

# Handbook for Green Products

HIGH-QUALITY COMPANY SOLUTIONS TOWARDS CLIMATE-ADAPTED AND ENERGY-EFFICIENT BUILDINGS IN VIETNAM



EDITION 2: TECHNICAL-CONSTRUCTIVE GREEN HOUSING PRODUCTS AND GREEN SERVICES

The scientific development of this handbook was supported by funds from the German Ministry of Education and Research (BMBF) in the context of the Megacity Research Project TP. Ho Chi Minh „Integrative Urban and Environmental Planning Framework – Adaptation to Climate Change“. This is part of the funding programme “Research for Sustainable Development of the Megacities of Tomorrow – Energy- and climate-efficient structures in urban growth centres“.



# **HANDBOOK FOR GREEN PRODUCTS AND GREEN SERVICES**

**REDUCE YOUR ENERGY COSTS**

**RAISE YOUR LIVING STANDARD**

**PROTECT THE ENVIRONMENT**



## Rationale

More than a third of global energy consumption is used for homes and buildings. The way that buildings are planned, renovated and maintained has significant effects, not least in light of global climate change. In Vietnam, the potential to promote climate-adapted architecture and energy efficient buildings is far from exhausted. Due to the tropical climate, a particularly large amount of energy for cooling and dehumidification is needed here.

The tremendous economic progress has allowed construction activities to grow enormously. For the first time, broad urban middle classes have emerged. The so-called “new consumers”, however, are often very consumption-oriented and lead increasingly resource-intensive lifestyles. On the other hand, they are the most important decision-makers in the construction of new residential buildings and can be regarded as a key group for greater sustainability in Vietnam. Among many Vietnamese households, there is a lack of awareness, knowledge, and also the will to change traditional habits towards more environmentally-friendly behaviour. For example, it is a common perception that investments in green housing are very expensive.

The reality shows that low- and medium-level technical-constructive solutions offer significant potential for reducing energy consumption. Investments into green housing products usually reveal amazingly short

payback times. The increasing implementation of green housing solutions should be further supported by a fine-tuned set of economic incentives from the side of the national and local governments.

The Handbook for Green Products is a tangible product of the working group on “Climate-Adapted Housing and Energy-Efficient Buildings” within the “Megacity Research Project TP. Ho Chi Minh” funded by the German Ministry of Education and Research as part of special research initiative “Research for Sustainable Megacities of Tomorrow”. Its visual and content design builds upon the highly successful Handbook for Green Housing, published by our team in 2011.

The Handbook for Green Products provides information in an accessible format about technical and constructive corporate solutions and services for climate-adapted and energy-efficient commercial and residential buildings in Vietnam. It focuses on aspects of insulation, because surveys have shown that this offers the highest potential for energy saving. Like the Handbook for Green Housing, this product pursues a bottom-up approach by trying to convince people rather than to force them by regulations. We firmly believe that behaviour change is the key to sustainability.

The main target group for this Handbook are end-consumers in Viet-

nam, construction and engineering companies, architects, manufacturers, developer enterprises, and institutions of higher education. It is not necessary to read the chapters in sequence. The readers are invited to retrieve information about selected product types or green services according to their specific needs.

It has been developed and will be disseminated by means of a multi-stakeholder alliance consisting of decision-makers from national and local governmental bodies, local NGOs, institutions of higher education, and local companies. The most important local cooperation partner regarding funding support and dissemination is the European Chamber of Commerce in Vietnam.

This handbook gives Vietnamese small- and medium-sized companies in particular a unique chance to explain the general relevance of their innovative products and their specific relevance for Vietnam in a consumer-friendly way. This will be followed by a solid product description and brief proof of performance. Further, it contains information about already existing reference projects. Finally, detailed contact data are given.

To avoid green-washing, all chapters have been carefully reviewed by renowned experts from our technical advisory board as well by the editorial team.



Mr. Preben Hjortlund  
Chairman  
European Chamber of Commerce  
in Vietnam

The European Chamber of Commerce in Vietnam, better known as EuroCham, is one of the principle voices of the business community in Vietnam. The chamber was established in 1998 and since this time, both EuroCham and Vietnam have come a long way as partners for European businesses and investments. Despite many achievements, much work remains to ensure Vietnam continues to develop as an attractive place to do business. Acting as an intermediary between our members - the business community - and local, national, regional and European authorities, to advocate improvements in the business environment, raise awareness on key issues and disseminate information on doing sustainable business in Vietnam and the region. It is imperative to be aware of the impacts of Climate Change and help to strengthen the voice of the European business community in this area. Thus EuroCham helps to enable those, who have dedicated and already implemented environmentally friendly business practices in their global corporate code of conduct, to apply sustainable business practices in Vietnam.

Consequently, European Chamber of Commerce supports the Handbook for Green Products and Services, which we consider as a valuable, tangible addition towards increased environmental awareness and sustainability. In our chapter about European Green Business Solutions for Vietnam, you can read more about EuroCham's scheduled activities for a Sustainable Economy in Vietnam to raise awareness as a platform for debate and for finding solutions.



Mr. Phuong Hoang Kim  
Steering Committee Secretary  
Vietnamese National Energy  
Efficiency Programme

The Vietnamese National Energy Efficiency and Conservation Programme (VNEEP) is pleased to present to you the Handbook for Green Products. This tangible product is introducing innovative company solutions for adaptation to the local climate and to energy efficiency measures in the field of residential houses and commercial buildings. VNEEP is particularly glad, that mostly Vietnamese small and medium-sized companies got the chance to inform about their products and services.

Following the first edition, the Handbook for Green Housing, published in 2011, this publication focuses on introducing about innovative green building products and green housing services. This handbook has been compiled by a team from different disciplines, among them social science, architecture and also energy professionals. This was generously funded by the Megacity research project Ho Chi Minh City.

Sustainable houses and buildings are not only reflected in the beauty on the outside or the reasonable use, but also bring out to the users aesthetic sense in every living corner and establishes relationships with the natural surroundings. The value of the houses and buildings depends on the sustainability. Each house and building has a specific way to show the sophistication of the architects and the investors. Let the history of your house tells future generations about a "Green" life.

The VNEEP is happy to endorse this valuable product and to support its dissemination process.



Mr. Phan Duc Nhan  
Vice Director  
Department of Construction  
HCMC, Vietnam

Our globe of today is confronted with manifold risks related to climate change. Every individual is affected by its impacts. It is a well-known fact that Vietnam is among the countries worldwide, most seriously threatened. Therefore Vietnam needs to adapt to climate change impacts but has also a responsibility to reduce its own greenhouse gas emissions. This is particularly the case for the thriving economic hub of HCMC. In our dynamic city, a huge amount of construction is going on, but not enough is done to promote green housing. However, there is a lot of environmental potential in the field of green construction materials.

The main target group of this handbook are our city inhabitants who are erecting new residential houses or are in the process of renovating their houses. Thereby, the Handbook for Green Products is offering valuable advice how to make your house more climate-adapted and more energy-efficient. This will do good not only for the urban environment but also for the monetary resources of the households in the medium- and long run.

The Department of Construction of the municipal government of HCMC would like to express its sincere thanks to the research consortium of the megacity research project TP. Ho Chi Minh funded by the Federal Republic of Germany. The enthusiasm of our German colleagues in developing and publishing the Handbook for Green Products as follow-up of the highly successful Handbook for Green Housing is highly appreciated. It is considered as essential measure in fighting the threats of global climate change.

# PART 1: GREEN PRODUCTS

<b>1. Solar Water Heaters.....8-12</b> SolarBK Co.	<b>6. Autoclaved Aerated Concrete.....24-26</b> New Era Block JSC
<b>2. Solar Power.....13-15</b> Redsun Energy JSC	<b>7. Plasterboards.....27-29</b> Boral Gypsum Vietnam
<b>3. uPVC Doors &amp; Windows.....16-17</b> Eurowindow JSC	<b>8. Polymer Compressed Concrete.....30-31</b> FICO Co. Ltd.
<b>4. Energy Saving AC.....18-19</b> Inverter Air Conditioning	<b>9. Bamboo Products.....32-35</b> Pinctadali Vietnam
<b>5. LED Light.....20-23</b> New Light LED Technology Ltd., Co.	<b>10. Vertical Garden.....36-39</b> Plink JSC

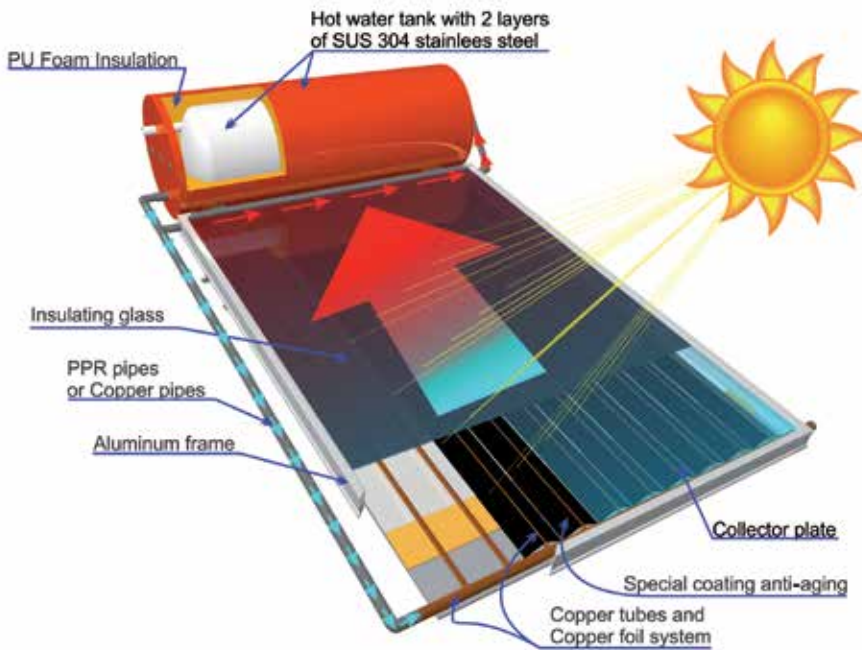
# PART 2: GREEN SERVICES

- |   |  |
|---|--|
| <p><b>11. ECC.....40-41</b><br/>Energy Conservation Center - HCMC</p>                                     | <p><b>16. VGBC.....50-51</b><br/>Vietnam Green Building Council</p>  |
| <p><b>12. ENERTEAM.....42-43</b><br/>Energy Conservation Research<br/>&amp; Development Center - HCMC</p> | <p><b>17. Green Architecture Services.....52-54</b><br/>Vo Trong Nghia Co. Ltd.</p>  |
| <p><b>13. EDEC.....44-45</b><br/>Energy Development Center - HCMC</p>                                     | <p><b>18. Green Architecture Services.....55-58</b><br/>1 + 1 &gt; 2 International Architecture JSC</p>                        |
| <p><b>14. GreenID.....46-47</b><br/>Green Innovation<br/>&amp; Development Centre - Hanoi</p>             | <p><b>19. Integrated Green Architecture and<br/>Green Consultant Services.....59-61</b><br/>ARTELIA - T3 Architecture Asia</p> |
| <p><b>15. VNCPC.....48-49</b><br/>Vietnam Cleaner Production<br/>Center - Hanoi</p>                       | <p><b>20. Green-Biz 2013.....62-63</b><br/>European Green Business Solutions<br/>for Vietnam</p>                               |

# 1

## Solar water heater

SolarBK Co.



Components of a solar water heater (Source: BK-IDSE Co 2012)

### Introduction

Heating normal temperature water with sun radiations is a technology known as thermal solar energy (from New Latin *thermalis* and from Ancient Greek *θέρμη* [*thermē*, "heat"]) and the product associated to this technology is referred to as solar water heater (SWH). This technology has one of the fastest returns on investment among the renewable energy solutions available. The other (more) famous solar energy utilization is the photovoltaic (PV) technology, which generates electricity for utilities and appliances.

In Vietnam, the first locally manufactured solar water heater was created

in 1976 by a group of researchers of Thái Nguyên University, but it was not until 1990 that a technically and economically viable model would be presented by the Research Center for Thermal Equipment and Renewable Energy of HCMC University of Technology. Mass production has started quite recently, only around 2006. Currently, very few Vietnamese manufacturers resist to the hard competition from imported SWH from China, Australia and Europe.

Today, solar water heating is a technology that is widely available in major cities and also the object of

continuous researches, studies and surveys to improve the efficiency, the design and installation optimization of these systems.



### Pay attention

The passive design of building is also a way to use solar energy as a heating source (for cool climates in Vietnam) or rather a way to protect the building from solar energy. In tropical Vietnam, thermal solar energy is not used for space heating, but only water heating.





Solar water heater of a town house (Source: BK-IDSE Co 2012)

### Reduce your needs before installing your solar system

The cheapest way to reduce your hot water bill is still to reduce your hot water load. Up to 40-50% of savings is possible with little investment, and it will also reduce your water bill.

The thermal solar water heaters' market in Vietnam is divided in two segments:

#### Residential buildings

For individual homes (town houses or shop houses, villas), SWH provide hot water for showering and cooking. Thereby the required volume of hot water usually does not exceed 500 liters/day. One retail unit is generally enough. This type of SWH usually uses the natural convection principle.

#### Commercial buildings

For this type of installation, the required quantity of hot water needs several panels and tanks. The sizes are customized for optimal efficiency, and most importantly, a central controller must be set up in order to

collect the water temperatures and control operation of the circulation pump of water inside. Besides, a return pump and pressurized pump may be used to meet the required pressure and temperature at the outlet. This installation has become particularly popular among hotels.

#### Product principles

##### The principle of natural convection ("passive thermo siphon")

The most basic system configuration is composed of one solar panel with a tilt angle connected to a hot water tank on the top. Normal temperature water enters the collector from the bottom of the collector and circulates through the plate. As the sun radiations hit the collector, the water is gradually heated. The principle of natural convection makes hot water go upward in the collector. Hot water is then stored in the hot water tank. This is called natural convection, or passive thermosiphon. This system is very energy efficient and fairly cheap; therefore, it is widely used under tropical climate (when no risk of freezing occurs).

##### The forced convection system

A circulation pump is used to boost the circulation of water when the basic configuration cannot be applied, i.e. the hot water tank is not placed above the collector(s) or the required output is high. Overall, using these pumps increase the efficiency of the system. However, it increases the electrical consumption of the whole system and will lead to additional maintenance problems.

##### Weather conditions

In fact, other back-up energy sources would be preferred. An electrical heater is installed only if service is required for 24/24h and 7 days/week. In many cases, electrical resistor is not recommended to reduce the overall cost of the system, and also it may be dangerous. Also, it is important to connect the resistor to a specific command unit to turn it on (and off) when necessary. To conclude, electrical heaters may be applicable in Northern Vietnam when hot water is required all the year long without any "break". SWH can be installed on many types of roofs, even little space is available. It helps reducing your bill up to 70%.



Solar panels producing electricity  
(Source: BK-IDSE Co 2012)

### The different types of collectors

Different types of collectors can be found on the market. The three most common types are shown in the overview table on page 11.

### Benefits

- Save money: your electricity bill decreases considerably.
- Short payback period: from 2 yrs. for residential systems and from 4 yrs. for collective systems.
- Safety: no electrical shocks
- Reduce carbon footprint: for each 100 liters of hot water produced by a SHW when the water temperature at the entry is 27°C and hot water at the exit is 60°C, about 2.18 kg of CO<sub>2</sub> emissions are not released into the atmosphere (equivalent to 40 minutes of gas cooking or 2 hours of electric cooking or 8 km travel by car)

SWH are robust products: Though most suppliers offer maintenance services for 7 or 10 years, systems manufactured according to standards have a longevity of above 20 years, with minimum maintenance required.

### Limits

- Heat loss: hot water piping must be optimized to reduce heat losses from hot water tank to the load.
- Contaminated water sources:

The composition of the water that enters the collector is an issue. Though it is now possible to equip swimming pools and resorts in Vietnam, water rich in aluminum and iron particles rapidly damage the pipes, the collector and the tanks. Consult with your solar water heater supplier about the specific water source before you install the system. The installation of a heat exchanger could be a solution.

- Shading and sunlight exposure: if the collector does not receive enough sunshine exposition (measured by no. of hours during the day), the temperature of hot water is not optimal. Be sure that the data of sun exposition of your home or building are correctly collected.



### Quality of consultancy services

Consultancy services should provide you with the most reliable and effective way to reduce your power consumption. Outside major cities, an analysis of your water source must be carried out.

Before making your mind, request for a site inspection and make sure the inspection form is fully completed. Keep a copy of this form.

## Choosing your supplier



### Certifications, Labels and Awards

We strongly recommend you should go for suppliers and manufacturers that follow of specific codes of practice, certification labels or apply a CSR policy. On page 12 you will find an overview table of certification labels.



### Recommendations

Compare at least 2 different services before you sign a purchase contract, regardless of the price.

Ask for a pre-installation layout or design (the user must be pleased by the aesthetics of the ensemble)



### Installation and maintenance

Request for the installation, maintenance and after-service terms in full detail in advance, to spare yourself with unexpected malfunctions. Each part of the SWH can be maintained for a different period of time.

**Incentives**

As of today, very few governmental incentives are offered to promote the use of renewable energy or the implementation of sustainable practices. In 2012, EVN (Electricity of Vietnam) offered 1,000,000 VND for one residential SWH per installation site, no matter the size of the tank or the type of collector. As for collective SWH, the incentive




is calculated based on the total capacity of the system:  
 (A): Quantity of hot water (in liters) / 200 liters = Equivalent number of residential systems  
 Amount of incentive by EVN = (A) x 1,000,000 VND  
 In 2013, EVN signed a partnership with accredited manufacturers to extend this incentive till 2015.



Solar water heater system  
 Majestic Hotel, HCMC  
 (Source: en.bk-idse.com)



Solar water heater system  
 Cap Saint Jacques Hotel - Vung Tau  
 (Source: en.bk-idse.com)

	Type	Advantages	Limits
	Polypropylene collector (PPR)	Water residue resistant Not affected by acidity and salinity of water Recommended for swimming pools	With stand low water pressure and water temperature Mostly for the South of Vietnam
	Copper flat plate collector (CFP)	Water residue resistant Not affected by acidity and salinity of water Recommended for swimming pools	Ultrasound technology must be used to guarantee good adhesion of fins to the copper tubes.
	Vacuum tubes: - Tubes absorb solar energy glass material through two layers of vacuum - Very little heat is rejected into the environment.	Highest heat absorption Among the most affordable panels	Less resistance to pressure, thermal shock and mechanical strength than flat collectors

Overview of different types of solar water heaters, their advantages and disadvantages

	Name in English	Name in Vietnamese	Authority
	ISO 9001:2008 Quality Management Certification	Chứng nhận quản lý chất lượng môi trường ISO 9001	TÜV SÜD Group
	Saving Energy Label	Nhãn năng lượng Việt Nam	Office of Energy Efficiency – Ministry of Trade and Industry Văn phòng Tiết kiệm Năng lượng - Bộ Công thương
	Solar KEYMARK Certification	Chứng nhận năng lượng mặt trời KEYMARK	DIN CERTO Organisation – German Institute for Standardization
	Gold Star Award	Giải thưởng sao vàng đất Việt	Vietnam Association of Young Entrepreneurs Hội doanh nhân trẻ Việt Nam

Overview of different certification labels in Vietnam

### About SolarBK

Established in 2006, SolarBK started as the first Vietnamese mass producer of solar water heaters and is now a renowned and respected brand. Built on more than 20 years of research and development, the company sticks to its original mission to bring the best and affordable renewable energy solutions to the Vietnamese people and contribute to the country’s sustainability goals. We believe that “Success comes

from Aspiration”, so we see challenges as opportunities to prove our commitment to greening Vietnam. Prestigious hotels, resorts and organizations trust Solar BK:

1. Sunrise Hotel in Nha Trang
2. Norfolk Mansion luxury service apartments in HCMC
3. Rex Hotel, Majestic Hotel, Continental Hotel in HCMC
4. An Phu International School of HCMC (swimming pool)



### Awards

- Winner of National Energy Globe 2012 for the lighting and power supply of 48 islands in the SE sea of Vietnam, using a combination of wind & solar energy.
- Ranked in the Top 100 of the Gold Star Award in Vietnam in 2011.
- Charity activities: in 2009 and 2011, 100 families in remote areas got equipped with a home solar lighting system at no cost.



**Address:**

**SolarBK Co.**  
11 TTN17 Street, Tan Thoi Nhat Ward,  
District 12, HCMC

Phone: +84 (0) 625-580-91  
Email: info@bk-idse.com  
Website: www.bk-idse.com

## 2

# Solar PV power

Redsun Energy JSC



The 50.16 KWp On-Grid and Back up combined system at the Institute for Environment and Resource - IER HCMC (Source: Redsun 2013)

## Introduction

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy.

Solar energy is simply the energy produced directly by the sun and collected elsewhere, normally the earth. Much of the world's required energy can be supplied directly by solar power. More still can be provided indirectly. The practicality of doing so will be examined, as well

as the benefits and drawbacks. In Vietnam, solar energy is a new field, but it will thrive in future.

## Technology

### Silicon Technology

#### How do solar cells work?

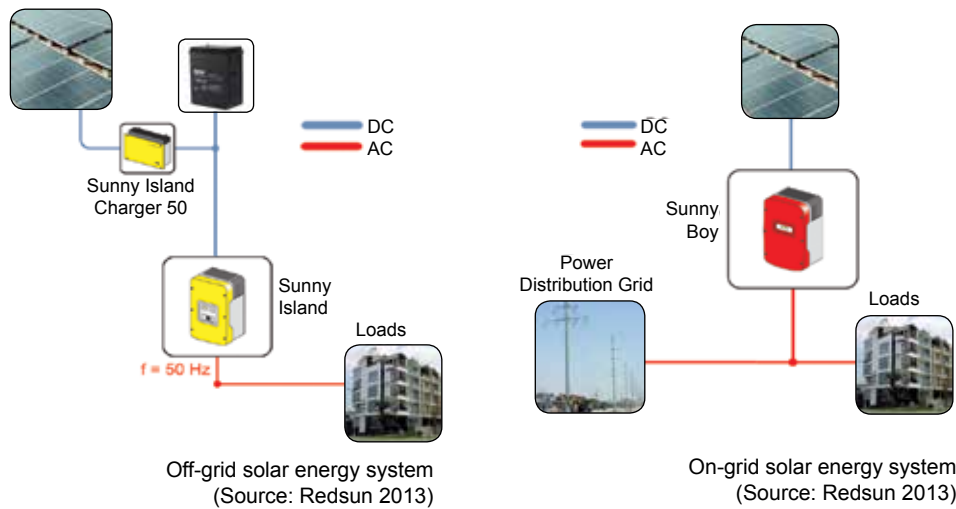
There are three basic types:

**Monocrystalline** - made from a single large crystal, cut from ingots. Most efficient, but also the most expensive option. Somewhat better in low light conditions (but not as good

as some advertising hype would have you make believe).

**Polycrystalline** - basically cast blocks of silicon which may contain many small crystals. This is probably the most common type right now. Slightly less efficient than single crystal, but once set into a frame with 36 or so other cells, the actual difference in watts per square foot is not much.

**Amorphous** - technology is most often seen in small solar panels, such as those in calculators or garden lamps, although amorphous



**Solar energy systems**

panels are also increasingly used in larger applications. They are made by depositing a thin film of silicon onto a sheet of another material such as steel. The panel is formed as one piece and the individual cells are not as visible as in other types.

**PV's: The principle of operation**

Due to the nature of solar energy, two components are required to have a functional solar energy generator. These two components are a collector and a storage unit. The collector simply collects the radiation that falls on it and converts a fraction of it to other forms of energy (either electricity and heat or heat alone). The storage unit is required because of the non-constant nature of solar energy: at certain times only a very small amount of radiation will be received. At night or during heavy cloud cover, for example, the amount of energy produced by the collector will be quite small. The storage unit can hold the excess energy produced during the periods of maximum productivity and release it when the productivity drops.

**Off-grid solar energy system**

**a. Principle of operation:**

DC Power from solar energy is charged to batteries by a solar control charger, and then converted to 220VAC/ 50Hz by an inverter. Loads will use power from inverter's output.

**b. Good points:**

Can be used as back-up power, easy to use, install, long working life, etc.

**c. Limits:**

High initial investment and maintenance costs due to expense for battery system.

**d. Applications:**

Remote areas, islands, highlands.

**On-grid solar energy system**

**a. Principle of operation:**

On-Grid system convert DC power of solar into 220VAC/50Hz power and connect directly to the grid without using battery. The system will automatically shut down to protect the grid when power from the grid is cut-off.

**b. Good points:**

No investment for battery needed, initial costs lower than off-grid sys-

tems, 25–30 years of life duration.

**c. Limits:**

Dependency on the grid. On-grid system operates parallel with the grid so when power of the grid is cut-off, there is no power to supply for all loads.

**d. Applications:**

Offices, households, factories, etc.

**Solar on-grid and back-up combined system**

**a. Principle of operation:**

Solar panels charge power to battery system continuously. In case solar power does not enough to supply the loads, system will auto-combine solar power with the grid to supply for loads. The system will auto-change to use power from the grid and recharge batteries when energy in batteries is used out.

**b. Good points:**

Efficient, automatic, reducing power costs, can be used with generator.

**c. Limits:**

High initial costs for battery system.

**d. Applications**

Offices, households, factories, base transceiver station, etc.

**Products**

**Product features of our Solar Lighting Kit:**

- 20W~25W output under standard conditions.
- Output Voltage 18V, suitable for 12V power system.
- Can fully charge up internal 12V 7.2AH battery within 4~6 hours.
- Intelligent and high efficiency charge and discharge controller.
- 1 day charging for 2 nights usage
- 2 Watt Super Bright LED Light Bulb.
- Delivery with mounting frame and stand for easy installation.
- Resistance to fluctuations of temperature, humidity & strong wind.

**Suggested applications:**

- Farmer household lighting.
- Camping uses for lighting and charging mobile phone and laptop.

**Product features of our solar photovoltaic panels:**

**20W~25W & 50W**

**Suggested applications:**

- Garden and pavement lighting.
- Farmer household lighting.
- Decorative water pump.
- Traffic signal lighting.
- Camping uses for lighting and charging mobile phone and laptop.

**80W & 110W**

**Suggested applications:**

- Street lamps.
- Garden and pavement lighting.
- Farmer household lighting
- Radio and TV.
- Decorative water pump.
- Small solar power system.

**130W**

**Suggested applications:**

- Street lamps.
- Garden and pavement lighting.
- Farmer household lighting
- Radio and TV.
- Small solar power system.
- Can fully charge up a 12V 38AH battery within 3~5 hours.
- Agricultural water pump.
- Integrated into panel array for solar power system up to 3KW.



2.6 KWp Off-Grid system  
(Source: www.redsun-solar.com)

**About Redsun Energy**

With the support of local investors, government authorities, France government, France Sunwatt Group, some researchers in France, Russia Thailand and China, Redsun Energy JSC was formed in 2007.

The factory put Long An Province into operation in April 2009. Our mission is to promote the use of renewable energy in Vietnam and the nearby countries, and to offer solar energy applications at affordable price to all of the people in Vietnam. The current production capacity of Redsun Long An factory is 12 MW per year, which is equal to the reduction of 13,000 tons of CO<sub>2</sub> emission annually.



**Address:**  
**Redsun Energy JSC**  
 17 Phan Phu Tien Street  
 District 5, HCMC

Phone: +84 (0) 862-611-071  
 Email: sales.redsun@gmail.com  
 Website: redsun-vn.com

## 3

# uPVC Doors & Windows

Eurowindow JSC



BIDV Tower - Hanoi (Source: Michael Waibel 2009)

## Introduction

Eurowindow (European Plastics Window Company Ltd) was established in 2002.

Based on European quality standards, Eurowindow uPVC products consist of synchronous components such as profile uPVC bars of chamber patterns with reinforced steel to enhance load-bearing ability, double gasket system and argon filled glass boxes to ensure air-tightness, sound-proofing and thermal insulation.

High-quality uPVC materials also have other advantages such as no bending, no shrinkage, less painting and maintenance needed, anti-fire, anti-oxidization, anti-smearing in solar radiation or acid rain condition. Thanks to these advantages, Eurowindow products bring about economic efficiency for users such as power saving, less maintenance cost and reasonable price.

Eurowindow has gradually diversified and localized its product ranges to reduce prices and better meet customers' requirements. Besides Eurowindow brand uPVC doors, two new product ranges has been launched in the market, namely

Asiawindow and Vietwindow at lower prices due to the usage of materials produced in Asian countries and Vietnam.

Asiawindow brand uPVC doors are made of materials imported from Asian countries like Taiwan, China, Malaysia, etc. This product range absolutely meets technical requirements in construction field and the price is 10%-15% lower than Eurowindow brand products'.

Vietwindow brand uPVC doors are made of domestic materials and the price is 25%-30% lower than Eurowindow brand products. This product range meets Vietnamese consumers' diversified needs.



### Pay attention

Whereas a greatly glazed building is often appreciated as modern in Vietnam, it has a very high solar gain, therefore a very significant energy consumption. Whatever glazing is to be installed, it is strongly recommended to protect it

from direct sunlight through outdoor built devices.

The relevance and performance of double glazing is to be investigated on a case-to-case basis, since it may sometimes hold the heat inside the building and thus increases the air conditioning load.

It is also important to remind that toxic chemicals are used to manufacture PVC (vinyle chloride); and recycling can also be an issue. Furthermore, when burning the PVC does release dioxins, toxic to immune system.

For these reasons, it may be relevant to limit the surface of glazing.



### Advantages

The initial investment cost for the uPVC windows is higher compared with some kinds of common windows. However, energy saving becomes clearer when the extra cost during usage is less.

Other advantages such as the convenience of hardware fittings, tight



and stable window wings, unbent or anti-shrunk windows, fresh color on frame surface and so forth are also recognized. Using uPVC windows is an economical choice in the short-term or long-term.

### Product overview

#### Double glazing glass

Normal-sized glass boxes are often used for windows, doors and large-sized glass boxes used widely for high-rise buildings. Eurowindow is one of pioneering companies to apply glass box production technology in Vietnam which can produce large-sized box with dimensions of 2.7m x 3.5m. Eurowindow's glass boxes are safe, aesthetic and have following prominent features:

**Sound proofing and thermal insulation:** The box-like structure with argon filled chamber helps minimize noise from surrounding environment and increase thermal insulation ability. Thus the installation of these boxes can save power for the operation of AC and lighting system.

**Anti-water condensation:** When installing normal glass, the temperature difference between inside

and outside of the room will cause water condensation. Eurowindow's glass boxes are produced with argon filled and silica gel chambers to alleviate water condensation when there is big temperature difference.

**Safety:** Made from laminated and tempered glass, Eurowindow's glass boxes are able to resist strong hitting force, therefore ensure safety and reliability for construction works.

**Flexibility:** Glass boxes of various colors, thickness, size, characteristics (patterned, light reflected, thermal insulated, tempered, safety laminated glass) enable flexibility in design and bring back the aestheticism for buildings and condominiums.

Eurowindow's products have been used for thousands of buildings all over Vietnam ranging from hotels, villas, office buildings, condominiums to trade centers.

Typical projects using Eurowindow's products in Vietnam are:

#### Commercial buildings

BIDV Tower (Hanoi)  
Vinpearl Entertainment & Tourism Center

Hang Khong Hotel (Da Nang)  
Ben Thanh Times Square (HCMC)

#### Residential buildings

Many town houses and villas in new urban areas such as Ciputra, Phu My Hung, etc. have been equipped with our products.

The whole company's range of products consist of:

- Windows, doors, balconies, high-quality uPVC partitions
- Aluminum doors and curtain walls of European quality
- Room-through doors in boarded wood, solid timber and MDF
- Doors which combine aluminum and wood
- Glass products: safety glass, tempered glass, glass boxes, patterned glass
- Automatic doors, rolling doors, artistic steel products.

Our target is to be the leading and biggest provider of door products in Vietnam. We also puts more effort in improving products and services quality and protecting the environment. High quality products, highly-skilled human resource, professional customer services are the key factors bringing Eurowindow brand to success.



**Address:**  
**Eurowindow JSC Hanoi Headquarter**  
30 BCD Ly Nam De,  
Hoan Kiem District  
Hanoi / Vietnam

Phone: +84 (0) 437-474-700  
Email: infoew@eurowindow.biz  
Website: eurowindow.biz

# 4

## Energy saving AC Inverter Air Conditioning



(Source: www.zerodegreeac.com)

### Introduction

Air conditioning (AC) is often seen as a prerequisite for a modern house in Vietnam. It should rather be seen as a way to improve the comfort when no other solution is possible, within dense urban areas, especially when no specific attention has been previously taken to the passive design of the building envelope. If AC is to be installed for a house, it is advised to go for an inverter technology. This is described hereafter through different products from renowned manufacturers.



### Advantages

The most standout feature of the inverter air conditioner is its low energy consumption, saving the consumer money and reducing its impact on the environment. It's estimated that AC, heating, ventilation and lighting of residential and commercial buildings account for 25% of the world's energy consumption. Innovative inverter technology can reduce energy consumption significantly compared with non-inverter

models. An inverter unit controls cooling and heating intelligently, adjusting to the ambient temperature of a room, thus reducing power usage while maintaining strong performance levels. Inverter AC technology in Vietnam is becoming more popular in recent years. Almost all available trademarks including LG, Panasonic, Sharp, Toshiba, Mitsubishi, Carrier, Midea, Samsung, etc. have introduced to the market the inverter AC products. However, it is recommended to choose the ACs with the highest level of the VNEEP energy efficiency label: 5 stars.

### LG's inverter AC

One of the latest inverter models on the market is LG's Deluxe Inverter V. The Deluxe Inverter V has an industry leading Energy Efficiency Ratio (EER) rating of 10, Seasonal Energy Efficiency Ratio (SEER) rating of 13. The rating indicates that the Deluxe Inverter V has achieved exceptional reductions in energy consumption – up

to 60 per cent over conventional air conditioners.



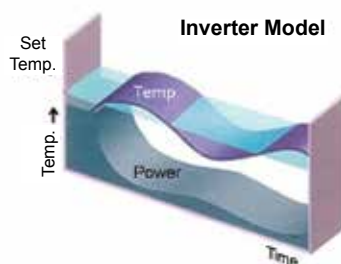
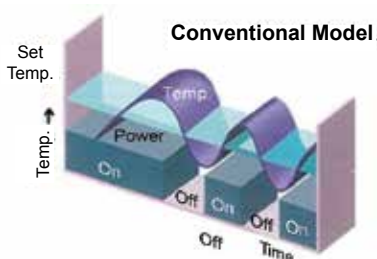
### Advantages

#### Quick operation

A strong advantage of the inverter AC is the convenient quick operation feature, which enables the desired air temperature to be quickly reached. The Deluxe Inverter V can reliably decrease or increase a room's temperature by five degrees Celsius in just three minutes, a full 20 per cent faster than non-inverter models according to tests. This feature also plays a major role in even further energy savings. Traditional air conditioners consume a lot of energy while they operate. One of the ways in which the Deluxe Inverter V reduces energy consumption is by delivering superior performance in less time. With this feature, inverter technology has also solved the problem of AC noise. Now the required temperature can be achieved without the disruptive sound levels, providing a quiet and comfortable environment.

#### Combining Technology

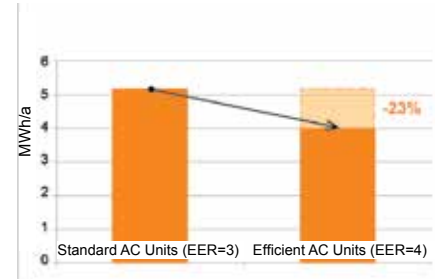
LG's Deluxe Inverter V delivers healthy air through its air purifying technology. Combining plasma technology and air purifying filters, the LG Deluxe sterilises both the air traveling through the air conditioner and the air in the surrounding space. Notably, the Deluxe Inverter V can



(Source: www.frostair.com.au)



Energy Efficiency labels of VNEEP, 5 stars are the highest level. (Source: tietkiemnangluong.com.vn)



Annual electricity consumption for AC in a typical town house in HCMC when using standard and more efficient AC units. (Source: Patrick Bivona 2012)

sterilise its own interior, preventing mold and bacteria from forming, unlike conventional ACs which are vulnerable to internal moisture formation. Combining inverter technology and cutting-edge air purifying technology, Briefly, LG's Deluxe Inverter V improves the quality of life and delivers lower electricity bills.

**Panasonic's Econavi AC**

Econavi combines intelligent sensor technology with sophisticated control programs, developed by Panasonic, to optimize cooling performance according to room conditions, eliminating wasted energy consumption. By detecting the presence/absence of people in a room and their levels of activity, ECONAVI ensures that your AC delivers optimum cooling. This results in comfort throughout the day.



**Advantages**

**Increased Energy Savings**

When Econavi Dual Sensor technology is active, two powerful sensors detect a wide-range of room conditions by sending out infrared rays and monitoring their reactions. Control programs analyze these conditions, seeking out ways to deliver comfortable cooling and reduce wasted electricity. This intelligent approach to cooling results in an up to 30% increase in energy savings.

**Daikin's DC inverter AC**

The DC Inverter series features the Reluctance DC motor for compressor and DC motor for fan. This hi-tech energy-saving package is completed by Daikin's advanced swing compressor and PAM control. The FTXS25E-model achieves a coefficient of performance of 4.17, 48% higher than a conventional model.



**Advantages**

**Energy saving**

After the indoor temperature approaches the set temperature, inverter control adjusts to low capacity operation to maintain this temperature. This makes inverter models more energy-saving than non-inverter models, which must repeatedly start or stop their compressors to maintain room temperature.

**Powerful**

Inverter ACs operate at maximum capacity as soon as they start up. As a result, the set temperature can be reached more quickly.

**Comfortable**

Inverter air conditioners finely adjust capacity according to changes in the AC load and the difference between the indoor temperature and set temperature is small. These give higher comfort levels than with non-inverter air conditioners.



**Pay attention**

To be environmentally friendly and compliant with the LOTUS rating tool for green buildings, all refrigerants of AC systems shall have a global warming potential over 100 years (GWP100) value less than or equal to 2000, and have an Ozone Depleting Potential (ODP) value less than 0.05. Refer to LOTUS technical manual from VGBC.

**Conclusion**

When compared to low cost AC systems, the inverter technology is an energy-efficient solution with a short pay-back time. However, it is important to remind that another way to increase the comfort inside a room at a much lower operating cost, is to use fans. Also, the improvement of the thermal envelope of a building can significantly reduce the air conditioning load and its rated power (and related investment).

**References**

www.vir.com.vn; www.daikin.com; www.panasonic.asia; www.lg.com/my/inverter-air-conditioners  
 Bivona, Patrick (2012) Reducing the electricity consumption due to AC in the tube house in HCMC. MSc Dissertation. University of East London, UK.

5

# LED Light

New Light LED Technology Ltd., Co.



Ceiling enlightened by LED (Source: www.keeyool.com)

## Introduction

### How the LED works?

Magic. Ok it's not magic, but I'm a writer not an engineer, so I'll do my best to give you the real answer. The LED (light emitting diode) works by using an electric current traveling through a negatively charged anode to a positively charged cathode. What is this science fiction you ask? Basically, a diode only allows an electric current to travel in one direction. This current causes electrons to recombine, which releases energy in the form of photons, AKA light.



### Advantages

If you've followed the latest trends in environmentally conscious lighting at all, you know that LED light bulbs

are going to replace your incandescent and CFLs in the next years. The advantages of using LED lighting are obvious:

- Eighty percent more energy efficient than incandescent
- Safer. No mercury, unlike CFLs pleasant, warm light
- A lifespan of more than 30 years
- Little energy is wasted as heat.

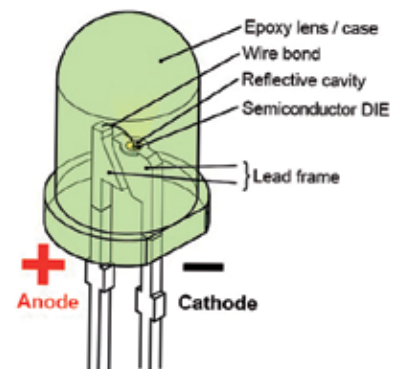
### Why LEDs last so long?

Unlike an incandescent light bulb, there is no filament, so there is almost nothing to burn out. The LED is a simple electronic circuit and has no moving parts. It's essentially a small circuit like you might find in a computer chip. Without any components to burn, or wear out from movement, an LED can last a nearly infinite amount of time.

### Why LEDs are so energy efficient?

This question also actually relates to why an LED runs so much cooler than a regular light bulb. To understand we need to see how an incandescent works. An incandescent light uses a strong electrical current to heat a thin metal wire, called a filament. The metal grows so hot that it begins glow. The metal cannot ignite because it is contained inside a vacuum in the bulb, however it does give off a tremendous amount of energy. However, only about 20 percent of this is energy is in the form of light, the rest is almost all wasted as heat.

As mentioned above, LEDs do not use heat to produce light. Instead it uses a small electrical current to excite electrons, which in turn release energy as light. Only a very small fraction of the energy is lost as heat.



(Source: www.acdcledlights.com)

## Products

### LED indoor lighting

- LED tube light
- LED bulb
- LED panel light
- LED workshop light
- LED downlight
- LED spotlight

### LED outdoor lighting

- LED street light
- LED flood light
- LED in-ground

### Specialized LED lighting

#### Coloured LEDs

Increasing brightness capability has seen coloured LEDs move into applications that were previously the domain of filtered incandescent light.

Perhaps the most obvious example is in car rear light clusters where red-emitting LEDs began to take over almost as soon as their efficiency allowed.

#### LED-based displays

The introduction of bright blue was also the last piece in the red-green-blue trilogy that allowed LED-based full colour displays to be produced.

For example, big video screens based on clusters of red, green and blue LEDs are a common sight at sporting events. LEDs are also now



Different types of LED products (Source: asamled.vn)

used as backlights in LCD TVs and video monitors, either all on at the same time - when the LCD incorporates its own colour filters, or flickering rapidly in succession allowing a monochrome LCD to produce colour images.

This R-G-B-R-G-B-flickering approach is also the basis for lighting a number of near-to-eye microdisplays.

In a related development, the advent of blue laser diodes has allowed the storage capacity of optical discs to be increased beyond CDs (infra-red laser) and DVD (red lasers).

#### LED materials

Two basic emissive semiconductor technologies have replaced virtually

all other in commercial visible LEDs. AllInGaP devices handle red to yellow wave lengths whereas InGaN are commonly used from green to violet, and also on to ultra-violet. Green LEDs emit less light than existing theories suggest they should, making them the subject of several research programmes, most notably at the University of Cambridge in the UK.

Both the materials, but particularly InGaN, are physically very robust and capable of handling high power densities with long life - although all LED have a brightness half-life which depends amongst other things on power density.

Both materials are also thermally-sensitive with light output dropping with increasing temperature.



LED light offers various colour options (Source: asamled.vn)

### LED structure

In general, modern LEDs consist of a heterostructure emissive layer backed by a Bragg reflector (a stack of half-wavelength thick transparent layers) which throws otherwise wasted light forwards.

An optical modifier may be included on top of the unit that cuts back-reflections. The size of the integrated circuit is chosen depending on the amount of light required, with 0.25x0.25mm common in 5mm devices and 1x1mm more likely in 1W LEDs.

### LED packages

5mm and 3mm round LEDs are still extremely common, although surface-mount packages - some with extremely small circuits - are now getting increasingly popular.

Unusually shaped packages, including rectangles, arrows and triangles are on the rise, as well.

For high-power devices, packages containing copper, aluminium and ceramic thermal paths directly from the circuit have been developed to

allow heat to be extracted effectively.

Lumileds screw-down 'Star' package is probable the most iconic and copied of these, although surface-mount packages with better thermal efficiency are rapidly growing in popularity. Cree, Lumileds, Nichia and Seoul Semiconductor all offer surface-mount power LEDs.

### Optical WLAN uses LED light for up to 800 Mbit/s networking

Networking researchers have used LED lighting to distribute Full HD movies to notebooks, smartphones and other devices, in a system that could join WiFi and PowerLine networks in shuttling high-speed data around the home and office. The optical WLAN co-opts white LEDs used for regular illumination to transmit data at up to 100 Mbit/s, by flickering it more rapidly than the human eye can see.

The lighting units - which rely on normal LEDs and a simple modulator to control the flickering - each have a roughly 90 square foot

range, while any gadget wanting to receive the signal is outfitted with a simple photo diode.

The overall appeal is obvious: the lights can apparently be modified to suit networking at little cost and with only minor adjustment, and can be used in places where traditional radio or wired networking is less feasible, such as in planes or in circumstances where running cables are not a possibility. There's also no limit on the number of recipients of the data: basically, as many photo diodes as can maintain line-of-sight with the transmitter.

It is best suited as an additional option for data transfer where radio transmission networks are not desired or not possible - without needing new cables or equipment in the house.

The next step is boosting transmission speed, with researchers working on increasing the data rate eight-fold. "Using red-blue-green-white light LEDs, we were able to transmit 800 Mbit/s in the lab" team member Klaus-Dieter Langer suggests.



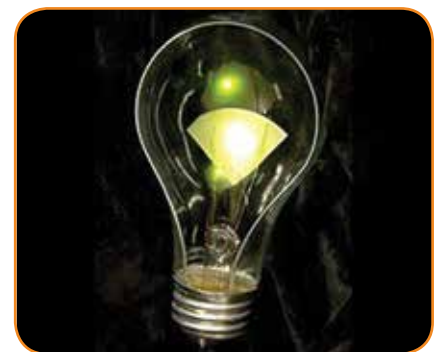
### Pay attention

For some applications, LED may not be the most relevant or energy-efficient solution. Therefore, the lumens/watt ratio should be used to compare several lighting options, e.g. for offices or road lighting.

### About us

New Light LED Technology Co., Ltd. New Light LED (AsamLED) is a company established from the project: "Production tech lighting

energy saving and environmental protection in industry and people" by Thu Duc Electronics Corporation (VTD) which provided 100% of capital investment for the establishment of AsamLED company. VTD has existed for over 40 years and in the organization, achieved high efficiency and good benefits for the state, the corporation, shareholders and employees. Investment, co-operation and joint ventures are important factors to the success of VTD in the past and the future.



LED-light within a conventional light bulb  
(Source: asamled.vn)



LED allows for innovative street light design  
(Source: asamled.vn)



**Address:**  
**New Light LED Technology Ltd., Co.**  
I-4b-3, N3 Rd., Saigon Hi-Tech Park,  
District 9, HCMC, Vietnam  
Website: [www.asamled.vn](http://www.asamled.vn)

**Office**  
2nd Fl., 30 Do Xuan Hop St., Phuoc  
Long A Ward, Dist. 9, HCMC, Vietnam  
Phone: +84 (0) 836-402-737  
Email: [info@asamled.vn](mailto:info@asamled.vn)

# 6

## Autoclaved Aerated Concrete - AAC

New Era Block JSC



(Source: e-block.com.vn)

### Introduction

Light weight concrete differs from heavy concrete by its use of naturally light weight materials (aggregates) such as pumice (volcanic stone) in place of sand and gravel used in ordinary structural concrete mixes.

Light weight concrete is about one half the weight of hard structural concrete. It can be mixed from a variety of light weight aggregates including vermiculite, perlite and pumice. Some form of suitable aggregate is available almost everywhere.

### Product overview

#### Lightweight

AAC blocks are one third or a half lighter than the equivalent fired clay brick and it is only ¼ the weight of dense concrete brick. The reason consists in the porous structure, where millions of air bubbles occupy 80% of the total block structure.

This unique characteristic leads to save the materials required for frame and foundation of the building as well as ease the construction and delivery process.

#### Acoustic Insulation

AAC has natural sound insulation thanks to its porous structure and its ability to dampen mechanical vibration energy. The sound coming from inside or outside of the room moves in zigzag direction, in which it will be split up and minimized substantially before going through the wall.

#### Insulation & Energy Efficiency

AAC blocks have a very low thermal conductivity. Therefore, space inside AAC building tend to be cooler in summer. As a result, the energy consumption for AC can be saved up to 40%, providing long-term added value for occupants. Moreover, an AAC wall is invincible under the heat of 1,200 °C.

#### High Accuracy

AAC blocks have a large size and are produced following specific standards. This increases the accuracy in construction process and reduces the loss of mortar in plaster. This feature helps to reduce mortar costs and construction time compared with normal fired clay bricks.

#### Durability

AAC is a construction material with high uniformity in which the concrete structure is cured in the high-pressure saturated steam. In the course of the autoclaving process, chemical elements and crystal structure are stabilized to generate a solid structure mainly including tobermorite. Therefore, AAC is highly durable and has one of the highest compressive strengths among light-weight construction materials and is therefore more sustainable than many other concrete blocks.

#### Pest Resistance

There is no chance for pests, insects and rodents to inhabit in AAC buildings, especially in the tropical climate.

#### Environmental Friendly

AAC is an ecological friendly building product, starting from raw materials to the production process. It cuts down toxic wastes and emissions which are harmful to the environment. AAC blocks are highly recommended by VGBC.





### Advantages

After doing research on the effectiveness of AAC blocks over fired-baked clay bricks in the case of a 9-floor building project in Cam Pha, Quang Ninh, the Vietnam Institute of Building Materials got followings results:

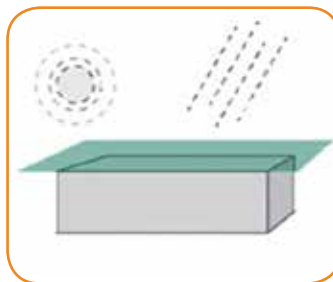
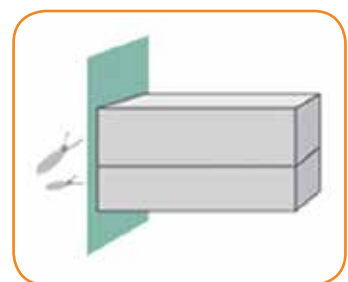
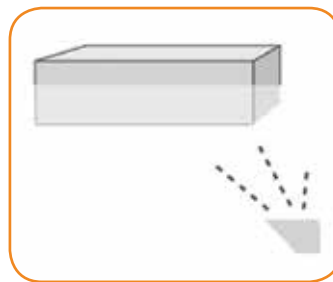
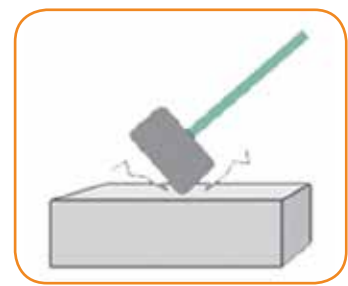
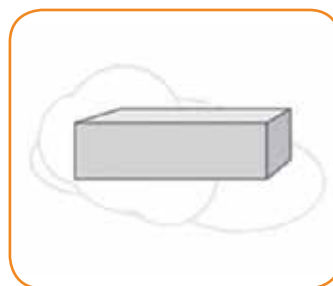
- AAC blocks reduced the reaction force of one pile head by 20%. This helps reducing the length of a pile.
- AAC blocks reduced the weight of column reinforced steel by 15%.
- AAC blocks reduced the weight of beam reinforced steel by 10%.

Together with the Vietnam Institute of Building Materials, Meinhardt Vietnam Company conducted a research to compare the efficiency of AAC blocks with the traditional fired clay bricks for a 18-storey building in HCMC.

The result indicates that using AAC block helps to reduce 4.6% overall investment costs of a crude building. All the above results assume that AAC blocks should be selected from the initial stage of a project design. Further, Meinhardt confirmed that, for projects which have foundation and structure designed on the basis on conventional bricks, AAC block is still very cost-effective in the construction process and brings plenty of benefits for the building occupants.



(Source: e-block.com.vn)



Overview of specific advantages of AAC blocks  
(Source: e-block.com.vn)



VINCOM center shopping mall  
(Source: Michael Waibel 2013)



SAPHIRE Wedding - Event  
(Source: Phan Thi Khanh An 2013)



RMIT Vietnam University  
(Source: Michael Waibel 2013)

### About us

Recently, in Decision 567/QD-TTg dated 28/04/2010 the Vietnamese Prime Minister has approved the general development plan of construction materials in Vietnam. Thereby, the national government assigned the Ministry of Construction as responsible for elaborating and preparing the development program of green construction materials until 2020. Among others, the task is to identify innovative solutions to replace conventional materials with a lot of embodied energy values such as burnt clay brick. In particular, with many outstanding features and environmental friendly manufacturing process, AAC blocks got officially selected by the Vietnamese government to replace the traditional burnt clay bricks.

EBLOCK AAC is a premium quality lightweight concrete produced by New Era Block Tile JSC (EBLOCK JSC) following German technology. EBLOCK is certified to well satisfy TCVN 7959:2008 standard and is highly recommended by the Vietnam Green Building Council (VGBC).

Recently, this product is becoming more and more popular in Vietnam. It is getting increasingly applied related to hotels, high-rise buildings, residential houses, educational facilities and industrial buildings.

### Reference projects

#### Residential buildings

- Mr. Huu Duc's House  
11B Nguyen Binh Khiem  
District 1, HCMC
- Mr. Duong's House  
C4, Pham Hung  
Binh Chanh District, HCMC
- Ms. Thu An's House  
345 Cau Tram  
Can Duoc District, Long An

#### High-rise buildings

- VINCOM Center Shopping Mall  
70 - 72 Le Thanh Ton St.  
District 1, HCMC
- INDOCHINA Plaza Hanoi Tower

#### Restaurants and hotels

- IBIS Hotel - District 7, HCMC
- SAPHIRE Wedding - Event  
526 Dien Bien Phu St, Binh  
Thanh Ward, HCMC

#### Educational facilities

- RMIT Vietnam University -  
Saigon South Campus  
702 Nguyen Van Linh Blv., Tan  
Phong Ward, District 7, HCMC

#### Industrial buildings

- PHONAK Operation Center  
Vietnam Factory  
Vietnam - Singapore 1 Industrial  
Zone, Binh Duong province
- EBLOCK laboratory  
Thinh Phat Industrial Zone,  
Long An province



#### Address:

**New Era Block JSC**  
60 Dang Dung St., Tan Dinh Ward,  
District 1, HCMC, Vietnam.  
Phone: +84 (0) 835-267-177  
Email: info@e-block.com.vn  
Website: www.e-block.com.vn

#### Long An Branch

Industrial Thinh Phat, Hamlet 3,  
Luong Binh, Ben Luc District  
Long An Province  
Phone: +84 (0) 723-640-015

## 7

# Plasterboards

## Boral Gypsum Vietnam

### Introduction

Plasterboard is the most commonly used building material worldwide for internal wall and ceiling linings. It is made from a core of naturally occurring mineral called gypsum, also known as calcium sulphate dehydrate. The core is sandwiched between two layers of heavy duty recycled paper. The face paper is suitable for painting or wallpaper. Plasterboard has square profile cut ends and long recessed edges to enable easy jointing.

Plasterboard systems provide a wide variety of economical construction solutions that are recognised for their light weight and high performance.

### Products

Boral Standard is the most versatile and modern interior lining product, suitable for both ceiling and wall application. It can be fixed to timber, metal framing and masonry construction, while providing an economical yet high quality finish to any interior projects.

#### Standardcore

Standardcore is a modern interior wall and ceiling lining product, with significant properties for durability and stability.

#### Boral StandardPlus

Boral StandardPlus is specially developed for north and central markets to improve the performance of sagging resistance and screw-ability.

#### Technical Boards

Giving increasing customer expectations, plasterboards not only serve for decoration purposes but can be easily and fast installed almost anywhere within a building. Boral has developed a wide range of boards that gather many features and therefore covers a great numbers of needs. They can be using for fire resistance, moisture resistance, impact resistance, increasing sound insulation, etc. For example, HeatBloc - the thermal performance plasterboard that isolates the home from the external weather change, keeping the heat or cool inside when needed and therefore reducing the power used to substitute the missing heat or cool and finally add to increase indoor air quality

**MoistBloc** is specially developed as a lining for wall and ceilings in wet area rooms such as in bathrooms, kitchen, and also in showers

**FireBloc** is the market leader for interior lining fire protection and is used extensively throughout the world for commercial buildings.

**HeatBloc** Plasterboard is purposefully built to meet design challenges where it is desirable to minimize the effects of radiant heat in ceilings and walls.

#### Multistop

The ultimate "All-in-one" performance board, combining fire and impact resistance with acoustic in-

sulation. This board is ideal for direct decoration & an attractive solution for high traffic areas.

**dBBloc** offers excellent levels of sound insulation when compared with standard plasterboard. Easy to cut, shape & install. Fire resistance same high performance.

#### EchoBloc

An acoustic and decorative solution, EchoBLOC is a square and round pattern perforated gypsum board designed for systems requiring both superior acoustic.

#### Shaftliner

Fire resistant performance reached 2 hours for standard shaft walls. Allows installation from outside of the shaft wall.



(Source: [www.boral.com.vn](http://www.boral.com.vn))



Bitexco Financial Tower  
(Source: Michael Waibel 2011)

**Ceiling Tiles**

BGV provides a various decorative collection of ceiling tiles made from reinforced board and fits nicely onto ceiling tees. All ceiling tiles provide high quality smooth finish and good light reflectance.



Lotte Mart Phu My Hung  
(Source: Michael Waibel 2013)

**Cleantouch:** Boral Vinyl Ceiling Tiles offer a comprehensive range of uniquely different designs. A reinforced plasterboard core is finished with a very high quality PVC lining that provides a durable & extremely flat face that is easy to clean.

**Boral Colortouch:** ceiling is manufactured through an industrial paint process. The nice colored surface is finished with quality paint to provide an aesthetic appeal and no further painting is required.

**Boral Arttouch:** ceiling tile designed for aesthetic feature & creative flexibility. The well embossed surface is finished with quality paint to provide an aesthetic appeal and no further painting is required.



Saigon Paragon  
(Source: Michael Waibel 2012)

**EchoBloc Tile:** is the Sound Absorption Gypsum Ceiling Tile, ready-made colored with graphic modern patterns: Round Hole and Square Hole.

**Projects**

The project team of Boral Gypsum Vietnam recommends to project owners and architects adequate solutions of ceiling and partition in accordance with international

certified standards such as sound insulation, sound absorbance, fire and impact resistance. These have already been applied to well known buildings in Vietnam.

**Residential buildings**  
**Estella Residential**

An Phu Ward, District 2, HCMC  
Developer: Keppel Land & Tien Phuoc  
Board Volume: 44,000 m<sup>2</sup>

**XI Riverview Palace**

Thao Dien Ward, District 2, HCMC  
Developer: Keppel Land & Tien Phuoc  
Board Volume: 128,000 m<sup>2</sup>

**Commercial buildings**

**Lotte Mart Phu My Hung**

District 7, HCMC  
Developer: Lotte Mart  
Plasterboard Volume: 80,000 m<sup>2</sup>

**Saigon Paragon**

District 7, HCMC  
Developer: Khai Silk.  
Plasterboard Volume: 40,000 m<sup>2</sup>

**Bitexco Financial Tower**

District 1, HCMC  
Developer: Bitexco Group  
Plasterboard Volume: 120,000 m<sup>2</sup>

**Industrial buildings**

**Samsung Mobile Factory**

Yen Phong IZ, Bac Ninh  
Developer: Samsung Vietnam  
Board Volume: 28,000 m<sup>2</sup>

**General Electric Factory**

Nomura IZ, An Duong, Hai Phong  
Developer: GE group  
Board volume: 18,000 m<sup>2</sup> (exposed ceiling)

**Intel Chip Packaging Plant**

Bac Ninh Province  
Developer: Pepsi Vietnam

## About us

Established in Vietnam since 2005, Boral Gypsum Vietnam (BGV) supplies a range of interior gypsum board lining solutions under the LAGYP brand. The company was the first to introduce plasterboard production to Vietnam.

In 2012 following the acquisition of 100% of the Lafarge Boral JV, BORAL brand has become the principle vehicle to promote and specify the range of plasterboard products and drywall systems offers in Vietnam. Boral Gypsum Vietnam is present throughout Vietnam with sales and technical teams who support a strong distribution network of dealers and installers across the country.

Boral Gypsum Vietnam manufacturing facilities are located near Ho Chi Minh City and inherit the worldwide expertise of the Boral Group to produce world-class plasterboard, drywall metal stud systems and finishing accessories using lean production technologies and envi-

ronmentally friendly materials and processes, including compliance to both local and BORAL Group standards for environmental management including waste recycling capabilities.



## Credentials

- Boral products and systems are generally manufactured from sustainable resources and recycled materials.
- Boral plasterboards have low embodied energy per sq.m. of surface area when compared to heavyweight construction.
- Boral plasterboard is a 'healthy' building material contributing to an enhanced indoor air quality by minimizing interior VOC contamination.
- The use of Boral plasterboard building systems allows reduction in the size of footings thus minimizing disturbance to the subsoil and environmental impact on the building site.
- Thermal resistance of Boral plasterboard partitions and ceil-

ings can be easily upgraded with the use of bulk or reflective insulation.

- Boral plasterboard walls allow the building to respond more quickly to mechanical heating and cooling.
- Non load-bearing Boral plasterboard walls can be easily removed or relocated to allow for changes in the building occupancy.
- Boral plasterboard walls can be easily repaired when dented or scraped.



## Protecting our environment

Boral Gypsum Vietnam business objectives go hand in hand with a commitment to respecting the communities within which we work and minimising the environmental impact of our operations. Boral's comprehensive environmental policy covers all aspects from the extraction of raw materials to recycling and the life cycle impacts of individual products. It includes the way we work with suppliers and the protection of wildlife habitats.



### Address:

#### Boral Gypsum Vietnam Ho Chi Minh Office

Floor 9, Bitexco Building,  
19-25 Nguyen Hue, District 1, HCMC  
Email: [boralsolution@vn.boral.com](mailto:boralsolution@vn.boral.com)  
Phone: + 84 (0) 839-151-400

### Hanoi Office

Suite 501, Floor 5th, Anh Minh office  
Building  
No 36 Hoang Cau Str, Dong Da Dist,  
Hanoi, Vietnam  
Phone: +84 (0) 435-149-590

# 8

## Polymer Compressed Concrete

FICO Co. Ltd.



City Garden Residential Development in HCMC (Source: Michael Waibel 2013)

### Introduction

Polymer compressed concrete is a new building material which has been produced from industrial wastes like fly ash-sand/gravel, cement and polymer additive.

Manufacturing this kind of bricks does not use agricultural soil and fuel (since non-firing). Therefore, it does not cause any environmental pollution and it is called "Environmental friendly material". Meeting all requirements for masonry bricks according to Vietnamese standards, concrete blocks are a suitable replacement for firing bricks.



### Advantages

The advantages of polymer compressed concrete bricks are:

- Accurate dimension, flat surface
- Ordinary cement mortar for buildings can be used, therefore mortar layer is thin reducing total weight of the building.
- Easily install cables inside walls.
- Local materials: cement, sand, clinker, constructing waste, soil, stone, etc.
- Products have the same price as clay-burned bricks.
- Compression intensity: 0.6-1 Mpa

### About us

**Manpower:** 7,000 employees.

#### Equipment and facilities

All manufacturing factories are well-equipped with the latest machines for production, installation and construction.

#### Experience

FICO has over 40 years of experience in mineral processing, development and production of building materials. We also have a large experience in investing and developing high-rise buildings as well.



Stable Connected  
(Source: Fico Co. 2013)



Force resistant: over 100kg  
(Source: Fico Co. 2013)



Lighter than clay-burned bricks  
(Source: Fico Co. 2013)



FICO Tower in HCMC (Source: Michael Waibel 2013)

### Activities

Our main activities consist of:

- Producing building materials.
- Trading building materials.
- Real-estate, property and infrastructure development.
- Installation & construction of civil & industrial projects (soft soil improvement, constructing high-rise buildings).

#### FICO's Cement Plants:

- FICO Tay Ninh Cement Plant: capacity of 4,000 tons of clinker per day and 1.5 millions tons cement / day.
- FICO Hiep Phuoc Cement Plant: capacity of 1,000,000 tons / year.
- FICO BMT White Cement Plant: capacity of 100,000 tons / year.
- DIC Binh Duong Cement Plant: capacity of 300,000 tons / year.

### Reference projects

#### Real estate & infrastructure development projects

##### City Garden

59 Ngo Tat To Street, Ward 21, Binh Thanh District, HCMC  
 Number of apartments: 927 units.  
[www.citygarden.com.vn/en/](http://www.citygarden.com.vn/en/)

##### Vitaly Project

2/34 Phan Huy Ich Street, Ward 15, Tan Binh District, HCMC  
 Number of apartments: 192 units.  
 Number of row houses: 45 units.

##### FICO Tower Project

927 Tran Hung Dao Street, Ward 1, District 5, HCMC

Office for rent: 10 floors

Number of apartments: 80 units.

##### Horizon Apartment

214 Tran Quang Khai Street, District 1, HCMC

Number of apartments: 251 units.

#### Civil engineering & industrial projects

FICO has been executing many civil and industrial projects, especially soft ground improvement. All the projects which FICO has completed are highly assessed in respect of economic efficiency and quality by the investors.



#### Achievements

The First class Independence Medals by President. The labor decorations of First class. Certificates of merit awarded by Prime Minister. Quality certificates for construction material products granted by exhibitions at U.S., Europe, Japan and Korea. Most of our member units got ISO 9001-2000, ISO 9001-2002. Gold medals at VIETBUILD exhibition for several years.



#### Address:

**VLXD No 1 Head Company - TNHH**

**MTV (FICO)**

15th floor Sailing Tower, 111A Pasteur, Ben Nghe Ward, District 1, HCMC

Phone: +84 (0) 838-230-809

Email: [fico@fico.com.vn](mailto:fico@fico.com.vn)

Website: [www.fico.com.vn](http://www.fico.com.vn)

# 9

## Bamboo Products

Pinctadali Vietnam



Bamboo forest along Red River in Hanoi (Source: Michael Waibel 2013)

### Introduction

Bamboo is a grass rather than a tree, its finished appearance is very distinctive. Most distinctive is the eye-catching pattern of slightly darker bands produced by its nodes – a feature that clearly sets it apart from wood. Bamboo's other aesthetic features include the tightness of its grain and the uniformity of its color.

Generally sold pre-finished, bamboo is available in its light, natural color or in darker shades produced by carbonization. Carbonization is a manufacturing process that subjects the bamboo to steam and pressure. This causes a darkening of the sugar content in its fibers resulting in a honey-brown color. The shade of the

color is dependent upon the length of the process.

Appearance of the finished product is further enhanced by the various plank constructions. Choices include vertical or horizontal solid construction, engineered construction, and woven stranded construction.

Amazing as it may seem, this hollow, grass-family plant is actually stronger than most hardwoods. Some species of bamboo have obtained Janka hardness ratings higher than maple and nearly double that of red oak – the benchmark of hardwoods. Besides its hardness quality, bamboo is also very resilient and can take a greater impact

than most hardwoods without denting. Hardness and resilience: a dynamic duo for durability.

Other outstanding properties of bamboo are its dimensional stability and moisture resistance.

Another factor that makes bamboo less likely to warp is that it grows in tropical regions. Therefore, it is naturally resistive to moisture. This makes it suitable for use in areas like bathrooms and kitchens where hardwood flooring is usually not recommended. Of course, being resistive to moisture means bamboo is also resistive to spills, and thus resistive to stains - certainly a desirable feature for any elegant floor.



## Product overview

### Laminated bamboo flooring

Bamboo flooring can give you the natural beauty of wood in your home without having a damaging affect on the environment. As one of nature's greatest gifts to mankind, bamboo has been used in many useful ways. In modern times it has become the wood of choice for making both decorative and practical items that are aesthetically pleasing as well as environmentally friendly.

During construction one inch bamboo pieces are laid horizontally then glued together, hence the term Horizontal Bamboo Flooring. Vertical Bamboo Flooring is constructed reversely; that is, the pieces are laid vertically to one another and glued together.

Durability and stability needn't be a worry for consumers, as bamboo flooring is at least equal in hardness to some hardwoods that are commonly used for flooring, like red oak, and it is up to 50% less prone to seasonal climatic change that can cause expansion or shrinkage.

### Strandwoven bamboo flooring

Strand woven bamboo flooring is made by compressing "strands" of bamboo strips under intense pressure, while using a heat-sensitive low volatile organic compound (VOC) adhesive. Bamboo poles are split, shredded into individual

strands, and fused under a cold press of 2,500 tons of pressure. After the curing process, the block is sliced into flooring and coatings applied.

The density of strand woven bamboo is over 1,100 kg/m<sup>3</sup> and it is twice as harder as oak. Strand woven bamboo flooring is extremely flexible in term of finish and can be customised to look like any kind of hardwood.

Strand woven bamboo flooring is uniquely suited for the wear requirements of high traffic residential and commercial locations but beautiful enough to be installed the finest homes.

### Bamboo Decking

Bamboo Decking is a new type of bamboo product made of natural bamboo and other additives. This construction material is a strong, moisture-resistant composite and can be used under sunlight, engineered to endure harsh weather and abuse of all sorts including rainstorms and heavy traffic. The surface looks great with a natural wood appearance and requires minimal maintenance.

Main features of Bamboo Decking:

1. Environmentally friendly, saving forest resources.
2. Water resistant, proven under salt water conditions.
3. Barefoot friendly, anti-slip, no cracking, no warping.
4. Requires no painting, low maintenance.
5. Weather resistant, suitable from



Laminated bamboo flooring - 2008  
(Source: Pinctadali Vietnam 2012)



Phoenix Cafe Restaurant - Hanoi 2012  
(Source: Pinctadali Vietnam 2012)



Wall bamboo panels - 2008  
(Source: Pinctadali Vietnam 2012)



Tourist Cruisers in Ha Long Bay - 2008  
(Source: Pinctadali Vietnam 2012)

-40°C to 60°C.

- 6. Termites and insect proof.
- 7. Easy to install and to clean.

### Wall & Ceiling Bamboo Panels

#### Commercial benefits

- Friendly environmental
- Natural bamboo color
- Safety and healthy
- Wear resistant
- Easy clean and maintenance.

#### Bamboo Furniture

Bamboo furniture is made of laminated bamboo - a modern invention

but has already become popular in many countries. The bamboo furniture is durable, practical and has a modern appearance.

#### Environmental Benefits

In an age of ever-growing concern over depletion of natural resources, especially of hardwood forests, the trend toward bamboo flooring could not be timelier.

Bamboo is extremely fast-growing compared to hardwoods. On average, bamboo is capable of reaching maturity, at heights well over 50 feet, and is ready to harvest in five years. Additionally, since it is a grass, it is harvested again and again from the same plant. Compare that to an individual hardwood tree taking anywhere from three decades to more than a hundred years to mature, depending on the species.

It is also less expensive than many hardwoods and can be purchased for nailed down, stapled down, glued down, or floated installation. With so many positive attributes, it's no wonder that bamboo has become the hottest trend in flooring.

#### Why consumers should consider strand woven bamboo flooring?

Strand woven bamboo flooring is not just for vegetarians and tree huggers. Buying strand woven bamboo flooring is a smart consumer move for a number of reasons.

Firstly, strand woven bamboo flooring is normally cheaper than tra-

ditional hardwood flooring, sometimes as much as 50% cheaper, and it is also cheaper than other types of sustainable flooring. There is an abundance of bamboo in the world that keeps bamboo products competitively priced.

Secondly, you are not sacrificing quality when you buy strand woven bamboo flooring instead of hardwood flooring. It lasts a life time with proper maintenance and is just as hard and strong as hardwood flooring.

Further the appearance of strand woven bamboo is not disappointing. It has a gentle grain and a natural appearance. It comes in a lighter natural shade, a darker 'carbonized' brown, or in a distinctive combination of natural and carbonized that is often called Tiger Stripe. Furthermore, strand woven bamboo flooring is ideal for those people suffering from allergies and asthma. Not only does it prevent dust mites, but it is also antibacterial, antimicrobial and anti-fungal. Only cork flooring can claim to be as healthy as strand woven bamboo flooring.

Lastly, if the world became hot enough to melt the ice caps and the air became so full of carbon that life was cut short and all the future drugs were lost because there wasn't enough forest cover in the world then consumers would be badly affected. That is to say the least. The greatest consumer benefit of strand woven bamboo floor-

ing and all bamboo products is that it offers a renewable alternative to hardwood products. The popularity of bamboo is helping to keep the world's eco-system healthy enough for consumers to enjoy their bought products and services.

### About us

Pinctadali is professional manufacturer, supplier and installer of high quality bamboo flooring, wall and ceiling covering as well as furniture and house-ware made of press bamboo. We are the first mover and leading company specialized in press bamboo furniture and house-ware in Vietnam.

Our products are manufactured on advanced technology production chain under Europe standard. They are passed all necessary tests for safety use and got quality certificates from different competent laboratories. We have been exporting our products to different countries in the world: France, Germany,



Bamboo – a sustainable material  
(Source: Michael Waibel 2013)

Belgium, Czech, Russia, Australia, Laos, etc.

In local market, we are the supplier of bamboo flooring and bamboo furniture to modern buildings like Pacific Place, Ciputra, The Manor in Hanoi, Sailing Tower in HCMC and luxurious tourism cruises and boats like Jasmine Cruise four stars, Bai Tho cruise and Bai Tu Long and different resorts in Phan Thiet, Nha Trang, Da Nang, etc.

Bamboo flooring, wall and ceiling covering have beautiful veins and nice looking, consistent and natural colour, high wear and fire resistance. They are perfectly alternative to wood and other building material. Bamboo flooring makes the home

warmer in winter and cooler in summer.

Bamboo furniture and house-ware have trendy design and strong construction which provide the comfort that you expect from furnishings in your home. Bamboo furniture is suitable to both traditional and modern building.

Our products are highly appreciated by customers thanks to its superior quality, natural beauty and uniqueness from bamboo tree crystallized in stylish design.

We commit to bring to our customers the modernization of the traditional with premium quality products which are friendly environmental and naturally humanistic.



#### Address:

**Pinctadali Vietnam**  
382/28/52 Pham Van Dong St.  
Hanoi, Vietnam  
Phone: 0084-4-3755 85 22  
Email: [contact@bambooali.com](mailto:contact@bambooali.com)  
Website: [www.santre-ali.com](http://www.santre-ali.com)

#### Phu Khang Gia JSC

6th floor, 10th Haiphong St., Hai  
Chau District, Danang City, Vietnam  
Phone: 0084-511-388 63 33  
Hotline: 0084-935 354 000  
Email: [info@pkgvn.com](mailto:info@pkgvn.com)

# 10

## Vertical Garden

Plink JSC



(Source: vuonthangdung.vn)

that use a soil are easy to replant, but can be messy. Using fabric matting such as felt is popular since the plants root themselves in the fabric. Vertical gardens drip feed plants, using an irrigation system that draws water up through a pump and then lets it trickle down through the garden. Ideally, any surplus water should be retained and directed back up through the pump to re-flow down through the garden. Vertical gardens are very water-efficient, needing about a third of the amount of water needed for a traditional garden. Fertilizers and plant foods can be added to the water whenever the plants need a boost.

### Introduction

Pressure on urban space has led to the creation of a new kind of garden – the vertical garden. It's the ideal way to make the most of the urban environment – and it's just as effective at home in your backyard – or in your house. The sense of quiet and calm that they create, while cleansing the air around you, is a wonderful asset to your home.

- Moderate a building's internal temperature
- Create a good micro-climate
- Help a building retain heat otherwise lost to convection
- Provide storm water management, absorbing 45-75% of rainfall
- Serve as a natural water filter & water temperature moderator
- Provide biodiversity & a natural animal habitat

### How it works?

Each vertical garden is given a unique design and selection of species. The composition of plants takes in consideration the specific environment where it will be built, such as the local- and micro climate, sun exposure and the surrounding context. The aim is to create a one of a kind and site-specific garden that stands beautiful through all the seasons of the year.



### Advantages

- Provide sound insulation
- Improve air quality
- Reduce the heat island effect

### Design Process

Plants in vertical gardens can be planted in small pockets of soil on an inorganic growing medium or can be purely hydroponic. Gardens

A well executed design is also a way to minimize the future maintenance demand of the garden. A plant's growth habit, size and behavior on a vertical surface is

important knowledge for making the right combination of species, in order to keep the competition between plants at a healthy level. Choosing the right plant for the right place makes sense for any garden, but maybe even more so in a vertical garden.

As ornamental objects, not only can the beauty of plants be fascinating, but also the fact that they are alive and always changing. Much work is put into the aesthetic result of the gardens, and part of that is to develop this attracting sensation of life and unpredictability that plants bring within themselves. For the overall design a lot of inspiration is taken from natural shapes and environments where these type of plants have their origin, and in the smaller scale each species is given a context where it can develop its characteristics. All together creating a unique garden with much content, surprise and variation.

A vertical garden can be installed in almost any location and as a living material, the potential of integrating plants in our urban environments is interesting. Places never thought of as possible could be inhabited by plants, like subway stations or other intensely frequented places where horizontal space is difficult to spare.

### Supporting structure

The supporting structure consists of

a 10 mm PVC-board mounted on a stud work. The solid PVC-board is sealed at joints, and an air gap between the board and the wall behind assure a double protection against moisture. On top of the board, a multi-layered, synthetic and highly absorbent felt surface is attached. It gives an even distribution of water over the surface and provides mechanical support for the plants as they grow attached to

the felt. A cut is made in the outer felt layer and the plants inserted in between. As a soilless surface, the construction is very light – less than 25 kg/m<sup>2</sup>. Including plants, but depending of what species that are used, the average surface depth is increased with 200-500 mm. As the supporting structure easily adapts to any geometry, a vertical garden can be totally integrated into the interior environment.



(Source: vuonthangdung.vn)

### Irrigation

The irrigation system is designed to minimize water consumption. It consists of an automation-unit with equipment for control of nutrient injection and irrigation cycles. When a surface has a variation of sun exposures, the irrigation is divided into segments in order to program it specifically for each part. Within the multi-layered felt surface a drip-tube is integrated. Water consumption varies with heat and sun exposure, but compared to normal green spaces or a lawn, the consumption is normally lower. It averages between 2-5 l/m<sup>2</sup>/day.

### Light

Direct sunlight can deliver over 100.000 lux whereas the average light level in an office is around 300-500 lux. Even if the least light de-

manding species are used, artificial light is normally necessary indoor. A few species will stay fine at 900 lux, but a slightly increased level at some parts of the surface will broaden the variation of species that can be used. An artificially illuminated surface has shifting light levels, due to the fact that light reduces with the square of the distance from the light source. Some areas might have 3.000 lux and others 900 lux. The plant design is made with this in mind, taking advantage of the higher levels for more demanding and interesting species.

Not only is artificial light necessary for the plants survival and growth, but it also makes the garden more beautiful as it brings out colors and textures of flowers and leaves. A suitable light source is the metal

halide. It produces the essential wave-lengths that plants need and is an energy-saving and cost-efficient alternative. Through an initial computer simulation, a study is made to calculate the required number and model of armatures. Finally, the levels are measured on location to fine-tune the setup.



### Maintenance

As the supply of the basic needs of plants (light, water and nutrients) are automated, not only does this make for unusually healthy plants - it highly reduces maintenance demand and makes the vertical garden possible to use on high buildings or other places where accessibility is limited.



(Source: [www.heraldsun.com.au](http://www.heraldsun.com.au))

The garden is designed so that the plants' natural growth habit is given space, and for different species to have a dynamic co-habitat with adjacent species. During a year, the garden will profit from pruning approximately 1-2 times per year. All plants that are used are perennial, but as the years go by, a few will have to be replaced. These maintenance measures will ensure a long term lush and attractive garden.

#### The Realization of a Project

The initial work includes studies of the local climate and the future location to see what site specific factors there are to consider. This will give the limits for what plants that may be used and is important information in the following survey of nursery stock from those nurseries, foreign or local, that can deliver to the location.

As the general conditions are defined, the design plan is developed in order to attain the desired character. It is during the design phase that the final selection of species is made, based on physical conditions, aesthetic preferences and availabil-

ity. At the construction site, the first step is to set up the supporting structure and make necessary preparations for the irrigation. When the technical system is completed with the mounting of the felt and the integrated drip-tube - the surface is ready for plantation.

During the whole process a dialogue is kept with the architect and client in order to achieve the desired result.

#### About us

##### Establishment

From the love for the nature, Mr. Nguyen Quynh Tung, General Director, started to do his own research about the vertical garden, which he learnt from the European garden model, and carried out to build this model in the Vietnamese market. Although many difficulties arose due to the lack of reference resources as well as detail manuals, he practiced a lot and gained experience from that.



(Source: verticalgardenbudapest.com)

After more than one year, the first successful garden of approximately 10 square metres was established at his company's site. In October 2011, his company officially launched this product to the Vietnam's market with the desire to improve the quality of life of urban residents.

##### Requests

Requests from any part of the world are of interest. Call or send an e-mail with your questions. The more specifications there is about the project the better. Valuable information can be given about adequate location, size, indoor/outdoor, direction (north-south), etc. We are looking forward to hearing from you.



**Address:**  
**Plink JSC**  
 48, 215 Alley, Dinh Cong Thuong Street  
 Hoang Mai District, Hanoi

Phone: +84 (0) 907-777-803  
 Email: tungnq@plink.com.vn  
 Website: vuonthangdung.vn

# 11

## ECC-HCMC Energy Conservation Center - HCMC



Lighting countryside campaign in Vietnam  
(Source: ECC 2013)



PV installation (Source: ECC 2013)



Pilot class (Source: ECC 2013)



Contracting ceremony for co-establishing ESCO Co. (Source: ECC 2013)

### About us

The Energy Conservation Center in HCMC (ECC-HCMC) was established in 2002 following the decision of HCMC People's Committee, under management of HCMC Science & Technology Department.

ECC-HCMC regards itself a pioneer in consulting-investment & implementation in Vietnam because at that time, there was no professional institution of energy conservation in all of Vietnam.

After more than ten years of operation ECC-HCMC still maintains the first place in Vietnam and among the top 5 of the most powerful centers in East Asia & Australia.

ECC-HCMC has been cooperating with over 20 nations and 15 international organizations such as: IFC, ADB, JICA, NEDO, UNIDO, EDEME, World Bank, etc.

ECC-HCMC is appreciated as the "furnace" of training. It served as "role model" to establish other energy conservation centers such as in Hanoi, Tien Giang, Can Tho, Dong Thap, Phu Yen, etc. All those learnt from the experience of ECC-HCM.

Our main products & services are:

1. Delivering consulting in:
  - Energy auditing

### Our mission

- Pioneer in consulting, investment & implementation
- Comprehensive solutions for energy conservation in Vietnam

### Our activities

- Establishing energy management systems
- Finance & investment of:
  - + Projects of energy conservation & new energy
  - + Implementing energy conservation policies.

Consulting & investment services of ECC-HCMC involve following sectoral fields:

- Industry
  - Buildings
  - Urban infrastructure
  - Traffic & transport
2. Technology transfer
  3. Training services:
    - Staff training about energy conservation and green building
    - Training programs get certified by IFC
  4. Investment: financial and energy conservation technology investment
  5. Public welfare activities:
    - Communicating, improving community's awareness
    - Lighting countryside campaigns



## Green housing campaigns

### Promoting green architecture

The trend of green architecture is continuously expanding on over the world. Green architecture in construction industry is being applied more and more. Responding to this trend, Vietnam is step by step approaching green architecture and applying it into buildings that contributes to the sustainable development in future. ECC-HCMC has many activities which promote the green building campaigns in Vietnam. Following are the 9 outstanding features of green architecture activities in ECC-HCMC during the past years:

1. Compilation of documents about green buildings according to LEED standard, the most famous rating system of green building in the world today; under cooperation between International Financial Corporation (IFC) and international experts.
2. Cooperation with University College of North Denmark (UCN) and the top Denmark architecture company KA in constructing the first Active House in Vietnam, which has

energy optimization following Denmark technology.

3. Cooperation with UCN university to transfer the best green architecture software, energy calculations of building and construction management in Denmark to engineers and architects in Vietnam.

4. Introducing about the "Active House" & "Passive House" from Denmark to Vietnamese architects and engineers.

5. Establishment of a "green architecture club" in 2011. This group has until now about 200 members including architects, civil engineers (60%) and students (40%) from University of Architecture, University of Technology, Hong Bang University, etc.

6. Auditing and consulting about energy conservation for over 200 buildings and projects until now.

7. Organizing the competition of "Energy efficiency buildings in Vietnam" and supporting 10 buildings in Vietnam to achieve certifications of "East Asia energy efficiency buildings".



Docking station for electric bikes at ECC-HCMC  
(Source: Michael Waibel 2013)

8. Coordination with PADDI (Urban broadcast & research center from France) to organize frequent training courses about green buildings for Vietnamese architects and engineers.

9. Organization of frequent training courses about green building following LEED certification standards.

In 2013, the Active House project and a series of activities were initiated: training courses, conferences and technology transfer with UCN University and KA architecture company, etc. All this marked a new era regarding green architecture activities of ECC-HCMC. In the year 2015, the erection of Vietnam's first Energy Plus house will mark a final breakthrough. This innovative building will make use of solar and wind energy. Thereby it will benefit from energy conservation technology and green products made in Vietnam and from other countries in the world. This will also offer the chance for a lot of technology transfer in the field of green housing in the future.



#### Address:

**The Energy Conservation Center,  
ECC-HCMC**

244 Dien Bien Phu Street, District 3,  
HCMC, Vietnam

Phone: +84 (0) 8 393-223-72  
Email: [ecc-hcmc@hcm.vnn.vn](mailto:ecc-hcmc@hcm.vnn.vn)  
Website: [www.ecc-hcm.gov.vn](http://www.ecc-hcm.gov.vn)

# 12

## ENERTEAM

Energy Conservation Research and Development Center - HCMC



Our team (Source: www.enerteam.org)

### Who we are?

ENERTEAM is an independent research and development institution in the field of energy and resource management. Already established in 1995, ENERTEAM is a consultant centre in four main areas 1) energy efficiency and conservation technology 2) cleaner production and resource management, 3) renewable energy and clean energy, and 4) environment pollution treatment.

In the energy saving field, ENERTEAM is proud of being the first energy efficiency centre in Vietnam. Actually, ENERTEAM has 19 full time staffs, of which 17 of them are competent energy and environment engineers. Beside its permanent staff, ENERTEAM is mobilizing international and as well as local competent experts/specialists through its network.

Since its establishment, with and without the collaboration with other international consulting firms, ENERTEAM has provided energy efficiency service to various organizations: Local and central government bodies in Vietnam, but also ADB, ADEME, EC, IFC, UNDP, WB, etc.

### Our vision

Holding young and dynamic staff with creativeness and courage to develop the center into one of the leaders regarding comprehensive research, development and implementation in the field on energy.

ENERTEAM sets its target to energy efficient and environmental friendly solutions for sustainable development.

To achieve all that, ENERTEAM contributes its services in a professional way.

### Our services

ENERTEAM assists customers in identifying, developing and implementation projects in the industrial and in the services sector. Our activities focus on energy auditing, technical, financial analysis, performance guaranty for energy saving and emission/pollution reduction.

ENERTEAM also encourages energy efficiency projects and emission reduction through co-generation, and CDM, etc.

Given the rising importance of renewable energies, ENERTEAM is closely cooperating with local and foreign bodies regarding the implementation of various renewable projects e.g. solar power, wind power, biogas and biomass gasification.

Beside research and development activities, ENERTEAM also holds seminars and trainings related to energy and environmental subjects.

### Our green products

#### Guidline book of Envirotel – “Integrating environmental practices in small and medium hotels: A practical guide”

This is a new tool designed to assist hotel managers and staff in assessing their current environmental practices and incorporating best environmental practices in their daily operations.

This initiative is complemented by a series of tools that UNEP has developed in partnership during the past decade to provide technical assistance to the hospitality industry.

The CD-ROM contains the English, Vietnamese and French versions. This CD-ROM has been produced with the support of the French Environment and Energy Management Agency (ADEME) and the French Ministry of Ecology, Energy, Sustainable Development and Spatial Planning was published in 2008.

#### **Combining brick kilns with a rice husk gasification system**

Instead of traditional burning kiln, this ensures environmental protection, energy conservation and energy efficiency. It got applied in the Mekong Delta (particularly in Sa Dec Town – Dong Thap province). The case study demonstrated the transition of manually brick production, which is showing a low efficiency and causes many environmental and social problems, into energy efficiency and clean technology. This

minimizes the energy consumption while enhancing the production efficiency. It restricts CO<sub>2</sub> emissions, helps the local population moving towards low carbon options, and thereby making global climate change policies more effective.

**Green services:** modeling building before being constructed and supporting to make the building to achieve a green building certificate.

Typical projects would be:

- Commercial buildings: Truong Son Building, Presidential Palace (Timor Leste)
- Industrial field: SAITEX factory at AMATA Industrial Zone
- Residential building: Springlight City in HCMC.
- Consultancy in setting up the EE Building Code for the Ministry of Construction of Vietnam.



Project about brick kiln combined with a rice husk gasification system  
(Source: ENERTEAM)



Installing a hot water system using solar power in Dalat City project  
(Source: www.enerteam.org)



Installing a hot water system using solar power in Dalat City project  
(Source: www.enerteam.org)



**Address:**  
**Energy Conservation Research and Development Center**  
 273 Dien Bien Phu Street  
 District 3, HCMC, Vietnam

Phone: +84 (0) 8 393-023-93  
 +84 (0) 8 393-073-50  
 Email: [enerteam@enerteam.org](mailto:enerteam@enerteam.org)  
 Website: [www.enerteam.org](http://www.enerteam.org)

# 13

## EDEC

Energy Development Center - HCMC



**Make Energy Accessible and Affordable!**

(Source: EDEC 2012)

### Establishment

Energy Development Center, EDEC in short, was established in 2011 by Mrs. Duong Thi Thanh Luong, a former teacher of Ho Chi Minh City University of Technology, the pioneer in wind energy in Vietnam.

### Mission and vision

EDEC was created to contribute to sustainable development through renewable energy solutions. In order to do so, renewable energy solutions must be rendered accessible and affordable. This is especially the case in Vietnam still listed as a low / middle income country.

To achieve sustainability and efficiency, we must learn from the projects that have been conducted in other countries, from projects that are now being carried out, so that projects are optimized and as many negative outcomes as possible are prevented. More importantly, EDEC's long term purpose is to prepare the next generation to face energy efficiency and environmental challenges. Educating the youth is the key to any program that aims at sustainability and raises the general level of awareness.

In short: EDEC's vision can be summarized as follows: To contribute to sustainable development via renewable energy, EDEC must:

- Make renewable energy accessible & affordable for everyone.
- Help establishing policies regarding renewable energy & energy efficiency.
- Learn from the best & the worst.
- Unite all actors involved in energy issues.
- Enhance and foster the use of renewable energy worldwide.
- Prepare the next generation for the energy challenges.

### Our services

In order to pursue our mission, we proactively involve ourselves in a wide range of clean energy projects in Vietnam such as:



(Source: EDEC 2012)

## 1 Energy Audits & Designs

Not only Vietnam but also the World is facing a common energy deficiency situation, so using energy efficiently is now the top priority task in every country policy.

In order to satisfy this demand, EDEC provides customers with energy auditing services, including:

- o Evaluate current situation
- o Analyze potential
- o Provide possible solutions

## 2 Trainings

At EDEC, training is always our top priority. We would like to bring you the international knowledge of:

- o How to live green and greener
- o How to make your business and your life safe and comfortable
- o How to reduce carbon footprint

## 3 Feasibilities Studies

Feasibility studies are preliminary investigations into the potential benefits associated with undertaking a specific activity or project. The main purpose of the feasibility study is to consider all factors associated with the project, and determine if the investment of time and other resources will yield a desirable result.

## 4 Project Management

EDEC believes that every success comes from efficient management and understanding the demands of investors. Our project management service helps customers monitoring the development process ensures that the project:

- o Be completed on time
- o Cost within the given budget
- o Be qualitative
- o Archive the original goals

## 5 Research & Development

- o Renewable energy applications and deployment
- o Rural electrification
- o Partnerships with universities and research organizations



### Certification program for sustainable SMEs in Vietnam

EDEC has a mission to learn from what works in more developed countries to transfer and to adapt it to Vietnam.

In partnership with the non-profit Boston Sustainable Network and Clark University (MA, USA), EDEC started the feasibility study of the implementation in Ho Chi Minh City of the Sustainable Business Leader Program in 2012.



#### Address:

1st Floor – Residence  
A18 My My Villas,  
Vanh Dai Dong Street, An Phu Ward  
District 2, HCMC, Vietnam

Phone: +84 (0) 862-798-055  
Email: [contact@edec.org.vn](mailto:contact@edec.org.vn)  
Website: [www.edec.org.vn](http://www.edec.org.vn)

# 14

## GreenID

Green Innovation and Development Centre - Hanoi



(Source: greenidvietnam.org.vn)

### About us

GreenID is a non-profit organization established under the Vietnam Union of Science and Technology Associations (VUSTA). GreenID promotes an inclusive approach to sustainable development in Vietnam and the larger Mekong region, with a particular focus on the role of the energy sector and its environmental impact. The organization's resource base includes environmental and energy experts, researchers, and activists. All share a common commitment to promote green, low carbon, environmentally friendly development and natural resource protection. GreenID firmly believes that viable solutions to the current challenges can only be achieved if local communities are involved in the whole process from planning to execution.

### Our Vision

GreenID envisions sustainable development for Vietnam and the larger Mekong region based on improved governance of the environment, good natural resources management, and widespread use of green technologies and production methods.

### Our Mission

GreenID works to achieve fundamental change in the approach to sustainable development by promot-

ing sustainable energy sources, improved water resources management and inclusive decision processes.

### Sustainable energy

Sustainable energy is the sustainable provision of energy that meets the needs of the present without compromising the ability of future generations to meet their needs.

Technologies that promote sustainable energy include renewable energy sources, such as solar and wind energy, biomass, biogas and waste energy, wave and tidal power, geothermal energy, and also technologies to improve EE.

In general, energy efficiency, energy conservation, renewable energies and inclusive stakeholders' participation in forming sustainable energy policies are said to be the main pillars of sustainable energy.

### Green communities

The Green Community program of GreenID aims at promoting green initiatives, community-base sustainable models as well as encouraging energy saving and energy efficiency

solutions, well reclaiming available energy resources at the local, application of climate change mitigation and adaptation measures as well as improving environmental governance.

GreenID firmly believes that communities' voices should be brought to the centre of public policy.

### Advocacy

Policy analysis is of great importance for the policy advocacy work, which has to be based on sound scientific knowledge. Therefore, a consideration and analysis of existing policies are much needed before any advocacy work starts. This process identifies strengths and weaknesses within current policies and legal framework, highlighting any gaps that need to be addressed. Policy initiatives can lead to large-scale changes in human behaviours and attitudes about environmental protection. However, it is also important to remember that policies and laws alone cannot affect long-term change. Therefore, they must be followed up by effective implementation, which should be stimulated, enforced and monitored by civil society organizations.



Vietnam's first wind turbine park in Binh Thuan province (Source: GIZ Vietnam)

### Reference projects

GreenID has managed many projects, which are directly or indirectly related to climate change issues.

#### **Mitigate Climate Change program**

This is funded by KARUNA and has following components:

- Building-up of a performance centre for sustainable energy models in Hanoi.
- Organizing competitions about initiatives for model application, solutions for sustainable energy in Vietnam.
- Organizing training & communicating activities for women and students about renewable energy models and energy saving.
- Within the "Green Community program" there are "Local Energy Planning Programs" which aim to intensify the re-use of resources & mitigating waste emissions.

#### **Building an energy alliance for sustainable energy development in Vietnam and the Mekong region**

This is funded by the Swedish International Development Agency – Swedish Embassy and is being implemented from May to September 2013. This project was initiated not only to support for two communes to develop their energy plans but also to conduct basic research as well as workshops on policies regarding implementation. This is to increase sustainable energy development in Vietnam in particular and the Mekong region in general.

#### **Disaster prevention and risk reduction, improved water supply & livelihood in Thai Binh province**

This is funded by Mercy Relief from Singapore and is being implemented in Nam Cuong commune, Tien

Hai district from October 2012 to October 2013. The overall objective of the project is to build up the capacity of the communities in disaster responsiveness and improve the water supply and livelihood.

#### **Promoting participatory and community – led energy planning approach in Nam Dinh province, the Red River delta, Vietnam**

This is funded by Rosa Luxemburg Foundation and is being implemented from February 2013 to December 2013. The objective of this project is to contribute to enhance sustainable energy development in Vietnam. This happens by promoting sustainable energy policies, context-relevant local energy planning, demand side management practices and renewable energy generation for sustainable usage.



#### **Address:**

**Green Innovation & Development Centre**

Suite 1504, Tower B, Building 173  
Xuan Thuy Street, Cau Giay District  
Hanoi, Vietnam

Phone: +84 (0) 4 626-973-18  
Email: [info@greenidvietnam.org.vn](mailto:info@greenidvietnam.org.vn)  
Website: [greenidvietnam.org.vn](http://greenidvietnam.org.vn)

# 15

## VNCPC

Vietnam Cleaner Production Center



### About us

Vietnam Cleaner Production Centre (VNCPC) was established on 22 April 1998 within the framework of the project VIE/96/063, signed by the Ministry of Education and Training (MOET) and the United Nations Industrial Development Organization (UNIDO) in 1998. Funding for the centre activities is provided by the Swiss Government through the State Secretariat for Economic Affairs (SECO). Vietnam Cleaner Production Centre is located at the Hanoi University of Technology, under its host organization: Institute for Environmental Science and Technology (INES). The VNCPC is a national focal point in the United Nations Industrial Development Organization – United Nations Environment Program (UNIDO/UNEP) network of national cleaner production centres for the promotion and implementation of eco-efficient industrial production in Vietnam through VNCPC.

### Our mission

The Vietnam Cleaner Production Center continuously attempts to achieve innovation, update and development so as to maintain the first place of consulting services in improving resource efficiency and cleaner production in Vietnam, to contribute to sustainable foundation of production and consumption.

### Our vision

We will continuously strive to improve the quality of our solutions and services to become a creative organization in which official staffs, with high professions and practices, work in a friendly and potential environment. We always have the best applied technologies (BAT) and the best environmental practices (BEP) to support high quality services for customers.

The Vietnam Cleaner Production Centre is a member of the UNIDO - UNEP network of national Resource Efficiency & Cleaner Production centres (RECP net)

Our partners are among others:





### Services

We are delivering awareness rising, consulting and training services such as:

- Resource efficiency and cleaner production
- Energy saving and energy efficiency
- Sustainability in production and consumption
- Product renewal following sustainability
- Constructing environmental management system
- Effectuating company's social responsibility
- Approaching financial incentive and establishing technology improvement following environmental friendliness

### Projects

#### Get Green Vietnam

Website: [www.getgreen.vn](http://www.getgreen.vn)  
 Supported by: SWITCH-Asia Program  
 Implementation: 04/2012-03/2015

#### Sustainable Product Innovation in Vietnam, Laos & Cambodia

Website: [www.spin-asia.org](http://www.spin-asia.org)  
 Supported by: SWITCH-Asia Program  
 Implementation: 04/2010-03/2013

#### Green Credit Trust Fund (GCTF)

Website: [www.vncpc.org](http://www.vncpc.org)  
 Supported by: State Secretariat for Economic Affairs, Switzerland (SECO)  
 Implementation: 2007-2014



Kick-off event of Get Green Project in March 2013  
 (Source: VNCPC)



Signing ceremony between UNIDO & the Government of Vietnam on establishment of the center in 1998  
 (Source: vncpc.org)

### Core values

Members of VNCPC family believe in following values:

- Being confidential with sustainability in production & consumption
- Working in groups with high responsibility
- Training & being creative
- Having respect & empathy



**Address:**  
**Vietnam Cleaner Production Center**  
 4th floor, C10, Hanoi University of Technology  
 01 Dai Co Viet, Hai Ba Trung District  
 Hanoi, Vietnam

Tel: +84 (0) 3 861-686  
 Email: [vncpc@vncpc.org](mailto:vncpc@vncpc.org)  
 Website: [vncpc.org](http://vncpc.org)

16

**VGBC**  
Vietnam Green Building Council



(Source: VGBC 2012)

**Who we are?**

The Vietnam Green Building Council (VGBC) is a project of Green Cities Fund Inc., an international non-profit organisation based in California, USA. It has been active in Vietnam since January 2008 and was officially recognised by the Vietnam Ministry of Construction in March 2009. In September of that year, the VGBC became part of the World Green Building Council – Asia Pacific Network, partnering with other Green Building Councils throughout the region.

The VGBC currently has over 90 members and partners from across civil society, academia, government and the private sector in Vietnam.

**Our mission**

**Driving towards a sustainable built environment**

The VGBC aims to be the focal point for academia, government and the private sector to promote a more sustainable and adaptive built environment.

**Main objectives**

The VGBC has set the following main objectives:

- Raise awareness and advocate for the development of green buildings in Vietnam
- Building up green capacity for all stakeholders
- Define green building metrics and develop the LOTUS green building rating tools.



(Source: VGBC 2012)

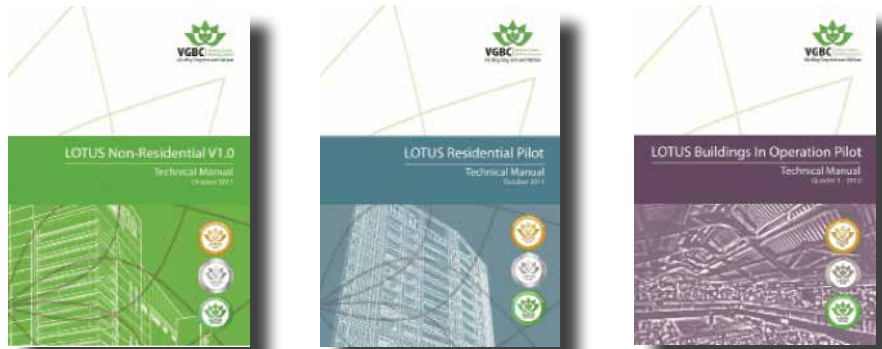
## Activities & achievements

### Raise awareness and advocate for the development of green buildings

The VGBC has been working to raise awareness and advocate for the development of green buildings by a number of different means. Through its strong ties with academia, government and private sector partners, the VGBC conducts dozens of presentations and lectures each year in Vietnam and internationally about green buildings and sustainable urban development. Also, the VGBC has worked to support the government in defining green building development policies and codes. In April 2012, the VGBC was appointed team leader by the Vietnam Business Council for Sustainable Development to write a “Green Building” report with a view to supporting the Prime Minister’s Office to define the Green Growth Strategy and the Green Building development roadmap.

### Building green capacity

The VGBC is also engaged in numerous activities with the aim to build green building capacity within Vietnam. In 2012 the VGBC has trained approximately 170 professionals in the planning and design of green buildings in the VGBC’s Green Building Basics and LOTUS Accredited Professional courses. The VGBC also conducted numer-



(Source: VGBC 2012)

ous training sessions and workshops for academia and government for partners such as the Ministry of Construction, Vietnam Institute of Architecture Urban and Rural Planning (VIAP), IFC, Institute of Tropical Architecture, Hanoi University of Architecture, Hanoi and HCMC Energy Efficiency Conservation Centers and several Industry members.

### Defining green building metrics for Vietnam

Another area in which the VGBC is engaged is in defining green building metrics for Vietnam. The VGBC has done this by developing a set of “LOTUS” green building rating tools. The tools are based on a number of international standards, however they have been tailored to meet the specific needs and demands of the Vietnamese construction industry. The LOTUS rating tools are a voluntary and market

based scheme which include:

- LOTUS NR (Non-Residential): released in 2010
- LOTUS R (Residential): released in 2011
- LOTUS BIO (Buildings In Operation): released in 2013

Since LOTUS NR was launched in late 2010, seven pilot projects have been registered. As of December 2012, two projects have already been certified and another is currently being assessed for a provisional certification. The VGBC has also developed an online Green Database to assist designers, constructors and developers to select green products and services. The database is a free directory containing green products, materials, appliances and services available in Vietnam. Since it was launched in 2011, almost 150 products and services have been assessed and published.



**Address:**  
**Vietnam Green Building Council**  
 18A Ngo Tat To Street  
 Dong Da District  
 Hanoi, Vietnam

Phone: +84 (4) 362-911-07  
 Email: info@vgbc.org.vn  
 Website: www.vgbc.org.vn

# 17

## Green Architecture Services

Vo Trong Nghia Co. Ltd

### Green Design in Vietnam

#### Rationale

Population growth and development are massive problems for Asian countries in tropical climates. These countries are exempt from the urban and architectural discoveries that are used in temperate climate countries and therefore this brings a new set of challenges. Vietnam is not the exception to this situation and is experiencing numerous problems caused by population growth and recent climate change, such as flood, drought and salt infiltration. All these problems can result in food crises.

Vietnam also faces a large number of urban problems, such as, traffic and air pollution. In HCMC, the most populated city in Vietnam, more than

4,200,000 motorbikes are owned by 7,800,000 citizens. An abundance of motorbikes causes daily traffic congestion as well as serious air pollution. According to statistics, more than 16,000 people died of diseases related to air pollution in the city. This so called development kills citizens, and similar situations are found all across the country. If the citizens of countries who live in tropical countries become more and more dependent on cars and air conditioners, they will bleed the earth dry of all of its natural resources.

Because of urbanization, Vietnamese cities have lost their greenery. In HCMC, only 0.25% area is covered by green in the entire city. Cities in Vietnam have gone too far away from their beginnings as a rampant tropical forest. As a result, the young generation in urban areas is losing its connection with nature. If we cannot change the mindset of the people the cities will be transformed into a concrete jungle.

We cannot stop people pursuing a rich life, nor rapid urbanization and development. However, if we continue at this rate our planet will face irreversible changes. This are the problems that architects need to solve.

#### Architecture for human beings

As an architect in this age, our most important duty is to return green lands to our Earth. Architects can contribute to this issue in a different

way from ecologists' activity of protecting the environment, by planting trees and greenery on roofs, facades and on as many places as possible on a building.

Tropical countries have a long history of living in harmony with nature, and developing their culture and spirit around rampant forests. There is a big possibility for tropical countries to begin the tide of green architecture. Generally speaking, architecture is built for human beings. But we think architecture can be built for trees and plants; in the end, it will enable the earth to continue supporting human life.

Green architecture leads people to reconcile with nature and enhance their life by embracing the natural forces of sun, wind and water. It is essential for developing countries to utilize natural energies to minimize the impact to the environment, and it is highly possible to live comfortably in tropical countries without using unclean energy. Not having winter, the buildings of those countries can realize a comfortable indoor environment with very simple and energy-saving outfits.

In the past few decades, energy issues have occurred simultaneously all over the world, such as exhaustion of petroleum, or safety of nuclear power. In developing countries with an unstable supply of electricity, it is also a pragmatic theme to create energy efficiency buildings.



Wind and Water Cafe, Binh Duong Province  
(Source: Michael Waibel 2012)

## Case study 1

### Stacking Green, District 2 Ho Chi Minh City

“Stacking Green”, a private house designed for a thirty-year-old couple and their mother in HCMC, is a typical tube house constructed on a 4m wide and 20m deep plot (gross floor area is 220 square meters). The front and back facades are entirely composed of layers of concrete planters cantilevered from two sidewalls. The distance between the planters and the height of the planters are adjusted according to the height of the plants, which var-

ies from 25 cm to 40 cm. To water plants and for easy maintenance, automatic irrigation pipes were installed inside the planters.

The green facade contributes not only to visual comfort for the inhabitants, but also to upgrading the indoor thermal environment, therefore saving energy. The green facade and rooftop garden protect its inhabitants from the direct sunlight, street noise and pollution. According to the post-occupancy measurement of the indoor environment, wind flows throughout the house thanks to the porous façades and 2 skylights, and also contributes towards saving a lot of energy due to HCMC’s tropical cli-

mate. The semi-open green screen also keeps the privacy and security of the house in a friendly rather than combative manner, which is extremely important for residents in the city.



### Overview

Principal architects: Vo Trong Nghia, Daisuke Sanuki, Shunri Nishizawa.  
Contractor: Wind & Water House JSC  
Status: Built in 02.2011  
Program: Private house  
Location: Ho Chi Minh City, Vietnam  
GFA: 215 m<sup>2</sup>  
Photographs: Hiroyuki Oki



Stacking Green, District 2, Ho Chi Minh City  
(Source: [www.archdaily.com](http://www.archdaily.com))



Stone House, Dong Trieu, Quang Ninh province  
(Source: www.archdaily.com)

## Case study 2

### Stone House

This torus-shaped stone house is located in a quiet residential quarter en route to Ha Long Bay from Hanoi. A rising green roof and walls composed of subdued dark blue stones create a landscape, which stands out boldly in the new residential area.

The rooms surround the oval courtyard with water, which let cool wind into the building. Circulating flow runs around the courtyard and con-

tinues to the green roof, connecting all places in the house. This courtyard and green roof compose a sequential garden, which creates a rich relationship between inside and outside the house. Residents experience the changes of the seasons and learn to appreciate their wealthy life with nature, thanks to this sequential garden.

To create a wall with smooth curvature, cubic stones with a thickness of 10 cm were carefully stacked. Consequently, the wall performs the play of light and shadow. Massive and meticulous texture of the

wall generates a cave-like space, which recalls the image of a primitive house.



### Overview

Principal architect: Vo Trong Nghia  
Contractor: Wind & Water House JSC  
Status: Built in 02.2012  
Program: Private House  
Location: Dong Trieu, Quang Ninh province, Vietnam  
GFA: 360 m<sup>2</sup>  
Photographs: Hiroyuki Oki



#### Address:

**Vo Trong Nghia Co., Ltd.**

#### Headquarters

85 Bis Phan Ke Binh, DaKao, District 1  
Ho Chi Minh City, Vietnam  
Phone: +84 (0) 838-297-763  
Email: hcmc@vtnaa.com

#### Hanoi Office

6F, Le Building, 11/71 Lang Ha  
Ba Dinh, Hanoi  
Phone: +84 (0) 437-368-536  
Email: hanoi@vtnaa.com  
Website: www.votrongnghia.com

## 18

# Green Architecture Services

1 + 1 > 2 International Architecture JSC

## Our philosophy

Our philosophy is to create and develop an architectural style which has the ability to combine good architectural principles with human's social logic and human's needs of everyday life.

We base our work on state-of-the-art research and apply following principles:

- using local materials combined with modern materials,
- implementing innovative traditional construction techniques,
- aiming at energy-efficiency and energy conservation as well at environmentally friendly architecture,
- studying specifically public spaces, pedestrian routes, squares, new models of urban areas,
- researching about innovate housing & public buildings types,
- planning new types of rural villages.

## Case study 1

### Warehouse Villa

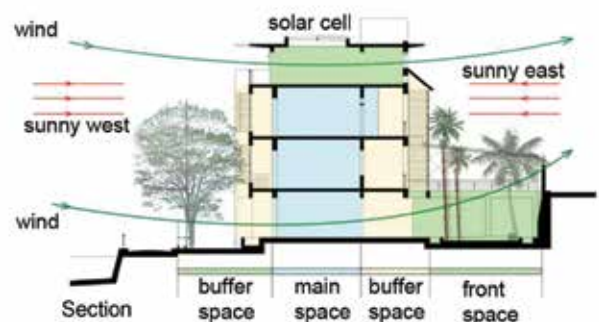
The villa was renovated from a former warehouse next to the lotus pond in Quang Ba. It was 3.5 meters lower than the front road's elevation. The design purpose was to maintain as much as possible the existing structure and materials. Therefore, the proposed design principles are very simple: the existing structure was kept untouched, and two triangle blocks were added in the East and West facades (the East block is for staircase and corridor; the West block is for balconies). In addition, the facades were treated and interior spaces were renovated in order to transform an empty warehouse into modern and warm living spaces.

The most important problem to be solved during design process was that the two main facades of the building are facing east and west

direction, exposing to direct sunlight in the morning and afternoon. By adding the corridor in the East and balconies in the West facades, the problem is solved as these spaces act like the buffer which will make the villa cooler in the summer and warmer in the winter. The West expanded spaces also are the open verandas from where the house owners can overlook the spectacular views of the lotus pond.

The main living spaces of the villa, thus, will be comfortable and energy saving despite of the harsh tropical weather in Hanoi.

In general, the design concepts for this renovation was to minimize the impact on the environment by maintaining existing structure and materials, using solar energy, therefore saving time and cost for construction. The result is a green house which is not only efficient in energy saving but also very elegant and well blend with the beautiful nature of Quang Ba.



Warehouse villa (Ho Tay – Tay Ho – Hanoi – Vietnam)  
(Source: 1+1>2 International Architecture JSC 2012)

### Case study 2

#### Green Rubic

The Green Rubic is located in Bai Chay Urban Park, Ha Long City, Quang Ninh province. With a land area of 420 square meters, the building has a convenient location which is at the corner of a large intersection. Green Rubic is a mixed use building, with the first three floors used for an electronic appliance supermarket, and the last two floors for residential. The design objectives are to create a modern and dynamic building for commercial use, and also a friendly, green and cozy living space.

The design concept was inspired by the sharpness and shape of coal, which is the symbol of Quang Ninh province. The building shape hence is simple and strong with glass as major material. Because of the location being at the road corner, the second floor was rotated at a small angle, creating an interesting view

along the road, and showing the flexibility and dynamic natures of the building. This design solution also makes the building more attractive to customers. The entire building look likes electronic equipment; enhance the business of the owner.

The small gardens and water features for the living spaces on top of the building have differentiated the residential spaces to the commercial spaces located downstairs. They bring a quiet, tranquil, and cozy living space for the homeowners. The idea is to bring nature into the living spaces and to separate these living spaces with the busy supermarket below.

Green design solutions were utilized: The rotation of the buildings creates shadows to cover the building at day time. The large water feature on the 4th floor helps cooling the room in the summer, and bringing relax feelings to the residents. Different voids inside the buildings

make the spaces more interesting and also cool down the house by bringing in cool winds. Most of the building utilizes natural day lighting and ventilation, reducing the cost for energy by a significant amount. The Green Rubic has optimized the natural, cultural assets of the local location, and hopefully it will become a landmark of the area.

### Case study 3

#### Sunset House

The Sunset House is located in Cau Giay New Urban Park in Hanoi, Vietnam. The land plot area and shape are sufficient to design a good residential living space. However, the fact that the land plot is in west direction created a big challenge for the designer, as west is the most undesirable direction to build a house in the North of Vietnam. In general, a building in west direction usually is extremely hot in



Green Rubic (Ha Long – Quang Ninh – Vietnam)  
(Source: 1+1>2 International Architecture JSC 2012)



the summer and cold in the winter, costing the owner a lot of money for energy consumption.

Taking into consideration this challenge as the main design problem for the House, the design objectives were to create a luxury and environmental-friendly tropical living space. The design solution was to create a large roof associated with other sun shading elements, covering most of the west side of the house. Passive solar design solutions have been optimized to avoid overheating in the afternoon for this west side. Solar panels have helped reduced energy consumption by 30%, especially for cooling in the summer. Plants are everywhere: in the small gardens inside the house, outdoor in the exterior garden, on the fences. The paved area is minimized to reduce impervious surface and increasing on-site infiltration. As the owner is an active person who loves nature, exterior and interior design solutions are to bring nature into the

living spaces as much as possible. Wide glass windows looking out to the surrounding landscape, various small gardens inside the house, a small water features on the top floor, etc. have created not only an interesting and comfortable, but also full of light and tranquil living spaces. In general, the use of green design solutions has created a low energy building with reduced environmental impacts, while it has achieved comfortable internal living conditions for the owners. The Sunset House is an architecture statement of green housing design for houses facing West in tropical climate.

#### Case study 4

##### Ta Phin Community house

The project site is at Unit 1, Xa Seng village, Ta Phin commune, 17km far from center of Sapa town, a popular tourism attraction in the north of Vietnam. The project is a multi-

functional community house, which will contribute to the local economic growth, enhance tourism development and maximize the local potentials. The project is also developed toward sustainable development for the local community by preserving natural resources and environment, as well as enhancing the local cultural diversity and traditional handicrafts. The action program will include training strategies for local people in sustainable agriculture, tourism, and project management. The community house will be incorporated with an herb garden, and will include a working space, an exhibition room for local handicraft product, a small library, a communication center, as well as a studio for training program. All the above activities have been supported and advised by not only the local people but also the authorities and other community associations. The building form is inspired by the traditional red-scarf of the Dao mi-

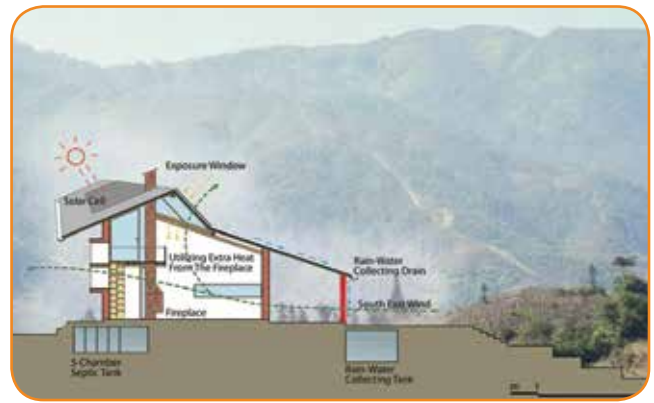


Sunset House (Cau Giay – Hanoi – Vietnam)  
(Source: 1+1>2 International Architecture JSC 2012)

minority woman, as well as the form of the mountainous topography of Sapa. The building uses local labor and material such as stone, recycled wood, adobe brick, etc. Other sustainable green technologies got implemented such as: rain-water filter system, solar energy, five compartment septic tanks, energy saving

fireplaces, utilizing extra heat from the fireplace. The location of the community house has also been well considered: It is located in the center of the commune, next to the elementary school and public rice milling station; therefore it can maximize the use of the entire above center. A

further benefit is that it can be easily spotted by tourists. The community house has just been opened for a short time; however it is getting many compliments and supports from the local community. We do hope that in future, the same idea will be applied for other communities, especially for minority communes.



Ta Phin Community house (Ta Phin – Sa Pa – Lao Cai – Vietnam)  
Architect: Hoang Thuc Hao  
(Source: 1+1>2 International Architecture JSC 2012)



**Address:**  
**1+1>2 International Architecture JSC**  
**Headquarters**  
Hanoi, Vietnam

Phone: +84 (0) 439-764-253  
Email: 1and1.arch@gmail.com  
Website: <http://112.com.vn>

19

# Integrated Green Architecture and Green Consultant Services

ARTELIA + T3 Architecture Asia



TAILOR-MADE INDEPENDENT CLEAN ENERGY ENGINEERING SERVICES

ARTELIA, created by the merger of COTEBA and SOGREAH, offers a global, multi-disciplinary vision of Engineering and Project Management in the fields of Construction, Infrastructure and Environment (Building and Industry, Water and Environment, Infrastructure and Transportation Systems).

In Vietnam, ARTELIA has a representative office since 2006 and is member of the Vietnam Green Building Council.

## Tailor-made solutions

We propose tailor-made independent (international and national) consulting, engineering and project management services in renewable energy, energy efficiency and green building:

- Renewable energy: solar energy (photovoltaics, solar hot water, concentrating solar power, solar-assisted air-conditioning), hydroelectricity, wind power, sea energy, hybrid plants and micro distribution networks, etc.
- Energy conservation and efficiency in buildings of any type
- Energy management (energy conservation & energy efficiency in any building(s), at provincial level (strategic studies), for low-voltage electric lines, carbon footprint analysis, etc.)
- Life cycle analysis, carbon footprint analysis
- Green building design: technical assistance for certification (LOTUS, LEED, HQE), building performance simulation, technical studies.



CONTEMPORARY & GREEN ARCHITECTURE

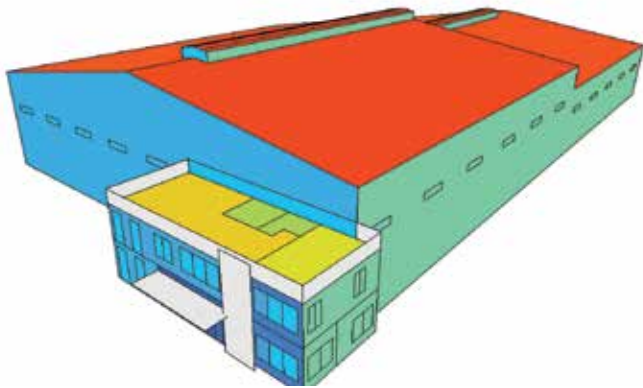
T3 Architecture Asia is a multi-disciplinary design team specialized in green architecture and in contemporary interior design. We aim at promoting energy efficient and climate-adapted buildings. Thereby we closely work together with energy efficiency engineers already from the concept design stage on.

From our office located in Ho Chi Minh City, we cover Vietnam and a part of Southeast Asia, especially Myanmar and Cambodia.

## Philosophy

As architects we follow a holistic approach focusing on small and medium size projects. Thereby we accompany our clients in the building process from the concept design to the end of the construction (author supervision). Further we offer:

- Supporting our clients to make the right choices (best compromise between architectural quality – energy efficiency - construction costs).
- An architecture that respects people (elegant, healthy, functional) and environment (local solutions and local consultants, low carbon consumption).
- Consultant services to architects regarding the choice between quality and sustainability at a fixed budget line.
- Architects who promote social mix, the mix of functions in the city, the fight against urban sprawl, contemporary architecture that blends into the landscape and takes into account the environment (climate, urban context, view).



Warehouse in Dong Nai - Solar Exposure of facades and roofs  
(Source: Artelia 2012)



Design sketch of a Green office in Saigon - Vietnam  
(Source: T3 Architecture Asia 2012)

### Artelia Services

- 1 Audit and expertise of buildings, systems, process
- 2 Design of energy-efficient buildings and systems
- 3 Potential study
- 4 Feasibility study
- 5 Strategy, definition of an action plan
- 6 Project management, supervision of works
- 7 Training, Due-Diligence

### T3's Services

- 1 Feasibility Study
- 2 Design Brief
- 3 Concept Design
- 4 Preliminary & Basic Design for Building License
- 5 Technical Design for Tender process
- 6 Interior Design and Furniture Design
- 7 Architectural & Interior Design Author supervision



Viet Nhat solar photovoltaic project, 215kWp – Vietnam  
(Source: Artelia 2013)



Design sketch of a Green Hotel in Bagan - Myanmar  
(Source: T3 Architecture Asia 2012)

**Our joint global offer**

**Our global offer (T3 / ARTELIA) for green building design:**

- Include green engineering at the first stage of the design process to achieve the biggest benefits and reduce construction costs;
- Close collaboration with architects and engineers for better understanding of requirements from either side to lower the risk of costly rework further down the project;
- Building design (or optimization) to make sparing and efficient use of all available resources with appropriate modeling tools, to accurately assess the response of a building to its physical environment and its occupants.

**What is a green building?**

Green design and construction consist in finding the best match between a site (city, countryside, seaside), the lifestyle of future users (inhabitants, employees, workers) and climate (tropical, temperate) while creating healthier and energy-

efficient homes and public or commercial buildings. Successful green buildings leave a lighter footprint on the environment through conservation of resources and use of energy-efficient, cost-effective, low-maintenance products for construction needs.

**Users comfort in green buildings**

If it is important to keep the heat in during the cold season in Europe, it is really important to protect the building from overheating in Vietnam. For instance, architects and energy efficiency engineers can calculate the best dimension and placement for solar shading devices (overhangs, louvers, trees) to ensure an adequate protection of windows and save energy for cooling. Or they also study together the possibilities for natural ventilation to create air flows in interior spaces.

**Green building costs**

Building green does not necessarily mean adding extra costs. Indeed, the initial design considerations that have the most influence on building performance cost nothing.



Green Resort in Nha Trang - Vietnam  
(Source: T3 Architecture Asia 2012)

Volumes, distribution, location and size of the openings are all basic parameters that architects and engineers can integrate into the project, after an evaluation of the needs of occupants and characteristics of the site (climate, orientation, nature of the soil).

If the client wishes to do so, it is of course possible to go further. In that case, architects and engineers bring their expertise and can advise in the choice of building system, green materials, green equipment/products (for instance, energy efficient air-conditioning systems, solar hot water equipment or photovoltaics modules).



**Address:**  
**ARTELIA Vietnam**  
 HCMC Office  
 06 Phung Khac Khoan  
 Dakao Ward, District 1, HCMC  
 Phone: +84 (0) 838-221-314  
 Email: [contact@vn.arteliagroup.com](mailto:contact@vn.arteliagroup.com)  
 Website: [www.arteliagroup.com](http://www.arteliagroup.com)

**Address:**  
**T3 Architecture Asia**  
 244/9 Duong Binh Quoi  
 Ward 28, Binh Thanh District, HCMC  
 Phone: +84 (0) 122-782-2580  
 Email: [contact@t3architecture-asia.vn](mailto:contact@t3architecture-asia.vn)  
 Website: [www.t3architecture-asia.vn](http://www.t3architecture-asia.vn)



# Green-Biz 2013

European Green Business Solutions for Vietnam



## Who we are

With deep concern about the lack of sustainable development progress in Vietnam, the European Chamber of Commerce in Vietnam (EuroCham) put European Green Business Solutions for Vietnam, in short 'Green-Biz', on the agenda. Consequently EuroCham's Green-Biz has developed and various activities address sustainable development in Vietnam, offer a platform for debate, but also aim to find and showcase practical solutions.

- To **create a bridge** for relevant Vietnamese and EU businesses and address the importance of green education and mindset
- To **discuss Vietnam's future** development with regard to sustainability and encourage green production and consumption
- To **act as a channel for dialogue** between business and the government, but also enable discussion within the business sector and academia

This variety of activities conducted by EuroCham and its partners are culminating at a high-profile two day b2b and b2g event that comprises a conference with an international exhibition and variety of networking events. Covering a Welcome

Cocktail and a Gala Dinner, a Conference and a Trade Show, it will showcase European Green Business Solutions for Vietnam, enable public-private dialogue and create a bridge for Vietnamese and European Businesses.

## Green-Biz 2013

The Green-Biz main two-day event was organized in Hanoi in 2009 for the first time and in 2011 in HCMC. Following the previous successes the Green-Biz 2013 concept is comprising an Exhibition and a Conference which are arranged at the same dates and venue. The Green-Biz 2013 main event, with bigger scope and scale, is taking place in Hanoi on the 19th and 20th September 2013. Beside the high-profile Governmental participants (e.g. Deputy Prime Minister, Ministers and Vice-Ministers of MOIT, MONRE, MARD, MST, MOC, MOF, MOT), Regional Governments are regularly participating as well as SEA businesses and NGO representatives, thus addressing the most comprehensive Green Growth issues in Vietnam and the region.

### Business and the Environment

At the most comprehensive Sustainability event in Vietnam, key European, international and Vietnamese representatives from public bodies, academia and private

businesses, Government, national and international institutions gather together. Thus providing the different stakeholders with the ability to discuss business practices with low-environmental impact, find partners, share experiences, create new business opportunities and expand their network.

The Sustainability challenge has to be addressed by a wide-ranging set of parties. Therefore the lessons learned from European companies in their homecountries and abroad, enable them to be long-term partners: They have the knowledge, experiences and technologies needed for a Sustainable Economy in Vietnam. Due to the fact that Green-Biz activities are organised by EuroCham in partnership with other major associations in Vietnam, we can offer true market insight from the perspective of both foreign and Vietnamese companies, as well as address the challenges towards a Sustainable Economy in Vietnam.

### Exhibition

As one integral part of the Green-Biz main event a trade fair for environmentally friendly products, services and technologies is organized on 19th and 20th September 2013 at the Green-Biz 5-star venue the Media Hanoi. There participants and visitors can directly connect to enterprises.

Featuring a comprehensive range of product categories, the five-star



Green-Biz Conference  
Source: EuroCham 2011

## Green-Biz 2013: Vietnam's No.1 Comprehensive Event on Green Business Solutions



Green-Biz Exhibition  
Source: EuroCham 2011

exhibition has become an effective and valuable platform for showcasing green business opportunities in Vietnam but also connecting companies, customers and decision makers nationally as well as internationally.

The exhibition is co-organised and supported strongly by the Vietnamese Government as well as international consulates, trade commissions and business associations, who organize specific booths. This makes Green-Biz a professional, practical outcome oriented event

that enables participants to act, connect and follow-up with real business opportunities in Vietnam. Beside the additional options, like match-making, business-talk rooms and addressing targeted buyer groups, most of Europe's variety of sustainability conscious business approaches and strengths can be experienced all at one trade-show.

### Conference

The Green-Biz 2013 Conference offers a platform for decision makers from both: public and private sectors as well as academia and not-for profit organizations. The high-ranking and specialized debate participants discuss Vietnam's most pressing challenges and feasible opportunities for cleaner solutions. Thus minimizing the effects of doing business concerning environmental aspects, the damage to the nature

and the ecological footprint in the context of Vietnam's sensitive environmental capacity.

The Conference Agenda is designed to comprehensively address the specific challenges in key activities but also offers smaller seminars and partners' activities to be incorporated.

These are the main topics at the conference:



Source: EuroCham 2013



### EuroCham Hanoi

Ground Floor, Sofitel Plaza  
1 Thanh Nien, Ba Dinh, Hanoi, Vietnam  
Tel: +84 (0) 437-152-228  
Websites: [www.greenbiz2013.com](http://www.greenbiz2013.com)  
[www.eurochamvn.org](http://www.eurochamvn.org)

### EuroCham Ho Chi Minh City

5th Floor, EuroCentre  
49 Mac Dinh Chi, HCMC, Vietnam  
Tel: +84 (0) 936-658-805  
Email: [greenbiz@eurochamvn.org](mailto:greenbiz@eurochamvn.org)

# 21

## Resources

### Editors



Responsible Editor  
 Dr. Michael A. Waibel  
 Department of Human Geography, University of Hamburg  
 Bundesstr. 55, D-20146 Hamburg, Germany  
 Email: waibel\_michael@yahoo.de, Website: www.michael-waibel.de

Editorial Assistant  
 Arch. Vu Phuong Linh  
 Southern Sub-Institute for Urban and Rural Planning  
 65 Mac Dinh Chi, District 1, Ho Chi Minh City, Vietnam



Editorial Assistant & Layout  
 Phan Thi Khanh An  
 Urban Planning Faculty of University of Architecture  
 196 Pasteur Street, District 3, Ho Chi Minh City, Vietnam

### Technical Advisory Board Partners



Eng. Phan Duc Nhan  
 Vice Director of Department of Construction  
 60 Truong Dinh Street, District 3, Ho Chi Minh City, Vietnam



MEng. Nicolas Jallade & MEng. Patrick Bivona MSc.  
 Artelia Vietnam  
 Ho Chi Minh City Office  
 06 Phung Khac Khoan, Dakao Ward, District 1, Ho Chi Minh City, Vietnam



Christoph Schill  
 EuroCham Ho Chi Minh City  
 5th Floor, EuroCentre, 49 Mac Dinh Chi, Ho Chi Minh City, Vietnam



MSc. Do Van Nguyet  
 Country Director Live & Learn  
 24 Lang Kien Truc Phong Canh, Lane 45A Vong Thi, Hanoi, Vietnam



Dr. Dirk A. Schwede (PhD, USyd. AUS)  
 ILEK - Institute for Lightweight Structures and Conceptual Design  
 University of Stuttgart  
 Pfaffenwaldring 14, D-70569 Stuttgart, Germany



MSc. Ngo Thi To Nhien  
 National Centre for Technological Progress  
 Ministry of Science and Technology  
 25 Le Thanh Tong Street, Hanoi, Vietnam



## Product Information

Waibel, M. (ed.) (2013): Handbook for Green Products. High-Quality Company Solutions towards Climate-Adapted Housing and Energy-Efficient Buildings in Vietnam, Edition 2: Technical Constructive Green Housing Products and Green Services. Transport Publishing House, Hanoi/Vietnam. 68 pages.

## Picture Credits

Christoph Hesse (1), BK-IDSE Co. (8, 9, 10, 11), Redsun Energy (13, 14), www.redsun-solar.com (15), Michael Waibel (4, 14, 16, 17, 26, 28, 30, 31, 32, 35, 41, 52), tietkiemnangluong.com.vn (18), www.frostair.com.au (18), www.daikin.com (19), Patrick Bivona (19), www.keeycool.com (20), www.acdcledlights.com (20), asamled.vn (21, 22, 23), e-block.com.vn (24, 25), Phan Thi Khanh An (26), www.boral.com.vn (27), Fico Co. (30), Pinctadali (33, 34), vuon-thangdung.vn (36, 37), www.heraldsun.com.au (38), verticalgardenbudapest.com (39), ECC (40,41), www.enerteam.org (43), EDEC (44, 45), greenidvietnam.org.vn (46, 47), VNCPC (48), vncpc.org (49), VGBC (50, 52), www.archdaily.com (53, 54), 1+1>2 International Architecture (55, 56, 57, 58), T3 Architecture Asia (60, 61), Artelia (60), EuroCham (63), Charlotte Burmeister (67).

## Translation and Corrections

Phan Thi Khanh An, Ngo Thi To Nhien, Michael A. Waibel

## Download Options



Web-site of the Megacity Research Project TP. Ho Chi Minh at BTU Cottbus

in Vietnamese language:

[https://www-docs.tu-cottbus.de/megacity-hcmc/public/2013\\_edition\\_Handbook\\_for\\_Green\\_Products\\_VN.pdf](https://www-docs.tu-cottbus.de/megacity-hcmc/public/2013_edition_Handbook_for_Green_Products_VN.pdf)

in English language:

[https://www-docs.tu-cottbus.de/megacity-hcmc/public/2013\\_edition\\_Handbook\\_for\\_Green\\_Products\\_ENG.pdf](https://www-docs.tu-cottbus.de/megacity-hcmc/public/2013_edition_Handbook_for_Green_Products_ENG.pdf)





Sustainable energy production in Vietnam: Wind turbine park in Binh Thuan province (Source: Tran Ba Khang)

Transport Publishing House  
80B, Tran Hung Dao Street, Hoan Kiem District, Hanoi/Vietnam  
Phone: +84-4-3942-3346; +84-4-3822-1627; +84-4-3942-4620  
Email: [nxbgtvt@fpt.vn](mailto:nxbgtvt@fpt.vn); Website: <http://www.nxbgtvt.vn>

Responsible for publishing: Le Tu Giang  
Edited by: Pham Quang Huan  
Responsible for content: Michael Waibel

1020 copies printed, size 20.5 x 29.5 cm at the Transport Publishing House.  
Publication Plan Registered Number: 1252-2011/CXB/2-140/GTVT  
Publishing License Number: 167/QD-GTVT dated ?? May 2013  
Completed and registered in May 2013

## Acknowledgement

This handbook builds upon the Handbook for Green Housing published in 2011. The base layout of the latter was mainly elaborated by Christoph Hesse, Department of Architecture, Darmstadt University of Technology, Germany. The development and publication of this handbook has been thankfully supported by EuroCham Vietnam, the Vietnam office of KfW Development Bank as well as the Megacity Research Project TP. Ho Chi Minh, funded by the German Ministry of Education and Research.



Federal Ministry  
of Education  
and Research



Future  
Megacities

Megastädte von morgen





**VIETNAM NATIONAL ENERGY EFFICIENCY AND  
CONSERVATION PROGRAMME**

**54 Hai Ba Trung Street, Hoan Kiem Dist., Hanoi, Vietnam**

**Phone: +844-2220-2412 – Fax: +844-2220-2412**

**Email: [vptknl@moit.gov.vn](mailto:vptknl@moit.gov.vn)**

**Website: <http://tietkiemnangluong.com.vn/en/>**