DOPPLER

development of palop
knowledge in radioastronomy

Valério A. R. M. Ribeiro & Domingos Barbosa, for a larger collaboration
Universidade de Aveiro & Instituto de Telecomunicações

AKDN
Aga Khan Development Network

universidade de aveiro
instituto de telecomunicações
UNIVERSIDADE EDUARDO MONDLANE
U.PORTO
FACULDADE DE CIÊNCIAS UNIVERSIDADE DO PORTO
Universidade de Coimbra
OSUWELA Associação Osuwela

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Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

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Economic development with radio astronomy 14
June 2019

The Aga Khan Development Netwo

- Founded and guided by His Highness the Aga Khan, the Aga Khan Development Network (AKDN) brings together a number of development agencies, institutions, and programmes that work primarily in the poorest parts of Asia and Africa.
- A central feature of the AKDN's approach to development is to design and implement strategies in which its different agencies participate in particular settings to help those in need

The Aga Khan Development Netwo

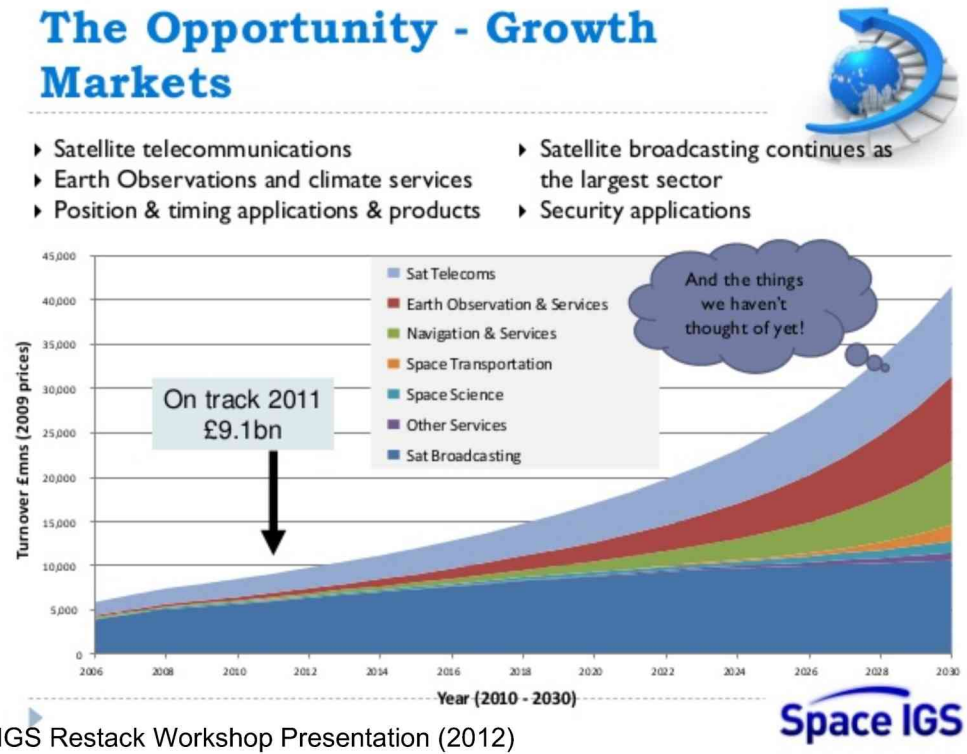
- The AKDN works in over 30 countries around the world
- It currently operates 1,000 or so programmes and institutions – many of which date back over 60 years, and some over 100
- It employs approximately 80,000 people, the majority of whom are based in developing countries
- The AKDN's annual budget for non-profit development activities is approximately US$ 950 million
- Its economic development arm, the Aga Khan Fund for Economic Development (AKFED), generates annual revenues of US$ 4.3 billion, but

PamirEnergy, a project company of the Aga Khan Fund for Economic Development.
AKDN/Matthieu Paley

Why?

"The important thing is not to stop questioning" - Albert Einstein

- Born out of the need to contextualize to Mozambique's reality
- Enhance Mozambique's participation in technology projects and the knowledge economy
  - i.e. Big data, Space, IoT for agriculture and resource management and exploration
- Identify and develop revenue streams to enable science infrastructure to become self-sustaining
- Engage with local enterprises and projects regularly and effectively and establish strong links with other EU development projects



IGS Restack Workshop Presentation (2012)

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The team

Ana Cláudia Teodoro
FCUP

Antonio Batel Anjo
OSUWELA/UA

Alexandre Correia
UC

Claudio M Paulo
UEM

Dalmiro Maia
FCUP

Dinelsa Machaieie
UEM

Diogo Gomes
UA/IT

Domingos Barbosa
IT

João Paulo Barraca
UA/IT

Miguel Bergano
IT

João Fernandes
UC

José Alberto Gonçalves
FCUP

Isabel Peças
FCUP

Mário Cunha
CUP

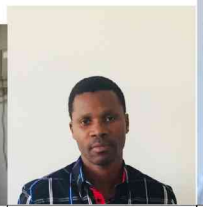
Neftalí Sillero
FCUP

Nuno Peixinho
UC

Sonia Ánton
UA

Sosdito Mananze
FCUP/UEM

Teresa Barata
UC



Valente Cuambe
UEM

Valério Ribeiro
UA/IT

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instituto de telecomunicações

U.PORTO
Faculdade de Ciências Universidade do Porto

Universidade de Coimbra

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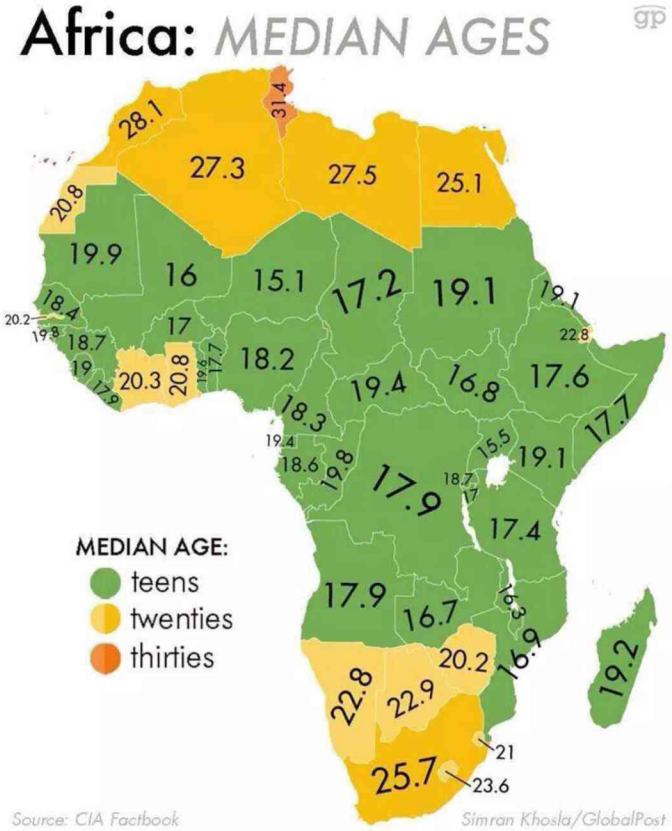
What do we set out to achieve?

Focus on the following key points:

- What is the existing infrastructure in Mozambique?
- How do we improve quality of life in Mozambique?
- How do we meet the UN development goals?

More precisely:

- What is the potential of DOPPLER to influence infrastructure, research and science communication in Mozambique?



Mozambican priority areas

Human resources development	Fishery
Education	Construction/Infrastru re
Agriculture	Ecotourism
Health	Industry and processin
Energy	Water
Marine Sciences	Mineral resources

Mozambican educational system

Níveis de Ensino	Anos lectivos									Crescimento (totais)	
	2016			2017			2018			Δ2017/	Δ 2018/
	Totais	Mulheres	%M	Totais	Mulheres	%M	Totais	Mulheres	%M	2016	2017
EP1	5,046,833	2,463,879	47.7	5,192,699	2.506.729	48.3	5,554,352	2,684,734	48.3	1.5%	7.0%
EP2	921,127	433,993	46.3	945,819	443.34	46.9	1,008,317	471,992	46.8	2.4%	6.6%
ESG1	791,202	386,576	47.3	796,306	389.526	48.9	844,673	408,988	48.4	0.2%	6.1%
ESG2	264,396	129,313	45.7	307.581	151.773	49.3	351,865	175,040	49.7	15.9%	14.4%
Total	**7,023,558**	**3.413.761**	**47.4**	**7,242,405**	**3.491.368**	**48.2**	**7,759,207**	**3,740,754**	**48.2**	**2,0%**	**7.1%**

Mozambican educational system

- 20% of students follow sciences
  - 2% of these are women
- Around 672, 13.6%, Professors with PhDs (2015)
- ~52 public and private universities
- Steady increase on number of research projects (UEM)
  - 352 (2015), 421 (2016), 462 (2017)
- UEM financing primarily from:
  - Government
  - National and international partnerships
  - Projects specific funding
  - Services

Building competencies

How do we improve quality of life in Mozambique?

- Africa has had a massive economic growth however, this growth has not always been converted to jobs
- Education at various levels suffers serious deficiencies in STEMS
  - Train the trainers
- Understand local habits

How do we meet the UN development goals?

- Make sure we are aware of the UN targets and indicators
- We require to keep track of our participants
  - This will set a [illegible] eline

Credit: The Science Connection: Strategic Foundations for Policy document 02/10, 2010

Building competencies

What is the potential of DOPPLER to influence infrastructure, research and science communication in Mozambique?

- Leverage its experience in research
- Utilise the experiences in putting together a national roadmap for research infrastructure
- Extensive experience of international projects

How can we help improve the quality of life by increasing scientific culture in Mozambique?

- Train the trainers
- Follow-up on participants for a period of time
- Utilise tools, specially open source, that the Mozambican people can use in their work

Advanced Training

Astronomy, Radio Astronomy and Space Sciences

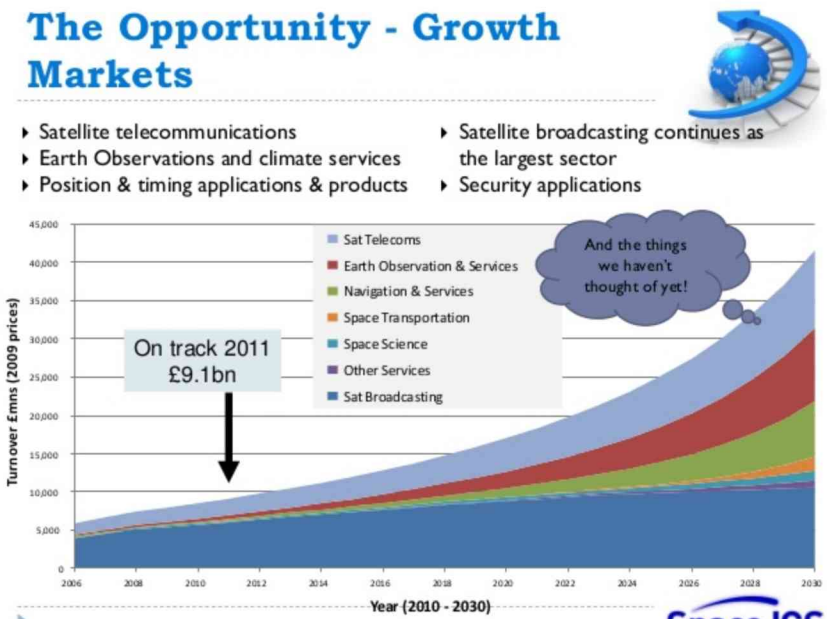
- Introduction to Radio Astronomy (D. Barbosa, IT)
- Interferometry in Radio (D. Maia, FCUP)
- An Introduction to Astronomy (J. Fernandes, UC)
- Solar Physics (D. Maia, FCUP/V. Cuambe, UEM)
- Planetary Sciences (N. Peixinho, UC)
- Galactic Astronomy (D. Barbosa, IT/D. Machaieie, UEM)
- Transients (V. Ribeiro, UA/IT)
- Extrasolar Planets (A[illegible] UC)

Credit: SKA South Africa

Advanced Training

Earth Observations

- Introduction to Remote Sensing (A. Teodoro, FCUP)
- Remote Sensing and crop monitoring: Food Production and Food Security (M. Cunha, FCUP)
- Digital Terrain Modelling using aircraft and satellite data (J. Gonçalves, FCUP)
- Navigation and Position using Global Navigation Satellite Systems (D. Maia, FCUP)
- Remote Sensing Applications in Geographical Information Systems (A. Teodoro/J. Gonçalves, FCUP)
- Satellite imagery as an essential tool for biodiversity studies (N. Sillero, FCUP)



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Advanced Training

Big data

- Operating systems - Linux and networks (J. Barraca, IT)
- Incode 2030: Programming - from C to Python (D. Gomes, IT)
- Cyber Infrastructures and Internet of Things (J. Barraca/ D. Gomes, IT)
- SKA/Radioastronomy Big Data (D. Barbosa, IT)

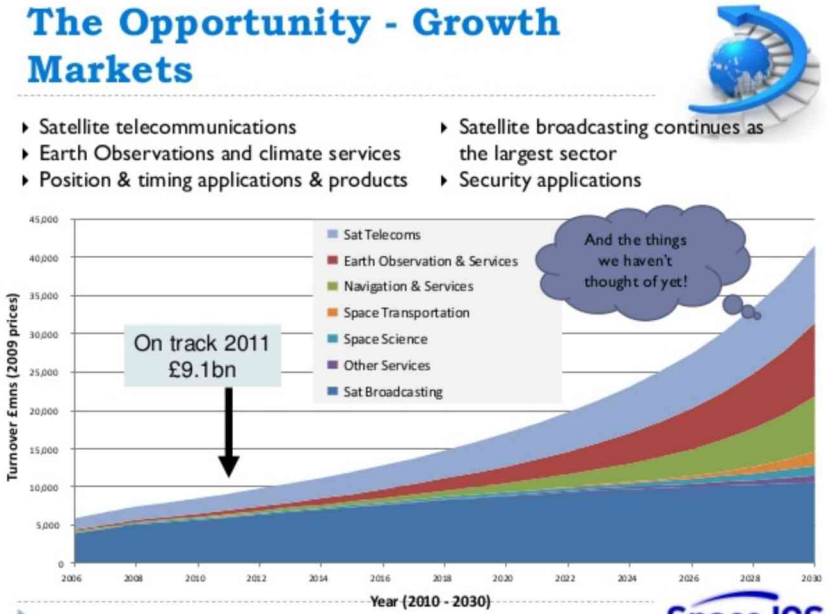
5 V's of Big Data

- Volume: Science
- Velocity: Science, IoT, Industry 4.0
- Variety: IoT, Industry 4.0
- Variability: Science, IoT
- Value: Science, IoT, Medical, Industry 4.0

Foster industry-specific training and development

Identify relevant industry for training

- Satellite communications installation, training and space sciences applications
- Deliver practical knowledge and skills that can benefit the region's economy by enhancing the technical infrastructure, capability and capacity
- Identify and develop revenue streams to enable science infrastructure to become self-sustaining
- Engage with local enterprises and projects regularly and effectively and establish strong links with other EU development projects



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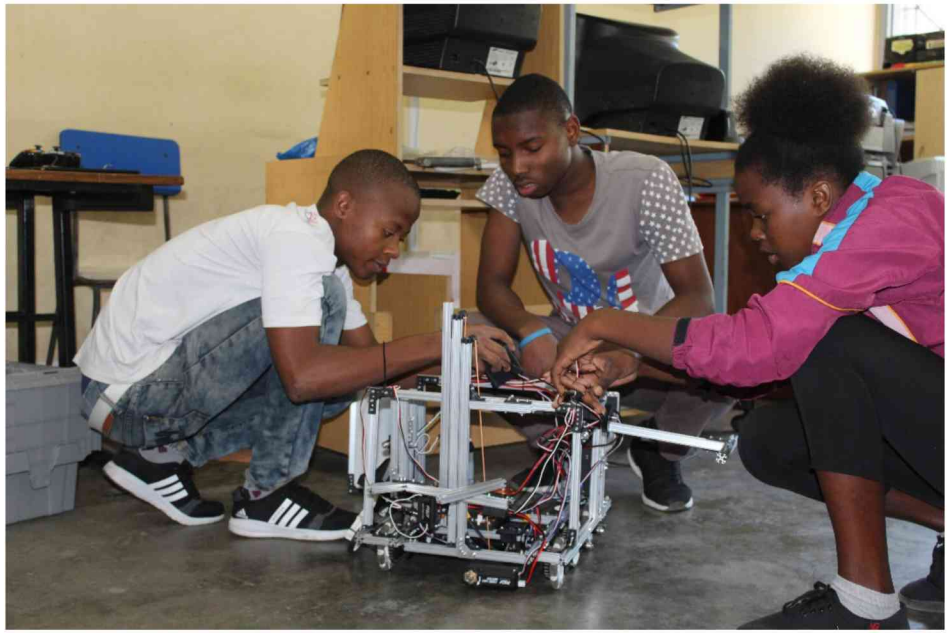
STEM Action



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Conclusions

Human resources development	Fishery
Education	**Construction/Infrastructure**
Agriculture	Ecotourism
Health	Industry and processing
Energy	**Water**
Marine Sciences	Mineral resources

"Satellite imagery has significant potential to provide more timely statistical outputs, to reduce the frequency of surveys, to reduce respondent burden and other costs and to provide data at a more disaggregated level for informed decision making." (Big Data UN Global Working Group