



GEF-6 PROJECT IDENTIFICATION FORM (PIF)

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

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PART I: PROJECT INFORMATION

Project Title:	Sustainable use of biomass to assist the development of Turkey's economy towards a low-carbon development path		
Country(ies):	Republic of Turkey	GEF Project ID: ¹	
GEF Agency(ies):	UNIDO	GEF Agency Project ID:	140325
Other Executing Partner(s):	Ministry of Food, Agriculture and Livestock MoFAL/TAGEM); Ministry of Energy and Natural Resources (MoENR)	Submission Date:	07-30-2015
		Re-submission Date:	08-12-2015
		Re-submission Date:	11-13-2015
		Re-submission Date:	12-17-2015
GEF Focal Area(s):	Climate Change	Project Duration (Months)	60
Integrated Approach Pilot	IAP-Cities <input type="checkbox"/> IAP-Commodities <input type="checkbox"/> IAP-Food Security <input type="checkbox"/>	Corporate Program: SGP	<input type="checkbox"/>
Name of parent program:	N/A	Agency Fee (\$)	419,540

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK AND OTHER PROGRAM STRATEGIES²

Objectives/Programs (Focal Areas, Integrated Approach Pilot, Corporate Programs)	Trust Fund	(in \$)	
		GEF Project Financing	Co-financing
CC-1: Promote innovation, technology transfer, and supportive policies and strategies Program 1: Promote timely development, demonstration and financing of low-carbon technologies and mitigation options	GEF TF	4,416,210	27,381,050
Total Project Cost		4,416,210	27,381,050

B. INDICATIVE PROJECT DESCRIPTION SUMMARY

Project Objective: Trigger sectoral transformation through application of modern bio-energy technologies to improve overall energetic performance, increase competitiveness and reduce greenhouse gas emissions in agro-industry						
Project Components	Financing Type ³	Project Outcomes	Project Outputs	Trust Fund	(in \$)	
					GEF Project Financing	Co-financing
1. Demonstration of modern bio-energy technologies and energy efficiency measures in the agro-industrial sector	TA	1. Modern bio-energy technologies demonstrated and ready for scale-up	1.1 Feasibility studies based on detailed techno-economic potentials of bio-energy in agro-industry (per geographical region) are further refined, with focus on economically less developed regions in the country 1.2 Modern bio-energy (and energy efficiency) technology applications in selected SME subsectors are prepared,	GEF TF	800,000	4,000,000

¹ Project ID number will be assigned by GEFSEC and to be entered by Agency in subsequent document submissions.

² When completing Table A, refer to the excerpts on [GEF 6 Results Frameworks for GETF, LDCF and SCCF](#).

³ Financing type can be either investment or technical assistance.

			with focus on process heat applications 1.3 Linkage with existing financing instruments established for an accelerated scale-up across agro-industrial subsectors			
	INV		1.4 An estimated 5-7 innovative and highly replicable technology applications with an estimated total capacity of 2.3 MW (or equivalent) in targeted sub-sectors as pilot facilities are realised	GEF TF	2,400,000	16,800,000
2. Refined policy and regulatory framework to enable transformation across sub-sectors	TA	2. Policy and regulatory environment is fine-tuned to enable scale-up of bio-energy plants	2.1 Sectoral policies, plans, programs, associate legislative and regulatory instruments are analysed and tailored recommendations for improvement are developed 2.2 Strategic roadmap is developed to enhance use of agricultural and agro-food waste streams for industrial renewable energy applications in target sub- sectors, with focus on process heat applications	GEF TF	500,000	2,500,000
3. Capacity base strengthened and awareness raising increased	TA	3. Capacities of key players strengthened and information made available to market enablers and major stakeholders	3.1 Capacity building mechanism for O&M, technical and service roles is established to develop and retain skilled workforce for innovative bio-energy technologies in industry through training of 400 technicians, 50 senior management level decision makers, 50 government representatives, and 50 trainers of trainers, in cooperation with technical partners (e.g. academic, industry associations etc) through 25 workshops 3.2 Capacity and knowledge of 50 decision makers in	GEF TF	405,914	2,529,570

			government and private sector are improved through 5 tailored workshops 3.3 Awareness in relevant sectors about biomass technologies increased through the development of tailored knowledge products to facilitate technology transfer in the agro-industry			
4. Monitoring and evaluation.	TA	4. Project's progress towards objectives continuously monitored and evaluated	4.1 A monitoring and evaluation plan will be prepared and carried out.	GEF TF	100,000	500,000
Subtotal					4,205,914	26,329,570
Project Management Cost (PMC) ⁴				GEF TF	210,296	1,051,480
Total Project Cost					4,416,210	27,381,050

For multi-trust fund projects, provide the total amount of PMC in Table B, and indicate the split of PMC among the different trust funds here: ()

C. INDICATIVE SOURCES OF CO-FINANCING FOR THE PROJECT BY NAME AND BY TYPE, IF AVAILABLE

Sources of Cofinancing	Name of Cofinancier	Type of Cofinancing	Amount (\$)
National Government	Ministry of Food Agriculture and Livestock (MoFAL) /TAGEM	Grants	5,255,045
National Government	Ministry of Food Agriculture and Livestock (MoFAL) /TAGEM	In-kind	14,106,280
National Government	Ministry of Energy and Natural Resources (MoENR)	Grants	19,185
National Government	Ministry of Energy and Natural Resources (MoENR)	In-kind	38,370
Private sector	Target enterprises	Equity	750,000
Private sector	Target enterprises	In-kind	732,170
Finance sector	Target development financing institutes and local banks	Loans	6,300,000
GEF Agency	UNIDO	Grants	90,000
GEF Agency	UNIDO	In-kind	90,000
Total Cofinancing			27,381,050

⁴ For GEF Project Financing up to \$2 million, PMC could be up to 10% of the subtotal; above \$2 million, PMC could be up to 5% of the subtotal. PMC should be charged proportionately to focal areas based on focal area project financing amount in Table D below.

D. INDICATIVE TRUST FUND RESOURCES REQUESTED BY AGENCY(IES), COUNTRY(IES) AND THE PROGRAMMING OF FUNDS ^{a)}

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	(in \$)		
					GEF Project Financing (a)	Agency Fee (b) ^{b)}	Total (c)=a+b
Total GEF Resources							

a) Refer to the [Fee Policy for GEF Partner Agencies](#).

E. PROJECT PREPARATION GRANT (PPG)⁵

Is Project Preparation Grant requested? Yes No If no, skip item E.

PPG AMOUNT REQUESTED BY AGENCY(IES), TRUST FUND, COUNTRY(IES) AND THE PROGRAMMING OF FUNDS

Project Preparation Grant amount requested: \$ 150,000					PPG Agency Fee: 14,250		
GEF Agency	Trust Fund	Country/ Regional/Global	Focal Area	Programming of Funds	(in \$)		
					PPG (a)	Agency Fee ⁶ (b)	Total c = a + b
UNIDO	GEF TF		Climate Change	n/a	150,000	14,250	164,250
Total PPG Amount					150,000	14,250	164,250

F. PROJECT'S TARGET CONTRIBUTIONS TO GLOBAL ENVIRONMENTAL BENEFITS⁶

Provide the expected project targets as appropriate.

Corporate Results	Replenishment Targets	Project Targets
1. Maintain globally significant biodiversity and the ecosystem goods and services that it provides to society	Improved management of landscapes and seascapes covering 300 million hectares	Hectares
2. Sustainable land management in production systems (agriculture, rangelands, and forest landscapes)	120 million hectares under sustainable land management	Hectares
3. Promotion of collective management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services	Water-food-ecosystems security and conjunctive management of surface and groundwater in at least 10 freshwater basins;	Number of freshwater basins
	20% of globally over-exploited fisheries (by volume) moved to more sustainable levels	Percent of fisheries, by volume

⁵ PPG requested amount is determined by the size of the GEF Project Financing (PF) as follows: Up to \$50k for PF up to \$2m (for MSP); up to \$100k for PF up to \$3m; \$150k for PF up to \$6m; \$200k for PF up to \$10m; and \$300k for PF above \$10m. On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

⁶ Provide those indicator values in this table to the extent applicable to your proposed project. Progress in programming against these targets for the projects per the *Corporate Results Framework* in the [GEF-6 Programming Directions](#), will be aggregated and reported during mid-term and at the conclusion of the replenishment period. There is no need to complete this table for climate adaptation projects financed solely through LDCF and/or SCCF.

4. Support to transformational shifts towards a low-emission and resilient development path	750 million tons of CO _{2e} mitigated (include both direct and indirect)	440,000 – 770,000 tCO ₂ (110,000 tCO ₂ direct and 330,000 – 660,000 indirect)
5. Increase in phase-out, disposal and reduction of releases of POPs, ODS, mercury and other chemicals of global concern	Disposal of 80,000 tons of POPs (PCB, obsolete pesticides)	metric tons
	Reduction of 1000 tons of Mercury	metric tons
	Phase-out of 303.44 tons of ODP (HCFC)	ODP tons
6. Enhance capacity of countries to implement MEAs (multilateral environmental agreements) and mainstream into national and sub-national policy, planning financial and legal frameworks	Development and sectoral planning frameworks integrate measurable targets drawn from the MEAs in at least 10 countries	Number of Countries:
	Functional environmental information systems are established to support decision-making in at least 10 countries	Number of Countries:

PART II: PROJECT JUSTIFICATION

1. *Project Description.* Briefly describe: 1) the global environmental and/or adaptation problems, root causes and barriers that need to be addressed; 2) the baseline scenario or any associated baseline projects, 3) the proposed alternative scenario, GEF focal area strategies, with a brief description of expected outcomes and components of the project, 4) [incremental/additional cost reasoning](#) and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and [co-financing](#); 5) [global environmental benefits](#) (GEFTF) and/or [adaptation benefits](#) (LDCF/SCCF); and 6) innovation, sustainability and potential for scaling up.

1.1) The global environmental problems, root causes and barriers that need to be addressed;

1.1.1) Key drivers of environmental degradation

Developing countries and emerging economies are increasing their energy consumption for their economic and industrial development. A carbon-intensive industrialization, as observed especially in economies with a large dependency on imported fossil fuels, presents a particular challenge in taking measures against climate change.

The impacts of climate change have been becoming more pronounced in recent years; for instance, severe droughts are increasing in intensity and duration both globally and in Turkey (for instance during the summer of 2014). Turkey's energy consumption has rapidly increased due to industrialization and economic development, urbanization and population increase.

In Turkey, total net greenhouse gas (GHG) emissions including LULUCF⁷ has increased by 163,3% between 1990 and 2012. This increase represents the highest change among all 51 UNFCCC Annex I countries. GHG emissions per GDP unit and per capita increased by 0,3% and 71,8%, respectively.

The main drivers for the increase in GHG emissions were the increase in electricity production, the increase in road transportation and the population increase. From these drivers the key driver of GHG emissions lies with the production and consumption of energy. Indeed 70,2% of total GHG emissions can be attributed to the energy sector, amounting to 308.604,26 kt CO_{2e} in 2012. Between 1990 and 2012, GHG emissions from the energy sector increased by 132,2%. With a share of 89,4%, the total primary energy consumption has been largely dominated by fossil fuels.

⁷ Land-Use, Land-Use Change and Forestry

In 2012, of the total GHG emissions, CO₂ was responsible for 81,3% and had increased by 152,5% since 1990; methane (CH₄) was responsible for 14% and had increased by 81%; and nitrous oxide (N₂O) was responsible for 3,4% and had increased by 21%.

TABLE 1. GREENHOUSE GAS EMISSIONS BY SECTOR IN TURKEY (1990-2012)⁸

<i>Sector</i>	<i>GHG emissions (kt CO₂ eq)</i>		<i>Change (%)</i>	<i>Share^a by sector (%)</i>
	<i>1990</i>	<i>2012</i>	<i>1990–2012</i>	<i>2012</i>
1. Energy	132 882.67	308 604.26	132.2	70.2
A1. Energy industries	34 142.96	119 588.40	250.3	27.2
A2. Manufacturing industries and construction	37 735.00	56 295.90	49.2	12.8
A3. Transport	26 286.59	61 562.84	134.2	14.0
A4.–A5. Other	32 533.56	68 829.61	111.6	15.6
B. Fugitive emissions	2 184.56	2 327.50	6.5	0.5
2. Industrial processes	15 442.26	62 773.50	306.5	14.3
3. Solvent and other product use	NA, NE	NA, NE	–	–
4. Agriculture	30 387.74	32 280.78	6.2	7.3
5. LULUCF	–44 070.09	–59 815.01	35.7	NA
6. Waste	9 721.57	36 215.19	272.5	
GHG total with LULUCF	144 364.14	380 058.71	163.3	NA
GHG total without LULUCF	188 434.23	439 873.72	133.4	100.0

The trend in emissions showed notable increases in energy industries (250,3%), transport (134,2%) and the manufacturing industry (49,2%). The sub-sector “energy industries” includes fuel combustion emissions from electricity generation facilities, petroleum refineries, and hard coal production facilities. Emissions from this sub-sector originated primarily (94%) from electricity and heat production.

In order to ensure its security of energy supply with respect to environmental sustainability, it is critical for the country to activate its domestic energy potential, most notably its large unutilised bio-energy potential in the agriculture sector. An increase of energy production from biomass sources will show how the trend of increasing GHG emissions can be reversed, and contribute to low-carbon economic development of Turkey. This project through innovative demonstration projects and according policy and training activities will initiate the activation of this potential, showing how low-carbon development can serve both environmental goals and trigger technology and business innovation, increase competitiveness of the local economy and create new jobs.

⁸ Source: derived from “Report of the Technical Review of the Fifth National Communication of Turkey” UNFCCC, 2015. GHG emissions data: Turkey’s 2014 GHG inventory submission, version 1.1. Note: The changes in emissions and the share by sector are calculated using the exact (not rounded) values and may therefore differ from values calculated with the rounded numbers provided in the table. Abbreviations: GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NA= not applicable, NE: not estimated. a: The shares of sectors are calculated relative to GHG emissions without LULUCF; for the LULUCF sector, the negative values indicate the share of GHG emissions that was offset by GHG removals through LULUCF.

Despite a decrease in the relative share of the agriculture sector in the national economy, it still contributes more to the economy than any other industry through its raw material production and accompanying agro-processing industry – as can be seen from Tables 1 and 2.

TABLE 2. KEY INDICATORS (2002-2011)

Key Indicators	2002			2011		
	TURKEY	AGRICULTURE	Share of Agriculture (%)	TURKEY	AGRICULTURE	Share of Agriculture (%)
Population (Million)	69.3	23.7	34.2	74.7	17.3	23.2
Employment (Million)	21.3	7.4	34.9	24.1	6.1	25.5
National Income (Billion \$)	230.5	23.7	10.3	772.3	62.7	8.1
Income Per Capita (\$)	3,492	1,064	28.6	10,444	3,653	35.0
Export (Billion \$)	36.0	4.0	11.2	134.9	15.3	11.3
Import (Billion \$)	51.5	3.9	7.7	240.8	17.6	7.3

Source: T.R. Ministry of Food, Agriculture and Livestock, 2013

TABLE 3. AGRICULTURAL LAND

(Thousand Hectares)

	Total utilized agricultural land	Area of cereals and other crop products		Area of vegetable gardens	Area of ornamental plants	Area of fruits, beverage and spice crops	Land under permanent meadows and pastures
		Sown area	Fallow land				
2001	40 967	17 917	4 914	909	-	2 610	14 617
2002	41 196	17 935	5 040	930	-	2 674	14 617
2003	40 644	17 408	4 991	911	-	2 717	14 617
2004	41 210	17 962	4 956	895	-	2 780	14 617
2005	41 223	18 005	4 876	894	-	2 831	14 617
2006	40 493	17 440	4 691	850	-	2 895	14 617
2007	39 505	16 945	4 219	815	-	2 909	14 617
2008	39 122	16 460	4 259	836	-	2 950	14 617
2009	38 911	16 217	4 323	811	-	2 943	14 617
2010	39 012	16 333	4 249	802	-	3 011	14 617
2011	38 231	15 692	4 017	810	4	3 091	14 617
2012	38 399	15 463	4 286	827	5	3 201	14 617
2013 ^(*)	38 428	15 618	4 148	808	5	3 232	14 617

Source: For land under permanent meadows and pastures 2001 General Agricultural Censuses, for other Ministry of Food, Agriculture and Livestock

Note: Figures may not be equal to total due to rounding off.

Data are grouped according to Statistical Classification of Products By Activity in European Economic Community (CPA 2002).

(*) Data are provisional

It is estimated that Turkey's biomass potential based on annual waste quantity of field crops totals 228 PJ, with corn having the largest share (33.4%), followed by wheat (27.6%) and cotton (18.1%). Total waste quantity of field crops is 13,011,132 tons. Total annual production and estimation of waste quantity of field crops in Turkey are given in the Table 3.

The total potential of annual wastes of horticultural crops in Turkey is 75 PJ. Among these crops, hazelnut has the largest share (55.8%), followed by olive (25.9%). Total annual waste quantity of horticultural crops is 3,908,570 tons. Certain fruit pruning wastes (peach, apple, pear, kiwi etc.) and green leafy cover of hazelnut are not included. Total annual production and waste quantity of horticultural crops in Turkey are given in the Table 4.

Total amount of (field + horticultural) biomass can thus be estimated to be over 15.000.000 ton in Turkey. Even if a certain part of this amount is already being used as pellets or briquettes, it is possible to substitute a considerable portion of fossil fuel use and achieve an according reduction in greenhouse gas emissions. It is believed that the main gap lies in the use of animal waste and organic wastes from industry, to generate green heat and power. Apart from

the green energy potential they contain, these wastes often also cause negative environmental impacts which can be managed by being transformed into a source of sustainable energy, income and socio-economic benefits.

In order to ensure a sustainable linkage between the increase in energy consumption and environmental sustainability, there is a need to shift from imported fossil fuels to an increased and efficient use of domestic energy resources and direct the national economy towards a green industry and low-carbon development path.

TABLE 4. TOTAL ANNUAL PRODUCTION AND WASTE QUANTITY OF FIELD CROPS IN TURKEY

Products	Wastes	Production (ton)	Area (ha)	Total Wastes (ton)		Usable Wastes (ton)	Usability (%)	Unit calorific value (MJ/kg)	Total calorific value (GJ)
				Theoretical	Actual				
Wheat	Hay	22.439.042	9.424.785	29.170.755	23.429.907	3.514.486	15	17,9	62.909.300
Barley	Hay	8.327.457	3.732.992	9.992.948	8.963.012	1.344.452	15	17,5	23.527.908
Rye	Hay	253.243	145.907	405.188	358.040	53.706	15	17,5	939.855
Oat	Hay	322.830	150.459	419.678	321.236	48.115	15	17,4	838.425
Corn	Straw	2.209.601	565.109	5.911.902	4.970.259	2.982.155	60	18,5	55.169.873
	Stem			596.592	1.907.307	1.144.384	60	18,4	21.056.667
Rice	Hay	331.563	59.879	582.555	209.532	125.719	60	16,7	2.099.510
	Shell			88.527	77.747	62.198	80	12,98	807.327
Tobacco	Straw	181.382	222.691	362.763	410.778	246.467	60	16,1	3.968.113
Cotton	Straw	2.292.988	680.117	6.317.181	2.520.281	1.512.169	60	18,2	27.521.470
	Carding waste			481.527	732.220	585.776	80	15,65	9.167.391
Sunflower	Straw	836.269	545.963	2.341.554	2.259.121	1.355.472	60	14,2	19.247.709
Peanut	Hay	55.241	25.167	127.054	28.638	22.910	80	20,74	475.155
	Shell			27.621					
Soybean	Hay	28.795	15.064	60.468	21.872	13.123	60	19,4	254.595

Table 4. Total Annual Production and Waste Quantity of Horticultural Crops in Turkey

Products	Wastes	Production (ton)	Number of Trees	Total Wastes (ton)		Usable Wastes (ton)	Usability (%)	Unit calorific value (MJ/kg)	Total calorific value (GJ)
				Theoretical	Actual				
Apricot	Kernel	467.903	11.288.357		154.573				
	Pruning			1.328.846	86.964	69.571	80	19,30	134.719
Cherry	Kernel	114.466	4.446.680		39.916				
	Pruning			137.359	21.400	17.120	80	19,00	325.279
Olive	Bagasse	1.496.630	90.208.994	673.484	829.816	746.834	90	20,69	15.451.997
	Pruning				441.254	220.627	50	18,10	3.993.345
Pistachio	Shell	42.926	29.600.005		14.007	4.202	30	19,26	80.932
	Pruning				209.611	167.688	80	19,00	3.186.080
Walnuts	Shell	115.698	3.737.868	173.546	75.792	60.633	80	20,18	1.223.584
	Pruning				50.480	25.240	50	19,00	479.563
Almond	Shell	46.701	3.631.622	44.366	25.784	23.205	90	19,38	449.716
	Pruning			13.076	28.500	22.800	80	18,40	419.521
Hazelnut	Shell	652.803	286.697.887	698.499	566.437	453.150	80	19,30	8.745.790
	Pruning				2.177.986	1.742.389	80	19,00	33.105.388
Lemon	Pruning	475.159	5.529.038	236.852	88.465	70.772	80	17,60	1.245.582
Orange	Pruning	1.180.851	11.884.275	3.424.439	237.686	190.148	80	17,60	3.346.612
Mandarin	Pruning	592.884	8.619.163	918.970	103.430	82.744	80	17,60	1.456.294
Grapefruit	Pruning	126.285	894.293		14.309	11.447	80	17,60	201.466

1.1.2) Innovativeness

The objective to be achieved as a result of this project will be to initiate and strengthen the green industry development through the use of bio-energy. The economic sector of focus will be the agro-industry, due to its importance for the national economy. The project will be used as an opportunity to drive economic development in currently less developed regions of the country. The proposed project will focus on using organic waste streams which are currently not or inefficiently valorized, for industrial renewable energy applications to provide part or all

of the enterprises' energy demand (especially process heat), with the overall aim for promoting application of innovative and adaptive technology in the target sector to reduce their dependency on fossil fuels.

One technology of focus will be bio-methanation (also referred to as biogas or anaerobic digestion), due to the large untapped potential in industry, because it is typically more economic than other technologies and because it is a technology area in which significant and promising innovation has been observed, both at the upstream and downstream level. Indeed, there are a number of international advancements in the overall bio-methanation process that either improve the performance of the technology (through pre-treatment technologies or biogas production technologies, i.e. upstream technologies) or improve the economics through the upgrading/value addition of the outputs or products (downstream technologies). International development and research is targeted at increasing biogas yields and the efficiency of the digesters through pre-treatment, the introduction of multi-stages, mixing optimisation, process control and co-digestion. In addition there is much work focused on the downstream upgrading of the biogas as well as looking at 'new' feedstock types. For example pre-treatment technologies are being investigated which will allow access to the lignocellulose to increase the rate of biogas production and to improve the mixing qualities of the substrates.

In most countries the biogas produced is mainly used for generation of heat and electricity with exceptions for Sweden and Switzerland where approximately half of the produced biogas is used as vehicle fuel. Gas is also fed into national gas networks in nine EU countries.

The innovation of the proposed project compared to the classical or existing applications of bio-energy is targeted at the technology and sectoral levels. Turkey as a middle-income country indeed has already experienced a certain degree of penetration of bio-energy technologies, yet the use of modern bio-energy technologies has not trickled down to the agro-food sector, which is dominated by small and medium sized enterprises (SMEs). The management of organic waste streams in the agro-food sector in Turkey is currently not developed to its full potential. For instance; crop residues are currently being burnt on the field, chicken manure dumps and pomace and pulp from fruit processing industry reportedly cause smell problem and carry contamination risks. To be more concrete on the technology side, the innovation is expected both in the use of new feedstock types (such as hazelnut shells and tea wastes) - which have never been used before despite the huge potential in the country - as in the output use; even though there is a high demand for (process) heat in the manufacturing sector, co-generation (power and heat) and tri-generation (power and heat and cooling) technologies have not yet been pioneered in Turkey.

The above demonstrates there is an opportunity for a more effective and efficient use of the waste streams for conversion to energy. This is new as these sectors have not been exposed to the use of the bio-technologies at enterprise level, and will diversify the business activities, increase the competitiveness and decarbonise the energy use of the local economic sectors. As for the application of an innovative business model (such as PPPs, third-party financing etcetera), the agency kindly requests the time of the PPG to conclude the exercise on the most appropriate business model to maximize private sector participation, and come up with a consolidated approach during the PPG phase. The ambition is also to identify a financing model that can be kick-started through this project and then continue for replication beyond the project end. The project's scope is thus highly relevant to national energy targets of using local, sustainable and clean sources to support the low-carbon development in Turkey. The project is innovative and pioneering in the sense that it will do so by addressing sectors (SMEs in agro-food) and outputs (RE based heating and cooling) which are currently largely overlooked in policy and financing priorities.1.1.3) Sustainability

The benefits of modern bio-energy conversion technologies are multiple: emission reductions, diversity of fuel supply and energy security, reduction in fuel costs and reliance on fossil fuels, a reliable energy supply, economic growth, job creation, as well as the global potential for technology transfer and innovation. The demonstration projects will be installed at the pilot enterprises. These enterprises are to be identified during the PPG phase, but based on UNIDO's experience the selection criteria will include cofinancing commitments and an openness to technology and business innovation. The technology application therefore is not only a transfer of "hardware", but comes with tailored technical training on operation and maintenance of the system for the technical team of the enterprises. In addition, the standard warranty and guarantee clauses will be applicable for the technology suppliers.

Long term ownership and sustainability will be ensured through working closely with the government partners (MoFAL/TAGEM and MoENR) and through the development of policy instruments such as the strategic road map. This roadmap will set out steps for these technologies remain a focus beyond the timeframe of the project and will

also ensure the steps are outlined for future R&D to ensure that Turkish manufacturers and academic institutions are at the forefront of technology development in this area.

Finally, sustainability and replication will be aimed for through the planned interaction with the development and commercial financial institutions. Discussions on securing finance, preparation of due-diligence guidelines and the banks' experience of extending loans for technology innovation in the target sector, will help to reduce perceived risk and encourage future lending. The institutional capacity is expected to be housed in existing entities under the Ministry of Food, Agriculture and Livestock MoFAL (TAGEM) or the Ministry of Science, Industry and Technology (MoSIT). For instance TÜBİTAK is an autonomous institute under MoSIT which provides technical support for energy research and innovative energy applications. The exercise on which knowledge partners will be best suited for which role under the project in order to have the strongest possible capacity and capability strategy will be concluded during the PPG phase.

1.1.4) Potential for scaling up for market transformation.

Demonstrating the technical feasibility and commercial viability of industrial bio-energy projects will provide national examples that can be replicated across the country. The pilots will be selected on a number of criteria including their GHG emission reductions and their replicability. The target agro-industrial sector has a wide variety of sub-sectors across the country where the technology could be installed. The modern bio-energy projects will show what is possible and the examples will be disseminated widely in the country, and the implementation and operation of these projects will build up the technical capacity within the stakeholder groups to help in the replication of these projects. Given the commercial interest in these projects, the different proponents will have an interest in keeping the projects running and hence sustain the global environmental benefits beyond the life of the project. The premise is that government and private sector will be prepared, through this project, to step up their involvement in the demonstrated type of innovations across sectors and the country, The strategy to reach this stage will be developed in full during the PPG phase, and will also include the assessment of the most suitable financing schemes to facilitate and maximise the inflow of co-funding during and beyond the project.

The key barriers, and an initial set of proposed actions to address these, are described below.

TABLE 5. KEY BARRIERS

Barriers	Proposed actions
<i>Administrative and Legislative Barriers</i>	
Project approval/permit/license processes: <ul style="list-style-type: none"> • Limited information in public institutions • Investors' lack of experience • End-users' lack of information <i>Uncertainty in the application of legislation that incentivise renewable energy production</i> <ul style="list-style-type: none"> • <i>Act includes facilities which will come into operation until 2015</i> • <i>Insufficient incentivizing effect of current measures</i> • <i>The lack of incentives for technology products other than electricity generation (for example: heat energy)</i> • <i>In case of use of domestic materials purchases guarantee</i> 	Preparation of an investment handbook/guide for parties granting/receiving approval in relation to project approval/permit/license processes Analyse and define, with the relevant institutions, a tailored set of incentives and recommendations to refine the existing framework for facilities using agricultural biomass for the generation of renewable electricity and heat Doing study on the evaluation of foreign technology applications in Turkey.
<i>Barriers of Capacity and Awareness</i>	
<ul style="list-style-type: none"> • Lack of modern biomass/biomass energy practices • Limited knowledge of biomass practices in 	Strengthen the capacity and increase awareness among all parties for financial support in close cooperation with sector representatives and target companies Demonstrate the use of biomass through modern technology

Barriers	Proposed actions
agro-industry <ul style="list-style-type: none"> Limited notion in enterprises about multiple benefits of modern bio-energy applications 	applications in representative enterprises
Lack of appropriate finance instruments	Provide support to target enterprises to access existing financing (for instance, through development of business plans, feasibility studies etc.) Establish a link with existing financing schemes
<i>Barriers of Market Development</i>	
<ul style="list-style-type: none"> The formation of storage risks that is due to unstable harvest periods of biomass resources Lack of a modern biomass supply chain Dispersed land distribution 	Comprehensive evaluation of biomass resources and establishment of a model which is both technically and economically effective
<i>Technical Barriers</i>	
Lack of technical and environmental standards creating uncertainty for market players	Standards and quality infrastructure to be brought in line with international experience and best practice

1.2) The baseline scenario and any associated baseline projects

Currently Turkey's energy consumption is increasing every year, and the country imports approximately 60% of its energy demands. To decrease its dependency on imported petroleum and natural gas, the country encourages electricity generation from renewable sources, which includes biomass (incl. landfill gas), hydropower, wind-power, geothermal and solar. By end of the 2013, Turkey electric power installed capacity value was 64.008 MW. The installed capacity of biomass-waste value is only 0, 37 % of the total installed power.

Agricultural waste forms the highest share (of 79%) of available biomass resources, with crop types like wheat, barley, tobacco, cotton, and rice. According to government studies, the theoretical potential for available agricultural waste (based on cultivated areas and remaining residues post-harvest) is at least 15 million tons per year, which is often burnt in open fields or are abandoned to decay. Detailed techno-economic potentials of bio-energy per region and agro-industrial subsector are currently lacking. The theoretical potentials are known per region (as shown below for the example of Dogu Anadolu), and the project (and PPG) will refine these data, using the opportunity of this project to drive economic development in less industrialised regions.

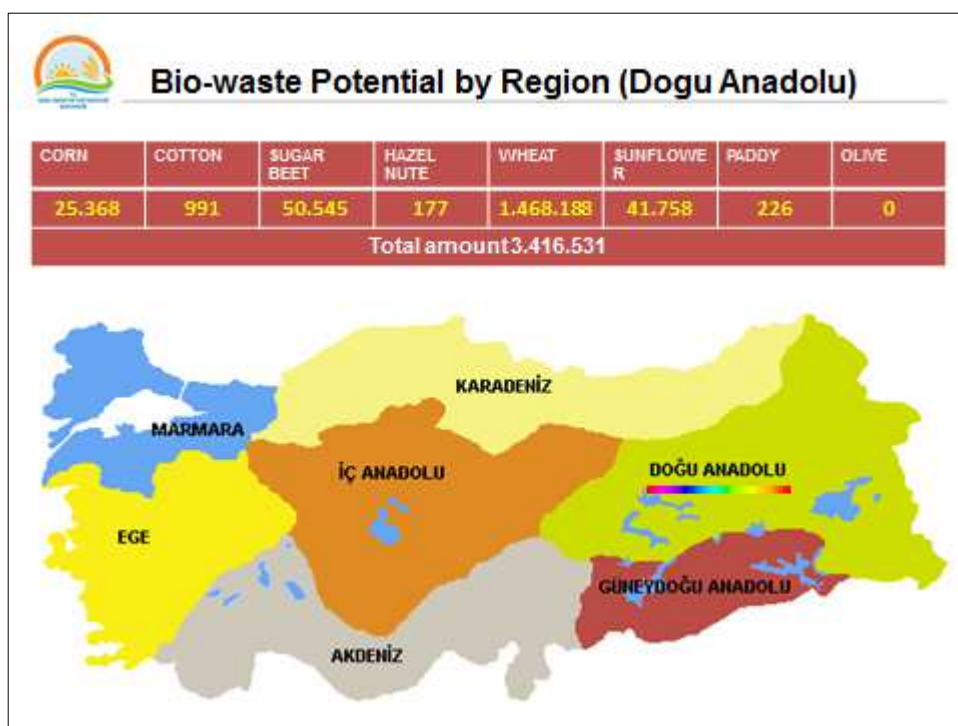


Figure 1. Regional distribution of theoretical bio-waste potential in Turkey (example of Dogu Anadolu)

Despite the significant potential Turkey has for biomass, currently only forty-two facilities are using biomass resources. Fifteen of these facilities produce electricity from collecting gas of the landfill from household waste. Other biogas facilities mainly produce biogas from household and animal wastes. There are also a couple of wastewater treatment plant that produce electric energy from sludge. The majority of these plants are using household and municipal waste, and hardly any demonstration project using the bio-energy from the agro-industry is being valorized. When considering the significant biomass potential in the agriculture sector, this remains very low.

While the Government has been making initial efforts to improve the use of biomass and stimulate private sector participation, the development of more detailed regulations is required, capacities are missing at several levels (policy, finance, technical), and there is a need for demonstration projects to showcase the suitability of modern bio-energy technologies. This UNIDO-GEF project therefore aims to support the Government in fine-tuning the regulatory framework which can provide the confidence for investors and project developers, and demonstrate the use of bio-energy to support the existing energy policy strategy. Based on the observation that political willingness, initial private sector interest and demand for electricity are all present, the project aims to play a triggering and facilitating role to reduce the risks for private sector. The target technologies and sub-sectors will be selected during the PPG phase based on regional, geographical and socio-economic distribution of the key sub-sectors.

1.2.1 Associated baseline projects: national energy strategy and biomass/bio-energy policy in Turkey

The project will build on the existing legal and regulatory framework in Turkey which has been presenting several policies and measures for the fight against climate change particularly in development plans and also national plans, programs and strategy documents, especially in energy, agriculture, forestry, transportation, industry and waste sectors. Turkey's main goal in the fight against climate change is the mitigation of GHG emissions. According to 2012 figures of GHG emissions, the energy sector ranks first among sectors emitting greenhouse gases (at 70%).

Turkey's strategy and policy is focused on providing energy security of supply through diversification in energy resources. An enhanced use of domestic and renewable energy resources is key to achieve this goal.

The project will strengthen the existing incentives which the Government of Turkey has been preparing and implementing in order to accelerate the use of biomass resources with modern technology application.

Specific laws and regulations are in place to give incentives to private sector to enter into the sector of renewable energy in general, and bio-energy in particular. Energy generation from renewable energy sources is regulated by the following laws and regulations:

- Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No. 5346) (also referred to as the ‘Renewables Law’) was enacted in 2005. Renewable energy resources within the scope of this law are defined as wind, solar, geothermal, biomass, biogas, wave, current and tidal energy resources, and river-type hydraulic generation plants with a reservoir area of less than 15 km². In 2007, an incentive for electricity production through renewable sources was announced. The law guaranteed a tariff range of 5 - 5.5 Euro cents per kWh for 10 years. On 2011 the law has been revised and the guaranteed tariff has been amended to 13.3 US\$cent/kWh for electricity production based on biogas. See below table.

Renewable Energy Source	US\$ cents/kWh
Hydropower	7,3
Wind power	7,3
Geothermal	10,5
Biomass (incl. landfill gas)	13,3
Solar 13.3	13,3

Source: Ministry of Energy and Natural Resources

The law applies for 10 years to power generators completed until the end of 2015.

Renewable producers will also benefit from an 85% discount on transmission cost for a period of 10 years.

- “Regulation for Production of Electricity without a License” of December 2010 (Official Gazette no. 27774), eliminates the requirement for a license from EMRA (Energy Market Regulatory Authority) for the production of electricity through renewable sources at facilities with less than 500 kW of installed capacity and at micro-cogeneration facilities with installed capacity of less than 50 kW. These producers will be able to sell their excess production to the grid. The price will be set as the feed-in tariff if the electricity is produced through renewable sources, while the price will be the average wholesale price for micro-cogeneration facilities. Additional incentives for using local (Turkish) equipment may add 0.4 cents to 2.4 cents per kWh to the price for five years.

1.2.2 Associated baseline projects: GEF funded projects and existing financing schemes

Loan schemes to the total value of €300 million with the European Investment Bank (EIB) provide support for small and medium-sized investments in environment and energy with the Industrial Development Bank of Turkey (TSKB) and the Development Bank of Turkey (TKB).

The Technology Development Foundation of Turkey (TTGV) has also launched their own Green Fund which has a budget of US\$4 million in order to provide matching funding for projects that promote green industries in Turkey.

The Clean Technology Fund (CTF) Investment Plan is supported by the International Finance Corporation (IFC), the European Bank for Reconstruction and Development (EBRD) and the World Bank to support the low-carbon objectives of Turkey’s 9th Development Plan (2007-2013) and includes a component on “other sources of energy”. Finally, there is the Turkey Sustainable Energy Finance Facility (TURSEFF) from the EBRD, as well as various funding schemes available for climate change projects under the cooperation programme between Turkey and the USA will also be explored for potential investment support.

During the preparation and implementation phase of the proposed project, efforts will be made to create linkages with the most appropriate financing schemes currently available in the country.

explore the possibility of using other funding resources, such as the

1.2.3 Associated baseline projects: private sector enterprises and entrepreneurs

The project will build on the existing entrepreneurial spirit to bring business and technology innovation to representative enterprises in target agro-industrial subsectors. As the application of modern bio-energy technologies

in these sectors has not taken off, the project will guide the preparation of bankable technology applications, and guide target enterprises through the different phases of design, feasibility, business plan and access to finance.

The assessment of the baseline projects will be completed during PPG phase in order to identify relevance and potential synergies to this project.

1.3) The proposed alternative scenario, with a brief description of expected outcomes and components of the project,

As this project seeks to facilitate private sector participation and the development of a market for bio-energy and create new economic opportunities for the agro-industry, modern bio-energy technologies will be applied in small to medium-scale enterprises and agro-food across the country. This alternative scenario will use the realization of highly replicable innovation projects as a trigger for increased interest and awareness from the sector and market enablers, and in parallel will put in place interlinked interventions focused at the policy and regulatory level, and capacity building for market players and other key stakeholders. By addressing systemic barriers related to policy and regulation, the project will create an environment conducive for private sector led investment activities in this sector. The project will also create a critical mass of capacity for both market enablers and players so as to support the nascent industry with relevant skills. To kick start investments in this sector, the project will implement carefully selected projects that would serve as best practice projects.

The major focus sector for this project will be the agro-industry; the agricultural sub-sectors of livestock, field crops and horticulture (e.g. hazelnut; olive), as well as fruits are indicatively shortlisted for further analysis during the PPG phase. Investment opportunities will be guided towards financial closure, in order to turn the existing waste streams into an innovative revenue streams, and initiate applicable business models in target sub-sectors for inclusive and sustainable industrial development (ISID).

To support greater replication of these pilot projects, the project will consider a financial mechanism aimed at allowing agro-processing industries to access the initial capital to finance their installations, and for having operation and maintenance services available throughout equipment lifetime. The financial mechanism will target enterprises in sub-sectors that produce waste from agriculture and livestock, and also have the potential to consume electricity and heat generated from that waste in their operations.

Based on the large available and unused biomass in Turkey this project is expected to lead to global environmental benefits through reduction of GHGs emissions through substitution of fossil fuels but it will also generate socio-economic benefits at the local levels that include increased productivity, innovation and competitiveness in the agro-industry, creation of local jobs for men and women and associated delivery of services.

More specifically, the project is structured around three key components, as outlined below.

COMPONENT 1: Demonstration of modern bio-energy technologies and energy efficiency measures in the agro-industrial sector

No modern technology application has been conducted for the use of agricultural biomass in Turkey. Some preliminary studies focus on the use of biomass for heat energy. This component will therefore bring latest technology and best practice to the country in the form of highly replicable technology applications. The project will prioritise the generation of process heat from bio-energy for industrial applications, over green power.

Preparatory studies and stakeholder consultations to identify most promising and interested sub-sectors will be carried out as part of this component. In terms of raw material-product, process conditions, technical specifications and analyses of the selected technologies will be prepared and adapted to local conditions and levels of capacity.

Technology practices and financially working models of implementation projects will be realized. In scope of this component, investment/financing plans will be reviewed and developed on the basis of experiences in the phase of technology demonstration and this will pay the way for an effective deployment and scale up.

Each sector has its characteristics, which influence the appropriateness of a particular business and technical model. For this reason, closely analyzing the business and technical models based on a good understanding of the respective target sectors will ensure maximum success rate with respect to the business and technical model selected. Standardised technology packages with specifications, manuals and guidelines for the selected technologies and target industrial sectors will be developed. The manuals would be industry specific (for the selected sectors) consisting of the detailed guidelines for selection of bioenergy from agricultural biomass, financial guidelines for

capital costs, operating costs, cost of delivered energy, benefits, financing mechanisms and incentives available, financial analyses and business models.

Selection of pilot plants and technology, and relevant technical committees will be determined in PPG phase based on refined regional distribution of sub-sectors, socio-economic parameters and in close consultation with the respective government bodies.

Technologies for consideration will include biomethanation or anaerobic digestion of liquid or semi-solid waste streams. Besides this, there are thermo-chemical technologies available including pyrolysis, incineration, gasification and combustion of solid wastes. The choice of technology will depend on the nature, quantity and calorific value of the agro-residues and the desired output (e.g. process heat and/or power). Biomass based thermal technologies for process heat applications will be primarily targeted to underline the importance and potential of renewable energy for industrial applications. Also more advanced applications will be considered, such as additional outputs from bio-methanation (bio-CNG, sulfur, purified water, etc) which can generate additional revenue streams. Agro-industries and food-processing in general have a high and diversified energy demand, including mechanical energy for product transformation, thermal energy for processes like pasteurization or cleaning, and cooling for storage. Accordingly, potential improvements in energetic performance can be identified in each of those processes and energy demands. UNIDO's experience in similar projects has shown that energy audits and pre-feasibility studies in target enterprises on bio-energy or other renewable energy applications, typically lead to the identification of a number of straightforward energy efficiency improvements like boiler replacement, waste heat recovery and even (partial) implementation of energy management standards (ISO 50001), often with short payback periods. In line with the rationale to first reduce energy consumption where possible before replacing with renewable energy, this type of energy efficiency measures will also be considered for implementation in the target enterprises in the respective sub-sectors.

The scale-up of the exemplary technology applications will be facilitated and accelerated by the creation of a linkage with existing financing schemes. The options for such scheme will be analysed during the PPG phase. Such linkage or tailored mechanism will create additional investment opportunities and trigger faster replication across the agro-industry.

COMPONENT 2: Refined policy and regulatory framework to enable transformation across sub-sectors

Although there are renewable energy applications using organic wastes in the international industry, governmental/national banks and finance institutions in Turkey are selective in financing of this kind of projects. Projects of energy recovery from organic wastes (for instance rice husk and domestic organic wastes) are not preferred and perceived as highly risky by the banking sector. This perception of risk may give rise to high loan interests in this sector. Different mechanisms/programs should be proposed to encourage the targeted projects. The policy component of proposed programs requires special steps to be taken by the government.

While there have been preliminary studies on the biomass technology applications, no tailored national action plan has been prepared. A comprehensive large national study on agricultural biomass will address this gap, and a strategic roadmap for the techno-economic potential of agricultural and agro-food waste will be prepared, including a focus on medium-scale industries. This strategic roadmap will form the basis of the National Biomass Action Plan introduced by the respective government bodies including MoFAL/TAGEM) and MoENR. This roadmap will include a proposal for a revision of the existing legislation (which currently focuses only on stimulating the generation of biogas from municipal waste streams for power production) to expand the incentives towards agro-residues and other products than electricity (especially process heat for industrial applications). The roadmap will also reflect the regional differences, and formulate appropriate specificity of relevant measures accordingly. Additional stimulating measures to reinforce the existing legislative framework (such as tax breaks, standardised power purchase agreements, tailored regulation for decentralised biomass applications, etc) will be considered based on best practice and appropriateness for the national conditions.

COMPONENT 3: Capacity base strengthened and awareness raising increased

Key stakeholders currently do not have sufficient knowledge on the commercial use of biomass subject, and general awareness and technical capacity is still lacking. The competence of all parties on this subject will be enhanced, taking into account gender differentiated knowledge gaps. In order to achieve this, main stakeholders, both women and men, including biomass producers, concerned industries, banks, finance institutions, technology developers,

local people influenced by organic waste disposal and public institutions will be provided with tailored initiatives to strengthen the capacities. Considering the targeted biomass producers, it is seen that the lack of technical information concerning technological biomass practices is one of the barriers to the starting of technological investments.

Capacities of implementing institutions will be strengthened and embedded in national institutions and the sector as a whole, so as to ensure the mainstreaming of industrial waste to energy projects after the project's end.

In order to ensure optimal operation of the systems after project end, targeted training will be organized on Operation and Maintenance of the technologies. This kind of training will be provided to the target enterprises where the technologies are being applied, but also to trainers in partnering knowledge organisations where this capacity can be institutionalized (such as universities, research organisations, industry associations etc). A specific training programme will be designed for industry O&M staff and technology and service providers to develop and retain skilled workforce for innovative bio-energy technologies in industry. Training will be foreseen for 400 technicians, 50 senior management level decision makers, 50 government representatives, and 50 trainers of trainers, in cooperation with technical partners (e.g. academic, industry associations etc) through 25 workshops.

Training will involve exercises for the participants to help them to assess viability and to help them to identify markets for their products. Workshops and site visits will be held in each of the regions with target SMEs. Apart from technical level (engineers, energy managers etc.) also a tailored training programme for senior management (CEOs, Managing Directors) will be developed and conducted to increase the awareness at the decision-making level.

Specifically for the governmental level 50 staff will be trained through 5 tailored workshops.

Awareness in relevant sectors about biomass technologies increased through the development of tailored knowledge products to facilitate technology transfer in the agro-industry. This is expected to also include the development of a course on improvement of energetic performance in agro-industry through renewable energy and energy efficiency. The selection of appropriate academic partners will be completed during the PPG phase.

Efforts will be taken to ensure that both women and men have equal opportunity to participate in and benefit from all capacity building activities. For this purpose, during the PPG phase, a gender-analysis will be conducted analyzing the different knowledge gaps and training needs of the target groups, to define concrete targets of female participation and to identify a strategy to give equal opportunities to women, men and the youth. The goal is to ensure that women are able to participate in, benefit from and access all capacity building activities and build up technical knowledge.

The capacity needs assessment per target group will be completed during PPG phase based on the refined biomass potential (per geographical region, per socio-economic indicators, etc) and will include the selection of most relevant knowledge partners per target region.

For technical inputs institutions like TUBITAK (The Scientific and Technological Research Council of Turkey) and Regional Development Agencies. CSOs like the respective industry associations in the target sectors, the Bioenergy Association, Regional Agricultural Cooperatives, and NGOs will be especially relevant to build awareness and willingness to innovate in target companies, as well as in the design and execution of capacity building initiatives.

COMPONENT 4: Project Monitoring and Evaluation (M&E)

The objective of this component is to facilitate a detailed and extensive M&E structure to be put in place under the project in compliance with UNIDO and GEF procedures. This will allow not only the monitoring of the project's progress but also the construction of an overall project impact assessment on a rolling periodic basis, built-up from the project's different components. The analysis of the M&E and impact assessment results of the different components will allow for periodic reviews of the project's 'Theory of Change' and subsequent implementation strategies and work plans. Beyond this tailor-made M&E and IA approach, the proposed GEF Project would also come under UNIDO's standard M&E approach for GEF funded projects, this consisting of mid-term review and final evaluations as well as defined period project implementation reporting based on the GEF/UNIDO templates (MTR/PIR/final PIR).

As a starting point, an ESMP will be formulated during the PPG and relevant environmental and social impact mitigation measures will be incorporated into project design. Additionally, a study on the sustainability of biomass

feedstock for production of electricity and heat will be conducted during the PPG and appropriate measures will be incorporated into the ESMP.

1.4) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing;

The proposed project is structured under Program 1 (“promote timely development, demonstration and financing of low-carbon technologies and mitigation options”) to “promote innovation, technology transfer and supportive policies and strategies”, which is focal area strategy of GEF, in scope of “Climate Change Mitigation”.

By means of this project, global environment management indicators will be developed as a part of national energy and environment management systems of Turkey and practices under the international conventions to which Turkey is a party will be improved. Successes in two main thematic areas of the GEF, climate change and biodiversity, are directly related to capacity development and expansion of appropriate technological applications.

As a result of this project, the market environment for industrial applications of biomass will be improved and sustained, including through an increased attractiveness and reduced risk of biomass investments and an established linkage with development and commercial finance mechanisms.

In the absence of this GEF project, modern bio-energy applications will remain marginal in number and scope, and, at best, remain limited to a small number of applications in large-scale agricultural industries. The GEF budget will be used to kick-start the local market for small- and medium-scale agricultural industries, strengthen the local expertise on design, operation and maintenance of biomass facilities and improve the existing regulations/policies allowing introduction of biomass technologies in the agricultural industrial sector. This will be done through a combination of technical assistance and investment support. The exact nature of the financing instrument will be defined during PPG phase, and will aim for a maximum triggering effect for the type and size of most relevant modern bio-energy technology applications. UNIDO’s best practice suggests that a limited triggering financing support (for instance as grant or through a revolving fund), combined with tailored technical assistance typically yields the best results.

1.5) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

This GEF project will initiate a significant reduction of greenhouse gas emissions in a largely untapped area, i.e. heating and cooling in agro-food SMEs. An increased use of biomass will substitute the use of fossil fuels for heat or power generation and thus greenhouse gas emissions arising from combustion of these fossil fuels will be prevented. In this way, Turkey will contribute to national targets as well as global targets to reduce GHG emissions.

Sustainable results will be obtained from this project through a cost-effective approach. The technical assistance and financial support from the GEF combined with the support of the government will function as an important leverage for biomass investments in agro-industries. Thus, besides indirect results such as creating extensive investment opportunities not only in the implementation period of this project but also after this period through planning and site researches and pilot facility applications to be conducted in scope of this project, the necessary substructure will also be created for introducing the service providers engaged in agriculture trade and agricultural industrial practices and commercializing biomass technologies. By all these means, the capacity needed by the country will be developed, a safe technical and financial ground will be set and finally new enterprises will be triggered and also longer term development and investment impacts will be created, which will bring national success to global environment management indicators in scope of GEF’s focus areas.

Based on initial assumptions, this project is expected to result in:

- Direct emission reductions of 110,000 tCO₂e through its demonstration activities
- Target investment levels of 13.8 million USD by the end of the project (leveraging at least 11.5 million USD for a 5:1 leverage ratio)
- Direct energy generation from demonstration projects totalling 2,300 kW_e or equivalent (indicatively 5-7 projects in the 300-600 kW range)

Indirect emissions reductions

Using the GEF bottom-up methodology, indirect emission reductions attributable to the project are expected to be 330,000 tCO₂eq. This figure assumes a replication factor of 3 (GEF uses 3 for a market transformation initiative and 4 where a credit guarantee is introduced).

Using the GEF top-down methodology, indirect emission reductions attributable to the project are estimated at 660,000 tonnes of CO₂eq. This figure assumes that total technological and economic potential for GHG emission reductions in this area over the post-project 10 years is 1,100,000 tCO₂eq, with a project causality factor of 60.

The range of indirect CO₂ emission reductions is 330,000 – 660,000 tCO₂eq.

Assumptions to reach this figures include a replication of 23 MW (equivalent) in the post-project period, and a grid emission factor of 0.65 tCO₂ / MWh. To simplify the calculation power production only has been considered, even though the project will focus on process heat generation and potentially other outputs and products like bio-CNG. Potentially accompanying energy efficiency measures have not yet been taken into account. The planned GHG emission reductions will therefore be estimated in detail during PPG phase based on the selection of sub-sectors and the most relevant bio-energy technologies and energy efficiency measures.

1.6) Innovativeness, sustainability and potential for scaling up

The project proposed for the start up of technology applications, deployment, scale up and sustainability will address the needs of all institutions and parties having a key role in ensuring commercial use of biomass. Turkey will establish a corporate capacity for the management and implementation of biomass use and it is believed that this corporate capacity will contribute to the development of information-based policies concerning biomass activities in the country in the long run.

The modern bio-energy applications are expected to act as game changers which will be picked up by market enablers, finance sector and policy makers to further enable the environment for this type of investments. Through technical and financial feasibilities to be prepared, entrepreneurs will see other potential benefits (technology and business innovation; competitive power, socio-economic benefits) that will further boost demand for investments and related services.

In addition, employment opportunities will be increased for both women and men in the agro-industry and thus local and national economy will be reinforced. Also social sustainability will be strengthened due to the systematic gender mainstreaming of the project during the whole project cycle.

The replication potential is significant, based on the initial estimates of the theoretically available potential, and the modern bio-energy applications are expected to unlock the large number of similar investment opportunities, and thus initiate a low-carbon transformation of the agro-industrial sector.

2. *Stakeholders.* Will project design include the participation of relevant stakeholders from [civil society](#) and [indigenous people](#)? (yes X /no) If yes, identify key stakeholders and briefly describe how they will be engaged in project design/preparation.

The project will be executed under the management of T.R. Food, Agriculture and Livestock Ministry-General Directorate of Agricultural Research and Policy (TAGEM) as the primary counterpart of GEF T.R. Ministry of Environment and Urbanization and T.R. Ministry of Energy and Natural Resources will take part in Steering Committee. Therefore the project will be carried out in cooperation with other national and local stakeholder government agencies. Other potential partners include T.R. Ministry of Forest and Water Affairs, commercial banks, funding agencies. Institutions like TUBITAK (The Scientific and Technological Research Council of Turkey) and Regional Development Agencies. and CSOs like the respective industry associations in the target sectors, the Bioenergy Association, Regional Agricultural Cooperatives, and NGOs will be involved in the design and execution of capacity building initiatives. Given the size and type of the bio-energy applications (i.e. in agro-industrial enterprises) to be supported under this project, it is not foreseen that indigenous communities will be displaced.

Stakeholders will also include a gender expert, local and international associations and/or agencies promoting gender equality and women's empowerment, in particular those focusing on energy needs and entrepreneurship.

3. *Gender Considerations.* Are [gender considerations](#) taken into account? (yes X /no). If yes, briefly describe how gender considerations will be mainstreamed into project preparation, taken into account the differences, needs, roles and priorities of men and women.

UNIDO recognizes that gender equality and the empowerment of women have a significant positive impact on sustained economic growth and inclusive industrial development, which are key drivers of poverty alleviation and social progress. Commitment of UNIDO towards gender equality and women's empowerment is demonstrated in its policy on Gender Equality and the Empowerment of Women (2015), which provides overall guidelines for establishing a gender mainstreaming strategy, UNIDO has also developed an operational energy-gender guide to support gender mainstreaming of its sustainable energy initiatives.

UNIDO recognizes that energy interventions are expected to have an impact on people and are, therefore, not gender-neutral⁹. In fact, due to diverging needs and rights regarding energy consumption and production, women and men are expected to be affected differently by the project (in terms of their rights, needs, roles, opportunities, etc.). The project aims to demonstrate good practices in mainstreaming gender aspects into promoting sustainable use of biomass to strengthen the economy in Turkey towards a low carbon development path, wherever possible and avoid negative impacts on women or men due to their gender, ethnicity, social status or age. Consequently, it will be considered to systematically include the gender dimension during the whole project cycle.

To mainstream gender into the project a gender analysis is planned and will be available during PPG phase to identify entry points for defining gender aware project outcomes, outputs as well as activities. During the preparatory phase, the project will conduct a gender analysis to identify the specific circumstances of women and youth and provide a basis of how the priorities and need for these vulnerable groups will be integrated in the implementation of the project. In addition, continued discussions will be held with the UNIDO energy-gender expert to ensure that the relevant gender dimensions are considered, and the project log-frame will be developed to reflect key gender dimensions of the respective outputs, activities, indicators and targets.

Guiding principle of the project will be to ensure that both women and men are provided equal opportunities to access participate in and benefit from the project, without compromising the technical quality of the project results.

In practical terms:

- Under the second component, the project will ensure that the developed regulations are gender sensitive.
- Efforts will be made to promote participation of women in training activities, both at managerial and technical levels. Given that the training to be provided by this project will be of a technical nature, the project will also provide bridging training courses so that women who may not have a technical background will have an intermediary training. In addition, the project will also provide training in local languages to encourage the participation of women, who may be illiterate, in such training.
- Gender-sensitive recruitment will be practiced at all levels where possible, especially in selection of project staff. Gender responsive TORs will be used to mainstream gender in the activities of consultants and experts. In cases where the project does not have direct influence, gender-sensitive recruitment will be encouraged. Furthermore, whenever possible existing staff will be trained and their awareness raised regarding gender issues.
- All decision-making processes will consider gender dimensions. At project management level, Project Steering Committee meetings will invite observers to ensure that gender dimensions are represented. Also, at the level of project activity implementation, effort will be made to consult with stakeholders focusing on gender equality and women's empowerment issues. This is especially relevant in policy review and formulation.
- When data-collection or assessments are conducted as part of project implementation, gender dimensions will be considered. This can include sex-disaggregated data collection, performing gender analysis as part of ESIA's, etc. For instance, during preparatory phase, it is planned to conduct a baseline assessment of the situation in pilot sites based on gender disaggregated indicators. The findings will contribute to design or adjust KPIs, as well as capacity building modules with the necessary orientation taking into account differences of needs between women and men.

In sum, the project design will acknowledge the differences of energy access impacts considering distribution of economic activities and social roles between women and men in Turkey, in line with GEF 6 Programming Strategy.

⁹ ENERGIA "Turning Information into Empowerment: Strengthening Gender and Energy Networking in Africa. Leusden, 2008; Joy Clancy "Later Developers: Gender Mainstreaming in the Energy Sector", 2009

4 Risks. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable).

The potential risks to a successful project implementation can be classified as regulatory, implementation, financial and economic and sustainability risks, described in further detail below:

TABLE 6. RISKS

<i>Risk</i>	<i>Risk level</i>	<i>Risk mitigation measures</i>
<i>Regulatory framework risk: uncertainty in the application of legislation that incent renewable energy production</i>	M	The incentive given for the energy to be obtained through biomass use is applied for ten years for those having production license subject to the Renewable Energy Law (REL) Support Mechanism that have commenced or will commence operation until 31/12/2015. However, in line with other developments, particularly the supply security, the amount, price and periods to be applied under this Law are determined by the Cabinet in a way to not exceed the prices in the Chart for production facilities with REL Certificate that will commence operation after 31/12/2015.
<i>Implementation risk: Entrepreneurs' lack of interest Technology providers' lack of interest.</i>	M	Development of detailed project plans with close cooperation with project partners, stakeholders and developers in the country. A comprehensive stakeholder advisement process in the stage of preparing the project. Capacity enhancement programs will be organised for the industry. Disseminating information of best practice examples to the industry Regular contact with biomass producers and market enablers
<i>Financial Risk; banks' requesting government guarantee or applying high interests in loan use due to their concerns about the operability and commercial profitability of facilities Insufficiency of available financial mechanisms</i>	M	Creation of a linkage with relevant financing schemes currently existing in the country Consider different financial approaches in consultation with financing and cofinancing partners including development financing institutes and the national (commercial) banking sector Investment opportunities will be identified and guided towards financial closure, in order to turn the existing waste streams into an innovative revenue streams, and initiate applicable business models in target sub-sectors for inclusive and sustainable industrial development (ISID). The focus will be on building a business case for the most appropriate output (e.g. process heat and/or power); biomass based thermal technologies for process heat applications will be primarily targeted to underline the importance and potential of renewable energy for industrial applications. Also more advanced applications will be considered, such as additional outputs from bio-methanation (bio-CNG, sulfur, purified water, etc) which can generate additional revenue streams. UNIDO's best practice suggests that a limited triggering financing support (for instance as grant or through a revolving fund), combined with tailored technical assistance typically yields the best results. Provision of technical assistance to properly design, operate and maintain the modern bio-energy applications will contribute to increased confidence in the technical reliability of the technologies.
<i>Economic and Sustainability Risk:</i>	L	Considering the large potential in existing biomass resources from agro-industrial waste streams, the partial use of these resources is not expected to have any impact on food production. In contrast, the project

Risk	Risk level	Risk mitigation measures
<i>The risk of raw material supply</i>		<p>will promote use of post-harvest agricultural wastes and byproducts and biomass wastes generated in production processes in the agro-industry.</p> <p>Sustainable use of modern biomass will be promoted in the project; relevant standards and certification schemes will be applied where necessary.</p> <p>A study on the sustainability of biomass feedstock for production of electricity and heat will be conducted during the PPG and appropriate measures should be incorporated into the ESMP.</p>
<i>Social and Gender Risk: There could be a risk of resistance against, or lack of interest in, the project activities from stakeholders, especially with regard to the active promotion of gender equality; or low participation rates of suitable female candidates due to lack of interest, inadequate project activity or missing qualified female population within engineering sector.</i>	L	<p>To mitigate this risk the project will pursue thorough and gender responsive communication and ensure stakeholder involvement at all levels, with special regard to involving women and men, as well as CSOs and NGOs promoting GEEW, and a gender expert. This shall mitigate social and gender related risks, promote gender equality, create a culture of mutual acceptance, and maximize the potential contribution of the project to improving gender equality in the energy field.</p> <p>A gender analysis will be done and an ESMP will be formulated during the PPG and relevant gender, environmental and social impact mitigation measures will be incorporated into project design.</p>
<i>Climate change risk</i>	L	<p>Increased drought periods (for instance in 2014) may affect the availability of biomass resources, both agriculture residues and livestock manure. The design of the project will include climate risk analysis and integrate mitigation strategies. During project preparation phase, an assessment of the availability of those resources based on different scenarios will be carried out and, when necessary, possible alternatives will be identified.</p>

5. Coordination. Outline the coordination with other relevant GEF-financed and other initiatives.

UNIDO and other UN agencies are currently implementing several projects in Turkey which will have a synergetic relationship with this project. The on-going GEF/UNDP/UNIDO project on industrial energy efficiency improvement has a total GEF grant of US\$6 million and promotes energy efficiency in the Turkish industrial sector. UNIDO is also currently implanting the Cleantech Turkey project with a focus on innovation for startups and small businesses. The detailed assessment of relevant initiatives will be completed out during PPG phase.

6. Consistency with National Priorities. Is the project consistent with the National strategies and plans or reports and assessments under relevant conventions? (yes /no). If yes, which ones and how: NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, etc.

As a member to Organization for Economic Cooperation and Development, Turkey is included in both Annex-1 and Annex-2 lists of the United Nations Framework Convention on Climate Change, together with developed countries. Turkey, which supported the purpose and general principles of the UNFCCC but did not become a party to this Convention due to its unfair position, struggled for a long time to change this position. In consequence of the 7th Conference of the Parties held in Marrakesh, Morocco in 2001, it was resolved that “Turkey’s name would be removed from the Annex-2 and included in the Annex-1 under special conditions at a position different from other Annex-1 countries” and Turkey became a party to UNFCCC on May 24, 2004 and to Kyoto Protocol on August 26, 2009.

As a party of the Annex-1 of the UNFCCC, Turkey is responsible for developing and implementing policies to fight against climate change and notify the UNFCCC of current greenhouse gas emissions and data regarding these emissions. On the other hand, Turkey has no obligation for mitigation greenhouse gas emission in the First (2008-2009) and Second (2013-2020) Commitment Period of Kyoto Protocol.

The Ministry of Environment and Urbanisation, National Focus of which is climate change, fulfills its task of national coordination for all matters concerning climate change. Furthermore, a corporate structure was formed before becoming a party to UNFCCC and Coordination Board on Climate Change (CBCC) was established by a Prime Ministerial Circular no. 2001/2. CBCC was restructured in 2013 and its name was change to Coordination Board on Climate Change and Air Management (CBCCAM).

“Republic of Turkey National Climate Change Strategy Document” and “Turkey’s Climate Change Adaptation Strategy and Action Plan”, in which Turkey’s short-, medium- and long-term plans concerning Climate Change Mitigation for the period 2010-2020 are included, were published.

The strategy documents (Agricultural Strategy, Agricultural Deduction Program, Rural Development Strategy and Action Plan, Energy Efficiency Strategy etc.), policies, long-term policy programs (Rural Development Program/IPARD, TUBITAK Vision 2023, etc.) and action plans (Waste Management Action Plan, Waste Water Treatment Action Plan etc.) contain various activities for emission mitigation as well as adaptation to the impacts of climate change for fighting against climate change.

7. Knowledge Management. Outline the knowledge management approach for the project, including, if any, plans for the project to learn from other relevant projects and initiatives, to assess and document in a user-friendly form, and share these experiences and expertise with relevant stakeholders.

The project will work in collaboration with various stakeholders to develop different knowledge tools (e.g. training tools, roadmaps, guidebooks etc) that will be disseminated widely.

Under component 1, the results of the modern bio-energy applications will be widely disseminated choosing the most appropriate medium to reach a large number of actual and potential stakeholders. The targets of this dissemination will be potential users of the technology, but also those in the private sector for whom supporting, servicing and maintaining the technology could be a business opportunity, this include manufacturers of spare parts, banks, and other financiers. Under component 2 on policy, the project will work with local institutions to develop the strategic roadmap, as well as relevant standards and guidelines, for a wide dissemination. As for the component on capacity building will develop training manuals that will be readily available for use by different institutions like universities, research organization and industry associations. The project will also help local training institutions to adapt these training manuals into curriculum for their institutions. This way, the knowledge generated from this project will be integrated into the education system. All publications developed under this project will comply with GEF and UNIDO communication policies.

To ensure up-to-date know-how, UNIDO actively collaborates with a number of energy technology centers, networks and learning platforms worldwide, such as the International Centre for Science and High Technology in Trieste, the National Cleaner Production Centers (46 countries) and the Green Industry Platform to form strategic partnerships to promote knowledge management and best practices for technology transfer. UNIDO also already applies a strategy of establishing regional centres as centers of excellence and knowledge hubs (for instance the ECREEE center in Cape Verde for West-Africa, and similarly ongoing initiatives for East- and Southern Africa, as well as for SIDS) as a way to institutionalise capacities and support regional coordination and information exchange. Depending on the timing for the creation of such a centre covering the Europe / Central-Asia region, this same rationale will be pursued to ensure sustainability of the capacity gained under this project.

UNIDO is well-placed to implement this project with its global network of experts and will be able to draw upon its experience from its wider portfolio of relevant and mainly GEF funded projects on bio-energy, including in Ukraine (low-carbon technologies in bakery industry, biogas from organic farm waste to provide heat and electricity for on-farm needs), gasification in wood-processing sector, Uruguay (biogas and other low carbon waste utilization technologies), the Dominican Republic (biomass for electricity generation), Albania (bio-energy in olive oil sector) and Chile (biogas for agro-industries). Furthermore, UNIDO has carried out projects in Nigeria (rice husks for

electricity), Thailand (bamboo waste from chopstick industry and rice husks for energy), Sri Lanka (bamboo waste processing into pellets).

All knowledge management activities will be gender mainstreamed. This includes integration of gender dimensions into publications, for instance, presenting sex-disaggregated data and gender-energy nexus theory; gender sensitive language in publications, photos showing both women and men and avoid presenting stereotypes; as well as assuring that women, men and the youth have access to and benefit from the knowledge created.

The most suitable partners and stakeholders will be identified (per component) during PPG phase. All publications developed under this project will comply with GEF and UNIDO communication policies.

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)


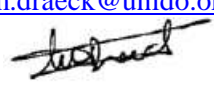
A. RECORD OF ENDORSEMENT¹⁰ OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter](#)(s) with this template. For SGP, use this [SGP OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Prof. Dr. Liitfi AKCA	Undersecretary	Ministry of Forestry and Water Affairs	08/12/2015

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF policies¹¹ and procedures and meets the GEF criteria for project identification and preparation under GEF-6.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
Mr. Philippe R. Scholtès, Managing Director, Programme Development and Technical Cooperation Division (PTC), UNIDO GEF Focal Point		12/17/2015	Mark Draeck, Industrial Development Officer, Energy Branch	+43 1 260265317	m.draeck@unido.org 

C. ADDITIONAL GEF PROJECT AGENCY CERTIFICATION (APPLICABLE ONLY TO NEWLY ACCREDITED GEF PROJECT AGENCIES)

For newly accredited GEF Project Agencies, please download and fill up the required [GEF Project Agency Certification of Ceiling Information Template](#) to be attached as an annex to the PIF.

¹⁰ For regional and/or global projects in which participating countries are identified, OFP endorsement letters from these countries are required even though there may not be a STAR allocation associated with the project.

¹¹ GEF policies encompass all managed trust funds, namely: GEFTF, LDCF, and SCCF