6. The satellite earth observation sector

Earth observation represents one of the earliest uses of space technologies. It allows the measurements from orbit of a very wide range of geophysical parameters, spanning the whole spectrum of the environment, including the atmosphere, land, oceans, ice and snow. The number of remote sensing satellites had been increasing as countries around the world seek to develop autonomous capabilities. Actors-wise, the United States, Europe, China and India are all important operators of satellite remote sensing fleets (Table 6.2). Out of the 109 operational earth observation missions managed by civilian space agencies, fifty are dedicated to gathering multi-purpose land imagery (CEOS, 2010). Commercial satellite earth observation represents a niche market valued at some USD 900 million to USD 1.2 billion in 2009, depending on the source, and includes full lines of products and services, not only imagery (Figure 6.1). The international commercialisation of satellite imagery started when restrictions on space technologies were relaxed at the end of the cold war. The main customers remain governmental agencies, which provide anchor contracts to remote sensing satellite operators in some cases. For example in 2010, the US National Geospatial Intelligence Agency launched a USD 2.8 billion Service Level Agreement ("EnhancedView SLA") to receive high-resolution earth imagery products and services over ten years from Digital-Globe, a commercial operator. According to Euroconsult estimates (2010), some 260 earth observation and meteorology satellites could be launched in the next ten years, generating USD 27.4 billion in manufacturing revenues for the space industry, compared to 128 satellites and USD 20.4 billion in revenues the previous decade. Although, it is estimated that 77% of all new earth observation satellites in the coming ten years will be owned or operated by a government or military entity, confirming the dominance of public institutions on the supply side (Northern Sky Research, 2010). In addition, more than a dozen radar satellites, which allow to see through clouds, are expected to be launched over the next decade.

Methodological notes

Data used here come from private data providers and from the Satellite database maintained by the Committee on Earth Observation Satellites (CEOS), an international group which aims to co-ordinate civil space-borne earth observations (*i.e.* fifty members and associate members made up of space agencies, national and international organisations). The CEOS database is updated annually, based on a survey of the organisation's members.

Sources

Committee on Earth Observation Satellites (CEOS) (2010), *CEOS Missions, Instruments and Measurements Database*, *www.ceos.org*.

Euroconsult (2010), *Satellite-Based Earth Observation, Market Prospects to 2018*, Paris.

Northern Sky Research (2010), *Global Satellite-Based Earth Observation*, 2nd Edition, November.

Satellite Industry Association (2010), *State of the Satellite Industry Report*, Report prepared by Futron Corp., Washington DC, June.

Notes

6.1: Not adjusted for inflation.

6.2: Several countries and agencies can co-operate for one satellite mission. Planned missions: Includes missions, both approved and under consideration, to be flown in the next two to ten years. Instruments: Earth observation satellites usually carry several instruments (*e.g.* diverse sensors) which can be built by agencies, laboratories, universities and/or industry.

Essential measurements about the earth and its environment conducted by satellite earth observations

Atmosphere: Aerosol properties, atmospheric humidity fields (water vapour), atmospheric temperature fields (air temperature), atmospheric winds, cloud properties, lightning detection, liquid water and precipitation rate, ozone, earth radiation budget (including solar irradiance), trace gases (carbon dioxide, methane and other greenhouse gases).

Land: Landscape topography (lake areas and levels), multi-purpose imagery (land cover, urban planning), soil moisture, surface temperature (fire disturbance), vegetation (biomass, agricultural crop identification), albedo and reflectance.

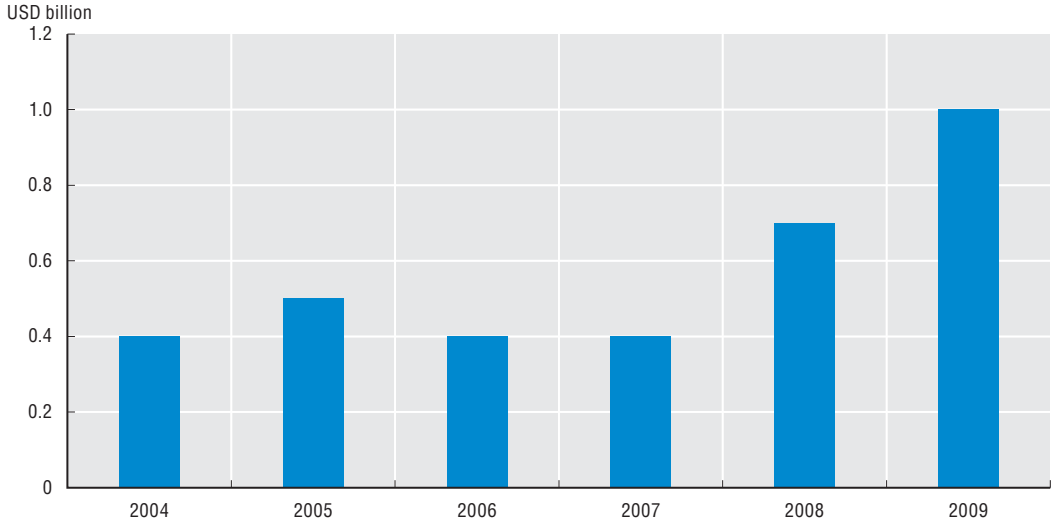
Ocean: Ocean colour (for biological activity, including fisheries), ocean salinity, ocean surface winds, sea level, currents, ocean wave height and spectrum, sea surface temperature.

Snow and ice: Ice sheet topography (glaciers and ice caps), sea ice cover, edge and thickness, snow cover, edge and depth.

Gravity, magnetic and geodynamic measurements: Groundwater, sea level.

6.1 Estimates of commercial remote sensing revenues, 2004-09

USD billion



Source: Satellite Industry Association (2010).

6.2 Selected ongoing and planned earth observation missions by civilian agencies

As of October 2010

	Agency	Ongoing missions	Planned missions	Instruments
Argentina	CONAE	8	1	24
Brazil	INPE	3	6	11
Canada	CSA	6	6	11
China	CAST	3	7	35
	CRESDA	2	3	–
	NRSCC	8	16	22
Europe	EC	–	14	8
	ESA	11	28	51
	EUMETSAT	6	14	14
France	CNES	14	10	40
Germany	DLR	5	3	9
India	ISRO	12	15	36
Italy	ASI	13	5	16
Japan	JAXA	6	11	16
	JMA	2	–	4
Korea	KARI	2	4	8
Nigeria	NASRDA	1	2	3
Norway	NSC	1	–	1
Russian Federation	ROSHYDROMET	2	12	33
	ROSKOSMOS	3	13	40
South Africa	SANSA	1	–	1
Spain	CDTI	3	1	3
Sweden	SNSB	1	–	4
Thailand	GISTDA	1	–	2
Turkey	TUBITAK	1	–	2
United States	NASA	14	31	81
	NOAA	22	12	55
	USGS	2	1	5
Ukraine	NSAU	1	–	5
United Kingdom	UKSA	4	–	8

Source: CEOS (2010).