



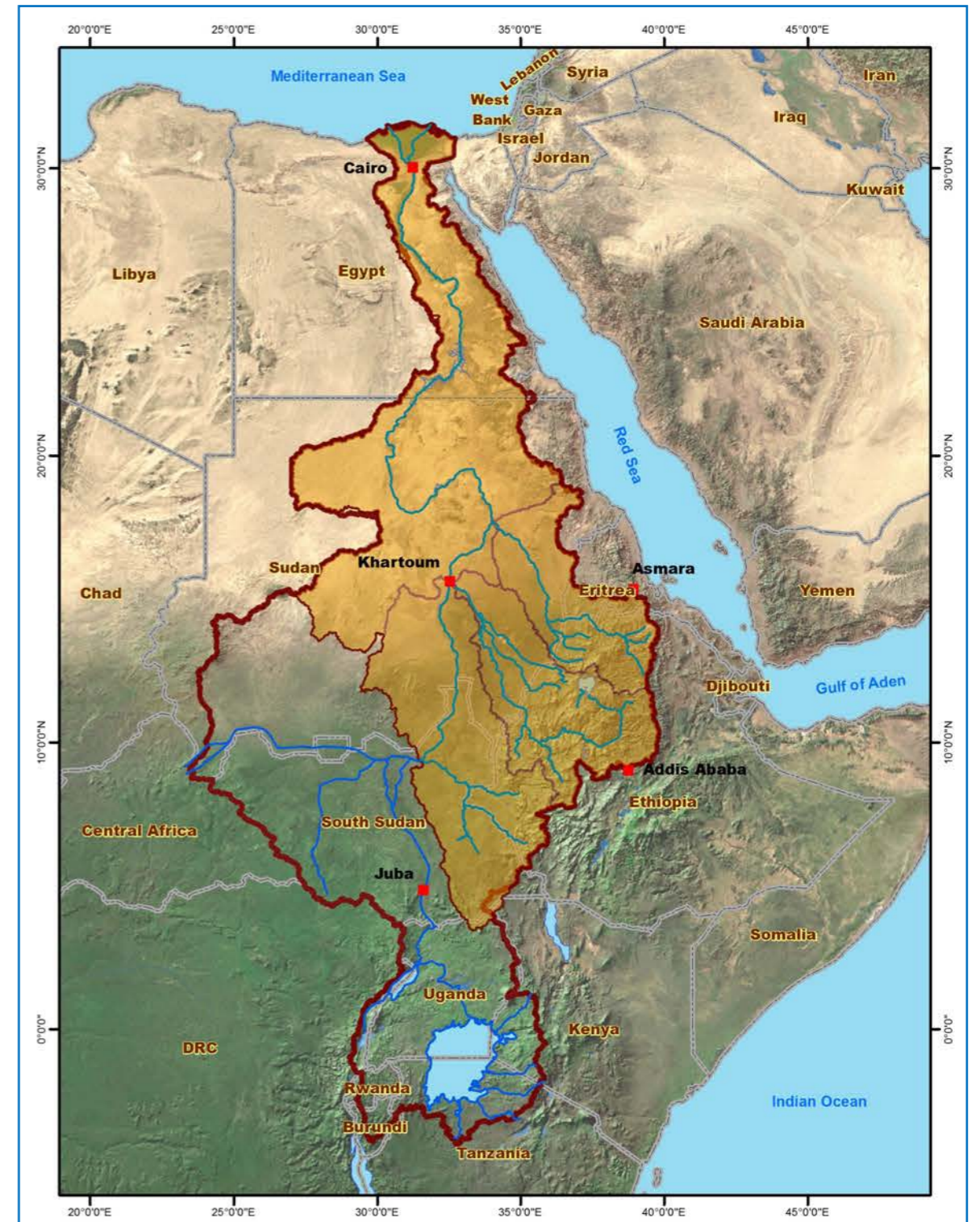
**EN-MSIOA  
(Eastern Nile Multi-Sectoral  
Investment Opportunity Analysis)**

**Eastern Nile Technical Regional Office  
(ENTRO)**

**Atlas of Maps**

**Prepared by:  
Gedion Tsegaye Sahle**

**January 2015**



## NOTE

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*This Atlas of Maps has been prepared as part of the Eastern Nile Multi-Sectorial Investment Opportunity Analysis (EN-MSIOA) Study. The designations employed and the presentation of materials in this Atlas do not imply the expression of any opinion whatsoever on the part of the Nile Basin Initiative (NBI) nor the Eastern Nile Technical Regional Office (ENTRO) concerning the legal or development status or aspiration of any country, administrative area, city or its authorities, or concerning the delimitation of its frontiers or boundaries.*

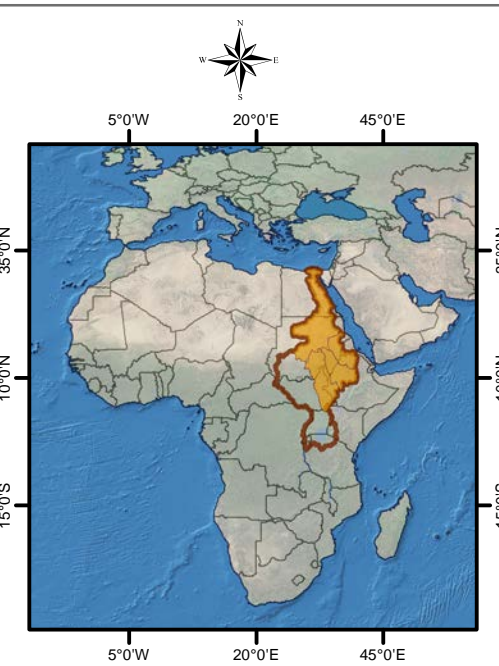
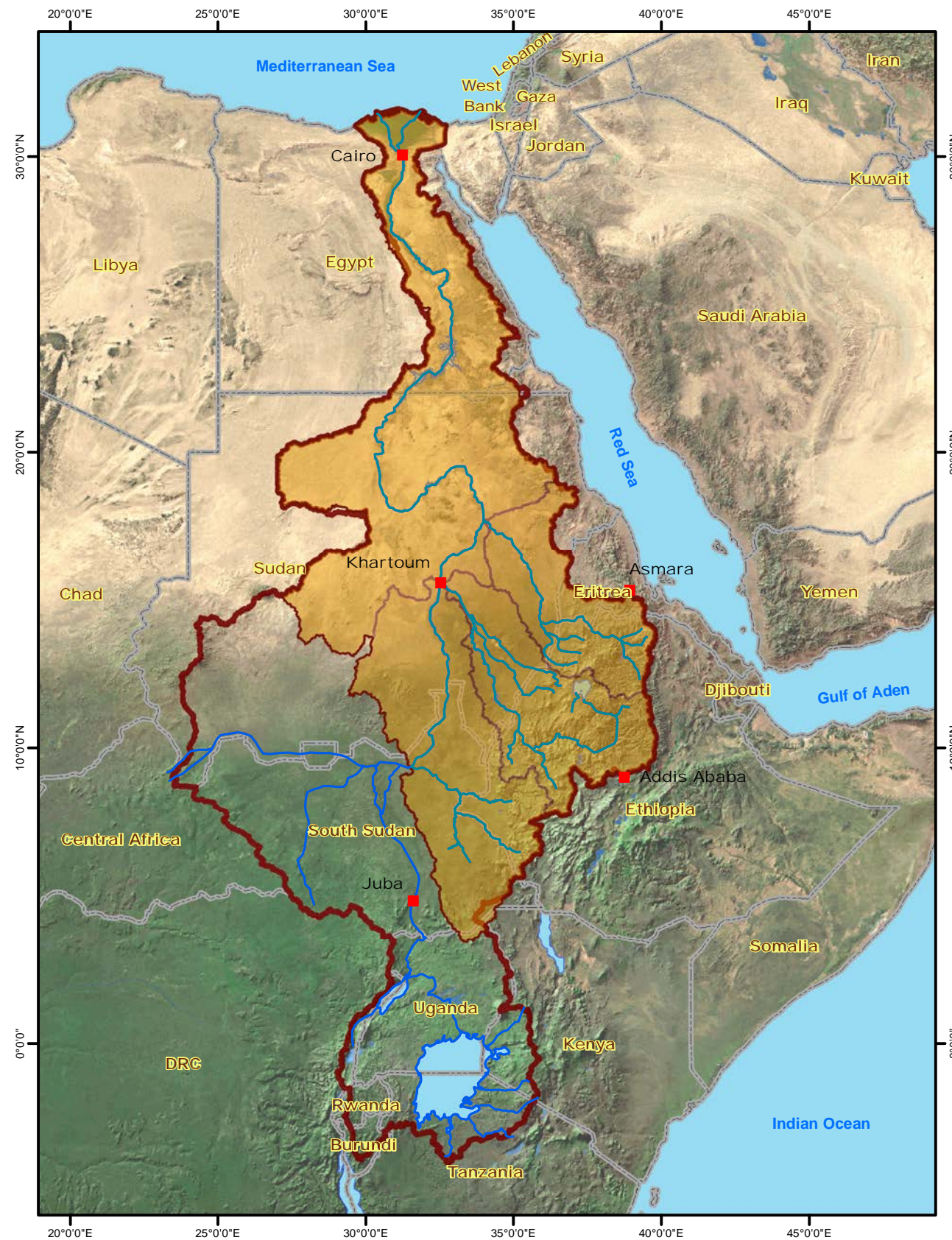
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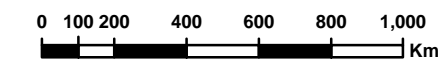
## Eastern Nile Sub-Basin within the overall Nile Basin



### Legend

- EN Capital Cities
- Main Rivers
- Eastern Nile Sub-Basin
- ▭ Nile Basin Boundary
- ▭ Lakes, Reservoirs, Seas & Oceans
- ▭ Country Boundaries

Basemap:  
Color shaded relief imagery from ESRI  
(Environmental Systems Research Institute).



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Map Title:  
**Eastern Nile Sub-Basin  
within the overall Nile Basin**

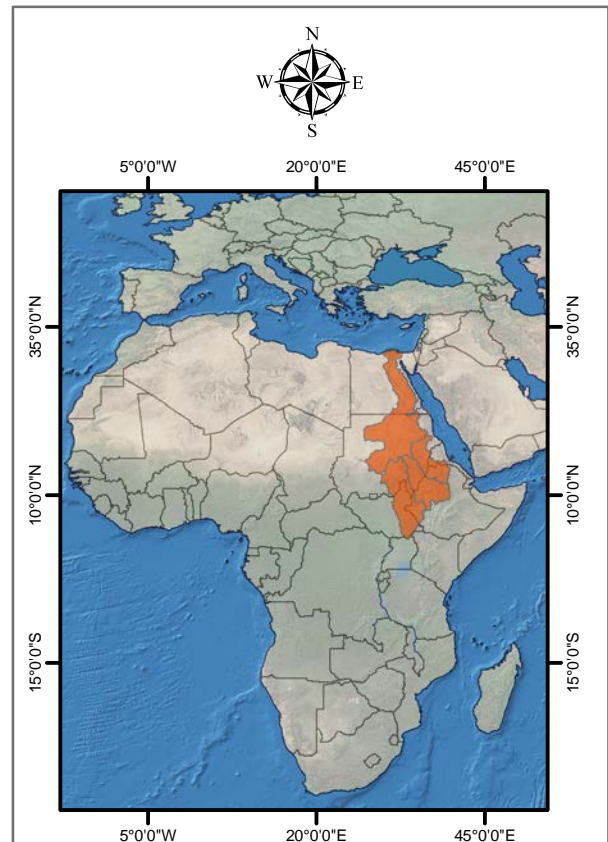
EN-MSIOA\_Map 1.1

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Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Eastern Nile Sub-Basins



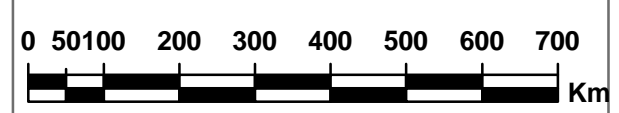
## Legend

- EN Capital Cities
- Nile Basin Main Rivers
- Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- Country Boundaries

## Eastern Nile (EN) Sub-Basins:

- 1 Abay-Blue Nile
- 2 Baro-Akobo-Sobat-White Nile
- 3 Tekeze-Setit-Atbara
- 4 Main Nile

Basemap:  
World color shaded relief imagery from ESRI  
(Environmental Systems Research Institute).



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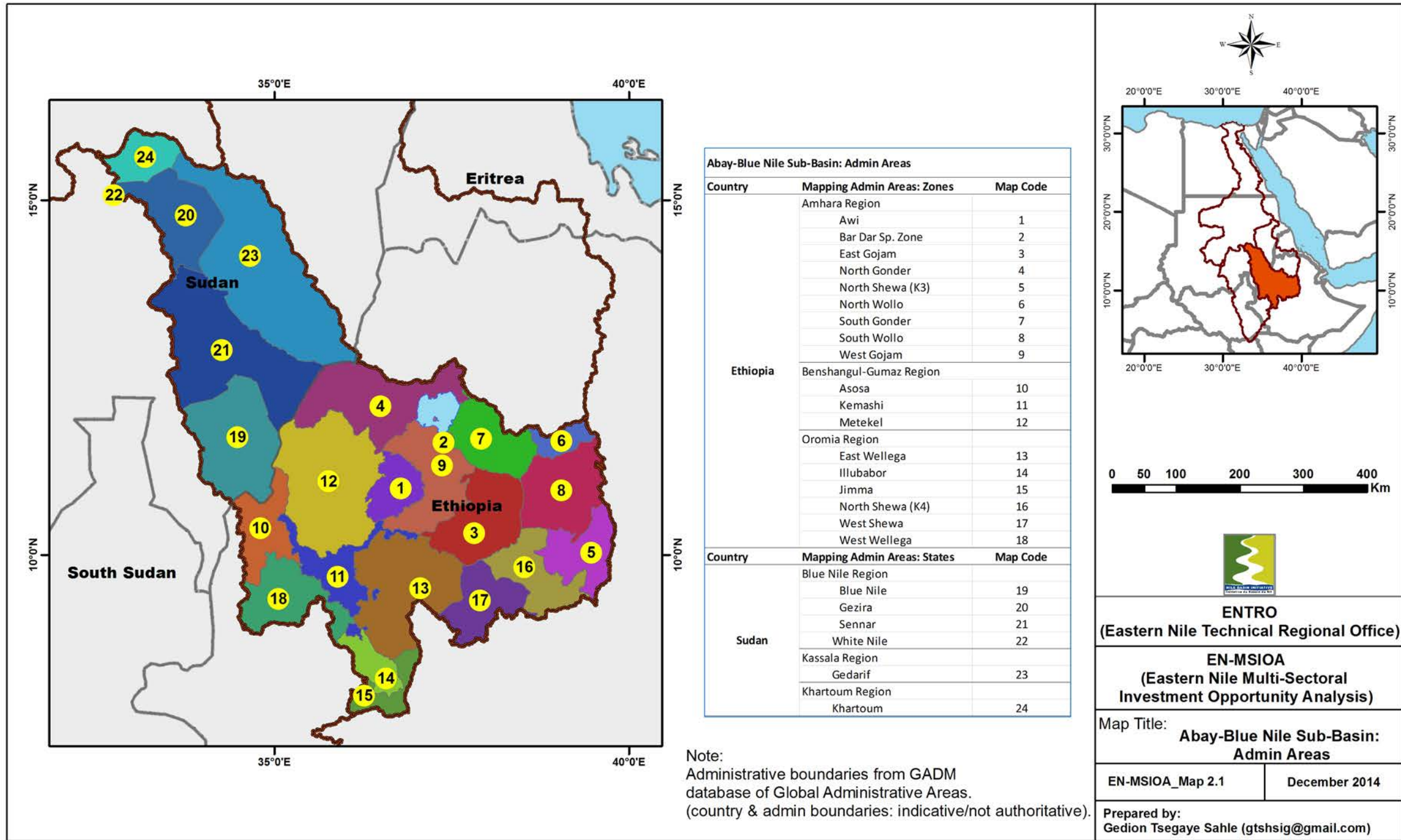
Map Title:  
**Eastern Nile Sub-Basins**

EN-MSIOA\_Map 1.2 | December 2014

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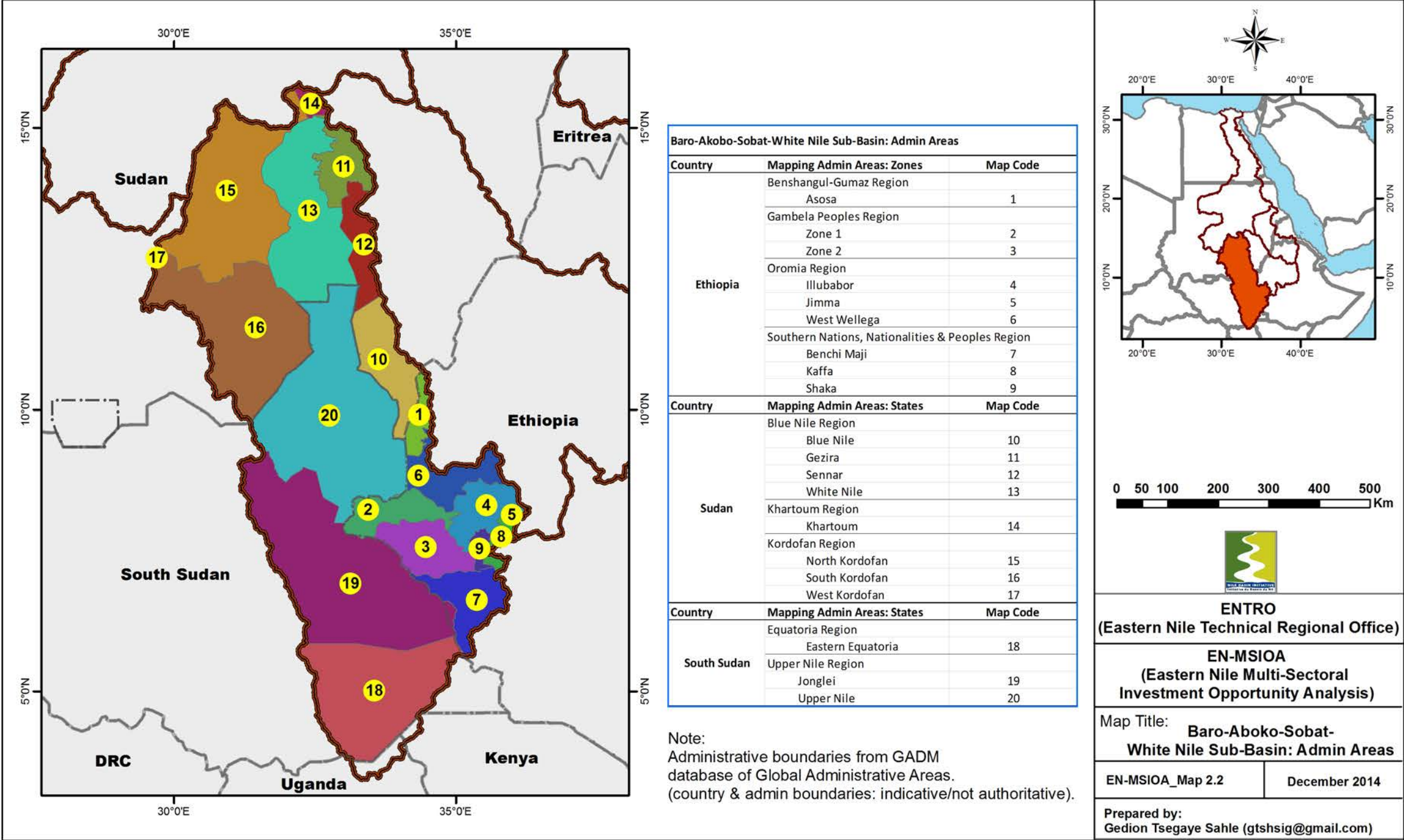


# Abay-Blue Nile Sub-Basin: Admin Areas

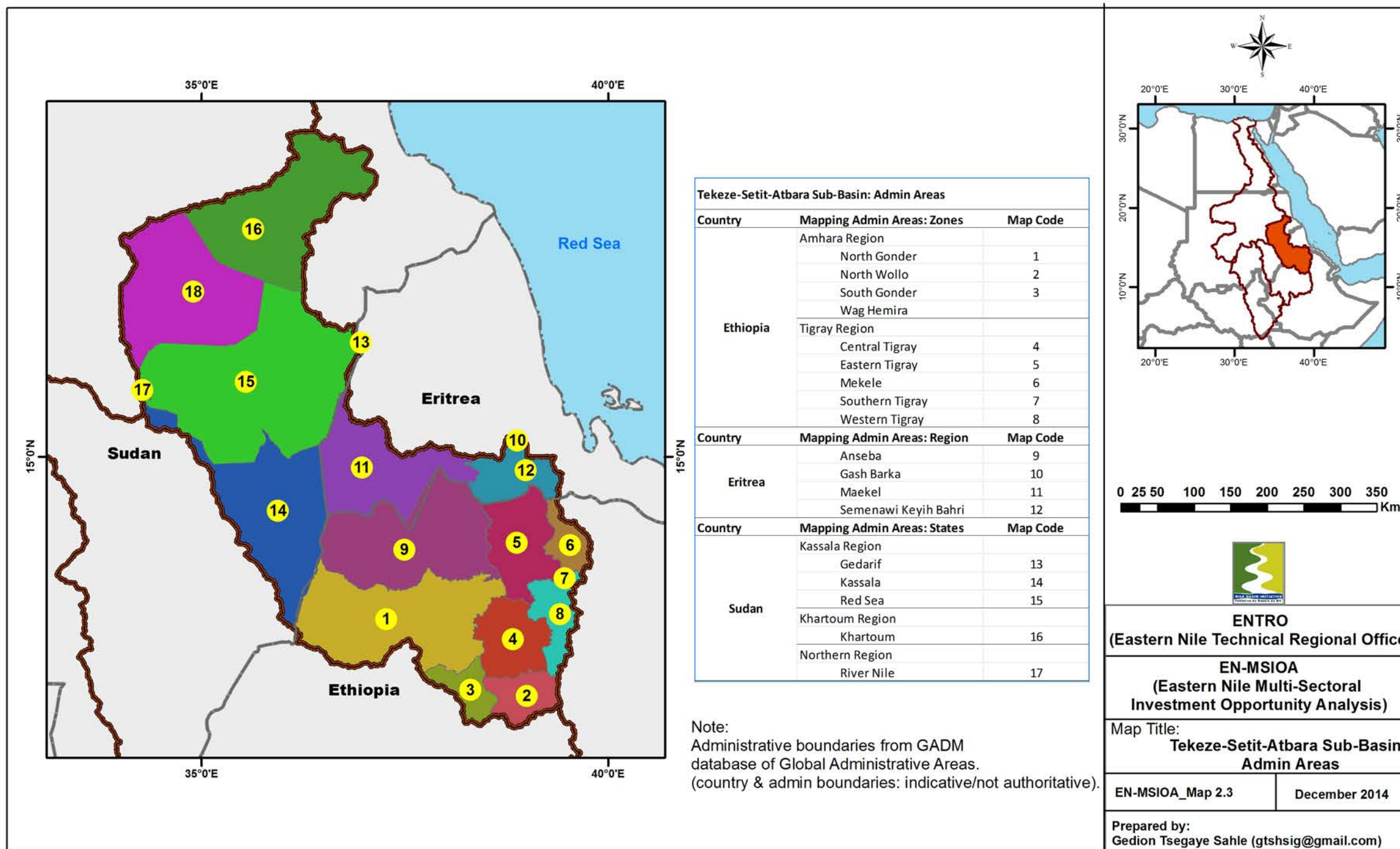




# Baro-Akobo-Sobat-White Nile Sub-Basin: Admin Areas

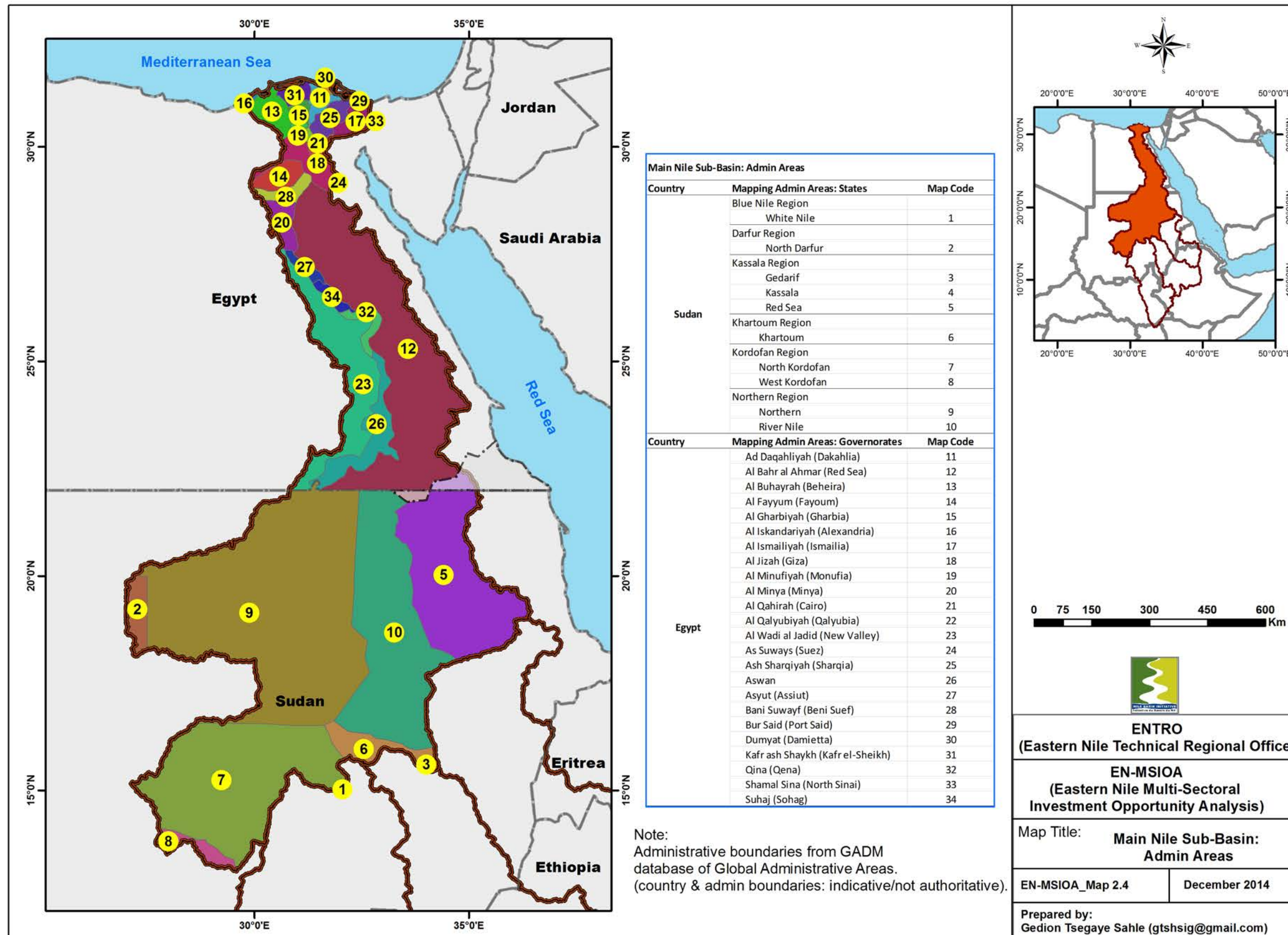


# Tekeze-Setit-Atbara Sub-Basin: Admin Areas

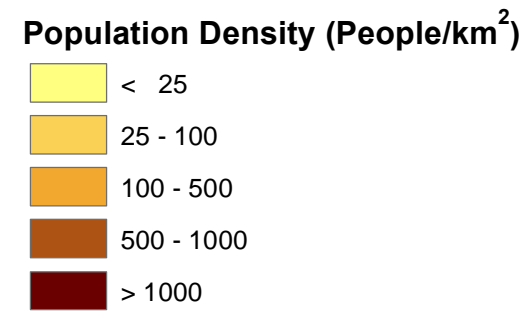
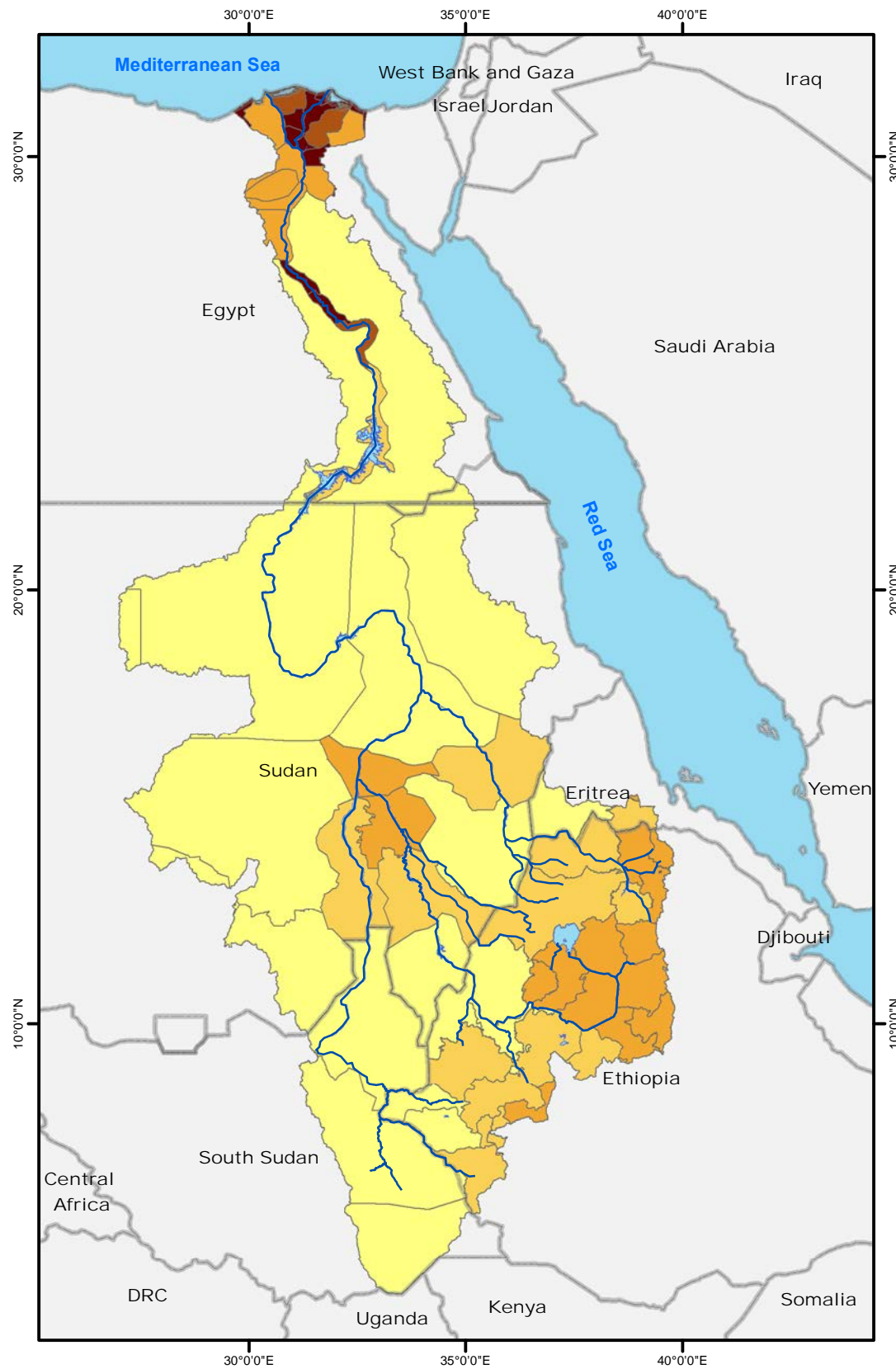




# Main Nile Sub-Basin: Admin Areas



# Eastern Nile Population Density



Sources of census or official population estimates include:

**Ethiopia:** 2007 Population and Housing Census; CSA (Central Statistical Agency of Ethiopia).

**Sudan:** 2008 Population and Housing Census; CBS (Central Bureau of Statistics of Sudan) and Southern Sudan Commission for Census, Statistic and Evaluation).

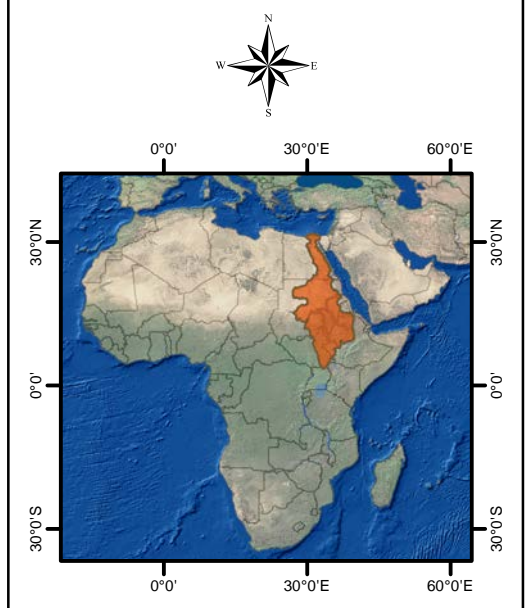
**South Sudan:** 2008 Population and Housing Census; SSCSE (Southern Sudan Centre for Census, Statistics and Evaluation) publication.

**Eritrea:** 2005 Population, official estimate; GeoHive referencing FAO's estimate.

**Egypt:** 2006 Population Census; Population Statistics for Countries, Administrative Areas, Cities and Agglomerations – Interactive Maps – Charts (City Population, web reference).

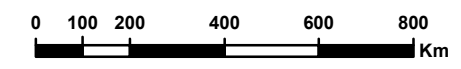
**Note:**  
 Eastern Nile Administrative Units:  
 Ethiopia: Zones  
 Eritrea: Regions  
 Egypt: Governorates  
 Sudan: States  
 South Sudan: States  
 Area ratios and other simple methods have been used to estimate population for some peripheral admin areas of the Eastern Nile sub-basin.

Admin areas: indicative/not authoritative



## Legend

- EN Main Rivers
- Lakes, Reservoirs & Seas
- Country Boundaries



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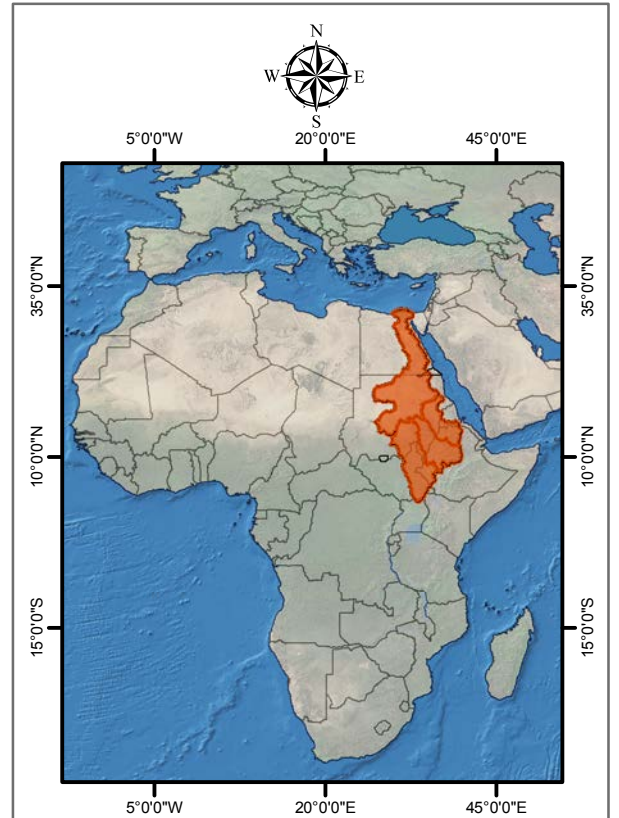
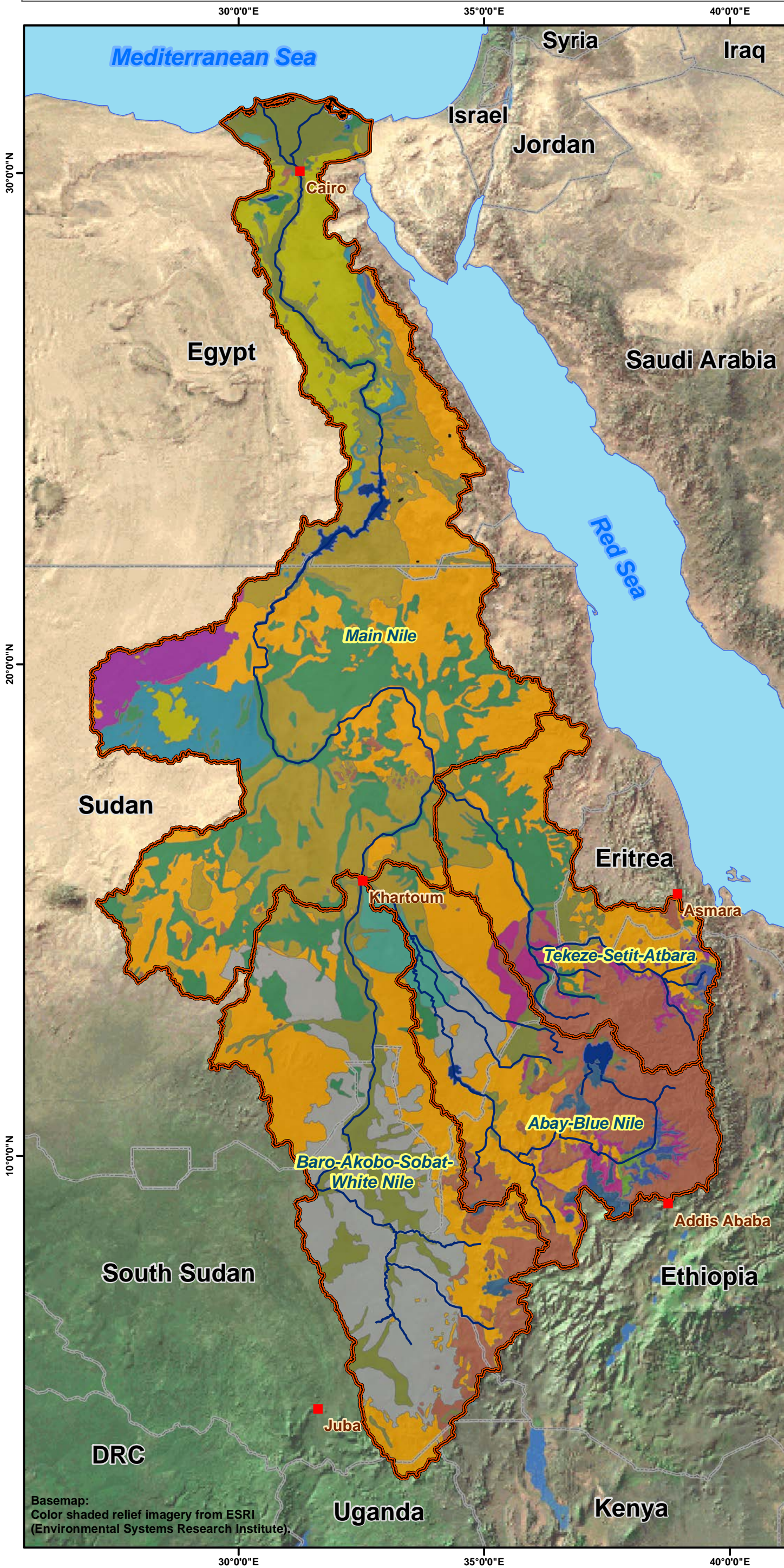
Map Title:  
**Eastern Nile Population Density**

EN-MSIOA_Map 2.5	December 2014
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 Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Eastern Nile Surficial Geology



## Legend

Surficial Geology (Geologic Time Scale)

- Cambrian
- Carboniferous
- Cenozoic
- Cretaceous
- Cretaceous-Carboniferous
- Cretaceous-Jurassic
- Holocene
- Jurassic
- Lower Cretaceous
- Lower Jurassic
- Mesozoic Igneous
- Ordovician
- Paleozoic Igneous
- Pleistocene
- Precambrian
- Quaternary (undivided)
- Quaternary Igneous
- Tertiary
- Tertiary Igneous
- Triassic-Permian
- Water

Note:  
Surficial geological map digitally acquired from USGS's World Energy Project; compiled and synthesized from UNESCO's geologic map.



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Map Title:  
**Eastern Nile Surficial Geology**

EN-MSIOA\_Map 3.1

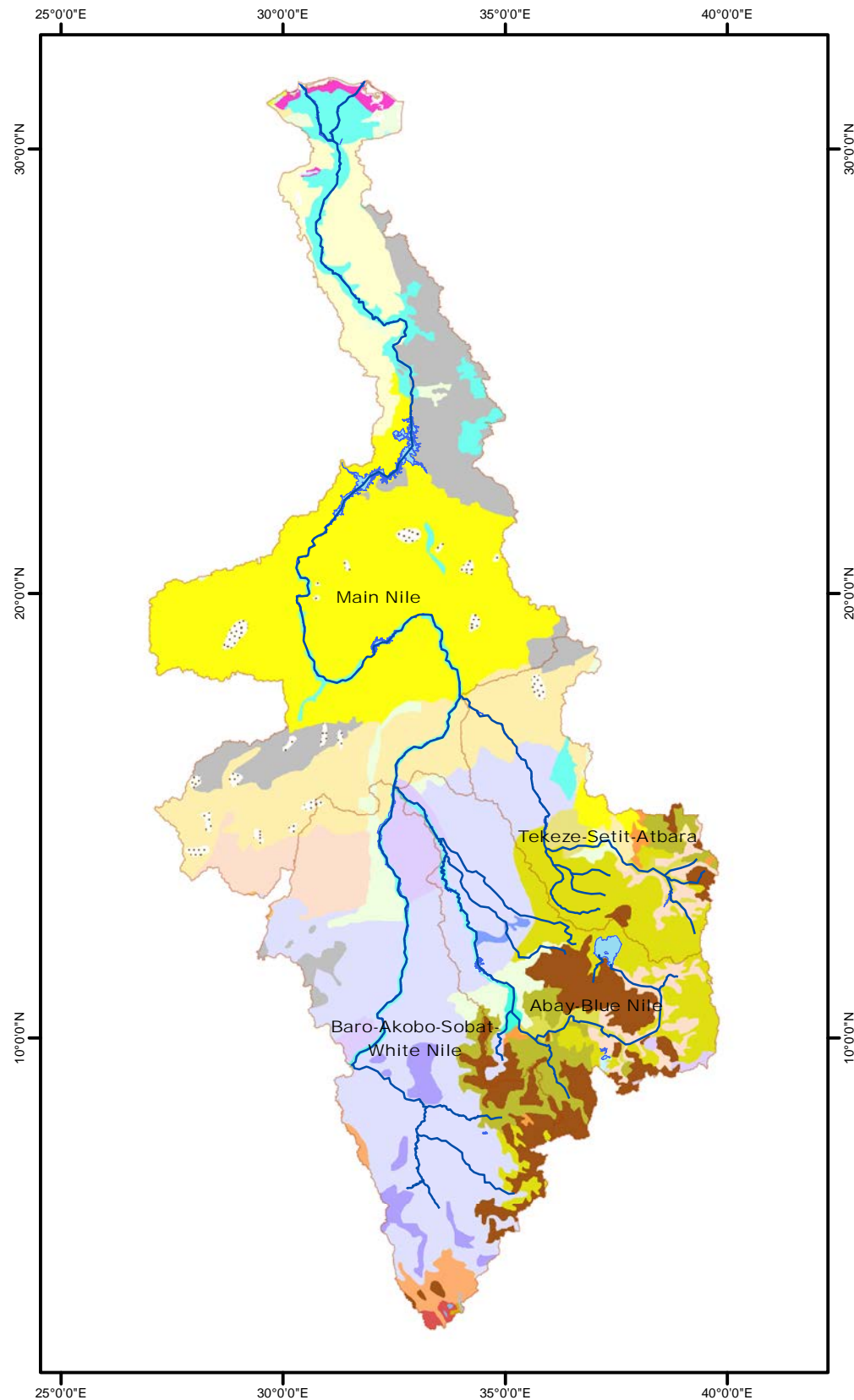
December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap:  
Color shaded relief imagery from ESRI  
(Environmental Systems Research Institute).



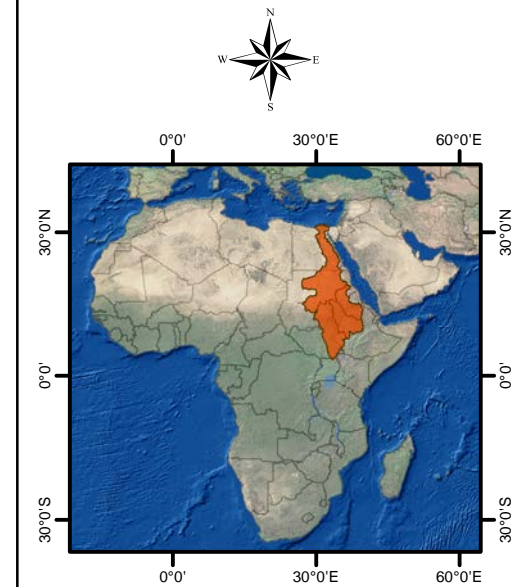
# Eastern Nile Soils



## Soil Units

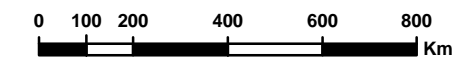
- Af- Ferric Acrisols
- Ao- Orthic Acrisols
- Fo- Orthic Ferralsols
- Ge- Eutric Gleysols
- Gh- Humic Gleysols
- Gm- Mollic Gleysols
- I- Lithosols
- Jc- Calcaric Fluvisols
- Ne- Eutric Nitisols
- Je - Eutric Fluvisols
- Qc- Cambic Arenosols
- Lc- Chromic Luvisols
- Lf- Ferric Luvisols
- Rc- Calcaric Regosols
- Re- Eutric Regosols
- Vc- Chromic Vertisols
- Vp- Pellic Vertisols
- Xh- Haplic Xerosols
- XI- Luvic Xerosols
- Y- Yermosols
- Yk- Calcic Yermosols
- Zg- Gleyic Solonchaks
- Rock Debris
- Dunes/Shifting Sand

Source: Digital Soil Map from FAO of the UN



## Legend

- EN Main Rivers
- EN Lakes & Reservoirs
- Eastern Nile Sub-Basins



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Map Title:  
**Eastern Nile Soils**

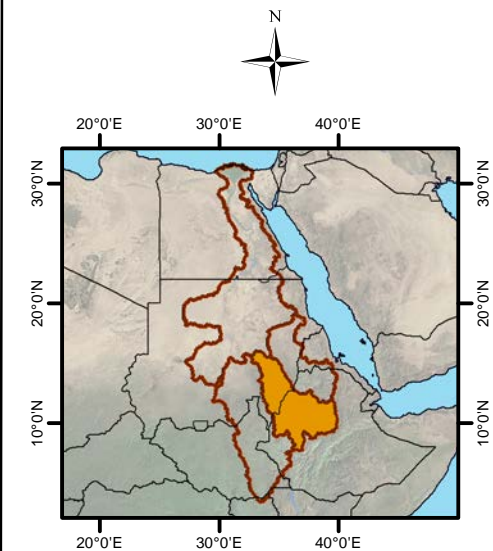
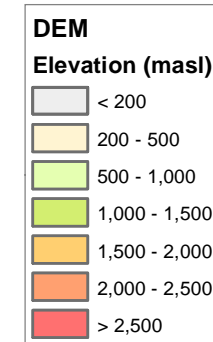
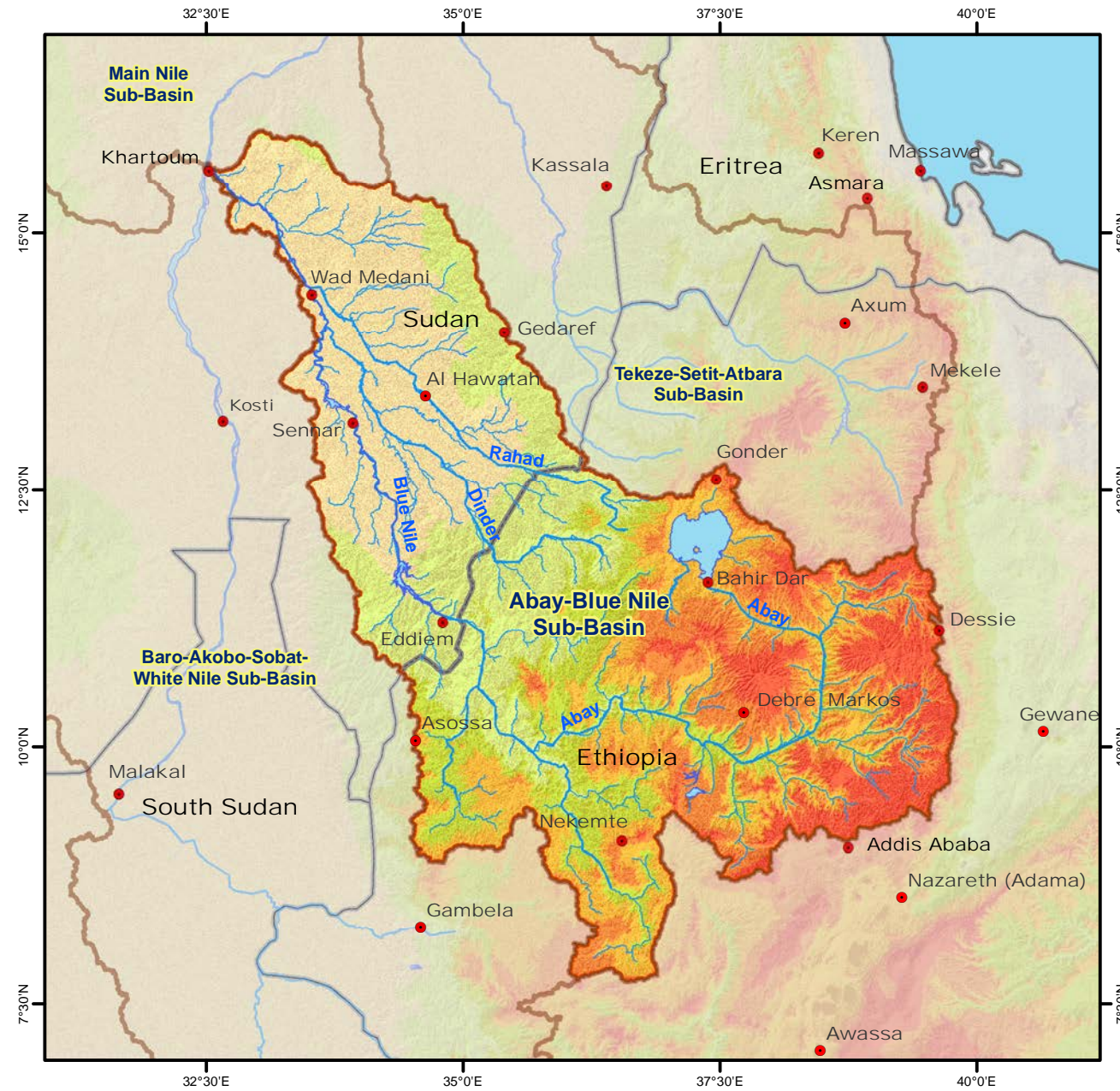
EN-MSIOA\_Map 3.2

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Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



## Abay-Blue Nile Sub-Basin: Relief & Drainage



### Legend

- EN Main Towns/Cities
- River Network
- Abay-Blue Nile Sub-Basin
- Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- Country Boundaries



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Map Title:  
**Abay-Blue Nile: Relief & Drainage**

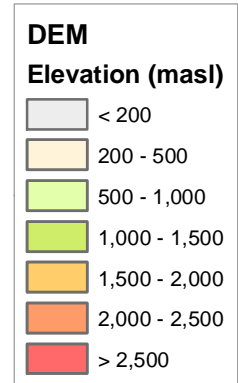
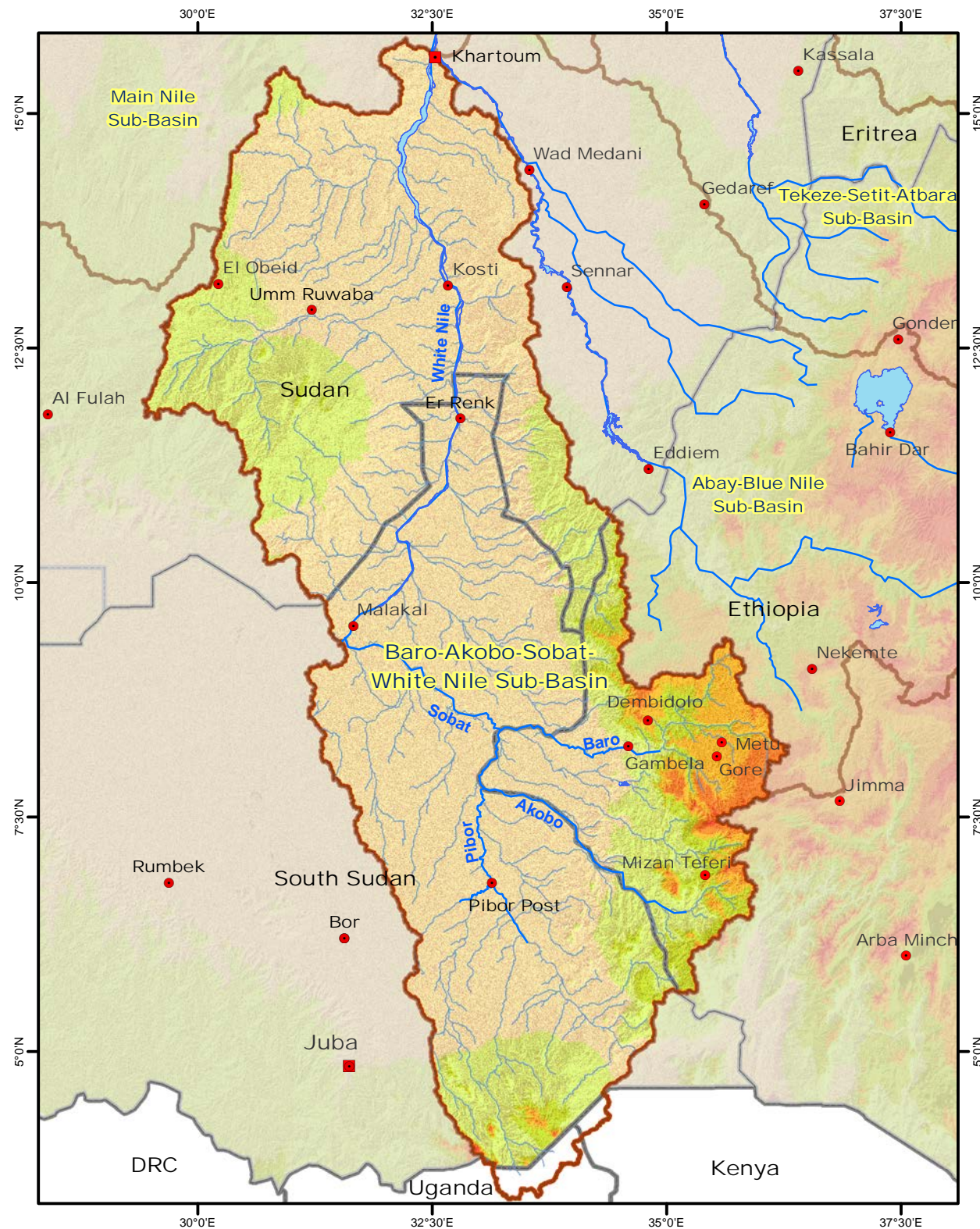
EN-MSIOA\_Map 3.3 | December 2014

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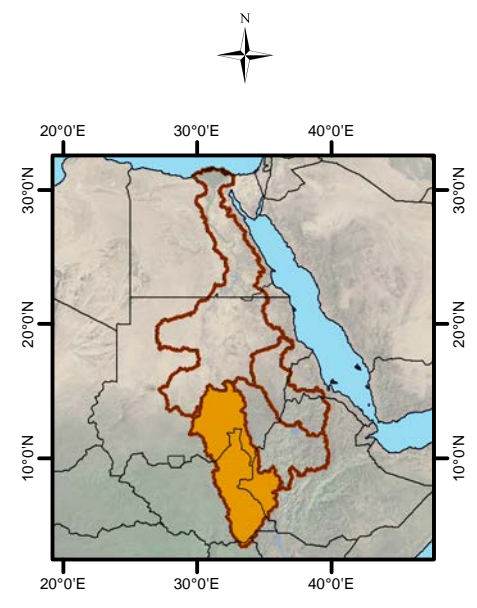
Source: SRTM DEM (Digital Elevation Model) and derived hillshade product.



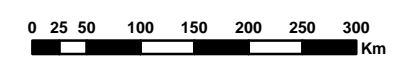
### Baro-Akobo-Sobat-White Nile Sub-Basin: Relief & Drainage



Source: SRTM DEM (Digital Elevation Model) & derived hillshade products



- Legend**
- EN Main Towns/Cities
  - River Network
  - ▭ Baro-Akobo-Sobat White Nile Sub-Basin
  - ▭ Eastern Nile Sub-Basins
  - ▭ Country Boundaries
  - ▭ Lakes & Reservoirs



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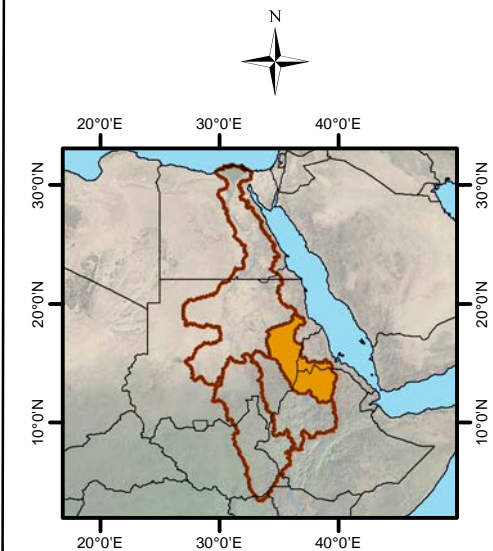
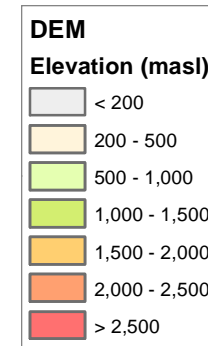
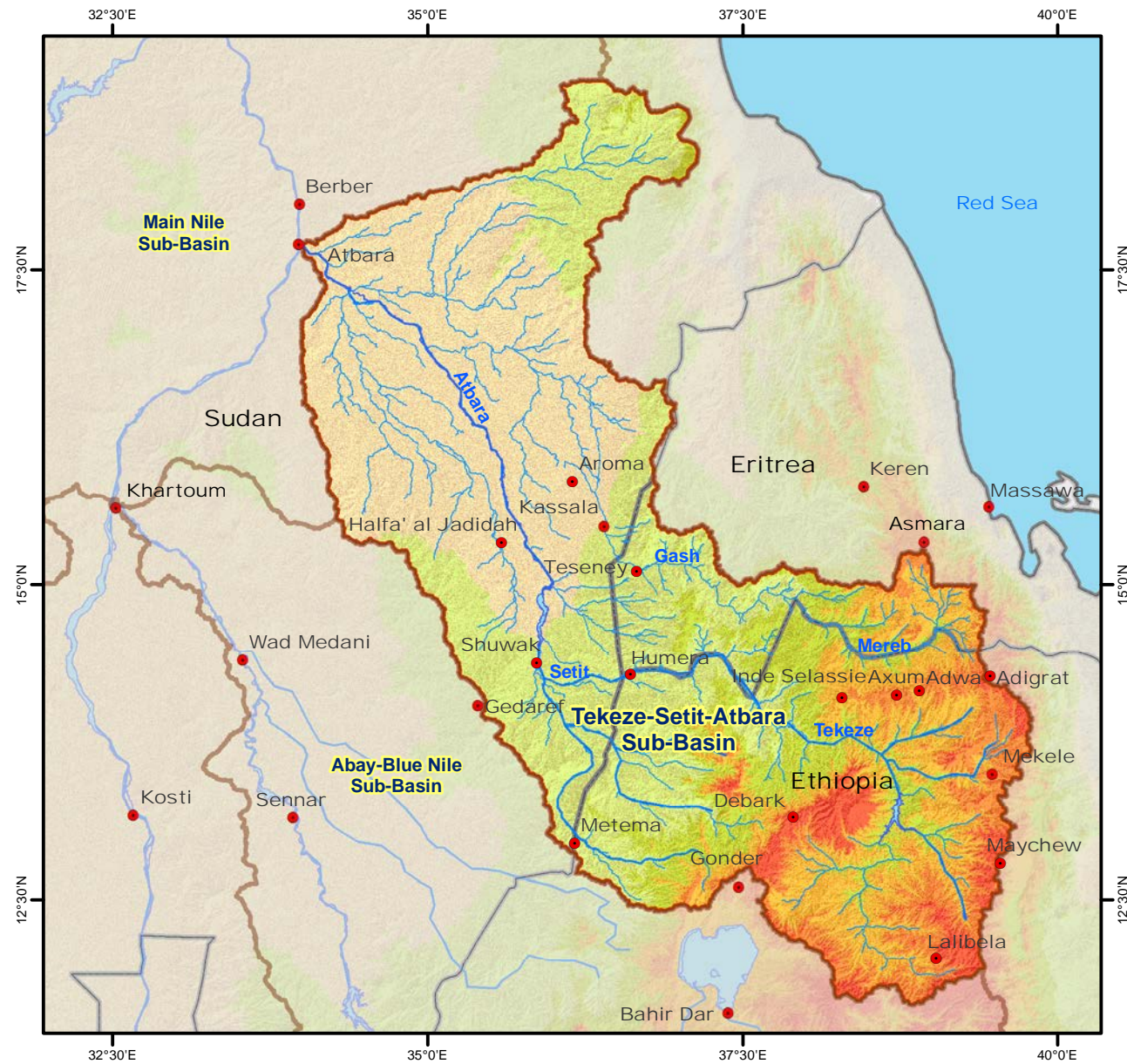
Map Title:  
**Baro-Akobo-Sobat-White Nile: Relief & Drainage**

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Prepared by:  
**Gedion Tsegaye Sahle (gtshsig@gmail.com)**



### Tekeze-Setit-Atbara Sub-Basin: Relief & Drainage



#### Legend

- EN Main Towns/Cities
- River Network
- Tekeze-Setit-Atbara Sub-Basin
- Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- Country Boundaries



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Map Title:  
**Tekeze-Setit-Atbara: Relief & Drainage**

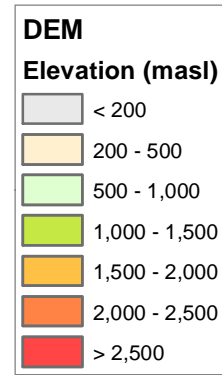
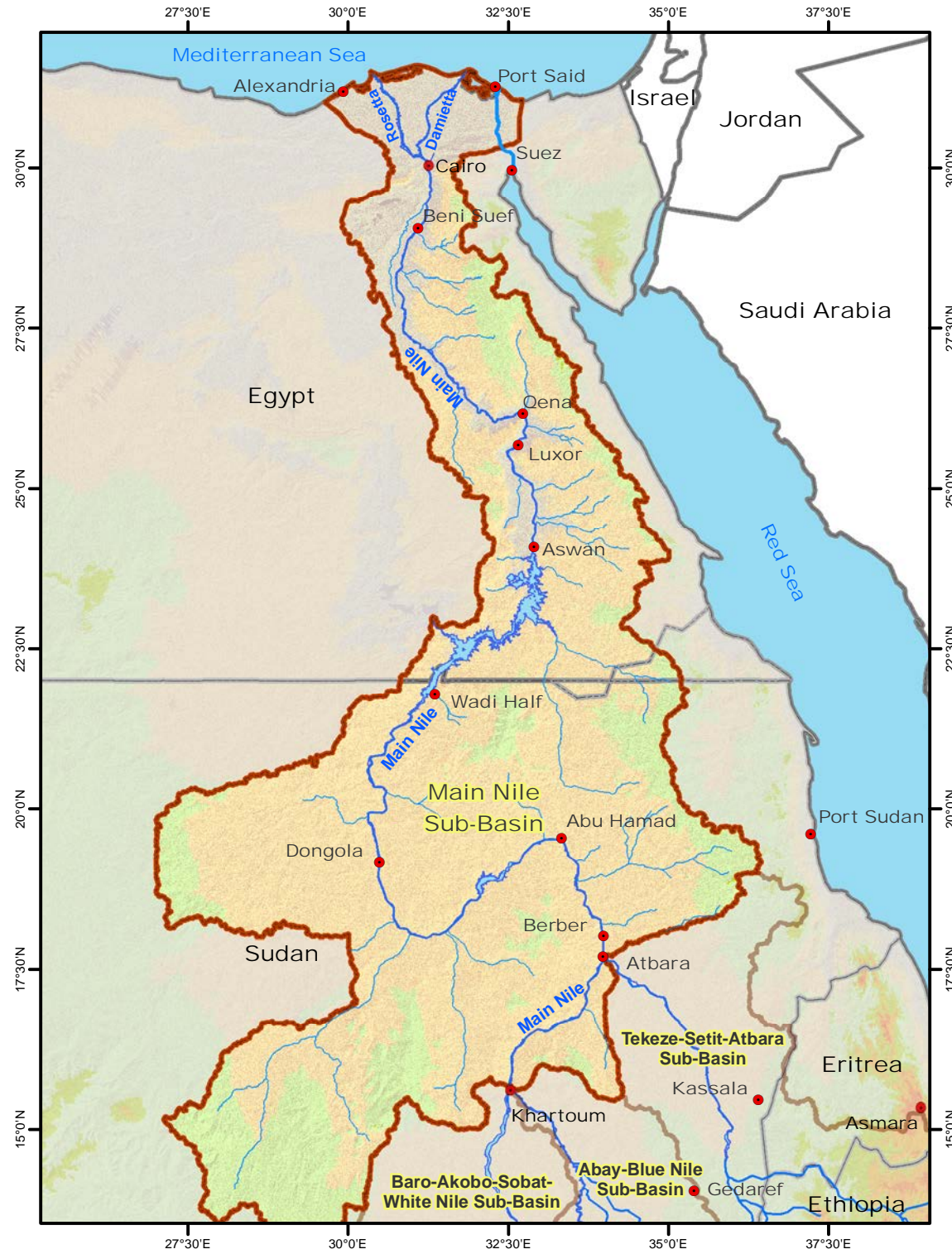
EN-MSIOA\_Map 3.5      December 2014

Prepared by:  
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Source: SRTM DEM (Digital Elevation Model) and derived hillshade product

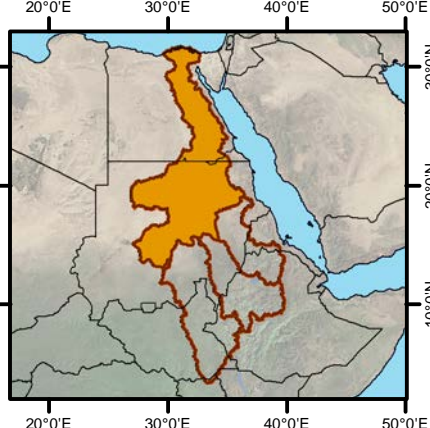


## Main Nile Sub-Basin: Relief & Drainage




Source: SRTM DEM (Digital Elevation Model) and derived hillshade product





**Legend**

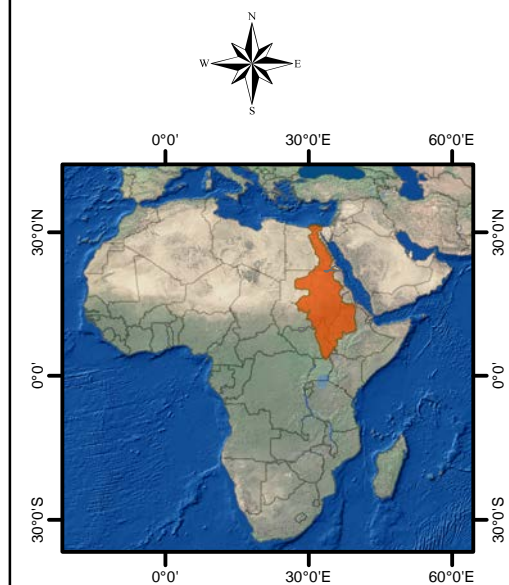
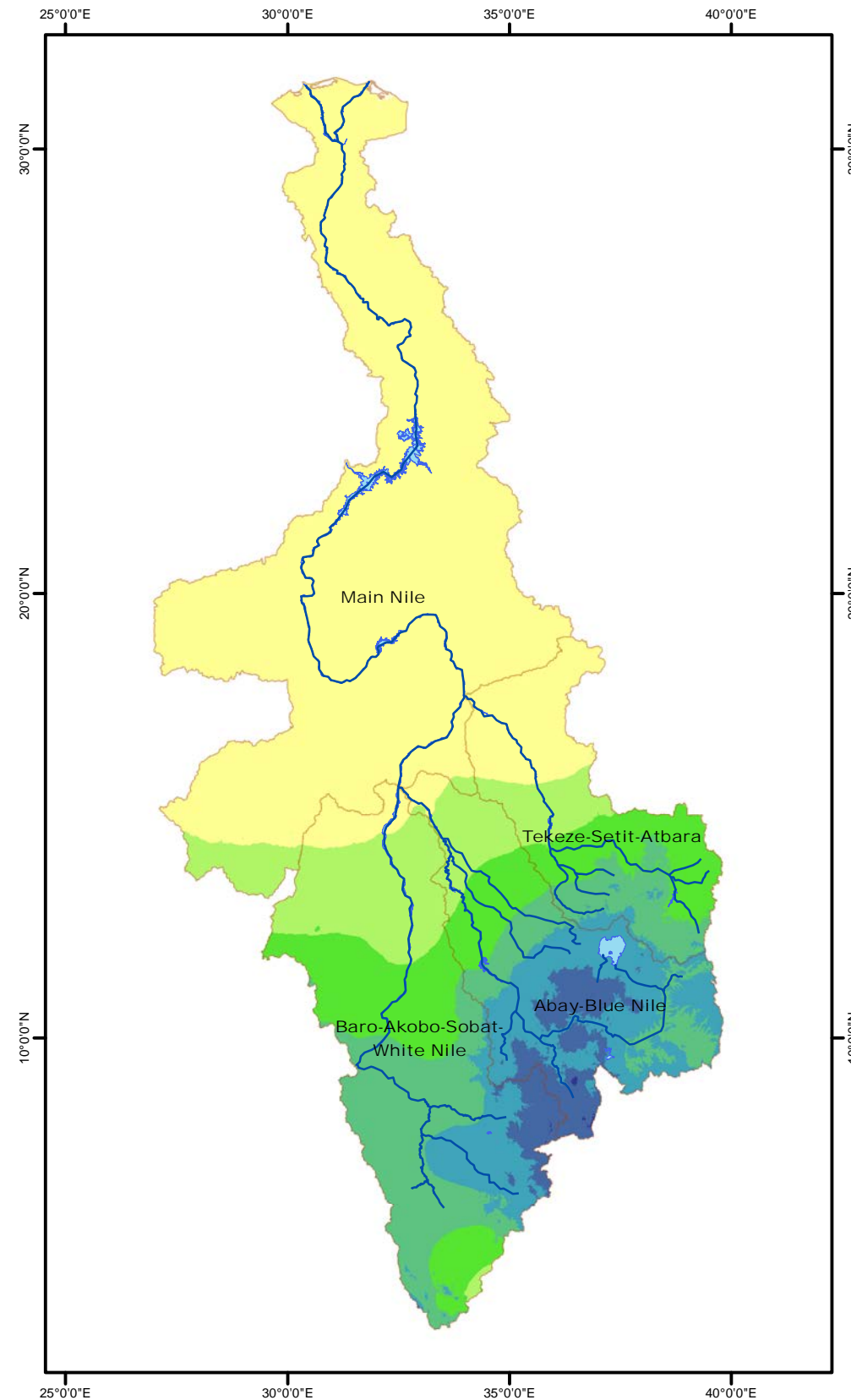
- EN Main Towns/Cities
- Main Rivers/Streams
- Main Nile Sub-Basin
- Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- Country Boundaries



<b>ENTRO</b> (Eastern Nile Technical Regional Office)	
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Map Title: <b>Main Nile: Relief &amp; Drainage</b>	
EN-MSIOA_Map 3.6	December 2014
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# Eastern Nile Mean Annual Rainfall

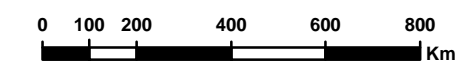


## Legend

### Mean Annual Rainfall (mm)

- < 200
- 200 - 500
- 500 - 750
- 750 - 1,000
- 1,000 - 1,500
- 1,500 - 2,000
- > 2,000

Source: WorldClim Precipitation Dataset



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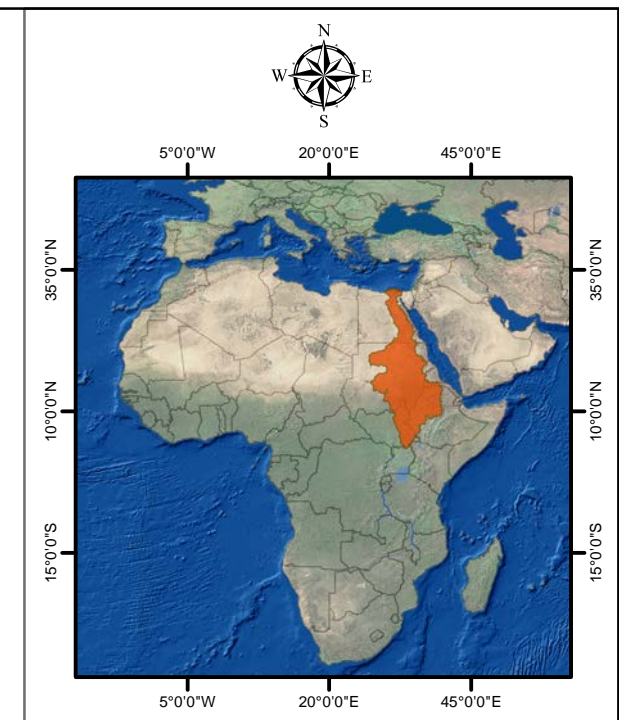
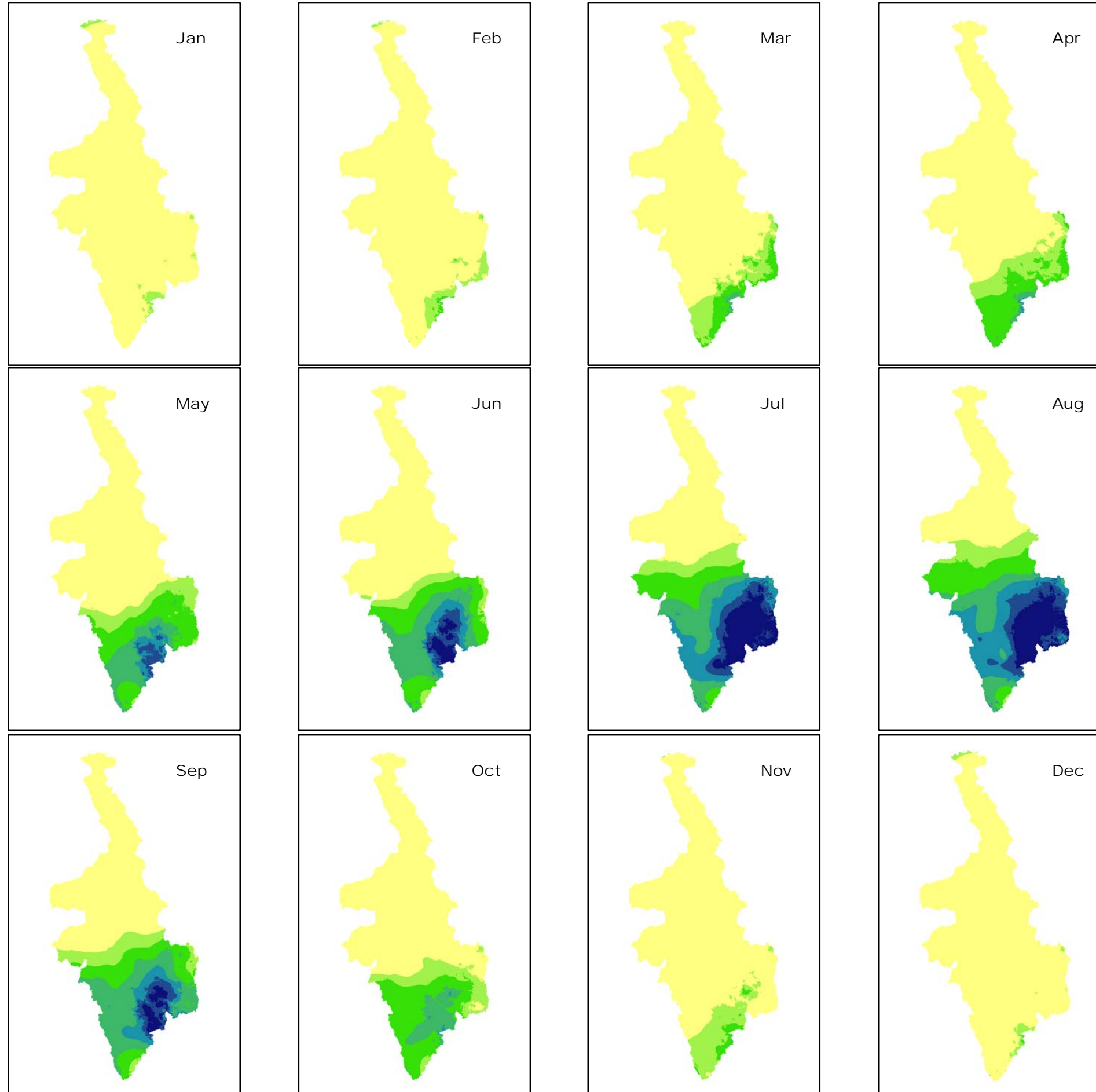
Map Title: **Eastern Nile  
Mean Annual Rainfall**

EN-MSIOA_Map 4.1	December 2014
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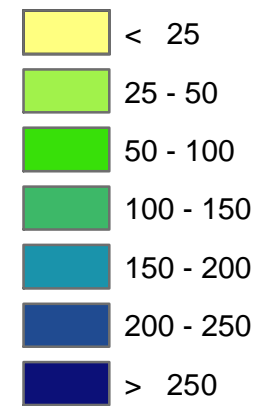


# Eastern Nile Mean Monthly Rainfall

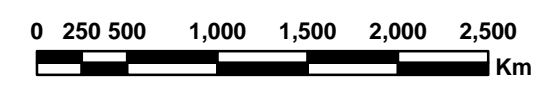


## Legend

### Rainfall (mm)



Source:  
WorldClim Mean Monthly Precipitation Datasets



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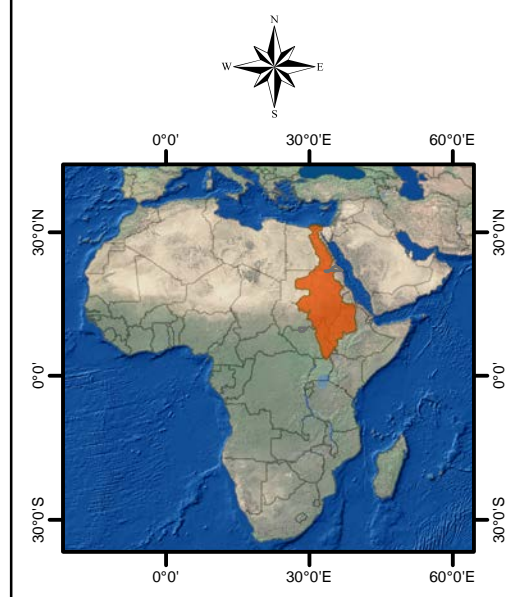
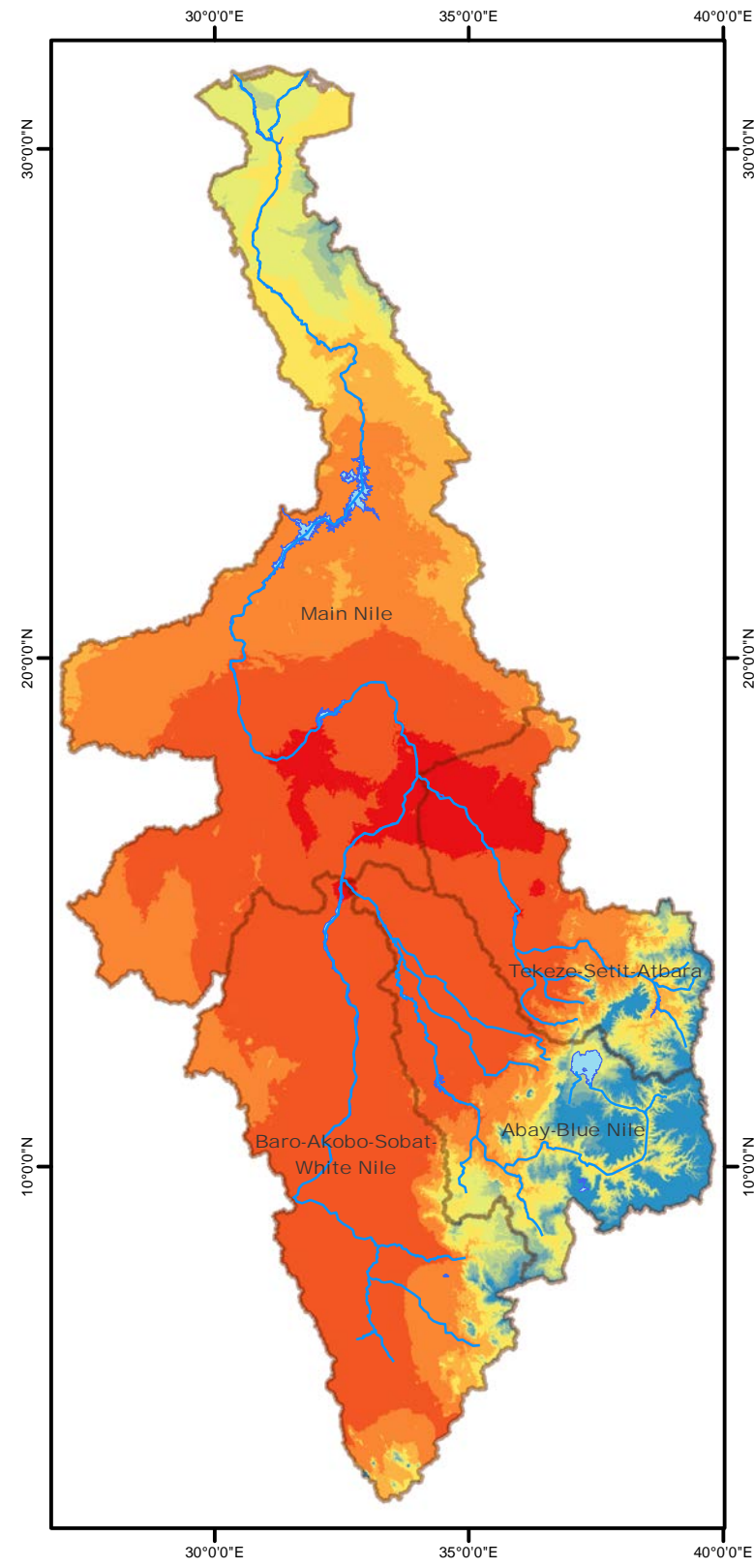
Map Title:  
**Eastern Nile Mean Monthly Rainfall**

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# EN Mean Annual Temperature

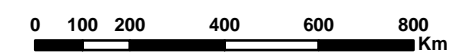


## Legend

### Mean Annual Temperature (°C)

- < 17
- 17 - 18
- 18 - 19
- 19 - 20
- 20 - 21
- 21 - 23
- 23 - 25
- 25 - 27
- 27 - 29
- > 29

Source: WorldClim Temperature Dataset



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**Eastern Nile Multi-Sectoral  
Investment Opportunity Analysis  
(EN-MSIOA)**

**Eastern Nile Technical Regional Office  
(ENTRO)**

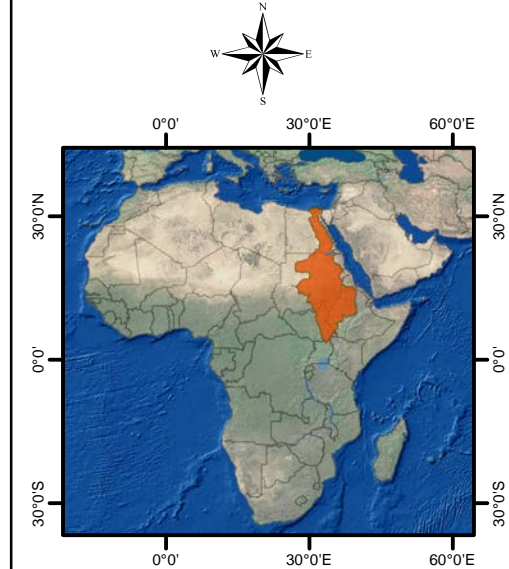
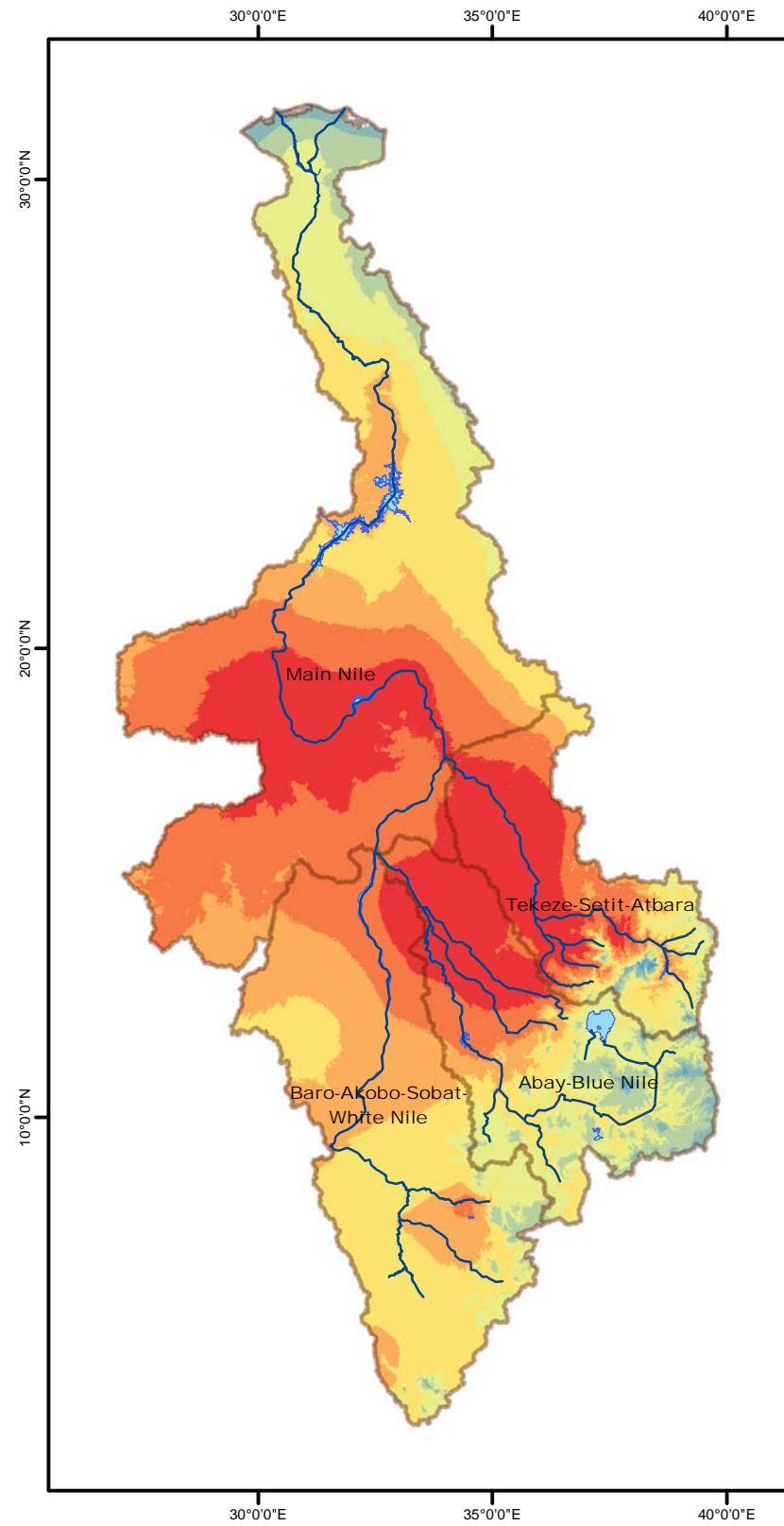
Map Title: **Eastern Nile  
Mean Annual Temperature**

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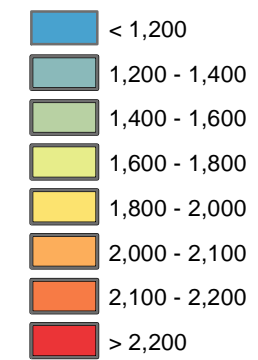


# EN Mean Annual Potential Evapotranspiration

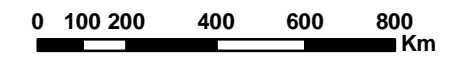


## Legend

### Mean Annual Potential Evapotranspiration (mm)



Note:  
Potential Evapotranspiration estimate from CGIAR-CSI  
(Consultative Group for International Agriculture  
Research - Consortium for Spatial Information).



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Map Title: **Eastern Nile Mean Annual  
Potential Evapotranspiration**

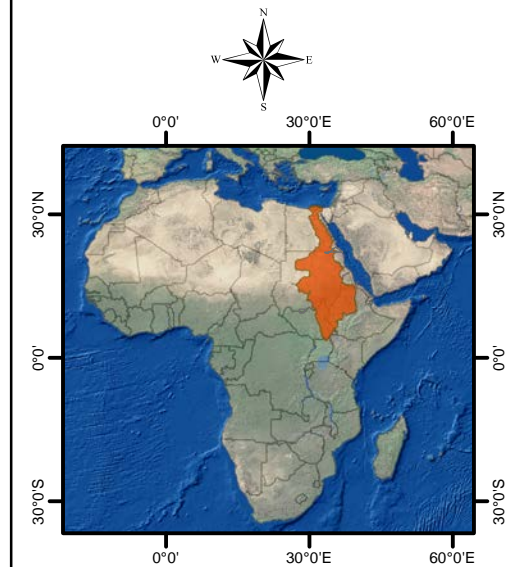
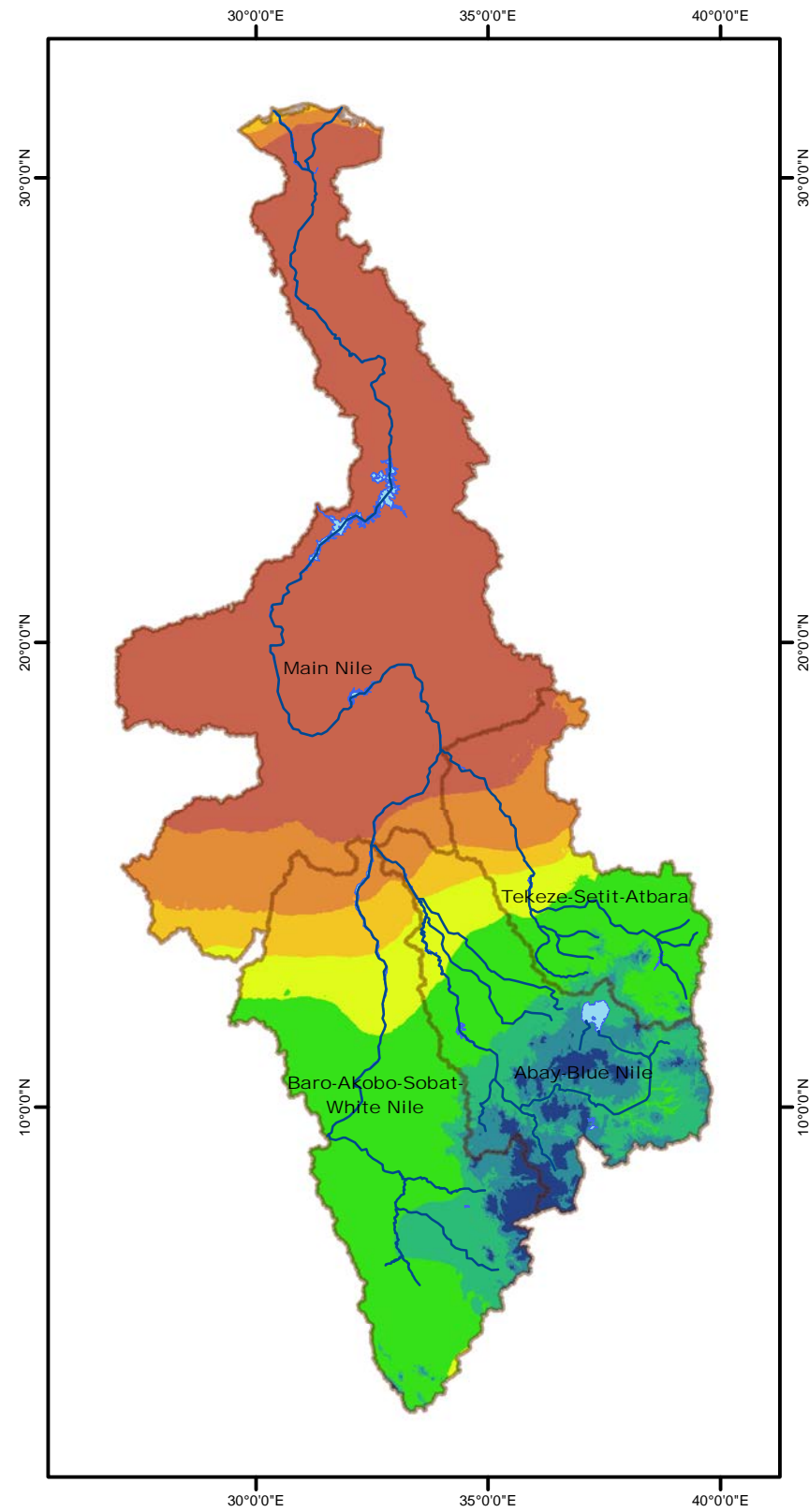
EN-MSIOA\_Map 4.4

December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

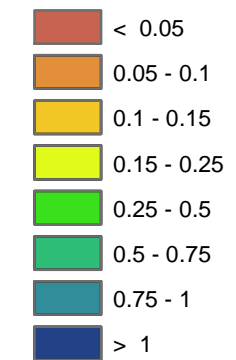


# Eastern Nile Aridity Index



## Legend

### Aridity Index



Note: Aridity Index from CGIAR-CSI  
(Consultative Group for International Agriculture  
Research - Consortium for Spatial Information).  
Aridity Index = Mean Annual Precipitation /  
Mean Annual Potential Evapotranspiration.



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Map Title:  
**Eastern Nile Aridity Index**

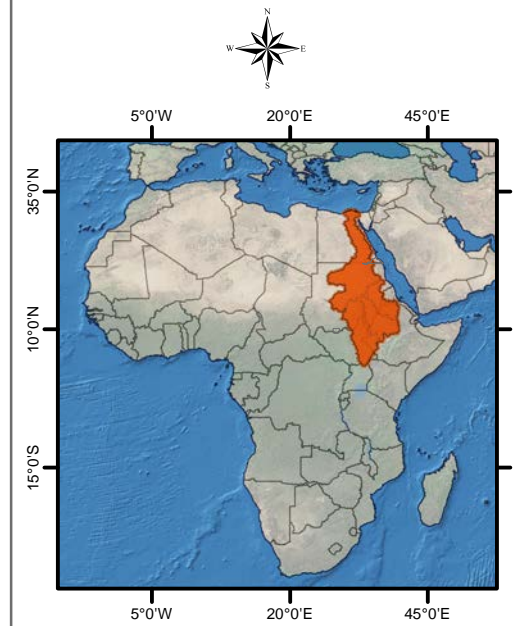
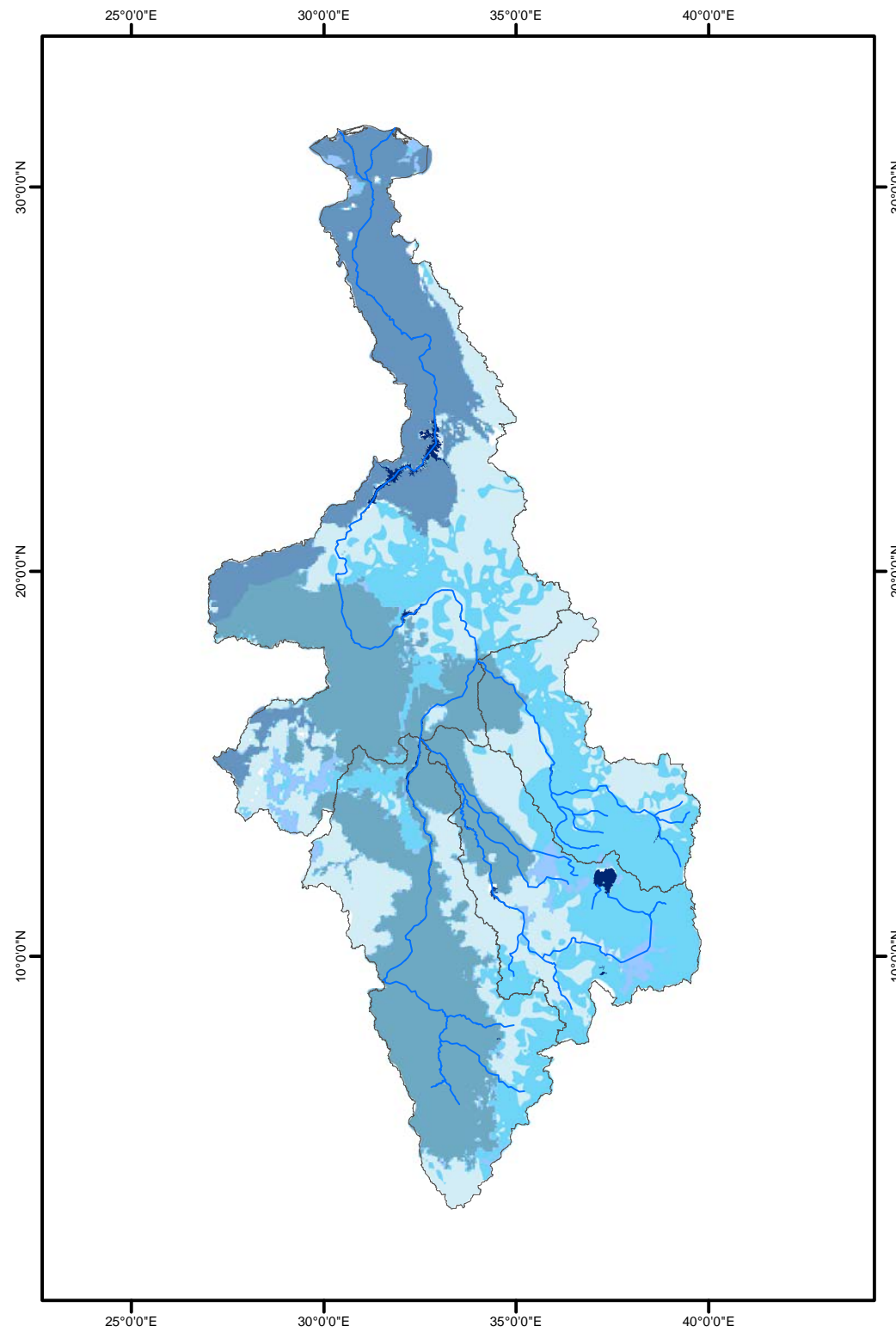
EN-MSIOA\_Map 4.5

December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Eastern Nile Groundwater Potential



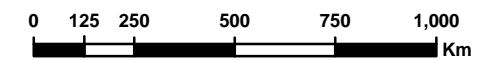
## Legend

### EN Groundwater Storage

#### Water Depth (mm)

- L (< 1000)
- LM (1,000 - 10,000)
- M (10,000 - 25,000)
- H (25,000 - 50,000)
- VH (> 50,000)

Note:  
Groundwater Storage data acquired from  
British Geological Survey (BGS).



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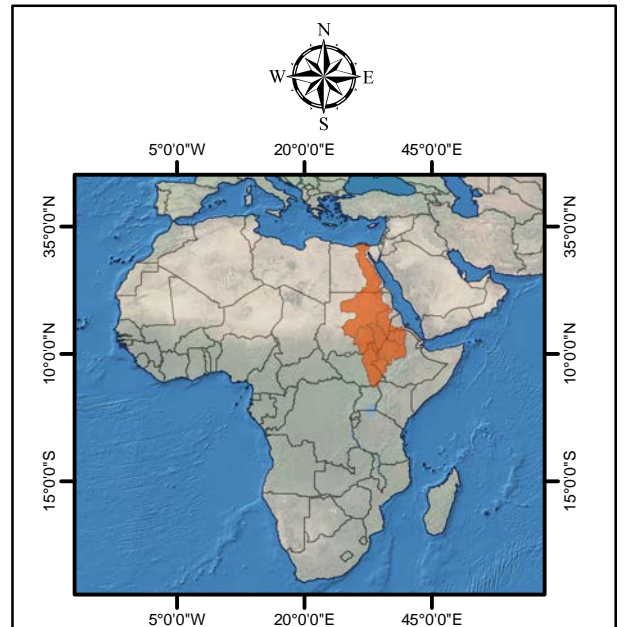
Map Title:  
**Eastern Nile Groundwater Potential**

EN-MSIOA\_Map 4.6      December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Eastern Nile Key Hydrometric Stations



## Legend

- Eastern Nile Capital Cities
- EN Key Hydrometric Stations
- EN Main Rivers
- ▭ Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- ▭ Country Boundaries

## Key Hydrometric Stations

- ABN\_1: Abay at Bahir Dar
- ABN\_2: Abay at Kessie Bridge
- ABN\_3: Abay at Shogole
- ABN\_4: Blue Nile at Ed Diem
- ABN\_5: Blue Nile at Roseires
- ABN\_6: Blue Nile at Sennar
- ABN\_7: Blue Nile at Wad Medani
- ABN\_8: Blue Nile at Khartoum
- ABN\_9: Dinder at Gewisi
- ABN\_10: Rahad at Hawata
- ABN\_11: Aleltu nr Muke Turi
- ABN\_12: Didessa near Arjo
- ABN\_13: Dabana near Abasina
- ABN\_14: Dabus near Assosa
- BASWN\_1: Baro at Gambela
- BASWN\_2: Sobat at Hillet Doleib
- BASWN\_3: White Nile at Malakal
- BASWN\_4: White Nile at Melut
- BASWN\_5: White Nile at Renk
- BASWN\_6: White Nile at Jebel Aulia
- BASWN\_7: White Nile at Mogren
- BASWN\_8: Sore near Metu
- BASWN\_9: Geba near Suppi
- BASWN\_10: Gilo near Pugnudo
- BASWN\_11: Pibor at Pibor Post
- TSA\_1: Tekeze near Embamadre
- TSA\_2: Tekeze at Girba
- TSA\_3: Atbara at K3
- TSA\_4: Atbara at Kubur
- TSA\_5: Setit at Hiliew
- MN\_1: Main Nile at Tamaniat
- MN\_2: Main Nile at Hassanab
- MN\_3: Main Nile at Atbara
- MN\_4: Main Nile at Dongola
- MN\_5: Main Nile at Aswan
- MN\_6: Main Nile at Sennar
- MN\_7: Main Nile at Naga Hammadi
- MN\_8: Main Nile at Asyut

Note: There are numerous other river/stream gauging stations in the four EN sub-basins other than the hydrometric stations shown here.



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Map Title:  
**Eastern Nile Key Hydrometric Stations**

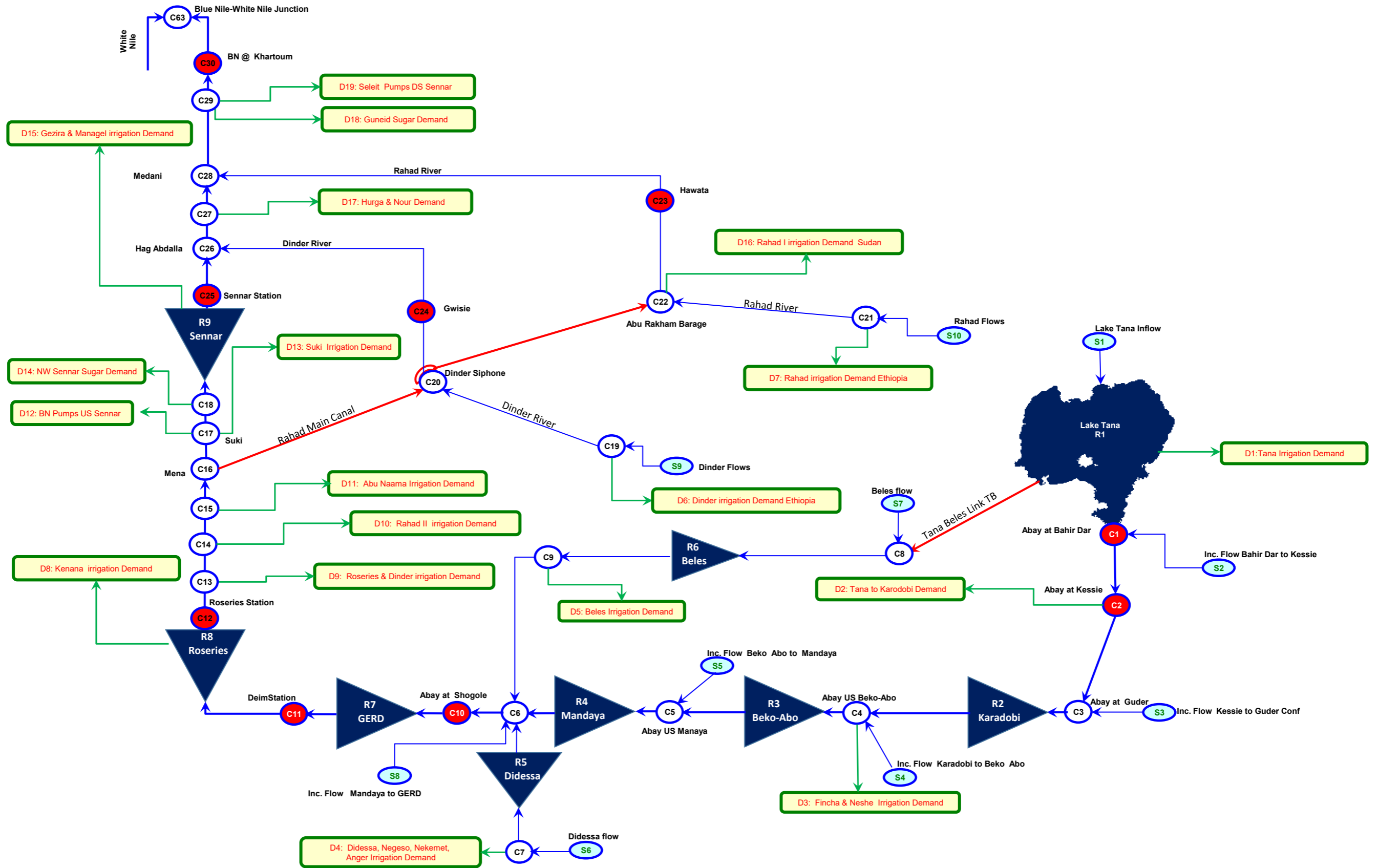
EN-MSIOA\_Map 4.7 | December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap:  
World color shaded relief imagery from ESRI  
(Environmental Systems Research Institute).

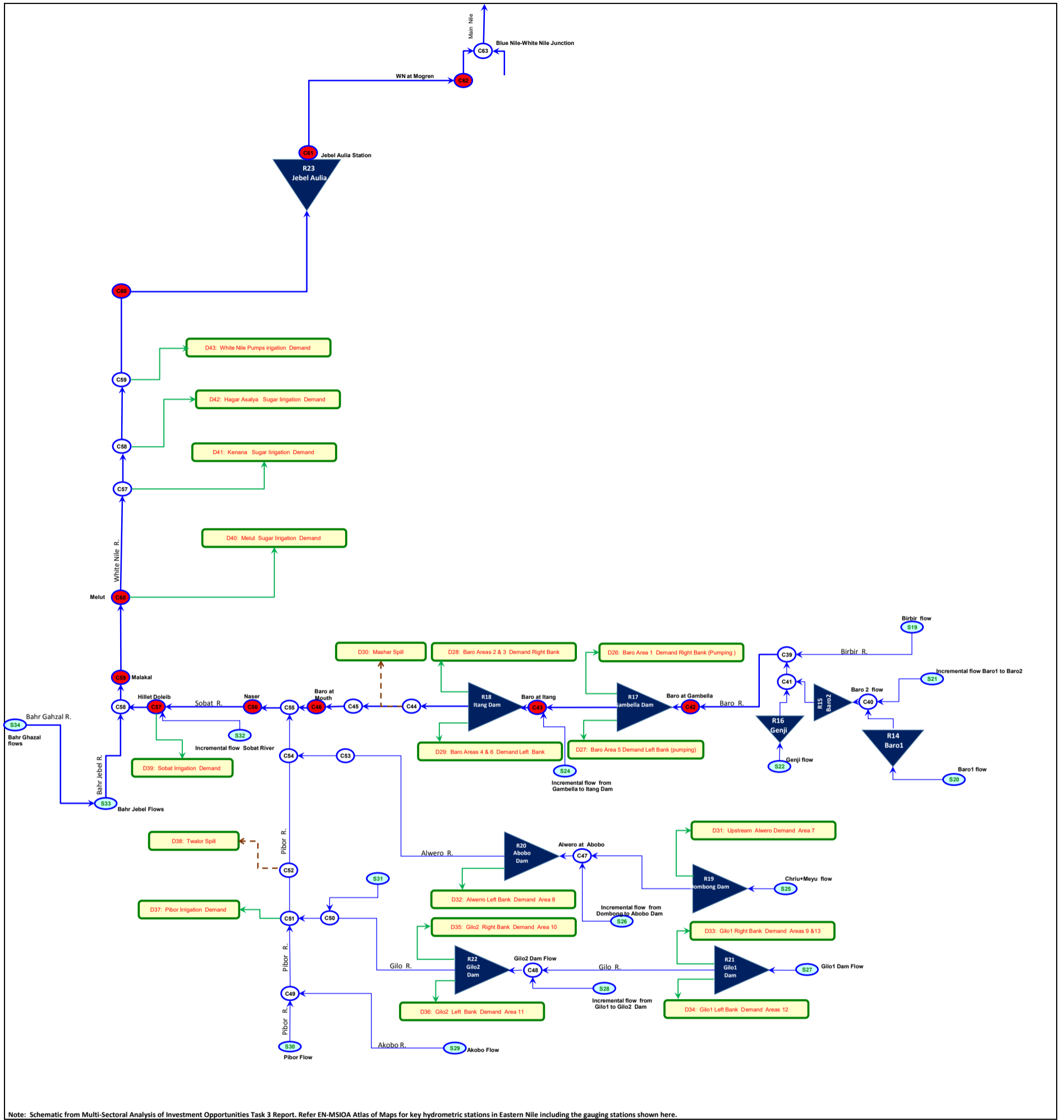


## Water Resources Modelling Schematic of Abay - Blue Nile (ABN) Sub-System



Note: Schematic from Multi-Sectoral Analysis of Investment Opportunities Task 3 Report. Refer EN-MSIOA Atlas of Maps for key hydrometric stations in Eastern Nile including the gauging stations shown here.

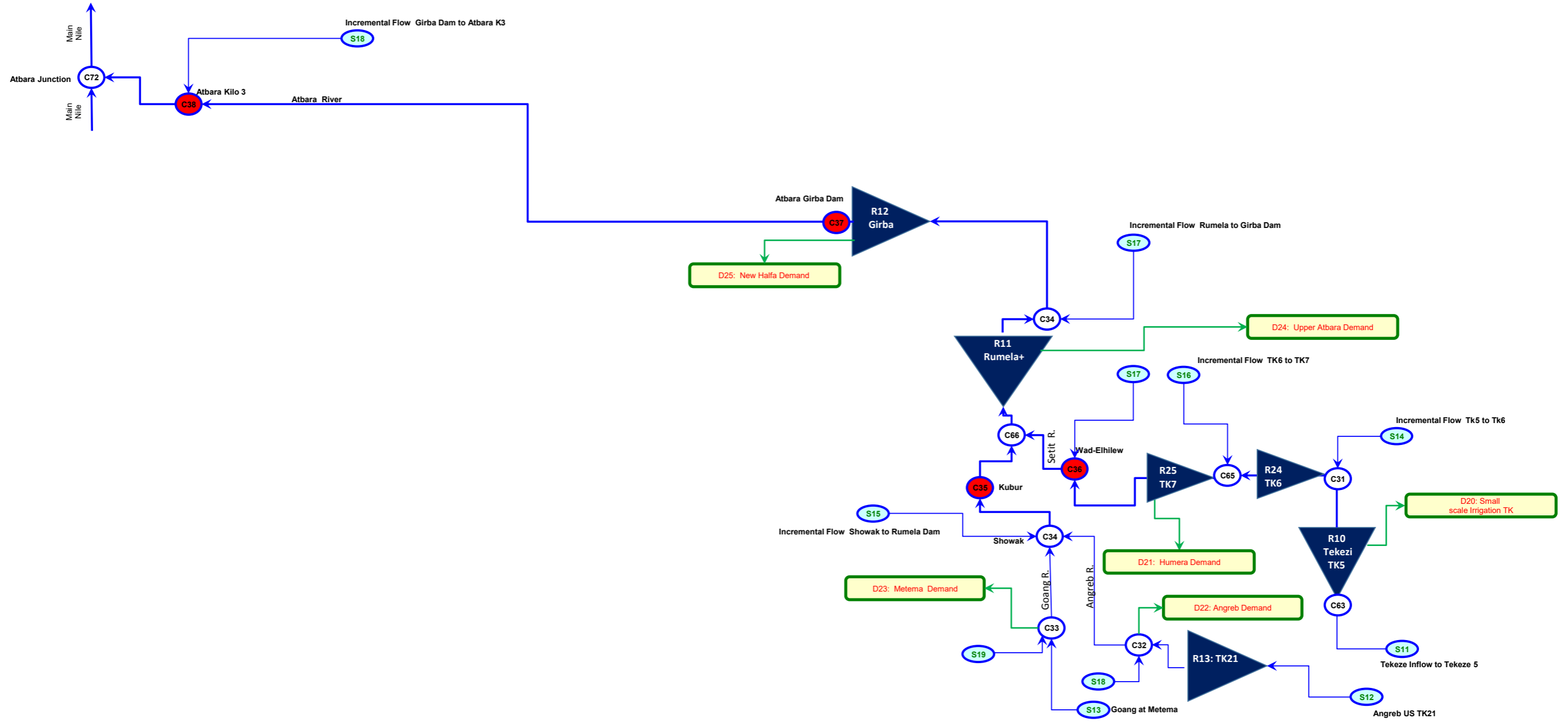
Water Resources Modelling Schematic of Baro-Akobo-Sobat-White Nile (BASWN) Sub-System



Note: Schematic from Multi-Sectoral Analysis of Investment Opportunities Task 3 Report. Refer EN-MSIOA Atlas of Maps for key hydrometric stations in Eastern Nile including the gauging stations shown here.

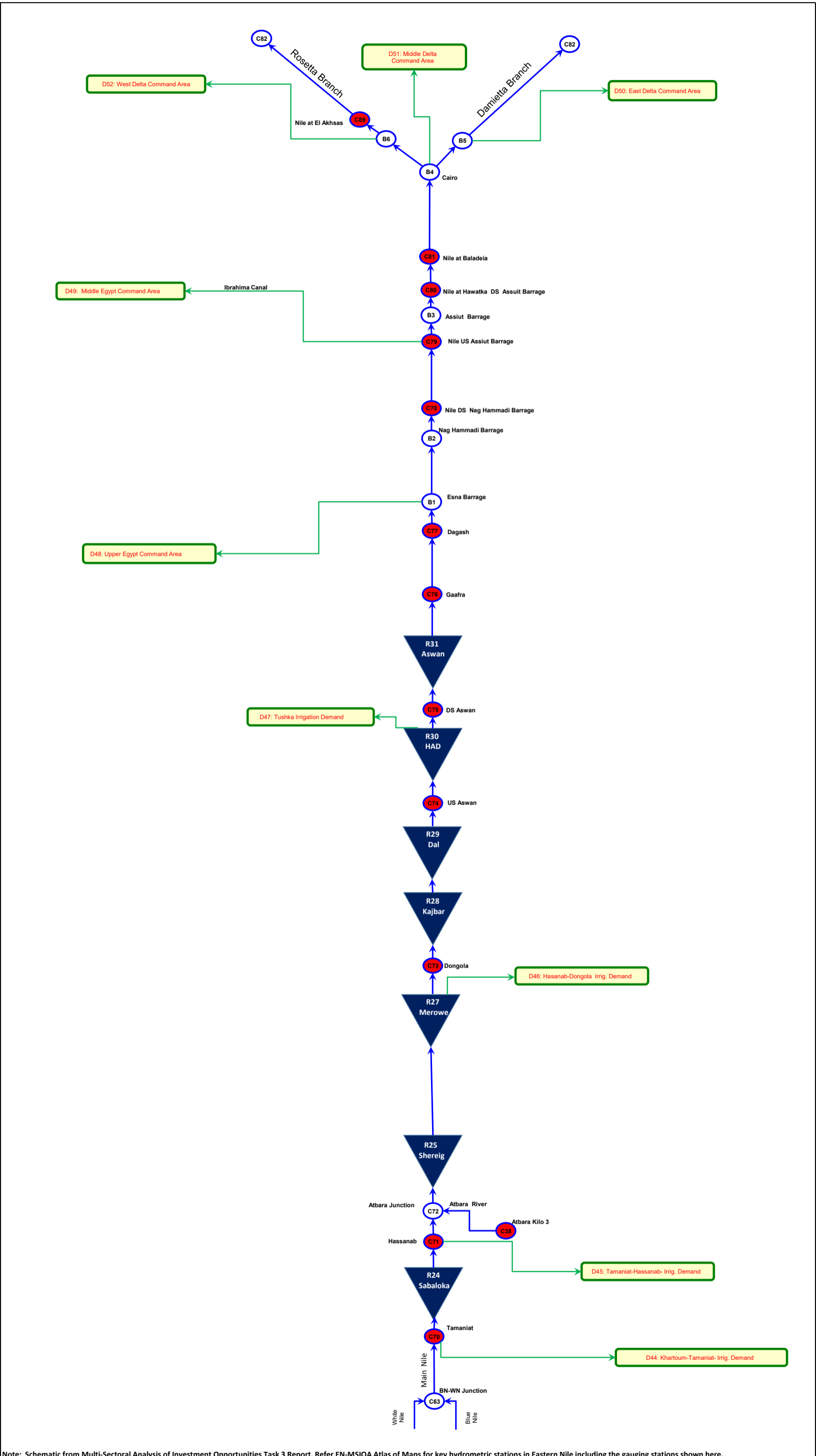


### Water Resources Modelling Schematic of Tekeze-Setit-Atbara (TSA) Sub-System



Note: Schematic from Multi-Sectoral Analysis of Investment Opportunities Task 3 Report. Refer EN-MSIOA Atlas of Maps for key hydrometric stations in Eastern Nile including the gauging stations shown here.

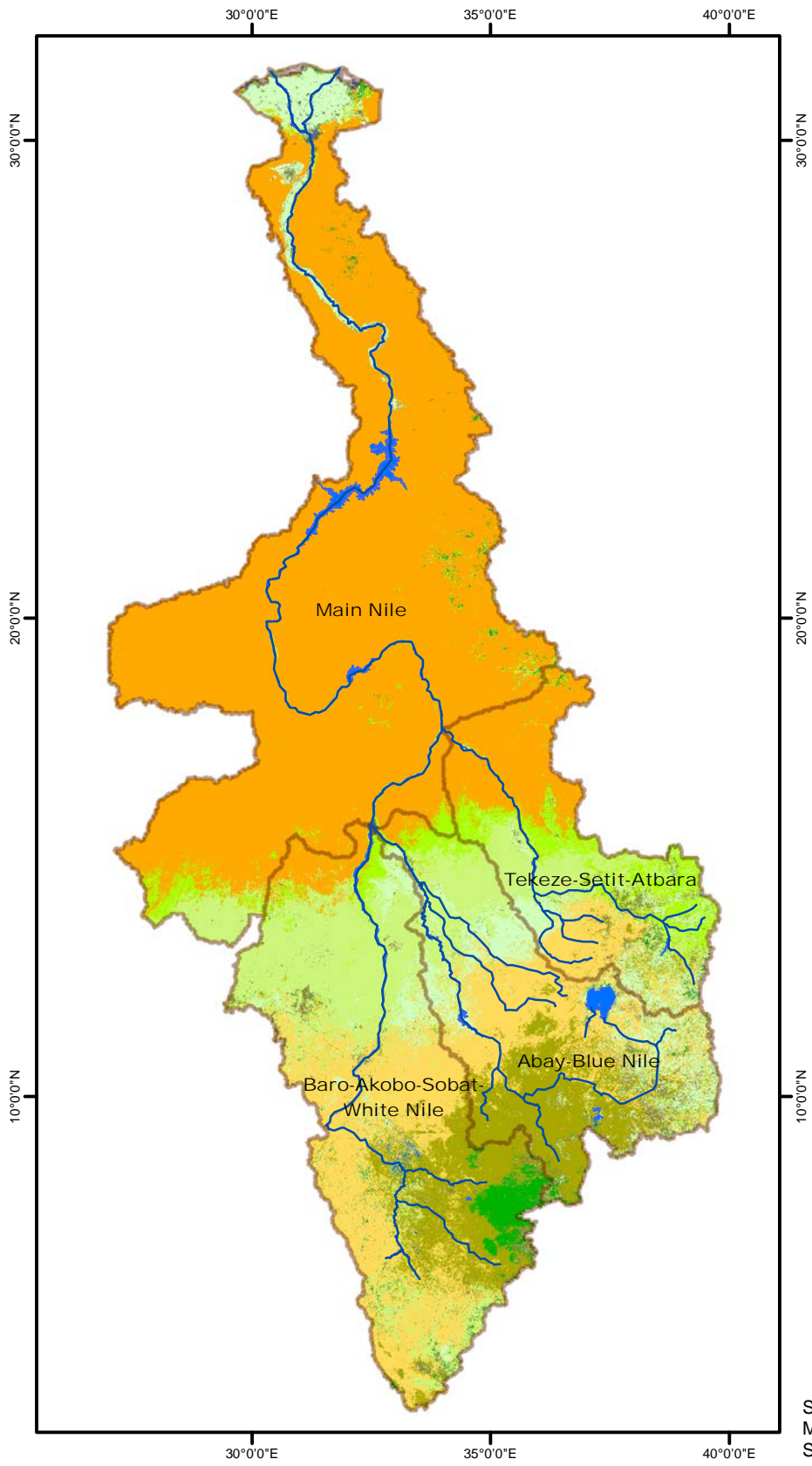
**Water Resources Modelling Schematic of Main Nile (MN) Sub-System**



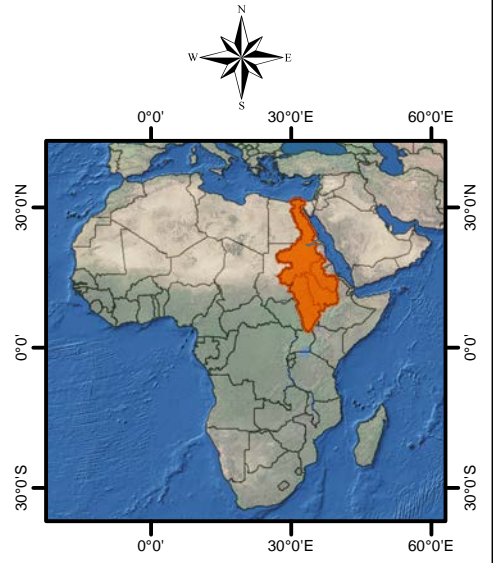
Note: Schematic from Multi-Sectoral Analysis of Investment Opportunities Task 3 Report. Refer EN-MSIOA Atlas of Maps for key hydrometric stations in Eastern Nile including the gauging stations shown here.



# Eastern Nile Landcover / Landuse

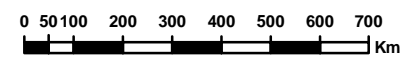


Source:  
Moderate Resolution Imaging  
Spectroradiometer (MODIS) Landcover 2009



## Legend

- EN Main Rivers
- Eastern Nile Sub-Basins
- Landcover-Landuse Classes**
- Evergreen Needle Leaf Forest
- Evergreen Broad Leaf Forest
- Deciduous Broad Leaf Forest
- Mixed Forest
- Closed Shrublands
- Open Shrublands
- Woody Savannas
- Savannas
- Grasslands
- Lakes, Reservoirs & Wetlands
- Croplands
- Urban
- Natural vegetation mosaic/croplands
- Barren or sparsely vegetated



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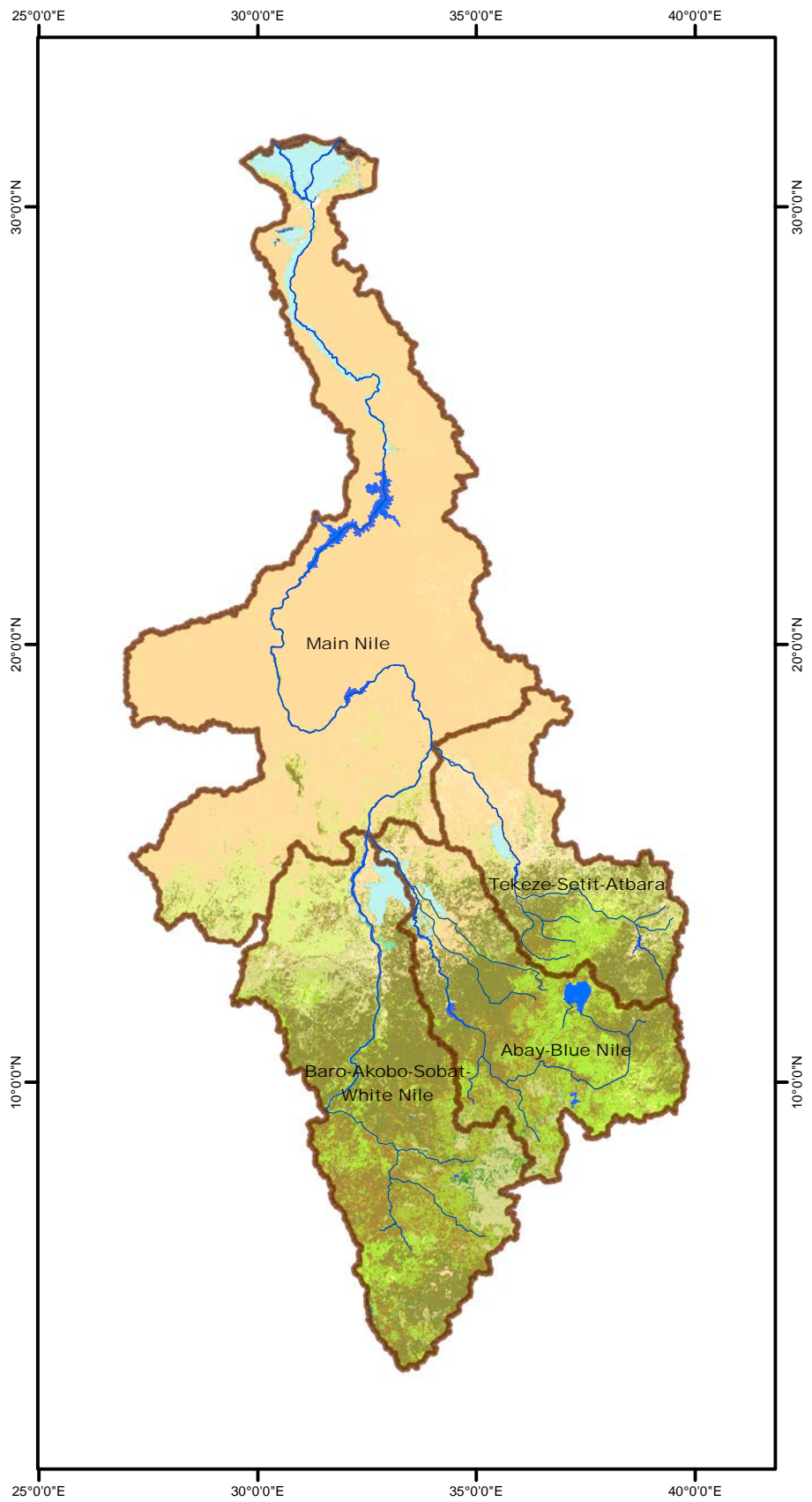
**EN-MSIOA**  
(Eastern Nile Multi-Sectoral  
Investment Opportunity Analysis)

Map Title:  
**Eastern Nile Landcover-Landuse**

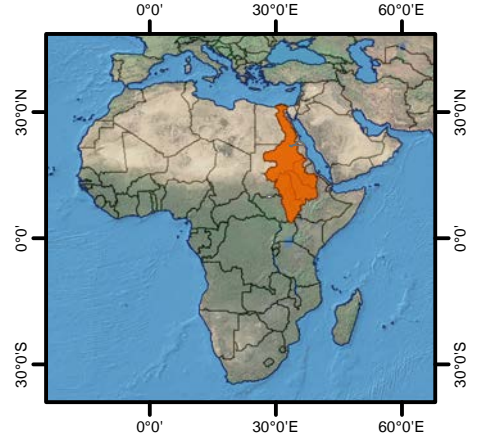
EN-MSIOA\_Map 5.1 | December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

# Eastern Nile Landcover / Landuse



Source:  
European Space Agency (ESA) Globcover 2009

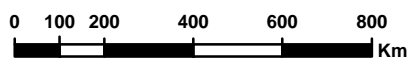


**Legend**

- EN Main Rivers
- Eastern Nile Sub-Basins

**Landcover Classes**

- Irrigated croplands
- Rainfed croplands
- Mosaic Croplands/Vegetation
- Mosaic Vegetation/Croplands
- Closed to open broadleaved evergreen or semi-deciduous forest
- Closed broadleaved deciduous forest
- Open broadleaved deciduous forest
- Open needleleaved deciduous or evergreen forest
- Mosaic Forest-Shrubland/Grassland
- Mosaic Grassland/Forest-Shrubland
- Closed to open shrubland
- Closed to open grassland
- Sparse vegetation
- Closed to open broadleaved forest regularly flooded
- Closed to open vegetation regularly flooded
- Bare areas
- Water bodies



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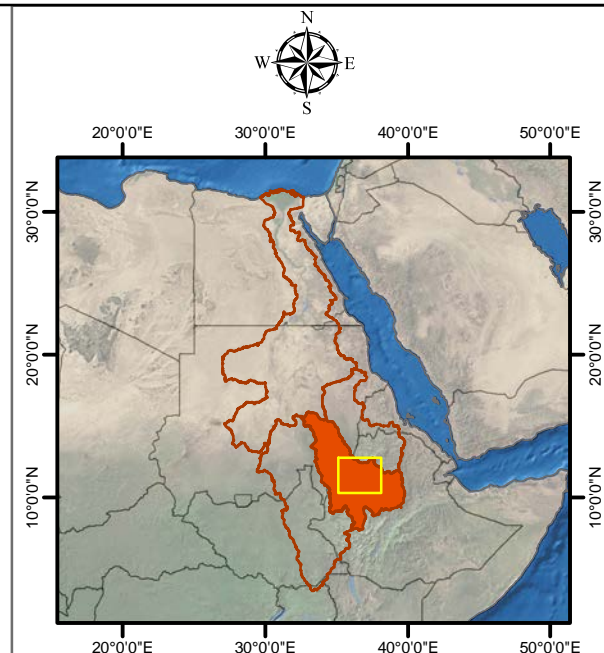
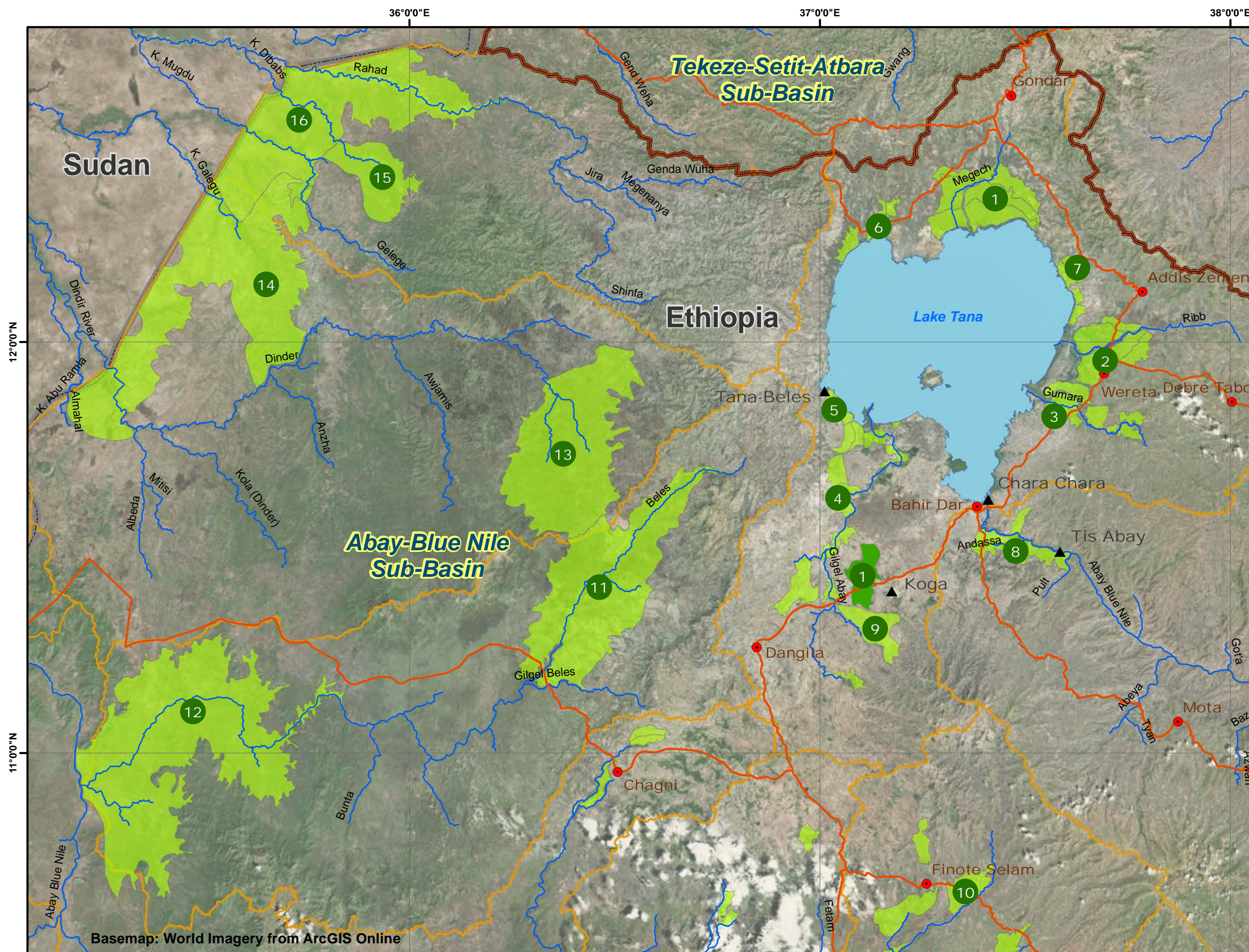
Map Title:  
**Eastern Nile Landcover-Landuse**

**EN-MSIOA\_Map 5.2** | **December 2014**

**Prepared by:**  
**Gedion Tsegaye Sahle (gtshsig@gmail.com)**

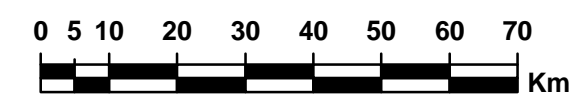


# Irrigation Projects in Tana-Beles & Upper Dinder-Rahad Sub-Basins



## Legend

- ▲ Existing Dams/Weirs/Barrages
- Main Towns
- Main Roads
- River Network
- Potential Irrigation Projects
- Existing Irrigation Schemes
- Sub-Catchment Boundaries
- Abay-Blue Nile Sub-Basin
- Lakes & Reservoirs
- Country Boundaries



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**EN-MSIOA**  
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Map Title: **Irrigation Projects in Tana-Beles & Upper Dinder-Rahad Sub-Basins**

EN-MSIOA\_Map 6.1 December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

### Potential Irrigation Projects

Tana Sub-Basin		Beles Sub-Basin		Upper Dinder Sub-Basin		Upper Rahad Sub-Basin	
1 Megetch	4 Gilgel Abay	7 North-East Tana	11 Upper Beles	13 Upper Dinder / Ayma	15 Galegu		
2 Ribb	5 South-West Tana	8 Tis Isat	12 Lower Beles	14 Lower Dinder / Ayma	16 Rahad		
3 Gumara	6 North-West Tana	9 Jema	10 Birr (Birr sub-basin)				

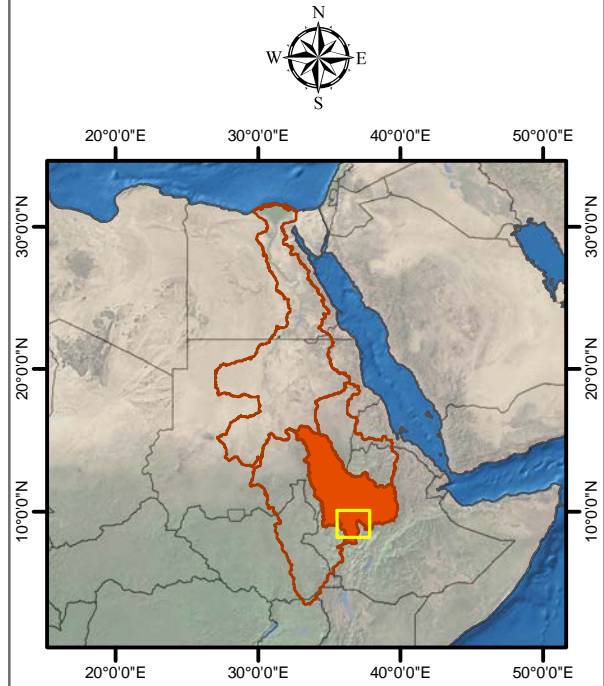
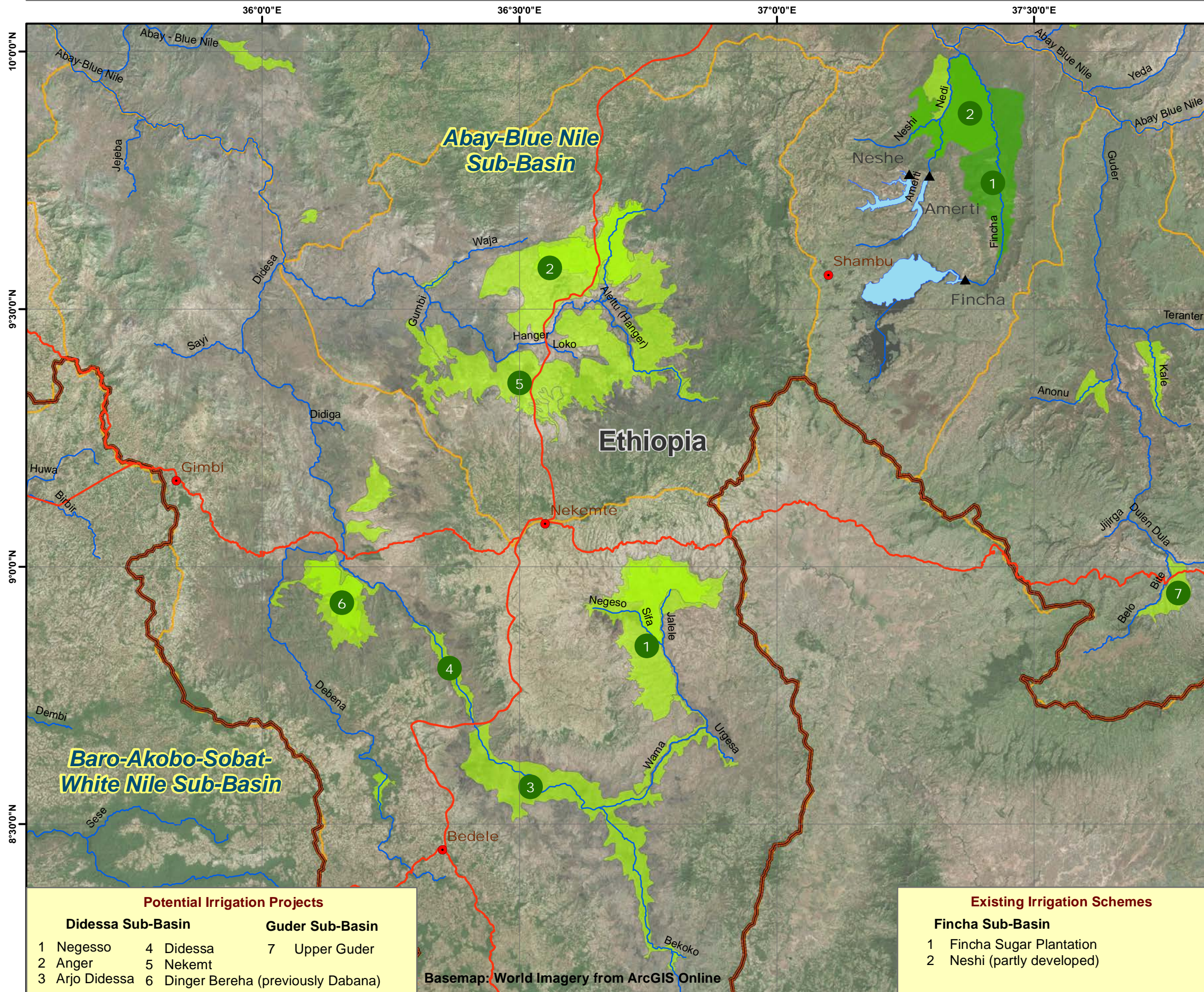
### Existing Irrigation Schemes

Tana Sub-Basin
1 <b>Koga Irrigation Scheme (Gilgel Abay)</b>
* Small Scale Irrigation/Traditional (not mappable at this scale)

Basemap: World Imagery from ArcGIS Online



# Irrigation Projects in Fincha, Guder & Didessa Sub-Basins



## Legend

- ▲ Existing Dams
- Main Towns
- Main Roads
- River Network
- Potential Irrigation Projects
- Existing Irrigation Schemes
- Sub-Catchment Boundaries
- ▭ Abay-Blue Nile Sub-Basin
- ▭ Lakes & Reservoirs
- ▭ Country Boundaries



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Map Title: **Irrigation Projects in Fincha, Guder & Didessa Sub-Basins**

EN-MSIOA\_Map 6.2      December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

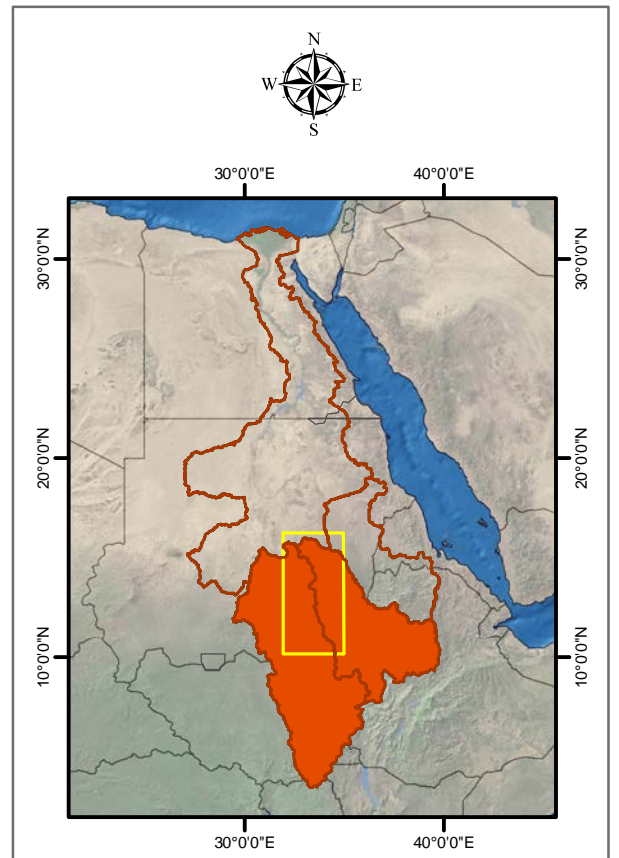
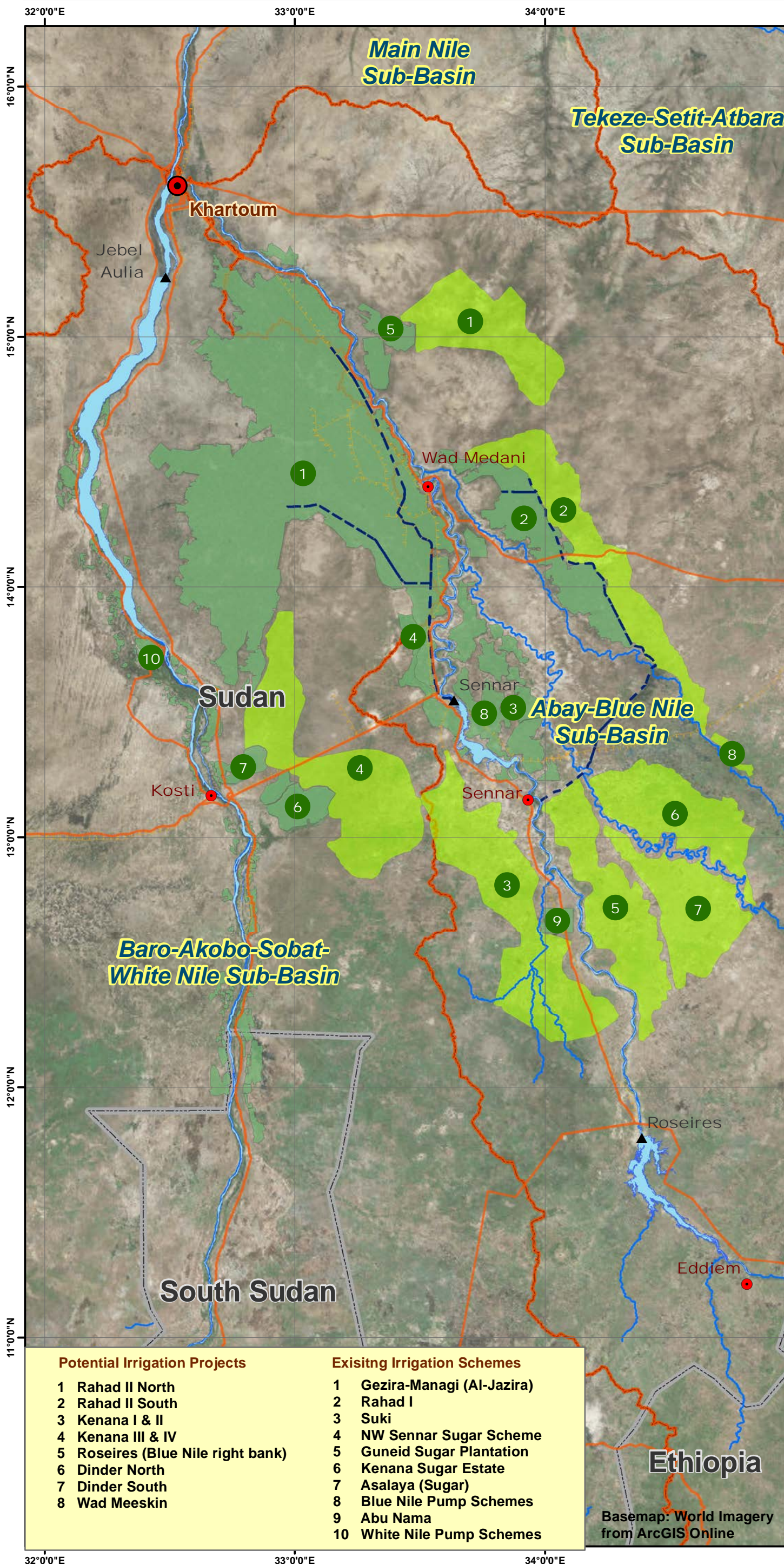
Potential Irrigation Projects		
Didessa Sub-Basin		Guder Sub-Basin
1 Negesso	4 Didessa	7 Upper Guder
2 Anger	5 Nekemt	
3 Arjo Didessa	6 Dinger Bereha (previously Dabana)	

Existing Irrigation Schemes	
Fincha Sub-Basin	
1	Fincha Sugar Plantation
2	Neshi (partly developed)

Basemap: World Imagery from ArcGIS Online

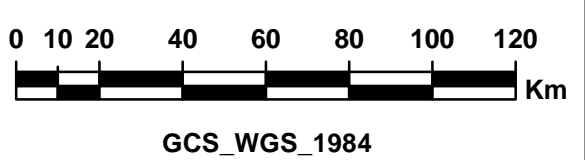


# Irrigation Projects in Lower Blue Nile & White Nile Sub-Basin



## Legend

- ▲ Existing Dams
- Main Towns
- Main Roads
- Railways
- - - Main Irrigation Canals
- Main Rivers
- Potential Irrigation Project
- Existing Irrigation Schemes
- Eastern Nile Sub-Basins
- Lakes & Reservoirs
- Country Boundaries



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Map Title: **Irrigation Projects in Lower Blue Nile & White Nile Sub-Basins**

EN-MSIOA\_Map 6.3 December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

### Potential Irrigation Projects

- 1 Rahad II North
- 2 Rahad II South
- 3 Kenana I & II
- 4 Kenana III & IV
- 5 Roseires (Blue Nile right bank)
- 6 Dinder North
- 7 Dinder South
- 8 Wad Meeskin

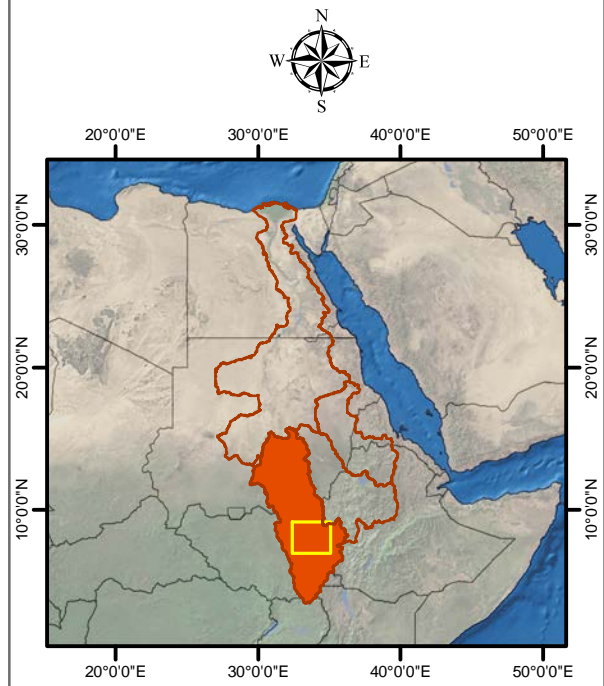
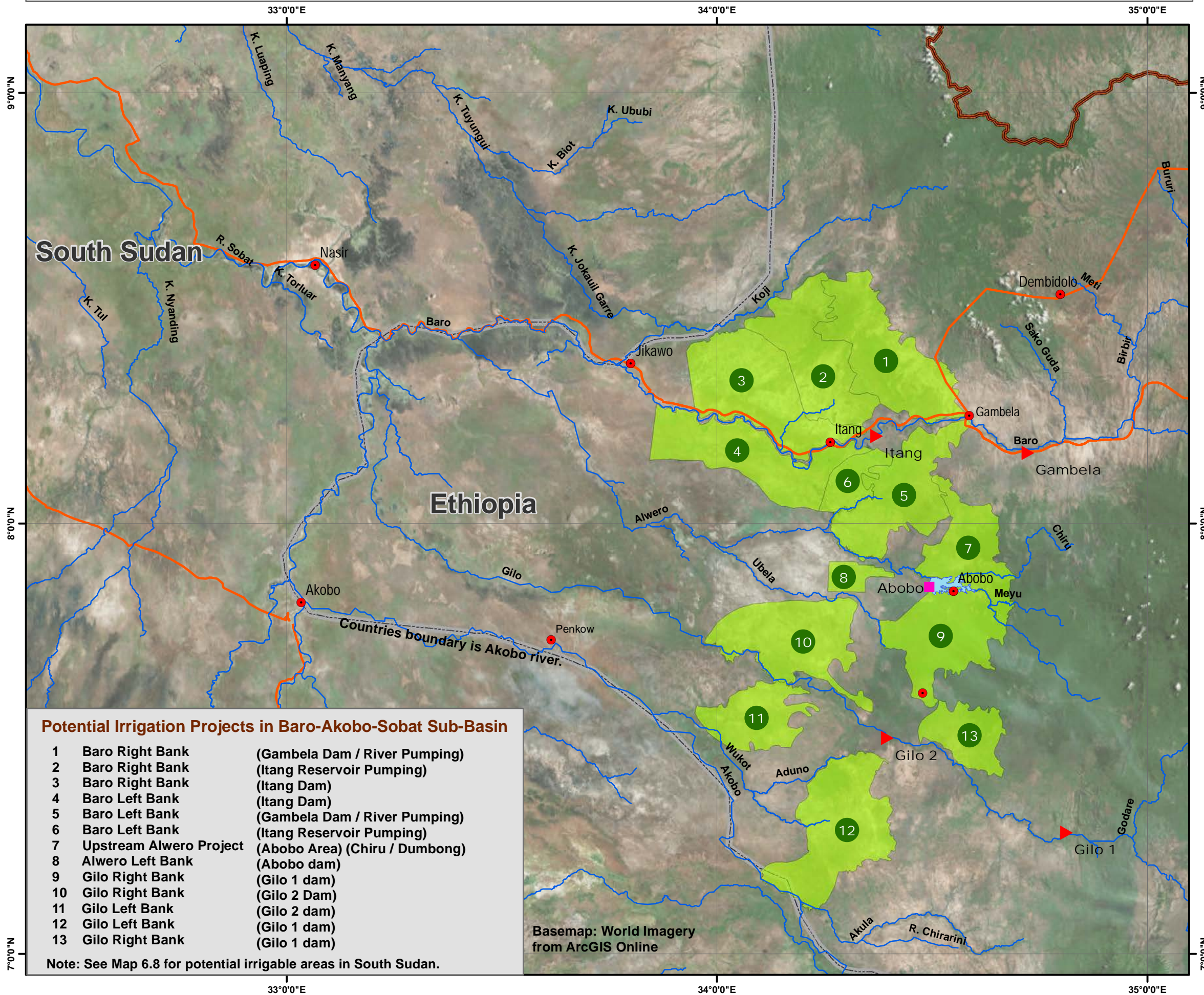
### Existing Irrigation Schemes

- 1 Gezira-Managi (Al-Jazira)
- 2 Rahad I
- 3 Suki
- 4 NW Sennar Sugar Scheme
- 5 Guneid Sugar Plantation
- 6 Kenana Sugar Estate
- 7 Asalaya (Sugar)
- 8 Blue Nile Pump Schemes
- 9 Abu Nama
- 10 White Nile Pump Schemes

Basemap: World Imagery from ArcGIS Online

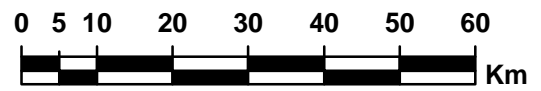


# Potential Irrigation Projects in Baro-Akobo-Sobat Sub-Basin



## Legend

- Main Towns
- ▶ Potential Dam Sites (Irrigation-Related)
- Existing Dam / Barrage
- Main Roads
- River Network
- Potential Irrigation Projects
- Eastern Nile Sub-Basins
- Lakes & Reservoirs
- Country Boundaries



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### Potential Irrigation Projects in Baro-Akobo-Sobat Sub-Basin

- |    |                         |                                |
|----|-------------------------|--------------------------------|
| 1  | Baro Right Bank         | (Gambela Dam / River Pumping)  |
| 2  | Baro Right Bank         | (Itang Reservoir Pumping)      |
| 3  | Baro Right Bank         | (Itang Dam)                    |
| 4  | Baro Left Bank          | (Itang Dam)                    |
| 5  | Baro Left Bank          | (Gambela Dam / River Pumping)  |
| 6  | Baro Left Bank          | (Itang Reservoir Pumping)      |
| 7  | Upstream Alwero Project | (Abobo Area) (Chiru / Dumbong) |
| 8  | Alwero Left Bank        | (Abobo dam)                    |
| 9  | Gilo Right Bank         | (Gilo 1 dam)                   |
| 10 | Gilo Right Bank         | (Gilo 2 Dam)                   |
| 11 | Gilo Left Bank          | (Gilo 2 dam)                   |
| 12 | Gilo Left Bank          | (Gilo 1 dam)                   |
| 13 | Gilo Right Bank         | (Gilo 1 dam)                   |

Note: See Map 6.8 for potential irrigable areas in South Sudan.

Basemap: World Imagery from ArcGIS Online

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**EN-MSIOA**  
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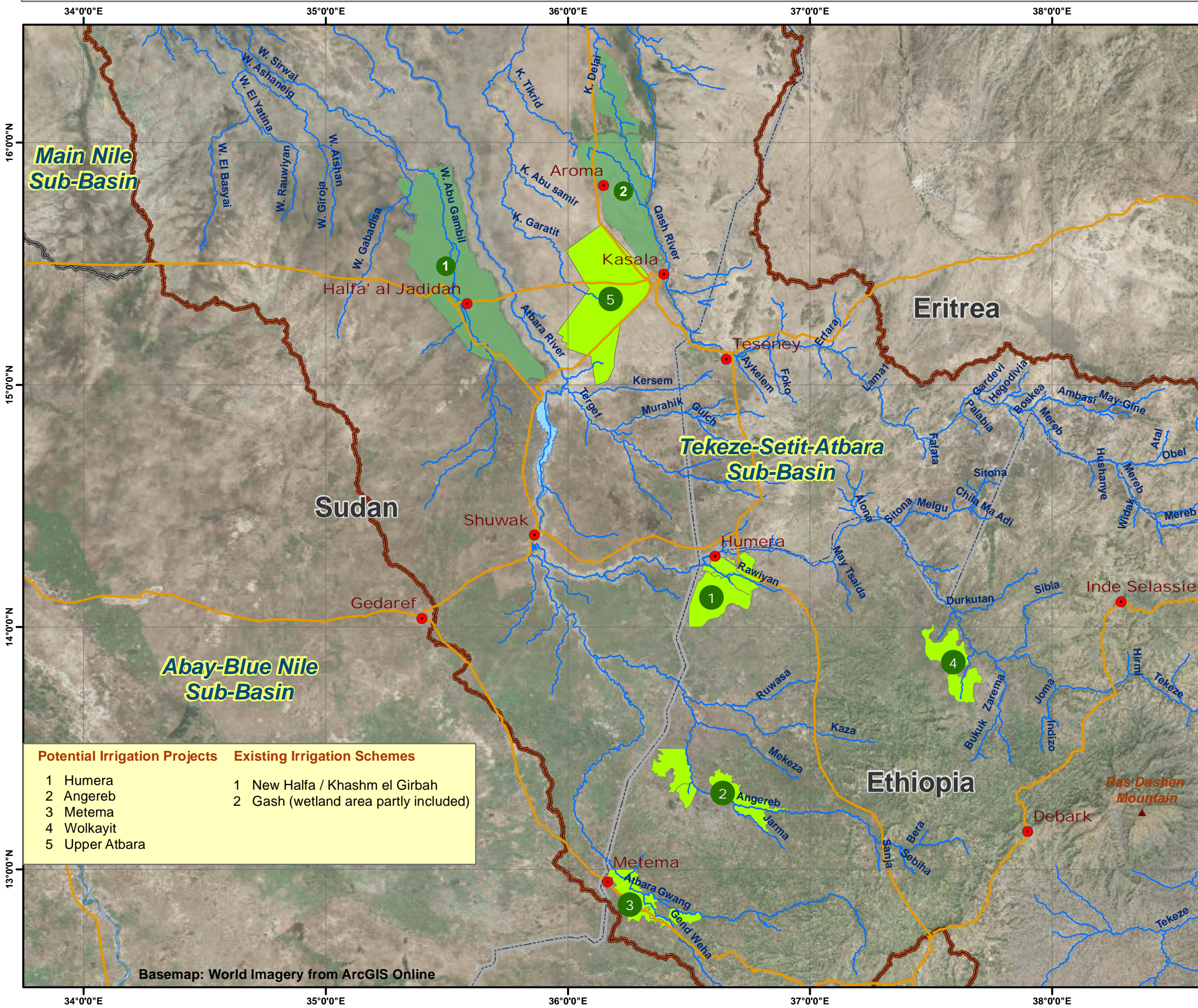
Map Title: **Potential Irrigation Projects in Baro-Akobo-Sobat Sub-Basin**

EN-MSIOA\_Map 6.4 December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

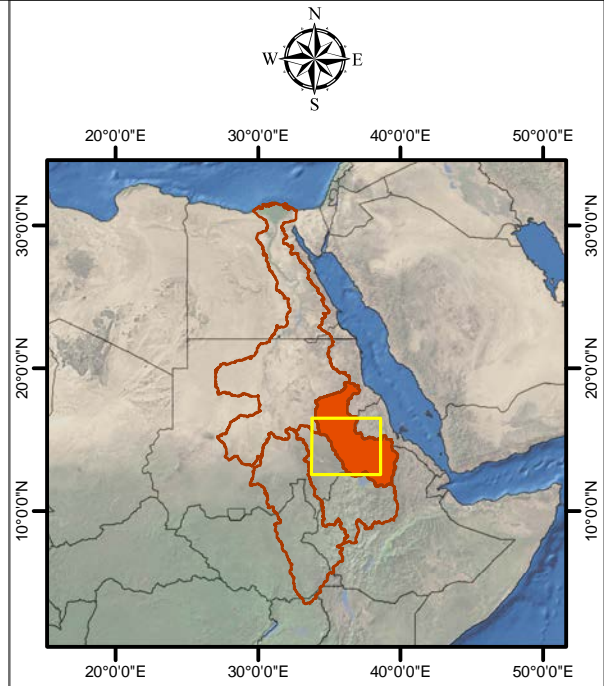


# Existing & Potential Irrigation Projects in Tekeze-Setit-Atbara Sub-Basin



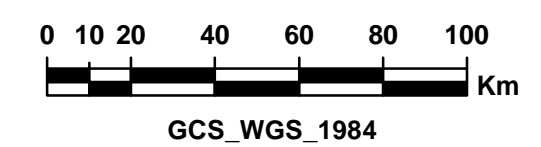
Potential Irrigation Projects	Existing Irrigation Schemes
1 Humera	1 New Halfa / Khashm el Girbah
2 Angereb	2 Gash (wetland area partly included)
3 Metema	
4 Wolkayit	
5 Upper Atbara	

Basemap: World Imagery from ArcGIS Online



## Legend

- Main Towns
- Main Roads
- River Network
- Potential Irrigation Projects
- Existing Irrigation Schemes
- Tekeze-Setit-Atbara Sub-Basin
- Lakes & Reservoirs
- Country Boundaries



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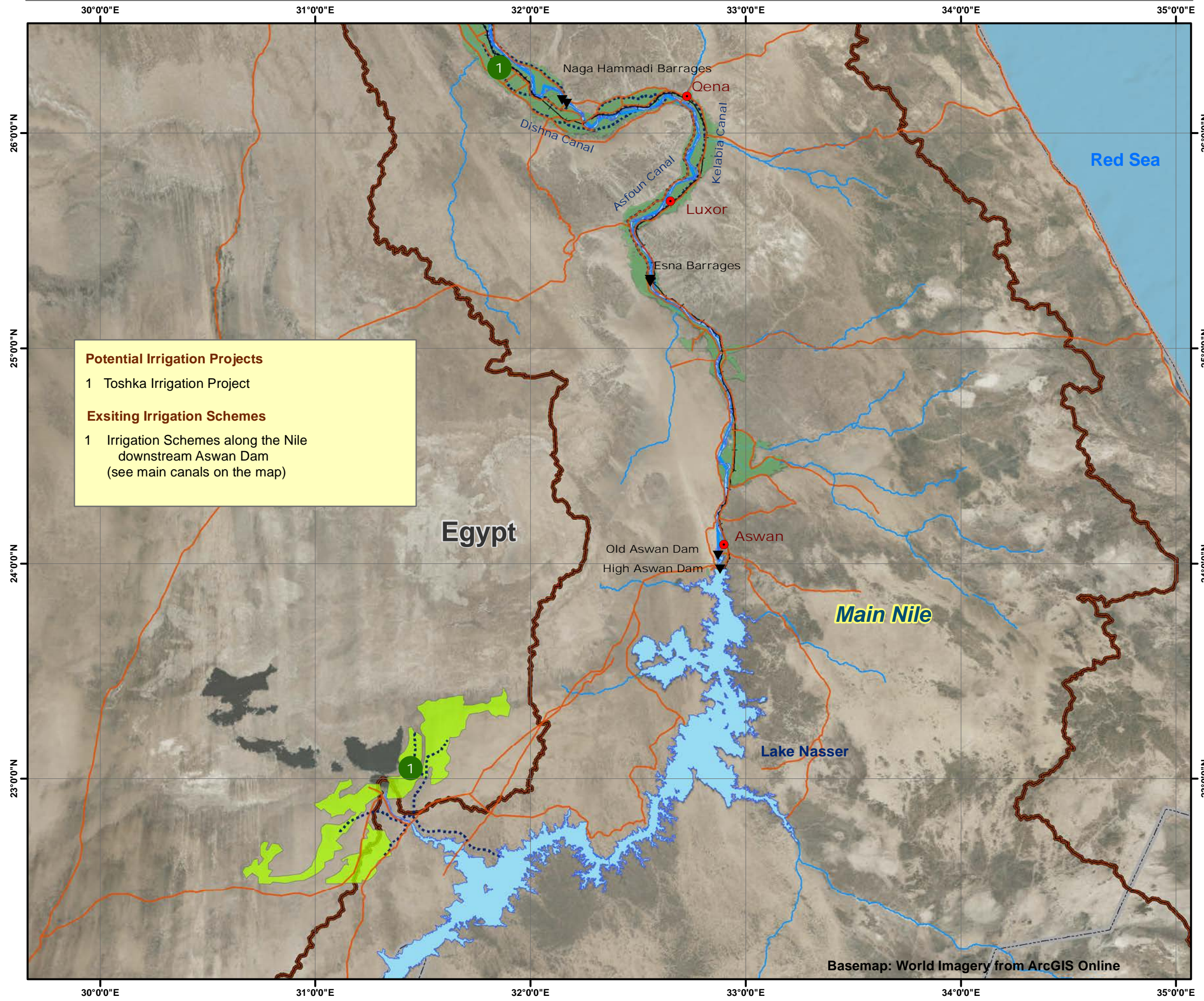
Map Title:  
**Existing & Potential Irrigation Projects in Tekeze-Setit-Atbara Sub-Basin**

EN-MSIOA\_Map 6.5      December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

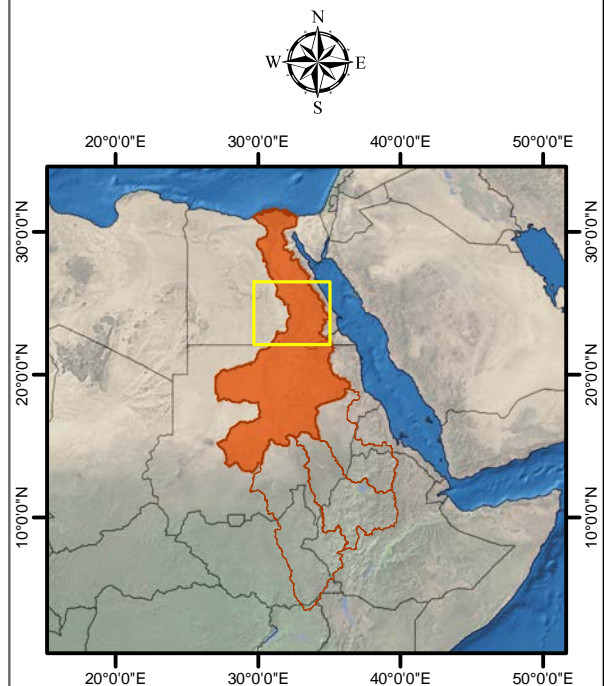


# Irrigation in Main Nile Sub-Basin, Aswan Dam Area



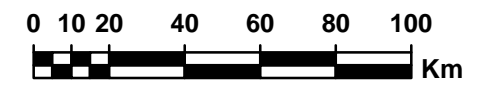
**Potential Irrigation Projects**  
 1 Toshka Irrigation Project

**Existing Irrigation Schemes**  
 1 Irrigation Schemes along the Nile downstream Aswan Dam (see main canals on the map)



## Legend

- ▼ Existing Dams / Barrages
- Main Towns
- +— Main Railroad
- Road Network
- ⋯ Main Irrigation Canals
- Rivers / Streams
- Potential Irrigation Projects
- Existing Irrigation Schemes
- ▭ Main Nile Sub-Basin
- Lakes, Reservoirs & Seas



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**EN-MSIOA**  
 (Eastern Nile Multi-Sectoral Investment Opportunity Analysis)

Map Title:  
**Irrigation Projects in Main Nile Sub-Basin (Aswan Dam Area)**

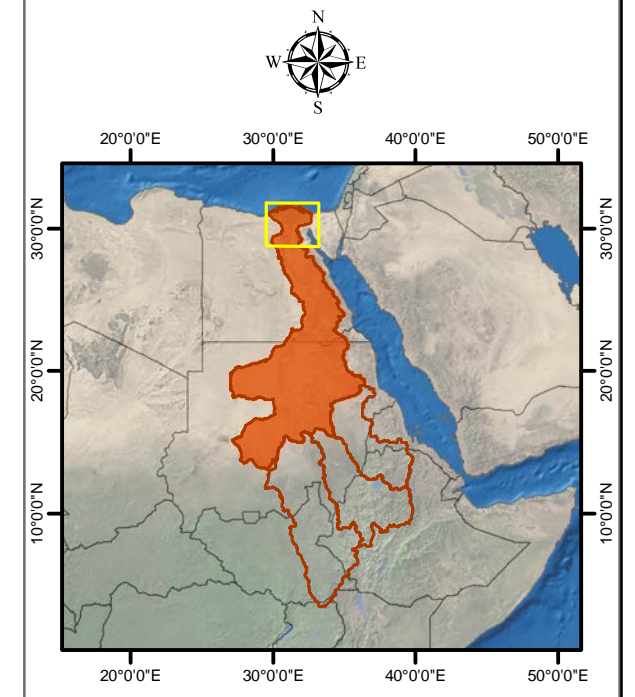
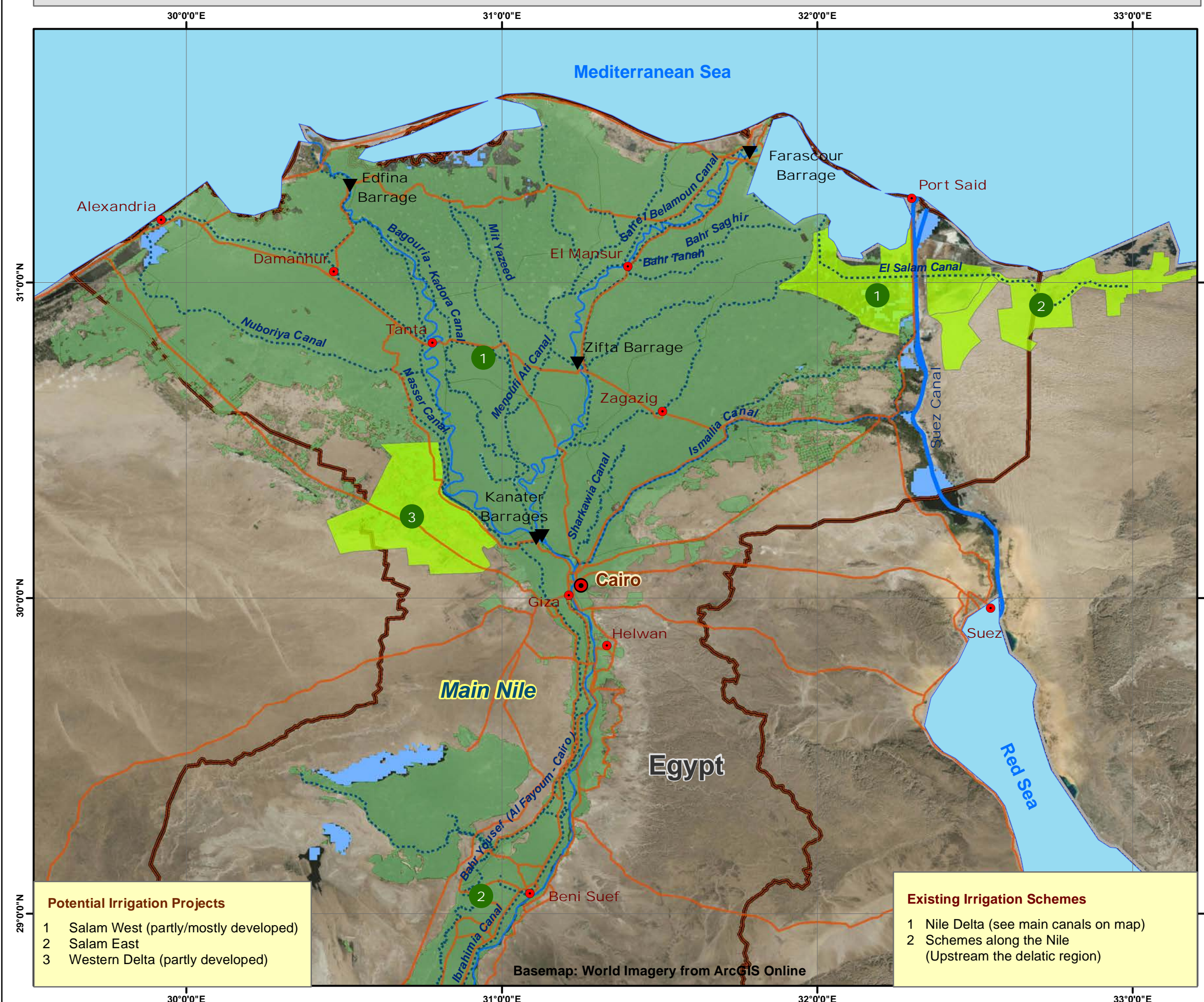
EN-MSIOA\_Map 6.6      December 2014

Prepared by:  
 Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap: World Imagery from ArcGIS Online

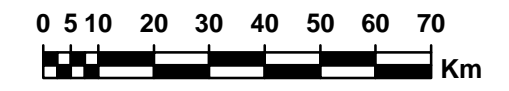


# Irrigation Projects in the Nile Delta Area



## Legend

- ▼ Existing Dams / Barrages
- Main Towns
- Main Roads
- ⋯ Main Irrigation Canals
- Main Rivers
- Potential Irrigation Schemes
- Existing Irrigation Schemes
- ▭ Main Nile Sub-Basin
- Lakes, Reservoirs & Seas



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Eastern Nile Technical Regional Office (ENTRO)

EN-MSIOA (Eastern Nile Multi-Sectoral Investment Opportunity Analysis)

Map Title: **Irrigation Projects in the Nile Delta Area**

EN-MSIOA\_Map 6.7 December 2014

Prepared by: Gedion Tsegaye Sahle (gtshsig@gmail.com)

**Potential Irrigation Projects**

- 1 Salam West (partly/mostly developed)
- 2 Salam East
- 3 Western Delta (partly developed)

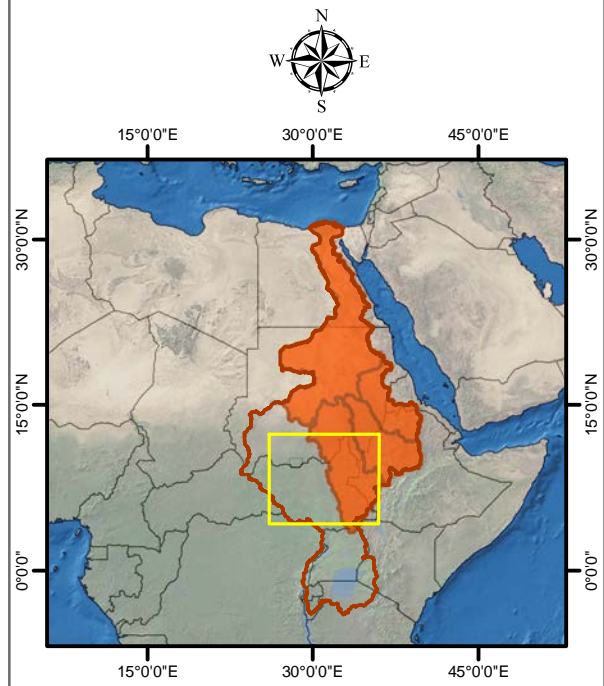
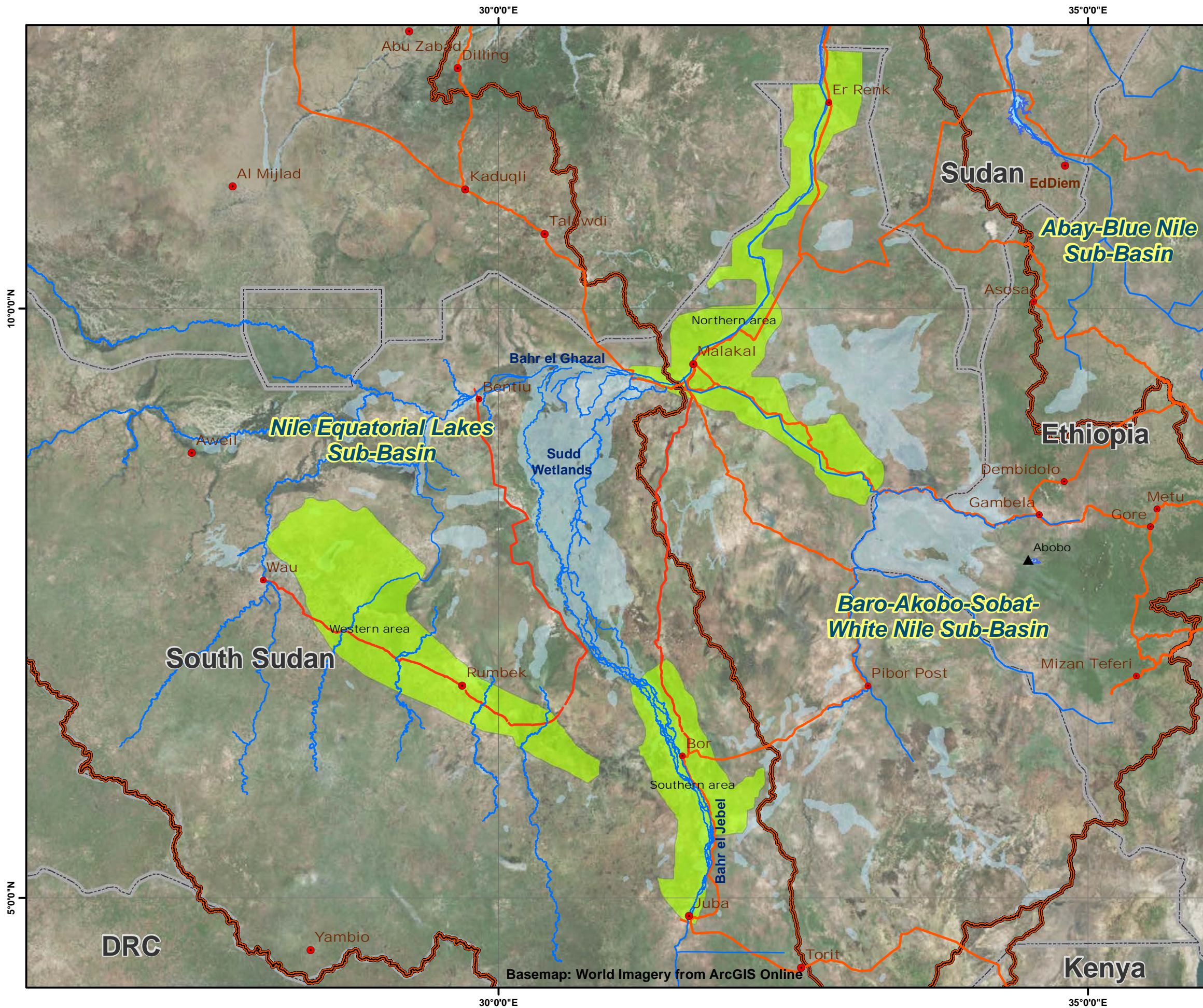
**Existing Irrigation Schemes**

- 1 Nile Delta (see main canals on map)
- 2 Schemes along the Nile (Upstream the delatic region)

Basemap: World Imagery from ArcGIS Online

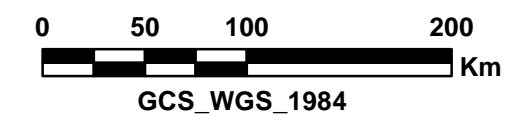


# Potential Irrigable Areas in South Sudan



## Legend

- Main Towns
- Main Rivers
- Main Roads
- Potential Irrigable Areas
- Wetlands (freshwater marsh, floodplain; pan, brakish/saline wetland & intermittent wetland)
- Sub-Basins Boundary
- Lakes & Reservoirs
- Country Boundaries



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**EN-MSIOA**  
(Eastern Nile Multi-Sectoral Investment Opportunity Analysis)

Map Title: **Potential Irrigable Area in South Sudan**

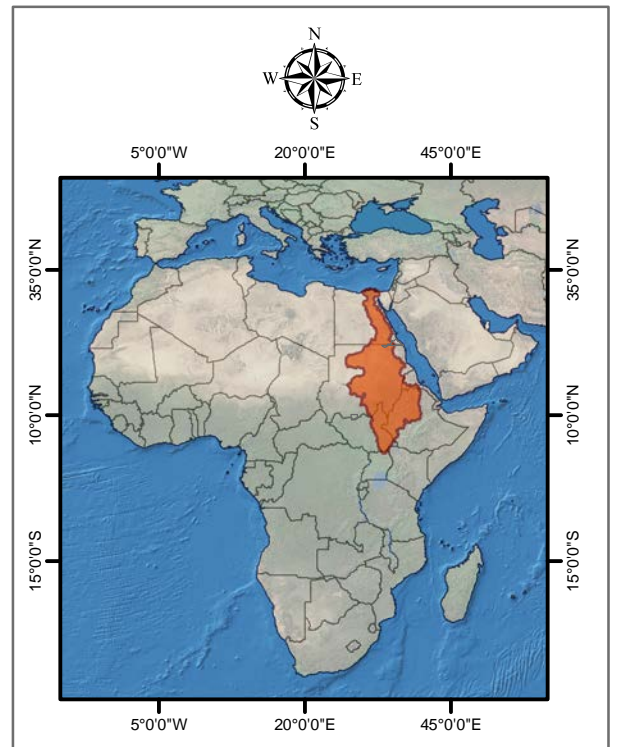
EN-MSIOA\_Map 6.8 December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap: World Imagery from ArcGIS Online



# Existing Hydropower Project Sites in Eastern Nile Sub-Basin



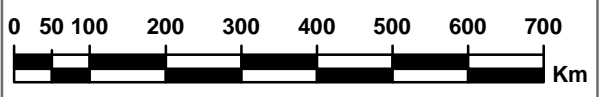
## Legend

- Existing Hydropower Projects
- Eastern Nile Capital Cities
- Nile Basin Main Rivers
- ▭ Eastern Nile Sub-Basins
- ▭ Lakes, Reservoirs & Seas
- ▭ Country Boundaries

## Existing Hydropower Projects Eastern Nile Sub-Basin

- 1\* Tana-Beles
- 2 Tis Abay I & II
- 3 Fincha
- 4 Neshi
- 5\* Renaissance / GERD
- 6 Roseires
- 7 Sennar
- 8 Sor 1
- 9 Jebel Aulia
- 10 Tekeze 1
- 11 Khasm El-Girbah
- 12 Merowe
- 13 Aswan High and Old 1 & 2
- 14 Esna
- 15 Naga Hammadi
- 16\* Asyut
- 17 Damietta

Note:  
 5\* & 16\* are currently under construction;  
 All point locations represent dams/barrages on rivers/streams except 1\* that show water intake point from Lake Tana.  
 GERD: Grand Ethiopian Renaissance Dam



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Map Title: Existing Hydropower Project Sites in Eastern Nile Sub-Basin

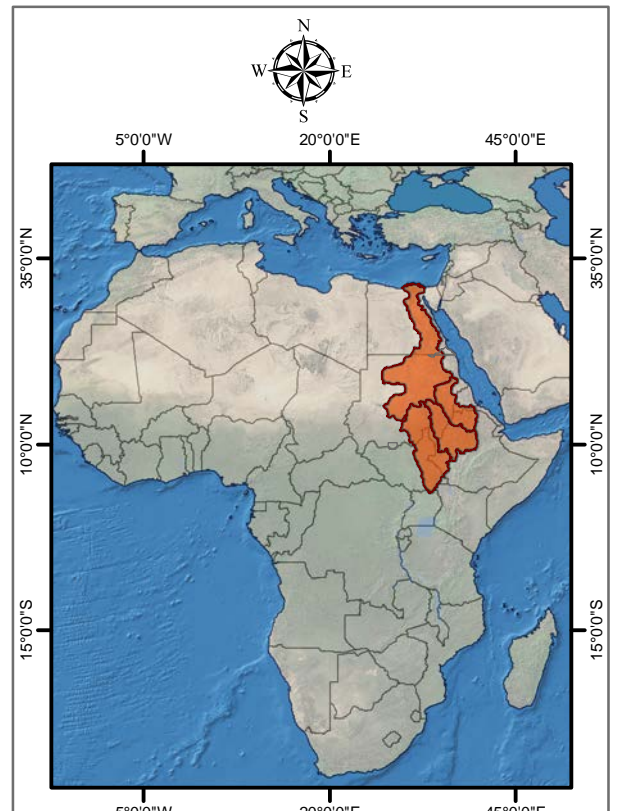
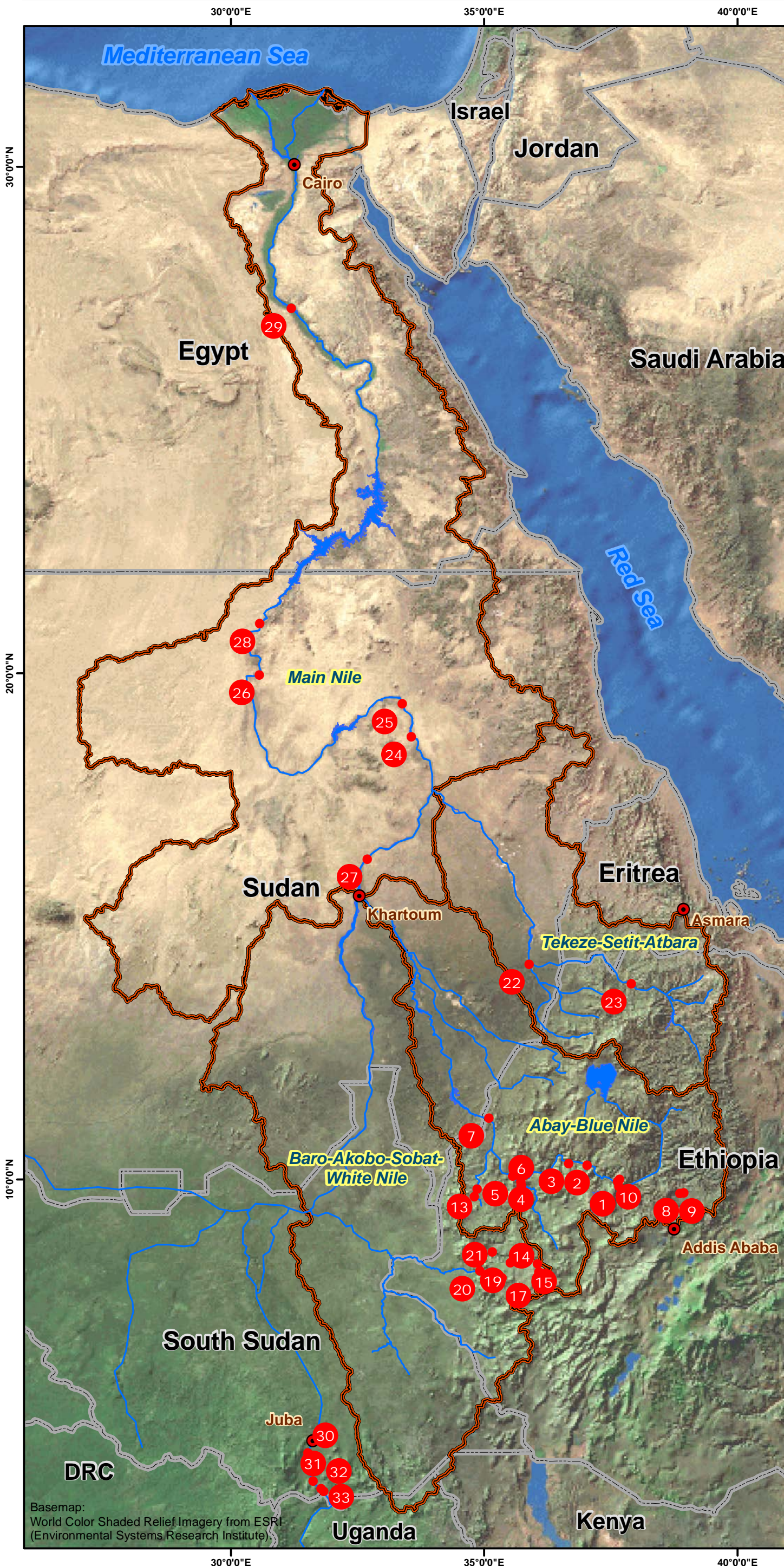
EN-MSIOA\_Map 7.1 December 2014

Prepared by:  
 Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap:  
 World Color Shaded Relief Imagery from ESRI  
 (Environmental Systems Research Institute).



# Proposed / Planned Hydropower Project Sites in Eastern Nile Sub-Basin



## Legend

- Proposed/Planned Hydropower Projects
- Eastern Nile Capital Cities
- Nile Basin Main Rivers
- Eastern Nile Sub-Basins
- Lakes, Reservoirs & Seas
- Country Boundaries

## Proposed / Planned Hydropower Projects in Eastern Nile (EN) Sub-Basin

1 Karadobi	17 Baro 1
2 Beko-Abo	18 Baro 2
3 Mabil	19 Sor 2
4 Upper Mandaya	20 Tams
5 Mandaya	21 Birbir R
6 Lower Didessa	22 Upper Atbara
7* Renaissance (GERD)	23 Tekeze 2
8 Aleltu East	24 Shereiḡ
9 Aleltu West	25 Dagash
10* Chemoga-Yeda 1	26 Kajbar
11* Chemoga-Yeda 2	27 Sabaloka
12 Upper Dabus	28 Dal
13 Lower Dabus	29* Assiut/Asyut
14 Geba 1	30 Bedden
15 Geba 2	31 Lakki
16 Genji	32 Shukoli
	33 Fula

Note:  
 7\* & 29\* are currently under construction;  
 All point locations represent dams/barrages/weirs on rivers/streams except 10\* & 11\* that show locations of power-houses.  
 For more information, refer to hydropower maps prepared for the four EN sub-basins (7.3 - 7.6).



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Map Title:  
**Proposed / Planned Hydropower Project Sites in Eastern Nile Sub-Basin**

EN-MSIOA\_Map 7.2

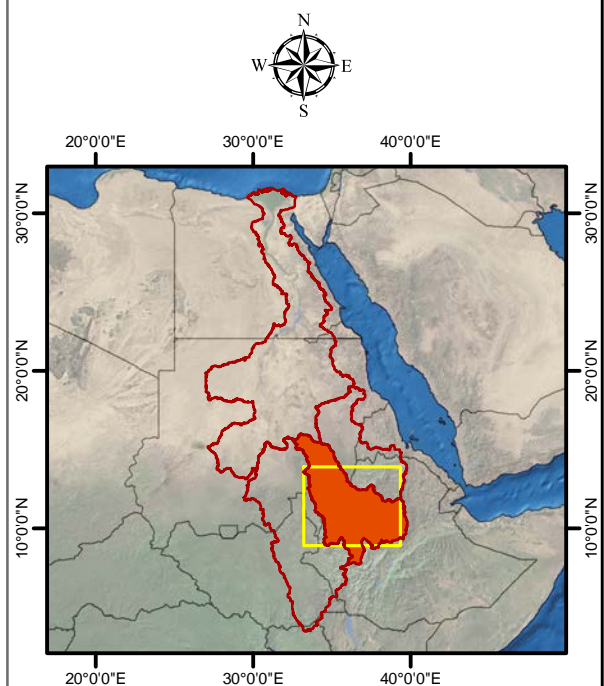
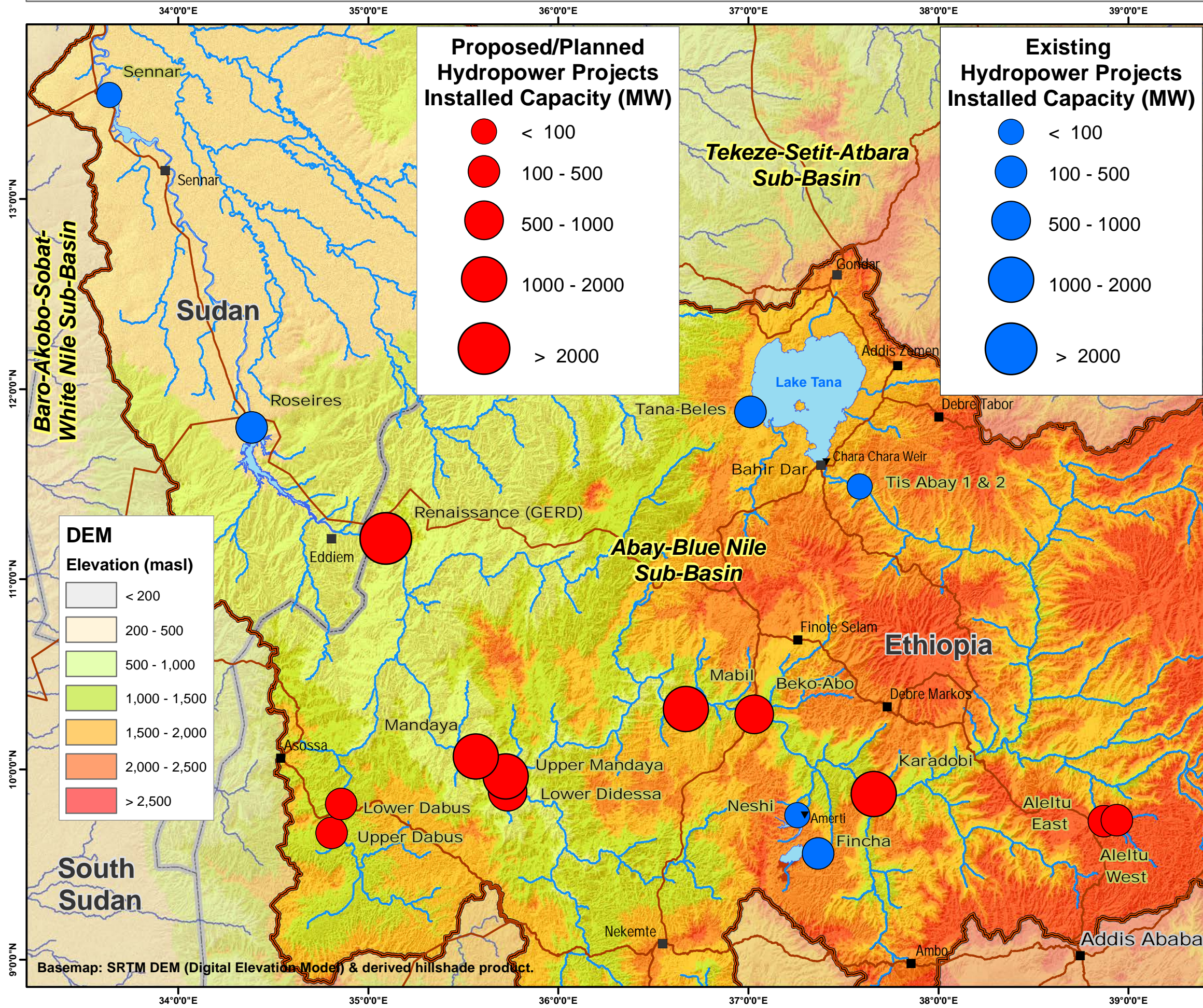
December 2014

Prepared by:  
 Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap:  
 World Color Shaded Relief Imagery from ESRI  
 (Environmental Systems Research Institute)

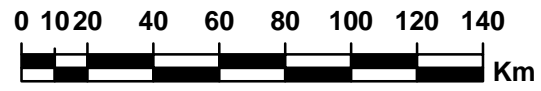


# Hydropower Project Sites in Abay-Blue Nile Sub-Basin



## Legend

- Main Cities / Towns
- Main Roads
- River Network
- Abay-Blue Nile Sub-Basin
- Lakes & Reservoirs
- Country Boundaries



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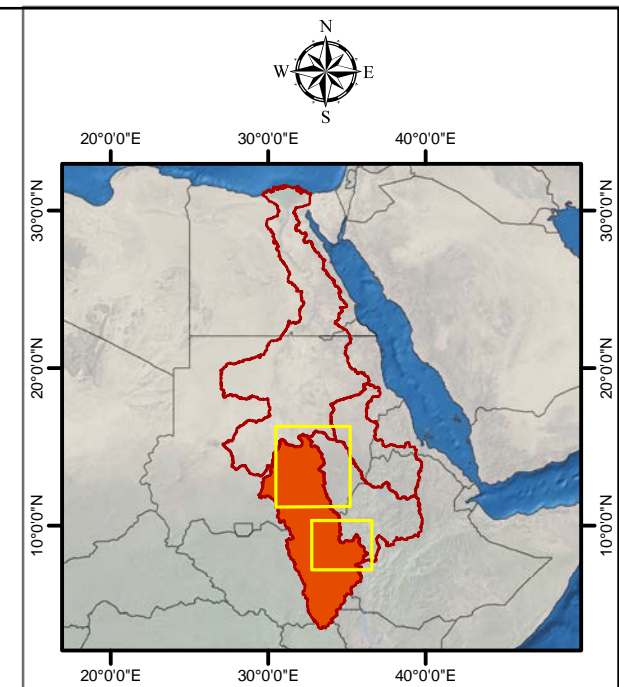
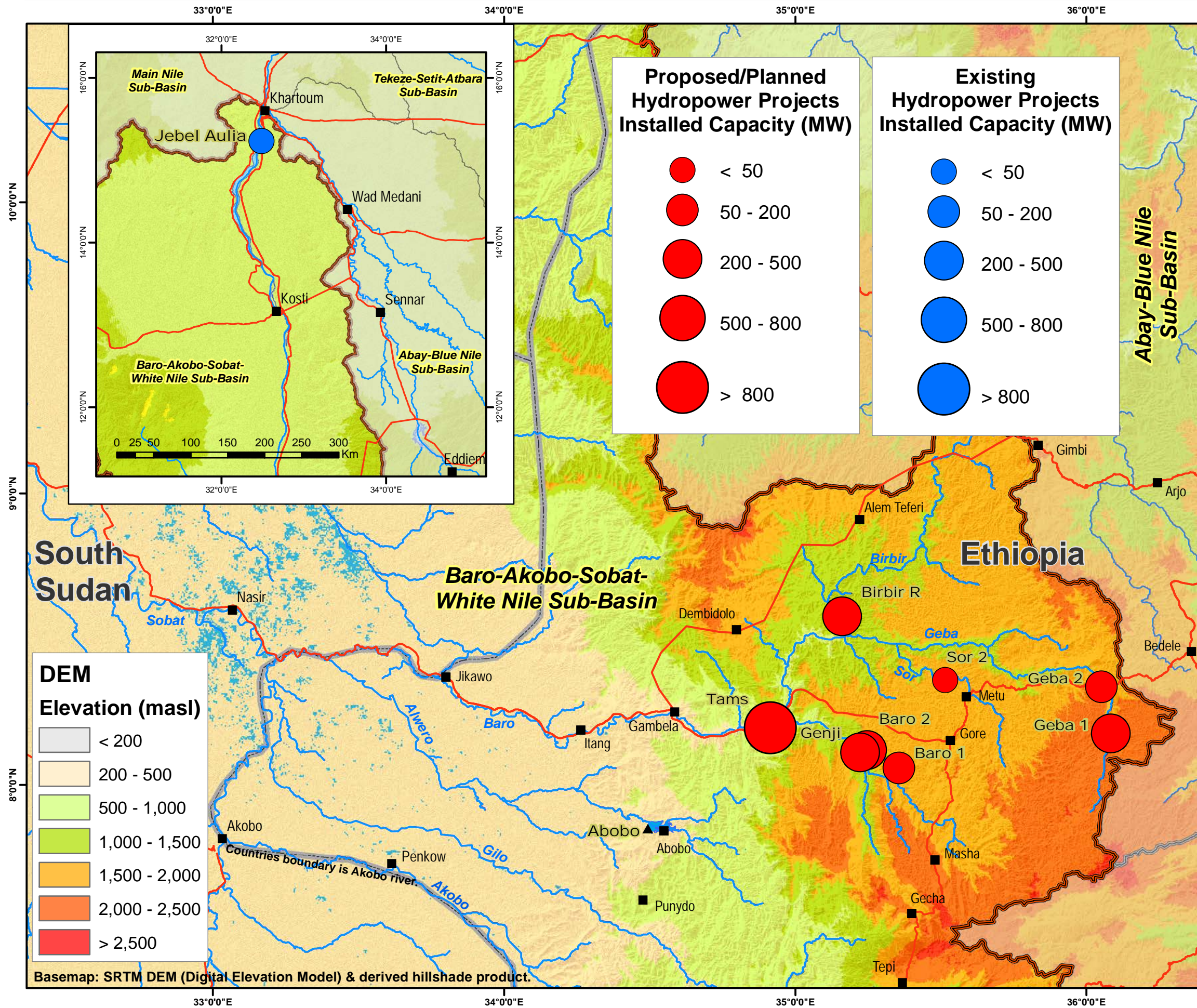
Map Title: **Hydropower Project Sites in Abay-Blue Nile Sub-Basin**

EN-MSIOA\_Map 7.3 | December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

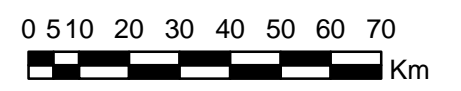


# Hydropower Project Sites in Baro-Akobo-Sobat-White Nile Sub-Basin



## Legend

- Main / Selected Towns
- ▲ Existing Dam / Barrage
- Main Roads
- River Network
- ▭ Baro-Akobo-Sobat-White Nile Sub-Basin
- ▭ Lakes, Reservoirs & Wetlands
- ▭ Country Boundaries



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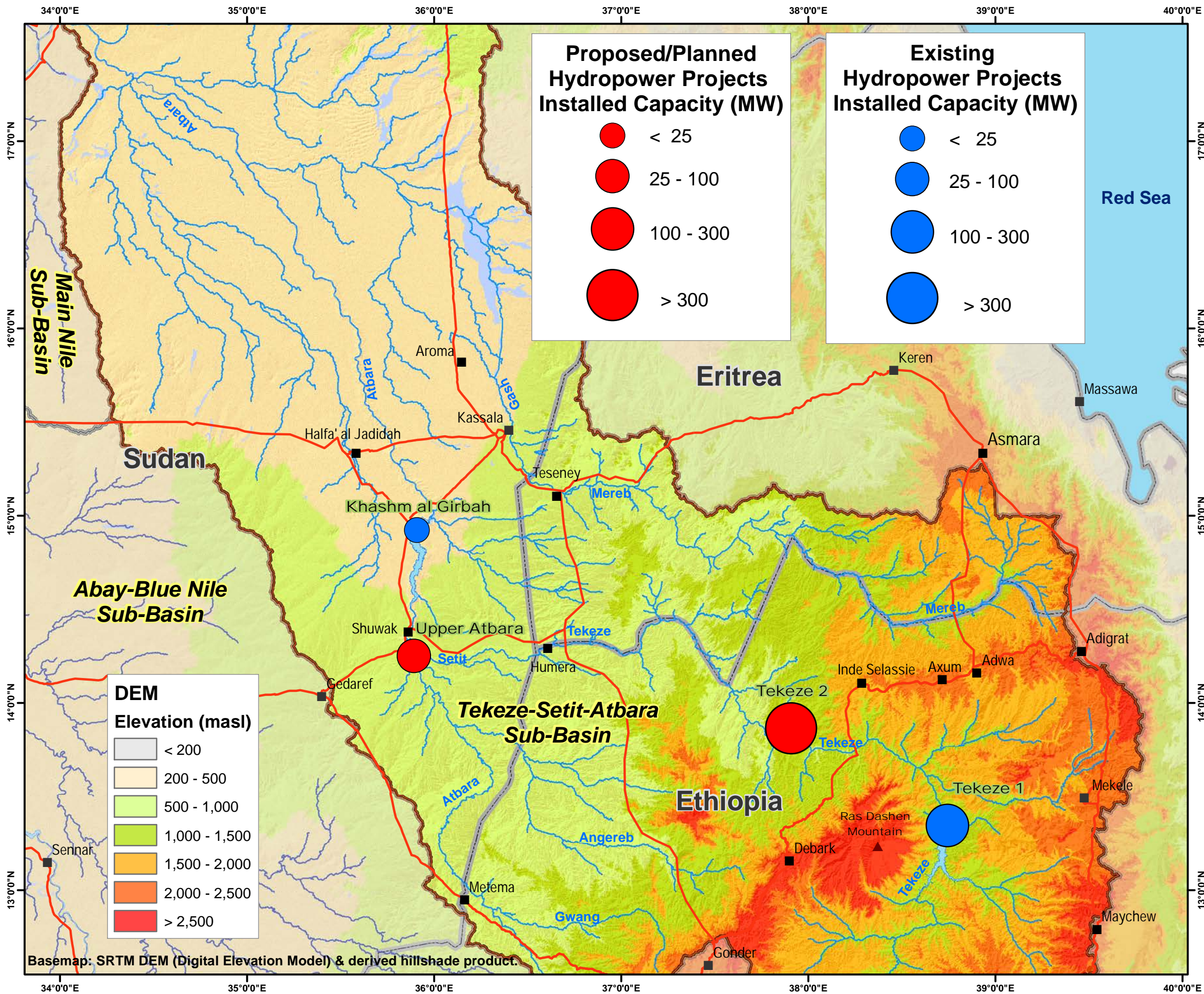
Map Title: **Hydropower Project Sites in Baro-Akobo-Sobat-White Nile Sub-Basin**

EN-MSIOA\_Map 7.4 | December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Hydropower Project Sites in Tekeze-Setit-Atbara Sub-Basin



**Proposed/Planned Hydropower Projects Installed Capacity (MW)**

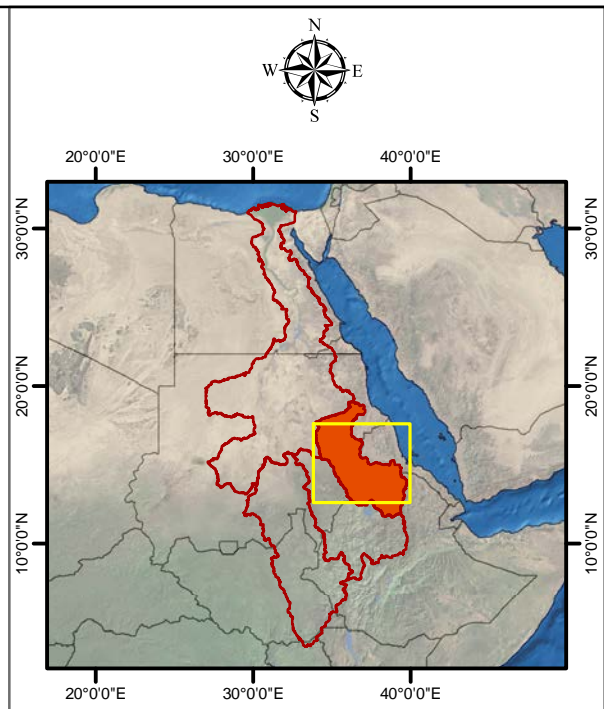
- < 25
- 25 - 100
- 100 - 300
- > 300

**Existing Hydropower Projects Installed Capacity (MW)**

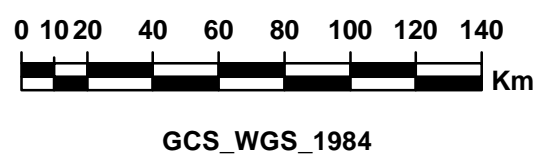
- < 25
- 25 - 100
- 100 - 300
- > 300

**DEM Elevation (masl)**

- < 200
- 200 - 500
- 500 - 1,000
- 1,000 - 1,500
- 1,500 - 2,000
- 2,000 - 2,500
- > 2,500



- Legend**
- Main Cities / Towns
  - Main Roads
  - River Network
  - Tekeze-Setit-Atbara Sub-Basin
  - Intermittent Wetlands / Marshes
  - Lakes, Reservoirs & Seas
  - Country Boundaries



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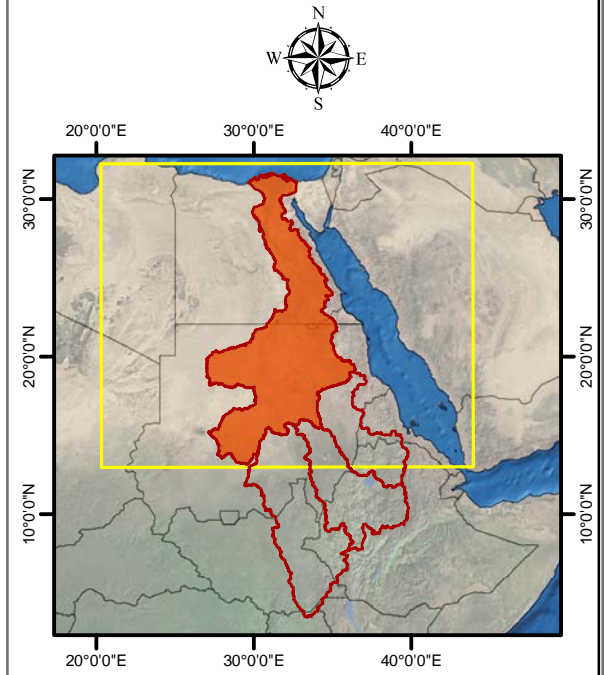
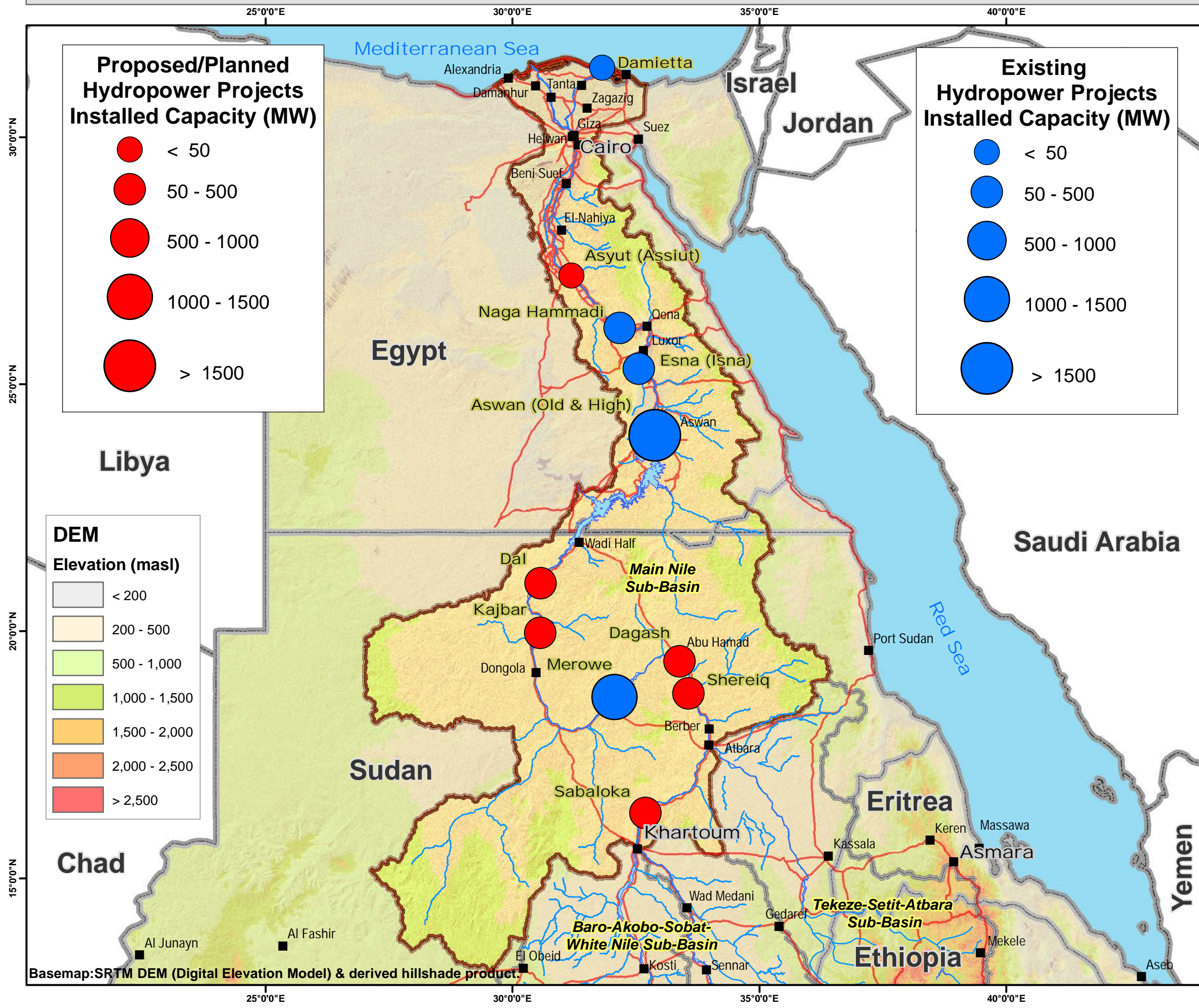
Map Title: **Hydropower Project Sites in Tekeze-Setit-Atbara Sub-Basin**

EN-MSIOA\_Map 7.5 December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Hydropower Project Sites in Main Nile Sub-Basin



- Legend**
- EN Main Cities/Towns
  - Main Roads
  - Main Rivers/Streams
  - ▭ Main Nile Sub-Basin
  - ▭ Lakes, Reservoirs & Seas
  - ▭ Country Boundaries



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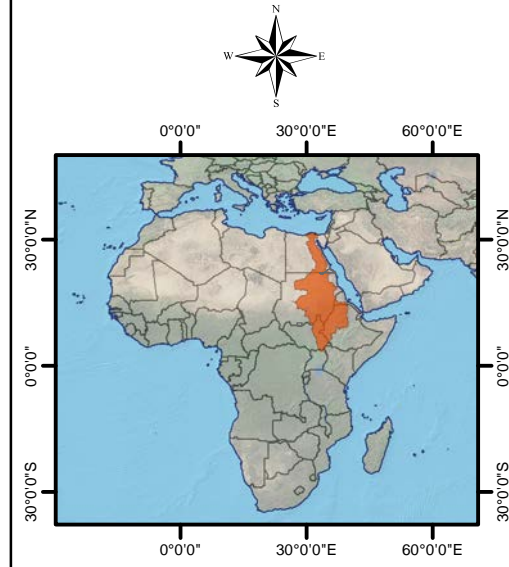
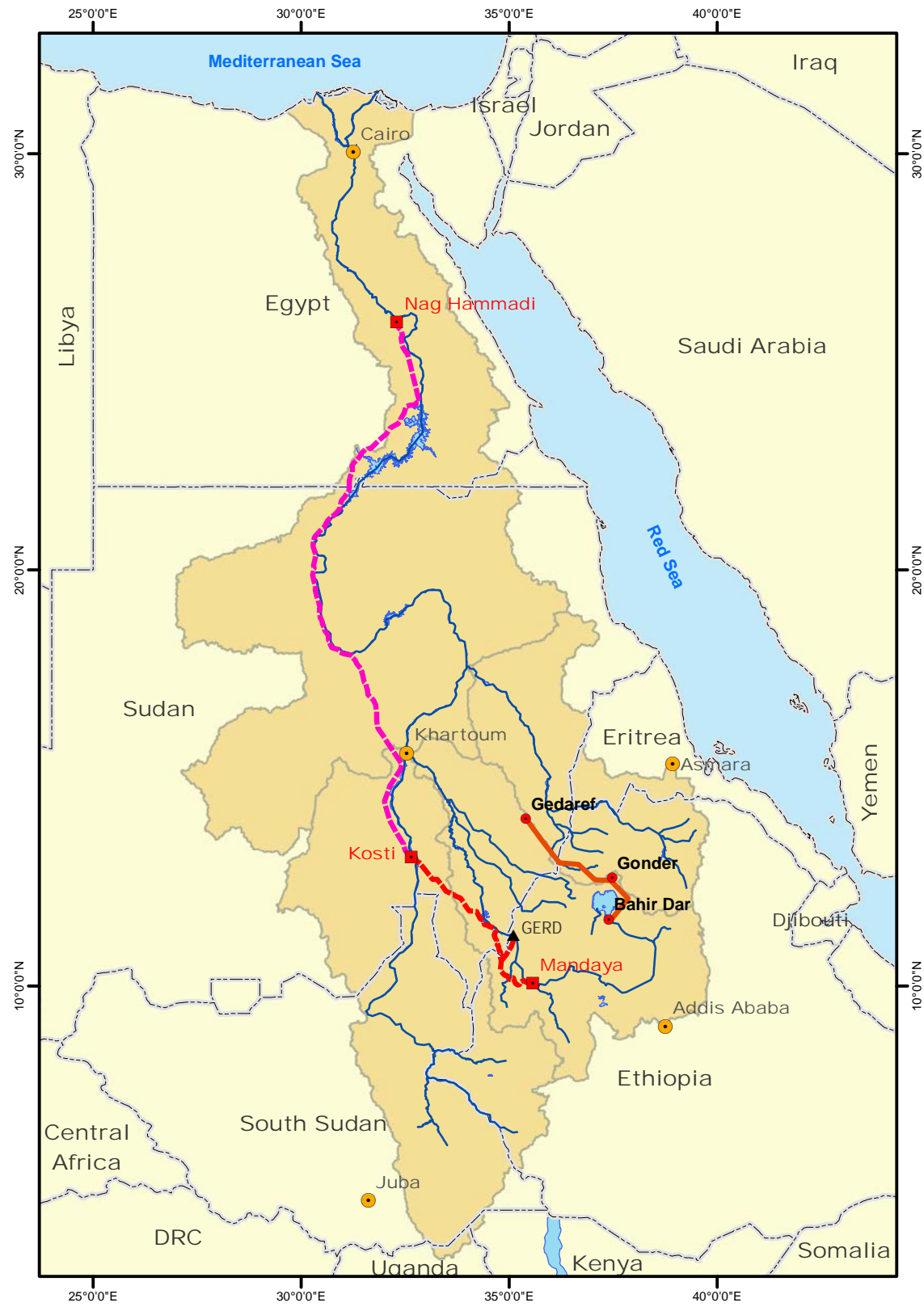
Map Title: **Hydropower Project Sites in Main Nile Sub-Basin**

EN-MSIOA\_Map 7.6 December 2014

Prepared by:  
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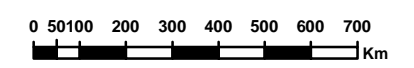


# EN Regional Hydro-Power Interconnection Systems



- Legend**
- EN Capital Cities
  - Selected Reference Towns
  - Proposed Sub-Stations
  - Ethiopia-Sudan Existing Transmission Lines
  - - - Proposed Regional AC Transmission Lines
  - - - Proposed Regional DC Transmission Lines
  - EN Main Rivers
  - Eastern Nile Sub-Basins
  - Lakes, Reservoirs & Seas
  - Country Boundaries

Note:  
GERD: Grand Ethiopian Renaissance Dam



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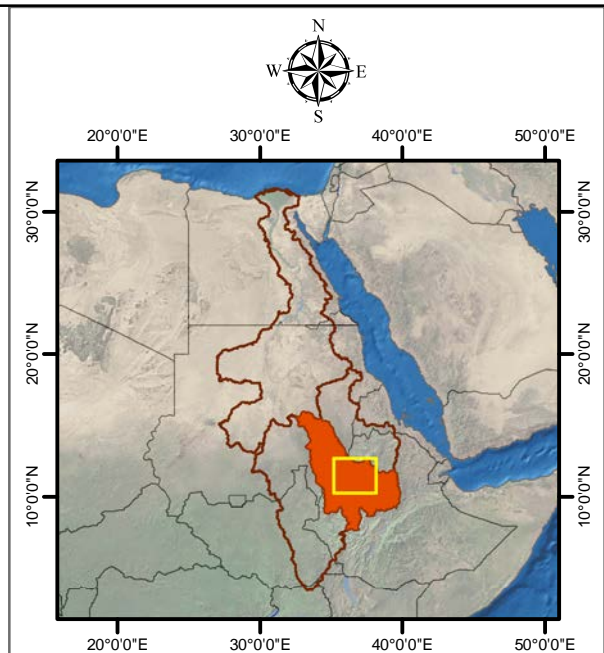
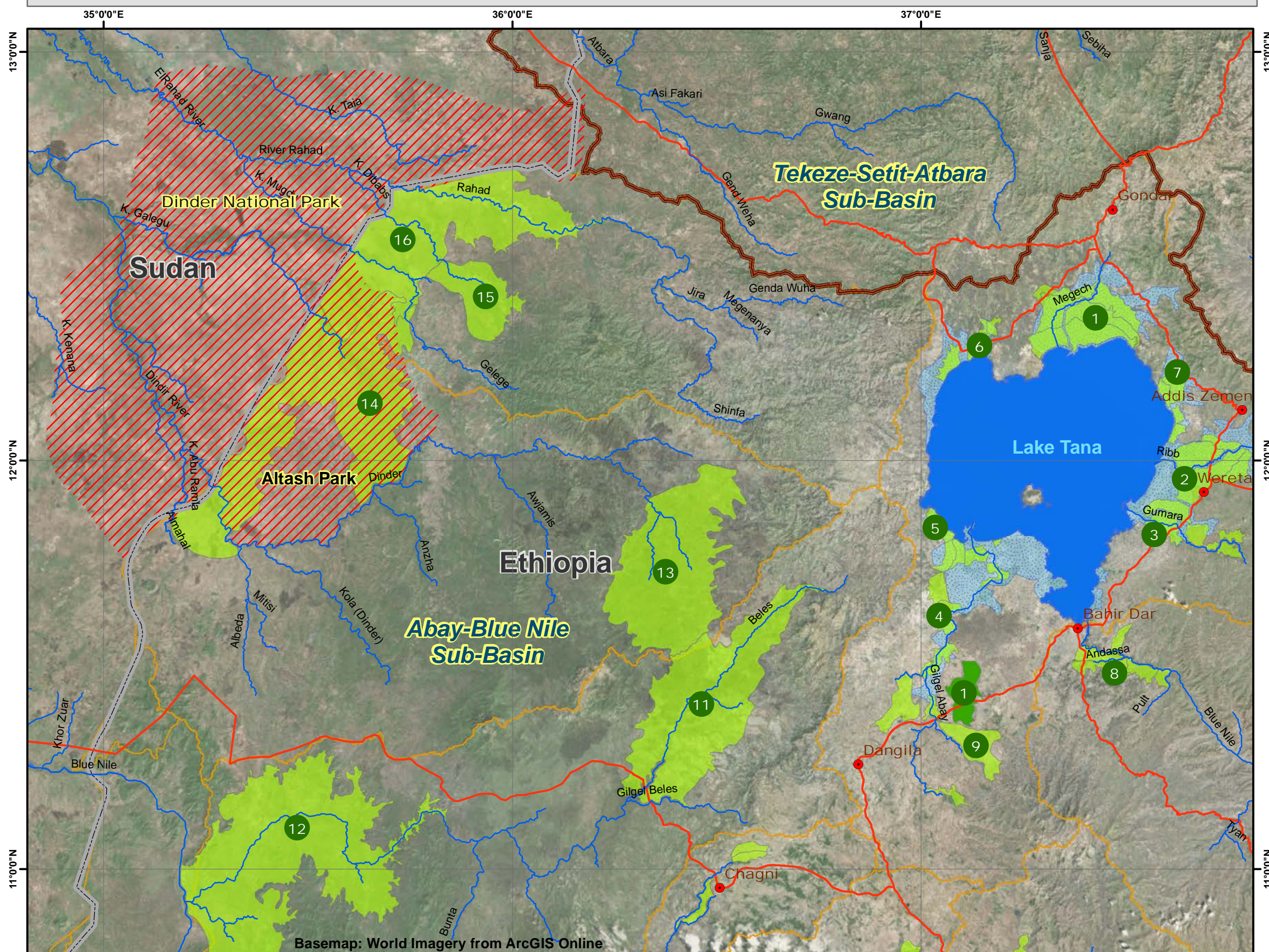
Map Title: **EN Regional Hydro-Power Interconnection Systems**

EN-MSIOA\_Map 7.7 | December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# Abay - Upper Blue Nile Irrigation Projects / Environmental Hot Spots



- ### Legend
- Main Towns
  - Main Roads
  - River Network
  - / / / / Parks
  - Potential Irrigation Projects
  - Existing Irrigation Schemes
  - Abay Sub-Catchments
  - Abay-Blue Nile Sub-Basin
  - Tana Flood Prone Areas
  - Lakes & Reservoirs
  - Country Boundaries



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Map Title:  
**Abay-Upper Blue Nile Irrigation Projects / Environmental Hot Spots**

EN-MSIOA\_Map 8.1 December 2014

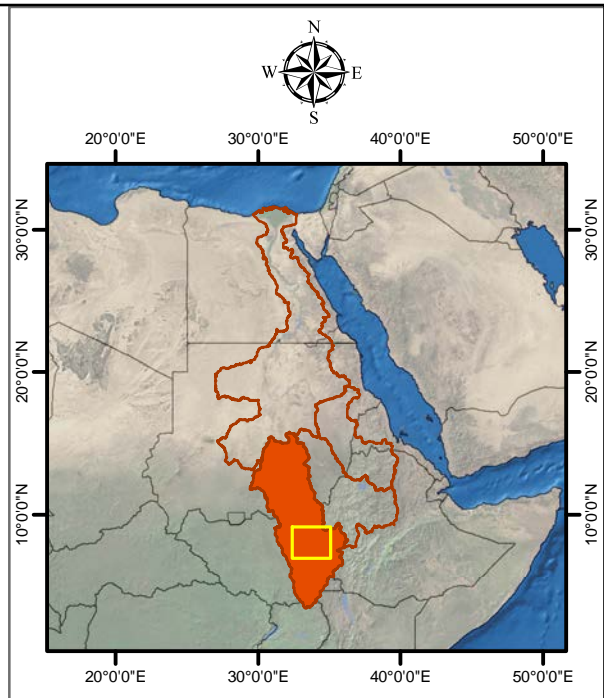
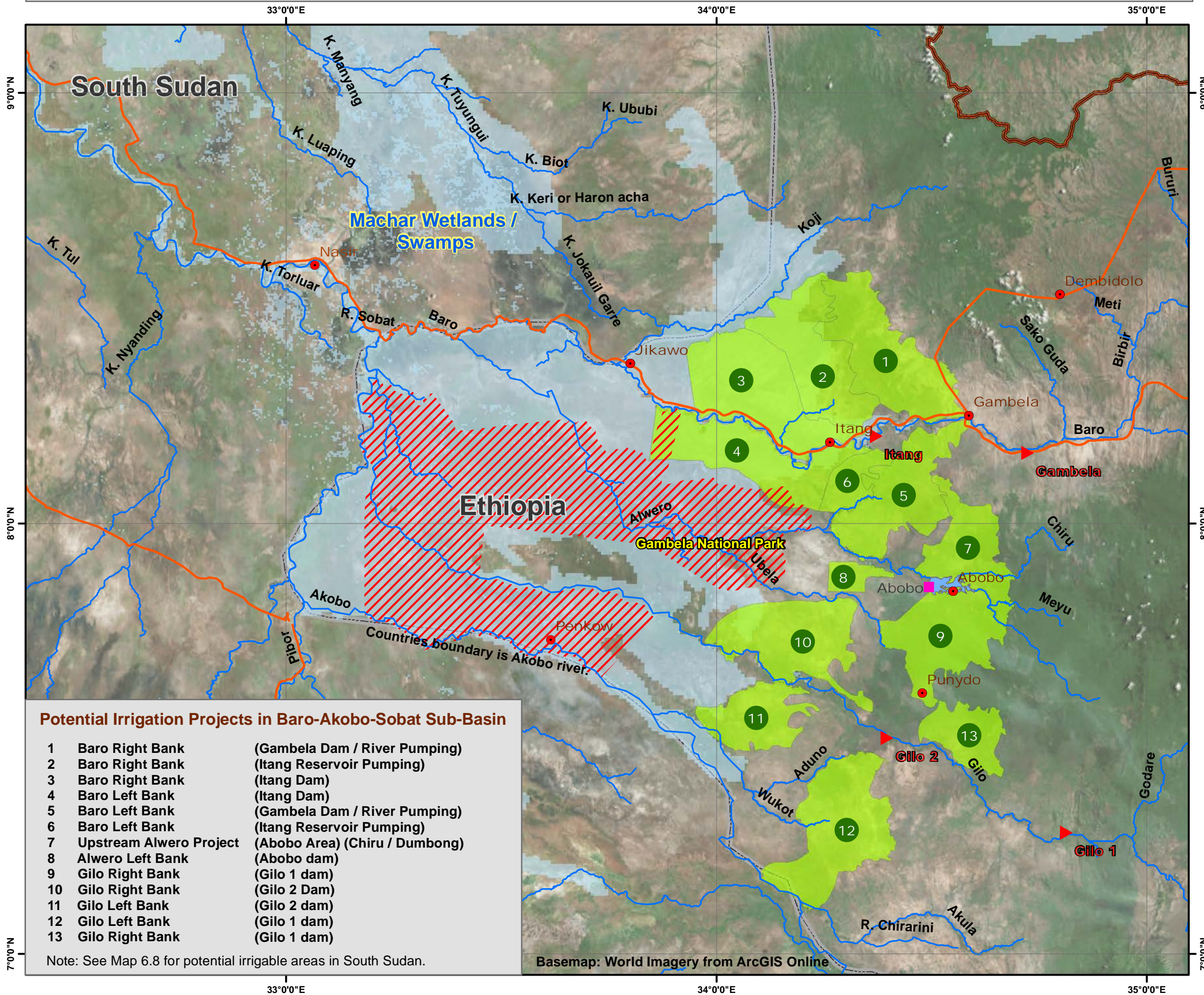
Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)

Basemap: World Imagery from ArcGIS Online

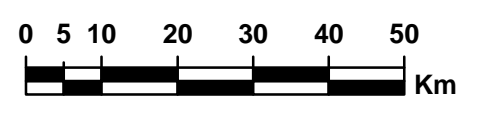
Potential Irrigation Projects				Existing Irrigation Schemes	
Tana Sub-Basin		Beles Sub-Basin	Upper Dinder Sub-Basin	Upper Rahad Sub-Basin	Tana Sub-Basin
1 Megetch	4 Gilgel Abay	11 Upper Beles	13 Upper Dinder / Ayma	15 Galegu	1 Koga Irrigation Scheme (Gilgel Abay)
2 Ribb	5 South-West Tana	12 Lower Beles	14 Lower Dinder / Ayma	16 Rahad	* Small Scale Irrigation/Traditional (not mappable at this scale)
3 Gumara	6 North-West Tana	9 Jema	10 Birr (Birr sub-basin)		



# Baro-Akobo-Sobat Potential Irrigation Projects / Environmental Hot Spots



- ### Legend
- Main Towns
  - ▶ Potential Dam Sites (Irrigation-Purpose)
  - Existing Dam / Barrage
  - River Network
  - Wetlands (freshwater marsh, flood plain; including swampy areas and intermittent wetlands)
  - ▨ Gambela National Park (from Ethiopian Wildlife Development & Conservation Authority)
  - Potential Irrigation Projects
  - ▭ Eastern Nile Sub-Basins
  - ▭ Country Boundaries



### Potential Irrigation Projects in Baro-Akobo-Sobat Sub-Basin

- |    |                         |                                |
|----|-------------------------|--------------------------------|
| 1  | Baro Right Bank         | (Gambela Dam / River Pumping)  |
| 2  | Baro Right Bank         | (Itang Reservoir Pumping)      |
| 3  | Baro Right Bank         | (Itang Dam)                    |
| 4  | Baro Left Bank          | (Itang Dam)                    |
| 5  | Baro Left Bank          | (Gambela Dam / River Pumping)  |
| 6  | Baro Left Bank          | (Itang Reservoir Pumping)      |
| 7  | Upstream Alwero Project | (Abobo Area) (Chiru / Dumbong) |
| 8  | Alwero Left Bank        | (Abobo dam)                    |
| 9  | Gilo Right Bank         | (Gilo 1 dam)                   |
| 10 | Gilo Right Bank         | (Gilo 2 Dam)                   |
| 11 | Gilo Left Bank          | (Gilo 2 dam)                   |
| 12 | Gilo Left Bank          | (Gilo 1 dam)                   |
| 13 | Gilo Right Bank         | (Gilo 1 dam)                   |

Note: See Map 6.8 for potential irrigable areas in South Sudan.

Basemap: World Imagery from ArcGIS Online

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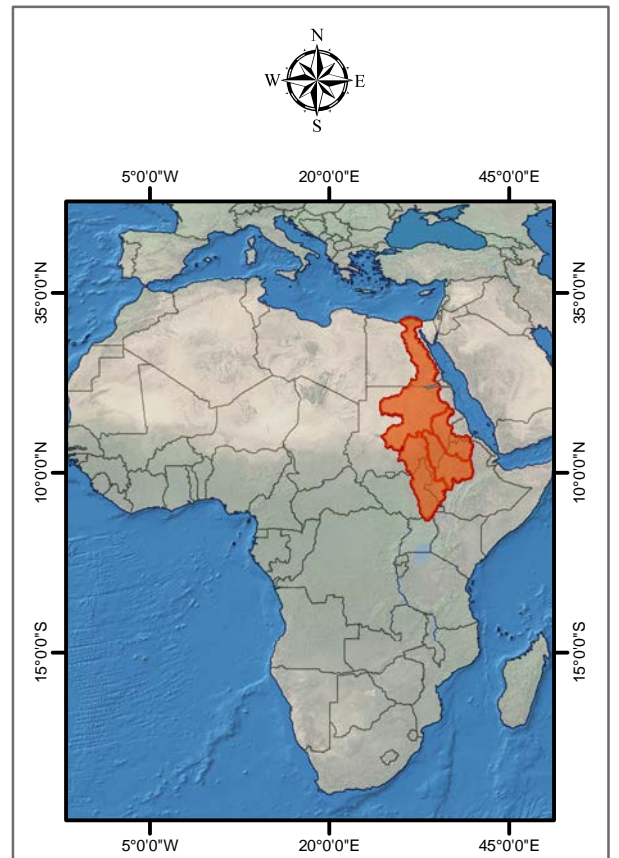
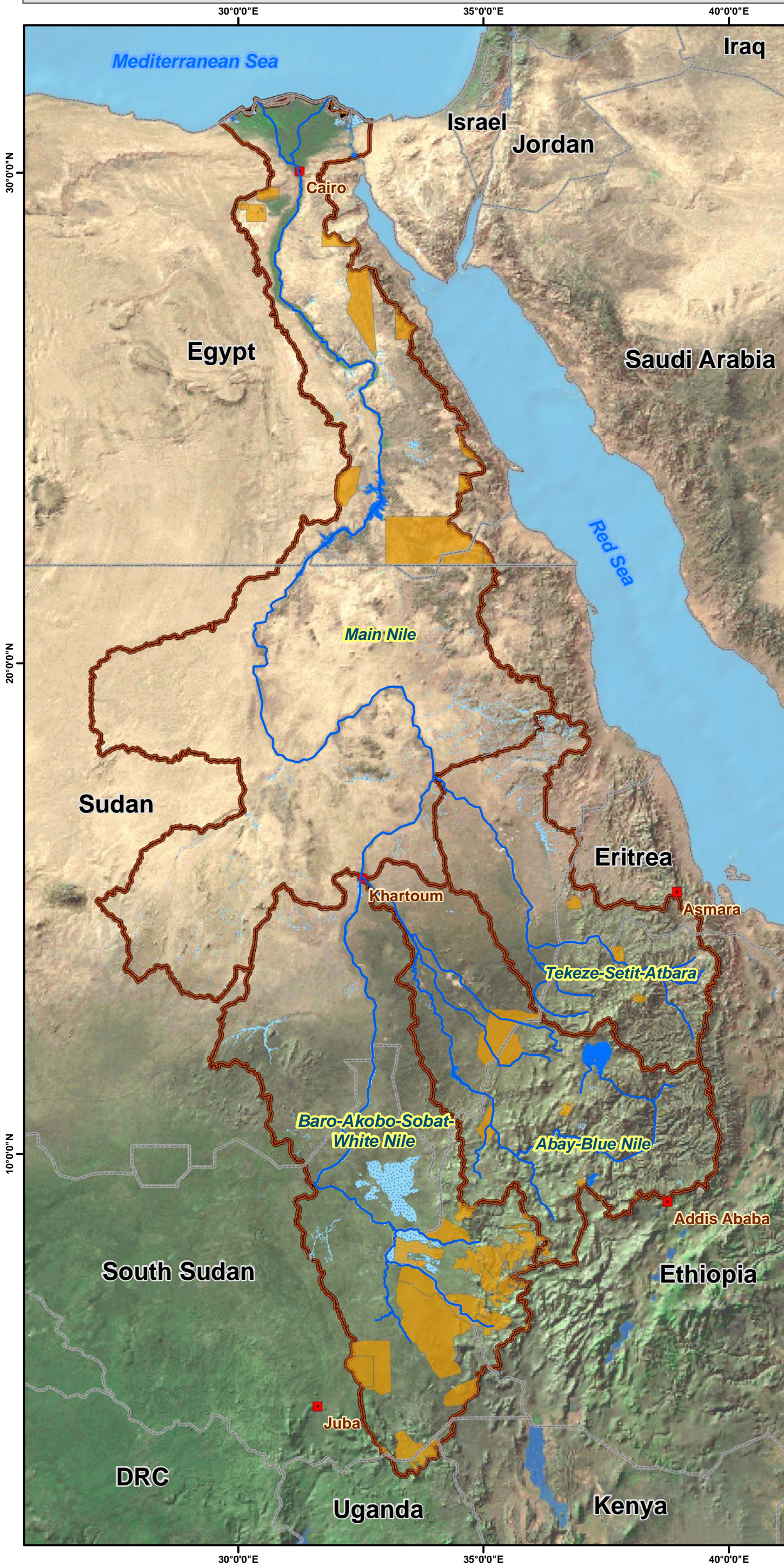
**Map Title:**  
Baro-Akobo-Sobat Potential Irrigation Projects / Environmental Hot Spots

EN-MSIOA\_Map 8.2      December 2014

Prepared by:  
Gedion Tsegaye Sahle (gtshsig@gmail.com)



# EN Parks, Wetlands & Conservation Areas



## Legend

- Eastern Nile Capital Cities
  - EN Main Rivers
  - EN Protected Areas (Parks & Nature Reserves)
- ### EN Wetlands
- Wetlands (Lakes & Reservoirs)
  - Wetlands (Marshy Areas/Swamps/Flooded Areas/others)
  - Eastern Nile Sub-Basins
  - Country Boundaries
  - Seas

Sources for Eastern Nile Protected Areas: The International Union for Conservation of Nature (IUCN), World Database on Protected Areas (WDPA), Ethiopian Wildlife Development & Conservation Authority and Eastern Nile Watershed Management (ENWM) project.

Basemap: World Color Shaded Relief Imagery from ESRI (Environmental Systems Research Institute).



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Map Title:

**EN Parks, Wetlands & Conservation Areas**

EN-MSIOA\_Map 8.3

December 2014

Prepared by:  
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