Renewable energy sources are used rather widely around the world.

At the present time they make up about 14% of the world energy balance (Figure 2.1), although the bulk of renewable energy sources are still traditional types of renewable energy: woody biomass (in developing countries) and large hydropower plants.

However during the past decade substantial growth has occurred in the use of non-traditional types of renewable energy: solar and geothermal energy, wind energy and energy from wastes, small hydro power plants, and tidal and ocean wave energy. The growth is due to substantial lowering of the cost of renewable energy technologies and higher fossil fuel prices.

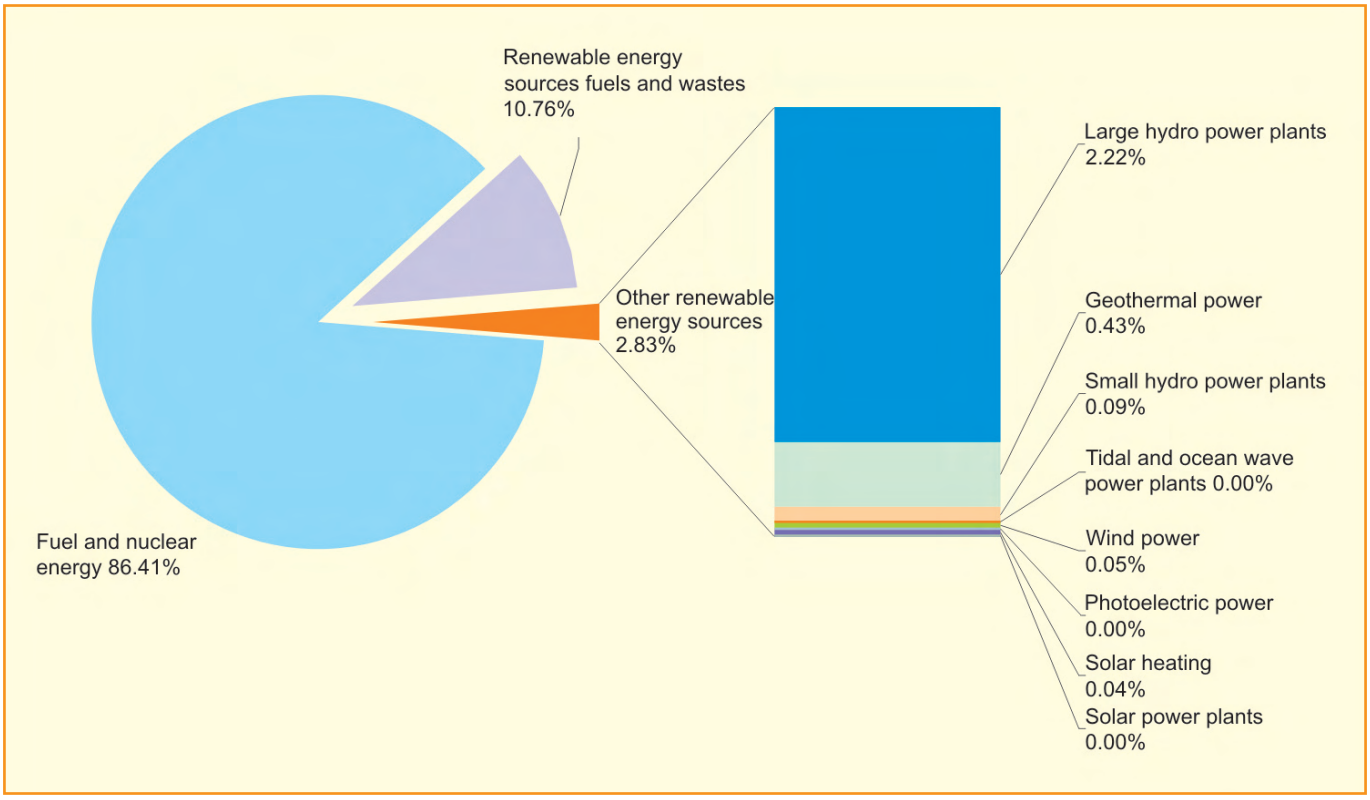
European Union countries, the U.S., Japan, China and India have had the greatest success in using non-traditional renewable energy sources.

Photoelectric energy, wind energy and solar heating are experiencing the fastest rates of development worldwide, with corresponding structural market changes.

For example, until 1996 the consumer goods sector (calculators, watches, etc.) and the communications sector dominated the world photovoltaic market in terms of total size and growth rates, whereas today's world market is experiencing a transition to the use of photovoltaic systems (PVS) integrated into the overall energy system, the so-called "on-grid" photovoltaic systems (Table 2.1 [22]).

Figure 2.1

Structure of the world's energy supply (2001)



Source: Reports for UNDP Clean Energy for the Rural Communities in Karakalpakstan Project (Phase 2)

Table 2.1

World photovoltaic market

Market segment	1990	1993	1996	1997	1998	1999	2000
	Capacity (MW)						
Consumer goods	16	18	22	26	30	35	40
Stand-alone farm systems	9	13	23	28	34	44	50
Communications	14	16	23	28	31	35	40
Hybrid photo/diesel systems	7	10	12	16	20	25	10
Plants connected to a grid	1	2	7	27	36	60	110
Large PVSs (>100 kW)	1	2	2	2	2	2	5
Totals	**48**	**61**	**89**	**127**	**153**	**201**	**255**

By the beginning of 2004, 560 MW photovoltaic systems had been installed in European countries alone, compared with only 392 MW plants in 2002, representing an annual growth rate of nearly 43% (Figure 2.2, [22]). Total worldwide photovoltaic systems capacity exceeded 3,000 MW in 2003. The development of solar heating has been no less successful. According to data for 2003, there were over two million solar heating systems worldwide [22]. The total area of solar panels in the U.S. exceeded 10 million square meters, in Japan — 8 million square meters. In Israel there are over 800,000 solar units providing 70% of the country's hot water [22].

By the beginning of 2003, more than 13.5 million square meters of solar panels had been installed in the European Union: the rate of installation of solar collectors has exceeded 1 million square meters a year in recent tears (Figure 2.3, [22]). European Union countries are taking the lead in developing wind energy, which is developing at no less a rapid rate (Figure 2.4). Annual wind energy growth rates in Europe are 33-34%, and by 2004 installed capacity of wind energy systems had reached 28.4 GW [22].

Figure 2.2

Worldwide development of photovoltaic energy

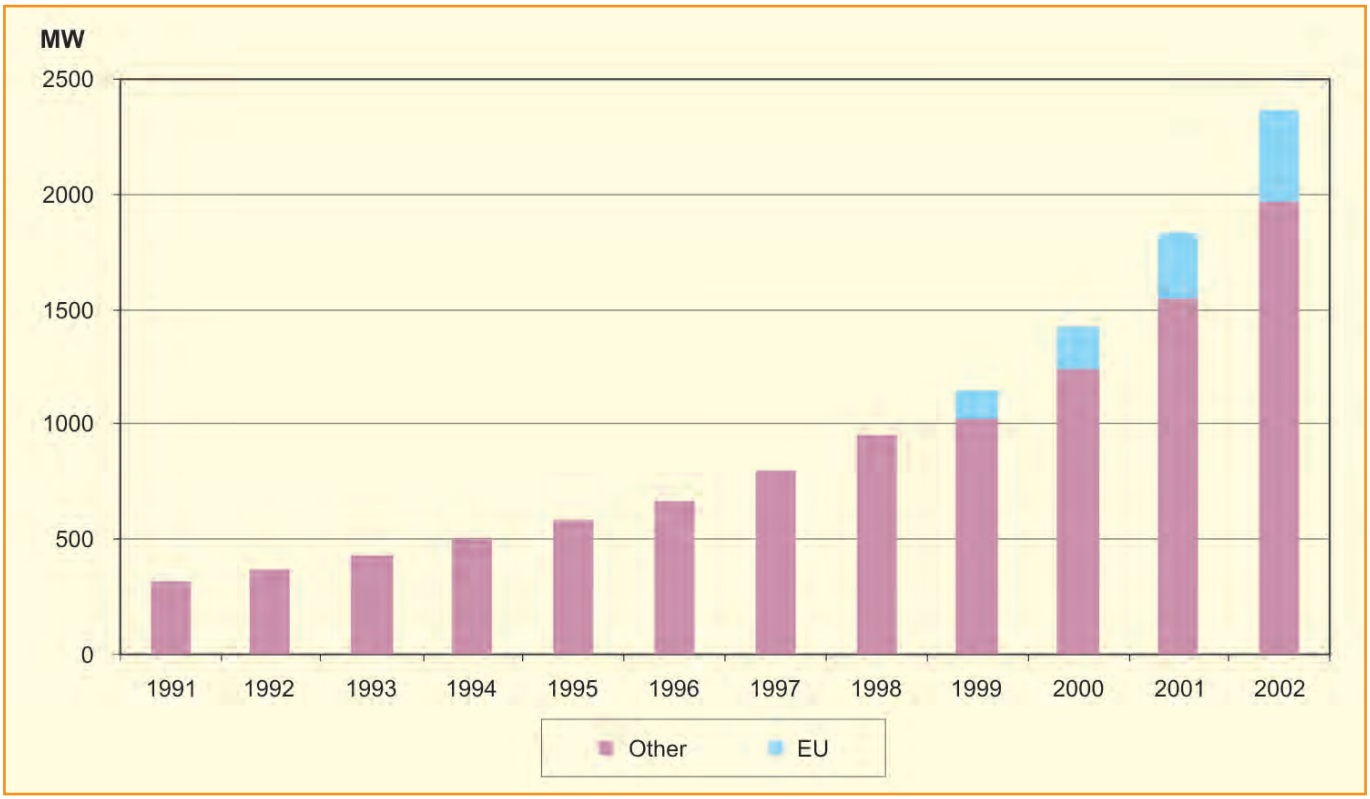


Figure 2.3

Development of solar heating in Europe

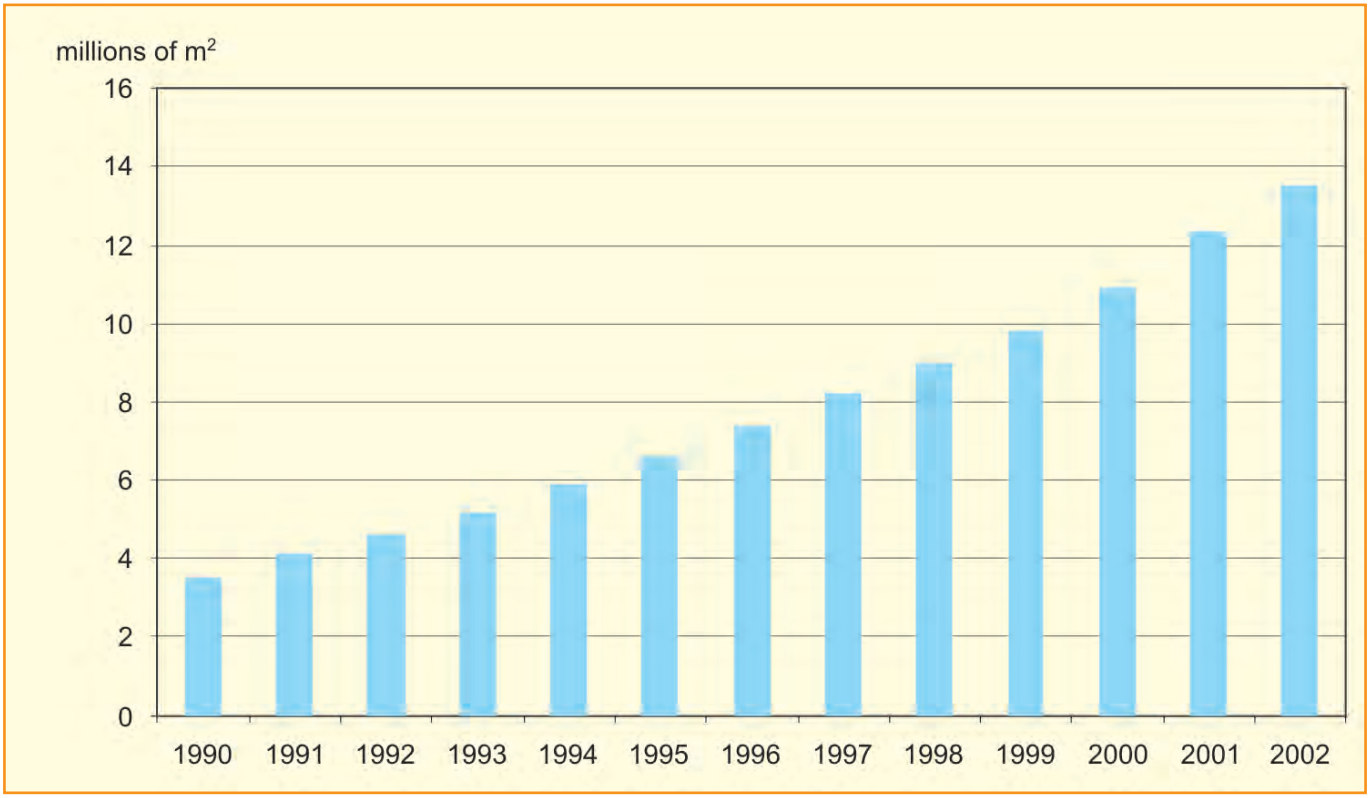
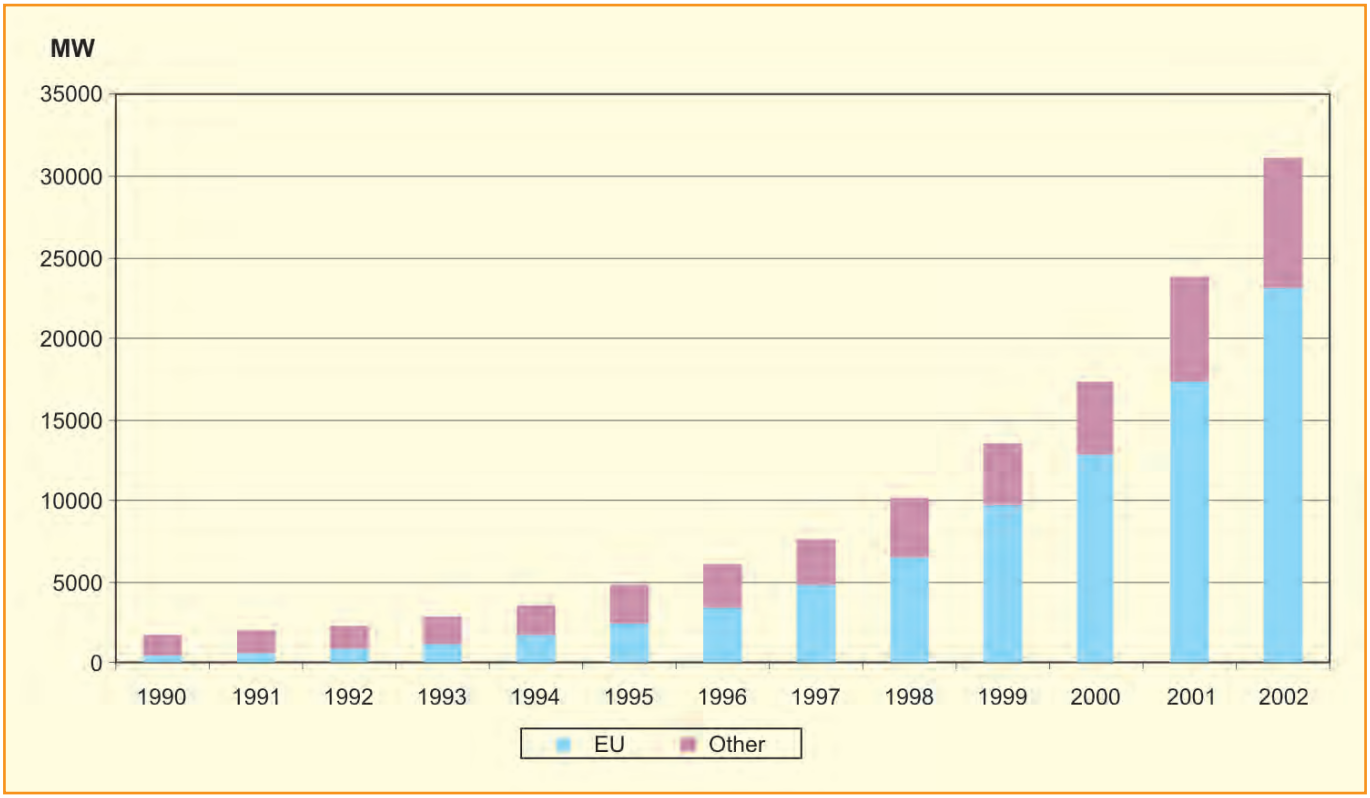


Figure 2.4

World development of wind energy



The use of other kinds of renewable energy is also increasing, but at slower rates. For example, geothermal energy use is growing at 10-11% and small hydropower at 3-5% per year [22].

According to some forecasts, if sound and reliable policies in support of renewable energy sources are pursued, renewable energy development rates around the world, at least in most countries, can be fairly high [23].