world and it is an aspiring market that could definitely work as a source of inspiration for the Philippines. Some examples of the globally-used technologies are: *air purification* to lower the heating costs, *phase-change materials* that draws in/release heat when it changes between solid and liquid state, *compact fluorescent lights* that last 40 times longer than regular light bulbs and *solar/wind harvesters* that generates power to the

buildings. (EPO, 2014) Sadly these technologies are still rather uncommon within the Manilan display but have in some ways already inspired the local companies to think in similar manners. For instance, the Philippines-based company, Boysen, have taken their paint-production a step further and developed the world's first air-cleaning paint with the use of advanced nano-technology. Not to mention, one of the biggest companies in the Philippines, DMCI Homes, that have recently rebranded themselves as the pioneers for sustainable innovations in construction. Their recent commitment to start establishing green architecture has resulted in the *Lumiventt Design Technology*, a design scheme that helps natural flows of wind and sunlight to freely circulate around the building due to a special architectural configuration, mostly applied to high-rise buildings. (DMCI Homes, 2011)

Other Manila-based companies have been focusing on addressing the growing over-population and mass-housing with solutions that are time-efficient, less costly and available for the poor. A construction company called Silicon has invented a green building technology, called *Waffle Box House*, which helps to decrease the carbon footprint with the help of a prefabricated box-like structure that utilizes less cement. It is also resilient to various natural disasters.

Phinma Properties, a real-estate developer, has recently imported a construction technology from the UK that is called *Tunnel Form System* that they started to apply in their social-housing projects in Manila. This allows the contractor to cast whole walls and slabs in only a single day-cycle by efficiently making use of the concrete's drying-time and utilizing it as soon as it is structurally stable enough to continue building.

These are all some examples of how private companies are shifting their mentality towards sustainability in Manila. As this market grows along with the urbanization, more and more multinational companies will recognize the opportunities in the metropolis and bring their own knowledge and skills from overseas. Unfortunately, today's situation is quite limited and only the bigger businesses can afford the expertness required to apply this line of thinking - governmental agencies simply don't have the capital. Philippines, being a developing country, have a lot of issues to prioritize such as calamities, poverty, peace and order so it's natural that the adoption of sustainable buildings ends up quite low on the list. To conclude my argument, it is important that national companies continues to build green designs in order to give people the confidence and security over the possibility of its rise within the country. As this momentum builds up, the government will be less reluctant to mandate green buildings measures and this will give rise to many more green initiatives. Lastly, it is also important that every architect takes their responsibility

by looking over their designs with a more profound reference to sustainability so that the needful momentum can be gained.

4 Urban Shelter Design and the Role of the Architect

I have discussed and brought up a couple of examples in how green design is managed in Metro Manila and some of the related issues. I ended my last argument with a note of the architect's responsibility towards green design but it must be admitted that the architect as an individual has limited power towards making great changes. In most cases, it is out of the architect's power to choose the site, the budget or even alter the laws. With other words, to achieve a more environmentally sustainable approach to building requires the commitment of the architect, the client, the politicians and the society at large. The designer have to be a part of a more far-reaching team in order to be satisfactorily effective and the participation needs to happen on a national and global scale. Many times have the words "great architecture requires great clients" been uttered, but that is not the ultimate truth. An architect has always the possibility to weight and alter the components of a building to guarantee its eco-awareness. Lastly, I would like to bring forward the different elements that could be modified for the better in the stage of design:

1. Material-choice

Constructing buildings requires a great deal of resources and a slight change can make a huge difference on the buildings affordability and durability, consequently being gentler towards the environment. Using biodegradable materials can lessen the pollution because of its ability to naturally decompose, and using recycled materials is sustainable because you don't have to deplete any natural resources.

2. Passive cross-ventilation

Simply by altering the configuration of a building and taking advantage of the natural air and light conditions on the existing site can turn out to be an enormous energy-saver. One way to do is for example the previously mentioned Lumiventt Technology by DMCI, where they are strategically placing atriums to achieve a passive natural ventilation inside the building.

3. Self-driven buildings

By using the energy from renewable sources such as sun and wind you can create buildings that operates without the use of additional electricity, therefore not contributing to the release of greenhouse gases. Placing solar cells on buildings or even wind turbines on roofs can be an a great substitute to electricity.

4. Water conservation and reuse

Fresh water shortages are common in big urban centers, such as Metro Manila. In same spirit as self-driven buildings, you should raise awareness in how waste-water can be preserved and reused in order to achieve an efficient water consumption. Having a separate sewage-treatment facility in a neighborhood creates an independent cycle where the water gets processed and later reused.

5. Flood management

Floods are a reoccurring calamity that is constantly afflicting the cities of Philippines. In rural areas this is an even bigger problems because of the lack of proper landscaping solution to manage huge volumes of water. Therefore it is important to plan for a proper storm-water management with a substantial green infrastructure that can absorb the intensified flows.

6. Smart windows

In order to cope with the blistering heat-rays of the summer and the penetrating cold of the winter, you need to have well-adjusted windows with the purpose of providing thermal comfort and acceptable indoor air quality. Today there are smart windows available on the market that are based on modern technologies. One version that is commercially approved is a window that is coated with a metallic oxide that lowers the heat-emittance, but even more technological solutions can be found, like the electrochromic glass, that with the use of small amounts of electricity self-controls its tinting depending on how much sun there is outside.

7. Cool roofs

In tropical climates, like the one featured in the capital, the sun can be quite extreme because of its central positioning in the sky. Naturally, the roof absorbs most of the heat during the sun-hours, hence it is out of utter importance to have a roof with a high level of solar reflectance and thermal emittance. Installing a green roof covered with basic plants is a way of lowering the need for heating and cooling, as well as reducing the urban-heat island and managing storm water.⁹

Bibliography

Chi-Nguyen Cam, W. 2012. *Technologies for climate change mitigation*, Roskilde, UNEP

Manley, K. 2015. *Prefab revolution? Factory houses are the secret to green building*, Queensland, The Conversation AU.

Available at: <http://theconversation.com/prefab-revolution-factory-houses-are-the-secret-to-green-building-42622>

R. Remo, A. and Sauler, E. 2016. *Low-cost housing backlog swells to 5.7M*, Philippine Daily Inquirer.

Available at: <http://business.inquirer.net/213602/low-cost-housing-backlog-swells-to-5-7m-units>

M. Ragragio, J. 2003. *The case of Metro Manila, Philippines*, Quezon City, London's Global University

Franta, B., Roa-Quiaoit, H-A., Lo, D. and Narisma, G., 2016. *Climate Disasters in the Philippines*. Cambridge, ENRP.

Jenkins, P., Smitt, H. and Wang, Y.P., 2007. *Planning and Housing in the Rapidly Urbanising World*. First Edition red. London: Routledge.

2014. *Developing a National Informal Settlements Upgrading Strategy for the Philippines*. HUDCC

Available at:

http://www.hudcc.net/sites/default/files/styles/large/public/document/NISUS%20Final%20Report_July2014.pdf

R. Cocjin, D. 2008. *Optimising the Design of Starter/Core Houses*. Quezon City, NHA

2012. *Sustainable Construction Mitigates Climate Change*. Asia Green Building.

Available at: <http://www.asiagreenbuildings.com/866/sustainable-construction-mitigates-climate-change/>

Ali, M., Ullah, S. and Khan, P., 2008. *Managing Innovation and Technologies in Developing Countries*, Seoul, KDI School of Public Policy and Management

2016. *Technologies Used in Green Construction and Green Building in the Philippines*. TREES Corporation.

Available at: <http://trees-kaltimex.com.ph/technologies-used-green-construction-green-building-philippines/>

2015. *7 Green Building Trends to Watch in 2015*. TriplePundit.

Available at: <http://www.triplepundit.com/2015/04/7-green-building-trends-watch-2015/>

2014. *Building the Future: Four innovation trends that are shaping green construction*. EPO.

Available at: <https://www.epo.org/news-issues/technology/sustainable-technologies/green-construction.html>

DMCI Homes, 2011, *Lumiventt Corporate*.

Available at: <https://www.youtube.com/watch?v=GrwjxlOmNs0>