

# **Market Opportunities for Climate Change Technologies and Services in Developing Countries**

U.S. Agency for International Development  
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Technology



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## ACRONYMS

ASD	Adjustable Speed Drive
BAU	Business-As-Usual
CCMTS	Climate Change Mitigation Technologies and Services
DOE IEA	Department of Energy's International Energy Administration
DSM	Demand Side Management
ESCO	Energy Service Company
FDI	Foreign Direct Investment
GCC	Global Climate Change
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HVAC	Heating, Ventilation & Air Conditioning
ITS	Intelligent Transportation Systems
OECD	Organization for Economic Cooperation and Development
T&D	Transmission and Distribution

## EXECUTIVE SUMMARY

A significant market for climate change mitigation technologies and services has been created in developing countries, driven by power sector reforms, cost effectiveness, and environmental concerns. This report estimates the size of this market in developing countries, and discusses two scenarios for growth over the next ten years. The developing regions analyzed include Asia, Africa/Middle East, Eastern Europe and Russia, and Latin America. The sectors analyzed include commercial, residential and industrial use, energy supply, and transportation.

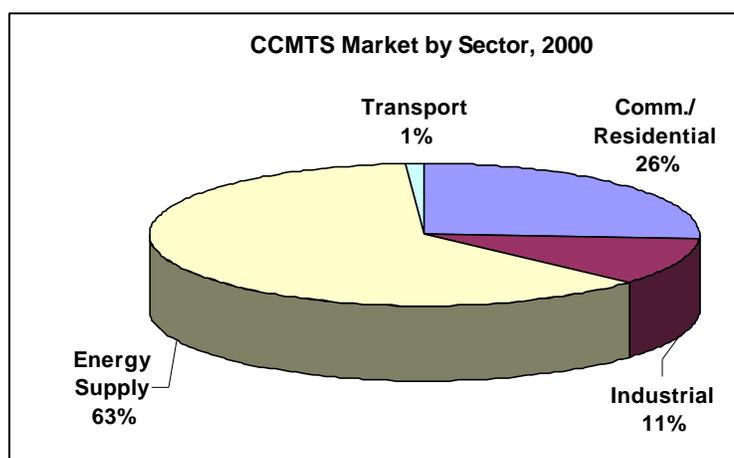
Combined, these four sectors make up a market for climate change mitigation technologies and services (CCMTS) that is estimated to be \$29.9 billion in developing countries in 2000. The U.S. share of this developing country market is estimated to be \$5.3 billion, or 18 percent, in 2000.

Market projections for growth to 2010 were developed under two scenarios, the “Business-As-Usual” scenario and the “Aggressive Growth” scenario. The Business-As-Usual scenario uses projected GDP growth rates to develop market estimates over the next ten years. Under the Business-As-Usual scenario, the CCMTS market is estimated to be \$51.7 billion in 2010. The Aggressive Growth scenario takes into account the highest expected growth rates for technologies. Under the Aggressive Growth scenario, the CCMTS market is estimated at \$64.9 billion.

*Market Estimates for CCMTS (\$ billion)*

	2000	2010 (BAU)	2010 (Aggressive Growth)
Market Size	\$29.9	\$51.7	\$64.9

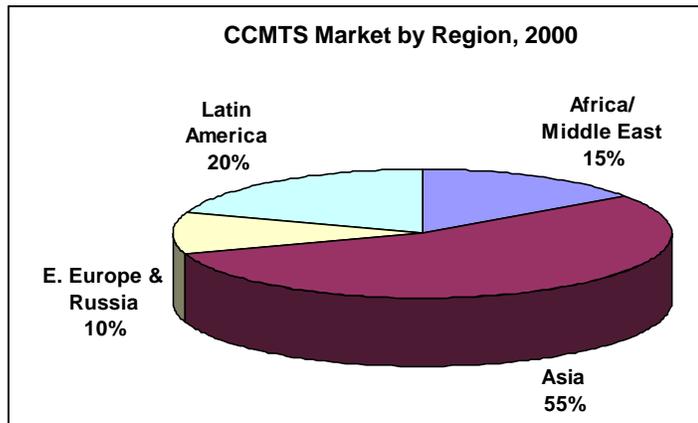
As shown in the adjoining chart, technologies and services in the *commercial and residential* sector represent 26 percent of the overall market for climate change mitigation technologies and services including those for energy efficient lighting, building envelope, building process controls, household appliances, and heating, ventilation and air conditioning. In many regions this market is well developed due to promulgation of codes and standards, government and institutionally supported programs for demand-side-management and end-use efficiency.



Climate change mitigation technologies and services in the *industrial* sector include process design and controls, motors, boilers, co-generation, and adjustable speed drives. Although it is a growing market, the climate change mitigation technologies and services associated with the industrial sector make up only 11 percent of the market. The modernization and expansion of industrial sectors in developing countries will continue to create new opportunities in this sector.

The *energy supply* sector is typically the largest contributor to GHG emissions and is a growing sector in most developing countries. There are multiple technology options offering developing countries an opportunity to continue the expansion of energy supply with minimal additional emissions. The improved efficiency of new technologies and the desire to use cleaner fuels in new facilities have contributed to a sizeable market of 63 percent for clean energy technologies and services in developing countries. The *transportation* sector is usually the second largest contributor to greenhouse gas emissions, but makes up less than 1 percent of the current market for climate change mitigation technologies and services. Mass transit, technologies and services for alternative fuel vehicles, and intelligent transportation systems are gaining the attention of developing country governments as an alternative to the highly polluting vehicles and transportation systems currently in place.

As shown in the adjoining chart, *Asia* is by far the largest regional market, accounting for 55 percent of the total market. This is in part due to the sheer size and population of the region as well as the high rates of economic growth that have prevailed for most of the past 15 years. Although *Asia* dominates in terms of absolute size, *Latin America* represents a fast growing market accounting for 20 percent of the developing country market. The *Middle East and Africa* account for 15 percent, and *Eastern Europe and Russia* for the remaining 10 percent.



# 1 INTRODUCTION

The market for technologies and services leading to reduced greenhouse gas (GHG) emissions is growing, driven in part by the international debate over climate change. The market for climate change mitigation technologies and services (CCMTS) includes the traditional energy efficiency market as well as supply-side technologies in clean and renewable power generation, and transportation. Growth in these markets represents opportunities for US manufacturers and warrants the attention and efforts of industry representatives and policy-makers.

The objective of this report is to estimate the market for CCMTS in emerging economies (Africa and Middle East, Asia, Eastern Europe and Russia, and Latin America) over the 2000-2010 period. The market growth estimates for 2010 are addressed from two perspectives: a Business-As-Usual (BAU) Scenario, and an Aggressive Growth Scenario.

Additionally, a brief review of the qualitative characteristics of the commercial and residential, industrial, energy supply and transportation sectors are provided as follow-on to the report “Markets for Climate Change Mitigation Technologies and Services in Developing Countries.”<sup>1</sup> In many ways this report builds on and should be used in conjunction with this previous effort.

## 1.1 SCOPE OF THE REPORT

The report discusses the emerging market for CCMTS in developing countries, and is presented in four chapters:

1. *Introduction.* This chapter briefly discusses the emerging market for CCMTS in developing countries.
2. *Qualitative Profile of CCMTS Market.* This chapter provides a qualitative profile of the CCMTS market in essential economic sectors including power generation; industrial, commercial and residential energy use; and the transportation sector.
3. *The Market for CCMTS in Developing Countries (Business-As-Usual growth scenario).* This chapter describes the market drivers for CCMTS in developing countries under BAU; the methodology for market size derivation; estimates the current and future market size under BAU; and discusses the current U.S. share of this market.

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<sup>1</sup> U.S. Department of Commerce, “Markets for Climate Change Mitigation Technologies and Services in Developing Countries,” July 1999. Hagler Bailly Services, Inc.

4. *The Market for CCMTS in Developing Countries (Aggressive Growth Scenario)*. This chapter discusses essential issues affecting markets in developing countries; the methodology for estimating the additional CCMTS market under an aggressive growth scenario, and the size of the CCMTS market in 2010 under this scenario.

## 2 PROFILE OF THE CCMTS MARKET

The combustion of fossil fuels contributes significantly to the emissions of carbon dioxide, one of the most important greenhouse gases. Carbon dioxide emissions are also more directly attributable to humans than the other GHGs, and are therefore a primary target of GHG emissions reduction activities. The major options for reducing carbon dioxide emissions fall into three categories:

- a) Increasing the efficiency of energy supply and end-use technologies;
- b) Shifting energy supply away from high carbon fuels; and
- c) Changing travel and traffic patterns to conserve energy.

This chapter describes the market for CCMTS in four sectors in qualitative terms:

- commercial and residential,
- industrial,
- energy supply, and
- transportation.

### 2.1 COMMERCIAL AND RESIDENTIAL SECTORS

The commercial and residential sectors offer opportunities for energy-efficient equipment including:

- lighting (T8, CFLs);
- heating, ventilation, air conditioning (chillers, fans);
- household appliances (dishwashers, refrigerators);
- improved building envelope technologies (insulation, “R” windows); and
- building energy use controls (control systems).

U.S. exports of energy-efficient lighting are likely to become the single largest market opportunity in this market segment based on the sheer volume of sales, and support from government demand-side-management programs (DSM). The building and construction-related good and services market (for example, HVAC, building envelope and building controls) benefits from construction booms often stemming from rapid economic growth. Consulting services to government agencies (in developing product energy efficiency standards), electric utilities (in developing DSM), and individual commercial entities are also in great demand.

## **2.2 INDUSTRIAL SECTOR**

The greatest increases in the efficiency of energy and materials use often come not from direct efforts to reduce consumption but rather from improved product quality and controlled consumption. Energy-efficient technologies include:

- industrial process, design and controls (pinchpoint analysis and digital controllers);
- efficient motors and pumps (adjustable speed drivers);
- cogeneration (heat recovery at sulfuric acid plants);
- efficient lighting;
- boiler efficiency; and
- replacement of existing technologies with newer ones (replacement of furnaces at glass plants from coal fired to gas fired)

The industrial sector is a growing market for energy-efficient technologies, as industries in developing countries are expected to continue investing in modern production processes. The five biggest energy consumers in the industrial sector are pulp and paper, chemicals, petroleum, primary metals, and cement industries, representing strong markets for GHG mitigation technologies in developing countries.

The greatest opportunities for energy efficiency consulting services in industry lie in helping facilities identify and implement energy efficiency improvement. The services may include energy efficiency audits, training programs for operators of energy-intensive equipment, designing systematic maintenance programs, and specifying and installing relevant process equipment.

Another market for consulting services is in helping government agencies, electric utilities, or organizations with a specific mandate to promote energy conservation to design and implement energy efficiency programs. For example, governments need assistance in developing equipment efficiency standards, regulations for utilities to encourage industrial DSM programs and purchase of cogenerated electricity, designing financial incentives, information programs, etc.

## **2.3 ENERGY SUPPLY SECTOR**

The energy supply sector is often the largest contributor to GHG emissions. As power generation continues to grow in developing countries, there are multiple technology options offering opportunities to expand energy supply while minimizing environmental impacts. Exports of these technologies constitute a major market opportunity for U.S. suppliers.

There are four basic categories of GHG-reducing technologies for the energy supply sector:

- clean power generation (combined gas fired turbines in mode);

- renovation and modernization of existing plants: power plant technology, combustion, efficiency improvements, and fuel switching (heat rate improvements);
- electricity transmission and distribution (T&D) efficiency improvements (loss reduction through capacitor installation); and
- renewable energy technologies (wind, biomass).

There is also a substantial market for consulting services in the energy supply sector, including assistance to governments in developing energy efficiency incentives for the power sector, and energy system planning for electric utilities.

## **2.4 TRANSPORTATION SECTOR**

The transportation sector is a major source of GHG emissions worldwide. In the U.S., the transport sector accounts for about 32 percent of carbon dioxide emissions. Motor vehicles are expected to be the fastest growing source of U.S. GHG emissions through the year 2000.<sup>2</sup> There are three primary means to reduce GHG emissions from motor vehicle travel:

- reduce vehicle travel (mass transit, intelligent transportation systems);
- increase fuel economy; and
- switch to fuels with a lower life-cycle carbon content.

Intelligent transportation systems (ITS) have the potential to reduce vehicle travel through reduced highway congestion, improved mobility, improved public transport; and overall transport management. The potential for emission reductions from increased efficiency and improved traffic management are an important benefit to implementing ITS.

The transportation sector in developing countries currently provides limited but growing opportunities for both equipment exports (vehicles with improved fuel efficiency characteristics, clean fuel vehicles, and related equipment) and consulting services. The consulting services focus on designing and implementing transportation management systems (including travel pricing mechanisms, public transit planning, and appropriate spatial development) for major metropolitan areas in developing countries.

## **2.5 PRINCIPAL DEVELOPING COUNTRY MARKETS FOR GHG MITIGATION TECHNOLOGIES**

Markets in developing countries represent opportunities for climate change mitigation technologies and services. Exhibit 1 on the following page summarizes the geographic regions representing best opportunities in developing countries for GCC technologies.

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<sup>2</sup> US DOT, 1998.

*Exhibit 1: Important Regional Markets for CCMTS*

Sector	Technologies	Africa/ Middle East	Asia	Eastern Europe & Russia	Latin America
Commercial & Residential	Energy-efficient lighting		✓	✓	✓
	Building controls/HVAC	✓	✓	✓	
	Building envelope		✓		✓
	Household appliances	✓	✓		
Industrial	Industrial process controls		✓		✓
	Industrial motors		✓	✓	
	Cogeneration			✓	
	Efficient boilers		✓	✓	
Energy Supply	Clean coal technologies		✓	✓	
	Advanced natural gas technologies	✓	✓	✓	✓
	T&D improvements		✓		
	Renewable energy technologies		✓	✓	✓
Transportation	Intelligent Transportation Systems		✓	✓	✓
	Engine technologies		✓	✓	✓
	Clean fuel vehicles		✓	✓	✓

**COMMERCIAL AND RESIDENTIAL SECTORS**

The most promising markets for building controls are in Asia and, to a lesser extent, Eastern Europe. Likewise, the building envelope market is largest in Asia, reflecting large construction markets that exist in many Asian countries. Although Asia dominates in terms of absolute size, Eastern Europe represents a fast growing market. Asia, the largest regional market, accounts for more than 50 percent of the total market for energy-efficient appliances. Since energy-efficient appliances tend to be more expensive than less efficient models, the market growth will be more or less dependent on increases in disposable incomes in countries that introduce minimum efficiency standards for appliances.

The market for energy efficiency consulting services geographically follows the market for relevant products. It is expected to be greatest in Asia (particularly in China, South Korea, Taiwan, Singapore, Thailand, and the Philippines), followed by Latin America and Eastern Europe.

**INDUSTRIAL SECTOR**

The market for process controls is expected to grow over the next two decades with increasing demand met primarily through imports. The biggest regional market for process controls is Asia, followed by Latin America and the most promising markets include South Korea, China, Taiwan, and Singapore. South Korea is quite advanced in its use of process controls. Chinese companies are installing basic process controls on newer machines, while Indian manufacturers are often installing used machines with very advanced automation systems.

Adjustable speed drives (ASDs) are a fairly new technology in the market but the demand for them has grown rapidly in conjunction with motor use in industrial, commercial, and residential sectors where variable load applications are common. The largest market for both motors and ASDs is expected to remain in Asia, but the East European market for ASDs is expanding as capital constraints ease.

The largest markets for cogeneration equipment are in China, Brazil, and Thailand. Growth over the decade is expected to be moderate, except in specific countries such as Turkey, India, Russia, Argentina, Brazil, and Venezuela. The cogeneration market is virtually nonexistent in Africa and the Middle East.

### **ENERGY SUPPLY SECTOR**

Combined cycle technology for gas-fired plants (in the Middle East, Latin America, and Eastern Europe) has a large developing country market. Utility-sized energy-efficient boilers are in demand to replace existing boiler equipment that is generally old and inefficient in Asia and Eastern Europe. Latin America is an important market for technologies in hydropower generation and has a growing gas turbine market as well.

Countries with existing renewable energy programs and related infrastructure will be the most growing markets for renewable energy technologies. Geographically, the demand is concentrated in areas where certain types of renewable energy sources are economically viable, and where there is a lack of access to the centralized power grid. Additionally, large-scale on-grid wind power systems are beginning to make their way to developing countries, led by China, and have the potential to develop into a substantial market.

### **TRANSPORTATION SECTOR**

The transportation sector in developing countries currently provides limited but growing opportunities for both equipment exports (cleaner vehicles, parts, and other equipment) and consulting services (primarily in transportation management systems).

The market for improved vehicle technologies geographically coincides with the markets of multinational vehicle manufacturers. Most developing countries do not exercise direct control over the design of the vehicles they import or assemble (vehicles manufactured or assembled by most countries use designs if not components supplied by multinational vehicle producers). Domestic policies can influence the mix of imported vehicles or their components to increase the vehicles' fuel economy. However, vehicle prices remain a critical factor in most developing country markets.

The size of the market for clean fuel vehicles depends primarily on the local price differential between gasoline and alternative fuels and the existence of a commercial infrastructure for alternative fuels. Currently, neither of these factors is favorable in developing countries. Therefore, the market for clean fuel vehicles will be very small in the near future. It is generally

limited to government procurement of such vehicles for use in cities with severe air pollution problems (e.g., Cairo, Sao Paulo, and Manila).

The market for consulting services in transportation management systems is driven primarily by multinational donor projects aiming at improving air quality in major metropolitan areas in developing countries. These services need to be tailored to each urban center individually to account for a wide range of local factors, such as physical infrastructure, characteristics of the urban transport system, and transport demand.

### **3 THE MARKET FOR CCMTS IN DEVELOPING COUNTRIES UNDER BUSINESS-AS-USUAL**

#### **3.1 MARKET DRIVERS**

The market for CCMTS reflects a number of trends and issues facing the global energy sector including a shift in focus from industrialized to developing countries. This shift is reflective of several global trends impacting the market for these technologies in developing countries including power sector reform, increasing demand for energy and electricity, cost effectiveness, and increasing environmental concerns. These trends have contributed to a growing market for energy efficient and climate change mitigation technologies in developing countries.

#### **POWER SECTOR REFORMS**

Power sector reforms provide an alternative to government funding of electricity supply required by a rapidly growing demand for electricity in developing countries. Reforms (commercialization, privatization, restructuring, and competition) affect the market for energy efficiency by changing the preference of fuel and supply technologies, tariff structures and price signals. In 1997 and 1998 more than \$13 billion was invested in power projects in developing countries.<sup>3</sup> Clean energy power projects, including combined cycle gas turbine, hydropower, and wind power make up a growing share of these investments, which would not be possible without some level of private participation in the power sector.

The liberalized energy markets also present opportunities for the introduction of alternative and renewable energy sources such as wind and solar electricity. Wind energy, in particular, has thrived in the reformed markets of industrialized nations and is expected to increase in developing countries as the economics and technologies improve.

Power sector reforms also provide incentives for end-use efficiency in developing countries by ending subsidies and adjusting electricity prices to reflect costs. Paying the full cost for electricity, and knowing that these costs will be collected, provides an incentive to electricity consumers to adapt energy saving technologies.

#### **GROWING DEMAND FOR ELECTRICITY AND ENERGY**

Developing countries, particularly those in Asia, have seen an increase in demand for energy and electricity spurred on by years of rapid economic growth. The increasing energy use per capita coupled with rising urban populations has created severe electricity shortages resulting in brownouts and blackouts. From these conditions developed a need for energy conservation

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<sup>3</sup> Estimated from project closures in 1997-1998, according to the Hagler Bailly Independent Power Producer Database.

leading to energy efficiency initiatives promoted by governments and development banks. Even when electricity supply improves, these programs continue to encourage the adaptation of energy efficient technologies. Government incentive programs and international initiatives have provided information, encouraging industries to adapt more energy efficient technologies and practices.

Additionally, the economic growth in developing countries has given way to construction booms providing tremendous opportunities for energy efficient technologies in the commercial buildings industry. In many new and growing sectors, energy efficient technologies are gaining market share over traditional technologies. Increased access to information and availability to CCMTS are important factors driving the growth of this market.

Finally, an increase in per capita income provides more disposable income and a demand for high quality products which are often more energy-efficient. This is especially true in the residential sector with household appliances.

### **COST EFFECTIVENESS**

Investors and business managers have learned that one way to improve the bottom line is to cut operating and production costs. Climate change mitigation technologies can save substantial amounts of money by increasing energy and process efficiencies to reduce input costs of electricity and fossil fuels. This cost savings has provided an incentive to implement energy saving practices in firms, particularly the energy intensive industries present in many developing countries.

In addition to creating new markets for CCMTS, this cost effectiveness has created an entirely new industry focused on identifying and profiting from energy savings. Energy Service Companies (ESCOs) with expertise in packaging and financing energy efficiency projects are rapidly expanding into developing countries and are expected to play an important role in the future CCMTS market.

### **ENVIRONMENTAL CONCERNS**

The environmental movement spawned in Europe and North America has grown over the past two decades, benefiting from the information age and globalization of world markets. Developing countries have recognized the value of the natural environment and are responding to the demands of local and international non-government organizations and development banks by instituting stricter regulatory and enforcement practices. Market-based instruments (e.g., fees, permits, subsidies, trading schemes, etc.) have also been embraced by many developing countries, as an alternative to traditional environmental regulations for encouraging cleaner and more efficient production.

Issues of water scarcity, biodiversity loss and global climate change have heightened the global awareness of environmental issues, contributing to the voluntary actions of companies who wish

to be recognized for their environmental performance. The environmental objectives of these companies are often met through the implementation of CCMTS.

### 3.2 METHODOLOGY FOR MARKET SIZE DERIVATION

The baseline data for certain sectors used to develop the estimates of the CCMTS market were drawn from Hagler Bailly's previous research in this area.<sup>4</sup> This research used 1996 import-export statistics to derive the developing country market estimates. These estimates were adjusted to 2000 markets estimates using GDP growth rates provided by the World Bank (Exhibit 2).

*Exhibit 2: Average Annual Percentage of GDP Growth in Developing Regions*

Region	1991-2000 average annual growth (%)	1996-2000 average annual growth (%)
Africa/Middle East	2.5	2.8
Asia	6.8	4.0
Central/East Europe	-1.5	1.8
Latin America	3.5	3.5

For the sectors not originally included in the 1997 Market Study (e.g., power, renewables, and transportation), trade data were once again used to develop estimates, with cross references from industry and trade publications. Data for the power sector were derived from Hagler Bailly's proprietary IPP database, the Utility Data Institute, and U.S. International Trade Administration export statistics. Supplementary information on the use of renewables in the energy supply sector was available through the U.S. Department of Energy's International Energy Administration and *Renewable Energy World*, both of which provided important statistics on current and projected market size and trends for renewable energy solutions.<sup>5</sup>

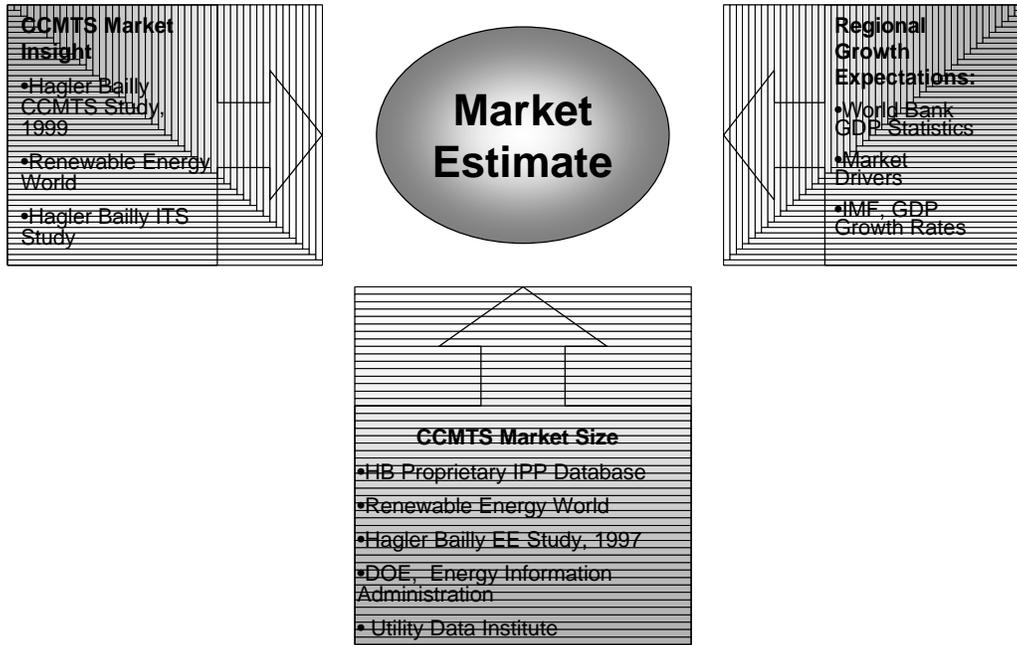
Finally, industry associations and Hagler Bailly's Intelligent Transportation Systems (ITS) research provided base data for the transportation sector<sup>6</sup>. Exhibit 3 below illustrates the various sources of reference contributing to the development of the estimated market for CCMTS in developing countries.

<sup>4</sup> See: USAID, "The Energy Efficiency Market in Developing Countries: Trends and Policy Implications, 1997. Hagler Bailly Services, Inc.

<sup>5</sup> Sources: DOE, Energy Information Administration, International renewable Energy Overview, 1998. DOE, EIA, Solar Thermal and Photovoltaic Collector Manufacturing Activities, 1998. DOE, EIA, Wind Energy Developments: Incentives in Selected Countries. DOE, EIA, Hydroelectricity and Other Renewable Sources, 1999. Renewable Energy World, July 1999. Renewable Energy World, May 1999.

<sup>6</sup> The Market for Emerging Technology Applications in Transportation, Hagler Bailly Services, 1999.

*Exhibit 3: Framework for Market Development in Developing Countries*



### 3.3 SIZE OF CURRENT MARKET FOR CCMTS

We estimate that the CCMTS market in developing countries is just under \$30 billion in 2000 (Exhibit 4).

Total CCMTS Market, 2000  
**\$29.9 billion**  
 U.S. Share of CCMTS Market, 2000  
**\$5.3 billion**

*Exhibit 4: CCMTS Markets by Sector, 2000 (\$ Million)*

Region	Commercial and Residential Sectors	Industrial Sector	Energy Supply	Transportation
Africa/Middle East	\$604	\$210	\$3,636	\$19
Asia	\$4,464	\$1,959	\$9,992	\$41
East. Europe & Russia	\$998	\$509	\$1,517	\$83
Latin America	\$1,658	\$467	\$3,691	\$60
<b>Total</b>	<b>\$7,724</b>	<b>\$3,145</b>	<b>\$18,836</b>	<b>\$203</b>

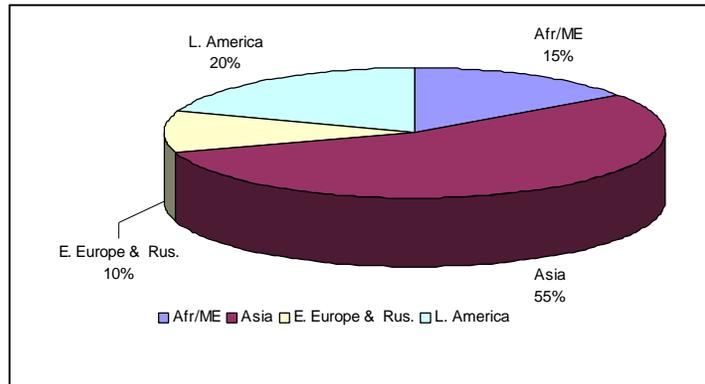
Hagler Bailly used 1998 U.S. export statistics as baseline data to derive the U.S. share of the total CCMTS market in the commercial, residential, industrial and power sectors. The 1998 estimates were adjusted to 2000 to reflect the underlying economic growth in developing regions. As shown in the adjoining table, the U.S. share of the CCMTS market is estimated to be \$5.3 billion in 2000, or about 18 percent of the total market (remarkably similar to the U.S. share of worldwide exports for all goods and services in 1997).<sup>7</sup>

*U.S. Share of CCMTS Market, 2000 (\$ Million)*

Sector	U.S. Market Share
Commercial and Residential	\$1,692
Industrial	\$883
Energy Supply	\$2,650
Transportation	\$81
<b>Total</b>	<b>\$5,306</b>

Exhibit 5 portrays the CCMTS market by region. Asia is by far the largest regional market, accounting for 55 percent of the total market. This is in part due to the sheer size and population of the region as well as the high rates of economic growth that have prevailed for most of the past 15 years. Latin America makes up the next largest market with 20 percent of the developing country market. The Middle East and Africa account for 15 percent, and Eastern Europe and Russia account for the remaining 10 percent.

*Exhibit 5: CCMTS Market in Developing Countries, 2000*



**COMMERCIAL AND RESIDENTIAL SECTORS**

The commercial and residential sectors offer sizable opportunities to suppliers of CCMTS. Asia’s construction boom of the 1980s and early 1990s helped propel this market overseas and it has continued to grow, expanding to Latin America, Eastern Europe and Russia and Africa and the Middle East. Exhibit 6 depicts the size of the market by technology and by region.

<sup>7</sup> Trade data from UNCTAD indicate that U.S. exports of goods and services in 1997 totaled \$949 billion, or 19 percent of total exports from all OECD countries (\$4,917 billion).

*Exhibit 6: Commercial and Residential Sector Market, 2000 (\$ Million)*

<b>Region</b>	<b>Lighting</b>	<b>Building Envelope</b>	<b>Building Controls</b>	<b>HVAC</b>	<b>Appliances</b>
Africa and Middle East	\$61	\$174	\$166	\$44	\$160
Asia	\$859	\$1,138	\$1,102	\$493	\$872
East. Europe & Russia	\$331	\$233	\$279	\$36	\$119
Latin America	\$133	\$430	\$641	\$213	\$242
<b>Total</b>	<b>\$1,383</b>	<b>\$1,976</b>	<b>\$2,188</b>	<b>\$786</b>	<b>\$1,391</b>

**INDUSTRIAL SECTOR**

The use of CCMTS in the industrial sector is an important and growing market in developing countries. The majority of developing countries have a large number of new industries moving into their countries, which provides a large market for new technologies. In addition to the growing market for CCMTS in new industries, some of the more established and older industries have a need for services and technologies to retrofit existing facilities. Exhibit 7 provides details of the market estimate for CCMTS in the industrial sector in 2000.

*Exhibit 7: Industrial Sector Market, 2000 (\$ Million)*

<b>Region</b>	<b>Controls</b>	<b>Motors</b>	<b>Boilers</b>	<b>Cogen</b>	<b>ASDs</b>
Africa and Middle East	\$44	\$84	\$30	\$18	\$34
Asia	\$704	\$209	\$488	\$152	\$405
East. Europe & Russia	\$89	\$104	\$116	\$67	\$134
Latin America	\$101	\$25	\$229	\$30	\$82
<b>Total</b>	<b>\$938</b>	<b>\$423</b>	<b>\$862</b>	<b>\$267</b>	<b>\$654</b>

**ENERGY SUPPLY SECTOR**

Up until recently, the energy supply sector has been a growth industry representing billions of dollars of investments in new generation, transmission and distribution systems and facility renovation and modernization efforts that follow a privatization or sale of an asset. The clean energy technologies for energy supply make up a significant portion of the total CCMTS market. Exhibit 8 breaks down the energy supply sector into clean generation (e.g., combined cycle natural gas, clean coal, nuclear, hydro), transmission and distribution improvements, wind, and solar.

*Exhibit 8: Energy Supply Sector Market, 2000 (\$ Million)*

<b>Region</b>	<b>Clean Generation</b>	<b>Wind Power</b>	<b>Solar Power</b>	<b>T&amp;D Improvements</b>
Africa and Middle East	\$3,392	\$6	\$68	\$170
Asia	\$9,161	\$321	\$53	\$458
East. Europe and Russia	\$1,400	\$34	\$13	\$70
Latin America	\$3,425	\$6	\$89	\$171
<b>Total</b>	<b>\$17,378</b>	<b>\$367</b>	<b>\$222</b>	<b>\$869</b>

**TRANSPORTATION SECTOR**

The transportation sector has only recently developed the products and services that significantly reduce GHG emissions, such as alternative or clean fuel vehicles and intelligent transportation systems. These vehicles are generally more expensive than traditional gas-powered vehicles, and are entering markets mainly through government and donor assistance programs. Intelligent transportation systems have generated interest for their potential to alleviate congestion, a by-product of which is reduced vehicle emissions. Exhibit 9 provides details for the transport sector.

*Exhibit 9: Transportation Sector Market, 2000 (\$ Million)*

<b>Region</b>	<b>Clean Fuel Vehicles</b>	<b>ITS</b>
Africa and Middle East	\$4	\$16
Asia	\$18	\$24
East. Europe & Russia	\$6	\$77
Latin America	\$5	\$55
<b>Total</b>	<b>\$33</b>	<b>\$172</b>

### 3.4 METHODOLOGY USED TO PROJECT CCMTS MARKET IN 2010 UNDER A BUSINESS-AS-USUAL SCENARIO

The estimates derived for 2000 were grown through 2010 using projected GDP growth rates for each region analyzed in this study. Exhibit 10 provides the estimates used to make these projections.

*Exhibit 10: GDP Growth Estimates, 2000-2010*

Region	Average Annual Growth
Africa & Middle East	3.7 %
Asia	6.6 %
East. Europe & Russia	5.0 %
Latin America	4.4 %

### 3.5 PROJECTED CCMTS MARKET IN 2010 UNDER A BUSINESS-AS-USUAL SCENARIO

Over the next 10 years, market growth is expected to continue. Exhibit 11 provides specific market growth estimates for each region and sector.

Total CCMTS Market in  
Developing Countries, 2010  
**\$51.7 billion**

*Exhibit 11. CCMTS Markets by Sector, 2010  
(\$ Million)*

Region	Commercial and Residential Sectors	Industrial Sector	Energy Supply	Transportation
Africa & Middle East	\$868	\$302	\$5,229	\$28
Asia	\$8,458	\$3,711	\$18,934	\$78
East. Europe & Russia	\$1,626	\$830	\$2,471	\$135
Latin America	\$2,551	\$718	\$5,677	\$92
<b>Total</b>	<b>\$13,503</b>	<b>\$5,561</b>	<b>\$32,311</b>	<b>\$333</b>

## 4 THE MARKET FOR CCMTS IN DEVELOPING COUNTRIES UNDER AN AGGRESSIVE GROWTH SCENARIO

For many technology markets, the CCMTS market will likely grow faster than the economy (as projected in the BAU scenario discussed earlier). Global trends impacting the market for CCMTS in developing countries include power sector reform, increasing demand for energy and electricity, cost effectiveness, and increasing environmental concerns. These trends, discussed below, were used to develop an Aggressive Growth scenario over the 2000-2010 period.

### 4.1 MARKET DRIVERS

This section examines the key market drivers, underlying assumptions and the impacts on the commercial & residential, industrial, energy supply and transportation sectors.

*Exhibit 12: Market Drivers, Assumptions and Impacts on Sectors*

ASSUMPTIONS	IMPACTS
<b><i>Power Sector Reforms</i></b>	
<ul style="list-style-type: none"> <li>➤ As reforms are completed a slowdown in both privatization and greenfields projects across all regions is expected.</li> <li>➤ Market liberalization will continue to provide opportunities for natural gas.</li> <li>➤ Removal of subsidies continues.</li> </ul>	<p><i>Commercial &amp; Residential:</i> possible price increases may encourage conservation</p> <p><i>Industrial:</i> liberalized markets may find increased cooperation among suppliers and consumers of energy encouraging additional cogeneration and boiler efficiencies</p> <p><i>Energy Supply:</i> overall slowdown of investments</p> <p><i>Transportation:</i> little to no impact</p>
<b><i>Electricity Demand</i></b>	
<ul style="list-style-type: none"> <li>➤ Continues to grow in developing countries but at slower rates.</li> <li>➤ Newly constructed or developed businesses are likely to employ energy efficient practices helping reduce growth.</li> </ul>	<p><i>Commercial &amp; Residential:</i> slower growth will remove some pressure for end-use conservation</p> <p><i>Industrial:</i> programs for end-use efficiency in manufacturing will continue</p> <p><i>Energy Supply:</i> new supplies are likely to be more efficient using natural gas and combined cycle</p> <p><i>Transportation:</i> little to no impact</p>

<p>➤ Cost effectiveness will remain an ongoing concern as globalization puts more pressure on developing country manufacturers to streamline costs.</p>	<p><b>Cost Effectiveness</b></p> <p><i>Commercial &amp; Residential:</i> as information and product availability increase this sector is likely to expand</p> <p><i>Industrial:</i> expanding manufacturing sectors are likely to demand efficient technologies</p> <p><i>Energy Supply:</i> ongoing renovation and modernization of old systems will encourage improved efficiency in the power sector</p> <p><i>Transportation:</i> a desire to cut down on fuel costs and productivity losses may encourage ITS</p>
<p>➤ Increased environmental pressures are likely to continue in the near future as income grows and awareness of negative environmental externalities spreads.</p>	<p><b>Environmental Concerns</b></p> <p><i>Commercial &amp; Residential:</i> not likely to cause any major changes</p> <p><i>Industrial:</i> improved information systems and environmental enforcement will increase demand of CCMTS</p> <p><i>Energy Supply:</i> an increase in the use of renewable technologies is expected, however they will continue to represent a small share of overall market</p> <p><i>Transportation:</i> an increase in demand for alternative fuel vehicles is anticipated</p>

## 4.2 METHODOLOGY USED TO PROJECT CCMTS MARKET IN 2010

Data from various industry sources, including manufacturers sales statistics, earlier business focus series reports, and Hagler Bailly's proprietary data, were combined to develop a new set of growth rates to reflect the influence of the factors discussed above (Exhibit 14). These growth rates vary between 4.1-13.9 percent per annum.

*Exhibit 14: Annual Growth Rates under an Aggressive Growth Scenario*

Region	Commercial and Residential	Industrial	Energy Supply	Transportation
Africa/Middle East	9.6%	11.7%	4.1%	4.1%
Asia	11.0%	9.5%	7.3%	7.3%
E Europe & Russia	13.9%	10.2%	5.5%	5.5%
Latin America	10.8%	9.7%	4.9%	4.8%

### 4.3 PROJECTED CCMTS MARKET IN 2010 UNDER AN AGGRESSIVE GROWTH SCENARIO

Using these growth rates, we estimate that the CCMTS market in developing countries is just under \$65 billion in 2010 (Exhibit 15). This figure represents an aggressive growth scenario where the market drivers described earlier in this chapter are the primary sources of new and growing market activities.

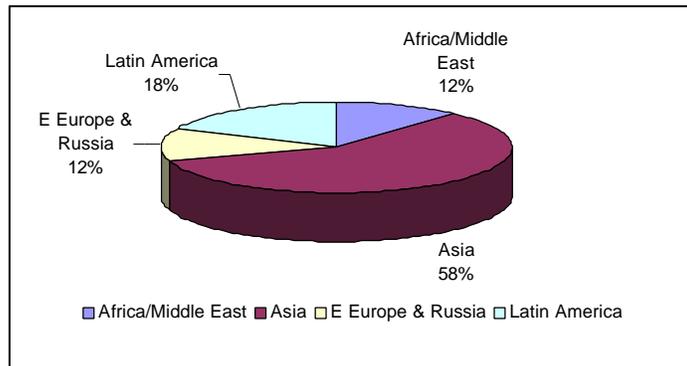
Total CCMTS Market in 2010  
(Developing Countries in \$ Millions)  
**\$64.9 billion**

*Exhibit 15: CCMTS Markets, 2010  
(\$ Million)*

Region	Commercial and Residential	Industrial	Energy Supply	Transportation
Africa/Middle East	\$1,505	\$635	\$5,427	\$29
Asia	\$12,688	\$4,833	\$20,232	\$83
E Europe & Russia	\$3,677	\$1,341	\$2,598	\$141
Latin America	\$4,605	\$1,173	\$5,934	\$96
<b>Total</b>	<b>\$22,476</b>	<b>\$7,983</b>	<b>\$34,191</b>	<b>\$350</b>

Exhibit 16 portrays the projected CCMTS market by region under this scenario. Asia is by far the largest regional market, accounting for 58 percent of the total market. This is in part due to the sheer size and population of the region as well as the high rates of economic growth that have prevailed for most of the past 15 years. Latin America makes up the next largest market with 18 percent of the developing country market. The Middle East and Africa, and Eastern Europe and Russia account for the remaining 24 percent.

*Exhibit 16: CCMTS Market by Region, 2010*



## 5 CONCLUSIONS

As demonstrated in Chapters 3 and 4, the market for climate change mitigation technologies in developing countries provide a significant opportunity for suppliers of these goods and services. (Exhibit 17).

*Exhibit 17: Market Estimates of CCMTS (\$ Billion)*

	<b>2000 Current Market</b>	<b>2010 (Business As Usual Scenario)</b>	<b>2010 (Aggressive Growth Scenario)</b>
Market	\$29.9	\$51.7	\$64.9

There is a substantial opportunity for growth in these technologies under BAU, and the market for CCMTS is even more enhanced by aggressive growth in the commercial and residential, industrial, energy supply and transportation sectors. Some U.S. suppliers of these technologies have shied away from these markets because they are assumed difficult to enter and small size wise, as reflected in the relatively low share of this market the U.S. currently commands. This study demonstrates the potential of these markets in terms of future growth and expectations. A multi-billion market warrants the attention and efforts of U.S. industry representatives and policy-makers before the U.S. loses ground to competitors.



U.S. Agency for International Development

## USAID Sees Rapidly Expanding Overseas Markets for Climate Change Technologies and Services

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT  
PRESS RELEASE

WASHINGTON, DC 20523  
PRESS OFFICE  
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FOR IMMEDIATE RELEASE  
Thursday, June 22, 2000

Contact: Jennifer Brown

**WASHINGTON, DC** - The U.S. Agency for International Development (USAID) released a report today that predicted dramatic growth over the next ten years for environmental technologies and services that will support mounting international efforts to reduce greenhouse gas emissions.

According to the report, *Market Opportunities for Climate Change Technologies and Services in Developing Countries*, under business-as-usual conditions the market for mitigation technologies and services is expected to grow from \$29.9 billion today to \$51.7 billion by 2010. When projecting at the highest possible growth rates for technology markets, the market could grow to as much as \$64.9 billion by 2010. Projections are based on the existing market for climate change mitigation technologies and services, and growth estimates for the industrial, commercial, residential, energy, and transportation sectors of each region.

"Building a market for climate technology is an important component of USAID's overall strategy for accessing the global market, which over the next 20 years will be valued at \$4 to \$5 trillion," said J. Brady Anderson, administrator for USAID, at the Congressional Economic Leadership Institute meeting on Capitol Hill.

The dramatic increases in these markets result from several factors. Growing populations, economic activity, and per capita income motivate many countries to conserve resources and to reduce pollution. Some countries more often see energy and industrial efficiency measures as necessary for successful competition in global markets.

Asia possesses by far the greatest market opportunities for climate change mitigation technologies and services, accounting for 55 percent of the total. Latin America represents a sizeable portion of the market at 20 percent. Africa and the Middle East comprise 15 percent of the market, while Eastern Europe and the Russian Federation make up the remaining 10 percent.

Of the areas where climate change technologies are in most demand, energy supply will play the largest role, taking up 53 percent of the overall market. The energy sector generates the largest portion of greenhouse gas emissions, but is also among the fastest growing sectors in most developing countries. Growing interest in energy efficiency, renewable energy, and clean fuel technologies will be a major impetus for growth in climate change technology sales to the energy sector. The commercial and residential

sectors represent 26 percent of the market, and include technologies and services for energy efficient lighting, energy conservation in buildings, appliances, and air conditioning. The industrial sector follows with 11 percent of the market, where modernization and growth will create significant opportunities for greenhouse gas emissions mitigation. The transportation sector reflects a one percent share of the climate change market.

As the economies of developing countries expand, many are expected to generate a growing portion of greenhouse gas emissions. Many countries are beginning to use climate change mitigation technologies to increase productivity and efficiency and improve local environmental quality to reduce greenhouse gas emissions from major economic sectors.

USAID's mission includes a commitment to helping developing countries address the threats of climate change through technical assistance, training, and technology cooperation. USAID is the U.S. government agency responsible for worldwide humanitarian and development assistance.

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