

Turkey's
***Best Practices on
Sustainable
Development and
Green Economy***
2012



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Akçansa, Waste Heat Recovery Power Generation Plant



AKÇANSA Çimento Sanayi ve Ticaret A.Ş.

Partner Organizations:	SİNOMA
Geographic Coverage:	Çanakkale City, Aegean Region
Implementation Period:	2010 - 10/2011

Organizational Profile:

Number of employees: 1065

Primary brands, products/services:

- Cement production and sales
- Ready-mix concrete production and sales under Betonsa brand. RMC from C8 to C100 and other special products.
- Aggregates production and sales under Agregasa brand
- Waste co-incineration and waste laboratory service
- Jetty Services & Port Operations

Types of customers/beneficiaries: Construction materials producers, construction sector
Geographic breakdown of markets served: Turkey Marmara, Ege ve Karadeniz Region and foreign countries

The Problem/Opportunity:

Climate change is a key challenge worldwide and puts risks and opportunities for Turkey, like obligations for developing action plans as well as Emissions Trading Systems.

The cement industry stands for 5% of anthropogenic sources of greenhouse gases (mainly CO₂) worldwide. Half of this percentage results from the calcination of limestone during clinker production process, 40% from fuel consumption, and 10% from electrical energy use and transportation.

Coping with climate change is at the core of Akçansa's sustainability strategy. Committed to reduce CO₂ emissions Akçansa focuses on three main approaches: use of waste as alternative fuels, reducing the rate of clinker usage in cement, and energy efficiency.

Objectives:

Akçansa has taken the opportunity to improve energy efficiency performance by investing in Waste Heat Recovery Power Generation Plant. Energy consumption presents an important fact of the cement industry's impact on environment and operational costs. Akçansa is targeting to minimize this impact by installing the Waste Heat Recovery Power Generation Plant in Çanakkale Cement Plant. The energy plant of 15 MW capacity recovers vapor steam to generate electrical energy. With this state-of-the art technology, 105 million kWh of energy will be saved per year and 60,000 ton yearly CO₂ emission reduction is expected through this saving. Considering CO₂ emission reduction

obtained, Akçansa is also targeting to take a position in the voluntary emission trading market.

Execution:

The project entails utilization of waste heat of flue gases generated in cement kilns of Akçansa Çanakkale Cement Plant. Prior to the implementation of the plant, the waste heat has been vented into atmosphere. A low temperature waste heat power generation technology is employed by the project to recover the waste heat from the coolers of kiln-heads (AQC) and the pre-heaters of kiln-tails (PH) of three clinker production lines. AQC boilers and PH boilers are used to produce steam to drive one set of power generation unit to general electricity.

The execution of this project has been conducted with the collaboration of experts from different disciplines. Akçansa project team has been responsible for coordinating all engineering, equipment supply, and sites works. The exported equipment and engineering works have been supplied by Sinoma, and site works by a local manufacturing company. During whole execution phases, particular attention has been attached to health and safety measures and environmental aspects.

Results/Outcomes:

The project provides yearly 105 million kWh of energy saving, thus it ensures the continuity of energy supply and conservation in coal reserves. The amount of energy saved makes 30% of the total yearly energy need of Çanakkale Cement plant; so 30% less energy is retrieved from the grid. Similar to any other energy intensive industry, high energy costs create a competitive disadvantage for the sector, therefore this plant delivers an important economically added-value for Akçansa; from a wider perspective for the national economy.

In addition to economic benefits, the project creates social opportunities. Waste heat recovery power generation plant in Çanakkale Cement Plant was the first of his kind in Turkish Cement Industry. The execution of the project as well as its operation requires a wide know-how, thus it created an emerging work opportunity and expertise area.

Finally, the most important outcomes are related to the environmental concerns. Turkey has been a party to United Nations Framework Convention on Climate Change and Kyoto Protocol, but it does not have a target for emission reduction. 9.5% of the total CO₂ emissions are caused by cement industry in Turkey. Akçansa, thanks to the WHPG plant, will prevent 60,000 ton of CO₂ emission through energy saving. Otherwise, this quantity of CO₂ would be compensated with the oxygen emitted by 2,700,000 trees.

This CO₂ emission reduction project has been registered to be accredited as Gold Standard Project; the VERs generated from this project would market as premium carbon credits.

The project does not have further impacts on other emissions, but thanks to the climate change mitigation and sustainable use of natural sources biodiversity of the region will be positively affected.

Future Plans:

Waste Heat Recovery Power Generation technology has been defined as best practice in IPPC Reference Document on Best Available Techniques in the Cement Industry.

Akçansa Çanakkale Plant has been the first cement enterprise that installed Waste Heat Recovery Power Generation Plant and has the biggest capacity throughout Europe.

Waste heat recovery being today a state of the art technology, is spreading to six Turkish Cement Companies other than Akçansa and there is a big potential for its usage over Turkish cement industry.

The availability of this technology, through its contribution in conservation of natural resources and in energy efficiency will help Turkey to drive towards a low carbon economy and sustainable development.

Lessons Learned:

Being a first implementation of this kind in Turkish Cement Industry, several obstacles have been met.

The core equipment of the state-of-art technology has been exported from China. The difficulties in communication and coordination have caused delay in delivery terms.

During the operation, the gas is vented at 460°C - 500°C, which is higher than the design level of 360°C. The resulting negative performance has been overcome by the installation of additional cooling equipment.

In the cement plants, the operators are highly expert in cement process; but they are not skilled enough for energy plants. The need for skilled-staff in energy sector has been observed.

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Partner Organizations:	Ministry of Food, Agriculture and Livestock, Çukurova University, Selçuk University, Hacettepe University, Uludağ University, Kahramanmaraş Sütçü İmam University, Harran University, Ankara University, Turkey Plant Breeding Association, Turkey Seed Industry Association, Sub Union of Seed Industrialists and Producers, Sub Union of Plant Breeders
Geographic Coverage:	Malt barley work carried out in Central Anatolia, Southeastern Anatolia, and Mediterranean and Trachea regions. Practices regarding hops carried out in Bilecik-Pazaryeri region (Northwestern Anatolia) and surrounding area.
Implementation Period:	1987 – 2012

Organizational Profile:

Number of employees: 1,822

Primary brands, products/services: Nine beer brands

Types of customers/beneficiaries: Adult consumers

Geographic breakdown of markets served: Turkey

The Problem/Opportunity:

Anadolu Efes launched its “Sustainable Agriculture” program as a response to the limited availability of malt barley and hops suitable for beer production – both in grain quality and quantity – in Turkey prior to 1987. In addition, as a company dependant on agricultural raw materials for its products, Anadolu Efes views the negative impact of climate change and other environmental factors on arable land and water resources as a risk factor for the sustainability of its supply chain.

Objectives:

Anadolu Efes “Sustainable Agriculture” practices aim to ensure the sustainability of high-quality raw materials for production. This objective is supported by three strategies:

- Improve quality and resource-efficiency of the agricultural raw materials,
- Ensure that these products are grown locally in each market,

- Expand supply area and ensure sustainability

As per these strategies, the Company targets to increase the quality and variety of the malt barley and hops used in production, by developing new strains that:

- require less water to grow,
- are resistant to changing climate conditions and,
- need less water and energy during the production process.

The Company also aims to make sure that the newly-developed strains are farmed correctly by its supplier farmers.

Execution:

To reach its “Sustainable Agriculture” program targets, Anadolu Efes set up an R&D unit responsible for development and production of new malt barley and hops strains as part of a long-term strategy.

Activities in this area can be classified as follows:

- Plant breeding/strain development
- Seed production
- Agricultural support for supplier farmers

As a result of its R&D efforts, the Company has developed and registered 15 new malt barley strains and 7 new hops strains, improving both the quality and resource-efficiency. Development of new strains that are resistant to drought and that need less fertilization, water and energy throughout the whole production process are viewed by the Company as important gains in its sustainability efforts.

The Company ensures that the newly developed strains are farmed widely by offering contract farming as part of its agricultural support program for farmer suppliers. The Company gives procurement guarantee for crops grown from certified seeds it provides, ensuring efficiency and financial stability for its suppliers. The Company also holds regular training sessions about new farming techniques for its farmer suppliers.

Anadolu Efes is not only the biggest buyer of malt barley and hops in Turkey but also the first and only company with R&D and contract farming programs for these crops.

Results/Outcomes:

Thanks to newly developed malt barley strains that require less water to grow, new agricultural areas have been opened to malt barley farming. Previously grown only in Cumra area in Central Anatolia, malt barley is now grown also in Adana and Adiyaman, the South Eastern regions with lower rainfall. Encouraged by Anadolu Efes agricultural support programs, guaranteed procurement at market prices and certified seed and on-time payments, farmers in these regions have switched to malt barley. As of 2010, close to 3,000 farmer families, earn their livelihood by growing malt barley for Anadolu Efes.

Total hops farming area increased to 2,777 decares in 2010 from 709 decares in 1989,

Anadolu Efes has developed 15 new, certified malt barley strains as a result of its R&D efforts in this area. Among these, two strains, “Atılır” and “Fırat”, requires in malt

production process 12-24% less electricity, 18-22% less fuel, 40%-47% less water as compared to “Tokak”, the most widely grown barley strain in Turkey.

The Company has also developed and registered 7 new strains of hops, including three “aromatic” and four “bittering” strains. These new strains provide a yield increase of 25%-30% as compared to the local strains.

Future Plans:

Anadolu Efes has targeted to reduce its water usage per hectolitre of beer by 25% by 2015, as compared to 2010.

To achieve this target, the Company has committed to continue its R&D efforts to increase the quality and variety of its malt barley and hops strains, develop new strains that are more resistant to changes in climate and require less water and energy during production process. The Company will also seek to expand the land area allocated malt barley and hops by increasing the number of its farmer suppliers and supporting these families. Additionally, the Company will expand those programs in place that aims to support its suppliers and business partners through training and financial support.

Lessons Learned:

Since it takes about 10-12 years for a newly developed strain to be commercially viable, “Sustainable Agriculture” program and related work require long-term planning and investment. Thus it is critical that the program is supported by the Company leadership with a long-term perspective and is allocated the necessary time, talent and financial resources. Long-term involvement of partner organizations as well as local municipalities is also a key success factor.

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Arçelik A.Ş.

Arçelik A.Ş.

Partner Organizations:	None
Geographic Coverage:	Europe, Asia and Middle East
Implementation Period:	04/2009 - 01/2012

Organizational Profile:

Number of employees: 22,000

Primary brands, products/ services: Arçelik, Beko, Blomberg, Grundig, Elektra Bregenz, Arctic, Altus, Leisure, Flavel, Defy

Types of customers/beneficiaries: Households

Geographic breakdown of markets served: Europe, Asia, Middle East, North and South America, Australia, Africa

The Problem/Opportunity:

The growing world energy demand and the rapid consumption of natural resources are forcing all of the world countries to take energy saving measures. In addition considering the present growth rate and water consumption pattern of our country, in order to leave enough water for future generations efficient ways of water consumption must be found. For this purpose dishwashers provide a better choice for the customers to clean their dishes with 10 times less water consumption than washing by hand. Recognizing the importance of sustainability of natural resources Arçelik is working to develop better dishwashers with lower water and energy consumption via innovative solutions.

Objectives:

Providing A class washing performance for dishes with minimum water and energy consumption in order to leave a better world for future generations.

In the meantime advancing in the production methods to minimize the natural resource requirement and stack gas emissions caused by production.

Developing the technologies to decrease the overall water and energy consumption of all Arçelik dishwasher range for sustainability.

Execution

The world's least water consuming and most energy efficient dishwasher is developed with the usage of sophisticated technologies like automatic door opening system, Alumination® isolation, air duct design with optimized air flow characteristics, reuse of water and heat buffer technology.

Automatic door opening feature opens the outer door at the end of the washing cycle to increase the drying performance of dishes. Alumination® isolation lowers the heat capacitance of the dishwasher structure for lower energy consumption. Additionally with the use of aluminum material instead of petroleum by-product bitumen, the stack gas emission and natural gas consumption occurring during the production processes are eliminated. New air duct design provides better drying performance with lower temperature wash cycle profiles. Reuse of most clean extra filtrated 2nd rinse water in the following wash cycle provides world leader 6 liters water consumption with A cleaning class for 13 place setting. Heat buffer positioned next to main structure absorbs the heat lost from the body during the wash cycle to save energy. All of these technologies embedded with optimized washing characteristics using the latest technologies in the electronics.

Results/Outcomes:

With Cactus project world's most energy efficient and lowest water consumption dishwasher with 0.68 kWh/cycle (annual 194 kWh energy consumption, 10% more efficient than A⁺⁺⁺ energy class) consumption in the reference program and 6 liters of water consumption with A⁺⁺ energy level in "Eco 6L" program is designed and presented to the market.

Cactus project has major contribution to the development of environmental awareness of the society. Also products had influenced most of the competitors of Arçelik to design more environment friendly products.

The European Committee of Domestic Equipment Manufacturers (CECED) database shows that 70% of the 8.7 million dishwashers in Turkish households have 15 liters of water consumption and A class (1.05 kWh/cycle) energy rating. If all of these dishwashers are replaced with Cactus dishwashers (with 6 liter water consumption) there will be 22 million tons/year of water saving which can be used for the annual water requirement of 500,000 people. On the other hand same replacement can lead to an annual saving of 900 GWh electricity energy, which is equivalent to 420,000 tons of eCO₂ greenhouse gas emission.. The use of Aluminum material instead of the petroleum by-product Bitumen for the isolation saves 0.25 m³/product of natural gas consumption for the process of Bitumen adhesion. In other respects Aluminum is nearly 100% recyclable whereas Bitumen cannot be recycled and hardly decomposed in the nature. The Cactus product respects to the nature beginning from its production phase and continuing during its life cycle.

Future Plans:

Technologies obtained during the Cactus project will be enhanced and used to develop new leading products with less energy and water consumption while respecting WEEE and other sustainability values. Arçelik is presently producing 1.8 million dishwashers annually and these technologies will be deployed to all Arçelik product range. Cactus product inspired Arçelik to develop much sophisticated dishwashers by innovative ways to have cleaning capabilities with much less or without water.

Lessons Learned:

Cactus project showed that large-scale studies could be concluded successively through the collective work of many disciplines. During the project extensive tests and research were conducted in the mechanical, electronic, material and microbiology fields. Intensive literature search, the use of sophisticated analysis programs and methods, prototyping and multiple confirmation tests are the main reasons for the success of the project.

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Ministry of Science, Industry and Technology, Parallel Development of Industrial Productivity and Environmental Performance at SME Level



Ministry of Science, Industry and Technology

Partner Organizations:	Five manufacturing firms in Ankara
Geographic Coverage:	Ankara
Implementation Period:	07/2007-03/2009

Organizational Profile:

Number of employees: 158

Primary brands, products/ services: Directorate General for Productivity (DGP) performs main activities stated below:

Developing policies and strategies on productivity and clean production,

Conducting studies in order to improve productivity and competitiveness,

Measuring and evaluating the changes in productivity on sectoral and regional basis,

Promoting productivity awareness in all sectors and supporting their studies.

Types of customers/beneficiaries: Public and private sector organizations

Geographic breakdown of markets served: Countrywide

The Problem/Opportunity:

SMEs in Turkey, which constitute 99,8% of all enterprises and 78% of total employment, do not have adequate awareness and information about neither the environmental impacts they may cause nor the environmental, economic and commercial gains they may have through environmental management. They also cannot access sufficient and qualified technical support due to insufficient financial sources. In addition, it is harder for SMEs to adopt pollution prevention technologies. However, legal regulations, customer expectations and external pressures drive SMEs to do environmental activities. SMEs in Turkey have to meet various requirements in order to compete with developed countries.

Objectives:

Main aim of the project is to demonstrate through pilot practices that it is possible to improve productivity simultaneously with environmental performance and disseminate the results of the project by trainings and publications. It is aimed to raise awareness about clean production/eco-efficiency concepts among Turkish SMEs and disseminate clean production/eco-efficiency practices by informing the SMEs about the beneficial outputs of the project. It is also envisaged that performing pilot practices can make it

easier for other SMEs to understand environment-productivity relationship. Generating an easy and lucid guide on clean production/eco-efficiency for use of SMEs is another aim of the project.

Execution:

Pilot practices were executed in five enterprises operating in manufacturing industry in Ankara. Main steps that were followed in the pilot practices can be listed as follows:

Selection of the enterprises and arranging meetings with the managers and employees of the enterprises about the project

Detailed analysis of production processes of enterprises and obtaining/collecting required data

Determination of the environmental performance indicators and productivity indicators which will be monitored

Calculation of the specified indicators before eco-efficiency practices

Evaluation of eco-efficiency opportunities in respect to environmental, economic and technical aspects and selection of the most appropriate

Procurement of necessary machines and equipment and execution of determined eco-efficiency practices

Calculation of the specified indicators after the eco-efficiency practices and comparing them with the ones calculated before

Calculation of the payback periods of the eco-efficiency practices

Demonstrating the environment-productivity relationship

Results/Outcomes:

The project provided economic advantages for five enterprises, where clean production/eco-efficiency practices were applied. In the metal coating enterprise, usage of some chemicals was reduced by 60% and 65% water saving was achieved through the applications for rinsing process and drag-out. In the aluminum profile manufacturing enterprise, 60% natural gas saving was provided in the process. In the metal cutting enterprise, yearly usage of cooling oil and water, which are used to obtain cooling liquids, was reduced by 24% and 25% respectively. In the food production enterprise, about 3,000 Euro was saved. In the welding workshop, monthly shielding gas consumption was reduced by 42%.

Raising awareness among enterprises and developing human resource infrastructure about clean production/eco-efficiency, which is a relatively new issue, are the social outcomes of the project. Through the evaluation of the project outcomes by the Ministry of Science, Industry and Technology, the action of “establishment of a national eco-efficiency center” was incorporated into Turkish Industrial Strategy Action Plan (2011-2014). Directorate General for Productivity is responsible for “the activities to prepare and to apply the clean production projects of the enterprises” according to the Decree No: 649 dated 17 August 2011. It is one of the important outcomes of project to sustain clean production functions in the national level.

In the metal coating enterprise, the amount of waste water reduced by 65% in the process. In the aluminum profile manufacturing enterprise CO₂ emission decreased by 60% as a result of the natural gas saving. In the metal cutting enterprise, waste water

amount decreased by 46%. In the food production enterprise, yearly CO₂ emission decreased by 26% by virtue of the natural gas saving. Lastly, in the welding shop, CO₂ and argon emissions were reduced.

Future Plans:

As stated above, DGP, which is the coordinator of this project, became responsible for clean production activities. Within this scope, DGP started working on human resource capacity building, determination of the activities which may be held related with clean production/eco-efficiency and infrastructure facilities about the establishment of a clean production/ eco-efficiency center. Through all these activities, it is planned to raise awareness on clean production/ eco-efficiency, implement new pilot projects in this field and develop clean production programs and projects. It is also planned to prepare new sector specific guides in order to promote SMEs to develop new practices in this field.

Lessons Learned:

Project team had some difficulties in the implementation process of the project as a result of the low awareness level of clean production/eco-efficiency among SMEs. Many meetings were made with many enterprises in order to select five enterprises. Most of them were not willing to get involved in the project. This problem was overcome by arranging informative meetings and trainings. It is realized that awareness raising and training activities on clean production/eco-efficiency is the first subject to be studied on. Organizations, which do not have enough awareness, are not willing to do clean production activities by using either their own budget or another financial source. But if they have sufficient awareness, they will support these activities.

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Boğaziçi University, Evaluation of Ecological Criteria for Cotton Textile Products



Boğaziçi University
Sustainable Development and
Cleaner Production Center

*Boğaziçi University, Sustainable
Development and Cleaner Production
Center, BU-SDCPC*

Partner Organizations:	BO Group, BOY-BO Textile Industrial and Commercial Limited Company
Geographic Coverage:	Hadımköy, Büyükçekmece, İstanbul
Implementation Period:	January /2010 - October/2010

Organizational Profile:

Number of employees: 15

Primary brands, products/ services: The Center ensures sustainable development of the global community through the use of interdisciplinary knowledge and experience, innovative technology transfer in close cooperation with related stakeholders.

Types of customers/beneficiaries: Universities, research institutes, governmental institutions, private sector etc.

Geographic breakdown of markets served: National/international entities

The Problem/Opportunity:

Raising public awareness on environmental issues and increasing demand in international markets for environment friendly products leads Turkey's cotton textile sector to improve environmental profiles of products. Cotton cultivation and fabric wet-processing are the major focuses of the production processes regarding environmental, economic and social aspects of cotton textiles. Conventional cotton cultivation requires substantial amounts of agrochemicals resulting in adverse environmental impacts. Organic cotton is a sustainable alternative to achieve elimination of these impacts. Fabric wet-processing causing high resource and chemical consumption is also an important audit focus point for Clean Production (CP).

Objectives:

The aims of the project are (a) to quantify and evaluate the major environmental impacts associated with the whole life cycle of conventional T-shirt using Life Cycle Assessment (LCA) methodology, addressing impact categories of acidification, global warming, photochemical ozone formation, aquatic and terrestrial eutrophication, (b) to reduce/minimize the negative environmental impacts through development of an alternative T-shirt production system (here after mentioned as ECO T-shirt) regarding sustainable production principles, and (c) to compare conventional T-shirt and ECO T-shirt considering selected environmental performance indicators. Potential environmental impacts are assessed considering cultivation and harvesting, ginning, spinning, knitting, wet-processing, service/use and disposal stages.

Execution:

The project has been conducted by applying the LCA methodology. All evaluations have been made according to EDIP2003 methodology with the aid of GaBi4-LCA software. Organic cotton cultivation productivity in Turkey is the main audit focus point of raw material selection criteria. Regarding Clean Production (CP) methodology, an effective chemical substitution study has been conducted in the dye-house of the plant to generate modifications resulting in reduced impacts. Within the scope of “green dyeing recipe” developed for “middle and dark color product groups”, *(a) qualification and quantification of the chemicals used in current dyeing recipe, (b) examination of Material Safety Data Sheets (MSDS) of all the chemicals, (c) evaluation of environmental performance of chemicals, identification of problematic chemicals and selection of their alternatives and (d) evaluation of environmental performance of “green dyeing recipe” by implementing a series of experimental analyses of new chemicals* have been performed .

Results/Outcomes:

Application of this project provided reduction in production cost by conservation of natural resources (energy and water) and elimination process chemicals. In ECO T-shirt application, 25% reduction in overall treatment cost has been achieved compared to conventional T-shirt production. The ECO T-shirt application increased company’s market share in the national and international level.

ECO T-shirt products produced in a sustainable manner created awareness for the consumers. Organic cotton application in ECO T-shirt products is crucial in terms of farmer and consumer health. Reduction in potential environmental impacts by organic products and eco-efficient production patterns provided a better public image to the company.

The comparison of life cycle stages of conventional T-shirt and ECO T-shirt variants shows that reduction of 15%-17% from global warming potential, 16%-24% from acidification potential, 73%-75.5% from aquatic eutrophication potential, 23%-34.5% from terrestrial eutrophication potential and 6%-14% from photochemical ozone formation potential have been succeeded.

It has been proven that applied CP options for ECO T-shirt production resulted in 40% water conservation, which is vitally important due to the nature of textile industry. In this manner, cost management is achieved by reducing water consumption, and consequently, the amount of wastewater to be treated. Additionally, 8.5% reduction in chemical consumption was also achieved through CP assessment. Moreover, from the point of energy conservation, 39.5% energy saving was also accomplished. The results of the calculations made during the feasibility stage proved that adopting CP options on water, energy and chemical consumption, as well as the economic gains from the point of wastewater treatment facilities is achieved for ECO T-shirt production.

Future Plans:

This project will open a pathway for other LCA applications for various types of industrial products in Turkey and this will lead to obvious progress in the company image and also sustainable production and consumption patterns. The organic cotton application and “green dyeing recipe” applied for ECO T-shirt products will obtain financial saving to the company in the long term. The sustainable production model that is developed within this project will constitute a best practice example for the textile manufacturers. The company aims to increase the national/international market share with the ECO T-shirt products, which protect environment and consumers through the sustainable production model.

Comparison of wet-processing inventories for conventional T-shirt and ECO T-shirt

Annex 1 Comparison of wet-processing inventories for conventional T-shirt and ECO T-shirt						
T-shirt						
Product	Conventional T-Shirt			Eco T-Shirt		
	Resource Consumption	Unit	Amount	Resource Consumption	Unit	Amount
Bleaching	Water	L	11820	Water	L	4728
	Energy	MJ	1972.5	Energy	MJ	760.26
	Auxiliary Chemicals			Auxiliary Chemicals		
	Wetting agent	kg	2.364	Organic wetting agent	kg	2.364
	Acedic acid	kg	4.728	Acedic acid	kg	2.364
	Antipilling agent	kg	0.709	Antipilling agent	kg	0.709
	Oil removing agent	kg	1.182	Oil removing agent	kg	-
	Stabilizer	kg	1.182	Stabilizer	kg	-
	Anticrease agent	kg	1.182	Anticrease agent	kg	-
	Sodyum thiosulphate	kg	2.364	Sodyum Thiosulphate	kg	-
	Caustic	kg	5.910	Caustic	kg	-
	Hydrogen peroxide	kg	5.910	Hydrogen Peroxide	kg	-
	Sequestering agent	kg	2.364	Sequestering agent	kg	-
	Wastewater	L	11531.15	Wastewater	L	4439.15
Dyeing	Resource Consumption	Unit	Amount	Resource Consumption	Unit	Amount
	Water	L	2364	Water	L	2364
	Energy	MJ	438.88	Energy	MJ	438.88
	Auxiliary Chemicals			Auxiliary Chemicals		
	Sequestering agent	kg	2.364	Sequestering agent	kg	2.364
	Anticrease agent	kg	1.182	Anticrease agent	kg	1.182
	Salt	kg	165.480	Salt	kg	165.480
	Soda ash	kg	47.280	Soda ash	kg	47.280
	Reactive dyestuff	kg	9.766	Reactive dyestuff	kg	9.766
Wastewater	L	2364	Wastewater	L	2364	
Washing	Resource Consumption	Unit	Amount	Resource Consumption	Unit	Amount
	Water	L	18912	Water	L	11820
	Energy	MJ	2985.8	Energy	MJ	1853.5
	Auxiliary Chemicals			Auxiliary Chemicals		
	Acedic acid	kg	2.364	Acedic acid	kg	2.364
	Soap	kg	2.364	Organic soap	kg	2.364
	Wastewater	L	18912	Wastewater	L	11820
Softening	Resource Consumption	Unit	Amount	Resource Consumption	Unit	Amount
	Water	L	2.364	Water	L	2.364
	Energy	MJ	134.03	Energy	MJ	134.03
	Auxiliary Chemicals			Auxiliary Chemicals		
	Acedic acid	kg	2.364	Acedic acid	kg	2.364
	Cationic softener	kg	4.728	Cationic softener	kg	4.728
	Silicon	kg	2.364	Silicon	kg	2.364
Wastewater	L	2364	Wastewater	L	2364	

Environmental and economic evaluation of the selected wet-processes

Table 1. Environmental feasibility results for input optimization

Process	Sub-process	Chemical Consumption (kg/kg textile)		Energy Consumption (MJ/kg textile)		Water Consumption (L/kg textile)	
		I	II	I	II	I	II
		Preparation	Bleaching	0.118	0.023	8.34	3.21
Coloration	Dyeing	0.95	0.95	1.86	1.86	10	10
	Washing	0.02	0.02	12.63	7.84	80	50
Finishing	Softening	0.04	0.04	0.57	0.57	10	10
Drying	Drying	-	-	1.80	1.80	-	-
Total		1.128	1.033	25.20	15.28	150	90
I : Conventional T-shirt, II:ECO T-shirt							

Table 2. Comparison of wastewater characterization and cost analysis

Waste water source	Waste water (m ³)	COD (kg)	Overall treatment cost (USD)
Conventional T-shirt	35.46	46.06	10.64
ECO T-shirt	21.276	38.74	8.08

Lessons Learned:

In this project, the main result is that the success of the ECO T-shirt products compared to conventional T-shirt is highly dependent on sustainable fiber production. Reduction in the use of fuels and introducing CP strategies or replacing conventional cultivation methods with organic methods are crucial in diminishing the nitrogen flows in raw material production stage. The selection of organic cultivation methodology would be appropriate in order to improve the overall environmental performance of the company.

Regarding CP assessment, consumption of resources is considerably lower for ECO T-shirt production compared to conventional T-shirt production due to CP applications in wet processes. Green dyeing recipe caused a net reduction for all investigated impact categories. The main reason is that elimination of process chemicals saved considerable amounts of energy and water, since process temperature has been decreased and several bath applications have been eliminated.

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Bursa Special Provincial Administration, Clean Environment Project with Natural Treatment Facilities



**Bursa Special Provincial
Administration**

Partner Organization	None
Geographic Coverage:	560 Villages of the Province of Bursa Out of 52 of 560 villages' projects are completed.
Implementation Period:	11/ 2004 – ongoing

Organizational Profile

Number of employees: 695 employees.

Primary brands, products/ services: Public Service. The Special Provincial Directorate of Bursa, was established on 04.03.2005 based on the bill of 5302 of The Special Provincial Directorate.

Types of customers/beneficiaries: Municipality of Villages of the People

Geographic breakdown of markets served: Province of Bursa, Marmara Region, Turkey. It is a public organization that services, the border of province and out of the border of the Metropolitan Municipality of Bursa.

The Problem/Opportunity:

Sewages of the villages in and around Bursa province created environmental pollution and was a threat for water resources. Through this project, Bursa Provincial Directorate created an opportunity to solve the bad smell and the environmental pollution caused by domestic wastewater from villages sewage. When the project started in 2004, there was unreliability to natural treatment system due to lack of knowledge and awareness on the issue. But in time the results of the project has been shared with the public and made them rely on the system. Now in 52 waste water treatment system, natural treatment (constructed wetland) has been established.

Objectives:

Within this project, it is aimed to improve living conditions of rural areas and to disseminate countrywide the sense of clean and living environment through environment friendly waste water natural treatment technology.

Execution:

The natural treatment of the wastewater system has zero operating costs and lower initial investment cost compared to conventional systems, it and there is no need of the workers.

The starting point of the project was based on the universal and constitutional right of everyone to live in a healthy and balanced environment. In this regard it is aimed to improve the conditions of rural life with eco-friendly wastewater technology to spread this across the country. This is planned to be achieved through:

Ensuring sustainable natural resources management

Supporting the conservation of water resources and ecological balance for healthy environment

Obtaining agricultural irrigation water by recovering of waste water

Improving the agricultural irrigation water quality that has been directly provided by existing water resources and product quality by preventing the exposed pollution, indirectly supporting economic development of the villagers

Establishing waste water treatment systems in all villages and disseminating natural treatment systems nationwide

Overcoming the threat of waste water for public health in the villages

Improving innovative and sustainable environment consciousness in rural areas

Results/Outcomes:

The project contributed to the prevention of the epidemic diseases and pollution created by wastewater of villages. It also ensured solving the wastewater problems through natural treatment or constructed wetland which also has economic aspects.

Since 2004, project has been improved by taking the results of R&D studies into consideration and optimum result oriented construction alternatives have been developed.

Bursa Provincial Directorate has put into use 22 conventional systems and 52 natural systems in waste water treatment facilities of villages.

Publications on natural treatment system have been produced and shared with the relevant governmental institutions.

Trainings have been organized for Uludap University Environmental Engineering Department. Also experiences and knowledge have been shared with Special Directorates in 15 provinces.

In the first natural treatment facility that was established in 2004, in the village of Eskikaraağaç, 50 mg/lit BOD₅ and 16 mg/lit TSS effluent quality has been obtained at the outlet channel of treatment facility, which has 400 mg/lit BOD₅ and 132 mg/lit TSS with the pollution load in wastewater.

The parameters that have been obtained from the effluent analyses of existing natural treatment/constructed wetlands systems ensure the Agricultural Irrigation Water Criteria that has been implemented by Ministry of Food, Agriculture and Livestock.

Table 1: The Average Treatment Efficiency of Constructed Wetland Treatment Systems of Bursa

PARAMETER	The Average Domestic Waste water	Wastewater Discharge Standard of Unity of EU	Wastewater Discharge Standard of Unity for Turkey	Average Output of Constructed Wetland Treatment Systems of Bursa
BOD₅ (mg/l)	240	25	50-75	17
COD (mg/l)	350	125	100-150	43
TSS (mg/l)	200	35	150-200	24
pH	6-9	-	6-9	7,27

Future Plans:

Built in 52 villages out of 560 throughout the province since 2004, waste water natural treatment systems have successful results. The problem of treatment of domestic waste water of villages has been solved with this system which is economic, nature friendly, has zero operating cost, and sustainable.

Since the system has the capacity to renew itself, it provides a positive contribution to sustainable and environmental conditions, and creates habitats for wildlife.

Lessons Learned:

Solution-oriented approaches implemented with academic discipline and a good feasibility study would create project alternatives integrated with sustainable environment and development objectives. In addition to that, transparent and participatory project management would ensure expected public interest and support. As a result, it is understood that parties producing and getting service would come together on a common ground of living environment.

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Coca Cola İçecek, Innovation Competition



Coca-Cola İçecek A.Ş.

Partner Organizations:	None
Geographic Coverage:	Turkey
Implementation Period:	01.2009 – ongoing

Organizational Profile:

Number of employees: 9,244 (Total), 2,820 (Turkey)

Primary brands, products/services: CCI's core business is to produce, sell and distribute sparkling and still beverages of The Coca-Cola Company (TCCC). Primary brands are Coca-Cola, Coca-Cola Zero, Coca-Cola Light, Fanta, Sprite, Cappy, SenSun, Damla, DamlaMinera, Powerade, Dogadan

Types of customers/beneficiaries: CCI has a total of 20 plants and offers a wide range of beverages to a consumer base of nearly 360 million people.

Geographic breakdown of markets served: CCI has operations in Turkey, Pakistan, Kazakhstan, Azerbaijan, Kyrgyzstan, Turkmenistan, Jordan, Iraq, Syria and Tajikistan.

The Problem/Opportunity:

Diminishing natural resources and devastating effects of climate change pose a significant threat for our world and therefore necessitate a sustainable business model. CCI works continuously to form such a business model and constantly encourages its employees to develop innovative and environment-friendly projects. Three priorities of CCI in the management of environmental impacts are water management, sustainable packaging, energy efficiency and climate change.

"CCI Innovation Competition" was initiated at the Ankara plant in 2007 as a suggestion system, then was restructured allowing for environment-friendly and innovative projects to be implemented in all CCI plants and in turn, project owners are rewarded.

Objectives:

To raise innovation culture and environmental awareness of employees

To ensure employee engagement

To recognize and reward innovative employees

To contribute to the sustainable development and protection of the environment in the scope of CCI's 2020 vision and strategies

The projects participating in the competition, which started to be implemented at all CCI plants as of 2009, are based on creativity, viability, and saving natural resources. The projects that have been encouraged with the Innovation Competition are intended to

make CCI's manufacturing processes more efficient, more environment-friendly and less consuming with regard to natural resources.

Execution:

Employees working at CCI's plants in Turkey participate in the "Innovation Competition" with their innovative and replicable projects that they developed throughout the year. The major characteristic of the competition is the requirement that submitted projects should have been implemented and demonstrated success.

These projects are the most important resource of the innovations at CCI. At the end of the year, each plant selects its own project candidates. A jury consisting of plant managers, engineers and employees, selects the best projects in view of creativity, innovation, creating value, sustainability, productivity and transparency. The results of the competition are announced at the award ceremony with the participation of top management every year, and those who proposed the best applications are awarded a monetary prize.

Totally 325 projects were recorded in an internal database at the end of 2010. All CCI employees have access to the best practices and make use of the projects.

Results/Outcomes:

The project provided significant benefits in achieving the environmental targets of the company. As a result of 398 innovation and replication projects created in the system in 2009 and 2010, a total of

10.5 million TRY

84,000 metric tons of water (equivalent to annual requirement of 1,000 houses)

1,632,000 kWh energy (equivalent to annual power requirement of 590 houses) was saved.

CCI is the Global Coca-Cola System leader in water and energy performance category. CCI achieved %4.3 reduction in energy and %5.3 reduction in water consumption at l/l product basis during 2009-2011.

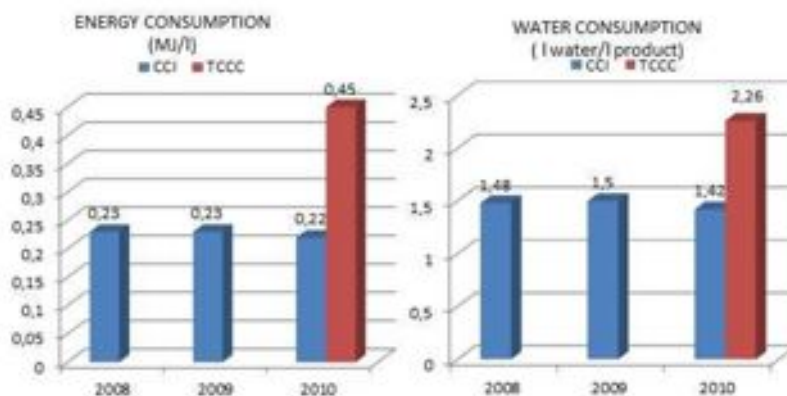


Figure 1 :2008 -2010 Energy Water Consumption Graphs

The project for the "Reduction of PET bottle blowing pressure from 35 bar to 17 bar" that was awarded in the 2009 Innovation Competition was chosen as the best practice in

global Coca-Cola system and implemented at other plants across the Coca-Cola Company.

Thanks to the innovative and proactive projects initiated regarding the environment, CCI is already prepared to the obligations to be imposed by the regulations on environmental protection that will come to force in the future (e.g. the Regulation on Monitoring, Confirming and Reporting Greenhouse Gas Emissions with Energy).

The announcement of this project and its outcomes via various communication tools such as the company portal, website, CSR report, internal communication magazines, posters, e-mail, brochures, meetings etc. had positive impacts on reinforcing the sustainability culture among employees. The project was shared with stakeholders as a good practice in "Turkish CSR Solutions Marketplace Event" with the tagline "CCI works, the environment wins" and news regarding the project had media cover.

Future Plans:

The goal for 2012 is to ensure that the application continues to be implemented by plants and initiated at the CCI Turkey departments out of the supply chain. It is possible to extend this system to other countries affiliated with CCI and it is already planned to extend it to cover all CCI countries in near future. The project's performance results will continue to be shared with stakeholders through our CSR reports and various platforms.

Lessons Learned:

In order to ensure the sustainability of the business in the long term and the protection of the environment, it is needed to encourage proactive and innovative projects such as the "Innovation Competition". Meeting 2020 vision is only possible with the participation of our employees in the system. The project has encouraged employee involvement in line with CCI sustainability strategies, set an example for working as a team and cooperating toward the same goal. Valuing employee ideas and awarding employees are the most important factors that lead to the increase of employee engagement and creating an innovation culture.. In order to guarantee an increase in the number of projects in the future, the number of projects will be monitored by the headquarter.



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ÇEVKO, Establishment of a Sustainable Packaging Waste Management System in cooperation with Industry, Local Authorities and Customers in Turkey



Environmental Protection and Packaging Waste Recovery and Recycling Foundation (ÇEVKO)

Partner Organizations:	Packers/Fillers Municipalities Collecting/Sorting Facilities
Geographic Coverage:	Nationwide
Implementation Period:	11/91 – ongoing

Organizational Profile:

Number of employees: 26

Primary brands, products/services: ÇEVKO serves the industry to fulfill their producer responsibilities in accordance with the Regulation on the Control of the Packaging Waste for the collection and recovery of packaging waste in Turkey in a sustainable system.

Types of Customers/beneficiaries: more than 1,200 companies

Geographic breakdown of markets served: Turkey

The Problem/Opportunity:

Increase in the amount of packaging is directly correlated with the rise in consumption and product variety.

Packaging waste is eligible for recovery under conditions of proper separation and collection. However, environmental, economic and social costs ensue when packaging waste is disposed of with organic waste. Therefore since the beginning of the '90s, collection and recovery of post-consumption packaging waste within a sustainable system has taken place in Turkey.

Recovery of packaging waste allows increasing of secondary materials while contributing to reservation of natural resources such as energy, oil and precious metals.

Managing packaging waste within a separate system results in creation of new sectors and job opportunities.

Objectives:

The vision of ÇEVKO Foundation is the development of a sustainable recovery system under the leadership of the industry in order to contribute to the environmental protection, social and economic development in Turkey.

The mission of ÇEVKO within this context is as follows:

Contributing to form a modern legal infrastructure regarding waste management with the support of stakeholders

Cooperating with local authorities for countrywide application of collection, separation and recovery activities

Ensuring information accumulation in waste management through domestic and international applications, informative and training activities regarding environmental awareness, taking place in R&D activities, provision of advisory and technical support to relevant stakeholders.

Execution:

At the heart of the ÇEVKO model lie the economic corporations marketing packaged products, municipalities and collecting/sorting facilities.

Fillers and packers of packaged products provide financial support to the system through ÇEVKO within the framework of packaging and the related recovery targets they are legally liable for. Municipal governments and collecting and sorting facilities, on the other hand, are responsible for the in-situ separate collection of packaging waste from organic waste. ÇEVKO ensures effective communication within this process for consumer awareness.

This process, began in 1991, continues to grow with increasing prevalence and effectiveness.

Results/Outcomes:

Approximately 2,500,000 tons of packaging waste have been collected in the period between 2005 and 2011 as a result of the recovery system conducted with the cooperation of municipalities and licensed firms. Within this framework over 12 million barrels of oil have been saved. This amounts to about 5% of 236 million barrels, an amount equal to the yearly gross oil consumption in Turkey.

Between 2005 and 2011, approximately 16 million trees have been saved as a result of the recovered paper and similar packaging products. Thanks to the approximately 2,5 million tons of packaging waste recovered in this time period, the reduction in greenhouse gas emissions is calculated to be close to 3 million ton CO₂ equivalent. (Ref. UK WRAP, Environmental Benefits of Recycling Report, 2006).

ÇEVKO lays emphasis on raising awareness of consumers and all stakeholders participating in the system. In the 14 years period from 1991 to 2004, efforts toward collection of packaging waste separately, reached out to a population of one million and resulted in one hundred thousand tons of packaging waste. Activities speeded up as the directive came into force in 2005 and by the end of 2011, through the cooperation between ÇEVKO and 96 municipalities, approximately 14 million people in 25 cities around Turkey have been included in activities for separate collection of packaging waste.

In terms of new job opportunities and corporate gains, the number of licensed firms in collection, sorting and recycling of packaging waste has increased from 50 in 2005 to nearly 400 in 2011.

Future Plans:

ÇEVKO implementation in one municipality in 1991 expanded to 96 municipalities and approximately to 14 million people by the end of 2011. Targets of ÇEVKO for the year 2023 include:

Reaching 60 million people through separate collection of packaging waste;

Cooperation with more than 60 thousand packers and fillers in a sustainable and a competitive system according to open market conditions;

Annual recovery of over 3 million tons of packaging waste;

Collection of waste under the patronage of municipalities in accordance with integrated waste management principles;

Ensuring sorting and recovery of packaging waste in privately-owned licensed facilities, in line with principles of quality, efficiency and economies of scale.

Lessons Learned:

Establishing an effective recovery system and maintaining its sustainability is possible only through legislation appropriate for the prevailing conditions in the country, taking into consideration the proposals of parties and the practices in EU member countries. Efforts of ÇEVKO in the period 1991-2004 were restricted in scope due to the lack of such legislation.

There have been issues regarding participation of parties and maintaining sustainability of recovery practices following the implementation of the Regulation on the Control of Packaging Waste, which filled the gap in the relevant legislation. Those issues stemmed from the lack of control of legislation provisions at the desired level.

Therefore, in addition to conforming to the legislation in all its practices, ÇEVKO make proposals to relevant legislators regarding regulations to correct such lacks.

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WWF Turkey, Wise Use of Water Resources and Adaptation to Climate Change in Konya Closed Basin



WWF-Turkey

Partner Organizations:	Eti-Burçak (Biscuit brand operating at national level)
Geographic Coverage:	Konya Closed Basin
Implementation Period:	03/08 – ongoing

Organizational Profile:

Number of employees: 36

Primary brands, products/ services: WWF-Turkey is the National Organization of WWF that works to deliver solutions for a living planet through its projects around Turkey. Its operations fall under 3 main pillars as outlined in its strategic plan-conserving our nature, tackling climate change and changing the way we live.

Types of customers/beneficiaries: WWF-Turkey has a tradition to work hand in hand with all stakeholders and acts as a facilitator to develop dialogue between public institutions, private sector, rural communities as well as its members.

Geographic breakdown of markets served: WWF-Turkey's priority areas are Konya Closed Basin, Büyük Menderes Basin, Lake Eğirdir, Kaş-Kekova Specially Protected Area, Küre Mountains and Eastern Blacksea Region.

The Problem/Opportunity:

Konya Closed Basin is of outstanding importance to nature conservation in Turkey and globally, particularly for its wetlands, the extensive areas of steppe habitat and for rich biodiversity. Basin is one of the "Global 200" eco-regions identified by WWF International. 15 important bird areas, 6 important plant areas and 2 Ramsar Sites are located within the basin.

However, the basin is under the threat of excess use of water resources mainly in agriculture and is one of the most vulnerable places in terms of climate change. 88% of water resources are used in agriculture, 61% of which is derived from ground water. Besides, 64,000 of 97,000 boreholes are illegally drilled.

Objectives:

WWF-Turkey and Eti Burçak cooperation aims at protecting water resources in the basin and sustaining wise use of water resources in agriculture. The best practice targets extending the use of modern irrigation systems, while putting forward the impacts of climate change in the basin and defining specific steps to reduce these impacts.

The best practice has a crucial role in reversing the impacts of unsustainable water policies and practices as well as taking the local community a step forward in adapting to climate change. It is also important to state that the project contributed to Millennium Development Goals through ensuring environmental sustainability and alleviating poverty by increasing welfare of farmers.

Execution:

2008- Promotion of Modern Irrigation Techniques in Konya Closed Basin: Four pilot modern irrigation projects were realized and farmer trainings were held in Çumra and Beyşehir.

2009-Turkey's Tomorrow Project: A research was conducted to reveal the expected impacts of climate change on water budget of Konya Closed Basin in short, mid and long run. A climate change modeling was carried out for Turkey and Konya Closed Basin for the years 2015, 2030 and 2050. Four different scenarios were created regarding water use in agriculture and production pattern.

2010-Adaptation to Climate Change for Turkey's Future Project: A road show was carried out in five different districts of Konya Closed Basin to disseminate the results of climate change modeling.

2011-Adaptation to Climate Change for Turkey's Future Project-Pilot projects and trainings: In order to concretize the climate change modeling, four pilot projects on an area of 17.5 ha were implemented to demonstrate modern irrigation systems and production of drought resistant crops. The pilot projects were supported by farmer trainings.

Results/Outcomes:

The best practice raised the basin community's awareness on the limited water resources, misuse of water in agriculture and threats for the future. The committed work of WWF-Turkey has helped to transform the region in terms of how 'water' is perceived, used and managed and there have been observable changes in the activities of public institutions in water and agriculture sector.

It is demonstrated that farmers can increase the productivity by 28% through drip irrigation as well as reducing their costs on energy and fertilizer use.

Ziraat Bank granted a loan of 185 million TRY for modern irrigation techniques from 2007 to 2011. In 2007, the loans accounted 21 million TRY, whereas it reached 50 million TRY on the following years. This total would cover 40,000 hectares of land.

According to the TURKSTAT data, the number of drip irrigation systems increased from 416 in 2006 to 8,212 in 2010.

Ministry of Food, Agriculture and Livestock took water resources, climate change, precipitation rates and climate change into account while planning incentives for the Basin.

3,500 farmers participated to the trainings on wise use of water resources and adaptation to climate change from 2008 to 2011.

It is demonstrated that 47% water and 58% energy were saved through pilot projects.

Ministry of Food, Agriculture and Livestock prioritized Basin within their Protecting Agricultural Land for Environmental Purposes Program and provided supplementary subsidies to farmers to protect natural resources.

Ministry of Forestry and Water Affairs prepared the Action Plan for the Protection of Konya Closed Basin and defined the steps to be realized to use natural resources and reduce pollution.

Future Plans:

By collaborating with local stakeholders, WWF-Turkey continues examining the main challenges in the region as well as developing new projects to create proper solutions to the problems. The upcoming activities of the project in 2012 are designed in line with the need of capacity building on the advantages of modern irrigation systems, financial tools to cover the costs, technical details on how to use these techniques for different types of crops.

Besides, these activities are supported by policy making and lobbying activities. With regard to this perspective, WWF-Turkey looks forward to concentrate in market transformation to integrate water footprint concept in policy-making processes.

Lessons Learned:

The experience in the Konya Closed Basin showed that projects targeting agriculture need time to make a change. Farmers are the final decision makers on the technology and production patterns they implement and they usually learn by experiencing the innovation on the field. Therefore, pilot projects are the most efficient tools to create a change among farmers.

Yet another important lesson learnt from this practice is the need to collaborate with local stakeholders and guarantee participation. Being in contact with interest groups, defining their needs and problems, developing solutions specific to local needs and creating the platforms to replicate these practices are the crucial success factors.

Additionally, it is necessary to be able to communicate with local and national policy and decision makers and act as a bridge between local and national stakeholders.

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VitrA Karo, Waste Heat Recovery at Ceramic Kilns

The logo for VitrA, featuring the word "VitrA" in a stylized, hand-drawn font. The letters are black and have a slightly irregular, artistic appearance.

VitrA Karo San. ve Tic. A.Ş.

Partner Organizations:	None
Geographic Coverage:	Initiated in Turkey, expanded to Germany
Implementation Period:	12/09 – 03/10

Organizational Profile:

Number of employees: 1,500

Primary brands, products/ services: VitrA Tiles is a ceramic tile producer and markets its products under VitrA, Engers and Villeroy & Boch brand names.

Types of customers/beneficiaries: Architects, End-Users, Project Owners, and Wholesalers

Geographic breakdown of markets served: Worldwide with a strong presence in and around Europe

The Problem/Opportunity:

Ceramic tiles are fired at temperatures above 1,000 °C at large kilns in order to achieve the desired technical properties. However, fired tiles need to be cooled down at the exit of each kiln. Using fresh air, which reaches 200°C at the exit of chimney outlets, does this process. Releasing this hot air to the environment wastes a significant amount of energy. VitrA has seen a great potential in recovering this energy and using it in its production processes.

Objectives:

VitrA developed a project to capture the hot exhaust air from kilns and use it at spray dryers. Spray dryers are heated up to 500 °C in order to pulverize liquid ceramic raw materials, which will be dry pressed afterwards. Spray dryer units account for 43% of the natural gas consumption of VitrA. Two big spray dryers would be supplied with hot exhaust air from four kilns and this would account for important energy savings for the company.

Execution:

The Waste Heat Recovery System was designed inhouse by using Autodesk Inventor software. Engineering optimization of the whole system took six months and local suppliers were chosen for producing special equipment. Development and production of all the necessary equipment took two months and meanwhile the project team has internally developed electronic controlling system as well as the controlling software.

The system was installed without preventing production on site, which was a great challenge for the project team. However, the team has managed to deliver installation of the fully functional system in one month. Hot exhaust air from four kilns were successfully connected to two spray dryers, which would start consuming 14% less energy.

Results/Outcomes:

The 2010 study on energy consumption of VitrA Tiles indicated that there were two major areas to focus for energy efficiency: 46% of the natural gas consumption was due to the kilns and spray dryers accounted for 43% of the whole consumption. The Waste Heat Recovery System addressed these two major areas of energy consumption. 14% decrease in energy consumption of spray dryers was achieved by supplying hot exhaust air from kilns, which is equivalent of €300,000 annual savings.

One of the major reasons for Turkey's budget deficit is the high bill on imported energy. VitrA Tiles has taken the lead role in Turkish ceramic industry by addressing energy efficiency and noticing the success of VitrA Tiles, many other producers are now working on similar energy efficiency projects. This growing interest in energy efficiency will create further employment opportunities in this field and contribute to Turkey's overall success.

Increased energy efficiency has resulted in annual savings of 1,484,000 m³ natural gas, which accounts for 3,000 tonnes reduction in annual CO₂ emissions.

Future Plans:

Success of the project has motivated VitrA Tiles to expand similar applications to its plants in Germany. In December 2010 a similar project was done at ENGER'S' production plant in Neuwied/Germany and in 2011 for Villeroy & Boch's ceramic tile production plant in Merzig/Germany.

VitrA Tiles will continue on improving energy efficiency of its production plants by focusing on major consumption areas in order to meet its sustainability targets.

Lessons Learned:

This project has proved that there is a huge potential for energy savings in most of conventional production processes. Innovation is the key enabler to identify such opportunities and determination drives the success of the project.

Thanks to the promising results of the project, the team at VitrA Tiles is now highly motivated to develop even better projects and VitrA Tiles will continue focusing on energy efficiency to showcase the best practices in its industry.

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Ministry of Energy and Natural Resources, Energy Efficiency Policies



Ministry of Energy and Natural Resources

Partner Organizations: Ministry of Interior, Ministry of Finance, Ministry of National Education, Ministry of Environment and Urbanization, Ministry of Transport, Maritime Affairs and Communications, Ministry of Science, Industry and Technology, Ministry of Forestry and Water Works, Ministry of Development, Republic of Turkey Prime Ministry Undersecretariat of Treasury, Republic of Turkey Energy Market Regulatory Authority, Turkish Standards Institution, The Scientific and Technological Research Council of Turkey, Turkish Union of Chambers and Commodity Markets, Turkish Union of Chambers of Engineers and Architects, and Turkish Association of Municipalities.

Geographic Coverage: Nationwide

Implementation Period: Ongoing

Organizational Profile:

Number of employees: 338

Primary brands, products/ services: Making measurements oriented to determine and evaluate primarily hydraulic, wind, geothermal, solar, biomass and other renewable energy resources and all energy resources of the country, preparing feasibility and case implementation projects, monitoring and evaluating studies in the field of renewable energy and energy efficiency, and managing energy manager trainings and Energy Efficiency Consultancy Companies trainings and audits.

Types of customers/beneficiaries: Industrial enterprises, service sector, Energy Efficiency Consultancy Companies and electricity production companies.

Geographic breakdown of markets served: Nationwide

The Problem/Opportunity:

In order to reach policies and objectives that are results-oriented and supported by concrete targets, it is important to act with a participatory approach and within the cooperation of public sector, private sector and non-governmental organizations.

It is also important to overcome the lack of awareness on energy efficiency and to eliminate the fear of bureaucratic obstacles against public institutions.

Objectives:

As the final output of energy efficiency studies, it is targeted to decrease the amount of energy consumed per GDP of Turkey (energy intensity) in the year 2023 at least 20% by value in 2011.

Execution:

Through the energy management program, for more than 500 industrial businesses, over 20 industrial zones, energy managers were designated and energy management studies have been initiated. In 2009 and 2010 Energy Efficiency Coordination Board adopted totally support for 32 projects and 13 of these projects were completed and 643,213.70 TL support payment were realized. In 2009 and 2010, 22 voluntary agreements were signed with industrial enterprises. With the courses organized for the certification of energy managers, nearly 4,900 people were trained and over 4,500 people were certificated as energy managers.

The products listed in the Energy Efficiency Law Numbered 5627 concerning minimum efficiency requirements have been introduced. At the central heating systems indoor air temperature control systems and allocation of expenses by the amount of heat used were began to establish.

Results/Outcomes:

Inspite of the monitoring and evaluation infrastructure for the energy efficiency policy and programs has not been completed yet, expected outcomes of these policies are as follows.

As it is known Turkey is an energy importing country and 70% of primary energy demand has been imported and approximately 40billion \$ has been paid in 2010. These policies will considerably provide benefits for the government budget and energy security on one hand and will reduce energy costs for the consumer on the other hand. Additionally, by increasing energy investments, energy saving potential between 15-30% according to the sectors will be recovered to Turkish economy and value of the assets and also production and competitiveness especially in energy intensive sectors will increase on sectoral basis. Energy efficiency policies will also support the improvement of Turkish SMEs. It is estimated that 25.4 Millions TOE energy have been saved by improving energy efficiency between 2000 and 2009. In addition to this, primary energy intensity has been decreased by %10 in 2010 compared to 2000.

It is estimated that 2 million employments will be required for reaching to the targets of 2020 in EU countries. It is expected that energy efficiency will create new job areas and increase the employment on both services and implementations such as energy managers, ESCOs manufacturing and applying energy efficient material, for energy efficiency projects in Turkey. Energy efficiency will also contribute in various areas such as the heath improvements, comfort and safety by improving public transportation etc.

Turkey is also now under the climate change process and energy efficiency policies will considerable contribute to the management of energy resources and mitigation of CO₂ and greenhouse gas emissions.

Future Plans:

It is targeted to decrease the amount of energy consumed per GDP of Turkey (energy intensity) in the year 2023 at least 20% by value in 2011 with ensuring the sustainability of Energy Efficiency Policies applications.

Lessons Learned:

Energy Efficiency Policies in Turkey are mainly based on emerging an energy efficiency services market and energy efficiency services companies (EVDs), increasing awareness and giving technical and financial supports to the sectors, supervising and controlling the energy efficiency implementations and also providing close cooperation among the national and international related organizations and stakeholders.

Until now, many awareness activities and training programs at national and international level have been achieved and some financial supports were given to the successful energy efficiency projects in industry and a number of EVDs have been authorized. But still the project implementations are not enough; therefore revising the regulation has doubled limits of the incentives. Again capabilities of EVDs are presently not enough in the market, so some international projects are being carried out and related regulation revised to facilitate the development of EVDs. On the other hand, since the lack of administrative and institutional infrastructure, Energy Efficiency Law and its secondary legislation could not be implemented well.

To solve these problems, Energy Efficiency Strategy Document has been prepared and put into force by approval of High Planning Council by February 2012. Following up the Energy Efficiency Strategy issued on the date of February 25, 2012, studies are being continued to prepare an energy efficiency action plan and to improve legislative infrastructure and also in order to ensure the close cooperation between the stakeholders and to reach national targets.

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Erdemir, Environmental Management System, Environmental Performance Index and Sustainability Activities



Eregli Iron and Steel Company

Partner Organizations:	None
Geographic Coverage:	Eregli Province, Production Site, Zonguldak
Implementation Period:	2004-2012

Organizational Profile:

Number of employees: 6,704

Primary brands, products/services: Producing iron and steel

Types of customers/beneficiaries: Automobile, white goods, construction etc.

The Problem/Opportunity:

Since the establishment of Erdemir, many recycling systems and treatment plants to preserve water, air and soil quality have been built. Furthermore, conducting the environmental studies in a more systemic approach and corporate environmental care throughout the corporate structure, establishing the ISO 14001 Environmental Management System was planned and got the Certificate in 2004. While establishing ISO 14001 Environmental Management System, in the scope of Total Quality Management studies, Environmental Management Process (EMP) was defined for higher efficiency. The process starts with environmental analysis, implementation and the success of the implementation is monitored and evaluated by the Process Management Group.

Objectives:

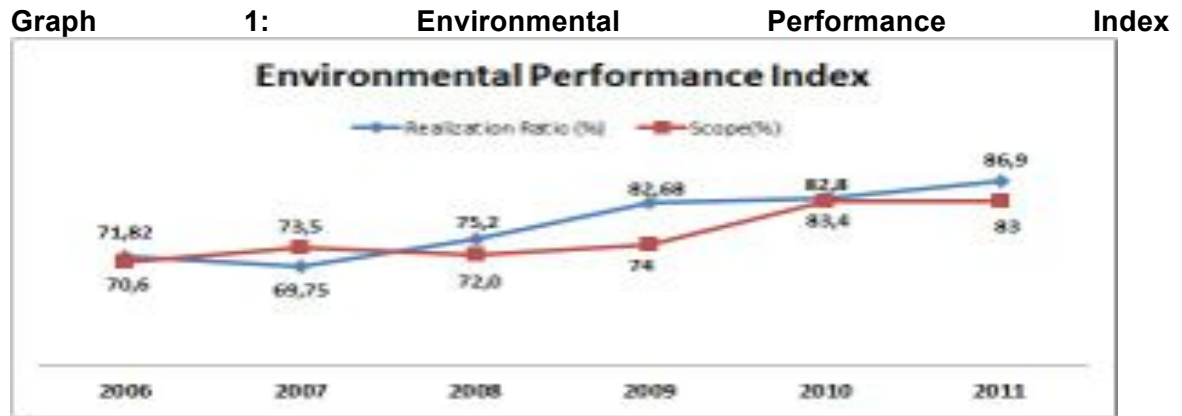
The EMP chain is an ongoing effort to enhance the continuous improvement. All environmental studies beginning with the start-up investments and equipment to the operation in a manner of environment-friendly are integrated in the process structure. The mission of the process is to meet the requirements of all relevant legislation and apply the environment- friendly technologies, use natural resources very effectively and maintain recycling, reduce the negative impact to environment generated from the production and promote the recycling wastes, evaluate the environmental impacts of new investments and production processes, and enhance the continuous improvement of environment.

Environmental Performance Index (EPI), which is the fundamental indicator of the process, focuses on the evaluation loads to the environments, which are under control and influence of the organization in a positive and measurable way. The expectation of this index is to maintain the continuous and frequent evaluation of impacts to air, water and land and this will provide the continuous improvement for future and focus on

minimizing the environmental impact of the Erdemir's activities and operations and get the environmental performance into a higher position.

Execution:

Process management members are selected from different departments of the company. The members play an important role in decision- making regarding the application and improvement efforts of the process. EPI, Material Efficiency, C Certification of Energy Efficiency Projects is the performance indicators of the EMP.



To define inadequate indicators providing information to management in terms of meeting targets and objectives of Erdemir is the basic and important part of the Environmental Performance Index. Defined indicators cover all the processes, activities, facilities including management systems, operational parameters and environment area as a CO₂ emissions.

Table 1: Environmental Performance Index indicators, sub indicators, the main of the criteria used performance and measurement and calculation methods.

MAIN AND SUBINDICATORS		THE MAIN AIM OF CRITERIA USED FOR PERFORMANCE	METHOD OF MEASUREMENT AND CALCULATIONS
Environmental Status Indicator	CO ₂	Reduction of air emissions	CO ₂ calculation method developed by Erdemir
	Gas	Reduction of air emissions	
Operating Parameters	NO	Monitoring wastewater parameters and reduce water pollution	Environmental Laboratory Analysis
	PM10		
	SO ₂		
	Air Quality Measurements		
	COD		
Liquid	SS	Use of natural resources efficiently	Audits
	Total oil and gress		
	Phenol		
	Cyanide		
Amount of Service Water Usage	Use of natural resources efficiently		
Solid	Solid Waste Recycling	* Increasing the percentage of solid waste recycling and prevention of environmental pollution caused by the accumulation of wastes	Audits
	Hazardous Waste Recycling	* Monitoring of Natural Resource Consumption	
	Minor Waste Recycling		
Management Systems	Objectives Improvement Activities	* Sustainable development and improve environmental performance	Audits
	Compliance with Regulations	* Determination of environmental projects, and performance monitoring	
	Internal Audits	* Ensuring sustainable development and improve environmental performance	
	Number of Environmental Accidents	* Evaluation compliance with regulations measure the realized projects that is to be solution for environmental concerns	
Training	Take precautions against accidents and the prevention of duplication of the Environment	Increasing environmental awareness	

In the calculation index of EPI, ratio for each three main indicators and sub indicators were determined as an effect value according to the impacts to the environment. By multiplying the results of the indicators and ratios of the indicators, with the sum of all values are achieved a single value.

Table 2- Environmental Performance Index Impact Ratios

Erdemir Environmental Performance Index					
	Total Impact Ratio	Indicators			Impact Ratio
CO2	10%	CO2 Emissions			
Operating Parameters	60%	Gas	50%	NO	28%
				PM10	31%
				SO ₂	31%
				Air Quality Measurements	10%
		Liquid	30%	COD	32%
				SS	16%
				Total Oil and Grease	32%
				Phenol	5%
				CN	5%
		Solid	20%	Amount of Service Water Usage	10%
				Solid Waste Recycling	30%
				Hazardous Waste Recycling	60%
				Minor Waste Recycling	10%
Management Systems	30%	ISO 14001 Environmental Management System		Scopes	30%
				Improvement Activities	30%
				Compliance with Law	39%
				Internal Audits	20%
				Number of Environmental Accidents	5%
				Training	6%

Results/Outcomes:

Environmental investments and improvements to increase the recycling ratio of wastes prevent of negative effects and reserves of natural resources are determined based on data of EPI. Performance indicators are assessed with the meetings done by the Environmental Process Group and environmental improvement studies initiated if deemed necessary. Monitored and assessed indicators within the scope of index provide data for the Environmental Impact Assessment Reports for new investments and this enables defining abatement techniques to prevent negative effects to nature. Since the recycling of solid waste and savings in the use of raw materials are directly related to conservation of natural resources in the steel industry, it has become one of the most important pillars of the notion of sustainability. By virtue of this, briquetting plant was installed in 2010 for the recycling of residues containing iron and carbons originating from the different production stages, studies are carried out on magnetic separation to increase recycling ratio of solid wastes. In addition, national competent authority approved that Basic Oxygen Furnace slag can be used for road construction as the result of Erdemir's studies.

Monitoring emissions and waste water parameters continuously in the scope of index enables the assessment of most significant effects and best available technologies for the removal of these effects. In this context, two main investments were realized in 2011. A new electrostatic precipitator was taken into operation in 2011 on the Sinter Plant Waste Gas System. The applied technology is the system designed for Sinter Plant so that the dust concentration was reduced by %90 - %95. To improve the discharge values from Coke Plant, Ammonia Stripping Unit providing the removal of significant parameters was installed in 2011.

As the climate change is a challenge of our century, CO₂ emissions are calculated by the developed method taking into account of content of all fuel and the raw materials used in Erdemir. CO₂ reduction from the energy efficiency projects are also calculated and assessed the reduction CO₂ emissions.

Implementation of environmental activities on the basis of the process approach ensures the comparison and evaluation of environmental effects from Erdemir's production with the laws, rules, regulations, performance standards and voluntary agreements. In addition the best available techniques and technologies to control of negative effects are assessed in this context. Thus, based on results of measurement and data analysis, minimize or control environmental impacts are carried out by a proactive approach.

Future Plans:

Because of ongoing changes in the environment and challenges to the generation, continuous improvement is an important topic. Most importantly, the environmental performance needs to be continuously improved. Process Management Group does a periodic review in order to identify methods to continuously improve Environmental Performance Index and its indicators. Modeling systems are planned to be used with the index indicators. Discharges and emission parameters assessed in the scope of index will be used in modeling systems to monitor air and water quality around the company.

Lessons Learned:

EPI helps the company assess and understand its impacts on the environment. This is one of the most important objectives of EPI so that defined indicators have to be reflecting and measuring the company's environmental effects.

As the environmental effects of whole factory are identified during the ISO 14001 Environmental Management Systems, selection indicators was not difficult but for calculation of index, the most part important part is to define the weight ratios (percentage of all parameters) of all parameters. Ratios have to be correct and right otherwise environmental performance index results will not be the real performance and it is useless.. weight ratios are discussed by the Environmental Management Group until everyone was sure about the accurate weight ratios.

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Ford Otomotiv San. A.Ş.

Partner Organizations:	None
Geographic Coverage:	Kocaeli; Marmara Region
Implementation Period:	1998-2012

Organizational Profile

Number of employees: 9,950

Primary brands, products/services: Manufacture and sale of commercial vehicles and engines. Export and sale of passenger cars

Types of customers/beneficiaries: With its strong roots Ford Otosan has been represented all around Turkey through dealers that embrace and enrich this partnership with their strong names. A professional aftersales network is established around Turkey for maintenance and repair services. In 2011 Ford Otosan became the market leader for the 10th consecutive year.

Geographic breakdown of markets served: Ford Otosan adds value to Turkey with its export performance to more than 70 countries in 5 continents and became the first vehicle exporter to the motherland of automotive industry, USA.

The Problem/Opportunity:

"Sustainable Environmentally Friendly Automotive Production" was practiced at Ford Otosan's Kocaeli factory. The foundations for the Ford Otosan Kocaeli factory were laid in 1998, and the factory started production in 2001.

The fundamental philosophy in the establishment of the factory was to conserve the ecosystem and biodiversity around the factory and to practice the best production technologies that would not harm the environment during production processes.

The practice is a good indicator that biodiversity and ecosystems can indeed be conserved even with industrial production taking place.

Objectives:

Preserving and improving the area's own natural beauty,

Establishing a sustainable production facility that can serve as an example to the region and the country as a whole,

Creating an environment with ecological diversity conserved for the benefit of employees and visitors,

Eliminating processes that require toxic chemicals so as to prevent the ecosystem from being affected by production activities,

Using high-tech abatement systems to minimize the pollution upon the receiving environment in processes where use of chemicals cannot be eliminated,

Sharing this knowledge with the public to facilitate environmental awareness

Execution:

The fruit trees in the factory area were protected. The pine trees in the operational area were transplanted elsewhere. The number of trees protected and transplanted is 2,352.

7,262 trees and 40,089 shrub-type plants were planted additionally in the area.

There is a 22,000 m² natural marsh in the factory site. This marsh, which is situated on a bird migration route, was protected in its own natural status, ensuring the birds' migration route stay as it is and supporting the continuation of natural life in the surrounding environment.

A 34,780 m² area formed on the factory site by a cave-in after an earthquake was rehabilitated and planted with greenery and plants together with the TEMA Foundation. There are 14,920 plants and 3,200 trees in the area.

The paintshop was designed to use water-based paint in both primer and basecoat, a first in the Turkish automotive industry.

Lead-free paints and passivation technologies that exclude Cr (+6) have been used.

Results/Outcomes:

The project does not provide a measurable economic contribution. But it has remarkable outcomes both in social and environmental dimensions.

The project contributed to spreading environmental awareness among the public via shareholders. Through the sharing of best practices concerning

- the environment, other companies were also informed and gained the chance to implement similar projects.

Through the spreading of awareness about the environment, environmental awareness and responsibility outside the workplace have been developed

The project helped to conserve the biodiversity and the ecosystem around Kocaeli factory site. A broad floral coat was created with the trees and plants protected and newly planted on the site. The total number of trees and shrub-type plants are 9,619 and 40,227 respectively.

The marsh protected on the site has become the only place around the Gulf of İzmit that migratory birds can accommodate, which are unable to stop elsewhere due to industrialization.

Thanks to water-based paints and incinerator technologies used in the facility, the emission of solvents—the largest environmental effect caused by automotive production facilities—has been reduced to very low levels.

The facility won the Kocaeli Chamber of Industry Large-Scale Business Environmental Award in 2004, 2007, and 2010; second place in the Management Category of the 2008 REC Turkey Environmental Award; the Ford Environmental Leadership Award in 2010; and the ISO Environmental Award Special Jury Prize in the Social Responsibility Category.

Future Plans:

The requirement to secure environmental approval for all new projects has been imposed to make the practice sustainable. The procedure for new projects to be reviewed environmentally requires examination of the environmental aspects of all new projects and the selection of environmentally friendly technologies that will not affect the ecosystem. Additionally, cooperation with the TEMA Foundation is in place for the protection and maintenance of existing areas.

Lessons Learned:

The most important lesson learned with the practice is that industrial production can indeed take place while also protecting nature and the ecosystem.

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Greenpeace, Campaign for Preventing Fry Fishing



Greenpeace Mediterranean

Partner Organizations:	None
Geographic Coverage:	Turkey
Implementation Period:	11/10 - 02/12

Organizational Profile:

Number of employees: 73

Types of beneficiaries: The fishing industry, especially small-scale fishing folk.

Geographic breakdown of markets served: Greenpeace Mediterranean has offices in Turkey, Israel and Lebanon, and is active in Jordan and Egypt.

The Problem/Opportunity:

According to FAO, nearly 75% of the world fisheries are over-exploited, depleted, or in a state of collapse and 90% of large predatory fish stocks are already gone. According to IUCN Red List grouper, turbot, dusky grouper and sea bass are listed as nearly threatened species in the Mediterranean.

In Turkey, the existing fisheries circular, which regulates the fisheries operations and specifies the legal catch size, has implementation problems. As a result of decrease in fish stocks, undersized fish catch rates increase every year. Therefore there was a need to revise the Circular to include more scientific-based criteria, starting from a revision of the catch-sizes, which is the basis for sustainable fisheries.

Objectives:

To achieve a scientific based modification of the legal catch-sizes in the commercial fisheries regulation in 2011.

To achieve progress towards ending illegal fishing, starting with trawling.

To promote the issue of 'undersized fish' and support the Ministry of Food, Agriculture and Livestock (MFAL) in successful management of fisheries, through media and public channels, in order to support the MFAL to take stronger action towards sustainable fisheries.

To create a public debate on the issue of undersized fish catch and mobilize people to take action.

Execution:

The project was launched in November 2010. Greenpeace finalized, together with scientists, a recommended list of catch sizes. Greenpeace volunteers then ran a survey in local fish markets with fish rulers designed for the campaign. These visits created public awareness and media interest. Greenpeace highlighted the enormous number of undersized fish sold in markets.

In February, Greenpeace exposed illegal trawlers and documented them. Greenpeace successfully implemented 'red phone activity' which resulted in sharing views and demands around 3,000 people. Before the start of the fishing season, Greenpeace mobilized people to deliver pens to Minister to make him sign new catch-sizes. Thousands of people sent pens. On September 1st the MFAL announced that legal catch size of grouper, dusky grouper and bluefish has changed.

Results/Outcomes:

It is still early to quantify the positive economic outcome. It will take some years to exactly measure the effects on the fisheries sector.

Since November 2010, 687,000 people supported the campaign by signing a petition (kacsantim.org) to stop illegal and undersized fishing. Opinion leaders, celebrities and columnists discussed the issue publicly and wrote about the problems of fishery. Greenpeace supporters were involved directly by calling and faxing 4,500 letters to the officials to ask for a change in fishery regulation. The drop in the fish stocks and undersized fish issue were covered extensively in the media with a total of 288 clippings in printed media and 103 TV appearances.

The Ministry of Food, Agriculture and Livestock changed the legal catch sizes of three species: bluefish, grouper and dusky grouper in the fishery circular, in line with Greenpeace's recommendations.

Also, The Ministry of Food, Agriculture and Livestock took necessary precautions against illegal fishing methods such as trawling. The Maritime Police and the Coast Guards continue holding organized operations against illegal trawlers and follow legal procedures.

Future Plans:

Greenpeace will continue campaigning against undersized-fish catch and illegal overfishing and for the Ministry of Food, Agriculture and Livestock to also change the legal catch size of turbot, sea bass and bluefish. Also Greenpeace calls the Ministry to make changes towards sustainable fishery while supporting with subsidies small-scale fishing folk and to start extensive research on fish stocks.

Lessons Learned:

To create a public debate on undersized fish catch was a challenge. The lack of scientific research on fish stocks had caused delay of the launch. Changes in legal catch size would have resulted in industrial fishing companies having to change their fishing equipment, which would have had economic consequences. Greenpeace directly communicated with the Minister and met with him three times to present scientific data.

All obstacles were successfully overcome thanks to an integrated communication strategy (online and offline), public support, the use of scientific data, the establishment of good relationship with stakeholder's and the support of celebrities.

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İçdaş, Sustainable Water Management Project



*İçdaş Çelik Enerji Tersane ve Ulaşım
San. A.Ş.*

Partner Organizations:	Aquamatch, Turkey OSSBERGER-Turbine, Germany Dokuz Eylul University, Faculty of Marine Sciences
Geographic Coverage:	Icdas Degirmencik Integrated Facility
Implementation Period:	01/07 – ongoing

Organizational Profile:

Number of employees: 4,200

Primary brands, products/ services: Main activity areas of Icdas; iron steel production, energy generation and shipbuilding.

There are three main activities falling within the scope of “Sustainable Water Management Project”. These are; acquiring fresh water from the sea, generation of electrical energy from cooling water and fish breeding in cooling water.

Types of customers/beneficiaries: There are different production branches in Icdas Integrated Facilities. Construction iron and wire rods are used by many construction companies and metal producers all around the world. The electricity generated in the facility is sold to users all around the country through national electricity grid. Whereas, the vessels built in the shipyard are bought by ship operators.

Geographic breakdown of markets served: While iron and steel products and the vessels built in the shipyard are offered for sale all around the world, the electrical energy is offered for sale on a national scale.

The Problem/Opportunity:

In the facility, where freshwater is produced from the sea, micron scale pore size of membrane filters varies according to temperature. Thus, the efficiency of the facility reduces in winter months when sea water is cooler. This problem is solved by diverting the relatively hotter water at the outlet of cooling water to the desalination facility.

Upon releasing the tiddlers into the fish breeding facility, they were under intense attacks of sea gulls. Another problem was speedy exhaustion of oxygen in the pool in parallel to the growth of the fishes. Level of dissolved oxygen is increased by supplying oxygen gas into the pools.

Special equipment is required in the selection of machinery and equipment in HEPP due to the corrosive effect of the sea water. Manufacturing of stainless and seawater resistant special turbines was 30% more expensive than standard turbines.

Objectives:

It is targeted that whole of the 7,000 m³/day freshwater requirement is safeguarded from seawater production facility and the integrated facility and 32 underground water wells are closed. More efficient use of underground waters in agricultural regions shall also be ensured.

Cooling water obtained from the sea has to be conveyed to thermal plant at 30 m elevation and to iron steel plant at 50 m elevation due sit conditions. It is targeted to generate electrical energy by discharging this water back to the sea through the hydroelectrical power plant, which is being constructed. It is planned that upon putting the project into practice, more than 20% of the energy consumed for pumping the water is recovered.

It is aimed to breed 100,000 sea bream and sea bass in cooling water discharge. It is also targeted to show that for the first time in Turkey fish can be bred in the cooling water discharge and that the effect of the cooling water on ecosystem could be sustainable.

Execution:

Facility for Producing Fresh Water from the Sea Water: With the project, a 12,000 m³/day fresh water production facility is planned. Supply, installation of the equipment and the commissioning of the facility were carried out by Aquamatch Turkey. Icdas personnel currently operate the facility. There is also a potable water production facility having 100 m³/day capacity within the integrated facility.

Electrical Energy Generation from the Cooling Water Discharge: Construction of the HEPPs and energy generation facilities are carried out concurrently and were commissioned simultaneously in 2008 and 2009.

Return of cooling water in iron steel plant flows down into 450 KW HEPP with 38 m drop. Whereas in the thermal plant, it flows down into 3 x 450 KW HEPPs with 20 m drop. Cooling waters used in electrical energy generation are discharged back into the sea through open canal.

Fish Breeding in the Cooling Water Discharge: Four earth pools are constructed for fish breeding activity under the consultation of academicians, and it is planned to breed 100,000 fishes in these pools. It is determined that the most suitable fish species to be bred in our region were sea bream and sea bass.

Works for the construction and production processes are carried out in coordination with the Provincial Directorate of Agriculture, and all the legal permissions are obtained.

Results/Outcomes:

Facility for Producing Fresh Water from the Sea Water: In this project, financial performance was of secondary importance, and environmental and social outcomes were brought into forefront. Social outcome of the project is the increase in longer usage of the underground water for agricultural purposes by the local community through the protection of the same amount of water. Ending the usage of underground water, which is a limited resource, and preventing the advancement of saltwater wedge into the mainland have been the environmental outcomes of the project.

Electrical Energy Generation from the Cooling Water Discharge: Recovery of 21% of the energy used for pumping water to the facility at the HEPPs brings the economical and environmental outcomes to the forefront. Environmental outcome of the project is its significant contribution to the energy efficiency.

Fish Breeding in the Cooling Water Discharge: Sea breams and sea basses reaching economical weight of 200-300 g takes about 15 months in classical land fishery facilities. On the other side, in the mentioned facilities, fishes complete their growth within 11-12 months due to the favorable water temperature. Although fishes are being fed during the winter months when the water temperature drops in the classical land fishery facilities, increase in weight cannot be achieved. Facility becomes 20% more profitable even when considered just from this aspect.

Another significant contribution of the activity to this facility is evidencing that the cooling water discharge has the suitable quality for fish breeding. Existence of the fish breeding facility contributes more to the reliability and image of the company than the financial performance.

Opening the facility for student visits has been the social dimension of the implementation. The technical tours are organized together with the local schools, and the students are given briefings about the fishery activities.

Future Plans:

Obtaining water from the sea in steel and Energy production is a more reliable water source compared to underground water, as the source is relatively unlimited. Obtaining fresh water from the sea appears as a reliable source in meeting all the water requirements of the facility today and in the future.

As the generation of electrical energy by utilizing the potential energy of the water when discharging the cooling water used at the facility back into the sea is a profitable activity, it is planned to keep HEPPs in operation as long as the facility remains active.

Fishery continues with its activities with lower operating costs compared to similar facilities by utilizing the waste heat and waste energy of the cooling water.

Each of the implementations taking place within the sustainable water management project has the attribute of being repeatable and applicable by similar facilities. Project is advantageous in terms of economical and environmental aspects for industrial facilities being located at the seaside and requiring great amount of water.

Lessons Learned:

At the planning stage of the project, having no examples at national level on HEPP project and fishery project in sea water raised doubt about their applicability. However, the facilities continue to operate with the performance expected for many years. These works showed that there is no limit to the things that could be done for sustainability with a good planning.

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İstanbul Metropolitan Municipality, Sustainable Management of Local Electronical Wastes in Istanbul



***Istanbul Metropolitan Municipality
(IMM)***

Partner Organizations:	Ecological Recycling Society (ERS), Greece Environmental and Cultural Heritage Conservation Association (CEVKU), Turkey
Geographic Coverage:	Istanbul
Implementation Period:	03/2007 - 09/2009

Organizational Profile:

Number of employees: 50,000

Primary brands, products/ services: It is the mission of the Municipality to offer local services to all residents with the understanding of providing an efficient and effective governance with the most up-to-date, equitable, and open to development qualities in order to fulfill the responsibilities with regards to Istanbul, which has been at the meeting point of civilizations, to increase the life quality of its citizens, the consolidation of the city's unique identity, and to make a meaningful contribution to make it a respected world city.

Types of customers/beneficiaries: Inhabitants of Istanbul

Geographic breakdown of markets served: Istanbul

The Problem/Opportunity:

Before this project, no other project on electronic waste treatment had been conducted by IMM or other local governments in Istanbul.

IMM didn't have enough knowledge about WEEE recycling and their treatment methods.

Inhabitants in Istanbul also didn't have enough awareness on WEEE.

Legal obligations and responsibilities on WEEE management were not clear due to the lack of regulations in force.

Objectives:

Through this project it is aimed to make a feasibility study about collection and evaluation of waste electrical and electronic equipment (WEEE).

Collect at least 6.000 units of computer wastes.

Reach 60% as the ratio of repaired amount to all collected.

Form the inventory of collected parts .

Make a market search for the parts that cannot be reused.

Make contributions to the WEEE legislation that would come into force in 2010.

Execution:

Public foundations, private companies and citizens who want to donate their computer wastes to IMM's workshop contact with IMM by telephone or e-mails throughout Istanbul and state the information related to the equipments. On this request, technicians go to the collection points in 10 days and receive the equipments in exchange for official report.

The equipments are tested if they are working or not. Then they are classified as reusable materials, recyclable materials and hazardous wastes. The equipments that will be repaired are stocked for reuse after their data are erased and they are repaired. Stocked equipments are then donated to the educational, public and social institutions that are in need. The equipments that are not possible to be repaired are separated into parts such as plastics, metals etc. and sent to recycling points. The materials consisting of hazardous materials are sent to licensed firms to be disposed.

Results/Outcomes:

The system of the project recovers 100% of used recyclable materials such as; plastic, metal, etc. But IMM cannot sell these materials directly because of the legal obligations; the system for the recyclables is not profitable for IMM. The materials consisting of hazardous materials such as monitor and tape cartridge are sent to licensed firms to be disposed in an environmental friendly way. According to the system it has to be paid to dispose of hazardous materials. As a conclusion, this phase of the system is also not profitable even it is costly to send the equipments to the receivers. When the whole system is evaluated, it is not profitable on behalf of IMM. But in general recycling process is profitable for national economy. If an infrastructure is set up about recycling of WEEE, this will be a profitable system.

The social impact of the project starts at donation point. Since there are still some students who have never seen a computer in east part of Turkey, schools and educational institutions have the first priority.

Public institutions have the second priority because they only have the opportunities provided by the government.

Social institutions have the last priority because private companies, producers and volunteers etc can support them.

WEEE is a diverse waste category, and international opinions regarding the impacts of various substances contained within WEEE vary. Electronic and electrical products have a significant impact on the environment when they are manufactured, used and reached the end of their life and are discarded because WEEE contains substances such as lead, mercury, cadmium, phosphors etc.

Future Plans:

Project is continued by IMM. Each activity will be carried out by IMM until the related legislation comes into force.

IMM workshop is sometimes insufficient to fulfill the demands of citizens/companies who want to give their waste to the workshop. So, WEEE Legislation should come into effect as soon as possible and essential investments should be done with financial support of producers. In this context, IMM is ready to apply its responsibility and invest for both workshop area and staff requirement if producers support it.

Lessons Learned:

During the project period, it has been learnt that; recycling of WEEE is important. This issue is something to be managed by the participation of public. Also we have seen that the citizens and stakeholders (producers, companies, etc.) are really willing to participate in the process. It can simply be managed to attract their attention with good advertisements.

In fact, the responsibility of separate collection of WEEE belongs to the producers according to the legislation that is expected to be published. They should be interested in this issue more during the period of legislation preparation; they should inform Ministry of Environment and Urbanization about their opinions and contribute to the legislation to be able to obtain more stable system regarding this issue.

This project only consists of the computer wastes. So it is thought that it will be very useful to carry out projects for the other type of recyclable wastes, too.

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Konya Special Provincial Administration, Rural Development Project through Production of Organic Strawberry



**Konya Special Provincial
Administration**

Partner Organizations:	Selçuk University, Faculty of Agriculture Konya Provincial Directorate of Food, Agriculture and Livestock
Geographic Coverage	Yaylacık Village Seydişehir Konya
Implementation Period:	2005-2007

Organizational Profile

Number of employees: 600

Primary brands, products/ services: All public services within the city, including health, agriculture, industry and commerce, environmental planning, protection of soil, prevention of erosion, youth and sports, culture, arts, tourism, social services and aid, micro credit for needy, public works and housing, nursery schools and youth hostels, providing land for primary education buildings and all services regarding construction, maintenance and other needs of these buildings besides services outside the borders of municipality including public works, roads, water, sanitary sewerage, solid waste, environment, emergency aid & rescue, supports to forest villages, forestation, establishment of parks and gardens.

Types of customers/beneficiaries: Local community living in Konya.

Geographic breakdown of markets served: City of Konya, Turkey

The Problem/Opportunity:

With an altitude of 1,700 meters Yaylacık village is located 65 kilometers away from Konya and 37 kilometers away from Seydişehir. The mountainous landscape limits the areas for agriculture to 2,000,000 m² of land.

Before 2006, the source of income for the villagers was wheat, barley, tomato, cucumber and various fruits with a production amount to meet their own needs. Bovine and ovine breeding was limited. During summer, people would move to Aegean region for seasonal jobs. The villagers had to receive aid from neighbor villages, counties and city for living.

Small land pieces of 1,000 to 1,500 m², the lack of modern irrigation systems and the lack of alternative agriculture techniques would make it tougher for the people to earn their own living, and would result in immigration of these people to other cities.

Objectives:

The overall aim of the project was to increase the contribution of rural people to economy through helping them earn their living in their home towns, raise their income and socio-economic levels, and also to minimize the development levels of rural and urban areas.

The aim behind organic agriculture and drip irrigation is to keep the nature in balance and to protect soil and water resources for the next generations and to prevent usage of chemical pesticides for the sake of human health.

Execution:

In 2005-2006, Konya Special Provincial Directorate started the Drip Irrigation Infrastructure Implementation. Result of consultation meetings with the project partners showed that a prolific type of strawberry which would grow from May to November, would be the most suitable fruit to plant. Organic production was preferred, as the soil was clean.

In coordination of three projects, trainings were provided to farmers to prepare the soil, to install the irrigation pipes, to use the mulch cover, to plant the seedlings and to do the drip irrigation.

In 2007, 300.000 strawberry seedlings were distributed to Yaylacık farmers where only five of them started production. On the following years the interest increased and today all farmers in Yaylacık are planting strawberries.

Konya Special Provincial Directorate, Selçuk University, Faculty of Agriculture, Konya Provincial Directorate of Food, Agriculture and Livestock and also the company who worked on organic certification and marketing of the products all shared responsibilities throughout the implementation.

Results/Outcomes:

Before the implementation, the annual income of wheat producing farmer with a 2,000 m² of land was approximately 72 Euros. After the installation of drip irrigation and start of organic strawberry production, the annual income of a strawberry producing farmer with 2,000 m² of land raised up to 4,260 euros.

As a result of increase in the income levels, the contribution of farmers to national economy increased as well.

The same model is replicated in 80 other villages and increased the income levels of farmers tremendously resulting in increase of trust levels of these people to government authorities.

A sustainable rural development model was created in five year time. Through this project migration from Yaylacık Village has stopped. The socio-economic levels of people increased and they gained self-confidence. Some villagers who moved to the city center earlier came back to their hometown during summer to plant strawberries in their gardens, which was not used before.

The annual Yaylacık Village Festival is renamed as 'Yaylacık Organic Strawberry Festival'.

As agricultural activities were restructured, the environmental impacts were minimized. Through organic production model the ecological environment is protected and soil/water pollution is prevented.

Future Plans:

The main source of income is organic strawberry production since 2005-2006 in Yaylacık and it seems that it will continue in the future. The major economic activity in rural areas of Konya is agriculture and water is generally the key resource to manage in terms of agricultural production model. All villages have sufficient water resources. When the water has been brought to production areas, where farmers can plant economically feasible products, then the sustainable development model is ready.

This model is replicated in 80 other villages between 2007 and 2011 on 59,000,000 m² of land with 7,826,000 Euros. In Konya Special Provincial Directorate's strategic plan, the aim is to continue similar activities in the region to reach 300 villages with the current financial resources, which seem sufficient for the next five years.

The next step for the sustainability of these initiatives is to establish and manage producer associations to create a certain amount of capacity in production and to market the product with its real value.

Organic potato and organic medical aromatic plant production started in Konya after Yaylacık initiative. In 2011, construction of a marketplace for organic product marketing is started in cooperation with a neighbor municipality Meram, to be completed in 2012.

Lessons Learned:

As a result of the implementation it is learned and proved that the income level of rural community can be increased through small but coordinated efforts of government institutions such as the local administrations.

The main challenge of the project was the suspicious perception of farmers about the organic production of strawberries and only five of them were initiated. Training activities and the awareness on the raised income level of strawberry producers changed the trend in one year. The other misperception was about the irrigation system, which is also solved through training and experience.

Final challenge was marketing of products as the total capacity was low and all producers wanted to sell their products separately. Soon after, the producers started acting together, consolidated their products to create capacity and selected a common marketing and distribution company to sell their products.

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Lipesaa, Waste Vegetable Oil Collection System



Lipesaa Mak. San. Tic. Ltd. Şti.

Partner Organizations: Vegetable Oils and Fats Industrialists' Association, Turkey (BYSD)

Geographic Coverage: Where applicable

Implementation Period: 06/2008 - 12/2011

Organizational Profile

Number of employees: 13

Primary brands, products/ services: Recycling Equipments, Vegetable Oil Collection Equipment, Waste Battery Collection Equipment and Automation Systems

Types of customers/beneficiaries: NGOs, Ministries and Municipalities

Geographic breakdown of markets served: All over Turkey

The Problem/Opportunity:

Disposal of waste vegetable cooking oil into the drains creates several environmental, operational and maintenance problems: i) drainage system pipes become unusable because oils solidify at the inner face of pipes and block waste flow; ii) sewage treatment cost increases for local municipalities;

iii) damages the underground water quality and covers surface area of open waters and blocks the oxygen transfer and thus reduces the dissolved oxygen concentration which is seriously hazardous for aquatic habitat; iv) shatters the biochemistry balance of soil, which drops effectiveness.

Objectives:

There are some laws and legislations for used cooking oil at commercial areas (restaurants, hotels, fast foods etc.) but for household use, it is mostly voluntary basis. Equipment (BAYTOM) aims to prevent disposal of domestic waste vegetable oil to drains and gives small gifts to encourage householders.

Execution:

This equipment will not only increase the interest of people, but also will raise environmental awareness of the new generation. Equipment will be located on various places in the cities such as shopping centers, schools, housing estates and various municipality buildings to have a good coverage. Householders will be able to dispose their used cooking oil safely by just visiting this equipment spots which then they will get a small gift for their good action. Equipment separates unwanted liquids (water addition fraud etc.) from used cooking oil and stores them separately. When the containers are full and/or in need of maintenance, equipment informs oil collector from mobile phone automatically.

Results/Outcomes:

Using this equipment will contribute to green economy and employment. When 10,000 tons of waste vegetable cooking oil is collected, it means 3,600,000 Euro less urban sewage system and sewage treatment maintenance cost for municipalities. In addition to that 9,500,000 Euro gained as biodiesel value.

New generation will be enlightened about the danger of waste cooking oil disposal which is the social dimension of the project.

The environmental risks will become less threatening by preventing waste oil disposal to drains., Underground water quality and aquatic habitat will be protected.

Using the biodiesel produced via waste cooking oils will help CO₂ emissions to decrease

Future Plans:

It is aimed to collect as much waste cooking oil as possible with the help of municipalities, partner organization and sponsors with widespread coverage in the country, to develop bigger capacity models for sewage treatment system to separate waste oil from sludge and to increase awareness of specifically housewives

Lessons Learned:

Machinery should be easy to use in order not to make uneducated people get confused. Size should be convenient. Pilot study showed that smaller container can be used for "other liquids" that are separated from waste oil which in the end make machinery smaller.

Color design should attract attention and it has to be easy to see.

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Ministry of Forestry and Water Affairs, Enhancing Forest Protected Areas Management System in Turkey Project” implemented in Küre Mountains National Park



Ministry of Forestry and Water Affairs

Partner Organizations:	General Directorate of Forestry, United Nations Development Programme Turkey Country Office, Dođal Hayatı Koruma Vakfı (WWF-Turkey), Global Environment Facility (GEF)
Geographic Coverage:	Kastamonu and Bartın Provinces (Küre Mountains National Park and its buffer zone)
Implementation Period:	05/08 - 06/12

Organizational Profile

Number of employees: 3,959

Primary brands, products/ services: Nature conservation (forests, wetlands, steppes, landscape, caves, marine and coastal areas), protected area (national parks, nature parks, wildlife reserves, Ramsar sites, etc.) management, biodiversity protection, wildlife and game management

Types of customers/beneficiaries: Local people, hunters, tourists, scientific researchers, academicians, forestry, inland fisheries and agriculture sector, non-governmental organizations (including cooperatives and unions), private sector and related public institutions.

Geographic breakdown of markets served: Whole Turkey, especially protected areas.

The Problem/Opportunity:

Having the first participatory boundary delineation in a national park establishment process, Küre Mountains National Park (KMNP) is declared on 07.07.2000, and has become one of the ecotourism hotspots in Turkey. However, the region has high migration rates to bigger cities and local population has been decreasing. KMNP buffer zone is located within the boundaries of eight sub provinces and one town, including 123 villages. Until 2008, a few villages were focusing on sustainable tourism and natural resource management, and they were not replicated in the whole buffer zone. The other weaknesses of the site are; lack of visitor management facilities and infrastructure, lack of knowledge at national and global level, lack of management plan and governance mechanism.

Objectives:

The project aims to establish mechanisms to ensure conservation and sustainable management of globally significant forest habitats in Turkey's forest hotspots by creating a model for in the Küre Mountains National Park and its buffer zone (totally 172,119 ha). Main targets are:

Designing, piloting and adopting the cost-effective conservation management approaches in KMNP and its buffer zone.

Sustainable natural resource planning and management in KMNP and its buffer zone

Replication of the model and lessons learnt in other eight forest protected areas of Turkey.

Execution:

The Global Environment Facility (GEF) supported "Enhancing Forest Protected Areas Management System in Turkey Project", has been implemented in Küre Mountains National Park since 2008 under the partnership of the Ministry of Forestry and Water Affairs General Directorate of Nature Conservation and National Parks, General Directorate of Forestry, United Nations Development Program (UNDP) Turkey Country Office and WWF-Turkey. The project implemented in Küre Mountains National Park succeeded to set up a model for conservation of the national park and its buffer zone, as well as sustainable development and tourism, and green economy. This model became exemplary for other forest hotspots in Turkey and national protected areas network. The project implementation will be completed at the end of June 2012.

Results/Outcomes:

The success of the project lies in effective and participatory management of Küre Mountains National Park, preparing international sustainable tourism and visitor management standards, increasing the participation of civic organizations in the region and creating green jobs.

"Pilot Applications Program" was established and five local projects on ecotourism, as well as awareness raising, wildlife protection, natural resource management, and production and marketing of local products were supported. Job opportunities were created for local women in ecotourism activities and home lodging has been accelerated around the national park with trainings for 38 local people on bed and breakfast accommodation, among which 33 were women. 15 of these trainees have been supported in setting up Küre Mountains National Park guest rooms in their houses under this pilot program.

216 solar energy-heating systems were supported in buffer zone villages.

KMNP buffer zone forest management plans (17 forestry sub-units' biodiversity integrated ecosystem based multifunctional forest management plans) were prepared

KMNP PAN Parks Group was established to implement sustainable tourism development plan and certify local business partners.

KMNP governance mechanism was established for effective management of the site.

First volunteer program of a national park in Turkey was set up.

KMNP communication strategy (including KMNP official website (www.kdmp.gov.tr), documentaries and short films) were prepared.

Two visitor centers, one information center and entrance gate systems were established.

Küre Mountains National Park (KMNP) Directorate was established and effective management of KMNP and its buffer zone (total 172,119 ha) was ensured.

KMNP was certified as first PAN Parks in Turkey.

Turkey's Protected Areas System Management Effectiveness Monitoring System was established.

Turkey's national strategy on protected areas and climate change was published.

KMNP ecosystem based multifunctional forest management plan, sustainable tourism development plan, visitor management plan, and draft management plan were prepared.

15,000 tree seedlings were planted in Kastamonu-Cide section of Kure Mountains National Park buffer zone to support wildlife.

Future Plans:

One of the main targets of the project is to replicate Küre Mountains National Park model in other eight forest hotspots in Turkey. Replication work in Karçal Mountains and Yenice forest hotspot has already been started within the project. Management planning process and zonation in KMNP has been up-scaled in the whole of Turkey by Minister's letter. In 23.04.2012 KMNP became the first PAN Parks certificated national park in Turkey, which will result in site management, monitoring and sustainable tourism activities at the international level. KMNP Directorate has been established for effective management of the site in collaboration with related public institutions, NGOs, universities and private sector.

Lessons Learned:

Since nature conservation and sustainable development activities are process oriented rather than result oriented, activities generally took longer than expected.

Below stated list details the main difficulties and measure taken to overcome them:

- Having many project partners: For effective project management and cooperation, a partnership protocol was signed among project partners. Additionally, a steering committee formed by high level decision makers was established for regular monitoring of project activities and progress. Eventually, participatory project development process eased the local ownership of the project by focusing on real problems and solutions. As the first GEF project implemented with an NGO partner, namely WWFTurkey, project has inputs of its global network and resulting in increased ownership and promotion at local and national level.

- Different stakeholder groups having different expectations from KMNP: Project team used participatory approaches to prepare KMNP management plan and sustainable development strategy. Pilot Application Program for KMNP was established and supported five local projects to increase NGO effectiveness in the region, and their participation in the process. Also, higher participation of local women in trainings and meetings increased project effectiveness. Establishing visitor centers, information center, and entrance gate systems are important to increase public awareness and local ownership.

- KMNP is located within the boundaries of two provinces: Bartın and Kastamonu. Local working groups were established in Bartın and Kastamonu for effective project management and in 2011 KMNP Directorate was established for effective management

of KMNP. Project team also used this as an opportunity to insert KMNP and its buffer zone priorities in two different regional development agencies' strategies, aiming the sustainability of developed plan and strategy implementations.

- Buffer zone management: KMNP has officially declared buffer zone, which is important in the protection of KMNP values and supporting alternative income generation processes. Buffer zone is 80% forest area, and for sustainable management of forest resources in the buffer zone, 17 forest sub-units' ecosystem based multifunctional forest management plans were prepared and implemented.

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METUTECH VRM Treatment Plant



*Middle East Technical University
(METU) /METU Technopolis*

Partner Organizations:	Rectorate of METU/ Directorate of METUTECH
Geographic Coverage:	Ankara, Mid Anatolia, TURKEY
Implementation Period:	01/05 – 05/12

Organizational Profile:

Number of employees: METUTECH: 28 / METU: 3,000

Primary brands, products/ services: METUTECH: Science Park Management/

METU: is a university, Teaching and Research

Types of customers/beneficiaries: METUTECH: RD Companies and their subsidiaries /
METU: Students and youth in general

Geographic breakdown of markets served: METUTECH: Mid Anatolia /METU:

Turkey and the Middle East

The Problem/Opportunity:

The university subsidiary company, METUTECH, manages the science park within the METU campus and needs to maintain its lawns for presentable appearance. Until 2007 municipality water was being bought for irrigation of lawns during summers at a cost exceeding 3.5 Euros/m³. This placed a massive financial burden on the management. As of 2007, irrigation water cost was decreased about 150,000 Euros per annum, with the wastewater reuse facility going into operation.

Objectives:

Objectives of the best practice may be summarized as follows: To reuse treated wastewaters in lawn irrigation so as to cut water costs at METUTECH, to set example for the community for sustainable management of water resources and to combat times of water shortages, to expose university students to a treatment technology which is at the fringes of development, to train graduates who would take part in design and installation of such advanced processes in the country, to promote research on an advanced process.

Execution:

A vacuum rotating membrane plant, VRM, donated by HUBER A.G. for research, development and training, was installed at METU campus in 2005. Initially VRM was an experimental plant and the treated effluents were being drained into the groundwater through a vegetation bed. Later, observing the flawless operation of the plant, METUTECH administration decided to invest into an 800 m³ closed storage basin and a distribution system for the irrigation of its lawns. This has been commenced in summer of 2007. The plant provides 200 m³ of treated and sterile water daily during the course of summer months; though it is operative year round and treated waters during winters were being wasted due to lack of extra storage facility. In 2009, a disused lagoon was upgraded into a storage basin for an extra 16,000 m³. Although still short of water, METUTECH is now irrigating much of its lawns.

Results/Outcomes:

With the operation of METU VRM treatment plant a saving around 150,000 Euros has materialized annually and this sum is now being spent for more useful purposes such as expansion of the METUTECH science park and to support university student grants.

The VRM plant set an example for the community in reusing treated wastewaters to combat droughts and water shortages. Currently two similar plants have gone into operation at a touristic region of Turkey, which suffer from chronic shortage of water. Both plants have been initiated upon administrators visiting the METU VRM plant. Municipalities are building two more membrane plants.

The METU plant and similar technologies preserve the environment at its pristine condition by producing sterile effluents that are free from pollutants. Effluents are no longer referred as wastewater, since they are ordinary water at that state. By closing the loop using this technology reuse waters can provide an Infinite supply of source water to communities that are short of water, thereby improving public health.

Future Plans:

METUTECH is now planning to install a second unit to increase the throughput so as to supply water for the toilet flushes in the new office buildings. This is expected to cut the running costs dramatically. One unit will still be used in lawn irrigation while the other will produce an infinitive source of water supply for the office buildings.

Lessons Learned:

The lessons learned from this implementation were all positive. The reuse practice in this example proved highly successful and beneficial since it worked flawless until now; though there have been times of difficulty when the plant had to shut down due to mechanical failures. These were repaired by local expertise and lead us to develop routine maintenance schedules for effective and uninterrupted operation.

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Süleyman Demirel University

Partner Organizations:	Bioglobal
Geographic Coverage:	West Mediterranean Region of Turkey (Antalya, Isparta and Burdur cities)
Implementation Period:	09/2008 - 04/2012

Organizational Profile:

Number of employees: 3,000

Primary brands, products/ services: Education (University has 50,000 students), research (3,000 researchers are working at university), services

Types of customers/beneficiaries: Students and stakeholders (medical, industry, farmers), research and development on biological control and education of master, Ph.D. students and farmers.

Geographic breakdown of markets served: West Mediterranean region of Turkey (Antalya, Isparta and Burdur cities)

The Problem/Opportunity:

Starvation is one of the main problems of the world today, millions of people are facing hunger and many people die. Therefore the importance of agricultural products has an even greater significance.

Mankind uses the yield, which remains after crop damage by various agents. We have to protect the cultivated plants from those agents in the most effective way. Research shows that whatever we do for protection, the global loss of yield due to diseases, pests and weeds is about 30%. Unfortunately the preferred method by farmers is chemical pest control because of its easy application and immediate results, but their negative effects are widely recognized. Chemicals threaten the health of humans, cause environmental pollution and affect the sustainability of ecosystems. Therefore biological control is preferred as the best alternative to chemical control in agriculture.

Objectives:

Biological pest control using organisms such as predators, parasitoids and microorganisms e.g. entomopathogens as well as formulated bio-pesticides has seen a steady increase during recent years. In order to address the important need to extend the biological control in agriculture and to take the lead in this area, the “Biological Plant Protection Research, Application, Production and Education Center” was established at the Süleyman Demirel University in Turkey.

The aim of the center is to undertake research and development of predators, parasitoids, microorganism and bio-pesticides already used or having the potential in biological plant protection, start production in order to facilitate their use and to educate students, farmers and consumers.

Execution:

In 2008 a project approved by the former State Planning Organization (Ministry of Development since June 2011) came into action by the finishing with the building of the facilities and starting the scientific work. This project of establishing that center on biological control was the basis for subsequent research:

It was started with working on the efficiency and production of beneficial insects of major pests of our region, and of their preys.

Chilocorus bipustulatus the most important predator of scale insects in citrus was mass reared and then applied in orchards in Antalya in 2011. The mass production of that predator is still going on. After obtaining good results the studies on the efficiency of the predator were continued and the Ministry of Food, Agriculture and Livestock approved a new project on an early warning and modeling system.

With time and by achieving good results, biological plant protection started to broaden and alongside production of beneficial insects, studies on beneficial microorganisms began in recognition of their global role in biological pest control.

Results/Outcomes:

- Rejection of exported vegetables and fruit contaminated with pesticides is prevented
- Environment friendly and pesticide free products strengthened the ability to compete on the world market and export potential
- Export opportunity for bio-pesticides and beneficial insects
- By reducing pesticide use the health of people was improved and costs of the health insurance system was lowered
- By lowering the use of chemical insecticides the farmers budget on chemicals was also lowered
- Diversification of the pest management market and diluting the oligopoly of pesticide companies
- Jobs have been created in newly established areas of biological plant protection
- Contribution towards green economy has been ensured
- The establishment of sustainable agriculture could contribute to a reduction in starvation of humans
- People are provided with more healthy and higher quality food
- The number of cases of cancer could be lowered
- Acute and chronic poisoning is prevented
- The health of farm workers is not put at risk because of use of alternative non-poisonous plant protection agents

- Opportunities for study and application of results are provided for scientists and students
- Training of farmers
- Increasing of the education status
- Negative side effects of agrochemicals on the environment and humans is reduced
- Development of pesticide resistance in pests is reduced
- Biodiversity is protected
- Steps are taken towards reestablishing environmental balance
- Pollution of soil, surface and ground water is reduced

Future Plans:

Production of beneficial organisms has been done until now on a relatively small scale for research and development. Our aim is to see mass rearing started on a large scale by the private sector and thus facilitate application of predators and parasitoids on a large scale. Our center would still be able to give supportive service and consultancy where needed.

Optimizing production methods for beneficial agents will be an ongoing process, as well as the adaptation and development of methods applicable in other regions.

Besides our work on predators, parasitoids, and microorganisms we are planning to start research and development of bio-pesticides based on enzymes and on plant extracts.

Lessons Learned:

There are many examples on successful applications of biological control on different plant pest. It can effectively be used especially in cultivations under cover. However, farmers in Turkey are generally not well educated and have no experience at all with biological plant protection, which leads to application of harmful pesticides after the use of beneficial insects. This can result in total failure of the whole scheme. Education of farmers through field days, television programs but also academic teaching will further the understanding of ecological aspects in pest control and increase the success rate.

Governments play an important role for the future development of pest control strategies. The authorities are expected to promote and support biological plant protection methods in various ways. Especially the process of registration of bio-pesticides and beneficial organisms should be made easier particularly for small companies to achieve, but without reducing the importance of risk assessments. Regarding the education of consumers but also producers the media has an important responsibility to influence in a positive way.

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Şekerbank, EKOkredi (Loan for financing energy saving and energy efficiency projects by individuals and enterprises)



Şekerbank T.A.Ş.

Partner Organizations:	İMSAD (Association of the Turkish Building Material Producers), İZODER (Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators), ÇEDBİK (Turkish Green Building Council)
Geographic Coverage	Across Country
Implementation Period:	05/2009 - ongoing

Organizational Profile

Number of employees: 3,581

Primary brands, products/ services: Şekerbank has been one of the leading banks servicing agriculture sector, micro, SMEs, supporting entrepreneurship and production.

Types of customers/beneficiaries: Şekerbank provides services in the fields of Corporate and Commercial Banking, Retail Banking, Agriculture and SME Banking.

Geographic breakdown of markets served: Şekerbank has over 3,500 employees, 272 branches located in 70 cities and 204 counties and 11 regional offices and 1 foreign representative office. The differentiating feature of Şekerbank is based on the long term presence of these branches spanning to 50-55 years. Şekerbank's 62% of the branches are located outside Turkey's three big cities.

The Problem/Opportunity:

Turkey imports 70% of its energy requirements; with considerable foresight energy need will double until 2020. 40% of electricity production is consumed in buildings, mostly for heating and cooling purposes. 90% of Turkey's 18 million houses are lack of thermal insulation. It is estimated that 1/3 of Turkey's yearly 50 billion \$ energy consumption takes places in the houses. In regard of these indicators energy efficiency projects are as much important as investments in energy production. Şekerbank supports local productivity through its community banking strategies; and believes that sponsoring energy efficiency investments can make a difference. Further, such an initiative also supports domestic business, production and employment figures of Turkey.

Objectives:

Creating awareness on energy saving and efficiency,

Protecting natural resources and supporting to reduce energy imports,

Decreasing households' and business' energy consumption, thus contributing to national economy,

Introducing to 10,000 new people energy saving concept every year

Providing higher quality living standards via more energy efficient buildings

Collaborating with public institutions, NGOs, local chambers

Providing new foreign resources for financing energy efficiency projects with favorable conditions by passing through funding from international financial institutions to Şekerbank's broad-based customer profile; as it is stated in UN Millenium Goal "Environmental Sustainability".

Execution:

Developed within Şekerbank's community banking strategies and as a leading product in Turkey, EKOkredi finances energy efficiency, waste management and renewable energy projects of individuals, SMEs, industrial and agricultural enterprises. Şekerbank collaborates various partnerships in public & private sector, and NGOs via EKOkredi;

Consultancy and project control services, with IZODER (Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators)

The only member from financial sector in "EU-Build Project to develop and promote financing models for energy efficiency in buildings", which has 47 participants from 9 countries with İMSAD (The Association of the Turkish Building Material Producers);

83 protocols with local chambers of commerce, financing businesses' energy efficiency investments throughout Turkey,

Various congresses, fairs and exhibitions with Ministry of Energy and other public institutions,

Cooperations with private sector companies, and

Campaigns with environmental NGOs; ÇEKÜL and TEMA Foundation

Results/Outcomes:

As of March 2012, 'EKOkredi' loans have reached 320 million TL. Thereby 22,314 individual customers, in addition to 396 SMEs, 2,775 craftsmen, farmer and small business owners have been funded with favorable financing conditions for their energy efficiency investments.

Out of total EKOkredi volume, 80 million TL loans were provided within EKOkredi Insulation provided with IZODER's technical consultancy. Insulation is considered to provide up to 50% saving in energy consumption.

Energy efficiency projects financed by EKOkredi had a positive effect on decreasing energy import, which is one of the top priorities of Turkish economy management.

The business model has attracted interest in international arena and provided new long term, sustainable foreign funding sources.

As an innovative banking product, EKO kredi has constituted a model for other banks to develop similar projects.

Finance for 20,000 housing insulation projects has increased business volume and employment figures in construction industry,

Marketing communication efforts for EKO kredi including customers' testimonials increased awareness and engagement among the society for energy efficient investments.

Launching "Energy Identity Document" certified by the government and financing this certificate with EKO kredi.

Insulation in housings have resulted in decreasing CO₂ emissions by 1.8 million tons for three decades,

Waste management and renewable energy usage projects funded with loans within the extent of EKO kredi have provided significant contribution to the preservation of the environment and natural resources in Turkey.

Future Plans:

EKO kredi is a key business initiative and a strategic standpoint for Şekerbank. Regarded in international financial sector as Turkey's "key bank", for its approach to locals, producers, craftsmen and SMEs, Şekerbank has undersigned with international financial institutions for financing sustainable energy investments on a long term basis.

Energy efficiency projects have a very low amortization period which helps to decrease energy consumption in houses and companies; in addition it has a positive effect on the control of energy import of Turkey.

Lessons Learned:

EKO kredi has a pioneering role in financing of energy efficiency and Şekerbank positions this product in the center of its business applications with the view of sustainability.

Lessons learned from the implementation phase can be listed as follows; the level of stakeholders' awareness to be lower than expected, putting more importance to consultancy services. With the result of these findings, Şekerbank has taken measures to increase consultancy capabilities through trainings across the entire value chain.

In addition, Şekerbank has developed an agenda towards designing corporate social responsibility projects with an objective to increase the awareness within the society.

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TEMA, Kaçkar Mountains Sustainable Forest Use and Conservation Project



The Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats (TEMA)

Partner Organizations:

- Middle East Technical University (METU) Biodiversity and Conservation Laboratory
- Nature Conservation Centre
- Directorate General of Forestry (• Directorate General of Nature Conservation and National Parks
- Artvin Culture and Solidarity Association

Project Associates

- Artvin Governorship
- Directorate General of Agricultural Production and Development
- BTC Environmental Investment Program
- İZODER Association of Thermal Insulation, Waterproofing, Sound Insulation and Fireproofing Material Producers, Suppliers and Applicators
- CitiBank

Geographic Coverage:

Kaçkar Mountains

Implementation Period:

01/07 - 09/11

Organizational Profile:

Number of employees: 138

Primary brands, products/ services: Awareness-raising, Campaigns, Education, Legal Services, Sustainable Rural Development, Biodiversity Conservation, Reforestation, Afforestation, Carbon Sequestration and Combating Desertification and Climate Change Projects, International Relations.

Types of customers/beneficiaries: TEMA has over 440,000 volunteers and 555 voluntary representatives all over Turkey.

The Problem/Opportunity:

Kaçkar Mountains are the western extension of Caucasus Mountains, specified among 34 areas in the world as Biodiversity Hotspots by Conservation International. Between 2004 and 2007, the Lower Caucasian Forests Gap analysis Project was conducted in the area with support from BTC Pipeline Company and through collaboration of TEMA and METU. The project studied naturally unique and endangered areas, the current conservation activities and conservation opportunities through collaboration with the relevant public bodies, NGOs and local people, and thus, initiated the Kaçkar Mountains Sustainable Forest Use and Conservation Project.

Objectives:

Scientific Approach for Conservation and Planning

To develop scientific methods for the conservation of Kaçkar Mountains, and establish a conservation model to convey its values to the future,

Rural Development

To support the local people to turn the resources of the forests into additional sources of income, and to improve their quality of life,

Wildlife Development

To monitor, conserve and develop wildlife, while providing local people with the methods to conserve their products without damaging wildlife,

Sustainable Tourism

To develop tourism, the most important and promising source of income for the local people, through environment friendly methods

Execution:

Project lasted four years eight months with a team of ten full-time staff which were supported by wildlife, biodiversity data and geographical information systems experts. Over 70 consultants spent 1,250 man days for the technical project activities. Two project vehicles alone travelled over 200,000 km throughout the project area of 1,800 km².

Project evaluated the natural values and critical areas of Kaçkar Mountains by a committee of 20 experts from various universities through extensive inventory studies.

Potential additional sources of income, namely non-timber forest products and other natural products were researched and demonstrated. Problems in the product marketing chain were addressed via pilot projects in order to improve agricultural income generation. Critical training was provided to increase agricultural productivity.

The economic value of forests was assessed to promote the worth of local forests. A campaign promoting the treasures of Kaçkar Mountains was launched.

Results/Outcomes:

By the end of the project, about 320 households earned an alternative income through sustainable site specific practices, more than 1,000 people got trained on sustainable and productive practices of agriculture, animal husbandry, tourism, insulation, techniques of avoidance from damages associated with wildlife and 50% of the people in the project area became aware of the unique natural worth of the region.

A pilot Vegetable-Fruit Drying Facility was built, agricultural training was offered to farmers and potential of income generation activities such as fodder crops plantation, beekeeping and fruit orchard management were demonstrated.

The region's first Brown Trout Farm was built with the support granted to a local entrepreneur in order to revive the endangered brown trout both as an economic and as a natural asset.

The project aimed to create a participatory, synergistic, collective working environment for all stakeholders for the management of the area. A comprehensive multi-sectoral plan produced through widespread participation was undertaken to improve coordinated actions by local and central governmental organizations and the civil society.

The process of participatory preparation and the compilation of a multi-sectoral management plan and the formation of a governance structure (KADAB), enabling local communities to have a say in the management of the area, not only increased the sense of ownership of the natural resources of the region but also empowered local inhabitants.

Thanks to the biodiversity inventories, a new plant species was discovered and dozens of endangered and endemic plant and animal species, old growth forests and monumental trees were recorded.

Two brand new Ecosystem-Based Forest Development Plans were prepared for Yusufeli and Altiparmak regions and other forest management practices were revised in line with the new data.

Rare and endangered wildlife habitats and behavior were monitored and researched using telemetry collars. Methods of living together with the wild animals were demonstrated to local people.

The capacity of the personnel responsible for nature and wildlife conservation was improved via technical training and frequent visits.

As a result of contemporary inventory surveys, hunting quotas were revised.

Based on concerns raised by the local people, an environmental impact assessment was prepared for the proposed Hydro-electrical Power Plants on Barhal River and awareness-raising activities were carried out.

Heat insulation was introduced and demonstrated in order to minimize illegal tree logging for heating purposes.

Future Plans:

The most important output of the project "Kaçkar Mountains Management Plan" is the anticipation that it will become a model for Turkey through local ownership and effective implementation.

The work will continue through the multi-sectoral plan implementation after the end of outside financial support. Governance structure responsible for the implementation of the Plan, namely KADAB (Kaçkar Mountains Conservation and Development Union), is in the process of establishment.

Parts of the multi sectoral plan are expected to be funded and realized within the future regional and national development plans.

TEMA Foundation appointed a staff member to follow up the action closely, KADAB establishment and operation in particular, for one year after the project's end.

Lessons Learned:

One of the most important lessons learned from the project was that the sustainable development model based on local values and resources could work even at the remotest areas of a country with severe outward migration.

The sense of ownership of stakeholders could be improved by creative win-win solutions.

Reaching conservational objectives in a non-protected area is a considerably important achievement for Turkey, where threats for biodiversity and natural resources are still increasing. This could be achieved by the ownership and commitment of the stakeholders and the Governor. Therefore, participatory processes and tools again proved to be extremely useful in convincing local authorities and local actors to assume additional responsibilities without any rewards.

It is a fact re-learned that participation of local stakeholders could be achieved by visible and concrete actions at the field. Therefore, such concrete demonstrations should be presented at the initial years of the project.

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TTGV, Eco-efficiency (Cleaner Production) Program



*Technology Development Foundation
of Turkey*

Partner Organizations: United Nations Industrial Development Organization (UNIDO)

Millennium Development Goals Fund (MDG-F)

Geographic Coverage: Focused on Seyhan River Basin but implemented at national scale.

Implementation Period: 06/2008 - 12/2011

Organizational Profile:

Number of employees: 39

Primary brands, products/ services: Support for Research and Development and Technological Innovation projects in the private sector.

Types of customers/beneficiaries: Private Sector

Geographic breakdown of markets served: Turkey

The Problem/Opportunity:

Climate change is a common problem that threatens development goals both in the developed and developing countries. In Turkey reduction of greenhouse gas emissions is the most considered dimension of climate change as all over the world. However, impacts of climate change will continue to increase even if the greenhouse gas emissions will be reduced. So the “adaptation to climate change” concept is brought to the agenda, as a priority need. Targets for reducing greenhouse gas emissions in Turkey have not been determined and realized yet. In parallel, “United Nations Joint Program on Enhancing the Capacity of Adaptation to Climate Change” brings adaptation to climate change to the agenda of Turkey for the first time in June 2008. The Eco-efficiency (Cleaner Production) Program was implemented as an industrial component of the Joint Program.

Objectives:

The purpose of the program is the adoption and implementation of eco-efficiency (cleaner production) approach as a means of climate change adaptation in industry and formation of the required infrastructure for its dissemination on national basis. In this context awareness raising and capacity building for eco-efficiency, dissemination of cleaner production technologies, formation of a national experts pool on cleaner production, establishment of an information centre, implementation of six demonstration projects, dissemination of the results and establishment of a national cleaner production centre are among the objectives of the program.

Execution:

Program activities were carried out by the Technology Development Foundation of Turkey in accordance with the following time schedule under the coordination of UNIDO with the consultancy of Prof. Dr. Göksel N. Demirer from Middle East Technical University (METU).

Planning and Preparation Phase	June 2008 – March 2009
1.1. Establishment of project team 1.2. Establishment of an Advisory Board 1.3. Determination of priority sectors 1.4. Determination of local (Seyhan River Basin), national and sectoral stakeholders	
Implementation Phase	March 2009 – March 2011
2.1. Establishment of an Information Centre which would work in coordination with the related eco-efficiency institution on national and international 2.2. Awareness raising and informative meetings/workshops at national and international level 2.3. Training programs on eco-efficiency and cleaner production 2.4. Eco-efficiency implementation (pilot projects) at companies 2.5. Providing continuous support for pilot implementation projects at companies 2.6. Studies on the establishment of National Cleaner Production Centre	
Monitoring and Dissemination Phase	December 2010 – December 2011
3.1. Pilot project implementations, monitoring of the results and reporting 3.2. Preparation of guiding documents on priority sectors 3.3. Dissemination activities	

Results/Outcomes:

A widespread awareness and interest developed for eco-efficiency (cleaner production) concept

A considerable capacity and a pool of national experts

An information Center and dissemination tools (web sites, publications, documentary film, resources, etc.)

Eco-efficiency (Cleaner Production) Implementation Manual

Infrastructure Studies for Eco-efficiency (Cleaner Production) Centre

Strategies and comprehensive studies started by public and private sector institutions

Six pilot projects with the following economic and environmental outcomes

Investment cost: 264,800 \$, annual financial saving: 1,357,792 \$, payback period of the six projects: 2.3 months

Production process and product quality improvement in the pilot project companies

Labor-saving in the pilot project companies

Shortening the duration of the process in the pilot project companies

Reduction in maintenance costs in the pilot project companies

Water Saving:	784,550 m ³ /year (%22)
Chemical saving:	192 tons/year Salt (NaCl) 7.7 tons/year Thinner 5.2 tons/year Sodium cyanide (NaCN) 1.2 tons/year Cadmium Oxide (CdO) 1.7 tons/year Other
Energy Saving:	4,681,000 kWh/year Natural gas 265,970 kWh/year Electricity
Reduction in CO ₂ emissions	978 ton/year CO ₂
Other savings	Shortening the duration of the process Reduction in maintenance costs Reduction in the cost of wastewater treatment Improving the working environment

Future Plans:

TTGV has gained an important capacity through the cooperation with Middle East Technical University and other related networks. Projects and activities of TTGV conducted on this subject are increasing exponentially. Collaboration and service requests from public and private sectors are tried to be met within the resources of TTGV. In this context, environmental management and cleaner production activities have been carried out for the textile sector within the scope of “United Nations Joint Program on Harnessing Sustainable Linkages for SMEs in Turkey’s Textile Sector. Moreover, “Dissemination of Cleaner Production in İzmir” Project has been carried out by TTGV with the financing of İzmir Development Agency. “Industrial Symbiosis Project in Iskenderun Bay” is also carried out by TTGV with the financing of BTC Pipeline Company. Furthermore, TTGV has been conducting some activities for the establishment of a network between companies active in different sectors and environmental service providers within the scope of the EU project called “Better Environment Better Business”. As a core business of TTGV financial support has been given to cleaner production activities of industry within “Environmental Supports” of TTGV since 2006. By means of mentioned projects/activities, dissemination of the cleaner production concept has been increased and sustainability has been ensured with the established cooperation and capacity.

Lessons Learned:

By considering learning by seeing behavior of the companies, it is observed that implementation projects increase the dissemination potential of eco-efficiency (cleaner production) and ensure the sustainability of these activities. Thus, pilot projects monitored, reported and presented accurately are very important for dissemination of these concepts. Contact and cooperation possibilities with all related stakeholders strengthen these types of programs. In such approaches, public private sector interfaces can be very active, and close and dynamic relationships with the industry are very important. For the integration of cleaner production concepts into national policies, comprehensive programs should be conducted on the policy, financing, cooperation, and information sharing networks, capacity and awareness components of the subject.

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