



Article Estimation and Mapping of Sub-National GDP in Uganda Using NPP-VIIRS Imagery

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Abstract: Uganda is one of the poorest nations in the world. It is important to obtain accurate, timely data on socio-economic characteristics sub-nationally, so as to target poverty reduction strategies to those most in need. Many studies have demonstrated that nighttime lights (NTL) can be used to measure human activities. Nevertheless, the methods developed from these studies (1) suffer from coarse resolutions, (2) fail to capture the nonlinearity and multi-scale variability of geospatial data, and (3) perform poorly for agriculture-dependent regions. This study proposes a new enhanced light intensity model (ELIM) to estimate the gross domestic product (GDP) for sub-national units within Uganda. This model is developed by combining the NTL data from the Suomi National Polar-orbiting Partnership Visible Infrared Imaging Radiometer Suite (NPP-VIIRS), the population data from the Global Human Settlement Layer (GHSL), and information on agricultural production and market prices across several commodity types. This resulted in a gridded dataset for Uganda's GDP at sub-national levels, to capture the spatial heterogeneity in the economic activity.

Keywords: GDP; nighttime lights; agriculture; development

1. Introduction

It is important to obtain accurate socio-economic information in a timely manner in order to evaluate the current development status in Africa and to address developmental challenges. Gross domestic product (GDP), one of the most widely used metric of national economic progress, measures the total amount of goods and services produced in a country. There is a very strong correlation between the GDP per capita and the Human Development Index (HDI), particularly for low-income countries [1]. Nevertheless, only aggregate data measuring the national GDP and GDP per capita exist for many African countries such as Uganda. There is a clear interest in understanding how the GDP and GDP per capita are distributed throughout Uganda at multiple scales, so as to target poverty interventions and bring greater prosperity to more people.

Africa is experiencing rapid urbanization because of fast population growth. It is estimated by the United Nations that more than 50% of the global population growth between now and 2050 will occur in Africa [2]. This rapid population growth is causing the fast expansion of megacities, small cities, and towns, and is putting great pressure on Africa's sustainable development objectives by causing a loss of biodiversity, environmental degradation, and natural resource depletion. Indicators like gross domestic product (GDP) can help assess the pace and dynamics of urban development.

There are many challenges to measuring GDP accurately. For example, accurate information regarding the size and distribution of the human population is not available for many regions around the world, and sometimes these data are of poor quality [3]. National censuses are not able to capture the human mobility or activity, as they are conducted residentially. Additionally, national censuses often release their results with limited resolution below the national level, as is the case with Uganda [4]. Cross-country measurements of GDP lack standardized accounting methods and have inconsistent data collection methodologies [5]. Satellite-based nighttime light (NTL) data can provide a unique method to visualize and analyze the spatial distribution of the socio-economic environment in a consistent, efficient, and low-cost manner. By monitoring the anthropogenic nocturnal light intensity, these satellite image derived datasets can help us to evaluate human activities at multiple spatiotemporal scales.

In the past decades, many studies have utilized the Defense Meteorological Satellite Program's Operational Linescan System (DMSP-OLS) NTL data to analyze various socio-economic indicators like GDP and electric power consumption. For instance, some researchers used the DMSP-OLS NTL imagery to generate and demonstrate the quantitative relationships between the NTLs and population and energy consumption in the USA [6,7]. Nevertheless, the DMSP-OLS satellite imagery suffers from significant deficiencies like coarse spatial resolution, saturation of bright lights, and the lack of in-flight calibration [8]. On 28 October 2011, the launch of the Suomi National Polar-Orbiting Partnership (NPP) marked a new generation of operational polar-orbiting spacecraft [9]. NPP-VIIRS exceeds its predecessors with its unique features, including a finer spatial resolution for all bands and a day night band (DNB) that can collect low-light imaging data. Thus, because of its improved NTL detecting ability, NPP-VIIRS has been applied in many fields that once used DMSP-OLS heavily.

Meanwhile, many studies have demonstrated that using nighttime lights alone is insufficient to accurately measure the GDP at sub-national levels. For example, in many countries in Sub-Saharan Africa (SSA), there is a large population (about 175 million) engaged in small-scale agricultural activities [10]. However, it is very difficult to capture these small-scale subsistence agriculture activities using nighttime lights, and their total economic activities can be underestimated. For example, nighttime lights fail to capture more than half of the economic activities in Liberia [11]. In addition, although GDP data is available at national level, it is important to obtain sub-national economic data to evaluate the distribution and dynamics of socio-economic development. This sub-national information is especially important for regions like SSA to address high population growth, food security, poverty, inequality, and growth challenges, and to meet the United Nations Sustainable Development Goals 2030. Therefore, the purpose of this study is to investigate the potential of combining nighttime lights with agriculture data in order to estimate the subnational GDP for countries with a large rural, agriculturally-dependent population. We aim to utilize the NPP-VIIRS NTL imageries in order to map the sub-national socio-economic development in Uganda. We have conducted our analysis using NPP-VIIRS nightlight imagery covering Uganda, for the year 2015, agricultural production and commodity price information [12], and population and settlement data from the Global Human Settlement Layer (GHSL). The structure of the paper is organized as follows: A detailed description of case study area, NTL data, and agricultural production data are presented in Section 2. The data processing and methods used in this study will be described in Section 3. We will then present the estimation results and discuss the performance of our methods by comparing with other existing methods. Finally, we summarize the results and draw conclusions in the last section.

2. Case Study Area and Data

2.1. Case Study Area

Uganda is one of the poorest nations in the world, and its GDP per capita (current US \$) is only \$740 [13]. In recent years, the proportion of the population living in poverty is increasing, and almost 10 million people are living under the poverty line. In addition, Uganda's economy is

heavily dependent on agriculture. Like many other sub-Saharan countries, Uganda has a large rural population. In Uganda, 76% of the population live in rural areas, and 24% of the national economy is derived from agricultural activity [13]. The district-level shapefile was obtained from U.S. Agency for International Development (there are 116 districts' information in the shapefile, but the total number of districts increased to 127 as of July 2018). The GDP information was obtained from the World Bank database (in constant 2011 US \$).

2.2. Data Collections

2.2.1. Nighttime Satellite Imagery

NPP-VIIRS NTL imagery was used to estimate the urban economic activities for each district in Uganda. The total estimated economic activities attributed to the commercial and industrial activities were calculated based on the total light intensity values within the districts. We selected the NPP-VIIRS "vcm-orm-ntl" product (VIIRS Cloud Mask-Outlier Removed-NTLs, obtained from http://ngdc.noaa.gov/eog/viirs/download_viirs_ntl.html) for extracting the urban and rural regions and for estimating productivity from the urban locations. This product contains cloud-free average radiance values with the outliers (including fires and other ephemeral light) removed. NPP-VIIRS is a stable, cloud-free, NTL intensity data source produced by the National Oceanic Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). Compared to the DMSP-OLS, NPP-VIIRS has a higher spatial resolution and wider radiometric detection range. Many studies have utilized NPP-VIIRS data for analyzing a range of socio-economic phenomena from a distance. NPP-VIIRS is suitable for detecting sub-national activities, because it captures high-radiance images and gathers information at roughly a 0.5 km² level, with a high dynamic range [14]. Shi et al. [15] used NPP-VIIRS to extract built-up urban areas of 12 cities in China, and found that NPP-VIIRS data have higher spatial accuracies than those from the DMSP-OLS data for all 12 of the cities. They concluded that these improvements are due to its high spatial resolution and wide radiometric detection range.

2.2.2. Population, Settlement, and Agricultural Data

The spatial population and settlement information was obtained from the GHSL dataset, which was mapped based on the Landsat imagery to show the global built-up areas and population distribution from 1975 to 2014 [16]. The GHSL framework produces global spatial information in the form of built up maps, population density maps, and settlement maps about the human presence on the Earth's surface over time. The GHSL population grid shows the distribution and density of the population. The population grid information is disaggregated from census or administrative units to number of people per cell (250 m and 1 km spatial resolution). The GHSL settlement grid shows the classified built-up areas, including "rural cells", "urban clusters", and "urban centers". We used the "GHS_SMOD_POP2015_GLOBE_R2016A_54009_1k" and the "GHS_POP_GPW42015_GLOBE_R2015A_54009_1k" data with a resolution of 1 km for our model.

This model uses district-level agricultural data to supplement the spatial data in the model. Agricultural activity is not as light-intense as commercial activities, so it would be underrepresented in a model based solely on nighttime lights. Taken together, nighttime lights (representing a higher value-add economic activity) and agricultural production (an important aspect of Uganda's economy) provide a broad-based estimate of economic activity at a sub-national level. This forms the conceptual foundation for the Enhanced Light Intensity Model.

These estimates use the data on 16 representative agricultural commodities (production and average market price) in order to derive an estimate of the spatial distribution of agricultural GDP in Uganda. A mix of food crops, cash crops, annual crops, and perennial crops are included, as well as cattle, Uganda's primary animal industry. These representative commodities include maize, millet, sorghum, rice, beans, cow peas, soya beans, groundnuts, sesame, banana, cassava, sweet potatoes,

Irish potatoes, coffee, cotton, and cattle. These are representative agricultural commodities and constitute the total agricultural output of each district, so the national agricultural GDP is used to normalize these estimates.

All of the district-level crop production estimates are taken from the 2008/09 Census of Agriculture [12]. The data measuring the heads of cattle per district are collected from the 2008 Livestock Census [17] and are normalized to national-level beef production data from the Food and Agricultural Organization. The cotton production data [18] are sourced from the 2009–2010 Annual Report by the Cotton Development Organization [19]. The agricultural component of the model merges the best available data in order to estimate the distribution of agricultural GDP across Uganda.

Coffee is Uganda's top export, and is divided among arabica and robusta varieties. Production data by district and variety are not readily available, so, in an attempt to estimate the geographic distribution of the production value from coffee, a multi-step process is used. Census reports from the Uganda Bureau of Statistics provide information on the share of households engaged in coffee production [20] and on the total number of households per district [21]. A map produced by Geo Gecko in 2017 delineates the share of production per district among robusta and arabica among five categories, namely: fully arabica, mostly arabica, fifty–fifty, mostly robusta, and fully robusta [22]. Finally, the 2008/009 Census of Agriculture provides the total production data by geographic region for the arabica and robusta varieties. These data sources are combined in order to arrive at a production estimate by district and variety. The price data were derived from the average weekly commodity prices recorded at markets in 2015 in Gulu, Mbale, Mbarara, and Kampala, sourced from FIT Insights Group Limited [23]. We chose to use the 2015 data for commodity prices, because it was a relatively stable agricultural year. The average coffee prices are taken from the Uganda Coffee Development Authority from October 2014 to September 2015 [24].

3. Methods

3.1. Data Pre-Processing

As NPP-VIIRS is not a direct measurement of socio-economic activates, we adopted a sequence of data preprocessing measures to remove the irrelevant features. Many studies used DMSP-OLS data to extract NPP-VIIRS data. For instance, the released NPP-VIIRS data may be affected by fires, gas flares, volcanoes, and background noise, which need to be removed in order to improve the accuracy and relevancy of GDP estimation. Li et al. [25] used a mask generated from the DMSP-OLS data to obtain denoised NPP-VIIRS data, by assuming that the lit areas in 2010 and 2012 were the same. With a similar assumption, Shi et al. [15] extracted NPP-VIIRS data based on the DMSP-OLS data from the same year. We used the annual product of 2015 ("vcm-orm-ntl"), which contains cloud-free average radiance values that have undergone an outlier removal process to filter out fires and other ephemeral lights. In order to obtain the lit areas in urban regions, we generated a mask from the settlement data with pixels with a value greater than 1 (representing urban clusters and urban centers) to extract lit areas from NPP-VIIRS data within urban boundaries. This is to extract the urban pixels that are related to urban socio-economic activities and to remove irrelevant light detections. As Kampala is the biggest and most developed city in Uganda, the urban pixel values of other areas should not exceed that of Kampala. Therefore, we used the maximum urban pixel value of Kampala as a threshold and found that all of the pixel values in the other urban regions were below this threshold. Finally, we set the non-urban NPP-VIIRS pixel values to 0 to help us identify the rural socio-economic activities.

Then, the preprocessed NPP-VIIRS imagery is analyzed based on the pixel values—pixels with value of 0 and pixels with positive values. Ghosh et al. [26] developed the model by incorporating the agricultural economic activity, which is an important component of economic activity in the developing countries. Agricultural economic activity contributes significantly to the national GDP, but it is not efficiently captured by the nighttime light imagery. In addition, there is a lack of information of the agricultural production at sub-national levels. Therefore, Ghosh et al. assumed that the darker regions

of the nighttime light can be used to represent non-urban land use, and the LandScan population data was used to estimate the agricultural activities. As agricultural productivities may not be uniform for all districts, population density cannot adequately reflect the actual agricultural economic activity. To overcome this limitation, we estimated the agricultural data based on 16 representative agricultural commodities (production and average market price) to derive an estimate of the spatial distribution of agricultural GDP in Uganda, and then applied the national agricultural GDP to normalize these estimates. Following the method developed by Ghosh et al., we assumed the following: (1) the preprocessed NPP-VIIRS imagery with pixel value >0 can represent the urban region that mainly consist of agricultural activities, and (2) pixel value = 0 can represent the rural regions to extract the rural population from the GHSL's population data. Therefore, the preprocessed NPP-VIIRS NTL imagery is mainly used to estimate the urban GDP values, whereas the extracted rural population, agricultural production, and price data are used to estimate the rural GDP values.

3.2. Model and Simulation of GDP

Many different models, including linear regression models, log-log regression models, and secondorder regression models, have been developed to estimate socio-economic data using NTL [27–31]. For instance, Henderson, Storeygard, and Weil [5] developed a statistical model by combining the data from NTLs and income growth so as to better estimate the true income growth. They concluded that satellite imagery can be a useful proxy for estimating economic activity if traditional data is not available or is of poor quality. Shi et al. [15] used a simple linear regression model to estimate GDP and electric power consumption at multiple scales. Nevertheless, because of a lack of reliable ground survey data in African countries like Uganda, it is very difficult to develop and validate a statistical model based on these existing methods directly. It has also been found that the population data may not fully demonstrate the agricultural activities. For instances, studies have found that there is a weaker association between light and economic activities in agriculture dependent countries [11]. Thus, we have developed an enhanced light intensity model (ELIM) to estimate the sub-national GDP in Uganda based on the following steps (Figure 1): (1) using the light intensity to extract urban regions and estimate urban GDP for each district, (2) using the population distribution and agricultural value ratios to estimate the agricultural GDP for rural regions, and (3) the combination of urban and rural GDP can represent the total GDP at sub-national levels.

We defined the rural pixel value (RV_j) of the rural GDP based on the population and agricultural production in each district, as follows:

$$RV_j = \frac{PN_j}{TRP} * \sum_{i}^{d} X_i * Y_i \tag{1}$$

where *j* is the unique identification (ID) of rural pixel (population layer), PN_j is the population value of the corresponding pixel, *TRP* is the total rural population value, *i* is the type of the agricultural product, *d* is the total number of types of the agricultural product, X_i is the production of the corresponding agricultural product, and Y_i is the average crop price of the agricultural product.

Then, we defined the urban GDP pixel value (UV_i) as follows:

$$UV_i = \frac{PV_i}{TNTL} * NAGDP \tag{2}$$

where *i* is the ID of the urban pixel (NPP-VIIRS NTL layer), *PV_i* is the pixel value of the corresponding pixel, *TNTL* is the total night time light values of the country, and *NAGDP* is the total non-agricultural GDP of the country.





Figure 1. Estimating sub-national gross domestic product (GDP) using enhanced light intensity model (ELIM) method.

4. Results and Discussion

4.1. Results

Figure 2 shows Uganda's GDP at sub-national levels for 116 districts in Uganda (detailed results are in Appendix A Table A1). In Figure 2b, the distribution of GDP in Uganda is heavily skewed. Only 11 out of the 116 districts have GDP per capita values above the national average, based on our results. This equates to roughly 81.5% (or about 32 million) of the population living in districts with GDP per capita estimates below the national average. Kampala has the largest GDP per capita (\$3368), followed by Wakiso (\$2496) and Mukono (\$1653). Central (the central region dos not include Kampala) and Western Uganda tend to have larger per capita GDP estimates than Eastern and Northern Uganda.



Figure 2. Map showing the distribution of Uganda's districts' total GDP (**a**) and GDP at a 1 km resolution (**b**).

Figure 3 shows that the GDP is heavily concentrated in Central Uganda and Kampala. The ELIM method estimates that Kampala (28.6%), Wakiso (19.6%), and Mukono (4.5%) account for more than half of Uganda's total GDP. Of the ten largest district economies, six are in Central Uganda. Sub-regionally, Kampala and the South-Central sub-region account for an outsized proportion of Uganda's GDP, relative to its population size, meaning that they are significantly more productive sub-regions in Uganda. Kampala is roughly 4.8% of Uganda's population, but it generates 28.6% of its GDP, whereas the West Nile region comprises 9.7% of Uganda's population and produces 2.2% of the country's GDP. The top 10 district economies in Uganda make up about 66.3% of the total GDP, with the remaining 33.7% of the national economy coming from 106 districts. To put it another way, these top 10 districts consist of roughly 19.4% of the total population and generate more than 66.3% of the total GDP.



Figure 3. Uganda 116 Districts' GDP and population (a) and Uganda regional GDP and population (b).

4.2. Data Comparisons

We compared our results with the publicly-available census data. Nevertheless, there are no sub-national-level GDP estimates in Uganda that can be used for direct comparison. Other researchers produced sub-national-level GDP estimates based on remotely sensed imagery. For instance, Nordhaus [32] produced the G-Econ database, which measures the global economic activity at a 1° latitude by 1° longitude scale (Figure 4a). Because of the coarse resolution, the G-Econ cannot sufficiently reflect the sub-national economic activities within the districts. However, the G-Econ data still supports our results by showing that Central and Western Uganda tend to have a greater GDP than the Eastern and Northern regions. Kummu, Taka, and Guillaume [33] produced the Gridded Global Dataset for GDP and a Human Development Index (HDI) at a sub-national level with a higher resolution (with 30 arc-sec resolution) (Figure 4b). The GDP data from the Gridded Global Dataset was derived from the GDP per capita (PPP), by multiplying it by the population data from GHSL. The input sub-national GDP per capita was produced by Gennaioli et al. for 1960–2010. The temporal interpolation and extrapolation approaches were used to fill the missing national and sub-national GDP per capita values. However, their data is unable to consider the nonlinearity and multi-scale variability of the geospatial data, and the GDP values are mainly derived from the population per pixel and GDP per capita at national level. This dataset is insufficient to identify the sources of the economic

activities and the variation of productivity within districts. Figure 4c shows that the difference between this study's ELIM results and the Gridded Global GDP dataset to the 1 km level. Figure 5 shows the same comparison, but aggregated to the district administrative unit. The Gridded Global GDP data have significantly underestimated the GDP from districts like Kampala, Wakiso, and Mukono, as the sub-national calculation is based on the sub-national population, not the heterogeneous productivity across rural and urban landscapes.



Figure 4. Comparisons of (**a**) G-Econ data from [34], (**b**) Gridded Global GDP data from the authors of [33], and (**c**) the differences between the percent of GDP for ELIM and the percent of GDP for the Gridded global GDP data at a district level.



Comparison between Gridded Global Data and ELIM results Percent of GDP by district

Figure 5. Comparison between the ELIM and Gridded Global GDP data.

5. Discussion

The NTL imagery can record the dynamics of human activities by monitoring artificial light on the Earth's surface. Therefore, we support the idea that in migrating from the DMSP-OLS to NPP-VIIRS data sources, the NTL imagery is an improved and more accurate source for estimating GDP. The traditional DMSP-OLS imagery has a coarse spatial resolution and this may limit its applications for estimating human activities at sub-national levels [35]. In addition, Bundervoet et al. [11] found that the correlation between lights and economic activity is stronger in places where agriculture is a a less significant component of the national GDP. Therefore, many traditional methods for estimating GDP with NTL may not be suitable for countries dependent on agriculture, like Uganda. Following this rationale, in this study, instead of using the population data only for estimating agricultural GDP, we proposed a simple process for estimating the rural GDP values, by combining the population and agricultural value ratios within the districts of Uganda.

There are still limitations for this method. First, because of the resolution restriction of NPP-VIIRS NTL, the NTL imagery is not likely to accurately demonstrate the dynamics of the economic activities at a finer spatial resolution. Second, since the NPP-VIIRS was only launched in 2012, there is a limited amount of time series data available. NPP-VIIRS may be combined with DMSP-OLS to cover a longer period of time, to demonstrate the dynamics of economic activities in Africa. Thirdly, because of the relatively coarse resolution of the NPP-VIIRS imagery, it may not be able to accurately define the urban regions and separate some agricultural activities from other secondary and tertiary sectors of the economy.

6. Conclusions

It is important to obtain timely and accurate information in order to evaluate the impacts of urbanization and to promote sustainable development in countries like Uganda. Stable nighttime light data from the DMSP-OLS and the NPP-VIIRS can be used to reveal the dynamics of urban expansion in Africa. In this study, we developed the ELIM method for extracting the dynamics of sub-national-level economic activities based on stable nighttime light data using a combination of population data from GHSL and agricultural value ratios. This ELIM method can be applied to many regions that (1) are dependent on agricultural activities and (2) have poor-quality census data. For example, ELIM can be applied to other Sub-Sahara African countries.

This ELIM method has improved upon the existing models by using agriculture production and price data to estimate the size of the agricultural economic activity in rural regions. Agricultural economic activity is a significant part of the national GDP, and it cannot be measured accurately using the nighttime light imagery alone. To overcome this limitation, we estimated the agricultural contribution geographically based on 16 representative agricultural commodities (production and average market price) so as to derive an estimate of the spatial distribution of agricultural GDP in Uganda, and then applied the national agricultural GDP to normalize these estimates. We applied a sequence of data preprocessing measures to remove the confounding factors from the NPP-VIIRS imagery.

The results of the ELIM indicate some emerging themes for those interested in district-level policy in Uganda. First, the distribution of economic activity is heavily concentrated in Central Uganda. Three districts (Kampala, Wakiso, and Mukono) account for nearly half of Uganda's total GDP, while comprising only about 10.7% of Uganda's population. Second, the top 10 district economies in Uganda make up about 66.3% of the total GDP, leaving the remaining 33.7% of the national economy coming from 106 districts.

Through a case study of Uganda, this research investigates the ability of the NPP-VIIRS data to estimate the sub-national GDP using multi-source data that not only improve the resolution of the dataset, but also capture the spatial heterogeneity of the socio-economic activities. By comparing our results with other publicly available data sources, the data generated from the ELIM model can better capture the variations of GDP within the sub-national administrative boundaries. GDP is also

allocated based on the types of economic activities, instead of just based on the simple averaged values of population and GDP per capita, thus capturing the heterogeneous productivity across rural and urban landscapes. Because of the limited availability of calibrated and processed NPP-VIIRS data, it is important to produce multiple years of NPP-VIIRS NTL data analysis in the future, to further compare and improve the model performance. Moreover, obtaining accurate and relevant ground truth data is

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Conflicts of Interest: The authors declare no conflict of interest.

important for validation, so as to produce better-quality results.

Appendix A

Table A1. Enhanced light intensity model (ELIM) results. GDP-gross domestic product.

District	Region	Rural GDP (Million US \$)	Urban GDP (Million US \$)	GDP Per Capita (US \$)
Abim	Karamoja	5.83	1.78	128
Adjumani	West Nile	61.24	7.04	150
Ágago	Northern	24.93	5.87	86
Alebtong	Northern	16.76	0.57	68
Amolatar	Northern	18.28	0.00	127
Amudat	Karamoja	12.15	0.39	90
Amuria	Eastern	26.96	0.58	52
Amuru	Northern	77.63	1.50	317
Apac	Northern	91.21	6.85	247
Arua	West Nile	101.15	75.17	202
Budaka	Eastern	11.40	11.75	117
Bududa	Eastern	40.40	5.43	244
Bugiri	Eastern	34.84	29.08	122
Buhweju	South West	32.30	1.03	275
Buikwe	Central	19.06	354.35	769
Bukedea	Eastern	29.75	4.59	160
Bukomansimbi	Central	39.04	7.72	288
Bukwo	Eastern	20.21	0.61	416
Bulambuli	Eastern	18.62	10.10	177
Buliisa	Western	12.96	0.00	145
Bundibugyo	Western	27.62	11.14	126
Bushenyi	South West	51.28	65.01	415
Busia	Eastern	27.17	47.48	225
Butaleja	Eastern	30.36	11.30	166
Butambala	Central	15.55	22.58	297
Buvuma	Central	5.24	0.00	84
Buyende	Eastern	45.07	1.45	150
Dokolo	Northern	29.06	2.88	153
Gomba	Central	26.40	7.01	196
Gulu	Northern	50.39	88.84	492
Hoima	Western	58.47	77.40	209
Ibanda	South West	82.68	29.75	408

Iganga Eastern 152.67 91.35 434 Isingiro South West 265.41 26.58 611 Jinja Eastern 35.28 625.23 1199 Kaborg Karamoja 29.33 0.00 59 Kabarole Western 158.02 64.35 505 Kabarole Western 19.35 12.24 69 Kakumiro Western 20.64 5.78 120 Kalangala Central 3.71 5.48 112 Kalungu Central 3.71 5.48 100 Kampala Xappala 3.49 6269.64 3368 Kanuuli Eastern 79.47 7.38 233 Kanugu South West 65.78 12.77 304 Kapadi Ga353 42.59 200 Katakvi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaa	District	Region	Rural GDP (Million US \$)	Urban GDP (Million US \$)	GDP Per Capita (US \$)
IsingiroSouth West 265.41 26.58 611 JirjaEastern 35.28 625.23 1199 KabaleSouth West 49.07 83.17 405 KabaleSouth West 49.07 83.17 405 KabaroleWestern 12.33 0.58 95 KagadiWestern 12.33 0.58 95 KagadiWestern 12.33 0.58 95 KakumiroWestern 20.64 5.78 120 KalunguCentral 3.71 5.48 112 KaliroEastern 27.21 52.22 338 KalunguCentral 3.859 36.48 401 Kampala 3.49 6269.64 3368 KamuliEastern 72.44 41.54 202 KamvengeWestern 79.47 7.38 233 KanunguSouth West 65.78 12.77 304 KapchorwaEastern 19.82 10.31 226 KaseseWestern 81.75 154.39 292 KatakviEastern 17.96 1.00 94 KayungaCentral 23.66 24.64 222 KibolaWestern 61.40 36.64 453 KibogaCentral 23.66 24.64 222 KibukuEastern 23.67 200 416 KiyunhongoWestern 61.68 19.67 223 KibokoNorthern 16.08 <td>Iganga</td> <td>Eastern</td> <td>152.67</td> <td>91.35</td> <td>434</td>	Iganga	Eastern	152.67	91.35	434
JinjaEastern 35.28 625.23 1199 KabongKaramoja 29.53 0.00 59 KabaroleWestern 158.02 64.35 505 KaberamaidoEastern 21.33 0.58 95 KadarolaWestern 19.35 12.24 69 KakumiroWestern 20.64 5.78 120 KalangalaCentral 3.71 5.48 112 KaliroEastern 27.21 52.22 338 KalunguCentral 3.59 66.48 401 KamuliEastern 72.44 41.54 202 KamunguSouth West 65.78 12.77 304 KapchorwaEastern 19.82 10.31 226 KaseseWestern 81.75 154.39 292 KatakwiEastern 17.96 1.00 94 KayungaCentral 23.66 24.64 222 KibogaCentral 23.66 24.64 223 KibogaCentral 23.66 20.47 230 KityandongoWestern 61.03 366 166 KiryandongoWestern 12.62 0.00 44 KoleNorthern 61.37 0.60 229 KotidoKasen 23.64 7.97 110 KweenEastern 12.53 0.00 14 KoleNorthern 61.37 0.60 229 KotidoKastern 38.77	Isingiro	South West	265.41	26.58	611
Katabong KabaleKaramoja South West 29.33 0.00 59 KabaroleWestern 158.02 64.35 505 KabaroleWestern 21.33 0.58 95 KagadiWestern 19.35 12.24 69 KakumiroWestern 20.64 5.78 120 KalangalaCentral 3.71 5.48 112 KaliroEastern 27.21 52.22 338 KalunguCentral 3.89 36.48 401 KamuliEastern 72.44 41.54 202 KamuguSouth West 65.78 12.77 304 KanunguSouth West 65.78 12.77 304 KapchorwaEastern 19.82 10.31 226 KaseseWestern 65.78 12.77 304 KayungaCentral 36.35 42.59 200 KiabaleWestern 60.40 3.64 453 KibogaCentral 32.66 24.64 222 KibukuEastern 12.36 24.64 222 KibukuEastern 32.66 20.47 230 KityandongoWestern 34.40 46.36 223 KisoroSouth West 36.26 20.47 230 KityandongoWestern 16.67 125 $Koboko$ 444 KoleNorthern 16.09 10.00 71 LiraNorthern 16.09 10.01 351 </td <td>Jinja</td> <td>Eastern</td> <td>35.28</td> <td>625.23</td> <td>1199</td>	Jinja	Eastern	35.28	625.23	1199
Kabale South West 49.07 83.17 405 Kabarole Western 158.02 64.35 505 Kapadi Western 19.35 12.24 69 Kakumiro Western 20.64 5.78 120 Kalangala Central 3.71 5.48 112 Kaliro Eastern 27.21 52.22 338 Kalungu Central 38.59 36.48 401 Kamvapala Kampala 349 6269.64 3368 Kamuing Central 38.57 7.38 202 Kamuing South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Katakvi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibale Western 60.40 3.64 4533 Kibogo Central 23.66 24.64 222	Kaabong	Karamoja	29.53	0.00	59
KabaroleWestern158.02 64.35 505KaberamaidoEastern21.330.5895KagadiWestern19.3512.2469KakumiroWestern20.645.78120KalangalaCentral3.715.48112KalunguCentral3.715.48401KampalaSampala3.496269.643368KamuliEastern72.4441.54202KamvengeWestern79.477.38233KanunguSouth West65.7812.77304KapshorwaEastern19.8210.31226KaseseWestern81.75154.39292KatakwiEastern19.8210.094KayungaCentral36.6524.64222KibadaWestern60.403.64453KibogaCentral23.6624.64222KibukuEastern97.1118.07336KiruhuraSouth West97.1118.07230KitgumNorthern16.0819.67125KobokoWestern34.4046.36223KisoroSouth West36.2620.47230KityunNorthern16.0819.67125KobokoKaaramoja47.600.36166KumiEastern23.67122.63341LuwaCentral35.756.072416La	Kabale	South West	49.07	83.17	405
Kaberamaido Eastern 21.33 0.58 95 Kagadi Western 19.35 12.24 69 Kakumiro Western 20.64 5.78 120 Kalangala Central 3.71 5.48 112 Kalung Central 3.71 5.48 401 Kampala Xampala 3.49 6269.64 3368 Kamuli Eastern 72.44 41.54 202 Kamungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasee Western 19.82 10.31 226 Kasee Western 19.62 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 223 Kibuku Eastern 22.3 7.56 144	Kabarole	Western	158.02	64.35	505
Kagadi Western 19.35 12.24 69 Kakumiro Western 20.64 5.78 120 Kalangala Central 3.71 5.48 112 Kalungu Central 3.59 36.48 401 Kampala Kampala 3.49 6269.64 3368 Kamuli Eastern 72.44 41.54 202 Kamuli Eastern 79.47 7.38 233 Kanungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Katakwi Eastern 17.96 1.00 94 Kayunga Central 23.66 24.64 423 Kiboga Central 23.66 24.64 222 Kibuku Eastern 17.96 1.00 94 Kiyundongo Western 34.40 46.36 2230 Kistora South West 36.26 20.47 230	Kaberamaido	Eastern	21.33	0.58	95
Kakumiro Western 20.64 5.78 120 Kalangala Central 3.71 5.48 112 Kaliro Eastern 27.21 52.22 338 Kalungu Central 38.59 36.48 401 Kamuli Eastern 72.44 41.54 202 Kamungu South West 65.78 12.77 304 Kapchorvw Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 19.82 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibaale Western 34.40 46.36 223 Kibuku Eastern 22.23 7.56 144 Kiryundongo Western 34.40 46.36 223	Kagadi	Western	19 35	12 24	69
Kalangala Central 2.01 5.48 112 Kalino Eastern 27.21 52.22 338 Kalungu Central 38.59 36.48 401 Kampala Kampala 3.49 6269.64 3368 Kamuli Eastern 72.44 41.54 202 Kamungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 36.26 20.47 230 Kitgum Northern 61.37 0.60 229	Kakumiro	Western	20.64	5 78	120
Kaliro Eastern 27.21 52.22 338 Kaliro Eastern 27.21 52.22 338 Kanugu Central 38.59 36.48 401 Kamuli Eastern 72.44 41.54 202 Kamwenge Western 79.47 7.38 233 Kanungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 23.66 24.64 222 Kiboale Western 60.40 3.64 453 Kiryandongo Western 34.40 46.36 223 Kisoro South West 97.11 18.07 336 Kiryandongo Western 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 <td>Kalangala</td> <td>Central</td> <td>3 71</td> <td>5.48</td> <td>1120</td>	Kalangala	Central	3 71	5.48	1120
Kalungu Central 34.21 34.22 50 Kalungu Central 38.59 36.48 401 Kampala Kampala 3.49 6269.64 3368 Kamuli Eastern 72.44 41.54 202 Kamwenge Western 79.47 7.38 233 Kanungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.3 7.56 144 Kirandongo Western 34.40 46.36 223 Kistgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44	Kaliro	Eastern	27.21	52 22	338
Kampala Kampala So.57 So.56 24.44 45.35 So.57 So.56 So.57	Kalungu	Contral	38 59	36.48	401
Kamuli Fastern 7.4 41.54 202 Kamungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.33 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kityum Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 15.53 0.00 71 <	Kampala	Kampala	3.49	6269.64	3368
Kamwenge Western 72-44 41.04 202 Kamwenge Western 79.47 7.38 233 Kanungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 4333 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Kaaramoja 47.60 0.36 166	Kamuli	Eastorn	72 44	41 54	202
Kanungu South West 75.7 7.50 255 Kanungu South West 65.78 12.77 304 Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiyandongo Western 34.40 46.36 223 Kisoro South West 36.26 2.047 230 Kitigum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Koid Karamoja 47.60 0.36 166 <td>Kamwongo</td> <td>Western</td> <td>72.44</td> <td>7 38</td> <td>202</td>	Kamwongo	Western	72.44	7 38	202
Kapchorwa Eastern 19.82 10.31 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 433 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kisoro South West 36.26 20.47 230 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 15.53 0.00 136 Kyegegwa Western 40.67 6.26 256 Kyeg	Kanungu	South West	79.47 65.79	7.30	255
Kapen 15.32 10.51 226 Kasese Western 81.75 154.39 292 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 423 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiryandongo Western 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko Western 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 40.67 6.26 256 Kyenjojo Western 58.57 12.08 161 Lamwo Northern <td>Kanahamua</td> <td>Eastern</td> <td>10.20</td> <td>12.77</td> <td>304</td>	Kanahamua	Eastern	10.20	12.77	304
Katakwi Eastern 17.96 1.00 94 Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kirunura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyeegeywa Western 58.57 12.08 161 La	Kapchorwa	Eastern	19.82	10.31	226
Katakwi Eastern 17.96 1.00 94 Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 15.53 0.00 136 Kyegegwa Western 58.57 12.08 161 Lamvo Northern 14.09 0.00 71	Kasese	Vvestern	81.75 17.00	154.39	292
Kayunga Central 36.35 42.59 200 Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 38.79 4.18 223 Kyagegwa Western 58.57 12.08 161 Lamwo Northern 23.67 12.263 341 Luuka Eastern 89.09 10.04 351 Lweno<	Katakwi	Eastern	17.96	1.00	94
Kibaale Western 60.40 3.64 453 Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 38.79 4.18 223 Kyankwanzi Central 38.79 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341	Kayunga	Central	36.35	42.59	200
Kiboga Central 23.66 24.64 222 Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitsoro South West 36.26 20.47 230 Kisoro South West 36.26 20.47 230 Kisoro South West 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 40.67 6.26 256 Kyengojo Western 40.67 6.26 256 Kyengojo Western 36.57 12.08 161 Lamwo Northern 14.09 0.00 71 <	Kibaale	Western	60.40	3.64	453
Kibuku Eastern 22.23 7.56 144 Kiruhura South West 97.11 18.07 336 Kiryandongo Western 34.40 46.36 223 Kisoro South West 36.26 20.47 230 Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 56.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 12.63 341 Luwero Central 48.74 148.98 412 Lwengo Central 56.57 60.72 416 Lyanto	Kiboga	Central	23.66	24.64	222
KiruhuraSouth West 97.11 18.07 336 KiryandongoWestern 34.40 46.36 223 KisoroSouth West 36.26 20.47 230 KitgumNorthern 16.08 19.67 125 KobokoWest Nile 12.62 0.00 44 KoleNorthern 61.37 0.60 229 KotidoKaramoja 47.60 0.36 166 KumiEastern 23.84 7.97 110 KweenEastern 15.53 0.00 136 KyankwanziCentral 38.79 4.18 223 KyegegwaWestern 40.67 6.26 256 KyenjojoWestern 58.57 12.08 161 LamwoNorthern 14.09 0.00 71 LiraNorthern 23.67 122.63 341 LuukaEastern 89.09 10.04 351 LuweroCentral 25.06 21.85 424 ManafwaEastern 44.38 21.34 154 MarachaWest Nile 35.95 8.39 203 MasakaCentral 47.82 230.47 1051 MasindiWest Nile 35.95 83.90 232 MbaleEastern 88.91 269.65 715 MbaleEastern 88.91 269.65 1311 MitoomaSouth West 48.82 4.98 262 MityanaCentral<	Kibuku	Eastern	22.23	7.56	144
KiryandongoWestern 34.40 46.36 223 KisoroSouth West 36.26 20.47 230 KitgumNorthern 16.08 19.67 125 KobokoWest Nile 12.62 0.00 44 KoleNorthern 61.37 0.60 229 KotidoKaramoja 47.60 0.36 166 KumiEastern 23.84 7.97 110 KweenEastern 15.53 0.00 136 KyankwanziCentral 38.79 4.18 223 KyegegwaWestern 40.67 6.26 256 KyenjojoWestern 58.57 12.08 161 LamwoNorthern 14.09 0.00 71 LiraNorthern 23.67 122.63 341 LuwaroCentral 48.74 148.98 412 LwengoCentral 45.57 60.72 416 LyantondeCentral 25.06 21.85 424 ManafwaEastern 44.38 21.34 154 MarachaWest Nile 35.95 8.39 203 MasakaCentral 47.82 230.47 1051 MasindiWestern 32.44 49.78 187 MayugeCentral 37.38 89.07 232 MbaleEastern 88.91 269.65 715 MbaleEastern 88.91 269.65 715 MbaleEastern 88.9	Kiruhura	South West	97.11	18.07	336
Kisoro South West 36.26 20.47 230 Kisoro Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 58.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341 Luuka Eastern 89.09 10.04 351 Lwengo Central 25.66 21.85 424 Manafwa Eastern 44.38 21.34 154 Maracha West Nile 35.95 8.39 203	Kiryandongo	Western	34.40	46.36	223
Kitgum Northern 16.08 19.67 125 Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 40.67 6.26 256 Kyenjojo Western 58.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341 Luuka Eastern 89.09 10.04 351 Luwero Central 48.74 148.98 412 Lwengo Central 56.57 60.72 416 Lyantonde Central 47.82 230.47 1051 Maracha West Nile 35.95 8.39 203 Masaka <td>Kisoro</td> <td>South West</td> <td>36.26</td> <td>20.47</td> <td>230</td>	Kisoro	South West	36.26	20.47	230
Koboko West Nile 12.62 0.00 44 Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 40.67 6.26 256 Kyenjojo Western 58.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341 Luuka Eastern 89.09 10.04 351 Luwero Central 25.06 21.85 424 Manafwa Eastern 44.38 21.34 154 Maracha West Nile 35.95 8.39 203 Masaka Central 47.82 230.47 1051 <	Kitgum	Northern	16.08	19.67	125
Kole Northern 61.37 0.60 229 Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 40.67 6.26 256 Kyenjojo Western 58.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341 Luuka Eastern 89.09 10.04 351 Luwero Central 48.74 148.98 412 Lwengo Central 25.06 21.85 424 Manafwa Eastern 44.38 21.34 154 Maracha West Nile 35.95 8.39 203 Masaka Central 37.38 89.07 232 <t< td=""><td>Koboko</td><td>West Nile</td><td>12.62</td><td>0.00</td><td>44</td></t<>	Koboko	West Nile	12.62	0.00	44
Kotido Karamoja 47.60 0.36 166 Kumi Eastern 23.84 7.97 110 Kween Eastern 15.53 0.00 136 Kyankwanzi Central 38.79 4.18 223 Kyegegwa Western 40.67 6.26 256 Kyenjojo Western 58.57 12.08 161 Lamwo Northern 14.09 0.00 71 Lira Northern 23.67 122.63 341 Luuka Eastern 89.09 10.04 351 Luwero Central 48.74 148.98 412 Lwengo Central 25.06 21.85 424 Manafwa Eastern 44.38 21.34 154 Maracha West Nile 35.95 8.39 203 Masaka Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715	Kole	Northern	61.37	0.60	229
KumiEastern23.847.97110KweenEastern15.530.00136KyankwanziCentral38.794.18223KyegegwaWestern40.676.26256KyenjojoWestern58.5712.08161LamwoNorthern14.090.0071LiraNorthern23.67122.63341LuukaEastern89.0910.04351LuweroCentral48.74148.98412LwerogoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Kotido	Karamoja	47.60	0.36	166
KweenEastern15.530.00136KyankwanziCentral38.794.18223KyegegwaWestern40.676.26256KyenjojoWestern58.5712.08161LamwoNorthern14.090.0071LiraNorthern23.67122.63341LuukaEastern89.0910.04351LuweroCentral48.74148.98412LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral37.3889.07232MbaleEastern88.91269.65715MbaleEastern88.91269.65715MbararaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Kumi	Eastern	23.84	7.97	110
KyankwanziCentral38.794.18223KyegegwaWestern40.676.26256KyenjojoWestern58.5712.08161LamwoNorthern14.090.0071LiraNorthern23.67122.63341LuukaEastern89.0910.04351LuweroCentral48.74148.98412LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral37.3889.07232MbaleEastern88.91269.65715MbaleEastern88.91269.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Kween	Eastern	15.53	0.00	136
KyegegwaWestern 40.67 6.26 256 KyenjojoWestern 58.57 12.08 161 LamwoNorthern 14.09 0.00 71 LiraNorthern 23.67 122.63 341 LuukaEastern 89.09 10.04 351 LuweroCentral 48.74 148.98 412 LwengoCentral 56.57 60.72 416 LyantondeCentral 25.06 21.85 424 ManafwaEastern 44.38 21.34 154 MarachaWest Nile 35.95 8.39 203 MasakaCentral 47.82 230.47 1051 MasindiWestern 32.44 49.78 187 MayugeCentral 37.38 89.07 232 MbaleEastern 88.91 269.65 715 MbararaSouth West 48.82 4.98 262 MityanaCentral 32.78 83.85 350 MorotoKaramoja 7.87 16.04 147 MoyoWest Nile 16.49 3.63 34 MpigiCentral 35.96 298.05 1624 MubendeCentral 215.47 125.19 489	Kyankwanzi	Central	38.79	4.18	223
KyenjojoWestern 58.57 12.08 161 LamwoNorthern 14.09 0.00 71 LiraNorthern 23.67 122.63 341 LuukaEastern 89.09 10.04 351 LuweroCentral 48.74 148.98 412 LwengoCentral 56.57 60.72 416 LyantondeCentral 25.06 21.85 424 ManafwaEastern 44.38 21.34 154 MarachaWest Nile 35.95 8.39 203 MasakaCentral 47.82 230.47 1051 MayugeCentral 37.38 89.07 232 MbaleEastern 88.91 269.65 715 MbararaSouth West 221.84 394.65 1311 MitoomaSouth West 48.82 4.98 262 MityanaCentral 32.78 83.85 350 MorotoKaramoja 7.87 16.04 147 MoyoWest Nile 16.49 3.63 34 MpigiCentral 35.96 298.05 1624	Kyegegwa	Western	40.67	6.26	256
LamwoNorthern14.090.0071LiraNorthern23.67122.63341LuukaEastern89.0910.04351LuweroCentral48.74148.98412LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Kyenjojo	Western	58.57	12.08	161
LiraNorthern23.67122.63341LuukaEastern89.0910.04351LuweroCentral48.74148.98412LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Lamwo	Northern	14.09	0.00	71
Luuka Eastern 89.09 10.04 351 Luwero Central 48.74 148.98 412 Lwengo Central 56.57 60.72 416 Lyantonde Central 25.06 21.85 424 Manafwa Eastern 44.38 21.34 154 Maracha West Nile 35.95 8.39 203 Masaka Central 47.82 230.47 1051 Masindi Western 32.44 49.78 187 Mayuge Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715 Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34	Lira	Northern	23.67	122.63	341
LuweroCentral48.74148.98412LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Luuka	Eastern	89.09	10.04	351
LwengoCentral56.5760.72416LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Luwero	Central	48.74	148.98	412
LyantondeCentral25.0621.85424ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Lwengo	Central	56.57	60.72	416
ManafwaEastern44.3821.34154MarachaWest Nile35.958.39203MasakaCentral47.82230.471051MasindiWestern32.4449.78187MayugeCentral37.3889.07232MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Lyantonde	Central	25.06	21.85	424
Maracha West Nile 35.95 8.39 203 Masaka Central 47.82 230.47 1051 Masindi Western 32.44 49.78 187 Mayuge Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715 Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Manafwa	Eastern	44.38	21.34	154
Masaka Central 47.82 230.47 1051 Masindi Western 32.44 49.78 187 Mayuge Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715 Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Maracha	West Nile	35.95	8.39	203
Masindi Western 32.44 49.78 187 Mayuge Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715 Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Masaka	Central	47.82	230.47	1051
Mayuge Central 37.38 89.07 232 Mbale Eastern 88.91 269.65 715 Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Masindi	Western	32.44	49.78	187
MayageCentral81.85269.65715MbaleEastern88.91269.65715MbararaSouth West221.84394.651311MitoomaSouth West48.824.98262MityanaCentral32.7883.85350MorotoKaramoja7.8716.04147MoyoWest Nile16.493.6334MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Mavuge	Central	37.38	89.07	232
Mbarara South West 221.84 394.65 1311 Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Mbale	Eastern	88,91	269.65	715
Mitooma South West 48.82 4.98 262 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Mbarara	South West	221.84	394.65	1311
Mitoana Contral 40.02 4.90 202 Mityana Central 32.78 83.85 350 Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Mitooma	South West	48.87	4 98	262
Moroto Karamoja 7.87 16.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Mitvana	Central	32 78	4.20 83.85	202
Moroto Ratanoja 7.67 10.04 147 Moyo West Nile 16.49 3.63 34 Mpigi Central 35.96 298.05 1624 Mubende Central 215.47 125.19 489	Moroto	Karamoja	7 87	16 0 <i>1</i>	1/7
MoyoWest Mie10.495.6534MpigiCentral35.96298.051624MubendeCentral215.47125.19489	Move	Mart NH2	1.07	10.04	14/
MppgiCentral55.96298.051624MubendeCentral215.47125.19489	Moiai	Control	10.49	3.03 200 OF	04 1604
Nubende Central 215.47 125.19 489	Nipigi	Central	55.96 215 47	298.05 105.10	1624
	viubende	Central	215.47	125.19	489

Table A1. Cont.

District	Region	Rural GDP (Million US \$)	Urban GDP (Million US \$)	GDP Per Capita (US \$)
Nakapiripirit	Karamoja	20.27	0.00	102
Nakaseke	Central	25.44	25.76	234
Nakasongola	Central	69.35	12.77	481
Namayingo	Eastern	20.75	0.00	80
Namutumba	Eastern	48.36	4.40	217
Napak	Karamoja	12.25	0.00	51
Nebbi	West Nile	45.68	12.33	151
Ngora	Eastern	13.91	6.47	105
Ntoroko	Western	6.09	3.83	92
Ntungamo	South West	240.62	50.98	552
Nwoya	Northern	49.38	1.19	802
Omoro	Northern	27.45	0.19	183
Otuke	Northern	7.59	0.00	78
Oyam	Northern	96.58	18.18	251
Pader	Northern	21.25	4.12	92
Pallisa	Eastern	41.43	10.14	124
Rakai	Central	94.92	42.93	275
Rubanda	South West	17.26	0.35	85
Rubirizi	South West	30.73	4.69	257
Rukungiri	South West	76.06	22.50	278
Serere	Eastern	108.12	1.41	312
Sheema	South West	44.65	20.44	256
Sironko	Eastern	24.83	21.47	174
Soroti	Eastern	98.46	72.86	444
Ssembabule	Central	69.02	12.11	341
Tororo	Eastern	136.89	119.59	466
Wakiso	Central	32.00	4262.30	2496
Yumbe	West Nile	63.40	0.00	91
Zombo	West Nile	28.55	7.90	148

Table A1. Cont.

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