PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: FULL-SIZED PROJECT
THE GEF TRUST FUND

Submission Date: 3rd December 2009
Re-submission Date: 5th January 2010

PART I: PROJECT IDENTIFICATION

GEFSEC PROJECT ID: **PROJECT DURATION:** 48 months
GEF AGENCY PROJECT ID:
COUNTRY: Jamaica
PROJECT TITLE: Promoting Energy Efficiency and Renewable Energy in Buildings in Jamaica
GEF AGENCY(IES): UNEP
OTHER EXECUTING PARTNER(S) : University of the West Indies (UWI), with technical and advisory support from the Center of Excellence for Renewable Energy (a division of the Petroleum Corporation of Jamaica/Ministry of Energy), the Scientific Research Council of Jamaica, the University of Technology, the National Housing Trust, and the Private Sector Organization of Jamaica.
GEF FOCAL AREA: Climate Change
GEF-4 STRATEGIC PROGRAM: CC-SP1 Building EE
NAME OF PARENT PROGRAM/UMBRELLA PROJECT:

INDICATIVE CALENDAR	
Milestones	**Expected Dates mm/dd/yy**
Work Program (for FSP)	03/01/2010
CEO Endorsement/Approval	10/01/2010
GEF Agency Approval	01/01/2011
Implementation Start	03/01/2011
Mid-term Review (if planned)	03/31/2013
Implementation Completion	03/31/2015

A. PROJECT FRAMEWORK

Project Objectives:

- To demonstrate that far higher standards of energy and resource-efficiency are possible in building practices and policies in tropical and sub-tropical regions. This will require the construction of a prototype net zero energy, zero-carbon ‘smart’ building as a demonstration project in Jamaica, accompanied with active dissemination and training programmes. The project will develop some highly innovative and adaptive solutions, with both active control and passive design features, and an integrated design for maximum efficiency.
- The building will also be designed to withstand severe hurricane conditions, as most projections for climate change indicate that there may be a higher incidence of powerful hurricanes in future.
- Many of the components will be pre-fabricated and the building will be ‘designed for disassembly’; an advanced manufacturing concept that gives outstanding Life-Cycle performance and will also allow the development of a range of modular solutions, some of which could be retrofit to existing building types.
- However, the primary goal is to build an innovative new prototype that offers radically better solutions. This is a potential 'game-changer'; it will demonstrate that tropical and sub-tropical countries are not restricted to modest, incremental improvements which will do relatively little to solve the problem of climate change, but can move directly to far superior solutions that will transform energy efficiency and productivity in tropical and sub-tropical regions.
- This will result in improved building practices, which will have multiple benefits: increased energy efficiency, reduced CO_2 emissions, increased resilience to the anticipated impacts of climate change, reduced dependency on imported oil, reduced financial outflows, and increased competitiveness in international markets.
- There will be a strong emphasis on the involvement of architects, builders, planners, major purchasers and other stakeholders to ensure rapid uptake of the new building concepts. The overall objective is to influence both the supply and demand side of the market by demonstrating that advanced building solutions are both feasible and highly desirable.
- The project will assess the technologies and new building solutions, establish baselines, measure performance and estimate savings. All project components (below) will be fully documented.
- The building will be used as a demonstration model, but will also be utilized for a range of other purposes which will generate sufficient cash-flow to ensure indefinite financial sustainability.

Project Components	TA, STA or INV[b]	Expected Outcomes	Expected Outputs	Indicative GEF Financing		Indicative Co-financing		Total ($)
				($)	%	($)	%	
1. RESEARCH, PLANNING AND DESIGN Identification of new design parameters; identification, assessment, planning and development of zero net energy building system, sub-systems and component technologies.	STA	• Most efficient opportunities for radical energy saving through redesign and technological substitution identified. • Optimal solutions for achieving far higher EE in buildings in tropical and sub-tropical regions identified.	• Detailed assessment of energy demand pattern and associated opportunities for energy saving in buildings in tropical and sub-tropical regions. • Detailed assessment of highly energy-efficient technological solutions to building requirements in tropical and sub-tropical regions. • Highly innovative design solutions with high levels of EE, new combinations of EE technologies. • Design of core building systems including PV power supply, building control technologies, water and power management, waste management etc. • Development of a plan for a prototype zero net energy building. • Development of optimal prescriptions for achieving far higher EE in buildings in tropical and sub-tropical regions. • Development of solutions that can then be readily adopted by architects and builders; clients and buyers will	225,000	33	450,000	67	675,000

			be encouraged to demand far higher standards of performance.					
2. BUILDING ENVELOPE - DETAILED DESIGN AND BUILD Design and construction of a prototype 'smart' zero net energy building that will supply its own energy (electricity and gas), operate its own waste treatment facility, and be built to survive hurricane conditions.	STA& INV	• Design parameters for building sub-systems and components showing how they can be developed and assembled in integrated forms to give zero net energy demand. • High resilience of buildings to severe hurricanes and therefore adaptation to climate change. • Market transformation by changing buyer expectations and demands, improvement of building standards and practices, improvements in the building material supply chain. • Increased standards for building services including deli-very of water, cooling, and lighting.	• Identification and procurement of suitable building site for prototype smart zero net energy building. • Assessment and identification of suitable building forms and materials to give far higher energy efficiency and performance and withstand anticipated impact of climate change. • Development of building components (see item 3 below) and assembly into modular systems, and construction of prototype building. • Promoting viable solutions to reduce environmental impacts and vulnerability to climate events. • Identification of building construction options that give far superior EE performance, development of technological solutions that 'design out' problems.	800,000	33	1,600,000	67	2,400,000
3. BUILDING TECHNOLOGIES, SYSTEMS AND SUB-SYSTEMS Designing and installing components for the zero net energy prototype smart building	TA & INV	• Building components developed and assembled to demonstrate the feasibility of a zero net energy building, integrating advanced technologies for electricity supply, lighting, cooling and insulation, water supply and	• Identification of optimal building technologies and solutions for tropical and sub-tropical climates with high ambient temperatures and humidity. • Completed design and installation of integrated technological solutions and all	800,000	33	1,600,000	67	2,400,000

		treatment, and gas supply • Increased investment in far more efficient lighting, heating and cooling solutions. • Faster phase-out of existing, inefficient technologies (such as incandescent lights which can be replaced with e.g. LED and light-emitting wall systems). • Higher volume and improved quality of EE products in market. • Transformed markets for lighting, heating and cooling technologies in Caribbean and other tropical and sub-tropical regions. • Use of prefabricated modules and ‘design-for-disassembly’ building manufacturing processes	associated building components. • Energy efficiency ratings for both components and for the integrated combinations and solutions. • Development of modular technological combinations and solutions and ‘design for disassembly’ processes.					
4. MONITORING AND EVALUATION	STA	• Efficient development, management and maintenance of the prototype. • A continuous learning process leading to the development of even more advanced solutions in future. • Improved quality assessment and quality control processes.	• Continuous assessment of the performance and efficiency of the building and building sub-systems. • Audits to model consumption and the relationship with usage pattern, external temperature, and humidity. • Audits to monitor the long-term performance and	200,000	33	400,000	67	600,000

			efficiency of the power, heating, cooling and water treatment systems. • Building energy and resource-use benchmarks and performance levels established, and identification of opportunities for further improvements. • Assessment of program impact. • Assessment of relevance of Building Baselines for Energy Efficiency Transformation [BBEET] for tropical and sub-tropical regions in comparison to outputs of this project.					
5. DISSEMINATION Training, workshops, publicity, awareness raising, stakeholder involvement.	TA	• The multiple benefits of highly EE buildings, the use of alter-native energy solutions and the importance of greater EE disseminated through media and workshops. • Increased market demand for higher energy, environmental and technical standards in buildings. • Increased availability and improved quality of key technologies (such as PV systems) in market. • Increased construction of highly energy and resource efficient buildings in the Caribbean and	• Prototype to serve as dissemination point for information and materials on best practices. • Higher market expectations for energy efficiency, environmental and technical standards for lighting/cooling in buildings. • Workshops and training programmes for relevant professionals. • Architects, building engineers, power utilities and other relevant experts aware of advanced new options. • Key agencies e.g. National Housing Trust and construction companies recruited to ensure uptake of ideas	100,000	33	200,000	67	300,000

		other tropical and sub-tropical regions. • Financial benefits of greater energy and resource efficiency understood by the public, housing agencies, banks, power utilities etc. • Avoided CO_2 emissions through gradual replacement of existing buildings with far more efficient buildings. • 'Virtuous cycle' of continuous improvement of energy and resource-use efficiency and standards.	• Policy makers understand the scope for dramatic improvements in building performance, encouraged to amend building codes and planning guidelines accordingly to achieve far higher EE in buildings. • Technical reports with lists of recommended building solutions and recommendations for use compiled. • Dissemination and sharing of information with Caribbean nations via e.g. the Caribbean Community administration in Guyana and the Caribbean Climate Change Centre in Belize, dissemination and sharing of information with other tropical and sub-tropical regions.					
6. Project management				236,000	36	450,000	64	686,000
Total Project Costs				2,361,000		4,700,000		7,061,000

** TA = Technical Assistance; STA = Scientific & technical analysis; INV = investment

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and by NAME (in parenthesis) if available, ($)

Sources of Co-financing	**Type of Co-financing**	**Amount**
UNEP	In kind (technical assistance, networks)	150,000
Government of Jamaica contribution	In kind (Ministry support)	250,000
IADB	Cash [1]	400,000

[1] The IADB contribution is still under negotiation; final confirmation is not expected until June 2010 or shortly after. If the contribution is confirmed, the US$400,000 would be allocated under project component 2 (building envelope), as the IADB interest is in researching and developing the systems needed to make buildings better able to withstand the kinds of weather conditions anticipated as a result of climate change. GEF will be kept informed

Private sector (hotels, construction companies, etc.)	In kind (management participation, advice, some donated materials and labour)	600,000
University of the West Indies	In kind (land for building, building services, staff time)	3,300,000
Total co-financing		4,700,000

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT ($)

	Previous Project Preparation Amount (a)	Project (b)	Total c = a + b	Agency Fee
GEF financing	0	2,361,000	2,361,000	236,100
Co-financing	0	4,700,000	4,700,000	
Total	0	7,061,000	7,061,000	236,100

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)

GEF Agency	Focal Area	Country Name/ Global	(in $)		
			Project (a)	Agency Fee (b)	Total c=a+b
UNEP	Climate Change	Jamaica	2,361,000	236,100	2,597,100
Total GEF Resources			2,361,000	236,100	2,597,100

PART II: PROJECT JUSTIFICATION

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

The global issues

Buildings account for over a third of world total energy use and associated greenhouse gas emissions. Some 10-20% (depending on building type) of the total life-cycle energy consumed is used for the manufacturing and assembly of building materials, construction, maintenance, refurbishment and demolition. Some 80-90% is used, over the life of the building, for heating, cooling, lighting and ventilation, house appliances and so on. It is therefore important to focus primarily on making buildings more efficient, so that they are easier and cheaper to heat, cool, light, ventilate and so on.

A range of retrofit solutions are now available, but these can only offer incremental improvements, which can only make a relatively minor contribution to resolving the problem of climate change. To put this in context; in order to ensure that the temperature rise remains below 2 degrees, IPCC estimates suggest that it would be necessary for the OECD nations to peak their emissions by 2012 (2015/16 at the latest), and fully decarbonise their economies by 2030, and the non-OECD nations to peak by 2025, and fully decarbonise by 2050. This is

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as to progress with the negotiations with the IADB, and the budget will be revised as appropriate if the negotiations are successful.

unlikely to happen; China's preliminary assessments indicate that China's carbon emissions will not peak until 2030-2040, or perhaps 2050. The particular significance of this is that on business-as-usual growth projections, China will by then be emitting almost as much carbon (equivalent) as the USA, India and the EU combined. This means that the temperature rise is now likely to be at least 4 degrees.

The demand for energy will continue to rise, however, as a result of three powerful drivers of increased demand; some 30% of the world's population still do not have energy services, the world's population is currently projected to increase to over 9 billion, and more energy will be needed as more countries industrialize. Current IEA projections indicate that energy demand will grow by over 50% by 2030, with developing countries representing over 75% of that increase, so that demand for oil will increase by almost 40% and coal by almost 75% over the same period. This will significantly increase emissions of carbon dioxide, thereby accelerating climate change.

The only way to avoid this outcome is to develop new, low-carbon energy sources that can supply the volumes required, and to implement radically more energy-efficient solutions to meet human needs. It is particularly important to develop solutions that are designed for developing countries, as these countries will otherwise become the primary drivers of accelerated climate change.

Many developing countries are in the tropical and sub-tropical regions of the world. The main building-related demands in the tropical and sub-tropical regions are generated by air conditioning, lighting, water heating and appliances, so these areas will be the main focus of this project.

The consequences of oil-dependency for developing countries

Oil prices will become more volatile with the approach of peak oil. The nations that are most vulnerable to volatile oil prices are poor countries with high levels of oil imports compared to their GDP, high current accounts and external debts, and whose access to global capital markets is limited, partly because economic dependency on oil (i.e. the GDP/energy ratio) in such countries has not declined to the same extent as it has in developed nations.

The multiple impacts of a rise in the price of oil can be seen in a country like Jamaica. Jamaica is an oil importer (relying on imported oil for over 95% of energy requirements) with relatively weak economic performance. Oil imports exceeded US$1bn for the first time in 2004/5, and rose to US$2.7 billion in 2008, which had serious implications for the balance of payments, inflation, business competitiveness and household poverty. In addition, recent proposals to include airlines in national carbon emission totals and co-opt them into carbon trading schemes will have implications for airfares. This could reduce earnings from tourism and related services; by far the largest source of foreign exchange for the Caribbean region.

Another rise in the price of oil could therefore disrupt a number of relatively fragile economies, resulting in an increase in emigration, an outflow of skills and capital, and an increased rate of illegal activities as legitimate development options erode. Rising crime rates and eroding security deter investors, thus delaying recovery and precipitating a further downward spiral.

In order to reduce this vulnerability to rapid movements in the price of oil, countries must radically improve their energy efficiency and invest in alternative (non-hydrocarbon) energy sources.

The implications of climate change

Many poor developing countries are also particularly vulnerable to climate change. Jamaica, for example, is a small island nation; a significant part of the housing stock and economic and transport infrastructure is in areas that are likely to become vulnerable to sea level rise, increased incidence of severe weather, flooding and storm surge. Over time, zoning and planning can gradually move people and the infrastructure into safer areas, but this will take decades.

Jamaica has already suffered a number of serious natural disasters. There are areas that suffer regular flooding. Hurricane Gilbert struck the southern coast of Jamaica in 1988 and caused extensive damage to housing, electricity infrastructure and the agricultural sector. Hurricane Ivan in 2004 also did significant damage, especially on the south coast.

These events highlighted several key weaknesses. Relief efforts were seriously handicapped by the lack of electricity in the affected areas and consequent inability to operate lighting, chillers, refrigeration (for e.g. medicines), pumps, communication networks and so on. Electricity is not usually available in the critical disaster and post-disaster periods when these facilities are most needed. This problem arises directly from the centralized generation of electricity and the network of distribution systems. These systems, especially the distribution poles and lines, are usually physically damaged during a hurricane or similar disaster, and it takes time to bridge the broken sections. Some individual sites have standby generators, but the majority of the population are vulnerable. The development of more self-sufficient buildings with decentralized sources of energy such as biogas and photo-voltaics is therefore an essential part of disaster preparedness.

The treatment of waste is also of vital importance. Hurricanes cause floods, which make sewers and septic tanks overflow. This, in conjunction with the bodies of drowned people and animals, can make the surrounding water a vector for virulent disease, especially in hot countries. One partial solution to both problems is to ensure that more buildings have secure solar-powered bio-digester tanks, partly in order to contain the sewage produced, but also to contribute to their own energy supply.

It is also important to ensure that all new construction is built to withstand hurricanes and the associated flooding and flying debris in order to reduce fatalities, as most current projections for climate change indicate that the incidence of severe hurricanes and cyclones in the tropics is likely to increase in future.

Energy use in Jamaica

Energy audits of buildings in Jamaica (Green, 2004[2]) indicated an exceptionally low standard of energy efficiency in buildings in Jamaica. Energy use depends, of course, on a number of factors, of course, including occupancy level, appliances and equipment present, the weather and operating hours. Controlling for these variables indicates that a modern building, using currently-available technologies, would use on average 40% less energy than the average residential house in low-income urban, inner city and rural areas in Jamaica, 50% less energy than the average affluent urban and suburban house, and 70% less energy than the typical commercial or light industrial building in Jamaica.

Much of this energy is not used to good effect. Most low-income houses in urban areas in Jamaica have slab concrete (with a high thermal mass) or metal roofs (with little insulating value), and the houses are usually very tightly clustered, which results in poor ventilation and thus a need for forced ventilation to make conditions bearable. Nearly all of these houses are therefore equipped with fans, but these mainly serve to vent heat and re-circulate hot air.

Most energy-saving measures would be highly cost-effective in this environment. For example, the installation of modern, efficient lighting systems would have an average payback period of six years, while a move to water-cooled condensing units for air conditioning would have an average payback period of 3.5 years.

Far more significant gains are achievable, but these would require changes in design to include, for example, proper building orientation, roof design and radiant barrier systems. These enhanced design solutions are the focus of this project.

The specific contribution of the project

[2] Green, E, 2004. An Analysis of the Efficiency of Energy Use in Jamaica's Built Environment and the Implications for National Sustainable Development. PhD thesis, University of the West Indies.

Jamaica's oil demand is primarily represented by the transport sector (land, sea and air transport) which accounted for 37% of total petroleum consumption in 2008, the bauxite industry, which accounted for 34% and electricity generation, which consumed 23% for domestic power, lighting, heating and cooling, as well as street lighting and commercial premises. With regard to electricity generation, the total size of the public electricity system is currently 818 MW[3], another 200 MW is self-generated by industry (mostly the alumina and sugar sectors). This project will focus on the built environment and on domestic and office consumption, for three reasons:

- The industrial and transport sectors are better able to adjust to rising prices, but the building stock turns over slowly and therefore has a long lag time behind the onset of new economic and environmental pressures.
- Domestic consumption (mainly for cooking and lighting) only accounts for 3% of national oil demand directly, but domestic and office electricity consumption account for much of the public electricity demand, because the main sectors of industry generate their own power, and therefore account for a significant fraction of national oil demand. It is conservatively assumed here that a net total of 15% of oil demand is used in the domestic sector in the form of electricity (i.e. 65% of total electricity demand), plus 3% of oil demand used directly, giving a total of 18% of national oil demand used in the built environment.
- Most of the settlements and related infrastructure are in areas that are likely to become vulnerable in years ahead.

The proposal is to develop highly energy-efficient solutions that can help to make houses more self-sufficient. To do this, a working prototype needs to be constructed followed by the dissemination of cost-effective solutions that can be readily adopted by architects and builders. Models and lessons are likely to have widespread applicability in most other developing countries with similar climatic conditions.

There are numerous opportunities for reducing energy consumption in buildings. Many of these have short payback periods (see above), with both economic and environmental advantages. This raises important questions as to why standards of energy efficiency in buildings are still so low in developing countries like Jamaica. Some of the main reasons are as follows:

- There is an economic disconnect between architects, builders and purchasers. For example, builders have little incentive to construct efficient buildings if the benefits largely accrue to the occupants; any additional costs must be passed on, which requires a change in consumer behavior. The life span of a building is typically 30-100 years, so the benefits will not entirely accrue to the first purchaser, but must be passed on to several generations of owners.
- There is a parallel fragmentation of the building process. There is little incentive to integrate different building functions (planning, engineering, architecture, energy systems, use patterns and so on), even though the greatest efficiency gains require such integration.
- There are low levels of awareness and technical knowledge as to opportunities for cost-effective improvements.

As a result, architects under-specify and builders under-invest in energy-saving designs and materials. This market failure can be solved; the solution will require a comprehensive set of building solutions and incentives for innovation, awareness-raising measures, proper standards and rating systems, and various forms of market suasion, such as energy pricing and tax incentives for relevant investments.

Recent research (in the UK, France, Denmark and the USA in particular) has established that it is now technically feasible to construct buildings with zero net energy demand. This involves a combination of very high levels of energy efficiency with photovoltaics and other energy-generating technologies used to meet residual demand, using battery storage or the grid (with a reversible meter) as back-up. Very significant efficiency gains can be made by introducing LED lighting and the use of wall coatings to control humidity, advanced appliances (such as

[3] The public system is owned by the Jamaica Public Service Company (about 621 MW), and independent producers and self-generators (about 197 MW).

insulated refrigerators) can now reduce consumption by over 90%, and solar-powered air conditioning units offer a highly cost-effective solution to humid, tropical climates.

This would make it, in principle, possible to displace approximately one-quarter of global primary energy demand. Preliminary research by the UN Industrial Development Organization in countries such as India has experimented with the use of cheap local materials in house construction to achieve very significant energy savings, thus suggesting ways in which the initial additional costs of construction could be reduced to the point where they become affordable even in poor communities.

The goal of this project will therefore be to develop better technical solutions through integrated building systems, and show how this can be done in a cost-effective manner.[4] These lessons will then be disseminated to planners, builders, engineers, developers and consumers, in order to change market behavior.
In summary, this project has four key goals:

- To make houses more energy-efficient in order to reduce operating costs, environmental impacts and oil imports.
- To develop decentralized energy solutions, so that a number of buildings have viable sources of power for essential purposes in a post-hurricane situation when power lines are down. It will be impossible to construct a sufficiently large number of shelters, and many people chose to stay in their own homes, mainly because of the threat of looting. It is therefore essential to find ways to ensure the survival of as many people as possible.
- To find cost-effective solutions, so that these ideas can be incorporated into both existing and new buildings in developing countries.
- To identify optimal energy policies, practices, solutions and technologies for tropical and sub-tropical regions, and to ensure that these are developed, transferred and implemented via research, teaching, training and advisory programs.

Dissemination and spin-off of findings and results

The project will develop new construction concepts using energy and resource-efficient materials, designed to minimize consumption and increase resilience to climate conditions. This will require the construction of a prototype net zero energy, zero-carbon ‘smart’ building as a demonstration project, followed by dissemination programmes. The project will demonstrate options for significantly upgrading building performance. These energy-efficient solutions will be actively disseminated into the construction industry and related professions, initially in Jamaica and then across the Caribbean region, to ensure rapid uptake of the smart building concept.

The goal here is a long-term transformation of housing policies, building practices and eventually the building stock itself; a progressive evolution toward life-cycle socioeconomic and environmental optima.

Technical specifications for the prototype building

The building will be a computer-controlled, smart, net zero energy, zero-carbon building[5]. It will be highly energy-efficient, supply most of its own water, electricity and gas, operate its own waste treatment facility, and be built to survive hurricane conditions.

Much of the expertise in net zero energy building design and construction resides in the advanced economies. For example, on 12th March 2008, the UK Government set a target of making all new schools and domestic buildings

[4] Technologies to be used may include low emissivity glass; LED lighting controlled by motion sensors; wall coatings to control humidity; solar-powered air-conditioning and refrigeration units etc. with thin film cadmium telluride PV mounted in active arrays for power; battery storage and the grid (with a smart meter) as back-up; a solar bio-digester plant to process sewage and produce methane for cooking; and roof designed for rain water catchment with ion-exchange, reverse osmosis or solar distillation to purify the water.

[5] These two terms are effectively equivalent, in that a building that has net zero energy demand does not generate any net carbon emissions while in use; this does not include any carbon emissions associated with construction or removal.

zero-carbon by 2016, and all non-domestic buildings by 2019. On 23rd April 2009, the European Parliament agreed to amend the Energy Performance of Buildings Directive to require that by 2019 all new buildings must be net zero energy; i.e. that they produce the same amount of energy that they consume. This does not require buildings to be self-sufficient in power, but allows for cost-effective balancing of supply and demand; buildings may purchase energy from the grid when their loads exceed their generating capacity, and sell energy from their on-site generation technologies back to the grid when their loads are low. There are now some advanced prototypes, such as the Green Lighthouse building, opened on the 20th October 2009, which now houses the Faculty of Science at the University of Copenhagen. This uses natural ventilation and shading to reduce the need for cooling, high glass windows and overhead skylights to provide natural lighting, solar cells to produce electricity, and has a small façade to reduce the need for central heating.

There are some critically important differences between these developments and the proposed prototype in Jamaica. These are as follows:

- In tropical and sub-tropical regions the goal is to keep the interior of buildings cool in a hot climate, not warm in a cold climate. This is more technically challenging, and will require a mixture of passive and active design, and the ability to monitor and respond to varying usage patterns.
- The usage pattern may change more dramatically than is likely to happen in countries like the UK or Denmark. In the latter, power demand will be relatively predictable, with daily, weekly and annual cycles. Daily demand will rise when people arrive at work, the weekly cycle will follow the working week, and dip at the weekends, while the annual cycle will show the seasonal variations of the heating and cooling demand. In regions that experience hurricanes and cyclones, however, it is essential to allow for the effect of extreme events, which will be superimposed on normal usage patterns. In Jamaica, for example, the hurricane season lasts six months (June 1st – November 30th), and this imposes significantly different design requirements.

Some of these different design requirements are as follows:

- The building itself must be designed to withstand the most severe hurricane conditions, especially as most projections for climate change indicate that there may be a higher incidence of powerful hurricanes in future. As the building will be for public use, it must therefore be designed to operate as a hurricane shelter in the event of a major storm. This in turn has a number of practical implications, as the occupancy of the building is therefore likely to be higher than normal during a hurricane. This means that demand for energy, water and sanitation is likely to peak at the same time that external supplies are most likely to fail.
- There is a need to have more internal storage to allow the building to operate off-grid (independently) for longer periods. This period will typically start before a hurricane, as the grid is usually powered-down when a hurricane is imminent (in order to ensure that any broken high-tension cables are not live), and will last for an extended period after a hurricane, as a severe hurricane usually does significant damage to the transmission system, almost all of which is above-ground. This means that the grid is often unavailable for many days after a storm. Thus before, during and after a hurricane, there may be no external power, while the building load is likely to remain high.
- Another requirement is that the building power systems (including the transformer and storage systems) must be in strengthened containment (or underground) to ensure that the core building systems can survive even a direct hit from the eye-wall of a category 5 hurricane.
- It is also essential to allow for stand-alone water capture, storage, filtration and pumping. Water systems may also be locked off in the aftermath of a hurricane, as flooding and landslips result in a surge of sediment into the system, and as landslides can also fracture distribution pipes. This means that it is important to ensure that the building can continue to supply water and process sewage and waste water for an extended period without external supplies.
- It is also necessary to design with a level of redundancy; i.e. there must be multiple systems in order to guarantee that the building can continue to function even if one system fails. For example, both the solar water heaters and the methane digester (see below) can be used to supply hot water to the building, so that the building can continue to operate even if one system is damaged in a hurricane.

The building will be designed for maximum use/occupancy, so that it doubles as a showcase for advanced energy management, and as a useful university facility, as well as serving as a shelter in the event of hurricanes. The current concept is that the building would comprise:

- 1 large conference/seminar room with videoconferencing facilities, and flexible partitions to allow the room to be subdivided for smaller groups. This would also allow the building to be immediately adapted for use as a hurricane shelter, with partitions used to separate e.g. common living areas from emergency medical treatment rooms for casualties.
- 2 or 3 offices for the building staff. As these will be permanent (non-flexible) spaces, they may be built in an annex to the main building.

Our costs assume that it will be a single-storey, 375m² building, which gives useable interior floor-space of 325m² after allowing for external walls and interior partitions. This is based on two factors. One is that in the event of a disaster, a building this size can be used to provide shelter for 100 people, allowing 3.25m²/person (sufficient for everyone to lie down). The other is that the roof space required for a 20 kW thin film solar array (see below) is about 375m². These two factors determine the size of the building.

Electricity

This will be based on a cost-effective, state-of the art photovoltaic (PV) system, provisionally 20 kW. There are various types of PV cells are available, but the least expensive modules today are thin films made of cadmium telluride. The efficiency of this module is about 9-10%, which is less than the amorphous or single crystal silicate module; but the technology is advancing fast and the prediction is that the efficiency will increase to 14% within a year. This efficiency will then match the efficiencies of other competitive PV cells[6].

This will be an active solar system. The solar cell array will be mounted in aluminium frames with small motor-driven sun-seekers that will control the tilting angle and orientation to track the sun, and so receive maximum radiation from sunrise to sunset. These will be controlled by the central building computer, which will also track hurricane warnings, and will lower the solar arrays to a zero angle before a storm arrives to minimize damage from flying debris.

This will be combined with industrial deep-cycle battery storage, a DC-AC 110/220 volt converter, and a smart meter to allow the building to (a) supply power to the campus and (b) source power from the campus during non-hurricane conditions in order to balance supply and demand.

This system will provide power for lighting (LEDs), the building computers and control systems, water heating, chillers and refrigeration units.

This element will entail designing, developing and installing the system and the software, the thin-film or silicon cells (provisionally 130W), support structure, sun-seeker drive motors, industrial deep-cycle battery storage (estimated life of 10-25 years) with cables, housing and ventilation, the inverters, voltage regulators, transformers, converters, interconnect wiring kit and system, lightning protection and sub-array kit, timing and switching sub-system, monitoring and recording system, instrument housing, monitoring and instrumentation enclosures, raceways and conduits, testing and commissioning.

Gas

This will be based on a solar biodigester plant which will take sewage from the building (and possibly adjacent buildings as well). This will be connected to a methane storage tank. Some of the methane will be piped to the kitchen, for cooking, the rest will be piped to a methane-burner, used to supply hot water. The main biodigester plant, gas storage tank and pipes will be underground, both for safety and in order to ensure that the system will continue to operate in a disaster, without leakage.

[6] One of the project goals is to reduce the cost of PV systems by improving the technical capacity in Jamaica to design, operate and maintain PV systems. By developing the technology to do much of the work locally, thereby reducing capital costs, solar cells could be supplied at significantly lower costs, which would assist market promotion.

Water

The roof of the building will be designed as a rain water catchment, supplemented by an inverted funnel catchment over a main butyl-coated storage tank of 20,000 litres ($20m^3$) capacity[7]. Water from the water catchment would be screened to remove coarse debris, then filtered, chlorinated, then de-mineralized with ion-exchange[8] to bring it to potable quality, before being pumped into the main storage tank. Water for sanitation will be screened and filtered, but by-pass the chlorinator and de-mineralizer. The main tank will have a solar-powered outlet pump, but will sit on a raised concrete platform so that there is a minimum 10 day supply that can be gravity-fed to the main building. This will ensure a supply of water even if the power systems fail.

The main storage tank will also be connected to the National Water Commission main line as a back-up system to allow for maintenance of the water catchment system.

Hot water will be supplied by a solar water heater (either one of 2,000 litre capacity or a double unit of 1,000 litres each, with primary (closed) and secondary (open) circuits). These would require a small pump to lift water from the main storage tank back up to the solar water heaters, which would be mounted on the roof.

Efficiency

- The building will be highly insulated to eliminate solar gain.
- The windows would be low emissivity glass, with powered accordion (folding) shutters. These shutters will be controlled by the central building computer, which will also track hurricane warnings, and will close the shutters before a storm arrives.
- Internal building lighting will be LEDs or wall-coatings.
- Motion sensors will be used instead of mechanical switches in order to maximize efficiency and minimize wastage.
- Motion sensors will be used instead of mechanical taps in order to eliminate water wastage.
- Surface coatings will be used to control humidity. Other surface coatings will be used to enhance natural light gain.
- The orientation and façade of the building will be designed to maximize passive cooling and minimize heat gain.

Security

Jamaica has a high level of crime, corruption and larceny, typical of many poor or middle-income developing countries, but higher than most. This means that the building itself must be designed to control unauthorized access, any externally-mounted equipment (such as the PV panels) must be designed to prevent illegal removal, and access to the roof must be controlled with fencing and monitored with trip-wires and CCTV.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL PRIORITIES/PLANS:

The National Development Plan and Medium Term Socio-Economic Policy Framework 2009-2012 (MTF) in Section B of the National Priorities/Plans section of the Vision 2030 Jamaica has four goals, one being that Jamaica has a healthy natural environment. The project will address Outcome 14: Hazard Risk Reduction and Adaptation to Climate Change. The project will also address Goal 3 of the MTF, which is to ensure Jamaica’s prosperity, and one key national outcome, which is energy security and efficiency.

Jamaica Energy Policy Green Paper 2006 – 2020 identified energy conservation and efficiency as a strategic objective to ensure the country's energy security and cost effective use of energy sources.

[7] Assumptions: sufficient water to support 100 people for 10 days with no external supply, at a minimum requirement of 15 litres/person/day, plus a ~30% margin of safety. A 20,000 litre tank will support 133 people, which gives an adequate safety margin.
[8] Solar distillation or reverse osmosis are also options but are usually more energy-expensive.

In 2008 the Ministry of Energy prepared an energy conservation and efficiency policy for the period 2008 - 2022. This focuses on public and private sectors (households, industrial, commercial, tourism) transport, codes and standards, renewable energy technology, the institutional framework and human resource development. Section 3.15, titled 'Establishing the building code and energy efficiency codes as mandatory standards' notes that it is much more cost-effective to insert ECE features at the design stage of a system or a facility than to try to retroactively upgrade energy performance after construction. The government now intends to make the new national building and energy efficiency codes mandatory standards for new constructions, as well as for the upgrading of existing buildings.

An energy efficiency building code was developed by the Jamaica Bureau of Standards in 1990. This code was welcomed by all key stakeholders, but it was not promulgated or made mandatory at that time. However, the energy code has now been reviewed and updated by the Jamaica Institution of Engineers (JIE) and the Jamaica Bureau of Standards; it is now ready for promulgation and incorporation as a mandatory building code. At the time of the submission of this application, the gazette notices for the following nine (9) Application Documents have been submitted by the Bureau of Standards Jamaica (BOSJ):

- Jamaica Application Document for the International Maintenance Code (IMC)
- Jamaica Application Document for the International Existing Building Code (IEBC)
- Jamaica Application Document for the International Fire Code (IFC)
- Jamaica Application Document for the International Private Sewage Disposal Code (IPSDC)
- Jamaica Application Document for the International Building Code (IBC)
- Jamaica Application Document for the International Property Maintenance Code (IPMC)
- Jamaica Application Document for the International Energy Conservation Code (IECC)
- Jamaica Application Document for the International Plumbing Code (IPC)
- Jamaica Application Document for the International Fuel Gas Code (IFGC)

The New Building Act for which drafting instructions are now being prepared will make compliance with these codes mandatory. It is estimated that the codes will give a 40% improvement in energy efficiency compared to current levels, which are relatively modest.

New housing completion rate

Year	2002	2003	2004	2005	2006	Average	Total
Total Number of housing completions	5,544	3,967	5,832	4,186	3,600	4,625	23,129

Source - PIOJ - 2006 S&ES

The typical energy use for a domestic residence is 2,160 kWh/year. If the new housing completion rate remains reasonable stable over the period 2009 to 2014 then the application of the New Building Act will save approximately 19,983 MWh (about 13,322 barrels of oil equivalent) and 23,780 tons of CO_2 emissions. Actual savings could exceed this, because these estimates neither include potential savings from the commercial building sector, which would be significantly higher, nor the possible gains through retrofitting EE technologies to existing buildings.

This proposed project will make two particularly important contributions:

- First, the new building codes will just set a basic minimum standard, and it is unlikely that there will be universal compliance. The construction of a zero-carbon prototype building will demonstrate that far higher standards are feasible, cost-effective and highly desirable.
- Second, building codes are a regulatory approach; they seek to make certain minimum performance standards mandatory. In a situation where there are known problems with enforcement and compliance, this is *necessary* but not *sufficient.* It is therefore essential to demonstrate that far higher standards are cost-effective and desirable, so that clients will demand better performance and buyer-behavior will change. It is essential to influence market demand, while simultaneously educating architects, engineers and builders in the new ideas and solutions.

This project is therefore highly consistent with current national priorities and plans, but will add very significant value by:

- Making it more likely that there will be compliance with the building codes
- Demonstrating the feasibility and desirability of higher standards, and thereby influencing market demand
- Informing and training architects, engineers, and builders so that they can utilize the new ideas and solutions
- Allowing performance standards to further increase in the future

C. Describe the consistency of the project with GEF strategies and strategic programs:

- **Error! Reference source not found.**Energy Efficiency in Buildings is a high priority in the current GEF CC strategy.
- This project supports an integrated systems approach to buildings as mentioned in the CC Strategy.
- This project supports key features of sustainable buildings, including efficient cooling and lighting.
- This project contributes to a number of high priorities in the Caribbean, SIDS and other developing countries, including adaptation to climate change, the affordability of buildings, indoor health, minimized resource use and economic development.

D. Justify the type of financing support provided with the GEF resources:

As the financial mechanism of the United Nations Framework Convention on Climate Change (UNFCCC), GEF will assist Jamaica to reduce the consumption of fossil fuel for energy generation to be used in buildings through the provision of a grant that will be used (i) to fund incremental costs related to the design, demonstration, and use of innovative building modules that will radically increase energy efficiency; (ii) to support capacity building of key actors. The GEF financing of $2.36 million will allow the leveraging of $4.7 million as co-financing, i.e., US$1 from the GEF allocation will be matched by about US$2 from national and multilateral sources and the private sector.

GEF grant financing will allow Jamaica, which has limited access to alternative sources of financing, to undertake this type of EE activity, which otherwise would not be done. The expected follow-on investments and benefits will be further evaluated during Project Preparation Grant (PPG) phase.

E. Outline the coordination with other related initiatives:

- This project will link up with the proposed GEF-financed global project, the Building Baselines for Energy Efficiency Transformation (BBEET) project and the ongoing GEF-financed Global Market Transformation for Efficient Lighting project, both undertaken by UNEP as well as relevant networks of partners in the Caribbean and beyond. Activities will also be coordinated with regional and national initiatives in the Caribbean to promote EE in buildings.
- UNEP will ensure that appropriate external and internal arrangements will be made with regard to the execution of the project and that the activities under the project will be properly coordinated with the two global GEF-financed projects.
- UNEP's Sustainable Buildings and Construction Initiative (SBCI) is a UN partnership established to promote more sustainable buildings, which includes increasing their energy efficiency. SBCI works in cooperation with other international sustainable buildings initiatives, including the Marrakech Task Force on Sustainable Buildings and Construction (MTF), the Energy Efficiency in Buildings project of the World Business Council for Sustainable Development (WBCSD), and the World Green Building Council (WGBC). The UNDP/World Bank (WB)/Inter-American Development Bank (IADB)-GEF has a portfolio of building-related projects; past projects that have mainly focused on mandatory codes, district heating systems or ESCOs. UNEP-GEF also supports National Cleaner Production Centres; their activities have included audits and ESCOs in buildings.

- SBCI brings together experts from around the world to promote energy efficient buildings. Global targets in developed countries now aim for zero emissions from new buildings, and to reduce emissions from existing buildings by half. These techniques and technologies will be made accessible to all participating countries through these global activities.
- Data from this project will also be fed into a global benchmarking of the performance of buildings, which is to allow countries to compare their building performance to global averages and targets.
- Data from this project will be used to support the New Building Act in Jamaica, and to inform the next revision of the Building Act.
- The project team at the University of the West Indies will work closely with key stakeholders, including the Office of the Prime Minister (which recently incorporated the former Ministry of the Environment), the Ministry of Energy, the Center of Excellence for Renewable Energy at the Petroleum Corporation of Jamaica, the University of Technology, the Scientific Research Council, the National Housing Trust and the Private Sector Organization of Jamaica to utilize their expertise and resources, to accelerate the development of solutions and promote the dissemination of new ideas. These organizations will be represented on the Project Steering Committee. Detailed arrangements for establishing stakeholder working groups and other relevant consultations during project execution will be prepared during the PPG phase.
- The countries in the region will be kept fully informed of the findings and results under the project through the active dissemination and sharing of information with CARICOM nations and the Caribbean Community Climate Change Centre (5Cs) based in Belize. Working groups will be established between UWI and these regional organizations to coordinate regional workshops and activities for promoting EE in buildings throughout the Caribbean region.

This project has been reviewed and approved by the Planning Institute of Jamaica, the Office of the Prime Minister (incorporating the functions of the former Ministry of the Environment), the Ministry of Local Government, the Ministry of Energy, the National Housing Trust, and the National Environmental and Planning Agency.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING

- The linked problems of climate change and energy security will not be solved without significant improvement in the performance of buildings. The greatest need for new and more cost-effective technological solutions lies in tropical and sub-tropical countries, as it is more technically difficult to keep the interior of a building cool and dry in a hot, humid climate than to keep it warm in a cold climate.
- Levels of energy efficiency in buildings in countries like Jamaica are currently low. This means that the building sector has a considerable potential for positive change, to become far more efficient in terms of resource use, less environmentally intensive, and less costly.
- However, there are still a range of technological, economic and marketing barriers to widespread uptake. This project will help to resolve those barriers. For example, the project will provide a cost-benefit analysis of each energy efficiency option, and explain the pay-back period, so that consumers can make better decisions.
- Integrated solutions offer greater efficiency gains, while the integration of building and appliance design will allow costs to be factored in to selling prices, thus de-fragmenting the market place and removing the main financial disincentive to adoption.
- This is therefore a key mitigating opportunity for greenhouse gas emissions.
- These lessons will be disseminated across Jamaica, the Caribbean and beyond, to other tropical and sub-tropical regions, thus achieving a wide impact and a significant multiplier for the investment of GEF and UNEP resources.

- The University of the West Indies serves fifteen Caribbean nations, who will be included in the initial round of dissemination. Thus the project will assist a number of developing countries to meet their obligations under the UNFCCC.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MEASURES THAT WILL BE TAKEN:

The main challenges in the planning and development phase will be technological, i.e., finding, evaluating, developing and implementing cost-effective solutions. The main challenges in the dissemination phase are that this will require persuading and convincing the relevant players, including the construction industry. The building industry usually sells buildings on the basis of cost, location and perceived quality, not EE. The first priority is to demonstrate feasibility and desirability. Further uptake may require further amendments to the building codes or other forms of market suasion, such as ratings standards and incentives for efficient designs. This will be achieved by working closely with the relevant Ministries.

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

The goal is to demonstrate the attractiveness of highly cost-effective building energy efficiency solutions, so that they can be implemented in developing economies without the need for subsidies or further financial support. The prototype will be located in Jamaica, but the regional dissemination program will ensure that the effects are multiplied across the Caribbean, and into other tropical and sub-tropical regions.

The Ministry of Energy in Jamaica has estimated that the enforcement of the new building codes for new-build units would give a total of avoided CO_2 emissions of some 23,780 tons over the five years to 2014, because they will give a 40% improvement in energy efficiency compared to current levels (which are extremely low). This assumes compliance, however, which is known to be problematic.

The potential contribution of this project is to demonstrate that far more energy and resource-efficient building solutions are possible in tropical and sub-tropical regions, to raise awareness and stimulate market demand for better solutions. A transition to zero net energy buildings would dramatically reduce net carbon emissions from the built environment.

The theoretical maximum contribution from this project in Jamaica would obtain if every new build was to be a net zero energy building, in which case the 40% gain would increase to a 100% gain, a hypothetical saving of 59,250 tons by 2014.

This does not include the potential contribution from any modular retrofit solutions. If modular retrofit solutions were assumed to give a more modest 20% efficiency gain in the existing housing stock, with a commensurate reduction in electricity demand, total oil demand[9] in Jamaica would be reduced by an estimated 20% of 18%, i.e. 3.6%. Total imports of petroleum products in 2008 cost US$2.71 billion, so a 3.6% reduction at that price would give a financial saving of US$97.6 million.

In 2008 Jamaica imported some 28 million barrels of oil, so the 3.6% reduction would represent a reduction of some 1 million barrels of oil. At 317kg of carbon per barrel of oil, a reduction of 1 million barrels gives reduced carbon emissions of 317 million kg carbon (317,000 tonnes)

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[9] Some 95.2% of Jamaica's total energy consumption by source is from petroleum, so the figures for total energy and for petroleum savings are very similar (Source: Planning Institute of Jamaica: Vision 2030 Jamaica: Energy Sector Plan 2009 – 2030).

However, the more significant benefit of this project is that the development of the prototype will generate solutions that can be applied in other tropical and sub-tropical countries. The combination of feasibility and desirability will accelerate uptake in Jamaica, across the Caribbean and overseas, in other developing countries.

More detailed projections will be made during the PPG phase.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:

UNEP

For the period 2010-2013 UNEP will exercising environmental leadership on six cross-cutting thematic priorities. This includes climate change mitigation. UNEP will therefore support countries to make a transition to more efficient use of energy, energy conservation, and utilization of cleaner energy sources. Under UNEP's Medium Term Strategy the project supports the following outcomes:

- Normative approaches (standards, labels, certification) to energy efficiency for various kinds of appliances and equipment will be supported;
- Macro-economic and sector analyses of policy options for reducing greenhouse gas emissions, including technology transfer, will be undertaken and utilized;
- Barriers will be removed and access to renewable and energy-efficient technologies improved through the targeted analysis of costs, risks and opportunities of energy-efficient and low-carbon technologies and solutions; and
- The national institutional capacity for assessing and allocating public funding and leveraging private investment for energy-related projects will be strengthened.

UNEP's Sustainable Buildings and Construction Initiative (SBCI) is a UN partnership established to promote more sustainable buildings, which includes increasing their energy efficiency. SBCI works in cooperation with other international sustainable buildings initiatives, including the Marrakech Task Force on Sustainable Buildings and Construction (MTF), the Energy Efficiency in Buildings project of the World Business Council for Sustainable Development (WBCSD), and the World Green Building Council (WGBC). The UNDP/WB/IaDB-GEF has a portfolio of building-related projects; past projects that have mainly focused on mandatory codes, district heating systems or ESCOs. UNEP-GEF also supports National Cleaner Production Centres; their activities have included audits and ESCOs in buildings.

- This project will build on ongoing programs at UNEP to develop and disseminate energy efficiency and sustainable technologies in building use and construction.
- UNEP's comparative advantage is in providing relevant expertise, evidence of proof of concept, access to relevant research in building technologies and in brokering multi-stakeholder projects and consultations. The SBCI will also provide a connection with major industry players that can advise and assist the project. UNEP will also be able to assist in the dissemination phase.

The University of the West Indies

- The mission of the University of the West Indies (UWI) is to support and accelerate the economic, social, political and cultural development of the West Indies through teaching, research and outreach, advisory and community services, technological innovation and intellectual leadership. UWI is a regional institution, serving fifteen Caribbean nations with a mix of traditional and web-based teaching. For over sixty years, UWI has given the Caribbean most of its leaders in government, business, education, law, engineering and medicine, as well as two Nobel Laureates. Eight serving Prime Ministers are UWI graduates.
- UWI is strongly committed to international collaboration; current research and teaching programs involve links with the Universities of Surrey, Edinburgh, Oxford, Cambridge, London, East Anglia, Portsmouth, Middlesex, London Metropolitan, Stockholm, Malmö, Oslo, La Laguna, Southern Denmark, South Pacific, Malta, Mauritius, the Virgin Islands, the Antilles and Guyana, and the Institute of Political Studies of Bordeaux. Members of UWI staff work with colleagues, governments, development banks and UN agencies to resolve problems in developing countries around the world.

- UWI has 1,500 academic and technical staff, 350 senior administrators and 39,000 students, of which 25% are graduate students, three main campus sites, one virtual campus, twelve university centres, eight Faculties and a number of specialist Institutes, Centres and Units designed to foster excellence in research and graduate education and facilitate inter-disciplinary collaboration, with a particular focus on areas that are critical for Caribbean development. The traditional disciplines include medicine, law, engineering, agriculture, computer science and information technology, biology, chemistry, physics, mathematics, environmental sciences, geography and geology, political science, governance, social studies, economics, education, history, arts, and language and linguistics. The focal areas of interdisciplinary study include sustainable development, alternative energy, biotechnology (particularly with respect to applications in agriculture and horticulture), agricultural diversification and economics, the legal protection and use of biodiversity, natural products and genetic resources, cultural studies and the development of cultural and entertainment industries for tourism promotion, social, economic and legal studies (particularly as they relate to crime, security, justice, governance and trade), tropical medicine, health and wellness (particularly as they relate to Caribbean communities and the tourism product), natural hazards management and disaster risk reduction, natural resource and environmental use and management (particularly as they relate to forestry, fisheries, water resources and sustainable tourism), education (with particular emphasis on innovative approaches to teacher training and development), the social, economic and environmental components of sustainable development in small island states, and integration studies (with particular reference to the Caribbean Single Market and Economy).
- UWI would bring a unique geographical reach and perspective to this project. First, as a regional institution, UWI serves fifteen nations, and will use its unparalleled regional contacts to bring in many of the other Caribbean and mainland American states. Second, UWI has a particular expertise in small island and marine issues, in Diaspora communities and in development studies, all based on strong, core competences in the traditional disciplines as well as a commitment to an interdisciplinary, practical, problem-solving orientation. Third, UWI has a strong commitment to developing countries, and extensive experience in analyzing and resolving the impediments to development in independent and non-independent, successful, transitional, fragile and failed states.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINTS AND GEF AGENCY

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S): (Please attach the country endorsement letter(s) or regional endorsement letter(s) with this template).

NAME	**POSITION**	**MINISTRY**	**DATE** *(Month, day, year)*
Ms. Leonie Barnaby	GEF OFP	Office of the Prime Minister	08/10/2009

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation.

Agency Coordinator, Agency name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Maryam Niamir-Fuller, Director DGEF/UNEP	M. Niamir-Fuller	12/03/2009	Edu Hassing	(+33-1) 44 37 14 74	edu.hassing@unep.org