

Use of space-based technologies to climate change adaptation and mitigation: Prospects for Ethiopia

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United Nations/Indonesia International Conference on Integrated
Space Technology Applications to Climate Change

**Jakarta, Indonesia
September 2-4, 2013**

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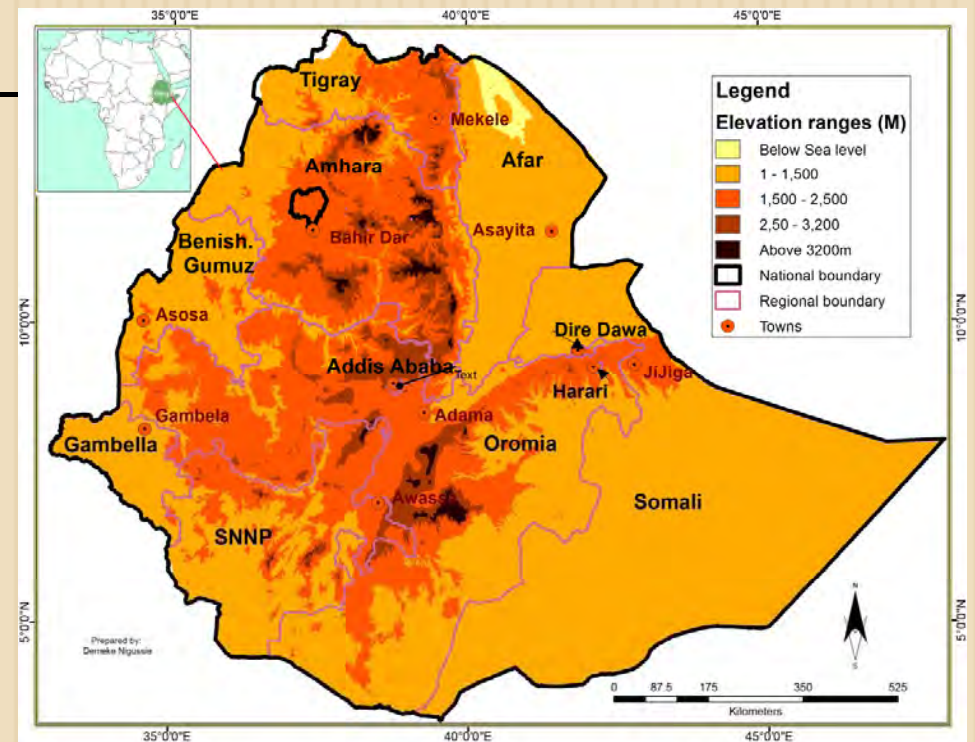
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Introduction

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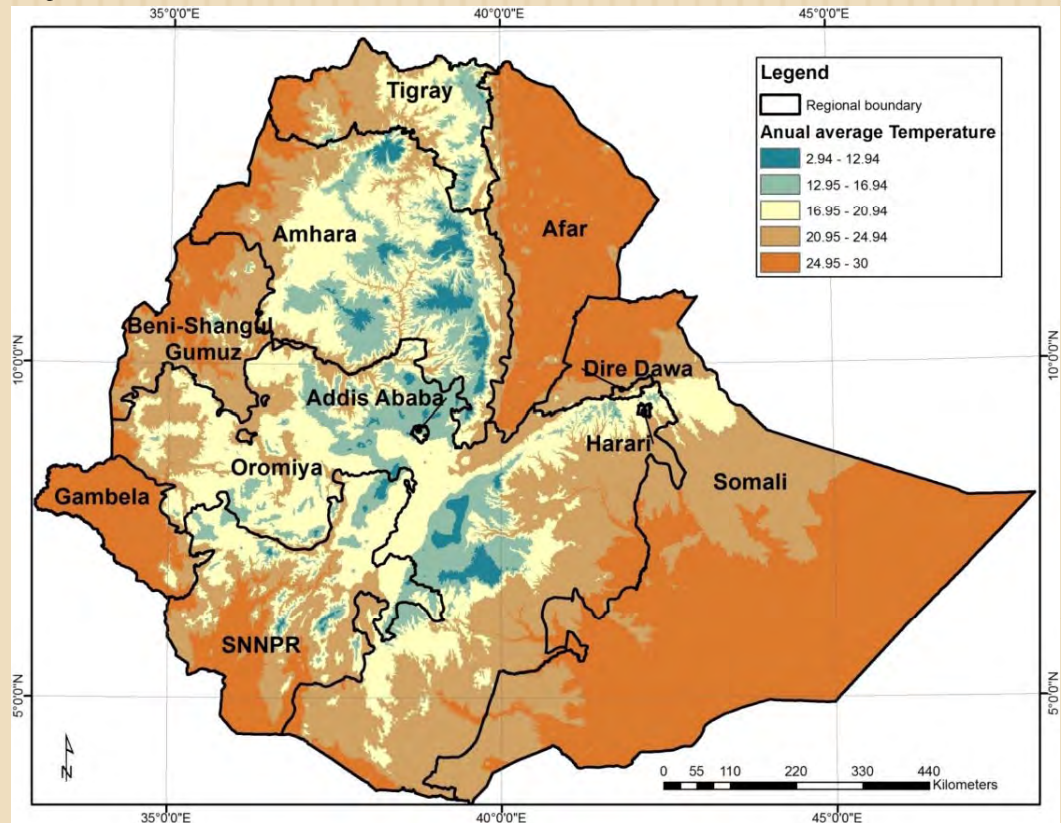
- Ethiopia is a country with population of over 86.6 million(CSA, 2013) and vast area of about 1.13 million km² >>>second largest in in Africa
- endowed with diverse agro-ecologies that are mainly modified by altitude.
- Consequently, the climate is temperate type on the highlands and hot in the lowlands.



Introduction (cont.)

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- These agro-ecological diversities together with socio-cultural diversities have endowed the country with plant and animal diversity.
- This diversity is largely endangered by exasperating climate change in Ethiopia.



Introduction (cont.)

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- Ethiopia is heavily dependent on **rainfed** agriculture.
- But, the frequent weather extremes both in time and space (too much or too little rainfall-**flood/drought**) critically affecting most of Ethiopia's agricultural activities since it is based on traditional farming systems and due to low adaptive capacity.
- Ethiopia's geographical location and topography in combination with low adaptive capacity entail a high vulnerability to the impacts of climate change(CC).

Climate change in Ethiopia

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- As Ethiopia's economy is dependent on rain-fed agriculture which is predominantly sensitive to CC, it is extremely vulnerable.
- Despite using traditional farming systems, the agriculture is still significantly contributing to the GDP, foreign currency and employment.



Climate change in Ethiopia (cont.)

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- Climate change is not a future possibility for Ethiopia; it is a present reality (<http://www.epa.gov.et/>).
- Ethiopia has suffered several droughts and famines
- CC is being revealed in drying of lakes, rivers and other wetlands, flooding and weather extremes.
- The shrinking/drying of some lakes can be an example for such alarming CC manifestations
 - Lake Haromaya...totally dried



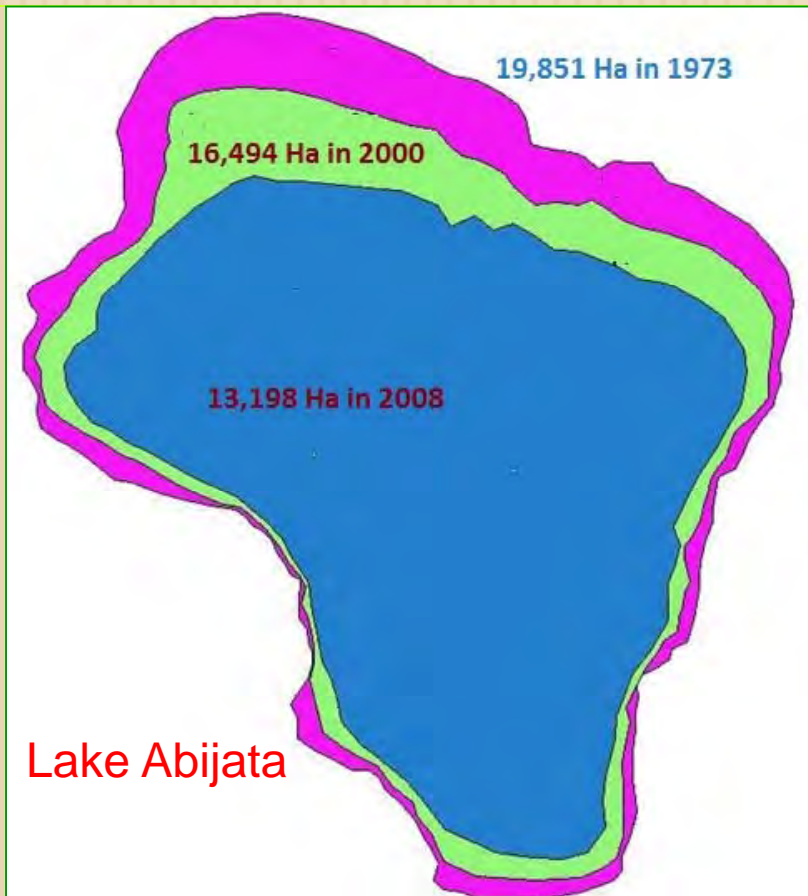
Source: CRGE

Climate change in Ethiopia (cont.)

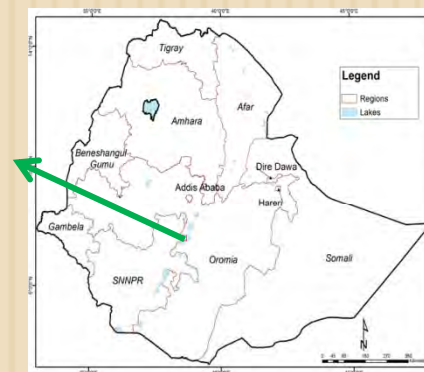
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Shrinking lakes Examples for CC

Lake Abijata since 1970's located in the Ethiopian rift valley



12,699 Ha
in 2010



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Climate change in Ethiopia (cont.)

Lake Haramaya

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February 2012

Images from GoogleEarth



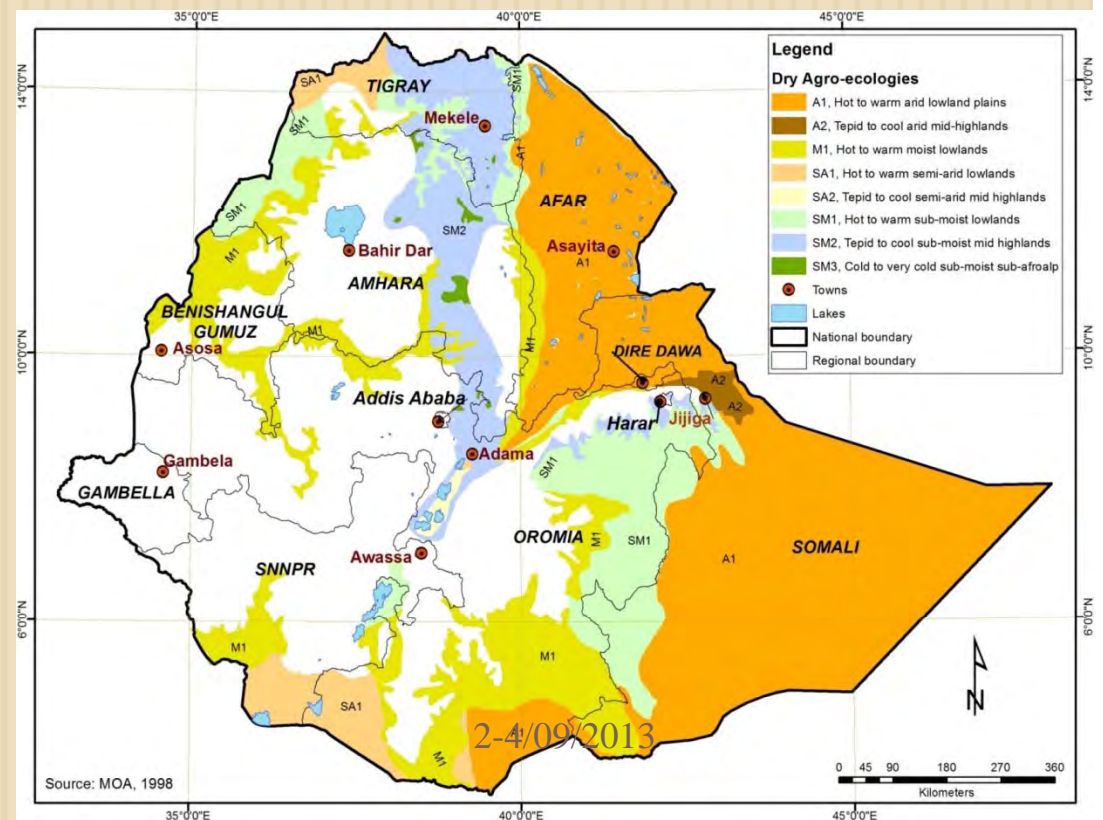
This lake is currently reported totally dried –most of it converted to farmland



Climate change in Ethiopia (cont.)

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- The NAPA report of Ethiopia (NMA 2007) identified the **arid, semi-arid** and **dry sub-humid** parts as the most vulnerable areas to CC-induced drought.
- According to the same source, agriculture sector is identified as the most vulnerable to climate variability and change.



Climate change in Ethiopia (cont.)

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- Most of the people in these areas are very poor which are highly vulnerable to CC.
 - adaptation can reduce their vulnerability to CC.

Institutional involvement

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- Ethiopia is exerting huge efforts in order to adapt and mitigate the adverse effect of CC.
 - The Environmental Protection Authority (EPA) has been mandated to co-ordinate the national response to CC.
 - but, in 2011 the Ministry of Agriculture (MoA) took over the responsibility of the national REDD+ programme from the EPA. The MoA is the one involved with implementing the Climate Resilient Green Economy (CRGE)
- (<http://www.thereddesk.org/countries>).

Institutional involvement (cont.)

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- Being the focal unit for agricultural related climate researches, the Biometrics, GIS and Agro-meteorology Directorate of EIAR is implementing CC related research activities with government and external funding such as:
 - the Rockefeller foundation,
 - CIMMYT and
 - ASARECA.

Institutional involvement (cont.)

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Several organizations operating in the country (GOs, NGOs, UN agencies, universities and research institutions and professional associations) also have projects that address climate change related issues. Few of such institutions exerting efforts to address CC issues are:

Gos

1. EPA(MoEF)

- ▣ MOA
- ▣ EIAR
- ▣ NMA
- ▣ ATA
- ▣ EMA
- ▣ AMU

CGIARs

- ICARDA
- IWMI
- CIMMYT
- ILRI
- ICRISAT

UN Agencies

- ECA
- UNDP

NGOs

- Farm Africa
- Care
- GTZ
- SOS Sahel

Universities

- AAU
- AMU
- MU

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Space Science in Ethiopia

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- Adequate information is required for CC adaptation and mitigation measures.
- information from RS, GPS and Meteorological satellites is critically important to address climate change issue in the country. Integrated use of GITs together with other space technology information will help to efficiently and effectively address the complex CC challenges.
- The awareness on the use of Geo-information technologies (GIS, RS & GPS) in various sectors of Ethiopia is improving.
- Despite the huge contribution of space-based information for CC study, the science is relatively young in Ethiopia.

Space Science in Ethiopia (cont.)

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- It is vital to have a good understanding of the extents and severity of CC potential impacts and predict change trends for sustained agricultural practices
- Sine integrated space technology information (ISTI) particularly from earth observation satellites with its large coverage, multi-temporal, multispectral capability have huge potential contribution in CC related data/information *for extensive areas, Ethiopia has already appreciated such prospects.*

Space Science in Ethiopia (cont.)

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- *Though the contribution of space based information for CC study is immense, the science is relatively young in Ethiopia.*
- *Cognizant of the benefits of space-based information, some concrete steps are being taken to promote the science in the country and benefit from space technology*

Space Science in Ethiopia (cont.)

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Though at early stage, some concrete steps are being taken

- *a research program in AAU Institute of Geophysics, Space Sciences and Astronomy (IGSSA)*

<http://www.aau.edu.et/index.php/academics/institutes/institute-of-geophysics-space-science-and-astronomy>

- *Space Science Society of Ethiopia (ESSS) is established to promote the Science in the country.* <http://www.ethiosss.org.et/index.php/en/>

- **Opened Astronomical Observatory and Space Science Research Center**

- *space science facility is inaugurated to work more to benefit from this technology.*

- ***These and other efforts in the country will help to promote the Science in the country***

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Prospects

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The on-going global efforts in Space Science parallel to other sciences are good prospects for the Ethiopia's efforts in CC adaption and mitigation. The increasing accessibility and availability of the following space related information directly or indirectly benefit Ethiopia in CC adaptation and mitigation activities

Earth observation/meteorological satellites

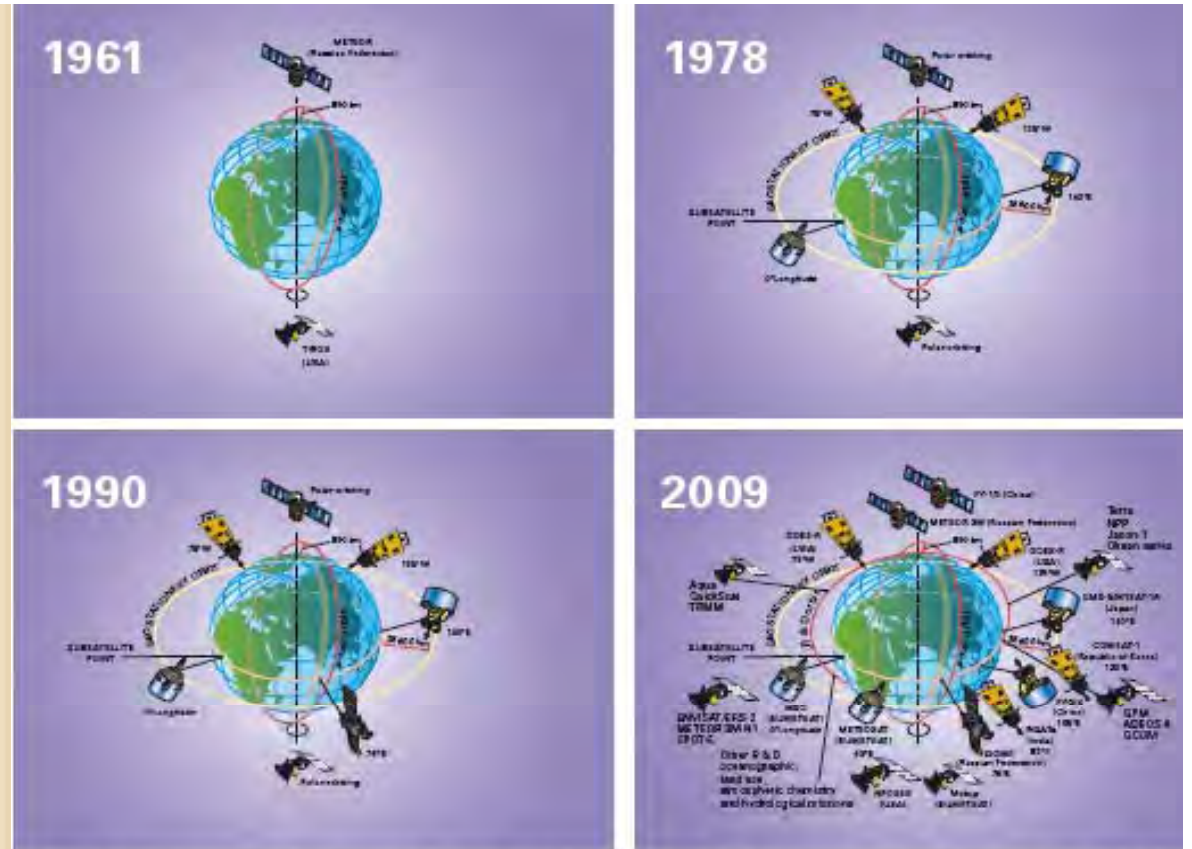
Navigational satellites

Tele/TV/Communication satellites

Prospects (cont.)

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To benefit from the increasing space based information, Ethiopia needs to strive more



This figure shows the evolution of the space-based global observing system.

Source: WMO, 2011)

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Prospects (cont.)

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Why Space-based information to climate change Ethiopia?

- CC studies requirements huge data/information, the globally developing space technology supported with appropriate tools/models is capable of providing this.
- Ethiopia and other developing countries can benefit a lot from this global growth of space-based information-being provided by advanced country/companies.

Prospects(cont.)

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1. Developments in Earth Observation Systems in particular have huge prospects due to:
 - The larger swath width of satellites at a single scene. The huge data that it generates
 - acquisition of data for inaccessible area is possible... for countries where road access is poor
 - The temporal and spectral resolution advantage
 - cost and time effectiveness and reduced field work

Prospects (cont.)

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2. Free satellite images, DEM and other data data being widely available and accessible for from the internet
 3. Free data together with the wide availability of free and open source software (FOSS), GPS and the internet will contribute a lot for CC adaptation and mitigation use for resource poor countries
- All these play a great role in promoting the use of space-based information for CC study.
 - But availing such data for research need to be expanded

Recommendations

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CC issue needs integrated efforts using integrated data/information. So, it is recommended that there will be some effort in donating/sharing the following resources for developing countries like Ethiopia those can not afford such huge data and technical capacity.

- ▣ Data support
- ▣ Technical support
- ▣ Specialized training
- ▣ Coordinated Global change assessment

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Thank you