

Aerial photography data acquisition and processing

The principal source of information for this Atlas is the aerial photographic survey, conducted in January-February 2008 by a consortium led by Genesys International Corporation Ltd. The survey was conducted using a specially fitted Cessna 310 aircraft flying at an altitude of 2 000 metres.

3 070 photographs were taken with a state-of-the-art Vexcel UltraCam-X 196 megapixel large format aerial camera. Two types of images were produced from the photographs: Red-Green-Blue (RGB), which is a normal colour photograph, and near-infrared, which is used, for example, to detect the greenness of the vegetation.

From the images, airborne GPS readings and ground control points, Genesys compiled a digital terrain model (DTM) to determine elevations with an accuracy of 50 centimetres on the upper stretches of the rivers, and 25 centimetres on the lower reaches. From this DTM, Genesys also generated contour lines to the same level of accuracy for the entire survey area.

Using progressive data processing including aerotriangulation, colour balancing, edge-matching and mosaicking, the photos were transformed into ortho-rectified, geo-referenced tiles suitable for mapping. Each tile is a square representing different areas depending on the river's part and photo resolution. In total, Genesys delivered the following to SWALIM:

River	Resolution	Size of tile	Number of tiles
Upper Juba	50 cm	5 km x 5 km	116
Lower Juba	25 cm	2.5 km x 2.5 km	568
Upper Shabelle	50 cm	10 km x 10 km	47
Lower Shabelle	25 cm	5 km x 5 km	249

With more than 1 000 GB of digital aerial photo dataset, SWALIM started its work. As a first step, the individual files, many of which approached 1.2 GB in size, had to be compressed to allow for ease of handling. To preserve image sharpness after compression, the image properties of colour, contrast and brightness were enhanced.

The main means of turning the dataset into client-friendly products by SWALIM was photo-interpretation. This consisted of identifying similar features on the photos and grouping them in consistent categories, extracting them and putting them into four thematic layers: land cover, roads, canals and settlements. The contour lines constituted a fifth layer. Single layers of information make it easier to display and understand the information.

The land cover mapping follows the FAO LCCS system of classification, focusing mainly on the crop areas. In addition to natural vegetation classes, six crop types were identified. Abandoned crop fields were also classified and represent potential land that could be put back into production with the rehabilitation of irrigation canals.

The roads along the rivers were comprehensively mapped, with a distinction between roads wider than 2.5 metres and narrower paths classified as trails. Paved and unpaved roads were distinguished. In the main urban centres, the dense network of roads which forms the backbone of town plans, were also mapped. The irrigation canal layer was produced in the same manner as the roads layer. Primary and secondary canals were distinguished, and where information was available, their names were included.

For the settlements layer, built-up areas, single houses and huts were individually extracted by image photo-interpretation using both visible and near-infrared images. The typical huts were distinguished by the local nomenclature: Arish for the rectangular huts and Mundul for the rounded huts. Furthermore all iron sheet roofs were mapped including total area of iron sheet roofs. Public buildings and IDP camps were digitized.

To understand terrain morphology and hydrology, topographic cross-sections were plotted from the DTM. Cross-sections can show, for example,

Xog helidda iyo ka shaqeynta hawl socodka sawirka hawada sare

Asalka isha ug muhiimsan macluumaadka Buuggaan Xog-Khariidadeeka waa sahan masawir qaadis dayaaradeed oo hawada sare, oo ay fuliyeen Janaayo –Fabraayo 2008 urur shirkado ah oo ay hogaaminsay Genesys International Corporation Ltd . Sahanka waxaa la fuliyeey ayadoo la adeegsanayo dayuurad Cessna 310 oo ku duulaysa joog ah 2 000 mitir. Waxaa si hab farshaxan ah lagu qaaday 3 070 sawir ayadoo loo adeegsaday qalabka masawir qaadista oo ah Vexcel UltraCam-X 196 megapixel. Labada nooc oo muuqaallo masawireed ayaa la soo saaray: Guduud-Cagaar-buluug(RGB), kaasoo ah sawir midab caadi ah, iyo shucaaca cas oo dhow (near-infrared), kaas oo loo isticmaalo, tusaale, in loo ogaado cagaarka dhirta.

Muuqaalada waxay leeyihiin, akhriska GPS xagga hawada sare iyo baraha dhulka laga hubiyo, Genesys waxay isu-ururisay qaabka dhulka oo tiroole ah (DTM) si loo ogaado joogagga ay leeyihiin in saxnaantu dhan tahay 50 sentimitir marka la eego xagga qaybta sare ee biyoshubka wabiyada, iyo 25 sentimitir oo ah xagga hoose. Sidoo kale DMT-kaan waxay Genesys ka soo saartay xariijimo joog isle'eg leh oo saxnaantu heer ahaan ay la mid ah tan dhammaan meelaha sahanka laga qaaday.

Ayadoo la isticmaalayo hab horu-socod ah oo xogta looga shaqeeyo oo isugu jira saddex gees dhig hawada sare ah, midab dheelitirid, dhinacyo isugu qabasho iyo naqshadayn, masawirada waxa loo badalay masawiro isku jimaysan, oo tixraac joqraafiyadeed leh oo ku habbon in khariidad looga samayn karo. Masawir kaste waa afar gees u taagan meelo kala duwan oo ku xiran qaybta wabiga iyo faahfaahinta sawirka. Isku geyn, Genesys waxay siisay SWALIM waxa soo socda:

Wabi	Muuqaalka sawirka	Cabirka badka sawair	Tirada badka sawairka
Jubada Sare	50 cm	5 km x 5 km	116
Jubada Hoose	25 cm	2.5 km x 2.5 km	568
Shabeellaha Sare	50 cm	10 km x 10 km	47
Shabeellaha Hoose	25 cm	5 km x 5 km	249

In ka badan 1 000 GB oo macluumaadka sawirada hawada sare oo tiroole ah, ayey SWALIM shaqadeeda ka bilowday. Talaabada kowaad, galal (fayl) mid mid ah, oo qaar badan oo ka tirsaa ay ku dhawaaayeen cabir ah 1.2 GB, ayey aahayd in la siku cadaadiyo (la yareeyo) si ay u suurogsho in si fudud loo isticmaalo. Si fiican waxaa loogu dadaalay in la dhawro oo wanaajiyo masawirka tayadiisa bayaan ahaanta markii la cadaadiyey ka dib, tayada midabka masawirka, farqiga iyo dhalaaka.

Sida looga dhigo macluumaadka badeecado macmiisha saaxiib u ah (soo jiidata) waxay noqotay in ay SWALIM fasiraad ku samayso sawirada. Tani waxay isugu jirtaa in la aqoonsado muuqaallada shayayda sawirada ku yaal ee isu ega iyo in la isku ururiyo hab leh dabaqado aan isbeddelin, in la soo saaro ayadoo la iskugu geynayo afar mawduuc lakabyo ah: hu'ga dhulka, wadooyinka, kanaalada iyo deegaanada. Xariijimada joogga isle'eg leh ayaguna waxay samaynayaan lakabka shanaad. Macluumaadka lakabyada mid mid ka ah waxay fududaynayaan in la soo bandhigo oo la fahmo macluumaadka.

Naqshadaynta hu'ga dhulka waxay raacaysaa habka ablabaynta (kala soocida) FAO LCCS, oo inta badan ku wajahan meelaha dalagga laga beero. Marka lagu daro dabaqadaha dhirta dabiiciga ah, waxaa la aqoonsaday lix nooc dalag. Waxaa kale oo kala sooca ku jira dhul beereedka laga tagay oo ka dhigan dhulka ay suurta gal noqon karto in lagu soo celiyo waxsoosaarka marka la dayictiro kanaalada waraabka.

Wadooyinka ku dheraran wabiyada oo si dhammays-tiran ayaa loo naqshadeeyey ayadoo loo kala soocay wadooyin ka balaaran 2.5 mitir iyo wadiiqooyin ka dhuudhuuban oo lagu tiriyey dhabooyin. Waxaa la kala soocay wadooyinka laamiga iyo kuwa aan laamiga ahayn. Xarumaha magaaloyinka ugu muhiimsan waxa jira wadooyin isku xir xiran oo cumur ah (sida shabaqa), kuwaas oo laf dhabar u ah marka qorshooyin magaalada loo samaynayo. Waxaa hab la mid ah kan lakabka wadooyinka lagu soo saaray lakabka kanaalada waraabka. Waxana la kala saaray kanaalada kowaadka ah iyo kuwa labaadka ah, markaasaa meesha xog laga hayo waxaa la raaciyeymagacyadooda.

Waxaa markii fasiraada lagu sameynayey lakabka deegaanada la kala cadeeyey meelaha dhismaha badan iyo guryaha mid midka ah iyo aqallada ayadoo muuqaalka sawirka la dheeganayo muuqaalka la arki karo iyo kan shucaaca casaanka dhaw. Waxaana aqalada caadiga ah lagu kala garan karaa magacyada afka deegaanka: Cariish waa aqal leh qaab leydi (afar gees) iyo Mundulku waa qaab goobaab ah.

the typical erosion of the river banks downstream of the main barrages, or some of the peculiar morphological characteristics of the rivers. In fact, anything that has a bearing on elevation in the survey area can be analyzed using cross-sections. They can be taken in any direction over any distance.

While the information presented in this Atlas and the accompanying DVD is extensive, SWALIM's work has only just begun. Much more can be extracted from the dataset – more layers can be developed, the current layers can be refined, and the number of cross-sections that can be taken is infinite. The next product, projected to be ready by the end of 2010, is a special edition of the Somalia Dynamic Atlas for the Juba and Shabelle Rivers based on the aerial photo dataset.

Waxa intaas dheer, dhammaan jingadda leh waa la naqshadeeyey, oo wadarta bedka saqafka ayaa lagu sameeyeydaray. Dhismeyaasha dawladda iyo iyo xerooyinka dadka barakacayaasha wadanka gudhiisa waxa lagu sameeyey qaab tiroole ah (digitized).

Si loo fahmo qaab-dhismaha dhulka, cilmiga biyaha, tobograafiyada jeexyada gudban, waxaa laga soo baxay DMT. Muqaalka jeexyada gudban, wuxuu tusinayaa, tusaale, ciid hallowga caadiga ah ee wabiga jiinkiisa ee dhinca biyoshubka hoos ka jira biyoxireenada, ama sifaalaha qaab-dhismeedka aan caadiga ahayn ee wabiyada. Runtii, waxkaste oo lug leh joogga dhulka la sahamiyey waa la sii baari kara ayadoo la isticmaalayo muqaalla jeexyada gudban. Waxay qaadan karaan jiho kaste inkasta oo ay fogaantu tahay.

Halka macluumaadkaan lagu soo bandhigay gudaha buuggaan xog-khariiradadeeka iyo DVD la socoda waa mid baaxad leh, shaqada SWALIM ay qabatayna waa mid hadda bilow ah. In ka badan ayaa laga soo dheegan karaa xogta kayd-san- lakabyo kale oo badan ayaa laga samayn karaa, lakabyada hadda jirana dib ayaa loo habayn karaa, waxaana jeexyada gudban laga soo qaadan karaa tiro aan dhammaad lahayn. Badeecada soo socota, waxay diyaar noqonaysaa dhammaadka 2010, waana daabacaad gaarka u ah buugga xog-khariiradadeedka Soomaalyeed firfircoon (Somali Dynamic Atlas) oo wabiyada Juba iyo Shabeelle kaasoo ku salaysan macluumaadka sawirka hawada sare laga qaaday.



The Cessna 310 aircraft before take-off
Dayaaradda Cessna 310 intii aysan kicin



Vexcel UltraCam-X 196 megapixel large format aerial camera with processing equipment



Kamerada dayaaradda oo leh qalab wax lagu hagaajiyo oo qaab weyn oo ah Vexcel UltraCam-X 196 megapixel



Actual area covered by the aerial survey

Dhulka xaqiiqdii uu daboolay sahanka hawada sare



Administrative boundaries Xuduudaha maamullada

