



The Role of GIS in Energy Access:

Case study of Ghana Energy Access (GhEA) toolkit

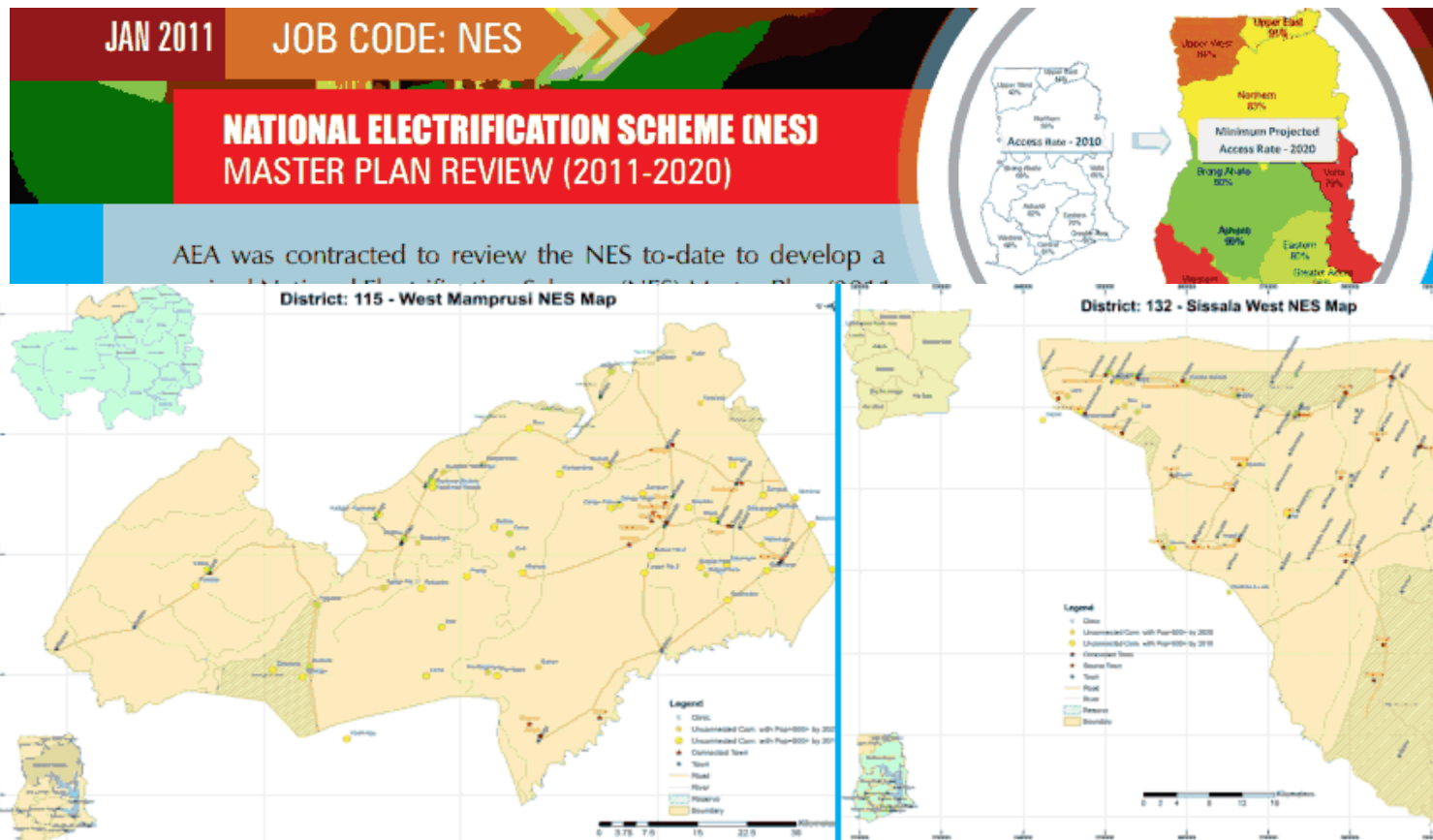
**REGIONAL TRAINING WORKSHOP ON GEOGRAPHICAL INFORMATION
SYSTEM FOR ENERGY PLANNING**

11-12 August, Dakar, Senegal

DANIEL LADZAGLA AND FRANCIS KEMAUSUOR
The Energy Centre , KNUST- Kumasi

GIS for energy access – Ghana cases

Review of Ghana electrification master plan, Ministry of Energy & Petroleum: 2009-2010



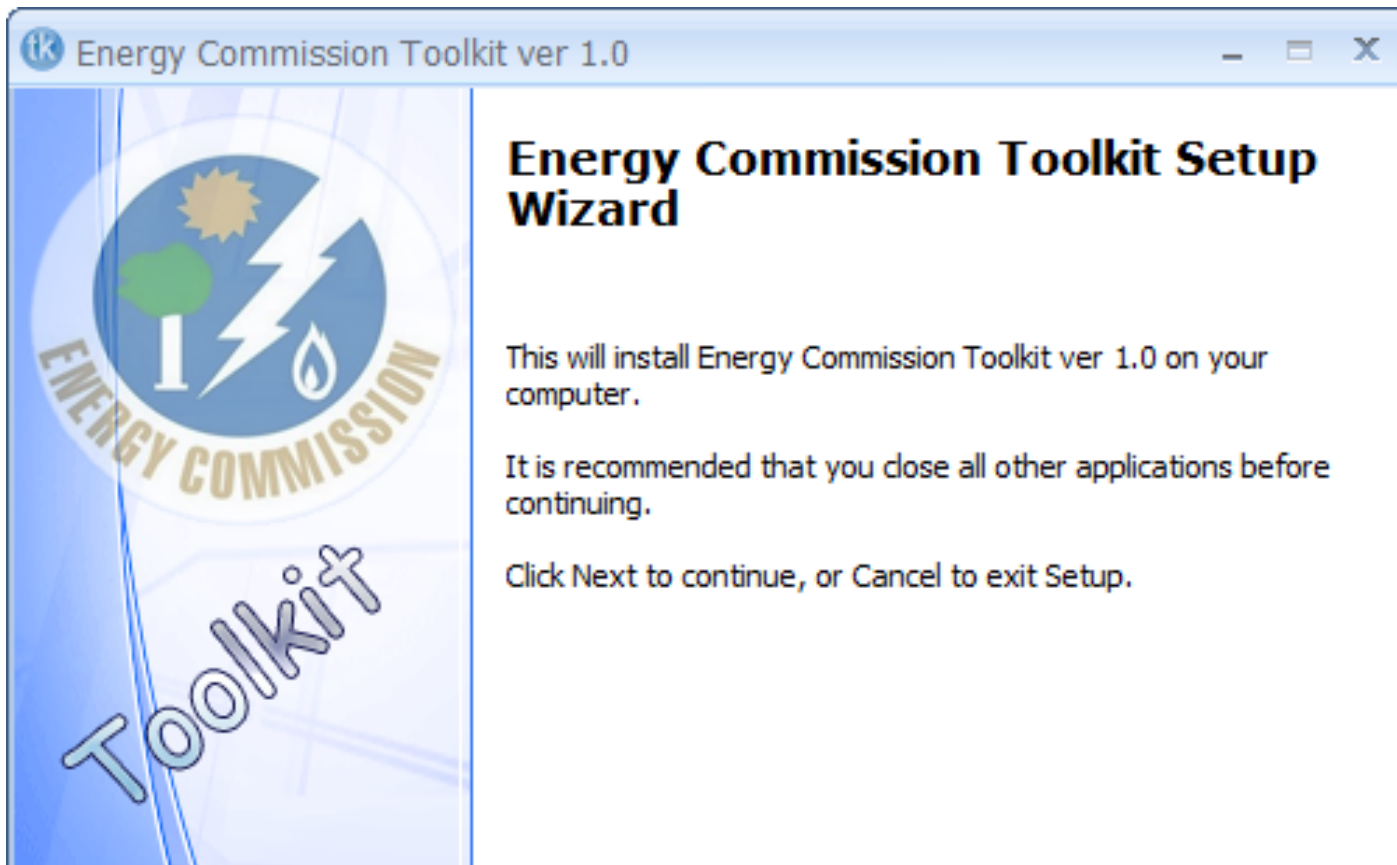
GIS for energy access – Ghana cases

EUEI-PDF funded GIS for energy access and development of GEAR toolkit, The Energy Center (TEC), KNUST: 2009-2011



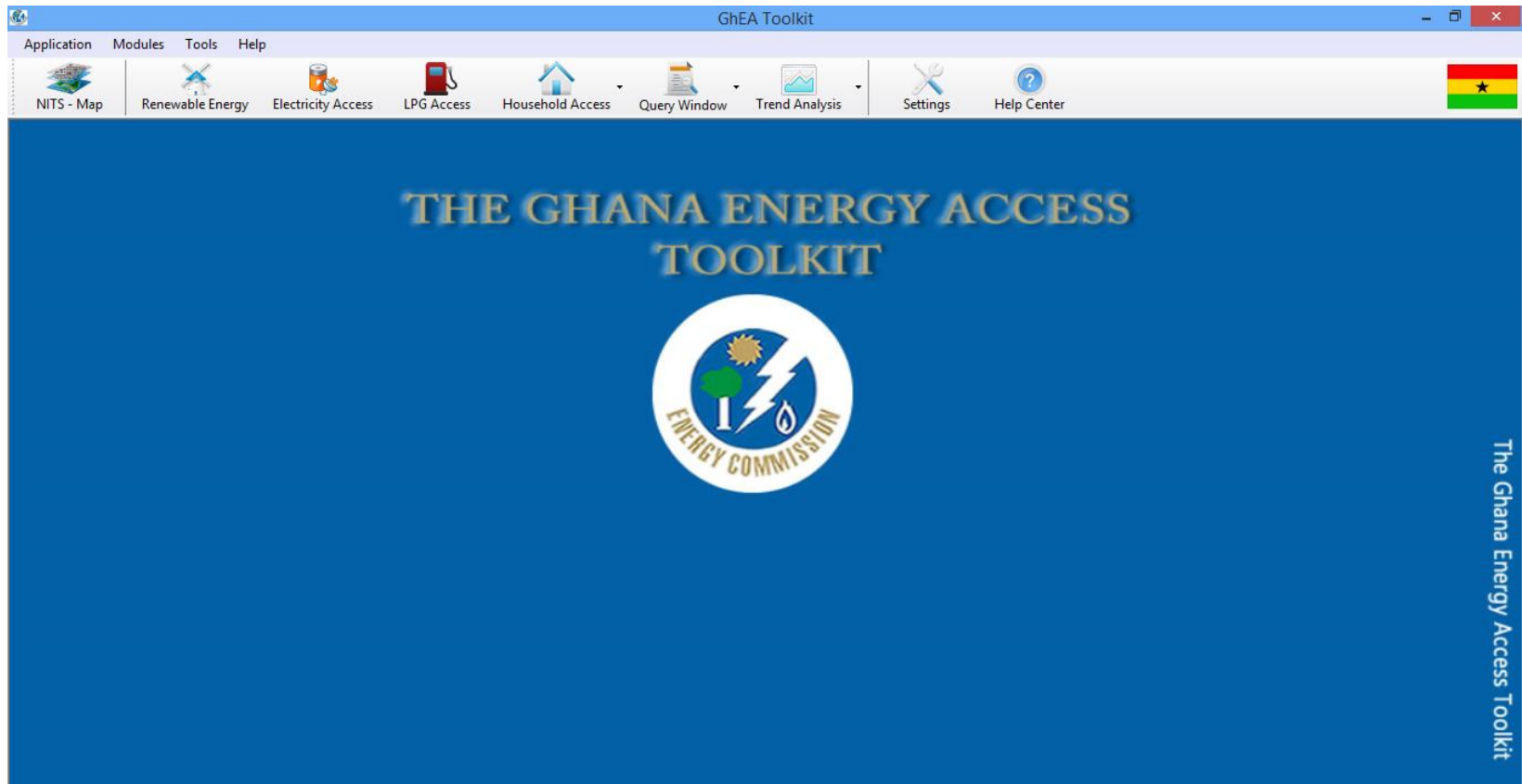
GIS for energy access – Ghana cases

Renewable Energy Toolkit, Ghana Energy Commission (EC): 2010

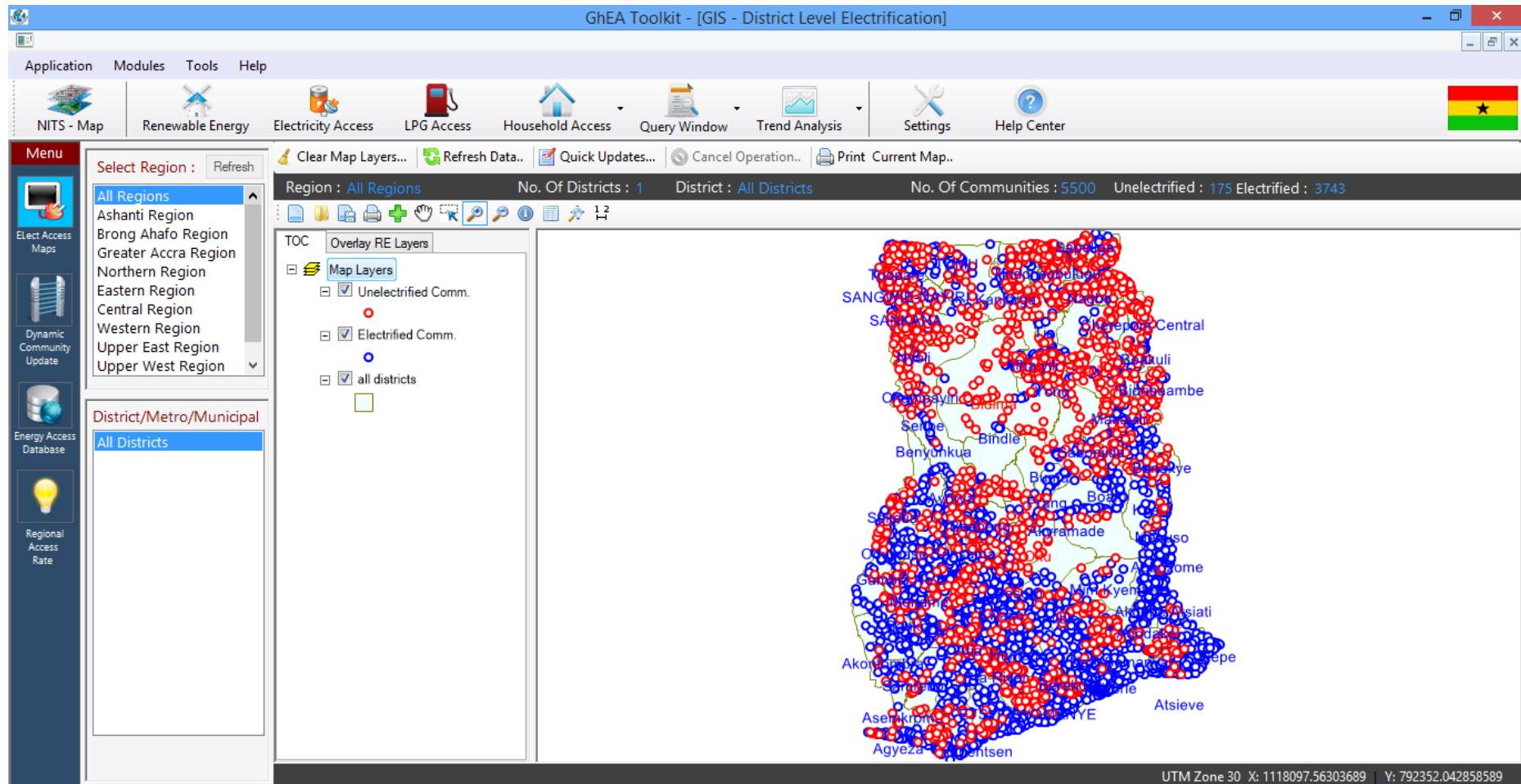


GIS for energy access – Ghana cases

- UNDP sponsored combined and enhanced toolkit from TEC and EC: 2013-2014



The GhEA Toolkit – Electrified and un-electrified communities



Exploring RE options in GIS environment

The screenshot displays the GhEA Toolkit - [GIS - District Level Electrification] application. The interface includes a menu bar (Application, Modules, Tools, Help) and a toolbar with icons for NITS - Map, Renewable Energy, Electricity Access, LPG Access, Household Access, Query Window, Trend Analysis, Settings, and Help Center. A status bar at the top right shows the Ghana flag.

The main window displays the following information:

- Region:** Ashanti Region
- No. Of Districts:** 27
- District:** Adansi North
- No. Of Communities:** 18
- Unelectrified:** 3
- Electrified:** 15

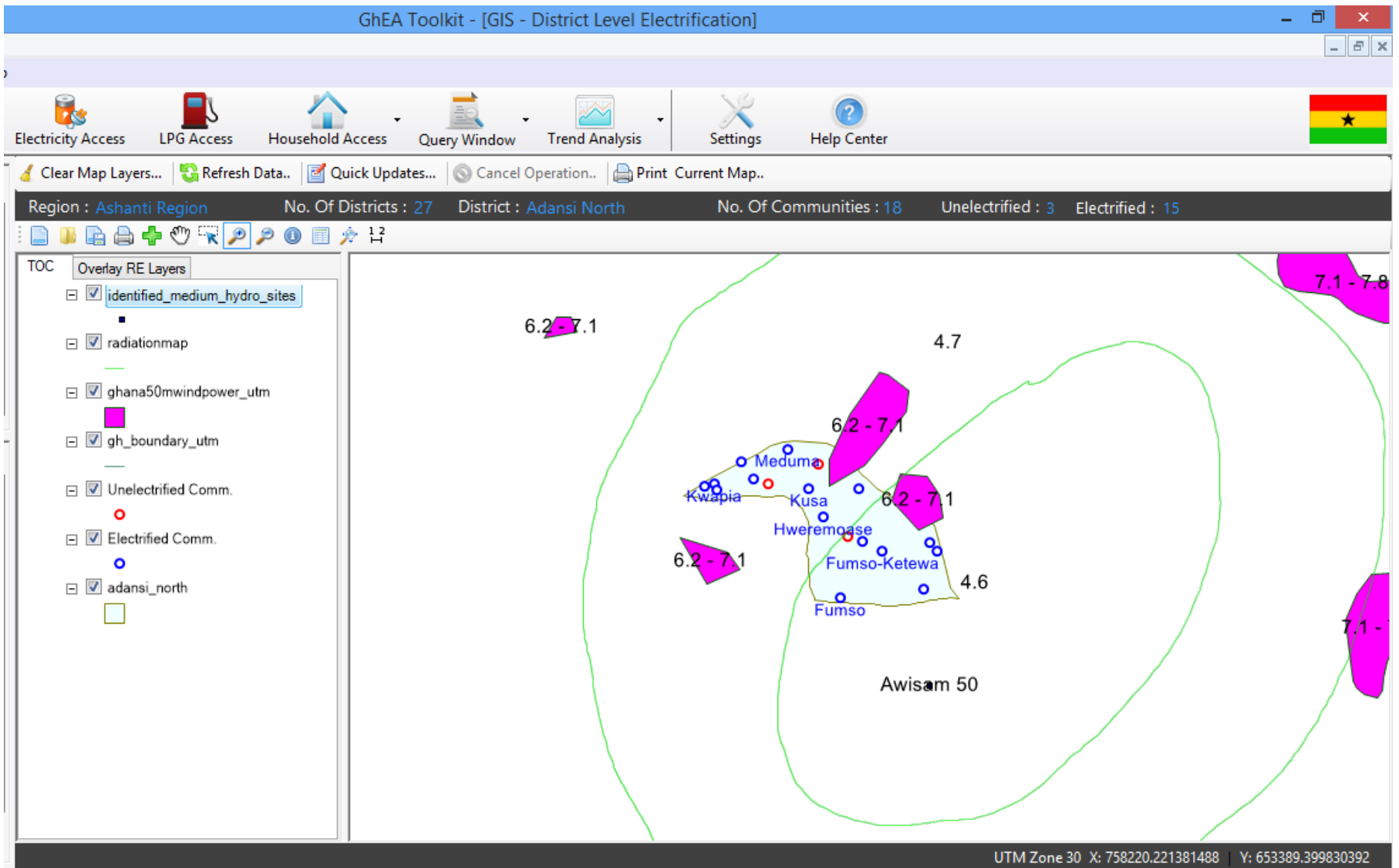
The interface is divided into several panels:

- Select Region:** A dropdown menu showing various Ghanaian regions, with Ashanti Region selected.
- District/Metro/Municipal:** A list of districts, with Adansi North selected.
- Overlay RE Layers:** A list of layers for overlaying Renewable Energy (RE) options, including:
 - 69-11-33kV Station
 - 69kV Station
 - 161-11kV Station
 - 161-33kV Station
 - 161-69kV Station
 - 161kV
 - 225kV
 - Diesel Generations
 - National
 - Region
 - New District
 - Geology
 - Land Cover
 - Soil Types
 - Soil and Game Reserve
 - Water
 - Roads
 - Rivers
 - Town
 - Settlements
 - Island Communities
- Map:** A map of the Adansi North district showing the distribution of RE options. The map includes a network of lines (likely power lines) and various symbols representing different RE options. A specific area is labeled "Fumao".

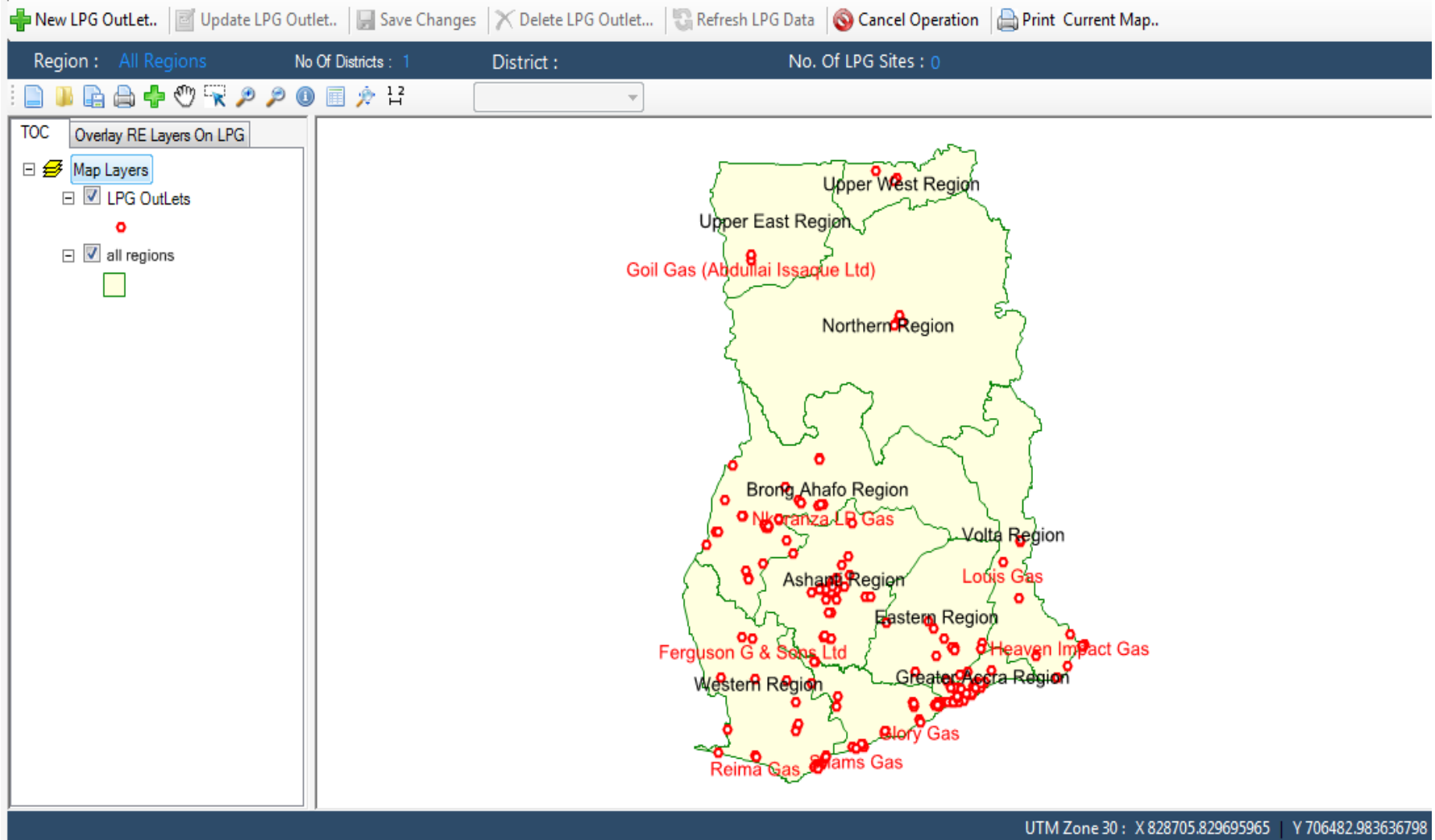
The status bar at the bottom of the application window displays the following information:

- UTM Zone 30 X: 1791336.86376406 | Y: 522855.139097445
- Ready: Electricity Access and Update Window
- Administrator | Energy Commission | 11 August 2014

Exploring RE options in GIS environment



The GhEA Toolkit – LPG Stations



Update window

GhEA Toolkit - [GIS - District Level Electrification]

Application Modules Tools Help

NITS - Map Renewable Energy Electricity Access LPG Access Household Access Query Window Trend Analysis Settings Help Center

Menu [Geographic / Attribute Data Update Center] No. Of Districts : 27 No. Of Communities : 68 Population : 128727 Batch Delete

Regions Of Ghana Operations: Districts In Region Community

Ashanti Region Load District
 Brong Ahafo Region Add District...
 Greater Accra Region
 Northern Region
 Eastern Region
 Central Region
 Western Region
 Upper East Region
 Upper West Region

Asante Akim South
 Atwima Kwanwoma
 Atwima Mponua
 Atwima Nwabiagya
 Bekwai Municipal
 Bosome Freho
 Bosomtwi
 Ejisu Juaben
 Ejura Sekyedumase

ABANKUROM
 ABENASI
 ABETENIM
 ACHINAKROM
 ADADIETEM
 ADARKO JACHIE
 ADU BUSANGA AKURA
 ADUMASA
 AGANSHELA ALPIA

Community Update Clear Community Water Bodies Delete Community Print... Cancel Batch Delete.

Dynamic Community Information

Community Information Add Dynamic Fields Field Operations

Save Updates... Edit Values... Refresh Data... Cancel Operation

Parameter	Value
Region	Ashanti Region
District	Ejisu Juaben
Community	ACHINAKROM
X	
Y	
Population	2858
Electrification	Electrified
Connection_Type	
Connection_Tech	

0 = Unelectrified
 1 = Electrified
 2 = Unknown

Map showing community boundaries and names: Juaben, Asotwe, Kotei, Baworo, Kwamo, New Ampabame, Apromasi, Donyina, Kwaso, Kubease, Koforidua, Wabiri, Anumso.

UTM Zone 30 : X:721895.394027832 Y:721638.432151673

Analysis Window

[Electrification Query Analysis DashBord]

- Map Window
- Statistics Window
- Selected Technology
- Back To Query Page

No Of Communities In : **Analysis Focus** = 33 Total Population Count **Analysis Zone** = 81,735

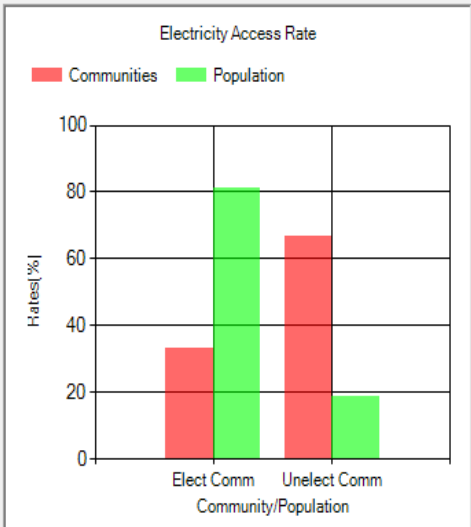
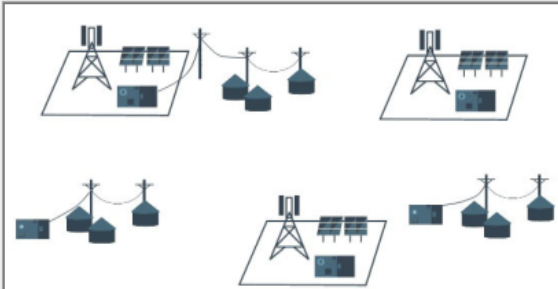
Total Communities.: **UnElectrified** = 22 Population **UnElectrified** = 15,425

Percentage Of Communities: **UnElectrified** = 66.67% Percentage Population : **UnElectrified** = 18.87%

XXXXXXXXXX: XXXXXXXXXXXX = XX XXXXXXXXXXXXX = XX

Query Type : = District Level Query

Analysis Focus = Ahafo Ano South



Electrification Parameters

Records 1 of 22

Region	District	Community	Electrification	Population	X	Y	Selected_Tech
Ashanti Region	Ahafo Ano South	Adukrom	Unelectrified	1017	621489.732	774865.434	grid
Ashanti Region	Ahafo Ano South	Afresini	Unelectrified	486	620669.81	749843.523	grid
Ashanti Region	Ahafo Ano South	Aponaponso	Unelectrified	965	626997.401	778338.212	grid
Ashanti Region	Ahafo Ano South	Attah Krom	Unelectrified	460	625298.836	756701.654	grid
Ashanti Region	Ahafo Ano South	Aworokrom	Unelectrified	597	616244.22	749933.72	grid
Ashanti Region	Ahafo Ano South	Baniekrom	Unelectrified	507	615540.235	760609.095	grid
Ashanti Region	Ahafo Ano South	Boateng Krom	Unelectrified	570	618791.393	752871.949	grid
Ashanti Region	Ahafo Ano South	Bokuruwa	Unelectrified	887	628273.285	780350.551	grid
Ashanti Region	Ahafo Ano South	Bonsukrom	Unelectrified	348	600650.609	758461.322	mini-grid
Ashanti Region	Ahafo Ano South	Dawtiem	Unelectrified	1180	609020.749	751414.268	grid
Ashanti Region	Ahafo Ano South	Duryan Nkwanta	Unelectrified	896	618440.942	759689.955	gnd
Ashanti Region	Ahafo Ano South	Essienkyem	Unelectrified	889	627060.983	771046.382	grid

Renewable Energy Resources

The screenshot displays the GhEA Toolkit software interface. The title bar reads "GhEA Toolkit - [Renewable Energy Resources]". The menu bar includes "Application", "Modules", "Tools", and "Help". The toolbar contains icons for "NITS - Map", "Renewable Energy", "Electricity Access", "LPG Access", "Household Access", "Query Window", "Trend Analysis", "Settings", and "Help Center".

The main content area is titled "Renewable Energy Resources" and features the Energy Commission logo. The text reads: "National - Regional - District level Renewable Energy Potential of Ghana". Below this, a list of modules is provided: "GIS Toolkits", "Animal Analysis", "Crop Analysis", "Energy And Emmission Calculator", "Video - Mini, Small And Medium Hydro Sites", and "Waveheight, Ocean Current And Tide Data".

A "Menu" sidebar on the left lists "Menu Options", "GIS Toolkit 1", "GIS Toolkit 2", "Livestock Waste", "Crop Residue", "Energy Calculator", and "Hydro Sites(Video)".

At the bottom, a "Copyrights" section states: "This Program is protected By copyright laws as described in the Help/About. This product is licensed to: The Energy Commission". Three logos are displayed below the text: the Energy Commission logo, a globe, and the Ghanaian coat of arms.

Benefit of Ghana's GIS energy systems

- Policy-makers
 - Assists with quick policy decisions when it is expensive to visit the field
 - Development of prioritization systems for energy access provision
- Utility companies
 - Monitor transmission and distribution systems and their coverage
- Planning commissions
 - Predicting, to a higher level of accuracy, potential sites for RE development
 - manage, monitor and maintain energy access data
- Energy investment firms
 - Locating RE resources and performing quick pre-feasibility studies

Challenges to GIS use in Energy

- **Technical expertise**
 - GIS expert(s)
 - Identifying appropriate existing support tools
 - Computer programmer (if a DST is to be developed)
- **Data availability****
 - e.g.
 - Energy demand data
 - Socio-economic data
 - Cost data
 - Spatial data

****Recommended the formation of a data task force in Ghana**

Brief demonstration of Ghana Energy Access (GhEA) Toolkit