



# NEW MAPS FOR A NEW MILLENNIUM

A FOUR-YEAR PROJECT TO UPDATE BURKINA FASO'S NATIONAL MAPPING FOR THE FIRST TIME IN 50 YEARS HAS JUST CONCLUDED. AUDE ARESTE LAMENDOUR AND AURÉLIE MILLEDROGUES REPORT

"The project was seen as a real landmark event. It was a result we were all proud to share," remembers Oumar Sanon, manager of the PC200 Burkina project.

PC200 Burkina was a four-year scheme to create a database and update national maps to a scale of 1:200,000 for Burkina Faso. The reasons for the project were clear. "Our 1:200,000 scale maps had not been updated since the 1960s when they were created by IGN," explains Patrick Stimpson, IGN France International's regional director for Western Africa. "There have obviously been deep-rooted changes over the past 50 years: towns have developed, villages have disappeared, moved or been created, new roads have appeared, waterways, river beds and tracks have been modified due to the rainy season or the works carried out amongst other reasons. Agricultural or breeding areas have also undergone significant changes.

"The disparity between our national mapping and the reality of changes that have taken place in the country was the motivating factor behind the EU bid to tender for Burkina Faso. The same observation made

in Senegal, Mali and Benin enabled those countries to update their mapping also and to improve the skills in this domain at a local level."

The project began in 2011 when IGN France International, the export branch of IGN France, was awarded the contract covering the provision of technical assistance in updating Burkina Faso's mapping database. It had a budget of €1.8m and was financed by the EU through the 10th EDF.

At all stages of the project, the work was carried out by teams combining Geographic Institute of Burkina Faso (IGB) personnel and technical assistance staff from IGN France International. "This was an essential working methodology in order to facilitate the transfer of information and allow both the Institute's technicians and management to take ownership of the project's work," says Laurent Falala, project manager for IGN France International.

## The four components

The project was based around four main components. The first critical phase consisted in acquiring RapidEye satellite images with a resolution





Members of the team

of 5m over the entire territory, as well as GeoEyedat at 0.5m over the 13 main towns in Burkina Faso. The images were chosen according to pre-determined technical criteria, particularly the requirement for clear skies.

The second concerned acquiring the IT equipment and software necessary for production, creating processes and production workshops, identifying local skills, mobilising teams and giving theoretical training for each stage of the project. Three workshops were created in line with these objectives: one on images, another on databases and a third one on mapping. Two studies trips to France were organised to complete this and included additional training, visits to IGN, the ENSG (National School of Geomatics), IGN Space and to Airbus Defence and Space.

The third, most essential aspect of the project was IGB's work to create all the products with technical assistance from IGN France International. These were:

### DTM and orthoimages

A digital terrain model and orthoimages to 5m were created for the whole of the country and very high resolution orthoimagery was created for the 13 main towns. After a stereo preparation phase out in the field, all the processing work was carried out using Geoview, IGN's own image processing software.

### A national database

This was organised around 10 themes: habitat/infrastructures; road and railroad networks; energy distribution network; hydrography; administrative restrictions; land occupation; orography; toponymy and the main points of interest; and geodesic network.

The database specifications (content and selection criteria) were elaborated with the help of future users during the national workshops. The database was constructed by entering a complete set of information, in 2D format using ArcGIS with orthoimages, and by performing field visits to complete and validate all the information collected: checks on communal infrastructures (schools, police stations, etc) and land occupation; toponymic surveys; localisation of villages; and counts of other infrastructure (bridges, crossing points, etc). Members of the national toponymic commission met together on several occasions to arbitrate and validate all the toponymic information in the database.

### Maps

A set of 27 maps to a scale of 1:200,000 were needed. This production phase started with the creation of the mapping model (choice of items in the key, layout, cover photos, etc) and then the maps using the database information. All the maps were printed at the IGN printing press in France.

## THE CHALLENGES

"There are several difficulties encountered on a long and complex project of this type," explains Laurent Falala, project manager for IGN France International. "In the case of the PC200 Burkina project, we were faced with delays in the delivery of equipment due to changes in the geopolitical context in the Sahelian region and delays in the acquisition of satellite images of the country. This type of situation can mean having to put off training or the visits planned by experts, which meant in our case, additional difficulties due to the subsequent unavailability of experts who often work on several projects simultaneously..."

"Another aspect that is difficult to manage is the difference in time given over to certain activities included in the terms of reference, therefore theoretical, and the reality out in the field. For example, we realised during this project that the completion times were sometimes too short. Some areas are more difficult to cover than others and the rainy season in the African Sahelian region can make trips into the field very difficult. These delays in the provisional schedule required permanent readjustments and a lot of flexibility and diplomacy was needed to deal with all these constraints."

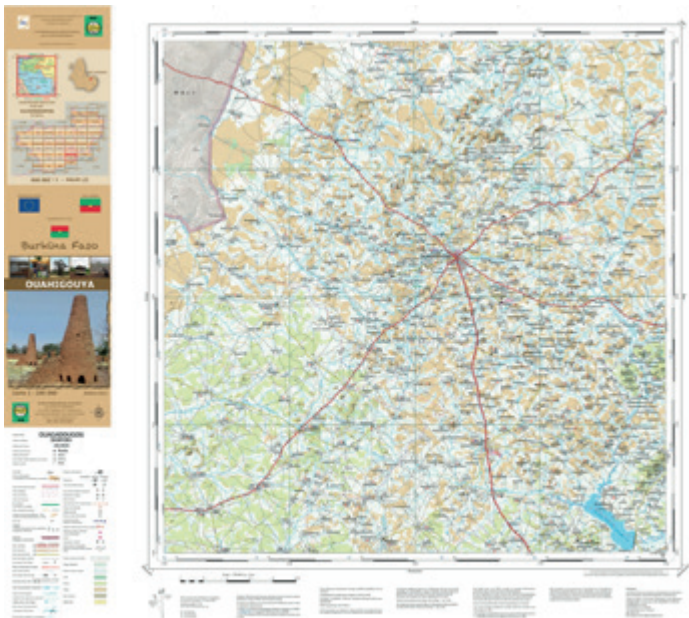


An older map depicting Ouahigouya





The new 1:200,000 map of Ouahigouya



### Derived products

Road and tourist maps to a scale of 1:1,000,000, a 1:200,000 scale road atlas, wall posters to a scale of 1:300,000 were also needed.

The fourth and final component of the project aimed to show future users the added value of the work carried out and highlight the use of such a project. Several national and regional events were organised to achieve this objective. These took place throughout the four-year duration of the project and enabled both teams to show the progress they had made.

"This phase was extremely important in order to keep the project's main beneficiaries interested in the work," explains the executive director of IGB. "The Burkinabe authorities showed their full support for the programme by participating in great numbers at each of these events."

### An enduring legacy

The PC200 Burkina project officially came to an end in February this year. The commitments made four years previously had been respected. The IGB personnel who were trained up throughout the project are now capable of producing thematic maps on demand or implementing information systems for private or public entities. Burkina Faso now possesses a set of products which constitute the basis of an infrastruc-

## SATELLITE IMAGE PROCESSING

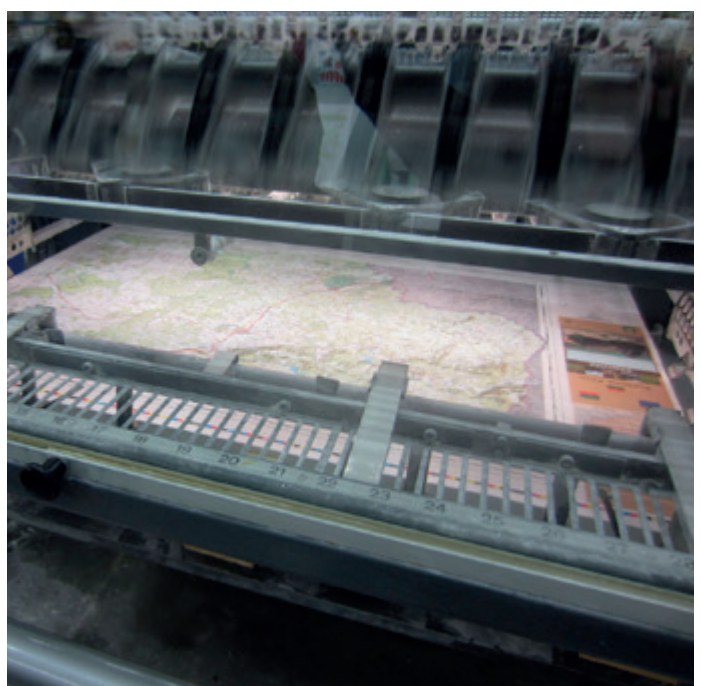
When the project began in 2011, the decision was made to use RapidEye satellite images with a 5m resolution to create the reference image layer used to update the Burkina Faso national topographic database. This initial project phase was necessary before starting work on the topographic maps. 138 RapidEye segments of varying lengths covering the whole country with clear skies were delivered for the project in June 2011. As per project specifications, these images were all acquired over the period from 2009 to 2011 and only during dry seasons, in order to minimise any radiometric differences. The Geographic Institute of Burkina Faso (IGB) was able to check the images delivered with the help of image experts from IGN-FI, then detect any residual errors and make requests for additional images to be provided in order to ensure optimal coverage of the territory.

From July 2011, despite the rainy season somewhat hampering fieldwork, IGN-FI was able to carry out several field trips to take readings at the control points. IGB technicians experienced in working on this type of project under difficult conditions were able to measure 79 control points using differential GPS and Burkina's first order geodesic network.

GeoView, the satellite image processing software developed by IGN France, was then used to improve the location of RapidEye images through spatiotriangulation. All the images were processed as a single set and calculations made with the help of readings collected from the control points by IGB as well as those from thousands of automatically calculated points of contact between images.

The images were then orthorectified, radiometrically equalised, placed in a mosaic and then laid out. A contrast was obtained by using a natural colour along with an infra-red colour. All the processing work was performed by IGB staff who had learned the techniques during a long period of shadowing the IGN-FI image experts.

After this image processing phase, the project had at its disposal data for consistent coverage of the Burkinabe territory to a resolution of 5m in natural and infra-red colours from the end of 2011. Work on updating the Burkina Faso national topographic database could now begin.



Printing the new maps





A ceremony to commemorate completion of the project



ture database, a decision-making tool which is indispensable for the development of emerging economies. The administrative bodies using geographical data that helped to build the new maps now have access to the database.

But there have been other benefits, too. Alain Rivas, mapping expert at IGN France International, says: "Over and above the quality of the products created, this project has been a wonderful human adventure. Relationships and strong ties have been made between those who have been working on the project over the last four years, and that wasn't part of the original project tender!"

## THIS PROJECT HAS BEEN A WONDERFUL HUMAN ADVENTURE

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## TOPONYMY

The PC200 project to update Burkina Faso's 1:200,000 maps included providing technical assistance in toponymics with the aim of validating all of the toponyms included on maps. Operators were given training on toponymy and surveying techniques in order to register the existing toponyms and collect new ones. In parallel to this work and in agreement with the Geographic institute of Burkina Faso (IGB), the national toponymy commission (CNT) was reworked and made responsible for validating its own toponymy.

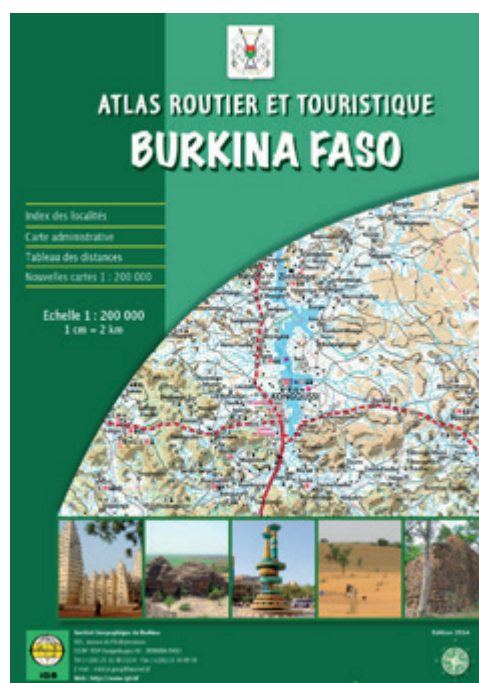
Several workshops were organised around the basic principles for work, rules for writing and methods for checking and validating names. In this way, a set of tools was developed for operators (identifying the questions to check in the field, keeping a field notebook, implementing the 'toponymic check' minute, in view of using the information within the topographic database according to the manner agreed on for entering the information into the database) and members of the CNT (powers of the committee and its operation, a toponymic charter, rules for transcription and glossaries of regional terms).

The outcome: validation of around 8,000 toponyms created using the administrative names of regions, provinces, towns and villages, or names associated with the relief of the land, its hydrography or vegetation, or those linked to the areas classified as being of touristic interest.

### Examples:

- Town of Sanaba: the letter 'm' was included in the new toponym, Koudomtenga, because of the meaning of the word 'koudomdé': tradition.
- Town of Tchériba: Gamadougou appears on the 1:200,000 scale map. 'Gamadou' was found thanks to the field survey as the complete generic term 'dougou' means 'land, village of'
- Town of Dédougou: Hélitenga uses the letter 'h' from the proper noun Héli, which is added to 'tenga', meaning 'village, land of'.

The immaterial cultural heritage represented by geographical names that are full of history and culture has been enriched by the transfer of know-how on toponymic domains from IGN France International to IGB. This transfer has enabled the CNT sessions to become a real place for exchange and discussions concerning Burkina Faso's ongoing quest to standardise the country's toponyms.



A new tourist map of Burkina Faso