REQUEST FOR CEO APPROVAL

PROJECT TYPE: MEDIUM-SIZED PROJECT
TYPE OF TRUST FUND: GEF TRUST FUND

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PART I: PROJECT INFORMATION

Project Title: **Solar Water Heater Market Development Project[1] (Panamá CSA)**			
Country(ies):	Panama	GEF Project ID:[2]	5287
GEF Agency(ies):	UNEP	GEF Agency Project ID:	00928
Other Executing Partner(s):	National Environment Authority (ANAM)	Resubmission Date	03/12/2014
GEF Focal Area (s):	Climate change	Project Duration(Months)	48
Name of Parent Program (not applicable):		Project Agency Fee ($):	182,227

A. FOCAL AREA STRATEGY FRAMEWORK[3]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCM-3 Promote investment in renewable energy technologies	• Favourable policy and regulatory environment created	• Renewable energy policy and regulations in place	GEFTF	1,225,182	2,839,800
	• Investments in renewable energy technologies increased; • GHG emissions avoided	• Renewable energy capacity installed; • Electricity and heat produced from renewable resources	GEFTF	693,000	5,302,200
		Total project costs		1,918,182	8,142,000

B. PROJECT FRAMEWORK

Project Objective: cost-effective CO2 reduction measures initiated by developing the market for solar thermal heating systems						
Project Component	**Grant Type**	**Expected Outcomes**	**Expected Outputs**	**Trust Fund**	**Grant Amount ($)**	**Confirmed Co-financing ($)**
1. Policy-regulatory framework for SWH promotion and informed policy decision-making	TA	• Effective policy-regulatory framework-endorsed by the government (see Indicator C in Annex A)	1.1 One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed 1.2 One market assessment and economic analysis of SWH options, and one end-of-project market and impact assessment completed 1.3 A Government-endorsed SWH action plan	GEFTF	323,802	229,800

[1] Desarrollo del Mercado de Calentadores Solares de Agua (Panamá CSA)
[2] Project ID as assigned by GEFSEC.
[3] Refer to the Focal Area Results Framework when completing Table A.

			1.4 Monitoring and evaluation (see Indicators 1.-5. in Annex A)			
2. Quality control and supply side strengthening	TA	Voluntary quality control systems in place in the SWH industry to offer SWH products and services that customers are satisfied with (see Indicators D)-F) in Annex A)	2.1 One capacity assessment for training needs completed on supply side, and building design and quality control system 2.2 SWH incorporated into curricula of at least two relevant educational institutions; 2.3 Training for SWH installers and technology providers; one recognition scheme for installers completed 2.4 Two SWH and green building training programs designed and implemented 2.5 One SWH standards and a quality control scheme developed 2.6 Capability to verify and test for compliance with the quality standards present 2.7 Agreed business plan for the establishment of a national solar thermal energy association (see Indicators 6.-13. in Annex A)	GEFTF	399,000	810,000
3. Enhanced awareness and end-user supportive mechanisms	TA	• Enhanced end-user awareness of the technical and financial viability of SWH applications and increased use of end-user financial mechanisms • (see Indicators H)-I) in Annex A)	3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector 3.2 At least one end-user financing mechanisms established that can be used for investment in SWH 3.3 A campaign with marketing and publicity activities, targeting different SWH market segments completed (see Indicators 14.-17. in Annex A)	GEFTF	353,000	1,040,000
4. SWH pilot projects and demonstration	INV	• SWH applications demonstrated and financial and technical viability confirmed • (see Indicators J)-K) in Annex A)	4.1 Identification, energy audits and SWH system proposal/feasibility 4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and 60 Mi kWh (see Indicators 18.-20. in Annex A)	GEFTF	668,000	5,310,000
			Subtotal		1,743,802	7,389,800
			Project management Cost (PMC)	GEFTF	174,380	752,200
			Total project costs		**1,918,182**	**8,142,000**

Note: Progress indicators with quantitative targets for each outcome and output are put in a separate table in the Results framework (Annex A) in which detailed explanations are provided

C. SOURCES OF CONFIRMED CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Letters confirming co-financing for the project are attached in Annex L

Sources of Co-financing	Name of Co-financier (source)	Type of Co-financing	Co-financing Amount ($)
Nat. government	ANAM	In-kind	1,022,450
Nat. government	ANAM	Cash	225,550
Nat. government	SNE	In-kind	184,000
Nat. government	SNE	Cash	2,000,000
Private sector	Banco General	Loan	3,100,000
CSO	PGBC	Cash	80,000
CSO	PGBC	In-kind	780,000
CSO	UTP	Cash	250,000
CSO	UTP	In-kind	400,000
GEF agency	UNEP	In-kind	100,000
Total Co-financing			**8,142,000**

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY

Not applicable

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Co-financing ($)	Project Total ($)
International Consultants	292,969		292,969
National/Local Consultants	154,350	60,500	214,850

Note:
Not including project management staff (Project Manager). Includes travel for international consultants (USD 58,594) and national consultants (USD 36,750). More details are given in Annexes E and F. (Local) subcontracts are an estimated USD 709,515.

F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

GEF resources will be used as a catalytic grant for the various components. For the realization of the pilot projects, GEF grant will go towards partly supporting incremental costs (feasibility studies, design, risks mitigation for investment and audits). The financing of the pilot projects (Component 4) will be secured by the pilot projects proponents, i.e. own resources from the private sector companies, residential home owners, supplemented by loans from financial institutions, such as the Banco General.

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[4]

The project design is line with the original PIF, but some changes have been introduced, guided by new data and information collected in the project design (PPG) phase with inputs and suggestions provided by public and relevant stakeholders. The most important change is the re-focus from 'solar water heater and energy efficiency' to 'solar water heater' technology and applications mainly. The reason is that many activities have been initiated recently on energy efficiency (EE) in buildings, both by the Government (including the formulation of energy efficiency goals and lines of action in the National Energy Plan and recent approval by the UREE Law, see further), donors and private sector.

The process of promotion of energy efficiency has been initiated, although there is still big scope for energy savings. Nonetheless, many end-users, technology providers and decision-makers have been exposed to the basic concepts of rational use of energy and are implementing energy savings measures. In contrast, the concept of using solar thermal for heating remains a concept that is not well known by the public at large.

Given the fact that GEF resources are limited, it was recommended during the PPG phase to focus on solar water heating (SWH) applications primarily. However, the project will continue to make links with existing EE activities and indirectly promote the rational use of energy. First, in SWH information supply and publicity links will be made with energy efficiency issues and green technology. Similarly, in training the intricate links between energy and water savings and SWH applications will be stressed. Third, in the pilot and demonstration component, energy audits will include energy and water saving items, but in the follow-up (design, installation, financial engineering) the project will support SWH, with design and implementation of possible EE investments arranged by the beneficiaries themselves. This is also justifiable from a cost analysis point of view, as many energy efficiency measures have short payback times (1-2 years), while SWH has much longer payback periods (4-5 years; see Annex D).

The definition of outcomes and outputs has been changed to reflect the above re-focus, to better cover the goal of each outcome, to condense the text and to distinguish clearly between what is an outcome, output and outcome/output indicator.

Reformulated text		**Text as given in the PIF**	
Outcome	Output	Outcome	Output
1. *Effective policy-regulatory framework-endorsed by the government*	1.1 One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed 1.2 One market assessment and economic analysis of SWH options, and end-of-project study 1.3 Government-endorsed SWH action plan; M&E	1. Knowledge management for informed policy decision-making *Strengthened framework for knowledge management and policy decision-making to support sustainable SWH market development*	1.1 Review of building, RE and EE; SWH policy (RE laws, UREE Law) and regulations (incl. building regulations) with recommendations (regulations, financial and/or fiscal incentives) that effect SWH and building energy efficiency and associated advocacy work 1.2 Outreach and capacity building of the public authorities responsible for the development, implementation and monitoring of the new legal and regulatory provisions and financial incentives 1.3 Detailed market assessment and economic analysis of SWH and EE

[4] The questions A.1 –A.7 in Part II corresponds to similar parts in the GEF-approved PIF and present additional information

			options, and end-of-project assessment of results and impacts 1.4 Project monitoring and evaluation; documentation of lessons learnt 1.5 SWH action plan (post-project strategy and recommended activities)
2. *Voluntary quality control systems in place in the SWH industryy to offer SWH products and services that customers are satisfied with*	2.1 One capacity assessment for training needs completed on supply side, and building design and quality control system 2.2 SWH incorporated into curricula of relevant educational institutions 2.3Training for SWH installers and technology providers; one recognition scheme for installers completed 2.4 Two SWH and green building training designed and implemented 2.5 One SWH standards and a quality control scheme developed 2.6 Capability to verify and test for compliance with the quality standards present 2.7 Agreed business plan for the establishment of a national solar thermal energy association	2. Quality control and supply side strengthening *Enhanced capacity of building professionals to integrate SWH systems into different type of new and existing buildings and of local industry to provide good quality products*	2.1 Required new SWH standards and an associated quality control scheme developed (or adapted from standards and other quality control components used in other countries or regions) 2.2 Enhanced testing capacity on SWHs to check compliance with the adopted quality control scheme. 2.3 Training activities implemented and recognition system for SWH installers in operation 2.4 Technical support to local entrepreneurs and importers to meet SWH quality standards, improve product quality and other characteristics in general 2.5 SWH and green building design integrated into the curricula of relevant educational institutions and training of building professionals (architects, engineers, building designers) on SWH and related green building measures 2.6 An agreed business and financing plan for the establishment of a national solar thermal association or similar entity to sustain the required market promotion activities
3. *Enhanced end-user awareness of the technical and financial viability of SWH applications and increased use of end-user financial mechanisms*	3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector 3.2 At least one end-user financing mechanisms established that can be used for investment in SWH 3.3 A campaign for marketing and publicity activities, targeting different SWH market segments	3. End-user supportive mechanisms *Enhanced awareness of targeted end users and financing mechanism to support available purchase*	3.1 Awareness and info events for key financial sector stakeholders and local suppliers on the specific characteristics of and financing opportunities in the SWH market 3.2 Design of information and marketing packages on solar thermal and energy and water savings measures; 3.3 Design of end-user financing mechanisms (coupled with financial incentives); Implementation arrangements agreed with the key

	completed		stakeholders and integrated into the overall marketing and financing packages for SWH and EE in buildings 3.4 Carrying out marketing and advertising activities and campaigning, targeting different SWH market segments (e.g., hotels and restaurants; health centers and hospitals; agro-industries; residential and public buildings) in co-operation with the public authorities and local solar thermal energy companies
4. *SWH applications demonstrated and replicated financial and technical viability confirmed*	4.1 Identification, energy audits and SWH system proposal/feasibility 4.2 220 SWH pilots supported (design, financing, installation, operation and monitoring) (installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and post-project)	4. SWH pilot projects and demonstration *SWH demonstrated and replicated*	4.1 Around 330 SWH installed in pilot demonstrations developed in the identified sectors (e.g., hotels, health, agribusiness and industry, residential and commercial buildings) supplemented by cost-effective energy efficiency options 4.2 List of proposals for post-project implementation (where needed, supported by financial mechanisms)

A.1 National strategies and plans

Or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

The **Second National Communication** (submitted in 2012) lists a range of climate change mitigation options in the energy sector on its page 114, including solar photovoltaic and thermal energy as well as energy efficiency options (efficient boilers, water heaters, lighting and motors) and specifically mentioning solar heating as a mitigation option.

Panama's **UNDAF** (UN Development Assistance Framework), 2007-2011 refers to "Environmental sustainability (water resources, biodiversity, forest development, climate change stabilization, disaster prevention) strengthened by normative frameworks, national strategies and local action" as one of the direct effects of international cooperation with the UN system in Panama.

A.2 GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

The project is in consistency with the GEF-5 Climate Change Focal Area Objective 3 (CCM-3) aiming at promoting investments in renewable energy technologies. It presents a program that promotes the introduction of solar water heating (SWH) applications in hotel, tourism, agribusiness and health sectors in Panama as well as in buildings, and where possible, accompanied by cost-effective energy saving measures. This will be achieved through a combination of technical assistance and investment activities, including (1) the adoption of a conducive policies and regulations regarding SWH; (2) technical capacity strengthening of enterprises involved in sales, installation and maintenance; (3) installed SWH capacity, direct and post-project direct, of over 10,000 m^2 (in hotels, hospitals and clinics, agro-industries and commercial/residential building) and (4) replicated through awareness creation and information dissemination in the above-mentioned sectors as well as in in other important sectors such as housing, public and private buildings.

A.3 The GEF Agency's comparative advantage:

The GEF Council document GEF/C.31/5 mentions 'climate change' as one area in which UNEP has a comparative advantage. The document mentions that UNEP's work builds on its expertise in assessment, standard setting, methodology development, and demonstration. Much of UNEP's work takes on a market sectoral approach responding to environmental drivers.

UNEP provides three types of services: (a) Analysis. In-depth assessment and analysis of opportunities for reducing greenhouse gas emissions through new technologies, as well as the promotion of global norms and standards for these technologies; (b) Financial innovations that promote private sector investment. Activities, training and application of financial mechanisms that help expand markets for low-carbon technologies, goods, and services; and (c) Policy support. Training and other institutional support that promotes policy development and planning processes consistent with evolving global norms. UNEP staff in the UN's Regional Office for Latin America and the Caribbean (ROLAC), which is based in Panama City, will also be involved in the Project

The project is in line with UNEP Medium-Term Strategy and Work Program, as approved by the UNEP Governing Council, as well as with UNEP´s climate change strategy, which is structured around four themes – mitigation, adaptation, science, and communication - and UNEP-DTIE[5] is currently engaged in a number of projects and programs designed to promote energy efficiency and renewable energy technologies. With regard to solar water heating, UNEP is supporting the following programs and projects that are relevant for the project and from which it will also benefit:

- The global knowledge management component of the "Global Solar Water Heating Market Transformation and Strengthening Initiative" (GEF ID: 2939)[6]
- SWH activities under the Mediterranean Investment Facility[7], including SWH programs in Egypt (EGYPSOL), Tunisia (PROSOL) and Montenegro (MONTESOL)
- Energy for Sustainable Development in Caribbean Buildings (GEF ID: 4171)
- Promoting Energy Efficiency and Renewable Energy in Buildings in Jamaica (GEF ID: 4167)

A.4 The baseline project and the problem that it seeks to address:

1) Energy sector

Power in Panama is generated by about 30 generating companies and fed into the National Interconnected grid system (89%, of which three companies have 68% of the market), self-generating companies (10%, such as the Panama Canal Authority) and isolated systems (1%). Installed capacity was 2,390 MW, of which 61% hydropower and 39% thermal generation[8]. Panama gross generation was 8,716 GWh in 2012 of which 62.8% produced by hydro, 25.8% by bunker fuel, 7.8% coal and 3.6% by diesel. All fossil fuels are imported.

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5 Division of Technology, Industry, and Economics.

6 This project is jointly implemented with UNDP and at the time of its approval envisaged the development of about ten national follow-on SWH projects of which this project in Panama is one; UNEP-DTIE is developing other national SWH projects in Latin America with assistance from the Latin American Energy Organization (OLADE).

7 A joint UNEP and Italian Ministry for Environment initiative.

8 Transmission is in the hands of ETESA (Electricity Transmission Company), whose National Dispatch Center coordinates the transactions between the various power generation and distribution companies. There are three distribution companies, EDERNET, EDECHI and ENSA. Tariff setting is under the auspices of ASEP (Authority of Public Services)

Energy consumption totaled 7,710 GWh in 2012 (an increase of 8.6% over 2011) with maximum power demand at 1386 MW. Firm power capacity at 1,779 MW in 2012 and this implies that the reserve margin was only 335 MW, which should be over 510 MW according to some studies. The national expansion plans include additional power capacity of around 2,000 MW[9].

Due to the importance of hydroelectricity in the power generation mix, Panama has a fair share of installed renewable energy capacity, mainly consisting of large hydropower schemes. Other potential sources include wind power, while also solar, geothermal and peat resources are available. Planning has traditionally focused on power generation and improving efficiency in power consumption. In reality, not only potential exists in power generation, but also in in energy for heating purposes, both in improving efficiency and replacing fossil fuels by cleaner alternatives.

The aim in energy policy is to reduce energy consumption by 30% by rational and efficient use of energy on the medium-term and have 100% coverage and energy access as well as security in energy supply.

2) Potential of solar water heating technology

Since early 1990's, the global solar thermal market has experienced a steady annual growth. At the end of 2010, the share of renewable energy in global final energy consumption (8,823 Mtoe)[10] was 8.2% and that of traditional biomass 8.5%. The solar thermal water and heating production was estimated at 60 TWh[11], compared to 520 TWh produced by wind and 63 TWh produced by solar PV applications. Solar thermal technologies contribute significantly to hot water production in several countries and increasingly also to cooling. In 2010 solar capacity grew with 44 GW or 27% to 232 GW (in comparison with 17% annual growth over 2006-2011). Market leaders are China (64% of installed capacity), Turkey, Germany, Japan, Brazil, India, Italy, Australia, Spain, France, Israel, Austria, Greece and USA.

Although strong development has been evidenced in some GEF program countries, notably in China and Turkey, in many others, such as Panama, solar water heating (SWH) is still hardly utilized despite favorable climatic conditions. To accelerate the global commercialization and sustainable market transformation of SWH, a global SWH project was launched in 2009, funded by GEF. The project consists of a global knowledge management component implemented by UNEP and a second component of national programs implemented by UNDP in Albania, Algeria, Chile, India, Lebanon and Mexico. As a follow-up phase, similar market transformation activities are foreseen to be initiated in at least 10 new countries. While administratively these second phase projects would not be considered as a part of the ongoing global SWH project, they would still benefit from and can contribute to its global knowledge management component, which is foreseen to continue to operate also after the global project on a self-sustaining basis by the Global Solar Thermal Energy Council (GSTEC). The proposed Panama SWH market development initiative presents one of the new SWH projects proposed for GEF 5.

3) National institutional and policy framework

<u>Policy and regulations</u>

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9 PENSIN 2012 (*Plan de Expansión de Transmisión):* Hydropower (730 MW; 2010-2014); wind energy (200 MW, 2013), solar PV (2.5-5 MW), LNG installations (200 MW), geothermal (24 MW) as well as regional interconnections with C0olombia (600 MW) and Central America (SIEPAC, 300 MW)

10 Mtoe: million tons of oil equivalent

11 TWh: terawatt-hour (1,000 billion watt-hour); GWh: gigawatt-hour (billion watt-hour)

Panama has been traditionally dependent on hydro and thermal power for the supply of its energy demand, but recent private developments have begun to make use of the country´s other natural resources, such as wind, in conjunction with the government´s plan to reduce its dependency on imported hydrocarbons, as well as make the current energy grid more reliable by diversifying source of power generation, including solar, wind geothermal and biomass energy.

The Laws No. 6 (1995) and 10 (1998) establish the institutional and regulatory framework for the **electric utility sector** in the Republic of Panama:

- Structure of the power sector in separate distribution, transmission and generation companies;
- Regulations for the creation and operation of public electric companies;
- Regulation for the operation of power companies and tariff setting and customers of the electric sector;
- Modalities for private sector participation;
- Final dispositions pertaining to the conservation of the environment, promotion of renewable or non-conventional sources and energy conservation.

Panama has basis for the promotion for **renewable energy in power generation** in Laws No. 6 (1997) and 45 (2004) that provide for:

- The power transmission and distribution companies are required to give 5% preference in the evaluated price to new and renewable energy sources in each tender to purchase energy and power;
- New and renewable energy sources (including hydro) up to 10 MW installed capacity are not subject to distribution or transmission charges and plants in the range of 10 to 20 MW installed capacity are not subject to these charges for the first 10 MW of installed capacity;
- Exemption of taxes on imports of equipment, machinery, materials, or others required for construction, operation and maintenance of particular new and renewable energy power plants of up to 500 kW installed capacity,
- Fiscal incentive for new and renewable energy projects up to 10 MW installed capacity, equivalent up 25% of direct investment, based on equivalent tons of CO_2 emission reductions per year calculated for the term of the license or concession, which can be used for payment of revenue tax (ISR) during the first 10 years of commercial operation, as long as the project is not benefitting from other incentives.

The **National Energy Plan** 2009-2023 (NEP) highlights the major importance of energy efficiency as a planning alternative in the energy sector. The main lines of actions regarding energy efficiency that are considered include:

- Standards for the imports of energy-efficient equipment (e.g., lamps, air conditioners, electric motors) and certification of energy efficient equipment; standards and guidelines for energy-efficient buildings;
- Dissemination campaigns, education programs and rational use of energy campaigns in public bodies.

The results have been mixed so far; for example, a campaign on efficient lighting (*Operación Bombillo)* which began in 2008 resulted in the replacement of 3 million incandescent lamps with compact fluorescent lamps. On the other hand, there has been little private initiative for sustainable energy investments.

A new **Law on the Rational and Efficient Use of Energy** (UREE) was approved in December 2012 by the National Assembly, which gives a sounder legal basis for the lines of actions of the NEP. UREE includes:

- Regulations will be established for buildings and certain equipment, such as lighting, air conditioners, electric motors, refrigerators and other electric consumer products. Starting in 2014, it would then be not allowed to import such equipment that would not comply with the minimum energy performance standards established. New and existing buildings (whether residential, commercial or institutional) would have to comply with certain buildings norms[12];

[12] E.g., electric circuits, lighting systems, water heating, thermal isolation, air conditioning

- Energy efficiency standards will be being developed by the Committee for Energy Efficiency Indices[13] as well as labeling of certain equipment and products and the process of certification of products (incl. testing laboratories);
- Support for research and development as well as demonstration projects[14] as well as the establishment of an Information Center for the public at large an coordination with the Education Ministry to include EE themes in the curricula;
- Certification of individuals and companies to provide energy efficiency services[15];
- Establishment of Energy Administrators (in 31 state institutions) and Energy Committees (in 15 state institutions) in those state institutions that consume most energy[16]
- Incentives, subsidies and finance, such as:
  - Establishment of a Fund for UREE projects, providing guarantees or preferential loans (for private sector) and setting up credit lines for financial institutions (for residential sector) as well as grants (institutions, NGO, etc.). The Fund was established with a donation of the Inter-American Development Bank (IADB) of USD 120,000 and to be expanded up to USD 30 million;
  - Incentives for efficient equipment, lighting products and machinery that comply with certain energy efficiency requirements can receive up to 50% of import duty exemption;
  - Incentives for electric and hybrid vehicles.

Law 37 of 2013 establishes incentives to encourage the diversification of the energy mix in the country, through solar generation, promoting (through the incentive scheme) the construction, operation and maintenance of **solar energy stations or installations**. It provides for:

- Exemption from certain taxes and duties on the importation and/or purchases in the national market of equipment, machines, materials, spare parts and others required for the construction, operation and maintenance of solar plants;
- A tax credit applicable to the income tax in a determined fiscal period, for a maximum of 5% of the total direct investment amount for works on the plants and/or facilities that are converted into public use infrastructure;
- The use of the method of accelerated depreciation of the equipment destined for the use of solar generation;
- The list of equipment, parts and systems that are subject to the initial custom exemption includes: a) solar water heaters or heat producing equipment; b) parts and components necessary to assemble the solar collectors to heat water and/or solar drying equipment, c) solar panels and individual solar cells, d) stationary accumulators of long duration, e) inverters and/or solar inverters; and f) other accessories, software and equipment destined for the use and/or development of solar energy.

With **Law 76 of 2009**, the Certificate for Industrial Promotion (CERFIN) is created, with the aim of encouraging the development of industry, based on the effective integration of technology with high added value. This benefit is applicable to industrial manufacturing companies, agro-processing and marine resources companies, as well as to all the integrated operations of industrial firms engaged in the acquisition and processing of agricultural and forestry raw materials, including micro, small, medium and other companies established or being established in the Republic of Panama. The Certificate for Industrial Promotion is a non-transferable nominative document approved by the authorities, which is exempt from any kind of tax, does not cause any interests, and is valid for eight years from its issuance[17]. The CERFIN will be granted for certain investments and activities (R&D, quality assurance and

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13 *Comité Gestor de Indices de Eficiencia Energética*, composed of Ministry of Economy and Finance, Ministry of Commerce and Industry (MICI); Panama Society of Engineers and Architects (SPIA); National Metrology Centre, Panama Canal Authority, National Secretary of Science and Technology and National Council of Private Enterprises.

14 Hotels, education facilities (colleges and universities), residentioal sectors, industrial sectpr and public sector

15 Registered with the *Junta Técnica de Ingeniería y Arquitectura* of SPIA and the *Consejo Nacional de Acreditación* of MICI

16 These 18 state institutions consume 666.3 GWh annually, costing USD 119.1 million. For 2010 and 2011 the plans were to save 104.9 GWh annually with monetary savings of USD 14.6 annually on average.

17 The certificate may be used by the beneficiary for the payment of taxes, fees or contributions of the company that were generated in fiscal years prior to its issuance, to cover the minimum payment of dividends or complementary taxes, for payment of excise tax on fuel or oil products, or for payment of taxes subject to withholding.

environmental management, investment or reinvestment of profits in the establishment or expansion of productive facilities or the capacity to produce, preparation and training of human resource; increase in employment associated with production) in agro-industries (35% of investment value) and other industries (25% of investment value). Companies which adopt the provisions of Act 76 of 2009 may import raw materials, semi-finished or intermediate products, machinery, equipment, packaging, and other inputs used in the composition or the process of developing their products, paying in addition to the VAT, only the import tax equivalent to 3% of CIF value of foreign inputs..

Institutions

The following table gives an overview of the most important institutions directly or indirectly involved in the topic of solar thermal energy in Panama.

Stakeholder	**Role in the project and project preparation**
Government and agencies	• The National Environment Authority (ANAM, *Autoridad Nacional del Ambiente*) will be the local executing agency of the project. Created in 1998, ANAM is the government agency responsible for natural resources management and environment protection and the implementation of related laws and regulation. ANAM is also responsible for preparing, coordinating and supervising the execution of the national climate change policy and in this capacity also acts as the GEF Focal Point • The National Secretariat of Energy (SNE, *Secretaría Nacional de Energía*) is the agency, with ministerial rank, responsible for the national energy policy and legal framework, i.e. guaranteeing adequate and affordable energy supply, regional interconnection and cooperation, as well as promotion of the use and R&D in renewable energy and energy efficiency; • The National Public Services Authority (ASEP, *Autoridad Nacional de Servicios Públicos*) is the autonomous state institution responsible for regulation and control of public service companies (electricity, drinking water, sewage, telecom, TV, radio). This includes issuance of specific regulations for rational energy use in relation to the electricity sector. • The Ministry of Commerce and Industry (MICI, *Ministerio de Comercio e Industrias*) is responsible for the planning, coordination and control of activities that promote local industry, external trade and modernization and normative framework, including incentives for trade and industry; • Under MICI, the Comission for Industrial and Technical Standards (COPANIT, *Comisión Panameña de Normas Industriales y Técnicas)* is responsible for norms and standards in the area of trade, production and technology. Its executive arm is the DGNTI (*Dirección de Normas y Tecnología Industrial*) and its aims are to develop standards through technical committees, and to implement programmes related to standardization, quality certification and metrology. • Under the Science and Technology ministry (SENACYT), CENAMAP AIP is organism responsible for metrology, while the National Accreditation Commission serves as accreditation body for testing institutes and inspection organizations • Other ministries and public entities include: o Ministry of Agricultural Development (MIDA, *Ministerio de Desarrollo Agropecuario*), o Tourism Authority (ATP, *Autoridad de Turismo),* o Health Ministry (MINSA, *Ministerio de Salud)* o Small and Medium-sized Enterprise Authority (ADPYME, *Autoridad de la Pequeña y Mediana Empresa*). o Ministry of Education; o Ministry of the Presidency (Blue Flag Program; Rural Electrification Department)[18]

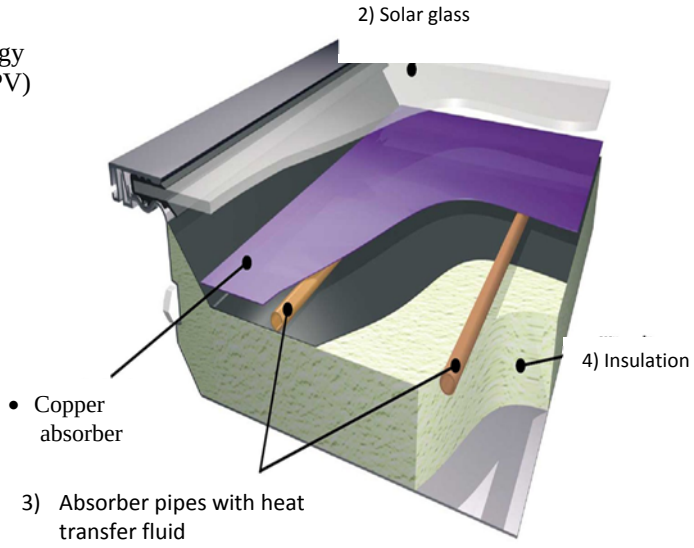
[18] *Programa Bandera Azul Ecológico; Oficina de Electrificación Rural*

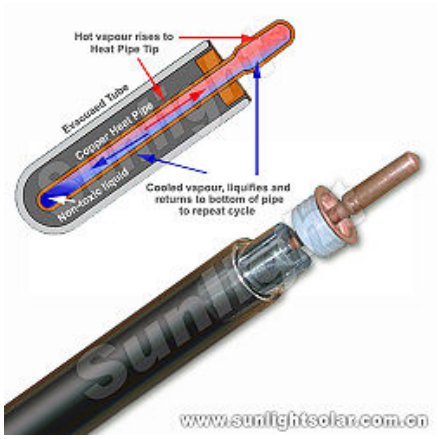
Box 1 Solar water heating systems

Solar thermal produces heat and therefore it must be clearly distinguished from two other renewable energy sources, which use the sun directly – photovoltaic (PV) and concentrated solar - both producing electricity.

Types of solar collectors

Flat plate collectors are the most common type of solar collector. They consist of (1) a dark flat-plate absorber of solar energy, (2) a transparent cover that allows solar energy to pass through but reduces heat losses, (3) a heat-transport fluid (air, antifreeze or water) to remove heat from the absorber, and (4) a heat insulating backing. These collectors can be improved by transparent cover to assure high transmittance and high durability, new absorber material, high temperature residence insulation and casing which ensures stability and protects the absorber and the insulation against environmental impacts.





Evacuated tube collectors (ECTs) can be classified in two main groups:

- **Direct flow tubes:** the fluid of the solar loop is also circulated through the piping of the absorber. If a single evacuated glass tube is used the whole interior is evacuated. For this configuration the flat or curved absorber as well as fluid inlet and fluid outlet pipes are inside of the vacuum. The absorber is coated with a selective surface. Currently the most common type is the Sydney tube collector. It consists of two glass tubes fused together. The vacuum is located between the two tubes. The absorber is applied completely around the tube, often a reflector is placed under the tube to also use the radiation that passes between the parallel mounted tubes. This radiation is reflected to the absorber;
- **Heat pipe tubes:** the absorbed heat is transferred by using the heat pipe principle without direct contact to the heat transfer fluid of the solar loop.

Unglazed collectors, which are the simplest and least expensive of all collectors, are used almost universally for heating outdoor pools and spas.

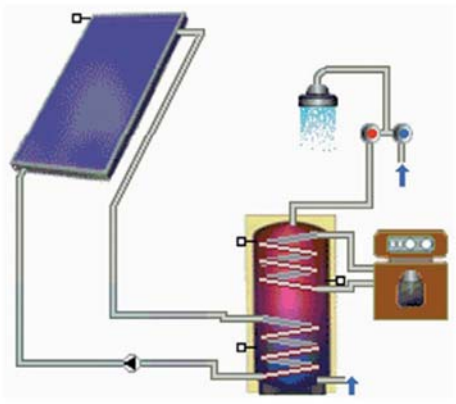
Solar heat can be produced over a wide **range of temperatures**:

- **Low-temperature applications,** require thermal (heat) energy and operate at less than 90°C. The standard products are based on flat plate solar, evacuated tube and unglazed collectors. Domestic applications fall under this category;
- **Medium-temperature applications** require thermal (heat) energy and operate in a temperature range from 90°C to 150°C. The standard products that can be used are solar box cookers, Evacuated Tube collectors, solar parabolic cookers and solar thermal concentrators.
- **High-temperature applications** require thermal (heat) energy and operate in a temperature range from 150°C to 300°C. The standard products that can be used are solar thermal concentrators. The applications are steam generation up to 350°C and pressure up to 25 bar in industries for process heat applications, including cooling and electricity production. These applications fall outside the scope of this project.

Box 1 Solar water heating systems (cont'd)

Types of solar systems

- **Thermo-siphon systems** are based on a method of passive heat exchange using on natural convection, which circulates liquid without the necessity of a mechanical pump;



- **Forced (pumped) circulation** use one or more pumps to circulate water and/or heating fluid in the system

Thermo-siphon technology is extremely simple in terms of design, manufacturing and installation; has low cost and can be easily applied in hot climates such as Panama. Pumped circulation systems can be combined with hot water and space heating and can be adapted to all climates, but require more expertise in design and installation; these are more common in Europe, for example.

Applications of solar systems

The core application of solar heat is the production of domestic hot water and space heating in buildings. The whole range of buildings is covered, from individual to collective, and even district heating, and applications can be subdivided into:

- Single family houses (see picture)
- Multiple family houses
- Public sector (hospitals, schools, office buildings)
- Tourism sector (hotels, accommodations, restaurants, cloth washing)
- Pool heating

A wide range of industrial processes (steam, agro food processing, drying) as well as the treatment of water (desalination) can be achieved by using solar thermal. In Panama, various types of collectors and systems have been installed.

Source pictures: PSI Pty (Panama)

Technology and educational institutes	• The University of Technology (UTP, *Universidad Tecnológica de Panamá)* provides higher-level science and technology education, organizing courses at the technical, first degree and postgraduate level. Since then 1990s is has carried out research in the area of energy efficiency and renewable sources of energy, including a small research activity on solar thermal energy applications. Within its curricula, it offers a Masters course on energy and environment within is Faculty of Mechanical Engineering that focusses on application of energy efficiency, clean sources of energy and environmental control in industrial and commercial installations and processes. The UTP serves on various technical committees related to energy. It operates an energy efficiency laboratory with the aim of getting accreditation for equipment certification (lighting, air-conditioning, refrigeration, electric motors) • The National Institute for Human Development (INADEH, *Instituto Nacional de Formación Profesional y Capacitación para el Desarrollo Humano)* provides training courses in various areas at various centers throughout the country
Power distribution utilities	• Panama's electric power distribution companies (EDEMET, EDECHI, ELECTRA-NORESTE) run campaigns to give customers guidance on rational use of energy (to schools and consumer associations, Internet, publicity campaign in the media)
Financial institutions	• In 2009, IADB approved a green facility (USD 20 million loan) for the Panamian bank Banco General to support investments involving energy efficiency, renewable energy, water and wastewater treatment, waste management and other carbon-mitigating projects. The bank plans to focus on small and medium-size businesses involved in projects requiring cleaner energy or industrial technologies[19]. The loan is to be expanded with another USD 20 million.
Associations and NGOs	• The *Panama Green Building Council* (PGBC) forms part of the World Green Building Council and is a NGO that promotes the concept of green buildings in Panama working with government (e.g. in the formulation of the new UREE Law) and with industry and commercial partners[20] • The Council of Private Enterprise (CONEP, *Consejo Nacional de la Empresa Privada*) represents a number of industrial and commercial associations of companies; • The Panama Chamber of Construction (CAPAC, *Cámara Panameña de la Construcción),* one CONEP's members, implements a program on energy efficiency in buildings and green measures in its buildings. The SIP (*Sindicato de Industriales de Panamá)* is also a member of CONEP • The Panama Society of Engineers and Architects (SPIA, *Sociedad Panameña de Ingenieros y Arquitectos)* groups these professionals and provides advice to the government and organizes promotional events • The Panamanian Association of Hotels (APATEL, *Asociación Panameña de Hoteles)* represents hotels and has promotion of sustainable tourism as one of its objectives

4) Technology introduction, supply and demand

There are no real reliable statistics on the sale of SWH systems in Panama, but the SWH market is small[21]. Some hotels have installed SWH systems[22]; other systems have been installed in hostels, individual homes, restaurants and to

19 To date, 14 projects have been financed for a total of $75 million, including three hydroelectric projects, a waste water treatment plant, and several LEED certified constructions.

20 Developed by the US Green Building Council, the Panama GBC is coordinating the LEED Certification of buildings (Leadership in Energy and Environmental Design. LEED is an international certification that looks at the environmental sustainability (such as energy efficiency, water management, use of renewable or recyclable materials, CO_2 footprint). Up to date, about 48 buildings have been LEED-registered

21 For comparison, data from SNE for 2001 mention 300 installed systems vs. 2,500 in neighboring Costa Rica.

22 Including Hotel Torres de Alba, Tryp Centro, Best Western El Cangrejo, Playa Tortuga, Royal Gardens, Hotel Príncipe en metro Panamá. Estimated costs are USD 0.71 (Tryp) and USD 0.91/m^3. *Sources:* IberGrupo presentation; project Inception Report. Other projects are contemplated, such as in Hotel Los Quetzales, Cielito Sur (en Chiriquí), Brisas Boqueteñas (see Annex N)

pre-heat water in boiler. A few local companies provide solar water heating technology, including Luz Buena, PSI, GreenTech, Ibergrupo and Marine Solar Tech. Typical SWH systems sold are 100, 150, 200 liters that cost between USD 550 – 3,000[23]. Cost of design and installation can be around USD 900, while the cost of energy analysis and audits vary between USD 1,000-2,000, depending on the size and water/energy needs of the building.

The current market is still considered as nascent. The analysis in the PPG (project design) phase shows that customers are most likely in hotels, health sector (hospitals and clinics), enterprises (agro-industries, sports clubs/swimming pools, restaurants, laundries, pre-heating water in industry) and high-income families. With the right package of policy instruments (incentives, finance, demonstration, and quality assurance and awareness campaigns) the market could be stimulated into a self-sustained take-off. Also the Government sector itself is an important potential SWH user, due to demand for heated water in its building and the pivotal role in can play in showcasing SWH application[24]. Annex N presents some data on market potential.

5) Financial environment

Despite the need for investment or expenditure to develop sustainable energy projects (solar PV, solar thermal, energy efficiency), there have been few initiatives in this area from consumers or the business sector. A few have chosen to implement such projects as a result from a (sponsored) energy audit. Firms generally use their financial resources to develop projects that increase production capacity. Local banks do not have a specific modality for financing sustainable energy projects. Nonetheless, banks such as Banco General and HSBC do have regular financing facilities (loans, leasing) that could be used, especially if backed up by credit lines. For example, the **Inter-American Development Bank** (BID) has made USD 20-40 million available to the Banco General to support the growth of its portfolio of projects related to energy savings/efficiency, integrated waste management, water and wastewater treatment, small-scale renewable energy and other small sized carbon mitigating investments (an initial USD 20 million has been made available).
Other sources of funding available in Panama are:

- **Fondo UREE** (as discussed earlier in this section);
- The **Energy and Environment Partnership with Central America** (EEP) is an initiative of the Ministry for Foreign Affairs of Finland, CCAD and SG-SICA. It contributes to projects with grants for pilot projects and studies. They support each project with a total sum between EUR 20,000-50,000 in addition to local cash or in-kind co-financing;
- The "**Iniciativa PYMES Verdes en Centroamérica**" is an initiative by the European Union, the German development bank KfW and the Central American Bank for Economic Integration (BCIE) that aims at:
  - Setting up credit lines with intermediary financial institutions for financing ER & EE initiatives by small and medium-sized enterprises (SMEs[25]) with grants up to USD 120,000;
  - Providing grants for energy audits up to USD 7,000 and studies for RE projects up to USD 50,000 (feasibility, environmental; impact assessment, final design and updating of studies)
  - Providing loan finance of up to USD 5 million per project/

[23] Info provided by various suppliers; p.c.

[24] According to SNE (2011), 54% of government institutions have water heaters (57% electricity, 43% LPG) of which 57% of capacity of 5-100 liters and 29% of capacity up to 50 liters

[25] Known in Spanish as *Pequeñas y Medianas Empresas (PYMES)*

A. 5 Incremental /Additional cost reasoning (Project framework details)

Describe the incremental (GEF Trust Fund) funds requested for GEF financing and the associated global environmental benefits (GEF Trust Fund) to be delivered by the project:

1) Barriers to SWH in Panama

Until now, however, the use of conventional heaters, using LPG or electricity, is still the norm for producing low-temperature heated water. The market for water heaters (SWH) has not proliferated, due to a number of barriers that inhibit the successful larger-scale introduction of the technology.

Barrier	**Option to establish a sustainable SWH market and corresponding output in the project**
• In general, knowledge about SWH systems is small and only few systems have been installed, so the technology is not very 'visible'. Consequently, there is little publicity in the media about their virtues and defects of the system. Many households will not take warm showers in the tropical climate of Panama. The market for SWH is likely to be clustered in certain socio-economic sectors (notably hotels as well as agro-industries) and public sectors (such as hospitals and clinics) and residential buildings in second place. • In reality, no assessment of the demand for SWH and in residential buildings or other sectors has been made. As a result of this lack of research, it is hard to gather information on the demand patterns in Panama regarding solar water heaters and possible type of users • The Panama Government has passed legislation to promote renewable energy (e.g. Law 37/2013) and energy efficiency (e.g. Law UREE) but regulations and incentives focus in practice on electricity rather than thermal systems.	Data gathering and market surveys • Output 1.2 • Output 1.3 Demonstration in different applications, combined with incentives Outcome 4 • Outputs 3.3 Information and awareness-raising through advertisements and other media • Output 3.1 • Output 3.3
• Given the uncertainty in demand, there are consequently few companies that distribute SWH systems; a question of the 'chicken and the egg'. There is no assembly of SWH systems in Panama, which are all imported. Many solar companies are small and usually specialize in other areas of technology imports. These companies might install solar systems without knowledge of proper system design and sizing resulting poor performance of the solar system that cannot serve the actual hot water demand. • Another major gap in the thermal solar water heater market in Panama is the lack of quality and standards: o Quality assurance labels (such as the Qualisol label, which exists in Brazil). Such label, which is attached to the solar water heating system, provides information to the consumers and certifies great levels of quality installation. Currently, neither voluntary nor mandatory standards exist for solar thermal equipment; o No testing takes place in recognized institutions that can certify equipment; o No training of designers, installers, manufacturers, and users on quality design and installation, taking into account safety and hygienic aspects	Capacity strengthening supply-side (providers, installers, designers) • Output 2.1 • Output 2.2 • Output 2.3 • Output 2.4 • Output 2.7 Setting up a quality control system • Output 2.5 • Output 2.6
• At the civil society and university level, there is also a lack of research and of SWH demonstration projects being undertaken. The University of Technology (UTP) performs some research on thermal solar energy. • There exists a dearth of trained technicians familiar with SWH installation and	Strengthening technological universities and institutions to do testing, perform research and provide training • Output 2.2

maintenance. Smaller companies often hire installers which sometime do not have knowledge on solar water heating or even proper plumbing[26]. The limited experience with SWH in Panama shows that failures are not due to SWH systems per se, but due to design faults and to wrong expectations from end-users as well as using materials that do not have sufficient quality. • Lack of perceived market opportunities and of technical support capabilities result in relative high cost of equipment, management and system maintenance.	• Output 2.6 Training of qualified technical personnel (providers, installers, designers) • Output 2.3 • Output 2.4
• It is not clear to potential users what the cost of the SWH is vis-à-vis conventional energy technologies (electric and LPG-operated water heaters). Having higher initial investment cost, potential clients shy away from the technology being unaware of the benefits on a lifecycle cost basis[27]. In principle, energy prices (electricity, fuels) are not subsidized in Panama, so users can potentially benefit from the technology (see Annex D).	Increase financial attractiveness by means of incentives, soft finance, and direct support: • Output 1.1 • Output 1.4 • Output 3.2 • Output 4.1 • Output 4.2

2) Project scope and activities

This project seeks to address the before-mentioned barriers to the more widespread introduction and availability on the market in Panama. An integrated and holistic approach will combine demonstration projects that have high replication potential with interventions that seek to establish a market environment conducive to investments in clean energy practices and technologies

Project goal

To support the national efforts to establish the market for solar thermal heating systems and promote cost-effective CO_2 measures (through capacity building and institutional strengthening and technology demonstration)

Component 1 Knowledge and information for informed policy decision-making

The Government can act directly or via local authorities, agencies or other public bodies. The government can substitute or complement private initiatives, using policy instruments, such as:

- Targets or obligations to use SWH in certain types of buildings;
- General energy performance requirements in regulations of (new) buildings, that create a basis for green technologies, including SWH (mandatory or voluntary); changes in regulations that hamper diffusion of SWH
- Regulatory framework for quality control and certification (mandatory or voluntary);
- Financial and fiscal incentives; funding for applied research and promotion and finance of solar thermal technology.

The status and feasibility of (voluntary) regulation in Panama needs to be assessed and, based on the market conditions regarding SWH and societal and political acceptance, recommendations can be made[28]. A complementary area to work

[26] Wrong selection of materials when soldering together can cause corrosion and result in water leakages at joint and seeming of tank and pipes. Cheap material used in the system will also shorten the system life time

[27] Over the lifetime of a system, the largest part of the cost (usually well over 90%) occurs at the time of investment, since the maintenance and decommissioning costs are very low. The economic benefit, however, is spread over the lifetime of the system, which is usually over 20 years. For many private individuals, the absolute amount of upfront investment costs is the key barrier. For many commercial decision makers, it is the payback time, which is seen as crucial.

[28] Current building codes and regulations as well as the set of current financial instruments and incentives and complimentary measures will be assessed and examined as part of energy improvements in general and SWH application in particular. For example, guidelines for building norms/codes make it easier for municipalities to promote energy efficiency and green buildings

is to study the impacts of redirecting cross-subsidies in the current fuel and power pricing and how SWH use would impact end-use consumption and cross-subsidy levels.

Lack of information on supply and demand hinders the elaboration of policy instruments targeting specific sectors. The component will also serve as the knowledge and information management component. A market study will be carried out, i.e. a quantitative and qualitative assessment of supply chain and of the potential demand of solar thermal technology in commercial sectors (especially in the tourism industry, hotels, restaurants, swimming pools), in the agro-industrial sector (water heating, drying) and in public and office buildings (e.g. hospitals) as well as in the higher-income residential sector. The study will be repeated with the same parameters to learn the changes in the SWH market and assess the direct impacts of the project on the market development, as part of the continuing monitoring and evaluation of the project. This data, together with the project final report[29], will inform public and private sector decision-makers.

The outputs of the project will raise awareness of key decision-makers in public and private sector on the benefits of SWG and the development of adequate regulations and incentives. The last group of activities (output 1.4) is the formulation of an Action Plan[30], which will be important for creating and maintaining support on the part of policy makers for dedicating state resources to SWH (as part of overall development, environmental and industrial strategies), thereby facilitating post-project replication and its evolution into a government-enabled sustainable program.

Outcome 1: • Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development e policy instruments and regulatory framework to encourage sustainable SWH market development	
Outputs	*Activities*
1.1 One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework	• Assessment of existing legal and regulatory framework[31] and of the feasibility of complementary or alternative measures (with recommendations) • Awareness-raising and discussion seminars on legal-regulatory instruments • Project website
1.2 One market market assessment and economic analysis of SWH options	• Market study on supply and demand for solar thermal systems • Similar end-of-project market evaluation and impact study; • Workshops
1.3 Government-endorsed SWH action plan	• Draft action plan for the implementation of recommended policy instruments (output 1.1) • Final plan (incorporating post-project activities recommended in the final project report; output 1.3) • Action plan discussion workshops
1.4 Project monitoring and evaluation; impact assessment and monitoring	• Support to monitoring and work planning, in particular of project results and assessment of impacts; • Inception workshop and report • Mandatory mid-term and final evaluation; audits • Final project report

[29] The final report will highlight the remaining gaps and barriers and delineate the most cost-effective and relevant policies and measures (control and regulations, market-based instruments, incentives, marketing and information) to address these gaps and thus guarantee sustainability.

[30] A typical Action Plan will have a target, such as SWH systems sold, square meters installed, energy yield and a budgeted plan with activities, such as standardization, quality, training, R&D, information and promotion, which are needed to reach the target as well as which policy instruments will be pursued to further develop the market, including going from voluntary to mandatory quality standards.

[31] Analysis and proposals for amending/expanding the set of regulations and incentives (under existing UREE law, import and other relevant legislation) that specifically target SWH

Component 2 Quality control and supply side strengthening

One main barrier to adoption of SWH technology by building owners is the lack of trust in proper installation of these systems, which normally is not part of the training of electricians or water system technicians. In most cases, installation is to be undertaken by a professional. To guarantee performance, the quality of the installation is as important as the quality of the system. The project will support setting up of training courses at the Technological University of Panama (UTP) and possibly other institutions as well as integrating SWH in existing courses. This will be accompanied with a 'recognition scheme' that guarantees certain minimum requirements in terms of training and qualification of installers. Each installer or professional passing the exam will be recognized as 'trained solar thermal' installer and will be able to display a quality logo. As far as possible, materials and technical manuals will also be made available through the project's website.

In addition, technical workshops on SWH system design and installation will be organized as part of the general capacity building campaign in the supply side chain and of the implementation of SWH quality code. The continued and enhanced training of specialized retailers, plumbers, roofers and installers will be very important to ensure the sales of cost-effective SWH over conventional systems and their proper installation with reliable after-sales service. Also, building the trust among architects and building developers and mechanical and HVAC[32] engineers about the costs and benefits of SWH is essential. Learning materials and manuals from other (Spanish-speaking) countries will be made available.

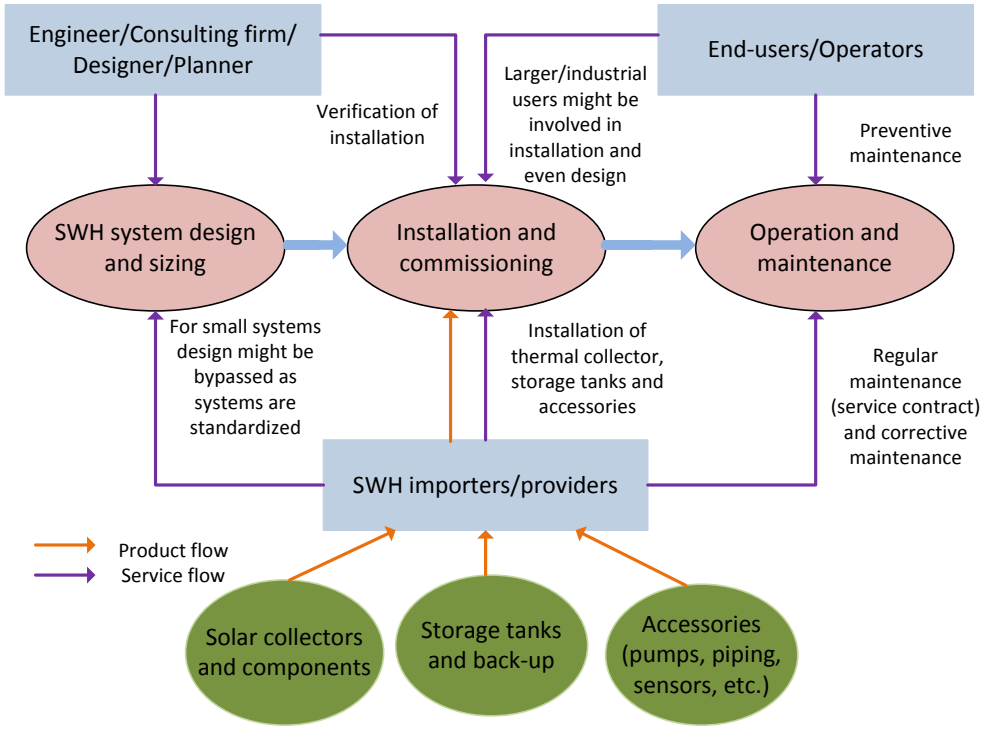


Figure 1 Supply-side of the SWH market with product and service flows

[32] Heating, ventilation, air-conditioning

Certification and quality assurance are critical in ensuring that consumers have confidence in and raising demand for the technology. A quality system typically consists of:

- Product standards (for safety, performance and durability) of the system components (collectors, tanks) as well as the system as a whole (i.e., optimal configuration of the system);
- Methodology for testing;
- A certification procedure (basically a surveillance system that guarantees constant quality).

Given the status of the technology in the Panamanian market, the quality control system will be a voluntary system, driven by the supply side representatives. The supply side would offer their products accompanied by testing report by an accredited institution and/or submit their products for independent testing. The project will support the adoption of testing standard and procedure. Although voluntary in nature, the project will work closely together with the relevant Panamanian authorities SNE (UREE and EE norms and standards proposals), COPANIT/DGNTI (standards implementation), CAN (accreditation) and the metrology institute CENAMEP[33]. Resources will also be made available for the improvement of existing testing laboratories (at UTP). In this respect, applied research, engineering education, development, product innovation, standardization and testing are closely linked and in all relatively small country as Panama likely the same institution(s) will be involved. The proper functioning of a quality control system will depend on the acceptance by the supply-side stakeholders. For this purpose the supply side will be encouraged to establish a specific committee, which can later form the basis for the establishment of specific solar thermal energy association. Industry will naturally prefer to avoid costs and regulations, but will benefit from the sale of quality products. In the end, quality control will be a joint effort by the supply side, public authorities (ensuring that incentives and regulations endorse quality) and consumer organizations[34].

The Action Plan (Output 1.4) will indicate

[33] See the List of Institutes on page 11

[34] Cooperation will be sought with COPANT (Pan-American Standards Commission), which regional Pan American Standards Commission, COPANT, is now working on unification of standards and certification schemes for solar thermal components and systems

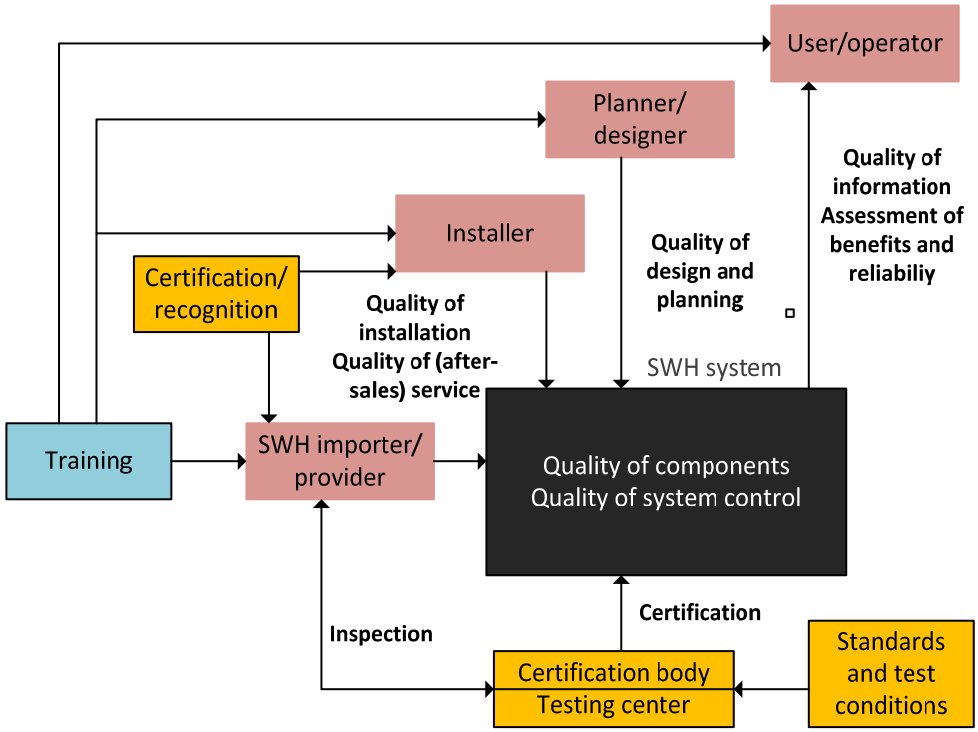


Figure 2 Role of training, standards and certification in various level of quality assurance

Outcome 2: • Quality control system in place and enhanced capacity of supply chain to offer SWH products and services	
Outputs	*Activities*
2.1 One capacity and training needs assessment supply side, building design and quality control system	• Assessment of capacity building and training needs in the local supply-side chain and quality control system • Discussion workshops and recommended actions
2.2 SWH incorporated into curricula of relevant educational institutions	• Supporting UTP (and other institutions) with setting up a training course on SWH with accompanying manuals and course materials and/or incorporating SWH in existing curricula;
2.3 Training activities implemented for SWH installers and technology providers; recognition scheme for installers established [35]	• Carrying out the trainings at UTP(and other institutions) and stand-alone specialized training workshops on design parameters, installation, maintenance and after-sales service and quality standards; • Elaboration and implementation of a certification scheme for SWH-qualified technicians and installers
2.4 Two SWH and green building training designed and implemented[36]	• Carrying out the training course at UTP (and other institutions) and stand-alone specialized training workshops, aimed at building professionals (architects, engineers, building designers) on SWH and related environmentally sound measures

[35] To meet SWH quality standards, improve product quality and provide adequate customer service

[36] Training of building professionals (architects, engineers, building designers) on SWH and related green building measures

2.5 One SWH standards and a quality control scheme developed[37]	• Elaboration of a proposal for SWH performance standard and system for verification and certification; • Discussion at meetings and workshops amongst supply side representatives and officials from relevant agencies and testing facilities
2.6 Capability to verify and test for compliance with the quality standards present	• Support to enhance the capacity on SWHs at testing facility (at UTP) and acquire international accreditation; • Support testing and certification of the first models
2.7 Agreed business and financing plan for the establishment of a national solar thermal association[38]	• Elaboration and proposal of business plans, formalization and establishment of the association; • Discussion at meetings; and formal launch of the association

Component 3 End-user supportive mechanisms and enhanced awareness

In Panama, solar thermal is not perceived as a standard option for water heating or drying, instead relaying on conventional electric or gas-fired equipment. With support of the project and based on the market assessment of Output 1.2, a communication strategy will be defined and a promotion campaign implemented, aiming at end-users, building developers and decision-makers in companies in the commercial and productive sectors. This will be reviewed regularly. It will also promote the lessons learned and best practices in the Project as well as obtained in similar activities in the region. The dissemination strategy would take into consideration promotional activities by SWH technology providers as well as public organizations and NGOs (including business associations, Green Building Council) through a number of deliverables, such as events (press conferences, participation in relevant workshops) , in newspapers and magazines (articles, press releases), radio and TV (promotional videos), brochures, billboards, posters for public buildings.

The campaign will supplement advertisements by SWH providers, which are normally small SME-type of companies with limited funds to launch an effective promotion. Also, the project, as a neutral and independent actor, is also in a better position to provide impartial and trusted information. The potential interest in cost-sharing publicity and campaigning with commercial and non-commercial media and NGOs will be explored. Regarding the latter group, the involvement of consumer organizations or any other civil society groups (non-governmental organizations, local communities, associations, etc.) can be a great success factor. Financing of solar thermal technology is an area where banks have no experience. Appropriate financial mechanism can be identified to make SWH attractive to customers, such as mortgage financing, soft loans, loan guarantees. By building on the market survey (output 1.2), the project seeks to identify appropriate financial mechanism and credit lines. Such financing could be offered to customers as part of the overall SWH marketing campaign, although their full implementation may not be until after the project after demand has risen. Such mechanism may include, a) Supporting SWH providers/ESCO, b) Budget allocation in public sector together with SWH guidelines for public buildings; c) Preferential financing for commercial companies and finance for residential (low-income; green mortgages, etc.).

[37] Or adapted from standards and other quality control components used in other countries or regions

[38] Or an existing entity to sustain the required market promotion activities

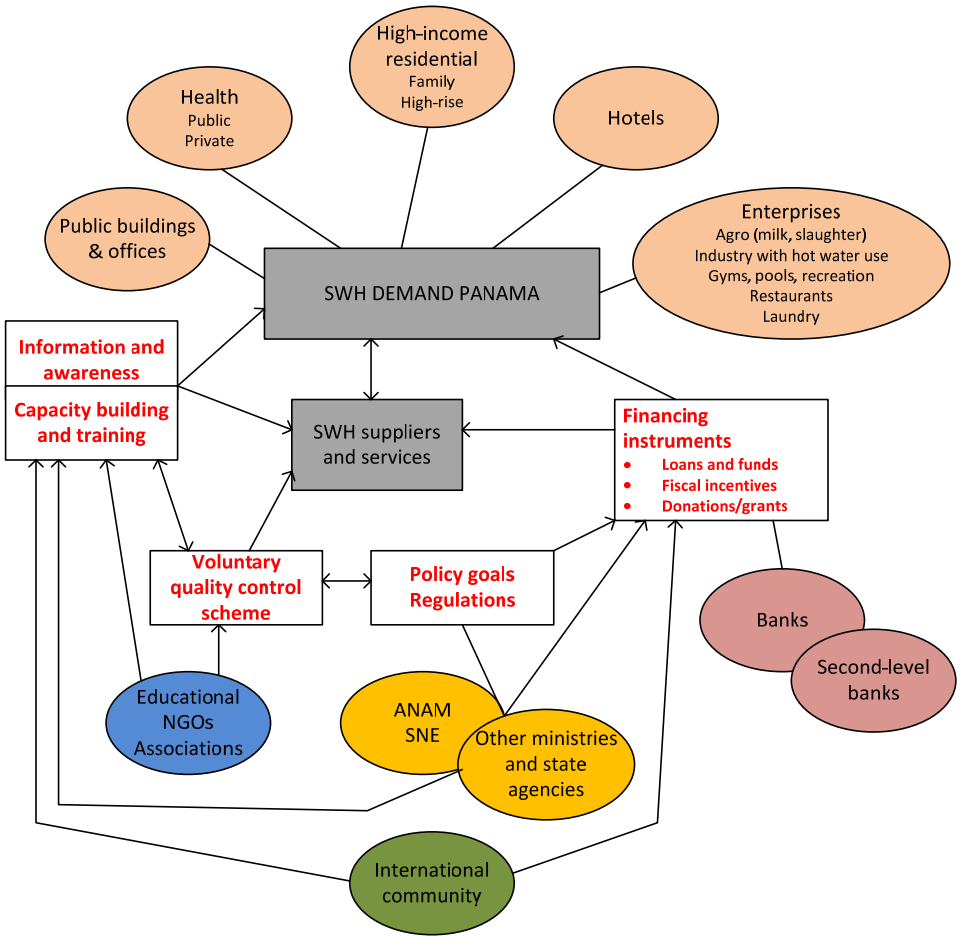


Figure 3 Relations between stakeholders and market development instruments

The campaigns and information mechanisms and channels to be used will be carefully designed to reach the target groups and specific market segments (hotel, larger public buildings, SME, home owners) or a geographical area, in which climatic conditions, built environment, consumer preferences and criteria for economic decision-making need to be taken into account. The market study of Output 1.2 will provide information on the potential amongst certain target groups and perceived risks and financial packages will be defined during the project in cooperation with interested financial institutions, such as Banco General and others. Banco General has committed to making loans and credit available, in their co-financing letter estimated at USD 3.1 million. The project can support Banco General as well as loan facilities set up under UREE in providing technical assessment on the SWH element in loan applications and on the other hand, guide and support prospective beneficiaries that may not be aware of or may not know how to apply to such schemes to get credit for installation of SWH. This TA support will be worked out in more detail after the assessment of financial issues and options of Output 3.2.

Outcome 3: • Enhanced end-user awareness on SWH and availability of end-user financial mechanisms	
Outputs	*Activities*

3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and technology providers sector[39]	• Strategy definition of awareness-raising (events; publicity campaigns; integration with government incentives and mobilization of finance) • Study tours and SWH application exposure events for private and public decision-makers[40] • Half-yearly project progress and info dissemination workshops
3.2 At least one end-user financing mechanisms established that can be used for investment in SWH	• Assessment study on financial issues, including data from project demonstrations and options and recommendations for feasible financial mechanism for SWH in Panama • Workshops on SWH applications, costs-benefits, finance and incentives • TA support to define and back up financial mechanisms
3.3 A campaign with marketing and publicity activities, targeting different SWH market segments completed [41]	• Design of campaign in media • TA support to implement publicity and information campaigning

Component 4 SWH pilot projects and demonstration

For both promotion and technical (experimental) reasons demonstrations projects are extremely useful. Projects implementing technologies that are not market ready, but which have an important potential, will allow testing and improving the solution, gather data, monitor functioning and finally demonstrate the feasibility to the general public and the industry in order to prepare the introduction on the market.

The pilot demonstrations will be carried out first in those buildings and/or sectors that are deemed to have high potential for SWH market development: a) tourism sector and hotels; b) health sector (hospitals and clinics) and c) agro-industries. The focus will be on low-temperature applications, i.e. applications with water heated to 50-100ºC. Examples of applications are warm water supply, (e.g. for showers and washing, heating of swimming pools), drying, cleaning and washing of agricultural products, as well as pre-heating of water (e.g. cloth washing, boilers, pasteurization, etc.).

'Early bird' pilot projects
Several companies or institutions have expressed during the project preparation (PPG phase) their interest in cooperation with the project, including sharing data on energy consumption, sizing and cost-benefits of proposed SWH systems, with the project on its turn providing technical feasibility analysis and design support.

Project	**Sector**	**Location**
Los Quetzales Ecolodge & Spa	Hotel/Tourism	Cerro Punta, Chiriquí
Boqueté Tree Trek	Hotel/Tourism	Boqueté, Chiriquí
Hospital Chiriquí	Health	David, Chiriquí
Hotel Casa Grande Bambito	Hotel/Tourism	Bambito, Chiriquí

Pipeline development and support
During project implementation the focus may be expanded to include larger industries (e.g. bottle cleaning and washing) and residential housing (showers, cloth and dish washing).The project will support a number of energy audits

39 Including the design of information and marketing packages on solar thermal and energy and water savings measures;

40 The project will promote alliances between government agencies, research and educational institutes entities, SWH suppliers, chambers and associations of industry

41 Including messages on energy and water saving measures

in up to 200 residential dwellings and enterprises. This will lead to suggestions on the deployment and feasibility of SWH as well as recommendations for cost-effective energy efficiency measures in the water heating and water use system and other improvements in the building[42]. A smaller number is expected to reach the installation and operational stage during the project's period with an estimated total capacity of 3,220 m^3, of which the project will partly support design study and installation and commissioning.

By the end of the project, a list of project opportunities will have been identified, based on the before-mentioned audits and supported on a continuous basis and will be in various stages of development, from operational, financial closure, design and feasibility to project concept. This ensures that not only a number of SWH installation will have taken place, but that a pipeline of opportunities will be identified with SWH capacity of at least 7,555 m^2 for post-project replication and, where possible and necessary, offered for financing, taking advantage of the financial incentives and fiscal instruments, identified in the other components of the project. Thus, direct and post-project direct installations would be at an estimated 10,775 m^2. It should be noted that financing schemes (grant, loan) are in principle available from Banco General or facilities under UREE to develop the pipeline[43]

Outcome 4: • SWH applications demonstrated and replicated	
Outputs	*Activities*
4.1 Identification, energy audits and SWH system proposal/feasibility[44]	• Identification of project opportunities • Energy audits and SWH system proposal in selected companies/buildings • Informational events
4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and 60 Mi kWh	• TA support (as needed) to selected companies/buildings in the preparation phase and limited financial support[45] • Financial and technical data collection and analysis from project demonstrations to show viability of SWH applications

3) Incremental cost reasoning and associated global environmental benefits

Solar water heating (SWH) is commercially viable and an available technology, which due to the different market barriers, however, has not reached the market penetration rate that it could reach on simply economic grounds. The baseline scenario is that in the absence of the suggested initiative to stimulate the SWH market and to remove the interrelated set of barriers and gaps mentioned above, development of the SWH market would simply not take off, despite indications that on the basis of the technical maturity and cost-efficiency of the SWH systems it should (as proven in many countries across the globe).

42 E.g., efficient lighting and luminaires, efficient space cooling, air-conditioning and better window isolation, as well as better 'energy housekeeping' practices, such as switching off appliances that are not in use and electricity use monitoring).

43 Estimated investment needed to install the total of 10,775 m^2 is an estimated USD 5.2 million (see Annex D), while commitments of Banco General and SNE for availability of funds are about the same (USD 5.0 million)

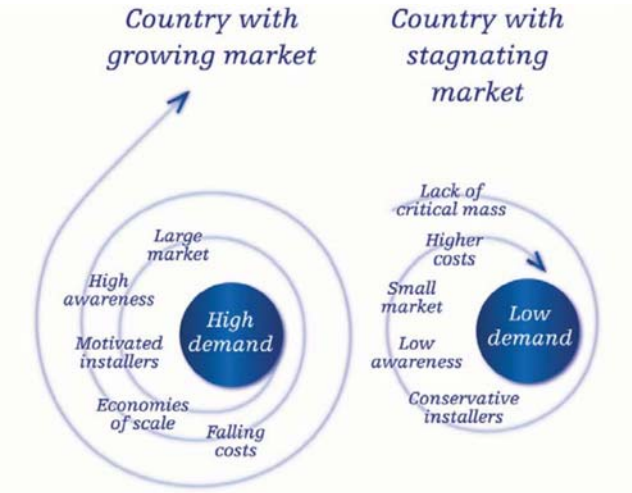
44 In hotels, health, agribusiness and industry, residential and commercial buildings; supplemented by cost-effective energy efficiency measures

45 Limited financial support can be provided to showcase SWH systems in high-potential, but resource-poor public sector entities (USD 250,000)

The purpose of the GEF intervention is to support the above-mentioned measures (incentives and regulations, quality assurance, awareness-raising, capacity building and training, R&D, financial mechanism, demonstration) in a holistic approach and to change the vicious circle that keeps the SWH market stagnating into a self-perpetuating cycle of market growth.

The objective of this GEF project is to reduce GHG emissions from Panama's buildings, public and productive sectors through barrier removal and implementation of solar water heating and accompanying practical measures in the existing building stock as well as mitigating future emissions in new buildings.

Figure 4 Market development and stagnation



4) Innovativeness, sustainability and potential for scaling up

As the demand for SWH products in Panama is low, only few companies import or can install SWH; but because SWH systems are not so 'visible' therefore, users will opt for the conventional water heating options (even if SWH would be more cost-effective on the longer run). This is a type of a 'chicken-and-the-egg' problem, i.e. which is first, demand or supply? Previous attempts to promote the technology by some Panamanian companies and institutions have failed to make a substantial inroad, because these were focusing on partial solutions (e.g. demonstration of a few SWH systems) only or by making wrong assumptions on the potential market group and demand. The *innovativeness* of the GEF-supported initiative lies in jumpstarting the market; i.e. trying to break the vicious 'chicken-or-the-egg' circle by developing the most promising market segments and simultaneously strengthening the SWH technology support and supply system (suppliers, service providers, installers; training) and offering solutions that are suitable for a country with a humid, hot climate, such as Panama.

On *sustainability*, a number of risks may affect the likelihood of continuation of the project's benefits after the project ends. These are listed in the next section A.6 and possible risk mitigation measures are assessed. The project's outputs are designed to implicitly improve its sustainability; for example:

- Strengthening the policy-regulatory framework (incentives, standards, regulations, action plan) to promote SWH technology in Panama;
- Development of linkages between a range of stakeholders from government (ministries, agencies), supply-side (SWH technology providers and installers), building developers, SWH technology users in various economic sectors (residential, hotels and restaurants, hospitals and clinics; small businesses)
- Appropriate capacity strengthening (technical training and skills; knowledge and information);
- Mobilizing financial resources and linking these publicity and promotional campaigning (demand-side);

Regarding *scaling up*, the project will provide technical assistance in the market and feasibility assessment and design of SWH systems in a number of applications (pilot demonstrations). To achieve a larger-scale replication, the project will support the development of a portfolio of opportunities of investment in SWH (output 4.1), based on the market assessment's (output 1.2), and experiences obtained with supporting the pilot demos (output 4.2). For the portfolio, sources of finance (output 3.2) will be linked with incentives provided as part of the improved policy and regulatory framework (outputs 1.1 and 1.4).

A.6 Risks,

Including climate change, potential social and environmental risks that might prevent the project objectives from being achieved and measures that address these risks:

Risk	Risk level	Mitigation measure
Lack of coordination between various government entities and with private sector stakeholders and the financial sector	Medium	Extensive stakeholder consultations, awareness raising, capacity building and other advocacy work during the project preparation and implementation with an effort to identify "local champions". Early engagement of decision makers in the project preparation and implementation. A Project Steering Committee (PSC) will integrate these government stakeholders to give overall guidance and will also (with private sector and NGO stakeholders) participate in Working Groups that will bring together stakeholders to discuss issues on a more technical level in certain thematic areas.
Delayed implementation of regulations under the new UREE Law in general as well as of new regulations and quality control measures specifically targeting SWH	Low	The project will mitigate this risk by seeking to engage and coordinate with key public authorities as well as private sector associations, responsible at different levels for the actual implementation SWH related regulations and quality control systems with related capacity building, when and as needed.
Lack of motivation and ultimate interest of the targeted stakeholders to participate in and learn from the training and capacity building activities organized by the project.	Medium	Creating incremental value for training by identifying and raising the awareness of the targeted supply side stakeholders on new business opportunities resulting from training and supporting the establishment of sustainable demand for the new services on EE and solar thermal and/or products.
The market development efforts and promotion mechanisms established are not sustainable due to uncertainty in and/or lack of demand for SWH	Medium	The project will carry out a detailed assessment on the demand for SWH and market characteristics, including a cost-benefit analysis vis-à-vis conventional alternatives for various applications. The project will address the various gaps that inhibit market penetration of SWH in a holistic way by simultaneously dealing with supply side and demand side issues. The integration of a realistic exit strategy into the project design with the commitment of the key stakeholders to support this strategy, including incentives and financial support mechanisms and continuing SWH promotion and information campaigns on the longer-term economic benefits of SWH and EE measures.
Climate change will affect viability of SWH applications	Low	More cloudy conditions could affect SWH output but this effect would be extremely minimal. Regarding buildings, future building codes account for weather conditions, but will be revisited as part of the policy dimension of the project. More modules can be added as weather patterns change and consumption needs are not met.

A.7 Coordination with other relevant GEF financed initiatives

The UNDP/GEF project "Energy Efficiency in Central America" (PEER) was successfully implemented in four countries in that region, including Panama, during 2006-2011. Although PEER focused on efficiency in *electric* energy, the proposed SWH project will built on the experiences and case studies of PEER and the goodwill created in Panama regarding sustainable energy initiatives.

The German GIZ is supporting the "4E Program: Renewable Energy and Energy Efficiency in Central America". Its first phase (2010-2013) is focusing on El Salvador, Costa Rica and Honduras, although synergies will be sought with the regional activities on renewable energy and energy that might involve Panama as well.

The project will also work with regional organizations, such as Inter-American Development Bank (IBD), Central American Integration System (SICA)[46] and the Latin American Energy Organization (OLADE), and seek synergies with ongoing and future technical assistance programs in the Central American region.

The project will contribute to the knowledge management component of the GEF project no. 2939: "Global Solar Water Heating Market Transformation and Strengthening Initiative" currently under implementation. In return, the experience of UNEP with regard to this global project and other SWH initiatives (mentioned earlier in Section A.3) will provide important lessons learnt for the project.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Stakeholders and project management

Describe how the stakeholders will be engaged in project implementation

1) Project administration

The project is co-financed with funding from the Global Environment Facility (GEF) with the United Nations Environment Programme (UNEP) acting as the GEF Implementing Agency. UNEP as the GEF Implementing Agency will be responsible for the supervision of project execution to ensure consistency with GEF and UNEP policies and procedures, and will be responsible for overall project reporting. UNEP will formally participate in meetings, the mid-term and final evaluations, clearance of half yearly and annual reports, technical review of project outputs, and additional technical assistance for the execution of the project as may be requested. UNEP will cooperate with ANAM; however, ANAM will be accountable to the Government and UNEP/GEF for ensuring (i) the proper achievement of the objectives of the Project; (ii) the monitoring and evaluation of the project outputs and outcomes; (iii) the effective use of both international and national resources allocated to it; (iv) the timely availability of financing to support project implementation; (v) the proper coordination among all project stakeholders; in particular national parties; and (vi) the timely submission of all project reports, including work plans and financial reports..

The project implementation is arrangements comprise the following:

- National Project Director (PD)
- Project Steering Committee (PSC)
- Project Implementation Unit (PMU)
- Technical Working Group

Project Director

Within ANAM, responsibility will be with a high-ranking official, who will act as National Project Director and thus assumes responsibility for the Project on behalf of the national Government.

Project Steering Committee (PSC)

[46] In particular, SIECA (Secretariat for Economic Integration of Central America) and CCAD (Central American Commission for Environment and Development)

The PSC is the highest decision-making authority of this project. The main role of the PSC is (i) to guide and oversee the technical progress and performance of the Project, and (ii) to enhance and optimize the contributions of various partner organizations through coordination of all activities and inputs. The PSC meetings will be formally called by the National Project Director (as Chairperson of the PSC) at least twice a year to discuss the project performance and provide future guidance. Extraordinary meetings will be held if deemed necessary by one of the PSC members. The PSC is likely to include high level representatives from ANAM, SNE and UNEP with the Project Coordinator as the secretary of the PSC. Other stakeholders (e.g. other ministries and public agencies, private sector, associations, NGOs) can be invited on a permanent basis (to be decided during project inception) or to attend meetings on an as-needed basis.

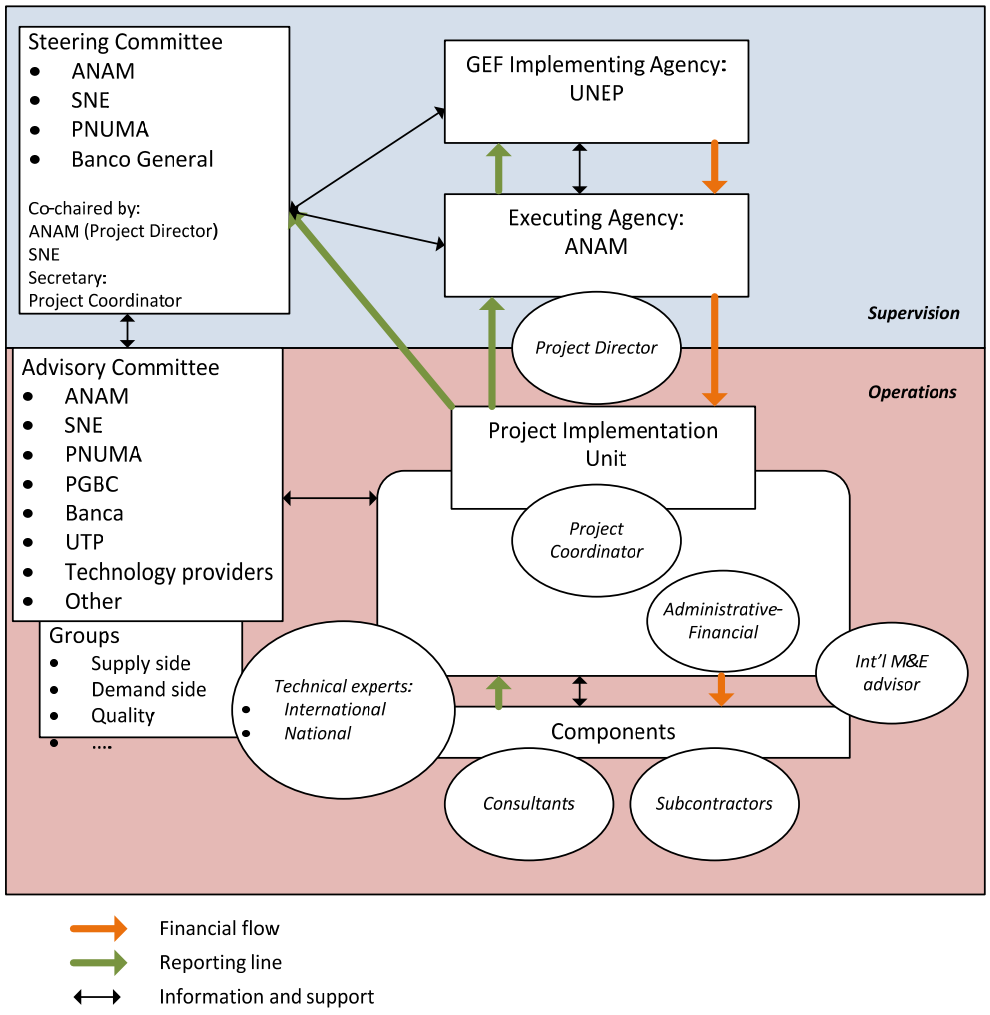


Figure 5 Project institutional setup and administration

Project Advisory Committee (PAC) and Technical Working Groups (TWG)

To interact with stakeholders at the institutional level, a Project Advisory Committee (PAC) will be formed consisting of the government entities participating in PSC, supply-side representatives, building associations, consumer organizations, universities/institutes and NGOs. The PAC will meet regularly during project implementation and will provide overall comments and advice on key project activities including fund commitments and co-financing

arrangements. Depending on the thematic issues, Technical Working Groups can be formed, e.g. one on the supply chain and technical strengthening, and one on the demand side and financial issues.
Project Implementation Unit (PIU)

A Project Implementation Unit will be set up by ANAM, responsible of the overall operational and financial management and reporting of the UNEP/GEF funds in accordance with the rules and regulations for nationally executed projects The PIU will be formally headed by the **Project Director** (in-kind contribution of ANAM), while the **Project Coordinator** (PC) will manage day-to-day operations of the Project with the support of an Administrative-Financial assistant. The PIU may be established at ANAM's premises or elsewhere.

Technical Advisors and Experts will not be permanent staff, but recruited from time to time to support the Project Coordinator in assuring quality of outputs of the project as a whole:

- Results and Impacts (international monitoring and evaluation advisor)
- Supply chain and quality control (international expert)
- Demand and finance (national expert)

The PC will be responsible for the day-to-day project operations, financial accounts, periodic reporting to UNEP and the PSC and for allocation of the GEF grant according to the quarterly and annual work plans and budgets in coordination with UNEP and ANAM. The PC will also act as secretary of the PSC. The PC will prepare the Project Inception report and, at the end of the project, the project Final Report (with support from the International Technical Advisor)

B.2 Socio-economic benefits

Describe the socio-economic to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund)

Economic
The project reflects commitment to increase the use of a renewable source of energy, namely solar thermal energy, as a pivotal way to meet the climate change challenge. The project will save money on the energy bill of residential, institutional and commercial end users and enhance the economic competitiveness in the supply side by offering a new high-quality on the market. From a macro-economic viewpoint, Panama will reduce the cost of imported fossil fuel. While large part of the system will be imported, the local economy will benefit from the market development of solar thermal and enhanced technology skills that comes with the assembly and installation of the systems.

Environmental
In addition to economic benefits, the SWH technology offers great potential to avoid CO_2 emissions from direct fossil fuel burning or electricity (see next section B.3) and reduce local and regional air pollution. The manufacture and production of solar thermal systems does not involve dealing with hazardous or toxic substances and the systems are easy to recycle.

Social benefits and gender
Because of its decentralised nature and its simplicity, solar thermal is a renewable energy which individual citizens can grasp. This allows a bottom up approach to energy and environmental issues.
Women are considered as a key stakeholder for development of industry, energy and environmental resources and climate change mitigation. Therefore, gender aspects will be taken into account as part of the market surveys and capacity assessments of Outcomes 1 and 2 at the onset of the project. Gender mainstreaming action will be integrated in all stages of a project cycle, including design of interventions, execution, monitoring and evaluation. References to gender will be consistent throughout the project approach, the activities, indicators, and budget. Female experts will be

encouraged to participate in the training and other project activities, while in the demonstration component special attention will be given to SMEs (e.g. restaurants or hostels) led by women entrepreneurs.

Indigenous people
The main market will be predominantly consisting of commercial actors. However, one target group will be 'clinics and hospitals'. If a clinic in one of the indigenously populated areas (e.g. Ngöbe Bugle, San Blas or Darién) were to install SWH, the indigenous patients visiting would benefit.

B.3 Global environmental benefits and cost-effectiveness:
Explain cost-effectiveness in the project design

The project is expected to have a **direct and post project direct l**ifetime emission reduction of 3.77 kilotons of CO_2 ($ktCO_2$) per annum from the installation of 10,775 m^2 of SWH system demonstrations of Component 4 (direct[47] and post-project direct), as a consequence of the substitution of fuels and electric heating by SWH. This implies cumulative greenhouse gas (GHG) emission reduction over the technologies' lifetime of 75.4 tCO_2. For details on assumptions and calculations, the reader is referred to Annex D.

As a result of the market surveys, identified pipeline of SWH project opportunities and mobilized finance during the project, the **indirect (bottom-up)** GHG reduction impact could be 3 times larger, about 226.2 $ktCO_2$.The market potential could be ten times as large, up to 100,000 m^2. The corresponding **indirect (top-down)** emission reduction impact is an estimated 443.0 $ktCO_2$, assuming a coincidence factor of 60%.

The following table compares the cost effectiveness of reducing GHG emissions in the proposed project, based on the estimates presented in Annex D.

	Cumulative GHG reduction ($ktCO_2$)	**GEF Cost-effectiveness (USD/tCO_2)[48]**
Direct emission reductions	21.1	
Post-project direct emission reduction	54.3	
Total direct and post project direct	*75.4*	*25.4*
Indirect emission reductions (bottom-up)	226.2	8.5
Indirect emission reduction (top-down)	443.0	4.3

The following table gives an overview of the cost-benefit analysis of the use of SWH (replacing fuel and electricity). For the details of the calculation and assumptions, the reader is referred to Annex D. It should be noted that at investment cost of USD 400-600 m^2, payback times are around 4-5 years, depending on the application and energy replaced (fuel and/or electricity). For instance, in residential house/office, the ratio between electricity/fuel (gas) is 70/30 and the payback is 4.3 years; for hotels, the ratio of electricity/fuel is 50/50 and the payback time ranges from 4.0 to 4.2 years (large/medium hotels respectively). For the hospital sector, the small agro sector and larger enterprises, the energy replaced is only fuel (gas), and the payback time is 4,5; 4,7 and 4,2 respectively.

47 As a result of 1,600 m^2 SWH installed during the project's lifetime

48 Defined as GEF contribution to the project (USD 1,918,182) divided by the direct (and post-project) lifetime emission reduction

Solar water heating	CASES:	Residential house/office	Hotel large	Hotel medium	Hospital	(Agro)/small enterprise	Larger enterprise
Number of pilots (direct)	70	30	10	12	8	8	2
Number of pilots (direct+post-project)	1105	1000	30	35	15	20	5
Total area (m^2)	10,775	2,000	4,800	1,400	375	800	1,400
Investment (USD) [2]	5,157,625	1,200,000	2,196,000	665,000	169,125	380,000	547,500
End-user savings (kWh/yr)	9,700,749	1,744,623	4,282,257	1,248,992	353,138	753,360	1,318,380
Savings (USD)	1,236,259	278,037	549,386	160,238	37,815	80,672	130,112
Payback (years)		4.3	4.0	4.2	4.5	4.7	4.2
System savings (kWh/yr)	10,041,991	1,850,787	4,464,253	1,302,074	353,138	753,360	1,318,380
GHG reduction (tCO_2/yr)	3,771	858	1,763	514	80	171	384
Cumulative reduction (tCO_2) [3]	75,411	17,156	35,269	10,287	1,602	3,417	7,679

C. DESCRIBE THE BUDGETED M & E PLAN:

This is discussed in detail in Annex G, which presents the budgeted M&E (monitoring and evaluation) plan. The M&E is consistent with GEF policy, including smart indicators in the project results framework with baseline values and end-of-project targets. The M&E plan will be reviewed and revised as necessary at project inception and a project supervision plan will be developed at this stage. The weight will be on outcome monitoring, but financial and implementation monitoring will equally be incorporated. In addition to resources set aside for the mid-term and final evaluations, funds are reserved to undertake targeted and qualitative stakeholder surveys and interviews to monitor changes in perception.

The Project will also establish a market monitoring system that will provide accurate information on a periodic basis with regard to the use of solar water heaters in Panama. The Project comprises mid-term and terminal evaluations as the main assessment method. These evaluations will be done independently and will be carried out by a project evaluation specialist that will be recruited by the Evaluation and Oversight Unit (EOU) and will work in consultation with Project Management Unit (PMU). A summary of M&E activities envisaged is provided in Annex G. The GEF contribution for M&E activities is USD 60,000, with co-financing of USD 60,000.

PART III: APPROVAL BY GEF OPERATIONAL FOCAL POINT AND GEF AGENCY

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT ON BEHALF OF THE GOVERNMENT:

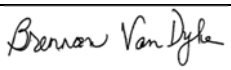
(Please attach the Operational Focal Point endorsement letter(s) with this form; see Annex K)

NAME	POSITION	MINISTRY	DATE *(MM/dd/yyyy)*
Mr. Silvano Vergara	General Administrator	National Environmental Authority (ANAM)	06/26/2012

B. GEF AGENCY CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address

Brennan VanDyke, Director, GEF Coordination Office, UNEP		December 03, 2014	Ruth Coutto Task Manager	+33144371634	Ruth.coutto@unep.org

ANNEX A: PROJECT RESULTS FRAMEWORK

Direct and indirect impacts

Objective	Ouctome iindcators	Baseline	Target	Means of verification	Assumptions	UNEP MTS
Cost-effective CO_2 reduction measures initiated by developing the market for solar thermal heating systems	A) Direct impacts: A.1 Installed capacity A.2 Associated energy savings and GHG emission reduction	A) N/A	A) Direct and post-project direct: 10,775 m^2, (direct: 3,220 m^2), resulting in lifetime GHG emission reduction 75.4 $ktCO_2$ (direct: 21.1 $ktCO_2$); End-user savings direct and post-project of 9,700 MWh/yr (direct: 2,925 MWh/yr) and system savings of 10,042 (direct and post-project direct) and 3007 MWh/yr (direct) [49]	• Official import and technology vendor statistics; vendor interviews • Project monitoring and evaluation • Initial and end-of-project market assessment	• Economic and financial feasibility of the SWH investments; • Continuing motivation and support of supply-side stakeholders, recognizing the value added • Interest of SWH users to invest in the technology • Continuing commitment of key partners and willingness to coordinate actions	Sub-program 1: Climate Change
	B) Indirect impacts: B.1 Increased demand and sales of SWH systems B.2 Associated energy savings and GHG emission reduction	B) Small number of installations in hotels	B) Indirect impacts: • Bottom-up: 226.2 $ktCO_2$ lifetime (replication factor = 3), due to 32,325 m^2 SWH operation • Top-down: 443.0 $ktCO_2$ (coincidence factor = 60%)			

[49] End-user savings = Fuel savings (use of LPG or diesel) + electricity savings (user's electricity consumption); System savings – fuel savings + plant gate's electricity savings. For a detailed explanation od calculations and likelihood of indirect emission impacts, the reader is referred to Annex D

Outcomes

Outcome	Indicators	Baseline	Target	Means of verification	Assumptions	Expected accomplishment
1. Effective policy-regulatory framework- endorse by the government	C) Number of policy instruments and regulations adopted to promote market of SWH	C) UREE does not include solar water heating specifically	C) By 2016, one (1) revised set of regulations under UREE is proposed and endorsed to promote the use of SWH/solar thermal technology	• Official government publications and news bulletins	• Timely implementation of regulations under UREE Law and other relevant Laws; • Continuing commitment of key partners and stakeholders in public sector	Expected Accomplishment (b): Energy efficiency is improved and the use of renewable energy is increased in partner countries to help reduce greenhouse gas emissions and other pollutants as part of their low emission development pathways
2. Voluntary quality control systems in place in the SWH industryy to offer SWH products and services that customers are satisfied with	D) The % of businesses that adopt and use voluntary SWH quality standards including monitoring and verification (M&V) system E) Status of certification scheme and % increase of installers and products that are certified F) The % increase of surveyed customers who are satisfied with their SWH installations	D) No standards exist, neither voluntary nor mandatory E) No products or installers are certified F) Baseline survey on SWH installation customer satisfaction will be conducted in the first year of the project	D) One (1) quality control system in place by yr 4 of required standards and associated certification scheme, to be adopted by industry on a voluntary basis; All (100%) of brands with over a 20% market share are certified E) One certification scheme for SWH equipment and installers adhered to by over 50% of SWH providers F) 50% of businesses have adopted and use voluntary standards	• Project monitoring and evaluation reports • Project technical reports (capacity assessments; activity reports of testing and certification) • Supply-side company reports and assessments • Proceedings of	• Continuing commitment of key partners and stakeholders in the supply chain and by support institutions (universities; laboratories) • Interest by supply chain stakeholders as well as building designers to receive training and capacity building	Expected Accomplishment (b):

Outcome	Indicators	Baseline	Target	Means of verification	Assumptions	Expected accomplishment
				training events and workshops	• Willingness of stakeholders to cooperate on quality control	
3. Enhanced end-user awareness of the technical and financial viability of SWH applications and increased use of end-user financial mechanisms	H) Percentage of end users aware of the technical and financial viability of SWH applications, in each target sector (Hotel, health, industry, residential/ buildings).	H) A survey will be conducted in the first year of the project to assess current levels of awareness by end users of the technical and financial viability of SWH applications in each target category	H) A minimum of 50% of end-users in each target sector are aware of the technical and financial viability of SWH applications by yr4	• Project monitoring and evaluation reports • Project technical reports (capacity assessments; financial mechanism and schemes; consumer awareness surveys) • Public awareness and campaign materials • Public sector financing and banking sector annual and other reports • Proceedings of training events and workshops	• Interest and willingness of demand-side stakeholders to commit investments in SWH technology; • SWH investments are economically and financially feasible depending on benefits and cost in particular subsector; actual fuel prices and incentive-financial schemes put in place	Expected Accomplishment (b):
	I) No of financial mechanisms being used for SWH applications	J) No financing mechanisms being used to promote installation of SWH	I) At least one financial mechanism used by yr 3 to support installation of SWH applications:			
4. SWH applications demonstrated and financial and technical viability confirmed	J) Percentage of SWH demonstration applications confirmed as being technically and financially viable. K) Number of systems	J) No data on technical and financial viability of SWH applications in Panama	J) 100% of project SWH demonstration applications show to be technically and financially viable. K) Systems operating	• Project monitoring and evaluation reports • Demo project monitoring	• Interest and willingness of demand-side stakeholders to commit investments in	Expected Accomplishment (b):

Outcome	Indicators	Baseline	Target	Means of verification	Assumptions	Expected accomplishment
	installed in project-linked demo projects		with a total SWH surface area pf 3,220 m^2 operating by yr4 expanding to 10,775 m2 after the project has ended (post-project)	reports • Company publications	SWH technology;	

Project outputs

Output	Output indicators	Baseline	Target	Means of verification	Risks and assumptions	PoW output reference number
Component 1 Policy-regulatory framework for SWH promotion and informed policy decision-making						
1.1 One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework	1. Number of proposals to change regulations and incentives to integrate SWH in constructions and to stimulate the SWH market	• Regulations are being developed as part of UREE Law, but not often geared towards electricity and not specifically aiming at SWH	• *One (1)* proposal for SWH –specific regulations are developed to support UREE (if existing ones are not adequate), elaborated in discussion with public and private stakeholders	• Official government publications and news bulletins • Project work plans; monitoring and evaluation reports • Technical reports (legal-regulatory; assessment, market studies); • Proceedings of training events and workshops	• Timely implementation of regulations under UREE Law and other relevant Laws; • Continuing commitment of key partners and stakeholders in public sector	Output 3: Tools and approaches designed and piloted in countries to develop mitigation plans, policies, measures, and low-emission development strategies, and spur investment and innovation within selected
1.2 One market assessment and economic analysis of SWH options	2. Number of market assessment and analysis studies carried out	• Some limited baseline info on SWH sales and market potential, obtained in the PPG phase;	• *Two (2)* assessment of SWH supply, demand and market conditions: o One study in yr1; and o one at the end of the project in yr4 (plus barrier and gap analysis) o At least two workshops, one at the beginning, one at the end, attended by 15 people			

Output	Output indicators	Baseline	Target	Means of verification	Risks and assumptions	PoW output reference number
1.3 One Government-endorsed SWH action plan	3. Number and status of Government-endorsed proposal to stimulate the SWH market after the project's end	• No action plan	• *One (1)* action plan by yr 4, incorporating the project's results, detailing market development objectives and strategies (e.g., finance, budget, incentives, m2 installation target, operationalization and institutional setup);			sectors in a manner that can be monitored, reported on and verified
1.4 Project monitoring and evaluation; impact assessment and monitoring	4. Number and status of project inception/ baseline update and project impacts/final report 5. Number of M&E reports	• No arrangements for SWH market and impact monitoring • No evaluations	• *One (1)* project inception report in yr 1 and *one (1)* project impact/final report in yr4 • *One (1) p*roject mid-term and *one (1)* final evaluation conducted on schedule			
Component 2 Quality control and supply side strengthening						
2.1 One capacity and training needs assessment supply side and quality control system	6. Number and status of needs assessment	• N/A	• *One (1)* assessment of capacity and training needs and proposal for trainings (outputs 2.3 and 2.4) and integration of SWH in curricula and short courses (output 2.5) by the end of yr1	• Project monitoring and evaluation reports • Project technical reports (capacity assessments; activity reports of testing and certification) • Supply-side company reports and assessments	• Continuing commitment of key partners and stakeholders in the supply chain and by support institutions (universities; laboratories) • Interest by supply chain stakeholders as well as building designers to receive training and capacity	Output 3
2.2 SWH incorporated into curricula of relevant educational institutions;	7. Number of curricula of university and vocational training that have incorporated of SWH-relevant topics	• Research on SWH at UTP; no vocational training on SWH installation	• *Two (2)* o Integration of SWH as part of mechanical and electrical engineering curricula and research at *one* university (UTP); o One course on SWH installation and maintenance (e.g.			

Output	Output indicators	Baseline	Target	Means of verification	Risks and assumptions	PoW output reference number
			INADEH; others)	• Proceedings of training events and workshops	building • Willingness of stakeholders involved to cooperate on quality control scheme	
2.3 Training activities implemented for SWH installers and technology providers; recognition scheme for installers established	8. Number and status of recognition scheme and certification 9. Status of training of SWH technicians and installers	• No certified SWH technicians or service providers • N/A	• *One (1)* certification system of for SWH equipment and service providers in operation by yr3 • About 30 days of technical training by yr 4 with at least 60 persons trained, of which 70% are recognized			
2.4 Two SWH and green building training designed and implemented	10. Number and status of training of architects and building design professionals	• N/A	• *Two (2))* technical training of 5 days each of by yr 4 with at least 20 persons trained			
2.5 One SWH standards and a quality control scheme developed	11. Availability of a quality control system for SWH equipment	• No standards for SWH equipment and/or components	• *One (1)* voluntary system adopted by yr3 by industry/association, consisting of required standards and a certification scheme;			
2.6 Capability to verify and test for compliance with the quality standards present	12. Availability of effective and affordable testing services	• No standards for testing; costs of testing and certification could be perceived as too high	• *One (1)* system of testing services available: o Adoption of one set of testing standards by yr3; o One testing lab operational by yr4 (also used for training, see Output 2.2)			

Output	Output indicators	Baseline	Target	Means of verification	Risks and assumptions	PoW output reference number
2.7 Agreed business plan for the establishment of a national solar thermal energy association	13. Number and status of organization of SWH stakeholders	• N/A	• *One (1)* solar thermal energy association established by yr2			
Component 3 Enhanced awareness and end-user supportive mechanisms						
3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector	14. Number and quality of events organized	• Lack of information on SWH feasibility, market characteristics and possible financing models	• At least *two (2)* events (at least 6 workshop.days (with attendance of 20 people per day)	• Project monitoring and evaluation reports • Project technical reports (capacity assessments; financial mechanism and schemes; consumer awareness surveys) • Public awareness and campaign materials • Public sector financing and banking sector annual and other reports • Proceedings of training events and workshops	• Interest and willingness of demand-side stakeholders to commit investments in SWH technology; • SWH investments are economically and financially feasible depending on benefits and cost in particular subsector; actual fuel prices and incentive-financial schemes put in place	Output 3
3.2 At least one end-user financing mechanisms established that can be used for investment in SWH	15. Number and type of new financing instruments	• No experience with finance, specifically targeting SWH or solar thermal	• At least *one (1)* financing line defined and approved (at Banco General or other banks) by yr2-3: o Linked with green mortgages; and/or o for SWH investments in SWH; and/or f o for SWH providers			
3.3 A campaign with marketing and publicity activities, targeting different SWH market segments completed	16. Availability of suitable public awareness raising materials 17. Visibility and impact of the awareness and marketing campaigns	• General lack of awareness and information on possible SWH applications, gains and benefits and reliability; SWH market is not effectively promoted	• *One (1)* public media ampaign defined and implemented disseminating high-quality info and materials (in cooperation with education and local media) by yr2-3			

Output	Output indicators	Baseline	Target	Means of verification	Risks and assumptions	PoW output reference number
Component 4 SWH pilot projects and demonstration						
4.1 Identification, energy audits and SWH system proposals/feasibility	18. Number and type of entities with energy audits/feasibility SWH carried out 19. Proposals for SWH capacity	• Limited annual sales of SWH systems, mostly in hotel projects	• Energy audits and feasibility analysis carried out in at least 200 entities; o Technical training and publicity of at least 3 workshop.days, incl. output 4.2)	• Project monitoring and evaluation reports • Demo project monitoring reports • Company publications	• Interest and willingness of demand-side stakeholders to commit investments in SWH technology;	Output 3
4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and 60 Mi kWh	20. SWH capacity installed		• Installation of at *least 3,220 m^2 of SWH capacity* (1000 residential; 105 public/commercial buildings) during project • Project and post-project installations up to *10,775 m^2* (during or shortly after the project)			

ANNEX B: RESPONSES TO PROJECT REVIEWS

(from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

1) Comments from GEF Secretariat at PIF

Questions in GEF Secretariat Review Sheet:

24) *Is PIF clearance/approval being recommended?*
April 5, 2013: The PIF has been technically cleared and is being recommended for CEO approval

25) *Items to consider at CEO approval:*
   a) *Confirmation and detailed analysis of GHG emission reduction figures*
   Details of the GHG emission reduction analysis are presented in Annex D
   b) *A budgeted M&E plan that monitors and measures results with indicators and targets*
   Details on the M&E plan and budget are presented in Annex G, while indicators of project results are given in Annex A.

2) Comments from GEF Secretariat at CEO Approval

7. Are the components, outcomes and outputs in the **project framework** (Table B) clear, sound and appropriately detailed?
   - *GEF comment:*
   MY 8/15/2014
   Not at this time. Please put a quantitative target for each of the expected outputs where applicable. In expected output 1.1 on page 1, for example, please indicate the number of SWH-relevant regulation and policy instruments, and recommended policy framework to be reviewed. For outputs 2.1, 2.2, 2.3, 2.4, 3.3, and 4.2, The GEF Secretariat also expects indicative numbers to be shown in Table B (Project Framework). In particular, for output 4.2, please specify it in square meters of SWH equipment. These numbers will help justify the budget of the GEF fund;
   - *UNEP response:*
   Writing space in Table B is too limited. For all indicators a quantitative target has been added in the results framework, indicating which progress indicator corresponds to which output.

10. Is the role of public participation, including CSOs, and indigenous peoples where relevant, identified and explicit means for their engagement explained?
   - *GEF comment:*
   MY 8/15/2014
   Yes, CSOs are engaged in project investments (page 3). but the main text of the CEO ER document does show any information on indigenous peoples. Please indicate if the project is relevant to indigenous peoples
   - *UNEP comment:*
   No, the main market will be predominantly consist of commercial actors. However, one target group will be 'clinics and hospitals'. If a clinic in one of the indigenously populated areas (e.g. Ngöbe Bugle, San Blas or Darién) were to install SWH, the indigenous patients visiting would benefit.

11. Does the project take into account potential major risks, including the consequences of climate change, and describes sufficient risk mitigation measures? (e.g., measures to enhance climate resilience)
   - *GEF comment:*
   MY 8/15/2014
   Not completed at this time. Please identify the risk due to the consequences of climate change;
   - *UNEP response:*

We do not see any risk to SWH due to climate change impacts.

14. Has the cost-effectiveness of the project been sufficiently demonstrated, including the cost- effectiveness of the project design as compared to alternative approaches to achieve similar benefits?
    - *GEF comment:*
      The Agency did not undertake cost- effectiveness analyses to evaluate alternative technologies against the SWH technology, but per renewable energy technology literature, so far, the SWH technology is most cost-effective among all renewable energy technologies;
    - *UNEP response:*
      This Comment is not correct. The Table "Calculation of GHG direct emission reduction" on page 41 in Annex D gives a comparison of SWH technology vs. electricity and LPG-fueled heaters, indicating energy savings, payback times and money savings

16. Is the GEF funding and co- financing as indicated in Table B appropriate and adequate to achieve the expected outcomes and outputs?
    - *GEF comment:*
      No. It cannot be commented at this time. Please add quantitative numbers for the expected outputs in Table B. Then, comments can be made. Please also see comments in Box. 7;
    - *UNDP response:*
      See Comment 7. Progress indicators with quantitative target (plus description what the quantity means) has been added in the results framework of Annex A.

17. At CEO endorsement: Has co- financing been confirmed?
    - *GEF comment:*
      MY 8/15/2014
      Not at this time. The total OFP endorsed amount is less than the total budgeted amount in Table A (and Table B). Please reduce the project budget. Please also double check the co- financing amounts in the co-financing letters and in Table C to make sure they are consistent;
    - *UNEP response:*
      GEF budget has been reduced to USD 1,918,182. We have also checked, found and corrected the inconsistencies in the co-financing. Total cofin is USD 8,142,000.

18. Is the funding level for project management cost appropriate?
    - *GEF comment:*
      MY 8/15/2014
      Not at this time. The percentage is current, but the amount is wrong since the total amount of GEF fund budget is more than what the OFP endorsed;
    - *UNEP response:*
      The GEF budget has been changed to the amount endorsed by OFP, USD 1,918,182. Correspondingly, PMC has been reduced to USD 174,380

19. At CEO endorsement/ approval, if PPG is completed, did Agency report on the activities using the PPG fund?
    - *GEF comment:*
      MY 8/15/2014. Not at this time.
      UNEP response: See Annex C

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[50]

A. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
Project Preparation Activities Implemented	***GEF Amount ($)***		
	Budgeted Amount	***Amount Spent Todate***	***Amount Committed***
1201 Lead Consultant	26,250	22,935	2,175
1202 SWH expert (pilot project	9,990	6,650	
1203 National Solar Water Heater Consultant	9,420	7,385	
Total	45,660	36,970	2,175

[50] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertaking the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: ESTIMATES OF DIRECT AND INDIRECT GREENHOUSE GAS EMISSION REDUCTION

This Annex provides a description of the possible pilot projects as well as the calculation of the corresponding energy substitution and greenhouse gas emission reduction.

D.1 Direct emission reduction estimates

The table on the next page gives the details of the method to estimate energy substitution and savings and the corresponding GHG emission reduction of the SWH demonstration/pilot schemes that will be supported under the GEF project:

- SWH demo/pilot schemes supported with audits and SWH proposal/feasibility (for about 220 systems) as part of Output 4.1 and are expected to result during in implementation during or after the project (direct and post-project direct emission reduction), if needed supported by financial mechanisms developed under the GEF project (output 3.2);
- Of these, an expected 70 SWH demo/pilot schemes (or the equivalent of 3,220 m^2 installed SWH capacity) will be designed and installed during the project's implementation period (direct emission reduction); the SWH system will replace electrical as well as gas-fired geysers and boilers or used to pre-heat water in commercial/industrial applications;
- It is expected that the energy audits (output 4.1) not only results in a proposal for a SWH system, but also identifies 'low-hanging fruit' energy and water saving options (such as efficient lighting, energy-efficient appliances such as air-conditioning; efficient showerheads). Their investment and implementation as such will be by the proponent itself, and will not part of the project's whose focus is on SWH.

Notes to the table:

(1) For each subsector (residential, hotel, hospital, small agro-industry, large enterprise), an average typical case has been defined in terms of square meters of solar collector. The price of systems varies substantially internationally, depending on type and model (see Box 1 in the main text), application (standard system or customized), with or without storage tank). In the calculations, prices of USD 400-600 m^2 have been assumed for the SWH system, including the water storage (tank), based on prices of such systems in Mexico. It should be noted that the market in Panamá is very nascent and in the beginning systems cost would be about 25% higher; however, over the years as the market would develop, prices would drop

The table below gives the annual energy consumption for water heating based on the hot water needs of a typical unit (residential, large hotel, small hotel, hospital and a larger (agro-)industrial enterprise. The SWH system would typically cover 30-40% of the energy needs.

Residential	*Large hotel*	*Other hotel*	*Hospital*	*Pre-heat water, industry*
45 kg person	200	kg/room	60 kg/bed	30,000 kg/day
4 persons	100	25 rooms occupied	40 beds occ.	
4.18 kJ/kg.K	4.18	kJ/kg.K	4.18	4.18
45 K	45	K	45	45
3,433 kWh/yr	381,425	95,356 kWh/yr	45,771 kWh/yr	572,138 kWh/yr
47% coverage	34%	34% coverage	51%	46%
System production	*System production*		*System production*	*System production*
1,601 kWh/yr	128,071	32,018 kWh/yr	23,543 kWh/yr	263,676 kWh/yr

Note: hot water consumption data based on research in PPG phase and taken from *Procalsol 2007-2012* (CONAE, ANES, GTZ; 2007; México DF)

Calculation of GHG direct emission reduction

Assumptions			
		Units	*Source of data:*
Grid emission factor	0.5675	tCO_2/MWh	Based on *Informe de Validación* (BID, AENOR, 2008)
Emission factor LPG	0.063	tCO_2/MJ	
	2.9043	$kgCO_2/kg$	
Emission factor diesel	2.8	kgCO2/liter	
Heating value LPG	46.1	MJ/kg	
Heating value diesel	35.9	MJ/liter	
Residential electricity	0.165	$/kWh	
Other electricity	0.136	$/kWh	Based on tariffs provided by ASEP (2nd half of 2012)
Price LPG	1.371	$/kg	Tropigas (Oct. 2012)
Price diesel	0.984	$/litre	
Annual average radiation (a)	1570	$kWh/m^2/yr$	Based on data provided by Inelectra and UTP; see Annex N
Collector efficiency (b)	0.60		
Losses piping, etc. (c)	0.15		
Solar energy gain (d)	800	kWh/m^2	= a*b*(1-c)
Efficiency electricity system (e)	0.95		
Efficiency gas system (f)	0.85		
Lifetime SWH	20	yrs	
Lifetime EE	10	yrs	
Interest	5%		
Power system T&D losses	9%		

Solar water heating	**CASES:**	**Residential house/office**	**Hotel large**	**Hotel medium**	**Hospital**	**(Agro)/small enterprise**	**Larger enterprise**
Estimates per pilot/unit	*Units*						
Tank capacity	(liter)	150	12,000	3,000	1,700	3,000	15000
Area (m2) [(1)]	(m^2)	2	160	40	25	40	280
Cost of SWH system ($)	($)	800	43,200	11,000	6,875	11,000	70,000
Tanque	($)	400	30,000	8,000	4,400	8,000	39,500
Cost per m^2 [(1)]	($/$m^2$)	600	458	475	451	475	391
Energy gain (E=d*area)	(kWh/yr)	1,601	128,071	32,018	20,011	32,018	224,125
Electric energy saved (P = E/e)	(kWh/yr)	1,685	134,812	33,703	21,064	33,703	235,921
Fuel substituted (L =E/f)	(kWh/yr)	1,883	150,672	37,668	23,543	37,668	263,676
	($/yr)	311	20,491	5,123	3,202	5,123	35,860
	(kg LPG / liter diesel	147 LPG	11,766 LPG	2,942 LPG	1,838 LPG	2,942 LPG	26,441 diesel
	($/yr)	202	16,134	4,034	2,521	4,034	26,022
% electric systems ($\%_P$)		0.7	0.5	0.5			
%. gas systems ($\%_L$)		0.3	0.5	0.5	1.0	1.0	1.0
Average end-user savings ($P*\%_P+L*\%_L$)	(kWh/yr)	1,745	142,742	35,685	23,543	37,668	263,676
End-user monetary savings	($/yr)	278	18,313	4,578	2,521	4,034	26,022
System savings	(kWh/yr)	1,851	148,808	37,202	23,543	37,668	263,676
CO_2 substitution	(tCO_2/yr)	0.86	58.78	14.70	5.34	8.54	76.79
Total	*TOTAL*						
Number of pilots (direct)	*70*	30	10	12	8	8	2
Number of pilots (direct+post-project)	1105	1000	30	35	15	20	5
Total area (m^2)	10,775	2,000	4,800	1,400	375	800	1,400
Investment (USD) [(2)]	5,157,625	1,200,000	2,196,000	665,000	169,125	380,000	547,500
End-user savings (kWh/yr)	9,700,749	1,744,623	4,282,257	1,248,992	353,138	753,360	1,318,380
Savings (USD)	1,236,259	278,037	549,386	160,238	37,815	80,672	130,112
Payback (years)		4.3	4.0	4.2	4.5	4.7	4.2
System savings (kWh/yr)	10,041,991	1,850,787	4,464,253	1,302,074	353,138	753,360	1,318,380
GHG reduction (tCO_2/yr)	3,771	858	1,763	514	80	171	384
Cumulative reduction (tCO_2) [(3)]	75,411	17,156	35,269	10,287	1,602	3,417	7,679

(2) The investment for the 10,775 m^2 of SWH systems is an estimated USD 5.16 million. This corresponds with the estimated level of cash co-financing associated purchasing or financing SWH systems as referred to in the co-financing letters from SNE (USD 2.00 million) and Banco General (USD 3.04 million). Of the systems, an estimated 3,220 m^2 will be installed during the project's lifetime (direct impact) and 7,555 m^2 as a consequence of the identification/formulation/financing activities supported by the project (post-project direct impact).

(3) The annual energy savings (substitution of LPG or diesel and plant gate's electric energy reduction) is around 10,042 MWh annually; this results in emission reduction of 3.77 $ktCO_2$ per year and lifetime reduction of 75.4 $ktCO_2$ per year (assuming 20-year lifetime of a SWH system).

This summarized in the table below:

s

The outputs 4.1 and 4.2 will result in a portfolio of SWH opportunities with an estimated 10,775 m^2 of installed capacity. By the end of the project, not all capacity will be installed, because some opportunities may be approaching financial closure, others will be in the design phase, with other SWH projects still in the feasibility stage. Conservatively, we estimate that about 70 projects (or 3,220 m^2 will be installed and properly operating by the end of year 4) and the climate change impact is referred to as **direct emission reduction ($CO_{2\ direct}$ = 21.1 $ktCO_2$).** The direct emission reduction estimate includes the proposed pilot/demo activities whose owners/managers have presented a co-financing letter.

The impact of other projects will be implemented (shortly) after the project's end (as a results of investment decision taken based on the audits and financing options made available) is referred to as **post-project emission reduction ($CO_{2\ pp\ direct}$ = 54.3 $ktCO_2$)**. Thus, **total direct and direct post-project emission reduction** will be an estimated 75.4 $ktCO_2$.

D.2 Indirect emission reduction

The technical assistance, capacity building, and the development of an SWH investment friendly enabling environment has a longer-term effect on jump-starting the SWH market in Panama, whose impacts go beyond the project's period of implementation. **Indirect emission reduction** are after-implementation impacts of the market facilitation and barrier removal project and estimated for the 10-year period after the project's end. The quantification of the indirect emission reduction is based on the methodology described in the GEF Manual[51].

The range is given by bottom-up and top-down estimates. In the **bottom-up approach**, it is assumed that the direct investments supported by the GEF project are replicated. A replication factor (RF) is used and indirect emission reduction follows from **$CO_{2indirect\ BU}$ = $CO_{2\ total\ direct}$ * RF**. Total direct emission reduction is the sum of the direct and post-project direct lifetime emission reduction. A replication factor of ´three´ is applied; **226.2 $ktCO_2$**, implying a significant market transformation impact.

In the **top-down approach**, an estimate of the market potential is made. Because market forces or government policies might generate some of these achievements at a later point in time even without a GEF intervention (baseline shifts), this figure is then multiplied by an assumed GEF causality factor (CF), which indicates to what degree the GEF intervention can claim causality for the reduction.

[51] Manual for Calculating GHG Emissions of GEF Projects: Energy Efficiency and Renewable Energy Projects; GEF/C.33/Inf.18 (2008)

The theoretical market potential can be calculated by estimating the universe of residences, hotels, hospitals and clinics and industrial enterprises in Panama. This upper limit market potential is summarized in the table below:

	Units		Source:
Hotels	680	21,067	Rooms; El Siglo 2011; Annex N (2011)
- hostels	241		
- occupation	50%		
Health facilities	918		
- Hospitals, health	456	8,565	Beds; MINSA-CSS 2013; Annex N
- occupation		49%	
Dwellings	907,425		Censo 2000; MIVOT; Annex N
	6%		Use of water heaters (Annex N)
Population	3,720,000		Annex N
- People/dwelling	4.1		
Larger enterprise	4,137		
SMEs	195,000		La Estrella.com.pa 2012
Agroindustrial	3,594		Based on FAO data

From these figure we can derive estimates of the number of entities, as given below:

Market potential	CASES:	Residential house/office	Hotel large	Hotel other	Hospital	(Agro)/small enterprise	Larger enterprise
Potential number of entities, 2028		76,930	310	171	316	4,119	959
Market coverage		30.0%	30%	30%	15%	10%	10%
Number of entities		23,079	93	51	47	359	96
Area (m^2)	105,497	46,158	14,873	2,047	1,184	14,376	26,859

Notes:

- Annual growth of 2.5% is assumed and the present number of entities is multiplied by 1.41 to get the number in the year 2028;
- In case of residence, hotels and hospitals, the total number of entities (2028) is multiplied by the use of water heaters (residential), room occupation (hotels) and bed occupation (hospitals) respectively

Thus, installed capacity in 2028 (10 years after the project's end) is estimated to be able to reach 105,000 m^2. We assume that the contribution of the GEF project to realizing this market potential would be substantial and propose applying a CF = 60%. Consequently, GHG lifetime emission reduction **$CO_{2indirect\ TD}$ = 443.0 ktCO_2** (corresponds to 63,300 m^2 of installed SWH surface).

The emission reduction estimates are summarized below:

	m2	Cum. GHG	
- Direct	3,220	21,091	
- Direct and post-project direct	10,775	75,411	
- Indirect	32,325	226,232	RF= 3
- Indirect	63,298	443,002	CF= 0.6

ANNEX E: CONSULTANTS TO BE HIRED AND SUBCONTRACTS

Position title	USD / person week	Estimated person weeks	Total (in USD)	Tasks to be performed
National staff and consultants-technical assistance (TA)				
National techical expert (demand and finance)	787.5	100.0	78,750	Provide overall guidance with special attention to policy, awareness creation and demand-side issues (Components 1, 3 and 4); Finalise ToRs for consultants and subcontracts
Project assistant	236.3	200	47,250	Assist in webpage development, workshop and event planning and organization; Internet search on technical SWH topics; travel and study tour arrangements; institutional liasons
Training on SWH installation, design and planning	1050	11.0	11,550	Provide advice on training of installers and equipment providers as well as designers/planners; To advise on strengthening supply-side orgamization (associations); Assist in writing ToRs for subcontracts and help defining training programme; Support definition and implementation of quality control and recognition schemes (outputs 2.3, 2.4, 2.7)
Networking and awareness of decision-makers	1050	4	4,200	Support the organization of high-level meetings between decision-makers in policy, supply-side,d emand-side and financial sector to discuss issues and options in SWH market development (output 3.1)
Technical suport in SWH pilot identification, analysis and pilot implementation	1,050	12.0	12,600	Help in identifying possible companies, buidings, institutions for SWH application; Help write ToRs for subcontracts in Component 4; Monitoring of pilot projects (outputs 4.1 and 4.2)
Total	**472.0**	**327.0**	**154,350**	
Position title	**USD / person week**	**Estimated person weeks**	**Total (in USD)**	**Tasks to be performed**
International consultants - TA				
Int'l advisor, monitoring and impact assessment	3,906	15.0	58,594	Monitoring the progress and supporting the learning, adaptive management and implementation of the project activities; Propose methodologies for baseline assessment, market monitoring and for assessing the impact of the project and the adopted policies in terms of energy savings and GHG reduction.
Int'l techical expert (supply-side)	1,875	50.0	93,750	Provide overall guidance with special attention to policy, technical capacity building and supply-side issues (Components 1, 2 and 4); Finalse ToRs for subcontracts and
Policy, planning and incentives	3,906	10.0	39,063	Advice on elements of SWH action plan (goals, policy instruments, incentives) and participate in awareness-raising events of Output 3.1; Support forumuation of financial mechanims (incentives, soft loans, guarantees)
Training on SWH installation, design and planning	3,906	9.0	35,156	Provide advice and assist in training for installers and equipment providers as well as designers/planners; Assist in writing ToRs for subcontract of the defining training programme (outputs 2.1, 2.2, 2.3, 2.4)
Quality assurance and contriol	3,906	4.0	15,625	Support definition and implementation of quality control and recognition schemes, based on international experiences and standards (outputs 2.1, 2.5)
Technical suport in SWH pilot analysis, monitoring and pilot implementation	3,906	13.0	50,781	Assist possible companies, buidings, institutions in design and feasibility analysis; Help write ToRs for subcontracts in Component 4; Monitoring and technical evaluation and troubleshooting for demo/pilot activities (outputs 4.1, 4.2)
Total	**2,901**	**101.0**	**292,969**	

Position title	USD / person week	Estimated person weeks	Total (in USD)	Tasks to be performed
National staff - Project management				
Project manager	820.0	200	164,000	The Manager is responsible for day-to-day management and co-ordination; budgeting; forward planning; liaising with project participants and stakeholders; preparation and presentation of project status reports to the Project Steering Committee; preparing subcontractors terms of reference and contracts; supervision of contracts; and project execution of all tasks identified under the project specified in the Project Document
Total		**200**	**164,000**	

Please note that the amounts in USD per person.week of national staff/consultants and international consultants mentioned above are based on their daily fee plus travel cost (tickets, DSA), valued at 25% of the fee of international consultants and 5% of the fee of national consultants. For the Project Manager travel cost is not included, but budgeted separately.

Subcontracts		USD	
Project website and info storage		7,500	Development of project's website
Market and institutional assessment		65,000	Assessment of market supply, potential demand, legal-regulatory aspects and identification of issues and options (outputs 1.1 and 1.2)
End-of-project technical assessment		54,825	Survey of market; identification of remaining barriers and gaps; recommendations for further action (outputs 1.2 and 1.4)
Support curricula development and strengthening laboratories (engineering, architecture and design)		50,000	Integration of SWH in curricula (electrical, mechanical, building design); elaboration of training materials; implementation of training; strengthening testing facilities (outputs 2.1, 2.2, 2,4,
Development of short courses (vocational training)		20,000	Training of SWH providers, installers and service providers (outputs 2.1, 2.3, 2.4); definition and implementation of
Voluntary quality assurance and control		15,000	Assessment of existing institutional capacity and recommendations for voluntary certification and labelling (outputs 2.1 and 2.5)
Financial mechanisms and incentives		15,000	Assessment and recomendations for financial support mechanisms, linked with incentives
Support SWH-dedicated financial mechanism		90,000	Support for beefing up existing credit lines and/or guarantee and/or fund (TA and financial suppport; output 3.2)
Design and implementations SWH promotional and publicty campaign (one or more subcontracts)		102,190	Design and implementation of promotional campaign and awareness-raising (flyers/pamphlets; radio/TV; printed press)
Technical support audits and feasibility SWH		160,000	Technical support identification, audits and feasibility of SWH and rational use of energy in selected entities
Technical support design and implementation SWH		130,000	Technical support design, implementation and commissioning of SWH in selected
	TOTAL	**709,515**	

ANNEX F: BUDGET AND CO-FINANCING

This Annex provides the following tables:

- Overview of GEF budget and co-financing
- Detailed overview of GEF budget
- Reconciliation between GEF activity based budget and UNEP budget
- Reconciliation between GEF budget and co-finance budget

F.1 Overview of GEF budget and co-financing

GEF-budget

	1. Informed decision making	2. Quality control and supply side	3. Demand; end-user support	4. SWH pilots and replication	PM	TOTAL
Int'l consultants	93,750	74,219	50,781	74,219	0	292,969
Nat'l onsult and staff	31,500	43,050	35,700	44,100	164,000	318,350
Travel staff + nationals	0	0	0	0	3,000	3,000
Subcontracts	127,325	85,000	207,190	290,000	0	709,515
Training	10,000	140,000	57,500	7,500	0	215,000
Equipment	0	55,000	0	250,000	3,500	308,500
M&E	60,000	0	0	0	3,880	63,880
Other misc	1,227	1,731	1,829	2,182	0	6,968
TOTAL	**323,802**	**399,000**	**353,000**	**668,000**	**174,380**	**1,918,182**

Co-financing (non-GEF funding; in-kind and cash)

	Comp 1	Comp 2	Comp 3	Comp 4	PM	In-kind	Cash	Total (USD)
ANAM	155,800	120,000	240,000	100,000	632,200	1,022,450	225,550	1,248,000
SNE	24,000	20,000	20,000	2,000,000	120,000	184,000	2,000,000	2,184,000
Banco General				3,100,000		-	3,100,000	3,100,000
PGBC			760,000	100,000		780,000	80,000	860,000
UNEP	50,000	20,000	20,000	10,000		100,000		100,000
UTP		650,000				400,000	250,000	650,000
Private							-	0
TOTAL	**229,800**	**810000**	**1,040,000**	**5,310,000**	**752,200**	**2,486,450**	**5,655,550**	**8,142,000**

F.2 Detailed overview of GEF budget

BUDGET - DETAILS	UNEP budget category	1100-1200	1100-1200	1600	20	30	4100	4200	50	5500	
		Int'l consult	Nat'l consult	Travel staff	Subcontr	Training	Exp equipm equipm	Non-exp equipm	Misc	M&E	TOTAL
Component 1		**93,750**	**31,500**	**0**	**127,325**	**10,000**	**0**	**0**	**1,227**	**60,000**	**323,802**
Output 1.1	- study policy, regulations, incentives				15,000						**15,000**
	- workshop					2,500					**2,500**
Output 1.2	- market study				50,000						**50,000**
	- project impact study				40,000						**40,000**
	- workshops					2,500					**2,500**
Output 1.3	- int'l advisor, impacts and monitoring	58,594							588		**59,182**
	- mandatory M&E									60,000	**60,000**
Output 1.4	- action plan	11,719			14,825						**26,544**
	- workshop					5,000					**5,000**
	- project website				7,500						**7,500**
Support expert, demand and supply		23,438	31,500						639		**55,577**
Component 2		**74,219**	**43,050**	**0**	**85,000**	**140,000**	**2,000**	**53,000**	**1,731**	**0**	**399,000**
Output 2.1	- assessment quality and supply system; training needs	19,531			15,000						**34,531**
	- workshops					5,000					**5,000**
Output 2.5	- proposal quality control				10,000						**10,000**
	- training workshops, QC institutions	7,813			10,000	12,500					**30,313**
Output 2.6	- TA support testing capacity				15,000			40,000			**55,000**
Output 2.3	- recognition scheme	0	4,200								**4,200**
	- technical training installers and providers	7,813	0			75,000					**82,813**
Output 2.2	- TA support product R&D				10,000						**10,000**
	- TA support curricula and short courses				15,000			13,000			**28,000**
Output 2.4	- TA course development building design and SWH	7,813	0		5,000	15,000					**27,813**
	- training for building designers; industrial engineers	7,813	4,200		5,000	30,000					**47,013**
Output 2.7	- business plan solar thermal association		3,150			2,500					**5,650**
Support expert, supply; Misc		23,438	31,500				2,000		1,731		**58,669**
Component 3		**50,781**	**35,700**	**0**	**207,190**	**57,500**	**0**	**0**	**1,829**	**0**	**353,000**
Output 3.1	- Strategy awareness-raising events	15,625	4,200								**19,825**
	- Seminars / workshops					15,000					**15,000**
	- Study tour and travel abroad					35,000					**35,000**
Output 3.2	- Assessment and recommendations finance	11,719			15,000						**26,719**
	- Workshops					7,500					**7,500**
	- TA support mechanism	0			90,000						**90,000**
Output 3.3	- Design of campaign				22,190						**22,190**
	- Campaign in in media				80,000						**80,000**
Support expert, supply; Misc		23,438	31,500						1,829		**56,766**
Component 4		**74,219**	**44,100**	**0**	**290,000**	**7,500**	**5,000**	**245,000**	**2,182**	**0**	**668,000**
Output 4.1	- Identification pilots and audits	23,438	8,400		160,000			50,000			**241,838**
	- workshops	7,813	4,200			5,000					**17,013**
Output 4.2	- Feasibility; Design and commissioning; installation	19,531			130,000			195,000			**344,531**
	- workshops					2,500					**2,500**
Support expert, supply; Misc		23,438	31,500				5,000		2,182		**62,119**
Project management and administration			**164,000**	**3,000**			**600**	**2,900**	**3,880**		**174,380**
TOTAL		**292,969**	**318,350**	**3,000**	**709,515**	**215,000**	**7,600**	**300,900**	**10,848**	**60,000**	**1,918,182**

F.3 Reconciliation GEF funds with UNEP budget format

	Expenditures by Component						Expenditures by project year			
UNDP budget line (all in USD)	1. Policy-regulatory framework for SWH promotion and informed decision-making	2. Quality control and supply side strengthening	3. Enhanced awareness and end-user supportive mechanisms	4. SWH pilot projects and demonstration	5. Project management	TOTAL	Year 1	Year 2	Year 3	Year 4
10 PERSONNEL										
1100 Project personnel (management and tech experts)										
1101 Project manager					164,000	164,000	41,000	41,000	41,000	41,000
1199 Subtotal	**0**	**0**	**0**	**0**	**164,000**	**164,000**	**41,000**	**41,000**	**41,000**	**41,000**
1200 Consultants and technical experts (incl. travel)										
1201 Technical expert, demand	19,688	19,688	19,688	19,688		78,750	19,688	19,688	19,688	19,688
1202 Technical expert, supply	23,438	23,438	23,438	23,438		93,750	23,438	23,438	23,438	23,438
1203 Project support	11,813	11,813	11,813	11,813		47,250	11,813	11,813	11,813	11,813
1211 Int'l advisor, monitoring and impact assessment	58,594					58,594	21,000	12,500	12,500	12,594
1212 Policy, planning and incentives	11,719		27,344			39,063	3,900	3,900	15,600	15,663
1213 Training on SWH installation, design and planning		35,156				35,156	11,256	11,250	11,250	1,400
1214 Quality assurance and contriol		15,625				15,625			7,800	7,825
1215 Technical suport in SWH pilot analysis, monitoring and pilot implementation				50,781		50,781		7,500	17,500	25,781
1221 Training on SWH installation, design and planning		11,550				11,550	5,550	6,000		0
1222 Networking and awareness of decision-makers			4,200			4,200	2,100	2,100		0
1223 Technical suport in SWH pilot identification, analysis and pilot implementation				12,600		12,600	2,600	3,700	2,600	3,700
1299 Subtotal	**125,250**	**117,269**	**86,481**	**118,319**	**0**	**447,319**	**101,344**	**101,888**	**122,188**	**121,900**
1601 Travel staff										
1699 Subtotal					**3,000**	**3,000**	**750**	**750**	**750**	**750**
1999 Component total	**125,250**	**117,269**	**86,481**	**118,319**	**167,000**	**614,319**	**143,094**	**143,638**	**163,938**	**163,650**
20 SUBCONTRACTS										
2301 Project website and info storage	7,500					7,500	7,500			0
2302 Market and institutional assessment	65,000					65,000	65,000			0
2303 End-of-project technical assessment	54,825					54,825				54,825
2304 Support curricula development and strengthening laboratories		50,000				50,000		25,000	25,000	0
2305 Development of short courses (vocational training)		20,000				20,000	10,000	10,000		0
2306 Voluntary quality assurance and control		15,000				15,000			15,000	0
2307 Financial mechanisms and incentives			15,000			15,000		7,500	7,500	0
2308 Support SWH-dedicated financial mechanism			90,000			90,000			30,000	60,000
2309 Design and implementations SWH promotional and publicty campaign			102,190			102,190	25,000	35,000	25,000	17,190
2310 Technical support audits and feasibility SWH				160,000		160,000	40,000	40,000	40,000	40,000
2311 Technical support design and implementation SWH				130,000		130,000	15,000	30,000	35,000	50,000
2399 Subtotal	**127,325**	**85,000**	**207,190**	**290,000**	**0**	**709,515**	**162,500**	**147,500**	**177,500**	**222,015**
2999 Component total	**127,325**	**85,000**	**207,190**	**290,000**	**0**	**709,515**	**162,500**	**147,500**	**177,500**	**222,015**
30 TRAINING AND MEETINGS										
3301 Meetings/workshops (Component 1)	10,000					10,000	2,500	2,500		5,000
3302 Meetings/workshops (Component 2)		140,000				140,000	5,000	50,000	70,000	15,000
3303 Meetings/workshops (Component 3)			57,500			57,500	5,500	5,500	5,500	41,000
3304 Meetings/workshops (Component 4)				7,500		7,500	2,500	2,500		2,500
3306 Stakeholder participation										
3999 Component total	**10,000**	**140,000**	**57,500**	**7,500**	**0**	**215,000**	**15,500**	**60,500**	**75,500**	**63,500**
40 EQUIPMENT AND PREMISES										
4101 Expendable equipment; office supplies		2,000		5,000	600	7,600				7,600
4202 Non-expendable equipment; office equipment	0	53,000	0	245,000	2,900	300,900	15,000	100,000	120,000	65,900
4300 Premises and counterpart facilities										
4999 Component total	**0**	**55,000**	**0**	**250,000**	**3,500**	**308,500**	**15,000**	**100,000**	**120,000**	**73,500**
50 MISCELLANEOUS COMPONENT										
5201 Sundry					2,000	2,000	500	500	500	500
5202 Publications & communications	1,227	1,731	1,829	2,182	1,880	8,848	2,100	1,800	1,800	3,148
5299 Subtotal	**1,227**	**1,731**	**1,829**	**2,182**	**3,880**	**10,848**	**2,600**	**2,300**	**2,300**	**3,648**
50 EVALUATION										
5581 Mid-term evaluation	25,000					25,000		12,500	12,500	0
5582 Final evaluation	22,500					22,500				22,500
5503 Inception workshop	2,500					2,500	2,500			0
5504 Audits	10,000					10,000	2,500	2,500	2,500	2,500
5581 UNEP participation						0				
5599 Subtotal	**60,000**	**0**	**0**	**0**	**0**	**60,000**	**5,000**	**15,000**	**15,000**	**25,000**
5999 Component total	**61,227**	**1,731**	**1,829**	**2,182**	**3,880**	**70,848**	**7,600**	**17,300**	**17,300**	**28,648**
99 GRAND TOTAL	**323,802**	**399,000**	**353,000**	**668,000**	**174,380**	**1,918,182**	**343,694**	**468,938**	**554,238**	**551,313**

F.4 Reconciliation co-financing with UNEP budget format

UNDP budget line (all in USD)	SNE		Banco General		PGBC		UTP		ANAM	UNEP	Total
	Cash	In-kind	Cash	In-kind	Cash	In-kind	Cash	In-kind	In-kind/cash	In-kind	(USD)
10 PERSONNEL											
1100 Project personnel											
1101 Project director									56,250		56,250
1106 Counterpart staff		110,000			55,000				709,000		874,000
1107 Counterpart support		20,000			20,000				135,000		175,000
1108 UNEP participation										50,000	50,000
1199 Subtotal	**0**	**130,000**	**0**	**0**	**75,000**	**0**	**0**	**0**	**900,250**	**50,000**	**1,155,250**
1200 Consultants											**0**
1231 Short-term staff SNE		15,000									
1232 Short-term staffs PGBC					5,000						
1232 Short-term staff ANAM									40,550		
1299 Subtotal		**15,000**			**5,000**				**40,550**		**60,550**
1999 Component total	**0**	**145,000**	**0**	**0**	**80,000**	**0**	**0**	**0**	**940,800**	**50,000**	**1,215,800**
20 SUBCONTRACTS											
2320 Grants and support contracts	2,000,000										2,000,000
2321 Loan contracts			3,100,000								3,100,000
2199 Subtotal	**2,000,000**	**0**	**3,100,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,100,000**
2999 Component total	**2,000,000**	**0**	**3,100,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,100,000**
30 TRAINING AND MEETINGS											
3306 Stakeholder participation and training		20,000				720,000	100,000	400,000	165,000		1,405,000
3999 Component total	**0**	**20,000**	**0**	**0**	**0**	**720,000**	**100,000**	**400,000**	**165,000**	**0**	**1,405,000**
40 EQUIPMENT AND PREMISES											
4203 Non-expendable equipment		5,000					150,000		20,000		175,000
4300 Premises and counterpart facilities		12,000				60,000			66,000		138,000
4999 Component total	**0**	**17,000**	**0**	**0**	**0**	**60,000**	**150,000**	**0**	**86,000**	**0**	**313,000**
50 MISCELLANEOUS COMPONENT											
5300 Sundry; unforeseen		2,000							36,200	10,000	48,200
5581 Monitoring and evaluation									20,000	40,000	60,000
5999 Component total	**0**	**2,000**	**0**	**0**	**0**	**0**	**0**	**0**	**56,200**	**50,000**	**108,200**
99 GRAND TOTAL	**2,000,000**	**184,000**	**3,100,000**	**0**	**80,000**	**780,000**	**250,000**	**400,000**	**1,248,000**	**100,000**	**8,142,000**

Notes:

- Nat. project director estimated at USD 750/day; technical staff at USD 150/day and support staff at USD 90/day
- Premises rent equivalent at USD 4000/yr for 16 m^2
- Personnel (budget category 10): budget for consultants and technical experts (1200) include cost of travel (ticket and DSA); budget for project staff (1100) does not include travel cost

ANNEX G: M&E BUDGET AND WORK PLAN

M&E Activity	Description	Responsible Parties	Timeframe	Indi budg
Inception Workshop (IW) and Report	• Report prepared immediately following the IW; it includes: o Includes a detailed Work Plan and budget (AWPs) for the first year, as well as an overview of AWPs for subsequent years, divided per output and inputs (budget lines. o A more detailed narrative of roles of UNEP, PMU and PSC: institutional responsibilities, coordinating actions and feedback mechanisms o Detailed Project Supervision and a M&E Plan	• Execution: PMU, ANAM and UNEP	• Immediately following, within 2 months of project start-up	GEF Co-fi
Half-yearly progress report; Quarterly financial reports;	• Part of UNEP procedures for project monitoring. • Quarterly financial: Detailed financial reports (in Excel), with justification of any change; • Bi-annual progress: o Analyzes project performance over the reporting period UNEP; Describes constraints experienced in the progress towards results and the reasons o Describes Work Plan for the next period in an Annex and the detailed budget divided per output and inputs (budget lines)	• Execution: UNEP • Support : PMU	• Two bi-annual reports for any given year (July 31 and January 31); • Quarterly financial reports • Last progress & financial Reports within 60 days of project closure of operations	Part mana Co-f
Measurement of progress indictors	• Measurement of project indicators (outcome, progress and performance indicators, GEF tracking tools) at national and global level, including measurement and further analysis of the logical framework indicators after the project's inception and before the project's end	• Execution: PMU • Inputs by government counterparts	• Outcome indicators: start, mid and end of project • Progress/perfor m. Indicators: annually	GEF proje Com Cofi
Technical and thematic Reports; Publications of lessons learnt	• Technical and thematic periodic reports could also be prepared to focus on specific issues or areas of activity covered by the project,	• Execution: PMU • Support: ANAM	• As necessary for the thematic reports	GEF proje Com Co-f
Project Implementation Review (PIR); Co-financing report	• Analyzes project performance over the reporting period UNEP; Describes constraints experienced in the progress towards results and the reasons • Draws lessons and makes clear recommendations for future orientation in addressing the key problems in the lack of progress. • The PIR is discussed at PSC meetings	• Execution: PMU • Support: UNEP and government counterparts • Discussed and accepted at PSC (Project Steering Committee) meetings	• Yearly, by 31 July latest • Co-financing report within 1 month of PIR	GEF proje mana Co-f

Project Steering Committee meetings and reporting; Monitoring visit to field sites	• Policy-level meeting of the parties directly involved in project implementation	• Government counterparts and UNEP;	• At least once a year (by mid-year) or more frequent as needed; • PSC report within 1 month of PSC meeting • Monitoring visits on as-needed basis	Co-fin: 5,000
Final Report	• The project team will draft and submit a Project Final Report, with other docs (such as last PIR) can serve as Project Final Report to the UNEP, at least two weeks before the PSC meeting for their review and comments; this meeting decides whether any action is needed to achieve the sustainability of project results; and draws lessons to be captured into other projects; • Comprehensive report summarizing all activities, achievements, lessons learned, objectives met or not achieved structures and systems implemented, etc. Lays out recommendations for any further steps that may need to be taken to ensure the sustainability and replication of project activities.	• Execution: PMU • Input: Government counterparts • Support: UNEP	• Final report at least two-three months of the project completion date; •	Part of project management Co-fin: 5,000
Midterm Independent Evaluation	• Determines progress being made towards the achievement of outcomes and identifies course corrections if needed. • Focuses on the effectiveness, efficiency and timeliness of project implementation; highlights issues requiring decisions and actions; and presents initial lessons learned about project design, implementation and management.	• Execution: independent consultants • Input: PMU, UNEP, ANAM	• At the midpoint of project implementation	GEF: 25,000 Co-fin: 5,000
Final External Evaluation	• Focuses on the same issues as the midterm evaluation. • Looks at the impacts and sustainability of the results, including the contribution to capacity development and the achievement of global environmental goals.	• Execution: independent consultants • Input: PMU, UNEP, ANAM	• One-three months prior to the TTR meeting	GEF: 22,500 Co-fin: 5,000
Audits	• Financial audits	• Execution: PMU	• Annually	GEF: 10,000
TOTAL indicative COST (Excluding project team staff time and UNEP staff and travel expenses)			**GEF: USD 60,000** **Co-fin: USD 40,000 (by UNEP), USD 20,000 (by ANAM)**	

ANNEX H: PROJECT IMPLEMENTATION PLAN

Component	Output	Year1		Year2		Year3		Year4	
1. Policy-regulatory framework for SWH promotion and informed policy decision-making	1.1 SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed								
	1.2 Market assessment and economic analysis of SWH options, and end-of-project study								
	1.3 Government-endorsed SWH action plan								
2. Quality control and supply side strengthening	2.1 Capacity assessment for training needs completed on supply side, and building design and quality control system								
	2.2 SWH incorporated into curricula of relevant educational institutions								
	2.3 Training for SWH installers and technology providers; recognition scheme for installers completed								
	2.4 SWH and green building training designed and implemented								
	2.5 SWH standards and a quality control scheme developed								
	2.6 Capability to verify and test for compliance with the quality standards present								
	2.7 Agreed business plan for the establishment of a national solar thermal energy association								
3. Enhanced awareness and end-user supportive mechanisms	3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector								
	3.2 End-user financing mechanisms have invested in SWH								
	3.3 Marketing and publicity activities, targeting different SWH market segments completed								
4. SWH pilot projects and demonstration	4.1 Identification, energy audits and SWH system proposal/feasibility								
	4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and 60 Mi kWh								

ANNEX I: KEY DELIVERABLES AND BENCHMARKS

Project objective:

- To support cost-effective CO2 reduction measures by means of developing the market fir solar thermal heating systems and through capacity building and institutional strengthening, and technology demonstration)

Indicator:

- Direct: 3,220 m^2 (equivalent to 2,254 kW), resulting in lifetime GHG emission reduction of 21.1 $ktCO_2$
- Direct and post-project direct: 10,775 m^2 (equivalent to 7,540 kW_{th}), resulting in lifetime GHG emission reduction 75.4 $ktCO_2$ lifetime GHG emission reduction; End-user savings of 2,925 MWh/yr and system savings of 3007 MWh/yr;
- Bottom-up: 226.2 ktCO2 lifetime (replication factor = 3), due to 32,325 m2 SWH operation; Top-down: 443.0 ktCO2 (coincidence factor = 60%)

Project Component	Expected Outcomes	Expected Outputs	Benchmark
1. Policy-regulatory framework for SWH promotion and informed policy decision-making	• . Effective policy-regulatory framework- endorsed by the government	1.1 Review of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework 1.2 Detailed market assessment and economic analysis of SWH options, and end-of-project market and impact assessment 1.3 Project monitoring and evaluation; final project report 1.4 Government-endorsed SWH action plan	• In discussion with public and private stakeholders, one (1) for SWH –specific regulations are developed to support UREE (if existing ones are not adequate) • One (1) Assessment of SWH supply, demand and market conditions, and one (1) study at the beginning and one at the end of the project (plus barrier and gap analysis) • One (1) project inception report and one (1) end-of-project impact study; • One project mid-term and one final evaluation conducted on schedule • One action plan by yr 4, incorporating the project's results, detailing market development objectives and strategies (e.g., finance, budget, incentives, m2 installation target, operationalization and institutional setup);
2. Quality control and supply side strengthening	Voluntary quality control systems in place in the SWH industry to offer SWH products and services that customers are satisfied with	2.1 Capacity and training needs assessment supply side, building design and quality control system 2.2 SWH incorporated into curricula of relevant educational institutions; 2.3 Training activities implemented for SWH installers and technology providers; recognition scheme for installers established 2.4 SWH and green building training designed and implemented 2.5 SWH standards and a quality control scheme developed 2.6 Enhanced verification testing capacity on SWHs to check	• One (1) assessment of capacity and training needs and proposal for trainings (outputs 2.3 and 2.4) and integration of SWH in curricula and short courses (output 2.5) by end of yr1 • Integration of SWH as part of mechanical and electrical engineering curricula and research at one (1) university (UTP); at least one (1) course on SWH installation and maintenance (e.g. INADEH; others) o About 10 days of technical training by yr 4 with at least 20 persons trained • One certification system of for SWH

		compliance with the quality standards 2.7 Agreed business plan for the establishment of a national solar thermal energy association	equipment and service providers in operation by yr3 o About 30 days of technical training by yr 4 with at least 60 persons trained, of which 70% are recognized • Adoption of a voluntary system by yr3 by industry/association, consisting of required standards and a certification scheme; • One (1) functioning testing framework: o Testing standards by yr3; o Testing lab operational by yr4 (also used for training, see Output 2.2) • One (1) solar thermal energy association established by yr4
3. Enhanced awareness and end-user supportive mechanisms	• SWH applications demonstrated and financial and technical viability confirmed	3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector 3.2 Design and implementation arrangements of end-user financing mechanisms 3.3 Carrying out marketing and publicity activities, targeting different SWH market segments	• At least 6 workshop.days on awareness for key decision-makers (with attendance of 20 people per day) over yr1-yr4 • At least one financing line defined and approved (at Banco General or other banks) by yr2-3: o Linked with green mortgages; o Four SWH investments in SWH; o Four SWH providers • One (1) public media campaign defined and implemented disseminating high-quality info and materials (in cooperation with Education and local media) by yr2-3
4. SWH pilot projects and demonstration	• SWH applications demonstrated and financial and technical viability confirmed	4.1 Identification, energy audits and SWH system proposal/feasibility 4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m^2 of SWH; direct and 60 Mi kWh	• Energy audits and feasibility analysis carried out in at least 200 entities; o Technical and publicity workshops (3 workshop days, incl. output 4.2) • Installation of at least 3,220 m2 of SWH capacity (1000 residential; 105 public/commercial buildings) during the project • Project and post-project installations up to 10,775 m2 (during or shortly after the project)

ANNEX J: GEF TRACKING TOOL

Special Notes: reporting on lifetime emissions avoided

Lifetime direct GHG emissions avoided: Lifetime direct GHG emissions avoided are the emissions reductions attributable to the investments made **during the project's supervised implementation period**, totaled over the respective lifetime of the investments.
Lifetime direct post-project emissions avoided: Lifetime direct post-project emissions avoided are the emissions reductions attributable to the investments made outside the project's supervised implementation period, but supported by financial facilities put in place by the GEF project, totaled over the respective lifetime of the investments. These financial facilities will still be operational after the project ends, such as partial credit guarantee facilities, risk mitigation facilities, or revolving funds.
Lifetime indirect GHG emissions avoided (top-down and bottom-up): indirect emissions reductions are those attributable to the long-term outcomes of the GEF activities that remove barriers, such as capacity building, innovation, catalytic action for replication.
Please refer to the Manual for Calculating GHG Benefits of GEF Projects.

Manual for Energy Efficiency and Renewable Energy Projects
Manual for Transportation Projects

For LULUCF projects, the definitions of "lifetime direct and indirect" apply. Lifetime length is defined to be 20 years, unless a different number of years is deemed appropriate. For emission or removal factors (tonnes of CO2eq per hectare per year), use IPCC defaults or country specific factors.

General Data	Target at CEO Endorsement	Notes
Project Title	SWH market development	
GEF ID	5287	
Agency Project ID	928	
Country	Panama	
Region	LCR	
GEF Agency	UNEP	
Date of Council/CEO Approval		Month DD, YYYY (e.g., May 12, 2010)
GEF Grant (US$)	1,918,182	
Date of submission of the tracking tool		Month DD, YYYY (e.g., May 12, 2010)
Is the project consistent with the priorities identified in National Communications, Technology Needs Assessment, or other Enabling Activities under the UNFCCC?	1	Yes = 1, No = 0
Is the project linked to carbon finance?	0	Yes = 1, No = 0
Cofinancing expected (US$)	8,142,000	

Objective 3: Renewable Energy		
Please specify if the project includes any of the following areas		
Heat/thermal energy production	1	Yes = 1, No = 0
On-grid electricity production	0	Yes = 1, No = 0
Off-grid electricity production	0	Yes = 1, No = 0
Policy and regulatory framework	3	0: not an objective/component 1: no policy/regulation/strategy in place 2: policy/regulation/strategy discussed and proposed 3: policy/regulation/strategy proposed but not adopted 4: policy/regulation/strategy adopted but not enforced 5: policy/regulation/strategy enforced
Establishment of financial facilities (e.g., credit lines, risk guarantees, revolving funds)	2	0: not an objective/component 1: no facility in place 2: facilities discussed and proposed 3: facilities proposed but not operationalized/funded 4: facilities operationalized/funded but have no demand 5: facilities operationalized/funded and have sufficient demand
Capacity building	1	0: not an objective/component 1: no capacity built 2: information disseminated/awareness raised 3: training delivered 4: institutional/human capacity strengthened 5: institutional/human capacity utilized and sustained
Installed capacity per technology directly resulting from the project		
Wind		MW
Biomass		MW el (for electricity production)
Biomass		MW th (for thermal energy production)
Geothermal		MW el (for electricity production)
Geothermal		MW th (for thermal energy production)
Hydro		MW
Photovoltaic (solar lighting included)		MW
Solar thermal heat (heating, water, cooling, process)	2.25	MW th (for thermal energy production, 1m² = 0.7kW)
Solar thermal power		MW el (for electricity production)
Marine power (wave, tidal, marine current, osmotic, ocean thermal)		MW
Lifetime energy production per technology directly resulting from the project (IEA unit converter: http://www.iea.org/stats/unit.asp)		
Wind		MWh
Biomass		MWh el (for electricity production)
Biomass		MWh th (for thermal energy production)
Geothermal		MWh el (for electricity production)
Geothermal		MWh th (for thermal energy production)
Hydro		MWh
Photovoltaic (solar lighting included)		MWh
Solar thermal heat (heating, water, cooling, process)	3,007.00	MWh th (for thermal energy production)
Solar thermal power		MWh el (for electricity production)
Marine energy (wave, tidal, marine current, osmotic, ocean thermal)		MWh
Lifetime direct GHG emissions avoided	21,091	tonnes CO2eq (see Special Notes above)
Lifetime direct post-project GHG emissions avoided	54,320	tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (bottom-up)	226,232	tonnes CO2eq (see Special Notes above)
Lifetime indirect GHG emissions avoided (top-down)	443,002	tonnes CO2eq (see Special Notes above)

ANNEX K: OFP ENDORSEMENT LETTER

Attached in a separate file

ANNEX L: CO-FINANCING COMMITMENT LETTERS

Attached in a separate file:

- ANAM
- SNE
- Banco General
- PGBC
- UTP
- UNEP

ANNEX M: ENVIRONMENTAL AND SOCIAL SAFEGUARDS CHECKLIST

As part of the GEFs evolving Fiduciary Standards that Implementing Agencies have to address 'Environmental and Social Safeguards'. To fill this checklist:

- STEP 1: Initially assess E&S Safeguards as part of PIF development. The checklist is to be submitted for the CRC.
- STEP 2 : Check list is reviewed during PPG project preparation phase and updated as required
- STEP 3 : Final check list submitted for PRC showing what activities are being undertaken to address issues identified

UNEP/GEF Environmental and Social Safeguards Checklist

Project Title:			
GEF project ID and UNEP ID/IMIS Number		***Version of checklist***	
Project status (preparation, implementation, MTE/MTR, TE)		***Date of this version:***	
Checklist prepared by (Name, Title, and Institution)	***ANAM, Panama***		

In completing the checklist both short- and long-term impact shall be considered.

Section A: Project location

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/N.A.	*Comment/explanation*
- Is the project area in or close to -		
- densely populated area	Yes	The project entails household or company level installation that fit on rooftops or small terrains. The location of the individual SWH systems is not an issue
- cultural heritage site	No	
- protected area	No	
- wetland	No	
- mangrove	No	
- estuarine	No	
- buffer zone of protected area	No	
- special area for protection of biodiversity	No	
- Will project require temporary or permanent support facilities?	NO	
If the project is anticipated to impact any of the above areas an Environmental Survey will be needed to determine if the project is in conflict with the protection of the area or if it will cause significant disturbance to the area.		

Section B: Environmental impacts

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/ N.A.	*Comment/explanation*
- Are ecosystems related to project fragile or degraded?	N.A	
- Will project cause any loss of precious ecology, ecological, and economic functions due to construction of infrastructure?	No	
- Will project cause impairment of ecological opportunities?	No	
- Will project cause increase in peak and flood flows? (including from temporary or permanent waste waters)	No	
- Will project cause air, soil or water pollution?	No	
- Will project cause soil erosion and siltation?	No	
- Will project cause increased waste production?	No	
- Will project cause Hazardous Waste production?	No	
- Will project cause threat to local ecosystems due to invasive species?	No	
- Will project cause Greenhouse Gas Emissions?	No	On the contrary, the project will help to reduce GHG emissions by substituting fossil fuels
- Other environmental issues, e.g. noise and traffic	No	
Only if it can be carefully justified that any negative impact from the project can be avoided or mitigated satisfactorily both in the short and long-term, can the project go ahead.		

Section C: Social impacts

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/N.A.	*Comment/explanation*
- Does the project respect internationally proclaimed human rights including dignity, cultural property and uniqueness and rights of indigenous people?	Yes	
- Are property rights on resources such as land tenure recognized by the existing laws in affected countries?	Yes	
- Will the project cause social problems and conflicts related to land tenure and access to resources?	N.A	
- Does the project incorporate measures to allow affected stakeholders' information and consultation?	Yes	
- Will the project affect the state of the targeted country's (-ies') institutional context?	No	The project will work within existing institutional context
- Will the project cause change to beneficial uses of land or resources? (incl. loss of downstream beneficial uses (water supply or fisheries)?	N.A	
- Will the project cause technology or land use modification that may change present social and economic activities?	N.A	
- Will the project cause dislocation or involuntary resettlement of people?	N.A	
- Will the project cause uncontrolled in-migration (short- and long-	N.A	

term) with opening of roads to areas and possible overloading of social infrastructure?		
- Will the project cause increased local or regional unemployment?	Yes	Application of SWH will increase the demand for skilled technicians in the regions
- Does the project include measures to avoid forced or child labour?	N.A	
- Does the project include measures to ensure a safe and healthy working environment for workers employed as part of the project?	N.A	
- Will the project cause impairment of recreational opportunities?	No	
- Will the project cause impairment of indigenous people's livelihoods or belief systems?	No	
- Will the project cause disproportionate impact to women or other disadvantaged or vulnerable groups?	No	
- Will the project involve and or be complicit in the alteration, damage or removal of any critical cultural heritage?	No	
- Does the project include measures to avoid corruption?	N.A	PMU staff to be recruited based on the qualifications of the candidates. Any procurement will be done in accordance with government regulations. Further, the PMU will be required to prepare and submit periodic financial reports in accordance to UNEP project implementation procedures.
Only if it can be carefully justified that any negative impact from the project can be avoided or mitigated satisfactorily both in the short and long-term, can the project go ahead.		

Section D: Other considerations

If negative impact is identified or anticipated the Comment/Explanation field needs to include: Project stage for addressing the issue; Responsibility for addressing the issue; Budget implications, and other comments.

	Yes/No/ N.A.	*Comment/explanation*
- Does national regulation in affected country (-ies) require EIA and/or ESIA for this type of activity?	No	
- Is there national capacity to ensure a sound implementation of EIA and/or SIA requirements present in affected country (-ies)?	Yes	In Panama, ANAM is responsible for monitoring implementation of EIA
- Is the project addressing issues, which are already addressed by other alternative approaches and projects?	No	
- Will the project components generate or contribute to cumulative or long-term environmental or social impacts?	Yes	See main text
- Is it possible to isolate the impact from this project to monitor E&S impact?	Yes	

ANNEX N: PPG REPORTS AND CONSULTATIONS

Stakeholder consultations during PPG phase

Stakeholders have been consulted and have been involved during project design at various points in time and at various occasions:

- Meetings with representatives from government officials, NGOs and private sector entities during two one-week missions to Panama undertaken by the international consultants[52], the first during 16-20 September 2013[53] and the second in December 2013[54];
- Stakeholder workshop, held at UTP, Panamá, 11-12-2013[55], at which the draft CEO AR concept was validated; Mission to Chiriquí by the national consultant (23-29 October 2013) with the aim of conducting consultations and seeking confirmation of project partners and other stakeholders in providing support and co-financing to the project[56].

During the (final) stakeholder consultation workshop, the attendees validated the proposed project framework. In particular, representatives from SNE, ANAM, Banco General, UTP and PGBC promised to back up their endorsement by means of a signed co-financing letter.

Technical reports

Available in separate electronic file is the following reports PPG Technical Reports:

- *Oportunidades Calentamiento Solar de Agua, Panamá* (Feb 2014), by the Solar termal expert[57]

52 Mr. Johannes (Jan) Van den Akker (Lead design consultant); Mr. Tomasz Kotecki (Solar thermal expert)

53 Report of the first mssion. See File "Proyecto de Desarollo del Mercado de CSA reporte primera misión.docx"

54 This included meetings and discussion with the team at ANAM and with representatives from SNE, PGBC, Banco General, UTP, MIDA, CNP+L, CONEP, SPIA, as well as SWH suppliers (Luz Buena, and potential beneficiaries (Hotel Country Inn+Suites)

55 See file "Misión 2 – Agenda Borrador.docx". The workshop in December, as well as the pre-PPG workshop (held in September 2012) were attended by stakeholders from government (ANAM, SNE, MEF, MIDA), health (Caja de Seguro Social), financial sector (Banco General), NGOs (PGBC, CNP+L), training and research institutes (UTP), hotels (APATEL association, Country Inn), private sector associations (hotels APATEL and SIP, Sindicato Industriales), SWH suppliers (Luz Buena, PSI), consultants (3R Consulting) as well as UNEP and the team of PPG consultants

56 Meetings with representatives from ANAM, UTP, SWH suppliers (Luz Buena, Marine Solar Tech) and possible beneficiary hotels (Hotel Espinosa, Los Quetzales, Boquete Trek Trek and Hospital Chiriquí). See travel report by the National consultant, Ms. Ana Domínguez. See file "Travel Report – Ana Dominguez smallsize.pdf"

57 File "1400218 2do entregable Kotecki.pdf"

ANNEX O: ACRONYMS AND ABBREVIATIONS

ANAM	*Autoridad Nacional del Ambiente* (National Environment Authority)
APATEL	*Asociación Panameña de Hoteles* (Panama Association of Hotels)
ASEP	*Autoridad Nacional de Servicios Públicos* (National Public Services Authroity)
ATP	*Autoridad de Turismo de Panama* (Tourism Authority)
BCIE	Central American Bank for Economic Integration
CEO	Chief Executive Officer
CENAMAP	Panama National Metrology Center
CERFIN	Certificate for Industrial Promotion
CAPAC	*Cámara Panameña de la Construcción* (Panama Chamber of Construction)
COPANIT	*Comisión Panameña de Normas Industriales y Técnicas*
CCM	climate change mitigation
CF	causality factor
CNA	*Comisión Nacional de Acreditación*
CONEP	*Consejo Nacional de la Empresa Privada* (Council of Private Enterprises)
COPANIT	*Comisión Panameña de Normas Industriales y Técnicas* (Industrial and Technical Standards Commission)
COPANT	Pan American Standards Commission
CO_2	carbon dioxide
CSO	civil society organization
CSA	*calentador solar de agua* (solar water heater)
EE	energy efficiency
ESCO	energy service company
GEF	Global Environment Facility
GEFTF	GEF Trust Fund
GHG	greenhouse gas
GSTEC	Global Solar Thermal Energy Council
GWh	gigawatt-hour (million kilowatt-hours)
IADB	Inter-American Development Bank
KfW	German development bank
$ktCO_2$	thousand tons of CO_2
MICI	*Ministerio de Comercio e Industrias* (Ministry of Commerce and Industry)
MIDA	*Ministerio de Desarrollo Agropecuario* (Ministry of Agricultural Development)
MINSA	*Ministerio de Salud* (Ministry of Health)
Mtoe	million tons of oil equivalent
MTE	mid-term evaluation (or MTR, mid-term review)
MW	megawatt (million Watts)
NEP	National Energy Plan
NGO	non-governmental organization
OLADE	Latin American Energy Organization
PC	Project Coordinator
PD	Project Director
PGBC	Panama Green Building Council
PIF	GEF Project Identification Form
PMU	Project Management Unit
PPG	GEF Project preparation grant
PSC	Project Steering Committee
PYMES	*pequeña y mediana empresas* (small and medium sized enterprises, SMEs)
PV	photovoltaic
R&D	research and development
RF	replication factor

SNE	*Secretaría Nacional de Energía* (National Secretariat for Energy)
SPIA	*Sociedad Panameña de Ingenieros y Arquitectos* (Panama Society of Engineers and Architects)
SWH	solar water heater
tCO_2	ton of CO_2
TWH	terawatt-hour (billion kilowatt-hour)
UN	United Nations
UNDP	UN Development Programme
UNEP	UN Environment Programme
UNEP-DTIE	UNEP Division of Technology, Industry and Economics
UREE	(Law on) Rational and Efficient Use of Energy
USD	US dollar
UTP	*Universidad Tecnológica de Panamá* (University of Technology)

ANNEX P: TABLE OF CONTENTS

REQUEST FOR CEO APPROVAL

ANNEXES