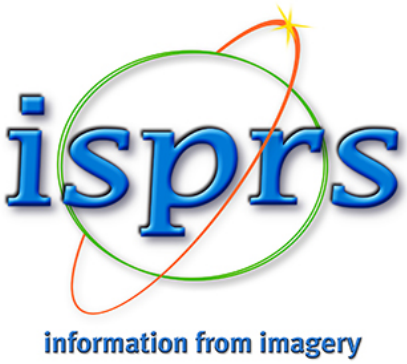

DEVELOPMENT OF A CURRICULUM FOR THE AFRICAN GEOSPATIAL SCIENCES INSTITUTE (AGSI)

A Report on the ISPRS Scientific Initiative Project 2014

Ian Dowman and Kamal Labbassi

This report for delivery to AGSI describes the process of developing a curriculum for AGSI and the recommendations that have resulted. The project was funded by the ISPRS Scientific Initiative and has taken six months to complete involving individuals from ISPRS and the North African region. The project involved a questionnaire of stakeholders in the project, a workshop and development of the curriculum.

The contents of the report are as follows:

1. *Introduction*
2. *Aims and objectives*
3. *Participants*
4. *Details of the project*
5. *Proposals for the curriculum*
6. *Future developments*
7. *Conclusions*

Appendix 1 *English version of the questionnaire*
Appendix 2 *Questionnaire respondees*
Appendix 3 *Examples of thematic modules*

DEVELOPMENT OF A CURRICULUM FOR THE AFRICAN GEOSPATIAL SCIENCES INSTITUTE (AGSI)
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1. INTRODUCTION

The International Society for Photogrammetry and Remote Sensing (ISPRS) has provided funding to develop a curriculum for the African Geospatial Sciences Institute (AGSI) in Tunis. The AGSI is a non-profit organisation registered in Germany and in Tunisia, supported by geospatial industry, governments and academia. The objective of AGSI is to accelerate the geospatial capacity development in North Africa by providing the facilities for geospatial projects and management training to regional government employees, university graduates, private individuals and companies. The initial curriculum will concentrate on vocational geospatial training, emphasizing practical, project-based work. Learning-by-doing is the priority and whilst all participants will be encouraged to continue with a more formal education, there will also be physical support for anyone who wants to start his own business. The curriculum will take account of the resources available and particularly look at how low cost equipment such as Remotely Piloted Aerial Systems (RPAS), also referred to as Unmanned Aerial Vehicles (UAVs), and terrestrial data collection instruments can be used. The main source of software will be commercial but open source software can also be used to supplement this. The emphasis will be on training and education which is fit for purpose in the region and which will allow those completing the course to work efficiently and effectively. Teaching will be mostly in English although some courses may be provided in French or Arabic.

2. AIMS AND OBJECTIVES

The primary objective of this project is to support capacity building in North Africa. North Africa has been subject to severe disruption in recent years and there is an urgent need for the construction of infrastructure (Oeldenberger and Khaled, 2012) and for the services of trained geospatial professionals and technicians. AGSI depends on donations for its income and for time given by supporting organisations and individuals. The objective of AGSI is to accelerate the geospatial capacity development in North Africa by providing the facilities for geospatial projects and management training to regional government employees, university graduates, private individuals and companies. AGSI will initially concentrate on vocational geospatial training, emphasizing practical, project-based work. Learning-by-doing is the priority and whilst all participants will be encouraged to continue with a more formal education, there will also be support for anyone who wants to start his own business. A new institution like AGSI needs a well-founded structure from the outset and the expertise in ISPRS working groups has been used to provide such as structure. In order to establish the required structure a combination of local information and international expertise is needed.

The aim of the ISPRS project is to assist AGSI in developing a curriculum which is suitable for local conditions, this involved a survey of potential stakeholders in North Africa and the drafting of a curriculum on the basis of the returns from the survey. The results of the questionnaire and the draft curriculum were discussed at a workshop held in Tunis in March 2014.

3. PARTICIPANTS

The proposal to the Science Initiative was prepared by Ian Dowman with support from WG VI/3 and a team with experience in education in North Africa:

Tsehaie Woldai, Vice President, Commission VI
Henny Mills, Co-chair WG VI/3.
Jide Kufoniyi, President, AARSE.
Bola Ayeni, Head of GIS, RECTAS, Nigeria.
Hussein Farah, Director General, RCMRD, Kenya.
Riadh Abdelfattah, Associate Professor, University of Carthage, Higher School of Communications of Tunis (SUPCOM).
Kamal Labbassi, Department of Geology, University of El Jadida, Morocco: project administrator for the project.

Support has also come from the German GeoConsultants Group (3G) which is organising the Geospatial Conferences in Tunis (GCT) and Dieter Fritsch, Institute for Photogrammetry (IfP), University of Stuttgart and the German University in Cairo (GUC). Other organisations, including ICA and CRTEAN, are also supporting the project.

4. DETAILS OF THE PROJECT

4.1 Background information

The issue of curriculum development has been discussed in various fora in recent years. A paper by Veenendaal (2014) gives a good review of current activity, local conditions should always play an important part in any development and this has been given particular attention in this project. A number of courses exist in North Africa in institutions of higher education, including in Tunisia, and there are also internationally oriented courses at RECTAS (Nigeria) and RCMRD (Kenya) which could serve as a model for AGSI. An important development in some developing regions is the involvement of local communities; the Indian Village projects for example involve local communities in the development of agricultural policies using Earth observations data.

4.2 Preparation and distribution of the questionnaire

A survey was designed to determine the training requirements in North Africa. A questionnaire was prepared in consultation with the project team. The full English version of the questionnaire is attached at Appendix 1. The main headings were as follows:

1. Information about your organization.
2. Staff requirements.
3. Example of large projects.
4. Support in terms of equipment and teaching personnel – are you able to help AGSI through provision of equipment, software or personnel?
5. Do you have any software packages available for use at AGSI? If so please list
6. Do you have any staff to deliver training at AGSI? If so please list.
7. Please add any additional comments.
8. Can the information provided be published? Yes/No

The distribution list was compiled with help from the German GeoConsultants Group (3G) which organises the Geospatial Conferences in Tunis (GCT) in 2012, 2013 and 2014, providing a comprehensive contact list for North Africa. A total of 341 questionnaires were distributed in Tunis, Libya, Morocco, Gabon, Mauritania and Nigeria.

4.3 Analysis of Questionnaire

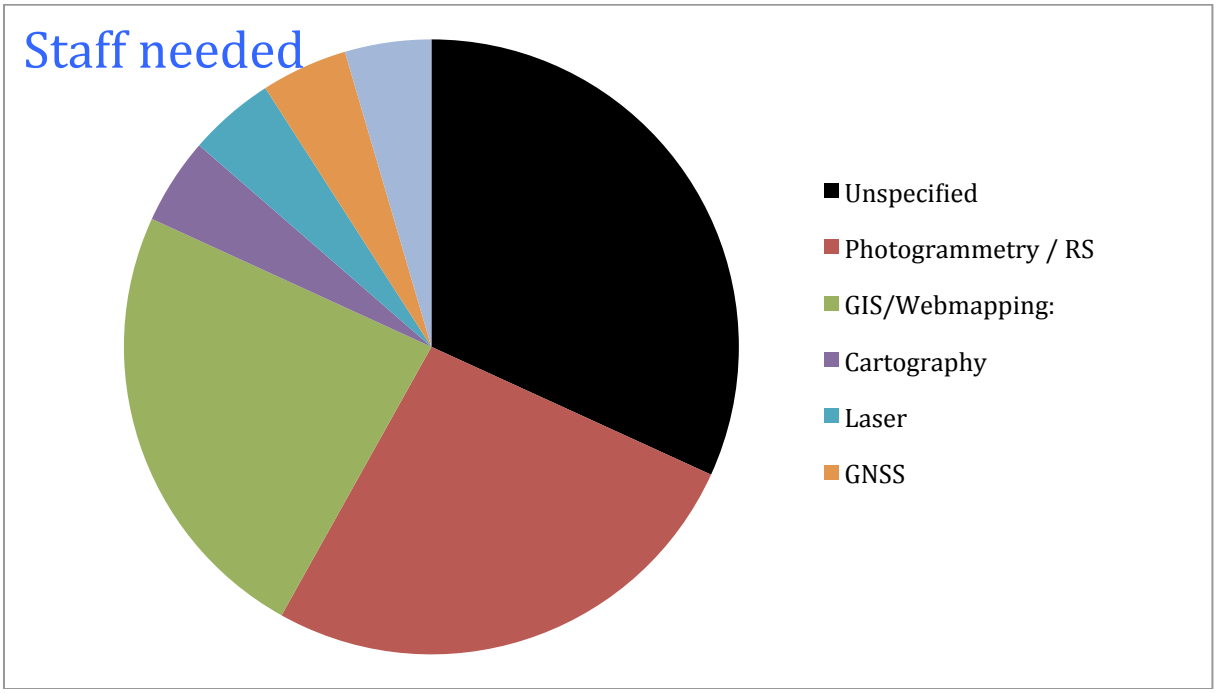
4.3.1 Responses received

18 responses had been received: 10 from Tunisia, 4 from Morocco, 2 from Mauritania, 1 from Gabon and 1 from Nigeria. A list of respondents is in Appendix 2. This is a comparatively low turnout despite follow-up requests for more responses. The majority of organizations responding are public (72. 22%). However, more responses were received from the private sector in Tunisia (40%). Most of the organizations (62.5%) are large, with over 100 employees and their fields of activity are variable and include: telecommunications, water, forest and agriculture, cartography and civil engineering. More than half of organizations (61.11%) work in their own country whilst 16.66% work at Regional level and at local level; 5.57% did not specify their Geographic area of business.

4.3.2 Requirements.

31.81% of the organizations were unable to specify their needs in terms of staff 26.27% will need qualified personnel in Photogrammetry and Remote Sensing and 23.72% need expertise GIS. Other requirements are shared between cartography, laser scanning and GNSS with a percentage of 4.54% each.

In terms of topics, the most requested needs were split between Photogrammetry/Remote Sensing and GIS with percentages respectively 26.82 % and 24.39 %. Other needs were between laser scanning, survey equipment, GNSS and UAVs with percentages of 7.3 % to 9.75%.



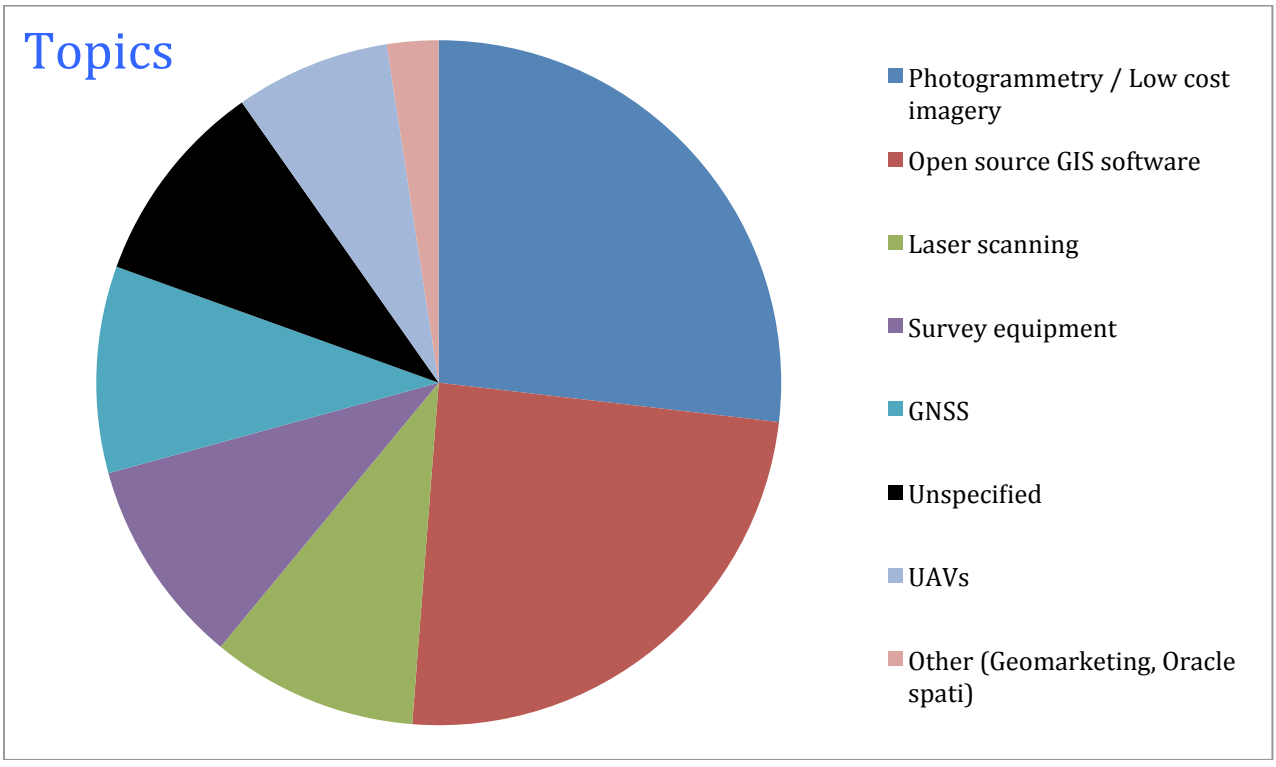


Figure 1. Breakdown of requirements from questionnaire.

On training, all organizations are willing to release staff to attend courses at AGSI. The most convenient training is day release at 40%, followed by full time with 33.3%. The type of training most desired is face to face courses and through conferences, seminars and workshops with 29.62%, followed by tailor-made courses with 25.92%. Other organizations have preferred distance courses and short stay courses at 7.4% each.

In summary although the questionnaires returned could not be considered as a good statistical sample, they did show the need for training in geospatial science, particularly in photogrammetry, remote sensing and GIS. The preferred mode of teaching is 'Day release' and there is a definitive willingness on the part of employers to support the aims of AGSI. These results were discussed at the workshop during the GCT2014 conference in Tunis.

4.4 Workshop

The workshop to discuss the results of the questionnaire and draft a curriculum for AGSI was held on 17th March 2014 in Tunis. Around 25 people attended, most from Tunisia and Libya, representing a range of organisations, but including many from government departments and private companies. The workshop started with presentations on the ISPRS project and on AGSI, and outlined the progress made to date. After a presentation on the analysis of the questionnaire a discussion covered many of the issues raised in establishing AGSI and defining its role.

Two main conclusions could be drawn from the returns of the questionnaire: first from the relatively low number of returns it could be inferred that at the moment is not a great deal of awareness in North Africa about the benefits of using geospatial data in projects; and second that those who did answer the questionnaire were unclear on what it could do for them (32% did not specify requirements). It was clear from this and from comments from the workshop participants that the first priority was to increase understanding of the value of geospatial data amongst decision makers, those commissioning work and those undertaking it.

In designing a curriculum based on the principles set out above there are a number of constraints. These issues were discussed during the workshop.

1. **Availability of equipment and software.**
   It was established that the priorities for equipment are one or more RPAS, one RTK base station, GNSS rovers, and hand held GIS data collection units. A range of software must be available at the AGSI, including photogrammetric suites and GIS packages from a number of vendors. Open source software could be also used to supplement commercial packages. It will be necessary to consider scenarios for teaching with limited equipment availability.
2. **Technical staff**
   Technical staff employed at the AGSI in Tunisia are required to support equipment, software and data.
3. **Teaching staff**
   The availability of permanent and temporary staff is a major factor in what can be taught. Ideally people with a range of expertise could be employed but this can be supplemented with trainers employed by companies in the region or from elsewhere. One possible scenario is to use international lecturers with support from local demonstrators or trainers, whereby the local personnel would ensure the continuity of local support. It was noted that many experts in Tunisian universities are not satisfied because they are not using their full potential and consequently could be available for part-time AGSI engagement.
4. **Local requirements**
   These have been obtained from the questionnaire responses. One particular aspect to be considered is the type of delivery: this could be full time, day release or evening sessions. Courses could take place at the AGSI premises or at the offices of those requiring training.
5. **Regional approaches**
   There is a need to look at what courses exist and how the AGSI can be complementary to these, benefitting from their experiences. Opportunities for collaboration should be explored.
6. **Legal issues**
   It was established that there were no legal implications to AGSI operations and that the training syllabus should incorporate information on local tendering procedures and evaluation of tender returns.

Initially the main role of AGSI should be to create an understanding of the value of geospatial data and the processes involved in processing the data and generating information. It is necessary to give the concepts behind geospatial software packages, not just train the use of software. People need to know what geospatial information to capture and how to capture it. Data sharing and integration are also important issues.

It was proposed that a progressive series of courses be adopted so that the first courses are aimed at people who could champion the use of geospatial data within their organisations. These champions would emphasise the benefits and value of geospatial data to provide information and increase efficiency (saving cost) within their organization. This should be followed by courses for managers who implement the use of geospatial data, and finally courses for the people who will engage in data collection and use of the required software.

4.5 Other issues

A number of other issues were discussed at the workshop.

Collaboration

There should be collaboration with local and regional colleges from the start and in the longer term there should be cooperation with European institutions, possibly delivering longer courses of 3-6 months. Student exchange could also take place for academic degrees.

Certification

Courses should be given recognition through certification. Ultimately they should achieve international certification. The European Credit Transfer Scheme (ECTS) could be used if this is possible, maybe jointly with a university (private) and/or industry. Government approval may be necessary. Issues of cross border education should be looked into. ECTS is a tool designed to make courses more transparent and to allow transfer between institutions. There is no reason why courses at AGSI cannot be designed to fit ECTS guidelines, but reciprocal recognition of AGSI courses will almost certainly be time-consuming to achieve.

Promotion of geospatial data

AGSI could also be instrumental in promoting geospatial data through grass roots effort in schools using portals such as digital-earth.eu. The AGSI can also have a consultancy role to assist organisations to introduce geospatial data. Organisations should not attempt to undertake projects in isolation, but look at how geospatial data can be used at all stages of a project, from planning, execution to analysis, building local experience and knowledge.

e-Learning

The possibility of e-Learning should be investigated. There are a number of courses available, working towards academic degrees and short course certificates.

5. PROPOSALS FOR THE CURRICULUM

5.1 Background

A number of papers in recent years discuss the development of curricula, for example Veenendaal (2014) and Mobasheri (2014). A common theme is the competency model proposed by Careeronestop (2014) which shows a full set of desirable skills as seen in figure 2, but AGSI needs to select those which are relevant to the local situation.

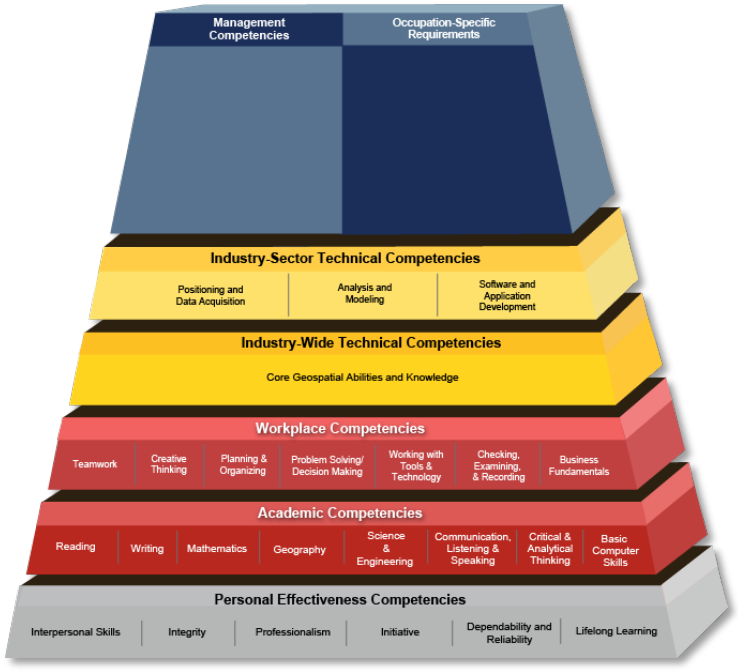


Figure 2. A competency model for Geospatial technology.

The workshop proposed that a progressive series of courses be adopted which develop a broad knowledge of geospatial technology and progress to detailed understanding and technical training as indicated in Figure 3.

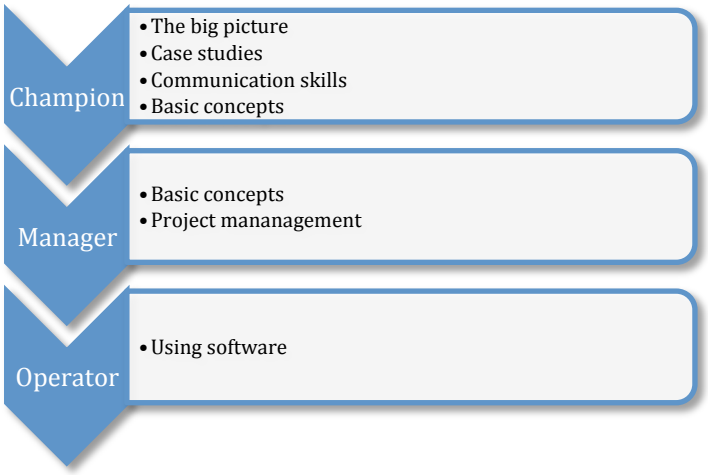


Figure 3. The principal progression of courses needed at AGSI.

Teaching should be developed on a modular basis and courses tailor-made to fit various requirements.

5.2 Proposed courses and modules

5.2.1 Outline of modules

Table 1 gives a list of modules with their outline content, which should be developed as a priority. The numbers in parenthesis [ ] give an approximation of the time needed where 40 hours would be a one week course with lectures and practical exercises.

MODULES	CONTENT
Overview modules introducing GIS	
The value of geospatial data [40]	Demonstration of how geospatial data can be used and case studies indicating how cost savings can be made through an integrated end to end approach
The role of geospatial data in projects [40]	A more detailed approach, than *The value of geospatial data* giving an introduction to photogrammetry, Remote Sensing and GIS, presenting the workflows necessary to generate information.
Case studies	Garbage collection Census & Elections Agriculture Forestry & Environment
Transferable skills	
Project management [10]	Geospatial project management skills & principles
Human Resources Management [10]	Sourcing of required skills, personnel development
Communication skills [10]	Efficient project communications
Understanding the concepts behind the methods – aimed at people with a initial knowledge of geospatial data but wanting to understand in-depth the principles, capabilities and limitations of capturing, processing and using geospatial data.	
Introduction to remote sensing [20]	History Electromagnetic spectrum Potential of Earth Observation
Preprocessing image data [20]	Radiometric Geometric

Workflows	Planning a project Stages in a project Project management
Positioning systems [24]	GNSS Reference systems Projections & Datums Inertial systems (airborne & terrestrial)
Imaging sensors [16]	Digital frame cameras Pushbroom sensors Scanners (Landsat) Airborne oblique camera systems Multi- and hyperspectral sensors Camera calibration
Characteristics of Terrestrial, airborne and satellite sensors images [40]	Relief distortion Oblique images Stereo geometry
Geometric processes [40]	Image orientation/triangulation Digital surface model extraction Orthoimage generation
Image processing [80]	Enhancement Classification Analysis Feature extraction
LIDAR [16]	Principles of laser scanning Positioning and orientation devices Managing point clouds
GIS data structures [40]	Conceptual models – Tessellation – Vector – Object oriented – Entity relationship models – Unified modeling language Logical data models – Network – Hierarchic – Object oriented – Geo-relational – Relational – Object relational
GIS data sources [40]	Vector Raster Statistical Field observations / Field completion
GIS data analysis [80]	Spatial analysis – Neighborhood – Proximity – network
Visualisation [16]	Scale Legend Symbolisation
Data quality [16]	Specifications Measures of accuracy and reliability Completeness Time stamping

Advanced modules	
Terrestrial, air- and space-borne Radar [24]	Principles Applications
Web and cloud based mapping [16]	Interoperability Geographic Mark-up Languages (GML)
Crowd-sourced mapping and reporting [16]	
Data sources and data integration [16]	
National Spatial Data Infrastructure (NSDI) [24]	Components Geospatial standards Metadata Policy issues

Table 1. A list of modules proposed initially for AGSI.

5.2.2 Courses

Courses	Modules
An introduction to the use of geospatial data	The role of geospatial data in projects Case studies
Spatial data for decision makers	The role geospatial data in projects The value of Geospatial data Case studies Data quality
Using geospatial data in projects	The role of geospatial data in projects Project management Communication skills
Positioning systems	Positioning systems
Workflows	Workflows
Working with images	Introduction to remote sensing Imaging sensors Preprocessing image data Characteristics of images Geometric processes (orthophotos and image matching) Data quality
Image processing	Image processing
Working with LIDAR	Terrestrial & airborne systems Positioning systems (GNSS & Inertial)
Working with GIS	GIS data structures GIS data sources GIS data analysis
Managing and presenting image data	Image processing Visualisation
Thematic applications e.g. Water Forestry Desertification and climate change Land administration Marine and coastal management Urban management Utilities Renewable energy infrastructure Environmental Impact Analysis	Modules relevant to the applications. Some more details of typical modules are given in Appendix 3.

Table 2. Basic courses with proposed modules.

Table 2 has been developed to fit the principles discussed and shows the modules proposed as a starting point.

These modules listed have not been normalised to be of equal weight, and although this is not essential in the early stages of AGSI, it would be useful when certification is being considered. When defining the modules in detail it is suggested that, where appropriate, teaching should centre around actual projects involving practical work and end to end project workflows.

Responses from the questionnaire and discussion at the workshop indicate that AGSI should start with short courses of 2 – 3 weeks duration, based on the modules set out above.

6. FUTURE DEVELOPMENTS

6.1 Scenarios for running courses

The proposals for courses and modules discussed above are based on the assumptions that resources are available to initiate training. In order to clarify restrictions that might affect a course, a number of scenarios are proposed and discussed. Options are discussed for starting short courses lasting for two to three weeks on the topics of '*An introduction to the use of geospatial data*', '*Spatial data for decision ma*kers' and '*Using geospatial data in projects*'. Some resources for teaching are also available, as well as funding, these are also briefly discussed.

Teaching in Tunis with local staff	
Pro: Local knowledge of staff. No travel and subsistence costs. Equipment and software from local companies.	Con: Sourcing of qualified local trainers. Availability of software and equipment.
Notes: this is the ideal scenario if qualified local resources are available.	

Teaching in Tunis with staff from outside Tunisia	
Pro: Wider range of expertise available. Possibility of bringing software which could be commercial or open source.	Con: Cost. Compatibility of software with local hardware and GI work environments.
Notes:	

Teaching in Africa under AGSI banner	
Pro: Local knowledge of staff. No travel costs for local staff. Equipment, software and laboratories are available. Easy access for local and regional students. Influence of AGSI increased throughout North African region.	Con: Additional cost of travel and subsistence for non-Tunisian students. Additional effort from AGSI staff to set up the courses.
Notes: It is possible that AGSI could establish partnerships with organisations in other countries in the region to provide courses, with the possibility that students from Tunisia could also attend. This would be more economical and spread the influence of AGSI throughout the region. These local partners can also promote, locally, and look for potential customers. Possible venues are RECTAS (Nigeria), El Jadida (Morocco), RCMRD (Kenya), Egypt	

Courses set up by other organisations – with/without distance learning	
Pro: Curriculum already established. Staff provided by sponsoring organisations. Possibility of bringing software which could be commercial or open source.	Con: Cost Compatibility of software with local hardware and GI work environments.
Notes: Possible organisations are EuroSDR, EDUSurv, UN SPIDER, ITC.	

6.2 Open source software

A number of open source packages are available which can complement commercial software. The most widely used are QGIS, ILWIS and GRASS. Information of using open source software is available at The Open Source Geospatial Foundation, (OSGeo), www.osgeo.org which was created to support the collaborative development of open source geospatial software, and promote its widespread use.

Table 3 lists some examples of open source software.

Software	Description
ESA software tools	A set of software tools for processing data from the ESA (https://earth.esa.int/web/guest/software-tools)
BILKO	An image processing package for education use (www.learn-eo.org/software.php)
Spirits	An integrated and flexible software environment for analyzing satellite derived image time series in crop and vegetation monitoring (http://spirits.jrc.ec.europa.eu)
Postgresql (and PostGIS)	A Database and its spatial extension
ILWIS	An Integrated Land and Water Information System
Quantum GIS (QGIS)	A complete Geographical Information System
uDig	A GIS software program
Geoserver	An open source server written in Java – allows users to share, process and edit geospatial data.
Mapserver	An open source development environment for building spatially enabled internet applications
MapFish	An open source web mapping development framework
OpenLayers	An open source AJAX library for accessing geographic data layers of all kinds
GeoTools	An open source GIS toolkit written in Java, using Open Geospatial Consortium specification

Table 3. Examples of useful open source software. (Includes information from Mobasheri et al (2014)

6.3 Funding sources

A number of potential sources of funding are available:

1. Learned Societies. Many organisations offer small grants, these include ISPRS, ICA, GSDI.
2. IGOs: UNOOSA, UNGGIM, GEO are prepared to fund courses.
3. National Academies of Science or other bodies: China (Pengde Li offered funds in his presentation at ISPRS Commission VI), Germany.
4. The international geospatial industry: Large organisations, such as Hexagon, Trimble and Esri are offering mainly software grants to universities and geospatial training institutions.
5. Funding available in Tunisia:

a. Francophone University Agency (Agence Universitaire de la Francophone (AUF))
b. The Word Bank
c. African Development Bank, ISESCO Islamic Bank
d. French Development Agency and *Japan International Cooperation Agency* (JICA) under the bilateral cooperation with Tunisia.

6.4 Other resources

Many resources are available on the web in the form of tutorials and e-Learning packages. Links to some of these can be found on the ISPRS website: http://www.isprs.org/education/tutorials.aspx. A review of e-Learning material was presented at the ISPRS Commission VI Symposium (Vyas and Koenig, 2014).

Other resources are available from various organisations, for example PCI Geomatics, have announced that the company is making its training textbooks available to the general public for non-commercial use. See more at: http://www.sensorsandsystems.com/news/top-stories/corporate-news/33881-pci-geomatics-expands-training-program-by-providing-free-access-to-online-coursebooks.html#sthash.zLwLqnto.dpuf

Cartographic/open source GIS/ visualisation material can be addressed by the ICA Commission on OpenSource Geospatial Technologies (in conjunction with the ICA Commission on Education and Training) which is well used to delivering customised courses , and can promote the concept that visualisation is not just an afterthought in geospatial data handling.

Earth observation data is available from a number of sources for educational use, for example Landsat, SPOT, ESA (Sentinel data) and DigitalGlobe. A useful summary of available Geospatial Imagery and Raster GIS Data Sources can be found at http://www.exelisvis.com/portals/0/pdf/6-14_Geospatial_Imagery_Raster_GIS_Data_Sources.pdf

Access to local aerial photography is highly desirable. The use of RPAS at the AGSI is an ideal teaching tool to collect imagery and to demonstrate end to end project workflows.

7. CONCLUSIONS

7.1 The curriculum

The questionnaire and workshop resulted in the project team having acquired a good knowledge of the objectives and context of AGSI. A framework for the curriculum has been developed and a number of issues identified. Furthermore a draft set of modules has been identified and some detail added to these.

7.2 Lesson learned

The project has demonstrated the value of having local knowledge and engaging with the beneficiaries of AGSI. The development of a full curriculum has been hampered by the lack of responses from the questionnaires, but this is in part due to the contracted time frame which was necessary because the workshop had to be held earlier than anticipated, allowing less time to collect and analyse responses. It also shows the lack of geospatial awareness and education in the region, which the AGSI is set up to address. It is recommended that the time scale for similar projects in the future be long enough to collect all necessary background information before holding a workshop.

7.3 General outcomes

Apart from progress in the development a curriculum for the training of geospatial technicians in North Africa, ISPRS has benefitted from gaining experience in working in on a practical project and experiencing problems on the ground. ISPRS has gained exposure in the area and is open to further cooperation in the region. There has also been cooperation with ISPRS Regional Members and the potential to provide services to ISPRS members in the region.

8. REFERENCES

Careeronestop, 2014. Geospatial Technology Competency Model. http://www.careeronestop.org/competencymodel/competency-models/geospatial-technology.aspx. March 2014

A. Mobasheri, H. Vahidi and Q. Guan, 2014. Towards A Web-Based Gis For Teaching Geo-Informatics At Under-Graduate Level In Developing Countries: A Case Study Of Iran The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences,Volume XL-6, pp 67-71.

S. Oeldenberger and K. B. Khaled, 2012. The African Geospatial Sciences Institute (AGSI): A New Approach To Geospatial Training In North Africa. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Kyoto, Japan, Vol. XXXIX, Part B6, pp. 45-51.

B. Veenendaal, 2014. Addressing The Challenges Of A Quarter Century Of Giscience Education: A Flexible Higher Education Curriculum Framework. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences,Volume XL-6, pp 107-112.

A. Vyas and G. Koenig, 2014. Computer Aided Teaching in Photogrammetry, Remote Sensing, and Geomatics – A Status Review. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences,Volume XL-6, pp 113-118.

9. ACKNOWLEDGEMENTS

The AGSI curriculum project has been made possible through a grant from the ISPRS Scientific Initiative. Support from the organisers of the Geospatial Conference in Tunis 2014 is gratefully acknowledged.

APPENDIX 1: The English version of the questionnaire

Development of a Curriculum for The African Geospatial Sciences Institute (AGSI)

Background

The International Society for Photogrammetry and Remote Sensing (ISPRS) has provided some funding to develop a curriculum for The African Geospatial Sciences Institute (AGSI) in Tunis. The African Geospatial Sciences Institute is a non-profit organisation registered in Germany which is supported by industry, government and academia. The objective of AGSI is to accelerate the geospatial capacity development in North Africa by providing the facilities for geospatial projects and management training to regional government employees, university graduates, private individuals and companies. The initial curriculum will concentrate on vocational geospatial training, emphasizing practical, project-based work. Learning-by-doing is the priority and whilst all participants will be encouraged to continue with a more formal education, there will also be support for anyone who wants to start his own business. The curriculum will take account of the resources available and particularly look at how low cost equipment such as UAVs and low cost or open source software can be used. The emphasis will be on training and education which is fit for purpose in the region and which will allow those completing the course to work efficiently and effectively. Teaching will be mostly in English although some course may be provided in French or Arabic.

Funds from the ISPRS Scientific Initiative will be used to develop a curriculum for AGSI based on the requirements of the region and using the expertise of ISPRS working groups. ISPRS can make a significant contribution to developing the curriculum which could then be used in similar initiatives elsewhere. ISPRS Regional Members will also be involved.

The first step in the project will involve a survey of potential stakeholders in North Africa in order to determine the requirements for training and education. The results from this questionnaire will be presented and discussed at a workshop to be held in Tunis in March.

Survey

You are invited to complete the questionnaire. The information which you provide will be used anonymously unless you give permission in question 6 below.

Please return the completed questionnaire by 14th February to:

Prof. Kamal LABBASSI
Chouaib Doukkali University,
B.P: 20, 24000 El Jadida,
Morocco
labbassi@ucd.ac.ma
kamal_labbassi@yahoo.fr

Questionnaire

1. Information about your organization.

Name of organization/company	
Nature of the organization	Public/Private NGO Other (Specify):
Name of contact	
Full Address (including phone, fax and email)	
Official Website	
Number of employees	
Type of activity (check as many as relevant)	Production Services Expertise and advice Provision of spatial data Use of spatial data Research - Development Academic Continuous training Other (Specify):
Role of geospatial information within the organisation (limit 50 words}	
Main techniques used	Basic survey GNSS Photogrammetry Satellite imagery Other (Specify)
Geographic area of business	
Principal equipment used	
Principal software used	
Specify your needs for training in the field of Geospatial Information? (Indicate the areas in order of importance in the company)	Survey equipment Photogrammetry Laser scanning, GNSS Open source GIS software Low cost imagery UAVs Others (Specify)

2. Staff requirements

a. What type of staff do you require? Please complete the table in order of priority of topics

	Topic	Educational level	Skills required	Number required
1				
2				
3				

b. Are you willing to release staff to attend courses at AGSI? Yes/No

c. If yes what type of training is most convenient?

Full time	
Day release	
Evening	
Other	

d. Type of training

In your opinion how should this training be conducted?	Face to face courses - Distance courses - Tailor-made courses - Seminars / workshops - Through Conferences - Other(specify)

2. Example of large projects

(List the regular work of the institution, indicating where appropriate on behalf of which organization they were made (beneficiary)

Project Title	Year	Partnership	Beneficiary

3. Support in terms of equipment and teaching personnel – are you able to help AGSI through provision of equipment, software or personnel?

Do you have any equipment which could be made available for training at AGSI? If so please list.	
Do you have any software packages available for use at AGSI? If so please list.	
Do you have any staff to deliver training at AGSI? If so please list.	

3. Please add any additional comments

4. Can the information provided be published?

APPENDIX 2: Questionnaire Respondees

Country	*Organization*	*Nature of the organisation*	*Number of employees*	*Field of activity*	*Notes*
Gabon	Agence Nationale des Parcs Nationaux	Public		Conservation-Development, Environment	
Morocco	High Commissariat for Water, Forests and Desertification Control	Public	Over 5000	Water, Forest	NMA needs training in specific areas
Morocco	Regional Office of Agricultural Development of Doukkala	Semi-public	Over 200	Agriculture	needs training in specific areas
Morocco	Direction de l'Aménagement du Territoire, Ministère de l'Urbanisme et de l'Aménagement du Territoire, Maroc	Public	Over 500	Urban	needs training in specific areas
Morocco	Université Sidi Mohamed Ben Abdellah, Faculté Polydisciplinaire de Taza	Public	Over 120	Training Research	needs training in specific areas
Mauritania	BAHER	Private	10	Engineering	Research organization needs training in specific areas
Mauritania	Directorate Of Mapping And Geographic Information	Public	20	Cartography	
Nigeria	Regional Centre for Training in Aerospace Surveys (RECTAS)	Public	200	Research– Development Academic Continuous training	
Tunisia	Industrial Land Agency	Public	200	Development of industrial zones	
Tunisia	Tunisiana	Private	2000	Telecommunications	
Tunisia	NGI Maghreb	Private	50	Mapping & services	
Tunisia	Servicom	Private	30	Telecommunications	
Tunisia	CERT	public	200	Telecommunications	
Tunisia	ines Rabbouch	Private	1	civil engineering	
Tunisia	Ministere de l'Equipement	Public	20000	Administration, Mapping, Environment, GIS Services, Public Works	
Tunisia	CRDA Kef	Public	750	Agriculture	
Tunisia	Agence Nationale de Protection de l'Environnement	Public	400	Administration, Environnement	

APPENDIX 3: Examples of Thematic Modules

INTEGRATED WATERSHED MANAGEMENT

Objective:

- Understand the intervention of RS and GIS in the integrated management of watersheds (soil, vegetation, water and forest)
- explain the contribution of a satellite image for the mapping and monitoring of natural resources in a watershed
- Be aware of operational projects

Axes of the training:

- Defining the Integrated Watershed Management
- Modeling of erosion and surface runoff
- Mapping and monitoring of forest change
- Exploration of underground water resources.
- Management of agricultural water resources
- Integrated decision support for the management of water resources in a watershed system : a case study

Exercises:

- Mapping of land use in a watershed
- Generation of a DTM and derivatives products in a watershed
- Modeling of water erosion.
- Modeling of agricultural water resources.

MANAGEMENT OF NATURAL HAZARDS

Objective:

- Understand the intervention of EO and GIS in the process of crisis management (before, during and after crisis)
- Understanding for various types of risks, and contribution of RS and GIS

Axes of the training:

- Concepts, definition and classification of natural hazards
- Management of natural hazards and contribution of space technologies
- Risk of fire and forest dieback
- Risk of desertification and drought
- Geological Risk
- Risk of flooding
- Environmental Risks
- Risk of landslides

Exercises:

- Modeling the hazard of forest fires
- Case study of different types of risk

TERRITORIAL DEVELOPMENT

Objective:

- Understand the process of territorial development.
- Understand the intervention levels of EO in the process
- Be aware of descriptors extracted from satellite images
- Understand the role, contribution and editing of GIS territorial
- Review of operational applications

Axes of the training:

- Presentation of the issue of territorial development
- Type and feature of satellite images for land management at different levels (national, municipal or local)
- Descriptors extracted from satellite images for mapping and monitoring land
- Exploitation of information in the GIS for land management
- Building of GIS territorial projects

Exercises:

- Observation of the territory from satellite images on different areas and scales and location of different territorial structures
- Production territorial descriptors : MNT, ortho-image maps or plans of land
- Handling GIS functionality around a territorial problem : multi-source data integration, multi-criteria analysis

MANAGEMENT OF WATER RESOURCES

Objective:

- Identify the contribution of the tools of RS and GIS in the field of water management
- Understand the nature of the treatment of satellites required for the extraction of information related to the management of water pictures
- Identify the type and nature of information to be integrated into a GIS dedicated to the planning and management of water

Axes of the training:

- Types and characteristics of satellite images used in the field of water resources
- Production technique of useful information for water resources
- GIS and integrated water resources management (IWRM)
- Hydrological modeling
- Exploration of underground waters

Exercises:

- Observation , identification and location of indicators and phenomena related to water resources in different category image
- Monitoring the evolution of irrigated area
- Application of GIS for the management and use of water

DEVELOPMENT AND URBAN PLANNING

Objective:

- Understand the structure and model of urban development
- Understand the nomenclature used in the urban area
- Identify types of satellite images used
- Identify working scales and resolutions
- Understand the tools used in the image processing
- Understand the process of multi-criteria analysis in GIS

Axes of the training:

- Needs and experiences in the urban domain : structure and model of urban development, nomenclatures used in the urban area
- Application of RS and GIS in urban development and its impact on the environment
- Applications of GIS in Urban Planning

Exercises:

- Monitoring of urban development and changes
- Detailed mapping of urban fabric from very high resolution images
- Advanced Spatial Analysis for Urban Planning Study

MANAGEMENT AND MONITORING OF AGRICULTURAL

Objective:

- Demonstrate the practical interest of RS and GIS for improving technical management, planning, monitoring and control related to agricultural areas: agriculture, forests, rangelands.
- Learning to choose adequate satellite imagery for mapping of agricultural land
- Learn to use the data in a GIS

Axes of the training:

- Agricultural mapping.

- Indicator for monitoring of the agricultural season
- System monitoring global vegetation
- Indicator of drought and desertification
- RS and GIS for the characterization and management of forest resources

Exercises:

- Viewing and pretreatment of satellite images in different agricultural zones
- Information retrieval of agricultural areas
- Indicator of vegetation monitoring
- Monitoring of forest changes
- Multi-criteria analysis around some agricultural problems

MANAGEMENT OF COASTAL AREAS

Objective:

- Know the issues and indicators for coastal areas
- Identify the contributions and limits of imaging EO to know and follow the coast
- Understanding the benefits of GIS for the management of coastal areas

Axes of the training:

- Definition of the coastal zone , interest t issue of coastal areas
- Means of studies and monitoring : indicators of coastal areas
- Choice of satellite images / treatment needs and associated
- Mapping and followed the evolution of the coastline: the impact of urbanization, port infrastructure..
- Evolution of coastline and beaches
- Mapping of contaminated areas : industrial waste , marine pollution
- Mapping characteristic modeling of aquaculture facilities

Exercises:

- Spectral behavior of objects in the littoral
- Mapping the coastline and follow the evolution of the coastline
- Mapping aquaculture area.