

**UNIVERSITY MALAYSIA PAHANG
LONG-TERM GREEN CAMPUS BLUEPRINT**

(initially completed in December 2012, and revised subsequently. Some initiatives, however, had been implemented even before this blueprint was prepared)

1.0 INTRODUCTION

In a special speech (**Wacana Strategik Naib Chancellor**) at UMP Pekan Campus on 13 October 2011, in Dewan Auditorium Pekan, the Vice-Chancellor, Professor Dato' Dr. Daing Nasir Ibrahim announced four Key Result Areas (KRA) as the university's development strategy towards excellence during the five-year period from 2011 to 2015, namely; Enhancement of Academic Quality, Financial Sustainability, Socio-Economic Development, and Rebranding for Strategic Positioning.

Electricity Savings has been identified as Initiative-11 of the second KRA (KRA2 – Financial Sustainability) – it is a vibrant and important area where UMP's operational costs can be made more efficient. Since its establishment, UMP's monthly electricity bills have been growing exorbitantly, mostly due to increased university population as well as increased programmes and activities, but also possibly due to some wasteful consumption. In 2009 (when the Pekan Campus was already in operation) total electricity consumption in both Gambang and Pekan Branches was 15,752,386 kWh, with the electricity bill totaling RM 5.3 million per year. Two years later, in 2011, the electricity consumption escalated to 21,051,341 kWh, with the electricity bill amounting to RM7.376 million. This is an increase of 33.6 percent in consumption, and 39.2 percent in costs over just a two-year period, which if not checked, would escalate even further.

This document forms the **UMP's Long-Term Green Campus Blueprint**, as requested by the Vice-Chancellor in the **2nd UMP's KRA Monitoring and Coordination Meeting** on 17 July 2012 (2.30 – 4.30pm) at the UMP Senate Meeting Room.

2.0 BACKGROUND

For many years, countries across the world have recognized energy efficiency programme as a crucial strategy to energy security measures – to prolong global fossil fuel's reserves such that the existing reserves would last longer, and such that the world would not face energy shortage in the future. The world's economy depends strongly on energy, and every country, and every institution in a country, is responsible to ensure that energy supply security is maintained and safeguarded, minimizing any possibilities of price fluctuations, cuts and disruptions. More importantly to the immediate consumers, energy efficiency initiatives provide direct savings by reducing or eliminating consumption wastes.

Incidentally too, the world at large is facing a big challenge with regards to emissions of greenhouse gases giving rise to climate change. About three-quarter of the effect of

greenhouse gas emissions is caused by the energy systems and their chain. Hence, energy efficiency has a direct impact in reducing greenhouse gas emissions. As a responsible institute of higher learning, through energy efficiency measures, UMP is undertaking its share of responsibility to contribute to the mitigation of these greenhouse gases.

Malaysia's total emissions in 2009 (the latest available data, then) **from consumption of energy** amounted to 148.01 million tonnes, ranking at no 32 among the world (with China at 7,710 mil tonnes, United States at 5,424 mil tonnes and India at 1,602 mil tonnes, as the first three top countries, and just below Singapore which ranks at no 31). Based on emissions per capita, however, Malaysia's figure ranks on the lower side, at 5.1 tonnes (close to China at 5.83 tonnes), as compared to Singapore at 34.59 tonnes, United States at 17.67 tonnes, and Indonesia at 1.72 tonnes). In spite of Malaysia's total emissions and total emissions per capita figure being on the lower side, being an environmentally-committed nation Malaysia has joined the global community in cutting down its carbon emissions.

In December 2009, at the United Nations Climate Change Conference 2009, 15th Conference of Parties (COP-15), the Prime Minister of Malaysia made a pledge that Malaysia would adopt an indicator of a voluntary reduction of up to 40 percent in terms of emissions intensity of GDP by the year 2020 compared to the 2005 level. (This indicator is conditional upon receiving the transfer of technology and finance of adequate and effective levels from Annex 1 partners of Kyoto Protocol). Indeed, this is a noble and ambitious pledge made by His Excellency the Prime Minister to the global community – and UMP will stand by his side to support and implement its share of the national goal. *(In a report by the Prime Minister in September 2015, Malaysia had achieved 32 percent of the 2020 target, indicating an achievement well ahead of time).*

3.0 UMP's LONG-TERM GREEN CAMPUS BLUEPRINT – VISION, MISSIONS AND STRATEGIES

In the course of achieving excellence in teaching and research, UMP will strive to do the following as its **GREEN CAMPUS VISION**:

UMP is committed to operate in a sustainable manner by being more prudent with its use of energy and other natural resources, as well as to contribute to the national and global agenda on environment and sustainability.

This Vision shall be achieved through the following **Missions**:

- i) To be more efficient in its energy consumption (including electricity and other energy forms), taking concrete steps to minimize waste;
- ii) To create a positive effect on the local environment and community through efficient use of natural resources and efficient management of wastes;

- iii) To reduce negative impact on the local and global environment at a rate consistent with meeting the national voluntary initiatives voluntary, as well and going further to meet the world targets where it is cost-effective to do so.

Based upon the above Vision and Missions, UMP aims to pursue the following:

- i) Reduce its energy consumption through avoidance of wasteful consumption and by being more prudent in its use of energy, particularly electricity and fuel for its transport fleet;
- ii) Reduce the university's environmental impact to the locality through better management of natural resources, greening and foresting of its campus – hence contributing towards carbon sequestration;
- iii) Meet the statutory requirements of all relevant legislations and other requirements and exceed these requirements where they best support the university's other core objectives;
- iv) Adopt best practices to ensure the prevention of air, water and waste pollution;
- v) Support national voluntary initiatives to cut down its greenhouse gas emission as pledged by the Prime Minister in Copenhagen in December 2009;
- vi) Monitor and regularly review the university's sustainability and environmental performance, and set annual objectives and targets to ensure continuous improvement;
- vii) Conduct and encourage more research in the campus under themes that include Energy Efficiency, Biodiversity, Sustainability, Renewable Energy Technologies, and Sustainable Indigenous Technologies, as well as the importance of Sustainability and Environmental Protection in its teachings;
- vii) Make Energy Efficiency, Environment and Carbon Reduction Initiatives (CRI) as important agendas in the university's management at various levels from the University Management Board Meeting to meetings at individual faculties and units level;
- viii) Communicate and sharing both internally and externally about its energy efficiency programme and environmental performance, including awareness and training for staff and students, as well as its local community.

To support and strengthen the implementation of this Blueprint, two PLANS are included in this Blueprint; the **UMP Energy Efficiency Plan (EE-PLAN)** and **UMP Environment and Carbon Reduction Plan (ECR-PLAN)**.

Both plans shall be implemented simultaneously, and in phases, as illustrated in the Table below. The payback period shall be particularly calculated for energy efficiency measures as they are more practically quantifiable. Initiatives related to the environment and carbon reduction measures, however, are not easily quantifiable – they are done in parallel where they are less costly, with the CO2 emissions reduction target calculated at a later stage as some research is needed to estimate its reduction.

PHASE	PERIOD	STRATEGIES/INITIATIVES
	Aug 2012 – Dec 2012	Drafting of UMP's Long-Term Green Campus Blueprint
1	Jan 2013 –	No-Cost and Low-Cost initiatives (with investments providing up to two years payback period)
2	Jan 2016 –	High-Cost initiatives (with investments providing up to five years payback period, or longer)

Two key principles are understood and stressed here:

- i) There will be no COMPLETION deadline of any phase after each has started. For example, when Phase 2 is introduced, Phase 1 initiatives shall continue and enhanced further. The EE-PLAN and ECR-PLAN when introduced shall operate based upon the KAIZEN management principle where they proceed on a continuous improvement principle;
- ii) The initiatives shall be implemented within the operational budget of the university. The initiatives shall be carefully exercised such that they would not impose a financial burden to the university.

4.0 ENERGY EFFICIENCY PLAN (EE-PLAN)

UMP shall strive to fulfill **Mission 1** of the UMP Green Blueprint, by pursuing, but not limited to, the following strategies:

4.1 To conduct Energy Audits as preliminary exercises to establish a more accurate scenario of the energy consumption characteristics of specific facilities, including estimation of the

energy wastage, specific measures to be initiated to further save energy, and estimation of the investments required to implement the energy efficiency measures.

4.2 To encourage more research-based projects to further promote energy efficiency in the university buildings, and from which useful data can be generated and technical papers published for the purpose of sharing initiatives and experiences. Research areas will include studies, among others, on improvement of air-tightness in air-conditioned buildings, thermal comfort conditions in air-conditioned and non-airconditioned spaces, thermal response of various types of external walls, effects of insulation materials, green roofing, optimization of day lighting, automatic controls in energy-efficient air-conditioning systems, collecting of raw data in solar and wind applications for renewable energy planning and implementations, and estimation of greenhouse gas emissions in UMP.

4.3 To install internal kWh meters for selected buildings and facilities such that their energy consumption pattern can be studied, and initiatives undertaken to minimize wastes and make their energy consumption be more efficient;

4.4 To conduct an Energy Profile Study, following the installation of internal meters as described above, which is necessary to establish a true picture of UMP's electricity consumption trend. Increasing monthly bills over the years would not tell much about UMP's electricity use, as they can be a result of several factors, including; increase of electricity tariff, increase of students and staff population, increase of new buildings and facilities, and special functions and activities happening within the year such as conferences, construction work, and hosting of national sports and events. A more meaningful indicator or index is the electricity consumption per square meter area, per capita. These indicators can be computed from the electricity monthly bills, and data on the increasing students and staff populations, and the university's growing facilities are necessary;

4.4 To save energy in the Lighting and Electrical Systems where significant electricity consumption can be reduced through making the campus lightings be more efficient through removing selected bulbs or tubes in areas where the lightings may be in excess, replacing of existing bulbs or tubes with more efficient types (such as T5 tubes or LED), and also possible rewiring of lights to allow alternative switching options;

4.5 To save energy in mechanical systems, where significant electricity savings can be made from the change of existing non-functioning or inaccurate thermostats/sensor to more efficient ones, to installation of stand-alone air-conditioning units for use during off-office hours (rather than powering on the central cooling systems whereby other unwanted facilities are also cooled down wastefully). A later phase of this initiative may also include installation of High-Efficiency Motors (HEMs) as big HEMS can reduce electricity consumption by as much as 40 percent as compared to cheaper and inefficient motors of the same capacity. *(In a national survey made in 2005 by the Energy Commission, in Malaysia, about 98 percent of the motors used were inefficient motors. Today, use of inefficient electric motors is still prevalent in the country);*

4.6 To implement all initiatives above under three different strategies; namely No-Cost Measures, Low-Cost Measures, and High-Cost Measures. These strategies require different quantum of investments and they each provide different levels of benefits and returns.

- **No-Cost Measures** are basically tightening house-keeping habits and instilling strong awareness among all levels of staff that energy is an expensive commodity in terms of its availability and price, as well as future availability. The building occupants at large should be made to understand that energy should not be wasted and instead be used prudently, just the quantity needed, and without being extravagant. (For example, when a meeting room is not being used the occupants must make sure that all lights and the air-conditioning system in the room should be switched off). Some fund however, is required to continuously create and strengthen the awareness, by conducting awareness workshops, campaigns and the printing of posters and banners. Many organisations estimate energy savings of 1 – 2 percent by initiating No-Cost Measures.
- **Low-Cost Measures** are improvement initiatives that do require a reasonable amount of investment. Such initiatives may include change of existing tungsten bulbs to compact fluorescent lightings (CFL) or LED bulbs, construction of shades or awnings above windows to cut down direct solar gain into air-conditioned rooms, and door-closers to automatically close doors in air-conditioned rooms. Such investments provide a Return on Investment (ROI) of up to two years. Low-Cost Measures may result in energy savings from 3 to 5 percent.
- **High-Cost Measures** are improvement initiatives that require significantly high investments, but the energy savings achieved are generally higher, by as much as 7 to 10 percent, or more. They are usually carried out based on recommendations made after an Energy Audit is being carried out. Such measures may include changes such as installation of stand-alone air-conditioning systems for facilities that operate at odd hours rather than use of central systems, since central system also cool other facilities wastefully. Phase 2 initiatives may include change of inefficient electric motors (which are most commonly used at present) to High-Efficiency Motors. ROI of investments for High-Cost Measures may run up to five or six years, or more.
- Options of No-Cost, Low-Cost and High-Cost Measures, for Phase 1 and Phase 2, are included as Addendum to this UMPEEP document. The scheduling (Gantt Chart) of these measures for both Phases are also provided in the Addendum. Administrative Arrangement is also an important part of the implementation strategy, and is also included in the Addendum.

4.7 To ensure all new university buildings and complexes in future shall incorporate Energy Efficiency features within the financial allocations provided. The consultants appointed would therefore prepare design and cost options for energy efficiency measures and advise the university's management accordingly. The options may include, but not restricted to, the following features:

- i) Optimisation of natural lighting where feasible, including design of gang switching systems to allow electric lights along the fenestrations be controlled independently;
- ii) Use of energy efficient bulbs and/or tubes which shall not only consume less electricity but also possess longer life;
- iii) Installation of internal kWh meters for designated buildings to allow monitoring of their energy consumption behavior;
- iv) Use of more accurate thermostats (thermal sensors) in the air-conditioned rooms, offices and spaces to truly achieve the university's policy of air-conditioning room temperature of 24°C;
- v) Installation of Building Automation System (BAS) to allow remote controlling and monitoring of the energy consumption for the building concerned;
- vi) Use of split-unit or/and Variable Refrigerated Flow (where feasible) air-conditioning systems for rooms, offices and spaces which require air-conditioning beyond office hours and at odd hours;
- vii) Use of Variable Speed Drive (VSD) and/or High-Efficiency Motors (HEM) in equipment that requires use of electric motors.

5.0 ENVIRONMENT AND CARBON REDUCTION PLAN (ECR-PLAN)

The university shall strive to fulfill **Missions 2 and 3** of the Blueprint, by pursuing, but not limited to, the following strategies:

5.1 To save fuel and reduce emissions by the fleet of vehicles owned and operated by the university, complementing the electricity savings and CO₂ emissions reduction initiatives pursued in buildings and facilities. This shall be made through improvement of the management of the fleet and operation schedules, as well ensuring that the vehicles are efficiently maintained to operate at optimum efficiency, thus minimising unfavorable emissions;

5.2 To promote, where possible and feasible, applications of renewable energy technologies for clean energy generation for use in the university as supplementary sources to the electricity supply from the grid, with efforts to draw in participation and collaboration with the private sector through grants and pilot tests;

5.3 To harvest rainwater, considering that water is a precious commodity and letting rainwater wasted is not sustainable. At the very least, rainwater could be used for gardening, washing, and flushing. With proper filtering, rainwater is safe to be used even for drinking and cooking. Rainwater harvesting in both campus (Gambang and Pekan) will not only save the

university from high water bills, but is also part solution to the current inadequate campus water supply – not to mention utilizing the “Gift of God”;

5.4 To further elevate its current e-Comm system towards a paperless university. Computer-based systems are widely used by most universities around the world. However, most current systems are still paper-based which involves high dependence on hard-copies. Minimizing the use of papers shall save more trees from being cut, which in turn will help the local environment and the world at large in carbon sequestration;

5.5 To practice the 3R concept (Reduce, Reuse and Recycle), in managing the different types of wastes generated by the university, including students colleges. The university shall ensure that the companies contracted to remove the university’s waste shall also manage the disposal of the waste sustainably and responsibly;

5.6 To actively engage in promoting sustainable wastes disposal and management, particularly agricultural wastes and municipal solid wastes in the east coast area. UMP shall be actively engaged with local authorities and the community in conducting research for converting wastes to energy, and implementing programmes in the sustainable disposal and management of wastes in the agricultural, residential and industrial sectors;

5.7 To promote cycling as a popular transportation and also a relaxation tool among staff and students within the campus, while at the same time saving fuel consumption, and more importantly reducing emissions and air pollutions. Cycling is also a healthy transportation mode, encouraging cyclists to keep their muscles and cardiovascular systems active, and allowing them to relax their brains. Future development of the campus will therefore incorporate, where appropriate, a network of cycling lanes to promote inter-faculty and internal campus transportation.

5.8 To ensure to the extent possible sustainable procurement – meaning that while the government procurement procedures are strictly adhered to, companies producing or supplying items, products and materials, as well as those providing services to the university would observe sustainable practices in their operations;

5.9 To include sustainable design options for new buildings and facilities In the course of UMP’s expansion and growth. The design of new buildings or facilities by consultants shall include options for efficient energy consumption and environmentally sound practices, to ensure that the environment, both locally and globally, is not compromised. Such options would also state the extra costs that may incur, complete with the rate of investment (payback period). The final choice and decision, however, shall be left upon the jurisdiction of the university’s top management;

5.10 To embark on a programme to plant more trees as an integral part of the campus landscape which would not only help to make the campus looks green, beautiful and serene, but as a definite action to sequestrate carbon dioxide. UMP shall seek external partners in the

special forestation programme which is being implemented currently with the support of FRIM and other relevant agencies and authorities;

5.11 To undertake the responsibility to quantify and report annually the university CO2 emission to its stakeholders, as part of the university's self-checking exercise in gauging effectiveness of its energy savings and carbon reduction initiatives,

5.12 To encourage more research in the campus under themes that include energy efficiency, biodiversity, sustainability, renewable energy technologies, and sustainable indigenous technologies, as well as the importance of sustainability and environmental protection in its teachings;

5.13 To further enhance inter and extra-communications within students and staff as well as the local community on awareness related to energy efficiency, efficient use of natural resources, and environmental global warming issues through provision of training and awareness programmes;

5.14 To encourage students to establish energy and environmental clubs among faculties to support the implementations of this blueprint through projects such as conducting awareness campaigns, promoting 3E (Reduce, Reuse, and Recycle) and "gotong-royong" to clean-up areas in and around UMP.

6.0 UMP'S ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

With energy and environment sustainability becoming an agenda of high concern nationally and globally currently, reputable and environmentally-responsible organisations and companies worldwide are designing and implementing their own ways of ensuring sustainability in their operations through their own Environmental Management Systems (EMS). This Blueprint therefore acts simultaneously as **UMP's Environmental Management System (EMS)**. The teams and personnel involved in implementing both plans (EE-PLAN and ECR-PLAN) shall be simultaneously responsible for the implementation of the EMS. Where necessary, however, the university can establish a formal structure or unit for more effective implementations of the Blueprint and the EMS, separately, or jointly.

7.0 CONCLUSION

The Earth is our only home, and we therefore take it upon our responsibility to care for our home. As citizens of the earth we cannot completely live our lives clean without to some extent polluting and resulting in negative environmental impacts onto Mother Earth, but at least we should strive to the best of our CAPABILITY and WILL to minimize such impacts. As an institution of higher learning UMP is entrusted with even a bigger responsibility, conducting more actively frontier research to ensure the long-term sustainability of our beloved country

and the world. Equally important is our teaching – to ensure that engineers, technologists and other graduates that we train become new breed of professionals with far-reaching conscience and responsibility to continue the strife and struggle to make the Earth a beautiful and comfortable home to live, for all of us.