Inventory and Assessment of Geosites for Geotourism Development in the southeastern Lake Tana region, northwestern Ethiopia

Presentation at EGU2020: Sharing Geoscience Online, EGU2020-841 (Session EOS5.1 Geoethics: How and why should geosciences serve society?)

Getaneh Addis Tessema^a, Jan van der Borg, Amare Sewnet, Anton van Rompaey, Enyew Adgo, Jan Nyssen, Kerebih Asrese, Steven Van Passel, Jean Poesen

^agechzadd23@gmail.com; getanehaddis.tessema@kuleuven.be





© Authors. All rights reserved

07/05/2020

1. Introduction

- Geosites: geological and geomorphological features scientific, with cultural, aesthetic and/ or economic values (Reynard, 2004).
- **Geotourism**: experiencing geosites (Dowling, 2013)
- Geosites are the main attractions for geotourism.
- Inventory and assessment-(Suzuki & necessary Takagi, 2018).



Blue Nile Falls, October/2019 (photo: G.A. Tessema)

2. Problem statement and objective

Ethiopia:

- Rich spectacular geosites.
- But, undervalued (Williams, 2020).

Lack of systematic evaluation geoheritage strategy & efforts to promote potential geosites as destinations geotourism (Asrat, 2018).



Erta Ale active volcano (photo: Disclose.tv^a)



Semien Mountains National Park (photo: Outsider.ie^c)

^ahttps://www.disclose.tv/erta-ale-volcano-earthquakes-can-reopen-the-hells-gate-in-ethiopia-314918 ^bhttps://ethiopiatropicaltours.com/sight/danakil-depression-afar-region-ethiopia/ ^chttps://outsider.ie/travel/ethiopia-simien-mountains/

Dallol (photo: Ethiopia Tropical Tours^b)

2. Problem ... cont'd

There are few studies on geotourism in Ethiopia.



The number of specialists' published journal articles on geotourism in 2012–2014 per countries of affiliations (Ruban, 2015, p. 11)

The objective of our study is to inventory and assess geosites for geotourism • development in the southeastern Lake Tana area, northwestern Ethiopia.



3. The study area

The study area is strategically located in one of the major tourist routes in Ethiopia.



Map of Ethiopia's northern historic tourist route (source: Kimkim^a)

^ahttps://www.kimkim.com/c/the-northern-historical-route-by-plane-and-car-10-day-itinerary#map

There are four UNESCO registered World Heritage Sites in the northern historic tourist routes of Ethiopia.



Map of the northern historic tourist routes in Ethiopia



Location of the study area (Tessema et al., subm.)





Geological map of the Lake Tana area (Williams, 2016, p.123)

The study area

The study area has two very important waterbodies, Lake Tana and Blue Nile River, with a potential to geotourism development.

Lake Tana and its (island) monasteries

- Lake Tana is the largest lake (ca. 3100 sq.km) in Ethiopia, and source of the Blue Nile River.
- has ca. 35 islands housing ca. 20 lt monasteries and churches, some dating back to the 13th & 14th centuries (Phillips and Carillet, 2009).
- The majority of the Lake Tana islands are formed of blocky lava fragments or are cinder cones (Williams, 2016).
- The lake and its islands are part of the UNESCO registered Lake Tana Biosphere Reserve.



Tessema)

Lake Tana and Kibran Gebriel island monastery. Bahir Dar City is in the background (photo: G.A.

3. The study area ... cont'd **The Blue Nile River**

- longest river in The Ethiopia (900 km)
- Has the deepest (with 1600 m) and most extensive canyon in the entire Nile Basin (Firew, 2014).
- The most important water body in northeast Africa (Firew, 2014).
- Egypt is 'the Gift of the Nile" (Herodotus)
- Blue Nile River contributes 56% of water for the Nile (Habteyes et al., 2015).



Lake Tana (photo: G.A. Tessema)

The Blue Nile River, ca. 2 km from its outlet in

Quest for the source of the Nile

"The source of the Nile was a quest that interested philosophers, emperors and geographers alike".

- Herodotus
- Ptolemy
- Alexander the Great
- **Julius Caesar** \bullet
- **Emperor Nero**
- Pedro Paez
- **James Bruce**

 \checkmark "It was the thing Julius Caesar most coveted to know in the world ... he would quit his country Rome for the satisfaction of discovering that source"

1618.

(Oestigaard and Firew, 2013)

Video on the Geopolitical impact of the Nile

✓ Emperor Nero sent two centurions to discover the source, but they failed. ✓ Pedro Paez (Portuguese Jesuit priest) - the first European to visit and document the source of the Blue Nile

3. The study area

Geosites that are currently being visited



Bezawit viewpoint (photo: G.A. Tessema)



Hippos in Lake Tana (photo: G.A. Tessema)



Blue Nile Falls (photo: G.A. Tessema; Tessema et al., subm.)



Pelicans on Lake Tana (photo: G.A. Tessema) 12

Geosites that are currently being visited



Kibran Gebriel island monastery (photo: G.A. Tessema)



Ura Kidanemihiret monastery (photo: G.A. Tessema)



Souvenirs in Zegie peninsula (photo: G.A. Tessema)



Painting inside Ura Kidanemihiret monastery (photo: G.A. Tessema)

4. Methodology



Methodology for inventory and assessment of geosites (based on Brilha, 2016)

^adetail in the next slide (slide 15)

4. Methodology ... cont'd

Quantitative assessment methodology

The quantitative assessment criteria, indicators and sub-indicators were developed based on a review of publications on the field.

- Two major groups of values (criteria) are used to assess geosites: main and additional.
 - \succ Main value consists of five indicators: scientific, educational, scenic, recreational and protection which are further subdivided into twelve subindicators.
 - > Additional value has two indicators (added and functional) which consist of six sub-indicators.

5 Inventory and assessment results

A first list of 120 geosites inventoried. The major geosites include:

- Waterfalls
- A lake with islands and island monasteries
- Hot springs
- A flood plain
- Caves and cave churches
- Lava tubes

- Lava tubes
- A mountain (shield volcano)
- Volcanic plugs
- Volcanic cones
- Volcanic columns
- Rock-hewn churches
- Viewpoints



Location of the 120 geosites inventoried (Tessema et al., subm.)

Some of the inventoried geosites



Jib washa lava tube (photo: J. Poesen; Tessema et al., subm.)



Gedame Eyesus cave (photo: G.A. Tessema)



Washa Teklehayimanot cave church (photo: G.A. Tessema; Tessema et al., subm.)



Washa Endiriyas cave church (photo: G.A. Tessema)

Some of the inventoried geosites



Makisegnit volcanic cone (photo: G.A. Tessema; Tessema et al., subm.)



Wohiny Amba volcanic plug (inset photo shows a former place of exile, photo: G.A. Tessema)





Qualit Volcanic plug- visitors make a quick photo stop (photo: J. Poesen)

Shamo volcanic plug (photo: G.A. Tessema)

Some of the inventoried geosites



Asiva volcanic column (photo: G.A. Tessema)



Mt Guna volcanic columns (photo: G.A. Tessema)





Tirib Gedel volcanic columns (photo: G.A. Tessema)

Mt Guna volcanic columns (photo: G.A. Tessema; Tessema et al., subm.)

Some of the inventoried geosites



Mt Guna viewpoint (photo: G.A. Tessema)



Dibankie volcanic cone and viewpoint (photo: J. Poesen)



Zegie viewpoint (photo: J. Poesen; Tessema et al., subm.)



Mohitro viewpoint (photo: G.A. Tessema)

Some of the inventoried geosites with ecological value (flora)



Erica arborea in Mt Guna (photo: G.A. Tessema)





Alemsaga forest (photo: G.A. Tessema)





Zegie peninsula forest in the background (photo: G.A. Tessema)

Tara Gedam forest (photo: G.A. Tessema) 22

Some of the inventoried geosites with ecological value (fauna)



Gelada baboon in Mt Guna (photo: G.A. Tessema; Tessema et al., subm.)



Baboon (inset) in Alemsaga and Common jackal in Mt Guna (photo: G.A. Tessema)



Poesen)



G.A. Tessema)

Eurasian cranes in Fogera plain (photo: J.

Birds near Shimbit Mikael Bahir Dar (photo:

- The 120 inventoried geosites:
 - screened by qualitative criteria (safety, accessibility, uniqueness)
 - clustered
 - and finally,
 - 44 geosites with and without viewpoints and
 - 17 viewpoints

were selected for further assessment.



Location of the selected geosites in the southeastern Lake Tana region (Tessema et al., subm.)



Assessment result of the values geosites in the southeastern Lake Tana region (Tessema et al., subm.)

Values

- SCI = scientific value
- EDU = educational value,
- SCE = scenic value
- REC = recreational value
- PRO = protection value
- ADD = added value
- FUN = functional value

NB: the assessments were for geosites with and without viewpoints only, and not for viewpoints

5 Inventory and assessment ... cont'd **Protection problems of geosites**





Mt Guna protected area – the locals started open grazing (photo: J. Poesen)

Dibankie volcanic cone- quarrying gravel for road fill (photo: G.A. Tessema)

6 Concluding remarks

- Inventory and assessment of geosites is a prerequisite for geotourism development for a given destination.
- Geosites of the study area have a significant potential for geotourism development.
- The geosites differ in size, ranging from single points such as hot springs to complex areas such as Lake Tana and Mt Guna.
- Complex area geosites received relatively higher scientific, scenic and recreational value scores.
- Besides, most geosites have a higher main value score than additional value.
- Lake Tana and its island monasteries, Blue Nile Falls and Canyons, Fogera plain and Zegie peninsula are among the geosites with the highest geotourism potential.

6 Concluding remarks

- Critical socioeconomic development needs in the study area include reducing poverty, achieving food security, transforming rural livelihoods and income, reversing land degradation, conserving natural resources, and reducing sedimentation of the Lake and dams (Goshu et al., 2017).
- The development of geotourism in the study area can play its part in tackling these problems and support sustainable development.

Affiliations of authors

Getaneh Addis Tessema^{1,2*}, Jan van der Borg¹, Amare Sewnet Minale³, Anton van Rompaey¹, Enyew Adgo⁴, Jan Nyssen⁵, Kerebih Asrese⁶, Steven Van Passel⁷, Jean Poesen^{1,8}

¹Department of Earth and Environmental Studies, KU Leuven, Leuven, Belgium ²Department of Tourism and Hotel Management, Bahir Dar University, Bahir Dar, Ethiopia ³Department of Geography and Environmental Studies, Bahir Dar University, Bahir Dar, Ethiopia ⁴Department of Natural Resource Management, Bahir Dar University, Bahir Dar, Ethiopia ⁵Department of Geography, Ghent University, Ghent, Belgium ⁶Department of Social Work, Bahir Dar University, Bahir Dar, Ethiopia ⁷Department of Engineering Management, University of Antwerp, Antwerp, Belgium ⁸ Faculty of Earth Sciences and Spatial Management, Maria-Curie Sklodowska University, Lublin, Poland

*corresponding author. Email: gechzadd23@gmail.com; getanehaddis.tessema@kuleuven.be



