MegaCities

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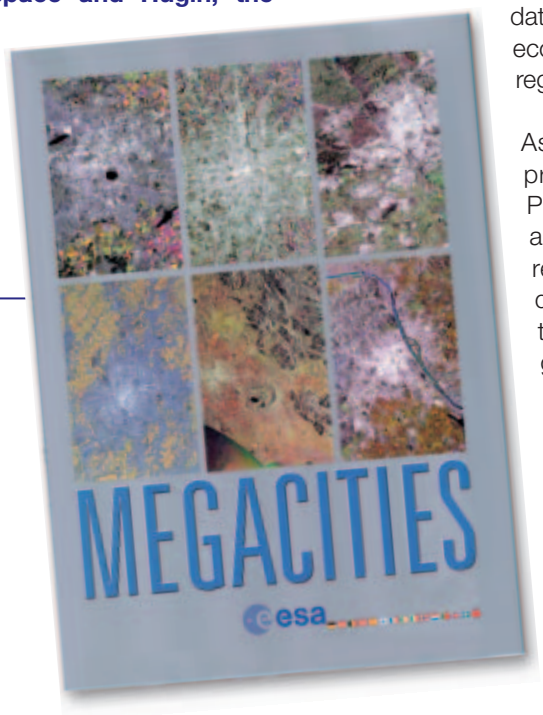
Remote-sensing satellites are a truly global tool for addressing 'global challenges' and 'global concerns'. To increase public, political and industrial awareness of their real potential, the ESA Technology Transfer Programme office chose to support the United Nations' 'Urban 21' Programme, and as part of that initiative the MegaCities book project. The goal in collecting scenes from as many satellites as possible to show the prevailing situations of 42 'MegaCities' around the World, including potential threats and hazards, was to contribute to a better understanding of the global challenge that they pose.

Through a public-private partnership involving the remote-sensing value-adding companies Geospace and Hugin, the reinsurer Munich Re, and the Austrian Space Agency as co-sponsors, a first English edition of 3500 copies of the MegaCities book has been sold and distributed. A second printing is now in process and a German edition is also available.



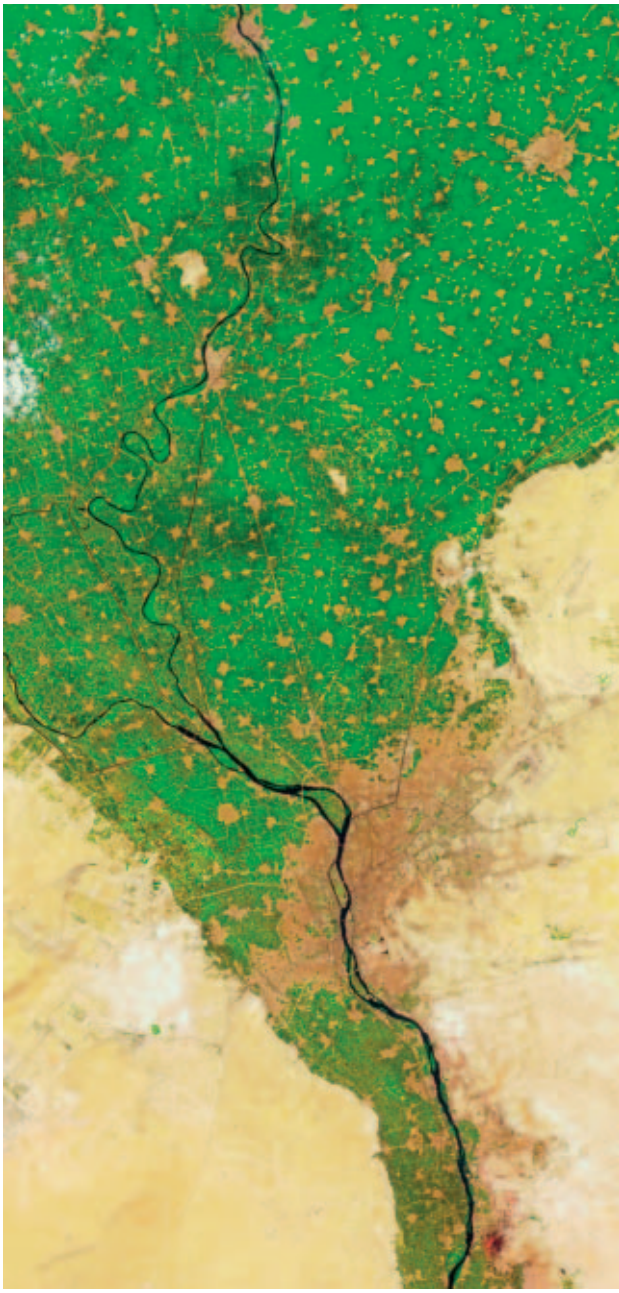
Introduction

By 2005, about two thirds of the World's population will live in cities, and about 50 MegaCities will sprawl across the Earth's surface. New methods and tools will be needed to address the multidisciplinary problems that they will face. Space technologies will be instrumental in providing the greater understanding and insight needed to manage these huge conurbations on our 'blue planet'. Remote-sensing satellites, with their many very specialised instruments, provide the precise data that is needed to unravel the complex ecological interdependencies on the global, regional and local scales.

As the initiator of the MegaCities book project, the ESA Technology Transfer Programme is targetting both businesses and the public to promote the application of remote sensing by satellite. As well as demonstrating the value of satellite technology to the European taxpayer at a glance, the book is also seen by ESA as a means of generating more business for the European Earth-observation value-adding community by drawing attention to the global markets associated with the huge application potential of satellite imagery. Insurance companies too, with their economic and regulatory powers, are also considered a valuable target audience, and one that might rely more in future on 'satellite truth' rather than on 'ground truth' alone in conducting its business.

In 1996, the idea was hatched to approach non-space industry directly at higher management level to improve awareness of Earth observation from satellites and the potential applications for their businesses. To prepare the ground, some exploratory activities were undertaken to assess such things as the potential for and limitations on the integration of Earth-observation (EO) technologies into the planning and development strategies for MegaCities. These were followed in 1997/99 by an ESA-sponsored study entitled: 'Demonstration of the Potential Value of ESA EO Data and Products – End-to-End Demonstrator: Mega-Cities'. During the UNISPACE III Conference in Vienna in July 1999, various speakers from the satellite remote-sensing community expressed their disappointment at the 'very limited impact' that the latest EO satellite-based technology had so far had on decision-making in the upper echelons of industry, administration and politics.

Urban Agglomeration	Population (Mio.)						Annual Growth Rate	
	5	10	15	20	25	30	1985-1995	2005-2015
Africa								
Lagos	10.287	24.437					5.68%	3.61%
Cairo	9.656	14.494					2.28%	1.97%
Asia								
Tokyo	26.836	28.701					1.40%	0.10%
Mumbai	15.093	27.373					4.22%	2.55%
Shanghai	15.082	23.382					1.96%	1.85%
Jakarta	11.500	21.170					4.35%	2.34%
Karachi	9.863	20.616					4.43%	3.42%
Beijing	12.362	19.423					2.33%	1.89%
Dhaka	7.832	18.964					5.74%	3.81%
Calcutta	11.673	17.621					1.67%	2.33%
Delhi	9.882	17.553					3.80%	2.58%
Tianjin	10.687	16.998					2.73%	1.91%
Metro Manila	9.280	14.711					2.98%	1.75%
Seoul	11.641	13.139					1.98%	0.32%
Istanbul	9.316	12.345					3.68%	1.45%
Lahore	5.085	10.767					3.84%	3.55%
Hyderabad	5.343	10.653					5.17%	2.83%
Ôsaka	10.601	10.601					0.24%	-
Bangkok	6.566	10.557					2.19%	2.51%
Teheran	6.830	10.211					1.62%	2.30%
South America								
Sao Paulo	16.417	20.783					2.01%	0.88%
Mexico City	15.643	18.798					0.80%	0.83%
Buenos Aires	10.990	12.376					0.68%	0.50%
Rio de Janeiro	9.888	11.554					0.77%	0.84%
Lima	7.452	10.526					3.30%	1.32%
North America								
New York	16.329	17.636					0.31%	0.39%
Los Angeles	12.410	14.274					1.72%	0.46%



In mid-2000, therefore, the Technology Transfer Programme office initiated the idea of a book devoted to MegaCities, presenting satellite remote-sensing scenes and their interpretations in an easy-to-understand manner. Geospace GmbH in Salzburg was chosen as prime contractor, based on its reputation in publishing EO-type books. A 'pre-print' containing 24 draft pages of the planned volume was exhibited during the Frankfurt Book Fair that autumn, with sufficient success for the project to be pursued.

Deciding on the final content of the book, which not only had to be suitable for a wide audience, but also had to present well-supported factual data that would influence decision makers, posed several challenges for the editors. This also meant striving to convey a clear message, with both the images and the text, and avoiding

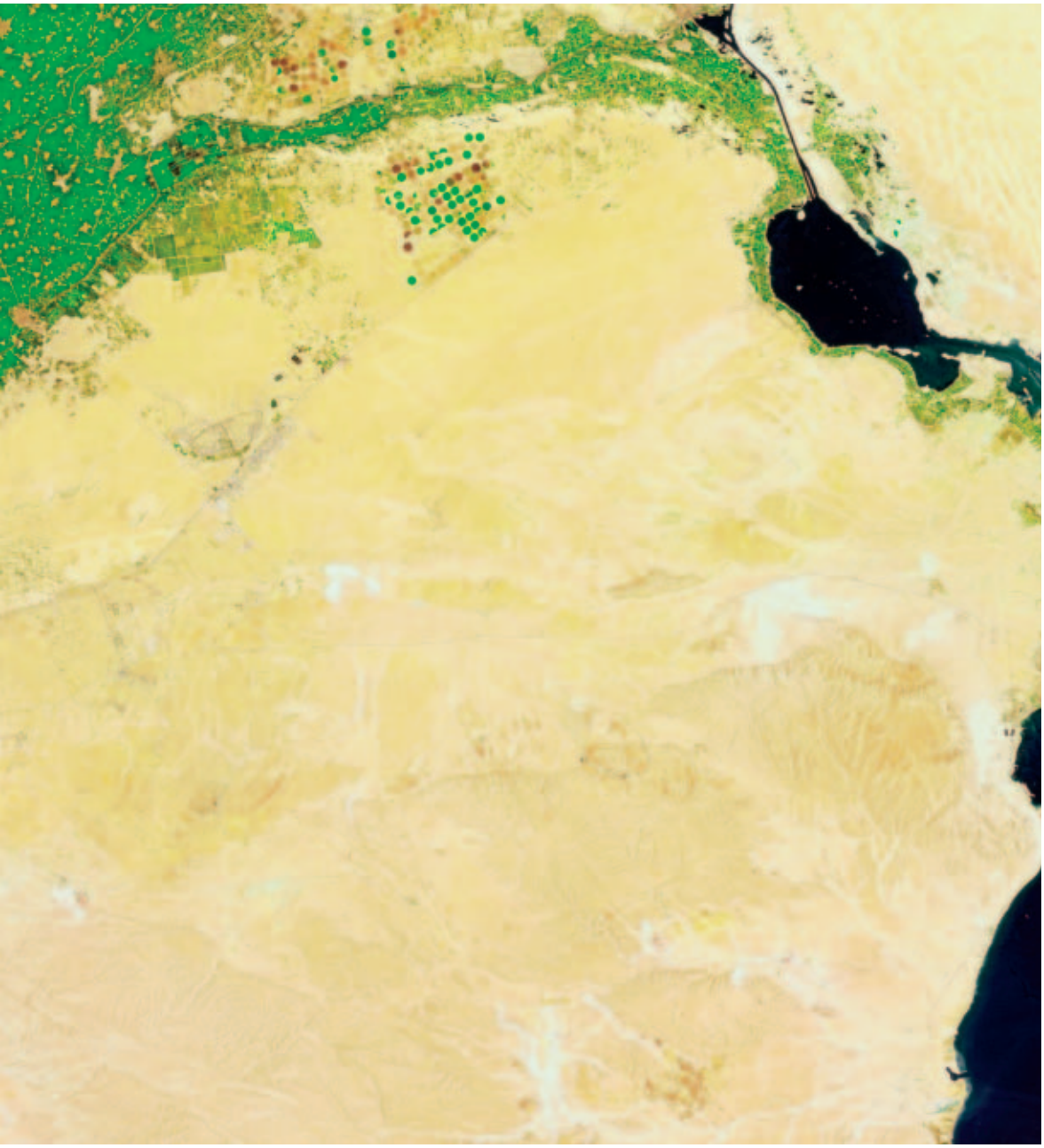


Figure 1. Cairo, seen from Landsat (courtesy of Geospace/EDC)

any biased characterisation of the chosen MegaCities. Geospace achieved this by asking different suitably academically qualified, and wherever possible locally based, authors to formulate the texts for each city. The final choice of images was also not made lightly, with every effort being made to strike a balance by selecting images with high visual impact from virtually all available civilian satellite sources. Last but not least, there were the usual economic constraints that shape the final form of such a book.

Economic considerations

It was decided at the outset that the price of the book should not exceed 50 Euro, despite the need for first-class layout and print quality to attract customers. This meant:

– the number of pages and thus the number of MegaCities portrayed had to be strictly limited
– the number of 'expensive EO scenes' had to be limited
– the 'partners' involved had to contribute some 50% of the total budget.

It was therefore clear that major support was needed from the industrial user side, from one or more ESA Member States, and from ESA's own Earth-Observation Department in contributing the ESA satellite scenes, before the Technology Transfer Programme could commit to undertake the project. In other words, several sponsors were needed to make the MegaCities book a reality.

The industrial sponsor

The search for, and finally the contractual involvement of, an industrial sponsor was the most critical aspect of the whole enterprise. After several initially promising contacts had

failed to materialise into financial contracts for a variety of reasons, the 24-page MegaCities preprint displayed at the Frankfurt Book Fair attracted the attention of staff from the Georisks Research Department of Munich Re, which deals with insurance covering earthquakes, floods, storms, hail, draughts, etc. Munich Re gave an immediate positive commitment, on condition that it would remain the exclusive sponsor and the wish that its CEO could contribute an appropriate introduction.

Munich Re's sponsorship took the form of the purchase of 2000 copies to be distributed to VIPs at the end of 2001, thereby promoting greater awareness regarding megacities and their associated risks, exactly in accordance with the original goal that had been set for the book.

The institutional sponsors

The Austrian Space Agency, in partnership with the Austrian Federal Ministry for Transport, Innovation and Technology, was instrumental in making the book happen by providing unwavering support from the start. Mr Klaus Töpfer, Executive Director of the United Nations Environment Programme (UNEP), was also asked to contribute to the book by writing a foreword. This he accepted to do without hesitation, acknowledging the great potential of satellite remote-sensing technologies to contribute to better urban development. Last but not least, ESA can be counted among the institutional sponsors in terms of using the book as a 'public relations tool' by buying some 650 copies. It distributed the book for the first time at the ESA Council at Ministerial Level in Edinburgh, in November 2001.

The industrial sponsor's viewpoint

Reinsurance companies form the backbone of the insurance industry, particularly for the high-risk sectors involving natural and man-made hazards and disasters. MegaCities are vulnerable man-made constructions that are very often located in areas prone to natural hazards such as river and sea flooding, earthquakes, tsunamis, and very high winds. Certain combinations of man-made and natural circumstances can aggravate the potential danger far beyond the risk of the individual hazards. Satellites very clearly show this, for example where earthquake fracture zones and large settlements coincide geographically,

Figure 2. Berlin, seen from IKONOS (courtesy of Geospace/SpaceImaging Europe)

whether it be the San Andreas Fault and Silicon Valley, or the fact that Istanbul sits on top of a major fracture zone.

In the industrialised societies, it is often the wealthier people and the industrial companies that settle in 'attractive high-risk areas', like Silicon Valley, as they can afford the necessary insurance cover. By contrast, in the Developing Countries it is usually the poorest people who are forced to live in such areas, because the safer zones are already fully occupied or building land there is unaffordable. The potential loss of life and infrastructure remains unacceptably high in both cases.

Preventive measures need to be organised at the economic, social, technical and legal levels in order to defuse and mitigate some of the potential disasters that threaten the MegaCities around the globe today. Disaster management after the event – whether it be a flood, a heat wave, a drought or an earthquake – is a particular challenge in MegaCities due to their complex and sprawling structure. The opportunity to look at all of these cities from a satellite tells the insurer that, despite their beauty and fascination, MegaCities harbour mega-risks, and this is a subject of great concern to the insurance industry as a whole. It is what the satellite images of the MegaCities tell us, qualitatively and quantitatively, that has prompted Munich Re to sponsor this book and distribute it to its clients, and why it is engaging more and more in the exploitation of 'remote sensing by satellite'.

A typical user's viewpoint

Hugin AG has presented copies of the ESA MegaCities book to its various customers in national and international planning authorities, as well as in industry. The overall feedback from all sides has been very encouraging. Those receiving the book were immediately more aware of the potential of EO technology and its applications to urban management. Comments have been especially positive concerning the fact that the book not only contains 'nice pictures', but also meaningful data and thematic information derived from the satellite image data. Some of the most enthusiastic responses have been from the environmental and planning authorities of MegaCities in the developing countries, such as Lagos in Nigeria.

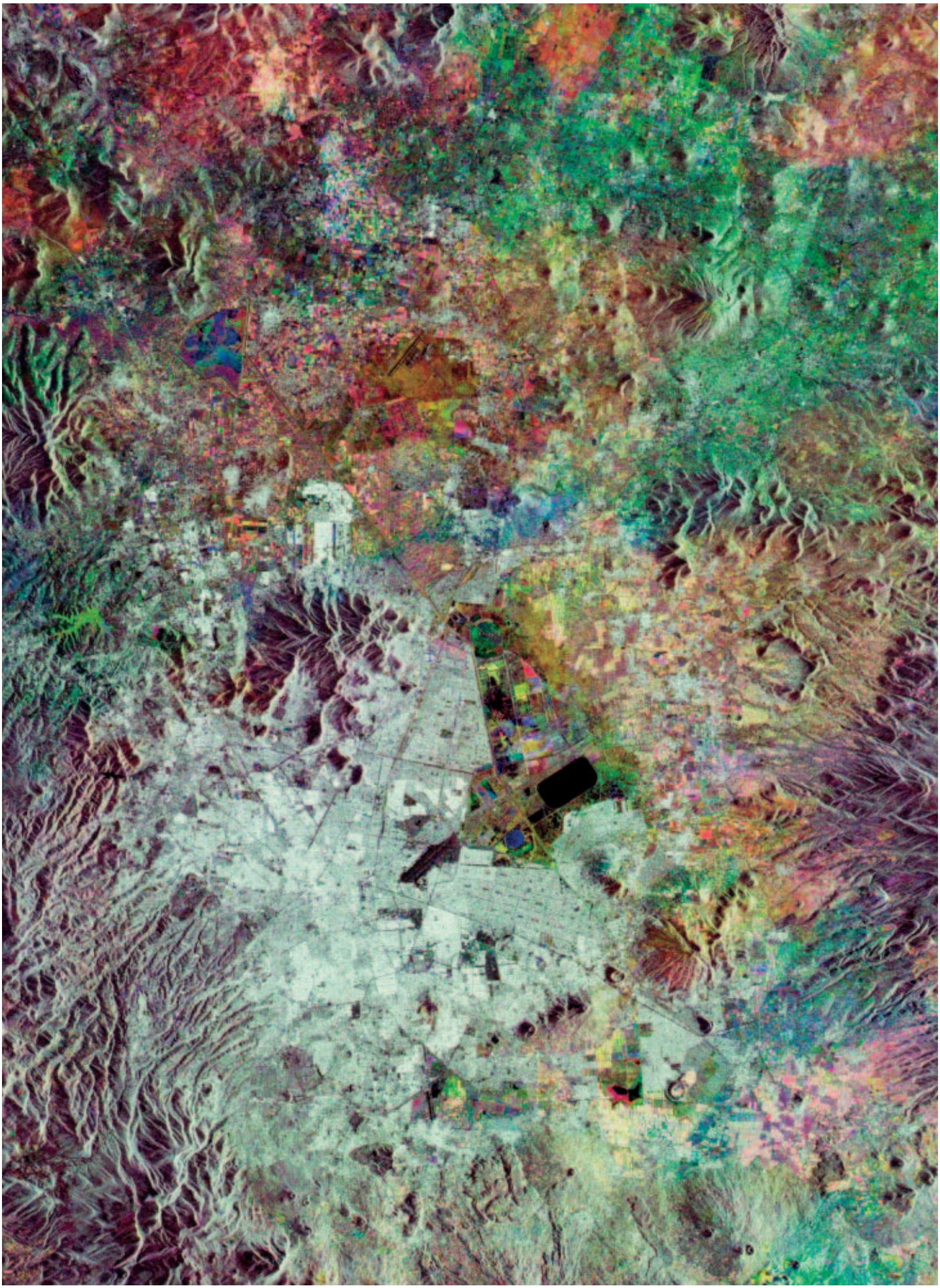


Figure 3. Mexico City, seen from ERS (courtesy of Eurimage/ESA)

Hugin had been engaged in a study on behalf of the European Commission (JRC) titled 'Development of Reference and Historical Databases for the Lagos Area'. The main goal of this project was multi-temporal land-use mapping in four time periods from 1962 to 2000, but also the collection and processing of ancillary data. A population estimation on the basis of Ikonos data was also carried out. This is believed to be the first such detailed multi-temporal study for a MegaCity. It demonstrated the importance of up-to-date high-quality satellite imagery and GIS products as a basis for planning and decision-making at the local-authority level for the management of one of the fastest-growing cities in the world. The fact that the Nigerian authorities were thoroughly convinced by the study results of the benefits of EO and GIS technology and are already committed to applying these techniques must be considered the most important outcome of the project and one that guarantees a real sustainable effect.

Outlook

Given the encouraging user responses received so far, there is good reason to believe that the MegaCities book will prove a commercial success in the public domain also. Specific marketing efforts will be made by the TTP in the future, targeting city planners, architects and building companies to promote the application of 'remote sensing by satellites' in their businesses.

Some of the MegaCities book customers have already asked what the theme of the next book will be! A satellite remote-sensing book addressing another 'global concern' identified by the United Nations, or one addressing 'the enlarging Europe' might be a possiblity. esa

To order a copy of the MegaCities book, contact:

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