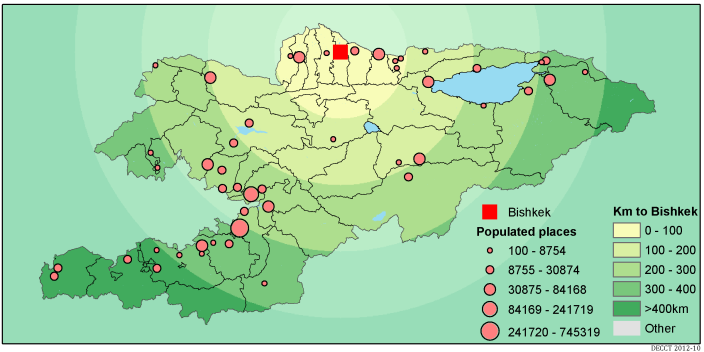
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Market Accessibility and Regional Maps: Kyrgyz Republic

**Brian Blankespoor (World Bank)**

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Poverty Reduction and Economic Management Unit

Europe and Central Asia Region

**Document of the World Bank**

Market Accessibility and Regional Maps: Kyrgyz Republic[[1]](#footnote-1)\*

**Brian Blankespoor[[2]](#footnote-2)**

Abstract

Access to markets is argued to have a significant role in development. In order to quantify the access of places to markets, policy makers are showing increasing interest in accessibility indicators (Yoshida and Deichmann 2009). This paper seeks to examine the spatial relationship of access to market in the Kyrgyz Republic using a recent census and household survey in order to identify possible linkages with rates of poverty and other micro (spatial) information. This analysis uses the Market Accessibility Index that measures the potential connectivity of population or expenditures between village/towns and big cities via the transport network. Results show that high Market Accessibility is located near the large cities with a concentration of infrastructure, while low access is more in the rural areas. Future work will use this indicator in economic models to statistical identify its significance with regards to per capita expenditure and poverty.

###### Key words: Potential Accessibility; regional development, transportation; poverty mapping; GIS; Kyrgyz Republic

**JEL classification: O18, R12, R58**

**World Bank Sector:** PRM

Executive summary

**Access to markets is argued to have a significant role in development**. In order to quantify the access of places to markets, policy makers are showing increasing interest in accessibility indicators (Yoshida and Deichmann 2009). For example, low access to social services, which is associated with low market access, is linked with development challenges such as poor health and education outcomes (World Bank, 2009).This analysis uses the Market Accessibility Index that measures the potential connectivity between village/towns and big cities via the transport network. Two inputs to potential connectivity are calculated: *population potential* from 2009 population data and *expenditure potential* from household survey per capita expenditure information. In Kyrgyz Republic, results show that high Market Accessibility is located near the large cities with a concentration of infrastructure, while low access is more in the rural areas. Higher access to *population potential* and *expenditure potential* are located in the capital region and to a lesser degree near Osh city. The *population potential* and *expenditure potential* results are highly correlated since the range of the population is greater than the range of per capita expenditure, which in turn explains the similarity of the results from both inputs.

**This paper suggests looking at development through a spatial lens in addition to a sector perspective.** Using access to market, a recent census and a household survey, the spatial relationships are examined for linkages with rates of poverty and other micro (spatial) information. First, areas of poverty are compared to market accessibility. Then, the comparison of poverty rate and market access to a number of health, education and other indicators illustrate the wide variation of rayon and town characteristics and spatial patterns in Kyrgyz Republic. With regards to health indicators and outcomes, the incidence of registered illnesses is high in the urban areas, where as maternal and infant mortality rates are found in the sparsely populated rayons. Hospitals and primary care facilities are located throughout with higher concentration in the two major cities. Education attainment is high near the large cities and education expenditure for both primary and secondary education is pro-poor. The average number of students by school and the average class size per district are high in the two major cities and also At Bashy. Finally, poverty areas are examined for areas of high unemployment and with sectors of employment typical of low wages.

**Policy makers can play a key role to promote the provision of basic services across the country and the connectivity of lagging areas**. The World Development Report 2009 on *Reshaping Economic Geography* provides an economic geography framework for policy (World Bank 2009). Provision of basic services such as health and education should be available to all regions that not only provide higher living standards, but also better prepare people for the equality of opportunity in urban and rural areas. Also, lagging areas need to be connected to leading areas. The Market Accessibility Index provides a measure to rank rayon connectivity of *population potential* and *expenditure potential*. Policies that include the promotion of the mobility of labor and the strengthening of investments can reduce the economic distance to market and access to social services. This connectivity provides potential opportunities and spillover effects for firms to locate in the appropriate places (e.g. land price and access to appropriate labor).

# Introduction

With access to market and social services significantly determining the economic status and welfare of the population, the increase of this access is argued to be a key contributor to poverty alleviation and regional growth (Yoshida and Deichmann, 2009; World Bank, 2009). Access to market measures the economic distance or connectivity between populated places, where high market access facilitates trade by easing travel time and transportation costs. Since it has been proven empirically that trade can increase per capita income, it follows that high access to market facilitates growth.[[3]](#footnote-3) Subsequently, low access to social services, which is associated with low market access, is linked with development challenges such as poor health and education outcomes (World Bank, 2009). So, it is important to measure accessibility to assist policy makers in quantifying this key indicator related to growth.

Transportation networks play a pivotal role in access to markets by connecting economic centers to economic activities and people to social services. High density and high quality infrastructure can reduce transport costs, which in turn provide gains in trade[[4]](#footnote-4). From three case-studies, Bryceson et al. (2008) suggest that road connectivity can provide poverty reduction when the time and distances make available “greater economic opportunities or better access to social services or useful social contacts” (478). Previous work that investigated the benefits of a large infrastructure investment in Bangladesh suggests that the benefits of connectivity of the Jamuna Bridge from the Central Region to the North-West Region are much larger than originally estimated through cost and time saving analysis (Masood 2009),[[5]](#footnote-5) which provided higher access to the capital region from the North-West Region.

Not only is access to market important, it can be compared to variety of micro (spatial) information. In recent years, Geographic Information Systems (or GIS) technology has improved and provides a common platform for a variety of micro (spatial) information that can be shown with a poverty map to visualize and analyze this important linkage. Scenarios can also be created to analyze interventions to infrastructure such as the creation of a major new bridge (e.g. Padma Bridge in Bangladesh in Blankespoor and Yoshida, mimeo). This projection model is useful not only for quantifying improvements in market accessibility via creating a new bridge or expanding a new road network, but also for translating the effects onto poverty reduction.

This paper provides the methodology to create a measure of market access applied to the Kyrgyz Republic and examines rates of poverty and other micro (spatial) information using a recent census and household survey in order to identify possible linkages.

The rest of the paper is organized as follows. Section 2 provides the analytical framework. Section 3 describes the data. Section 4 presents the empirical framework. Section 5 has the results and discussion. Section 6 has the references and section 7 has an appendix with a table.

# Framework

Given that economic activity often takes place where people are located and larger populated places lead to agglomeration economies by efficiencies in production, proximity to economic distance matters. As part of the New Economic Geography literature[[6]](#footnote-6), the World Development Report (WDR) 2009 (World Bank 2009) argues that economic outcomes have transformed along three dimensions: distance, density and division. One factor that contributes to economic distance is the infrastructure that connects the centers of economic activity. Physical factors also influence economic distance like high mountain ranges that make travel and trade difficult. Economic density shows the locations and size of populated places. Economic division addresses the ease of movement, particularly international borders.

Building on the framework of the WDR 2009, Poor Places, Thriving People (World Bank 2011) presents a typology of economic geography dimensions in the Middle East with careful attention to the local characteristics of the lagging regions, which have the disadvantage of a limited market size. The report suggests looking at development through a spatial lens instead of a strict sector perspective. Although admittedly sectors are more clearly and cleanly defined vis-à-vis boundaries, institutions and relationships, a spatial lens promotes the need to provide access to basic services in all regions and connect lagging regions to leading regions.

Connectivity from the leading regions to the lagging regions can help reduce poverty by providing access to agglomeration economies, additional educational opportunities, specialized social services and greater size and type of markets. In more remote areas, farmers may have increased incentive to produce the full potential of the land when provided less middle traders and easier access to markets (Yoshida and Deichmann 2009). The relationship between poverty alleviation and connectivity of lagging and leading regions, services and markets is complex and maps can illustrate spatial patterns, however the maps display correspondence without suggesting causation.

With regards to the economic geography of the Kyrgyz Republic, Atamanov and Sattar (mimeo) explore the contrasting hypotheses of “concentration” and “geography” with household survey data. The concentration hypothesis suggests that poverty is related to the personal attributes, which make them poor, whereas the geography hypothesis suggests that the returns from individual characteristics differ according to the geography[[7]](#footnote-7). The authors’ findings include a large disparity of welfare between urban and rural areas and can be explained by the concentration or density of better characteristics that is dominated by the capital (Bishkek) region’s high living standards. In addition, Bishkek not only performs better than all other urban areas due to a high concentration of better characteristics and these characteristics provider greater returns than all other urban areas. This report does not include information on accessibility.

Geographic technologies have improved and assist economic analysis by linking spatial information that can increase understanding of the spatial distribution of poverty, human capital, physical investment, and outcomes. Linking factors geographically with micro data can be combined to illustrate linkages with poverty and indicate ways to address it (e.g. growth).

## Hypotheses

Hypothesis 1:

Areas of high poverty are located in areas with low market accessibility.[[8]](#footnote-8)

Hypothesis 2:

Areas of high poverty overlap areas with low coverage of basic services such as education and health.

Hypothesis 3:

Areas of high poverty overlap with areas of high unemployment.

Hypothesis 4:

Areas of high poverty overlap with sectors of employment typical of low wages.

In order to quantify access to market, this paper uses the market accessibility index (Deichmann 1997). Then, this index is used to visually display areas of poverty coincident to areas of potential economic activity.

## Market Accessibility Index

This Market Accessibility index is part of a large literature of “accessibility index” see e.g. Deichmann (1997), Geertman and Ritsema van Eck (1995), Guy (1983), Hansen (1959), Ingram (1971), Selza et al. (2011), and Yoshida and Deichmann (2009). World Bank applications of the index include: Bangladesh (Blankespoor and Yoshida, mimeo), Sri Lanka (Yoshida and Deichmann 2009), West Bank and Gaza (World Bank 2011b) and Egypt (World Bank 2012a).

Exploiting the theory of a classic gravity model, the Market Accessibility index is a measure of potential economic connectivity between village/towns and big cities. These population centers are considered a proxy of market size or population potential. This metric discounts the market size proxy by an estimate of travel time along a transportation network, which assigns little relevance of a market size in a very far place from the origin or, conversely, assigns a strong relevance for markets in close proximity to the origin. Using the transportation network and estimated travel time is a more realistic measure of economic distance than Euclidean distance because not all distances are equal in travel time and physical or man-made barriers may provide routes that are not straight line distance. Since various methodologies exist for the discount of the market size, a robustness test is suggested.

Geo-referenced transportation data provide the network for the analysis from which to calculate the estimates of travel time. Geo-referenced GIS data are essential in establishing the transportation network. Ideally, these data are in GIS format and the lines are topologically connected (i.e. each road segment is geographically connected to the adjacent road segment). These geographic features provide the location of the roads; however information about each segment is used in constructing a reasonable travel time model such as road class (national, regional, local, minor, other).

The market accessibility index calculation with the negative exponential potential model is:

**** (EQ. 1)

Where *S* is the size of the population*, j* is one of the set of populated places considered in the model,  *I*  is the potential calculated at every node of the network, and *a* and *b*  are distance decay parameters.

# Data and variables

## Population

Geo-referenced population information is used to identify the locations of potential markets. Population numbers from 2009 are derived from the National Statistical Committee (NSC) (2010) at the rayon, town and city level[[9]](#footnote-9). Population locations were derived from the locations from ARIS (Kyrgyz Republic's Community Development and Investment Agency) that had an urban footprint and the United Nations (UN) Common and Fundamental Operational Datasets (COD-FOD), which had location coordinates and population for approximately 20 locations. When both the ARIS and UN COD-FOD had matching place names, the location of ARIS was deemed more precise. Demographic information such as mean household size and gender of the household head (0 = male and 1= female) are from 2009 and derived from the NSC (2010).

## Poverty rate – head count rate

Poverty rate are calculated from povmap and used for display purposes in this paper. These data are produced using the ELL method (Elbers et al., 2003) from data in the Kyrgyz Integrated Household Survey (2009) and the 2009 census (The National Statistical Committee of the Kyrgyz Republic 2010) - (for details see Mahadevan, Yoshida, mimeo).[[10]](#footnote-10)

## Education

Shares of households completing levels of education are derived from the 2009 census. There are nine categories considered in the education variable: 0: "No Education", 1 "Higher Professional Degree", 2 "Incomplete Higher Professional Degree", 3 "Secondary Professional Degree", 4 "Primary Vocational Degree", 5 "Secondary General (Complete)", 6 "Basic General (Secondary Incomplete)", 7 "Elementary General (Primary)", 8 "Without Elementary Education", and 9 "Illiterate". Four variables are constructed from these dummies: the percent of the household with primary education, secondary education, tertiary education or vocational education.[[11]](#footnote-11) Other education data, which are average number of students per school in a district, number of schools per 10000 population and average class size, are provided by the United Nations Kyrgyzstan district profile (United Nations, 2013) that sources data from the National Statistical Committee of the Kyrgyz Republic as of the year 2011[[12]](#footnote-12) and the 2009 population.

## Health

By rayon, the Ministry of Health (2009) provides data on the number of beds, maternal mortality rate and the Infant mortality rate. In addition, the census provides the number of people registered with an illness and by specific disease such as infections and parasitic diseases and blood circulation diseases by rayon from which a rate of the 2009 population is constructed (The National Statistical Committee of the Kyrgyz Republic 2010). Also, the United Nations Kyrgyzstan district profile that sources data from the National Statistical Committee of the Kyrgyz Republic 2011 has information on the number of hospitals, the number of primary health care, the number of doctors and the number of nurses (United Nations, 2013). The number of health workers per 1000 is constructed using the UN-NSC total number of doctors and nurses divided by the 2009 population per 1000.

## Sector or employment

The 2009 census (The National Statistical Committee of the Kyrgyz Republic 2010) provides information on the share of the household in a specific sector of employment and the percent of the household employed. The sectors of employment include: manufacturing (mfg), agriculture (agri), construction (constr), trade (trade), transport (trans), mining (min) and electricity / gas / water (egw).

## Night time lights

Night time light composite of 2010 is downloaded from US NOAA and quantifies the luminosity, which observes without filter the average of the visible band digital number values (0 – 63) by grid cell at 30 arc second grids.

## Fiscal investment

BOOST data[[13]](#footnote-13) are obtained for the Kyrgyz Republic for the year 2010 (Table 4). These data provide consolidated general government spending (excluding intrabudgetary transfers). A selection of these data is used to determine the government spending in transport category (7045: Transport) and capital investments in road repair (70451: Road transport and 31113320: Capital repair of roads). Education expenditures for pre-school and primary education are from (7091: Pre-school education), primary and secondary expenditures (7092: Primary and Secondary education) and tertiary education expenditures (7094: Tertiary education).

## Current Roads

Current transport network in Kyrgyz Republic GIS data are provided by ARIS. These data have the following road segment categories: motor road, blacktop road, ground road, unpaved road and horsepath. The main road data for Tajikistan, Kazakhstan and Uzbekistan are from Open Street Maps (2012).

## Border crossing

In particular, the current roads for the Osh-Batken-Isfana segment cross the Uzbekistan and Tajikistan borders. Point location (coordinates) for each border crossing on the road network for current Osh-Batken-Isfana road network is estimated and identified in the IBRD map 36940. Estimated wait times at each border crossing (in order to estimate average travel time with border crossings) are 4 hours.

# Empirical framework

In order to construct the market accessibility index, data modifications are made and a travel time model is constructed.

## Market Accessibility specification: *population potential* and *expenditure potential*

A travel time model is constructed based on available GIS data in order to assess all possible travel routes between the target city and the origin on a transportation network, and search for the shortest travel time from each origin to each target city. The construction of the transportation network can involve multiple data sources and needs effort to ensure connectivity between all segments to each other. The travel time model is constructed with the best available information and uses the given road class and road condition information available for each segment, then an estimated travel speed is assigned for all possibilities of class and condition (Table 1).

Given EQ 1 of the Market Accessibility Index, the model is run with two different inputs as the size variable. First, the size variable is population for *population potential* and is provided from the 2009 census. Second, an addition model output of accessibility is the *expenditure potential*, which is information provided by the per capita expenditure by rayon from the household survey combined with the 2009 population information from the National Statistical Committee. The decay parameters of the model are a=0.5 and b=20.[[14]](#footnote-14)

After the Market Accessibility Index model produces an observation for each junction in the road network, ESRI ArcGIS inverse distance weighting (parameters: 12 nearest neighbors) is used to create a continuous surface. Since activity is most likely to occur near the roads and in populated areas, the final step summarizes the rayon-level average of the Market Accessibility Index derived within a 2 Kilometer buffer from each road segment.

## Caveats

The data do not allow for particular consideration of Osh city due to data issues in the Household Budget Survey (2009)[[15]](#footnote-15); the information is marked as no data. Other caveats include: many factors contribute to the connectivity of places – accessibility - beyond travel time, distance and per capita expenditure such as tangible (informal and formal barriers such as border controls and/or tolls) and non-tangible (religion, language and cultural practices and heritage). The accessibility index is a relative ranking of connectivity, which is normalized from 0 to 100, and the interpretation of the results should be a comparison to other rayons and towns.

## Data modification

The following modifications are made to the data in order to perform the analysis.

First, the model requires travel time per road segment. The geographic data are projected in order to have the distance calculated in meters.[[16]](#footnote-16) Then the road categories are converted to travel time and additional wait times are added for border crossings to the Tajikistan and Uzbekistan enclaves. All road segments outside Kyrgyz Republic are from Open Street Maps (2012), where only primary routes to major cities are selected.

Second, population points are the weight location in the access model. The population is derived from the National Statistical Committee and matched the ARIS TOWN\_VIP and rayon level GIS data. Census information has four districts within Bishkek, however the GIS data only delineate one shape, and so all district level observations of Bishkek are aggregated to the city level[[17]](#footnote-17). Finally, population points are matched to the nearest road intersection for the road network analysis.

Third the expenditure potential is calculated like the population potential with the additional calculation of the per capita expenditure times the population.

Fourth, government expenditure data are derived from the BOOST database (World Bank 2012b). Since the codes of the BOOST rayons differ from the GIS codes, a dummy variable with the presence of the word “aiyl” or village within the description of BOOST was added in order to determine in a rayon with the same name as the principal town, whether the expenditure is part of the town or rural areas in the rayon.

# Results and discussion

## Results

This section provides the results for both runs of the market accessibility index and then compares it to the poverty rate and other micro (spatial) information. In addition, the poverty rate is compared with other micro (spatial) information to order to identify possible linkages.

### Population potential and expenditure potential

From the Market Accessibility index with population potential Bishkek and Osh have high market access due to the high population, a concentration of the transportation and good road network (Map 1). The lower population areas and the mountainous areas have a lower population potential and the distribution is skewed (Table 2 and Chart 1). This geography divides Kyrgyz Republic into distinct north and south divisions. In addition, the South-west of Kyrgyz has an enclave of Tajikistan and Uzbekistan that are completely surrounded by Kyrgyz territory. This can make travel very difficult due to time required for the border crossings and the need for proper permits and visas.

Map 1 : Market Accessibility - population potential

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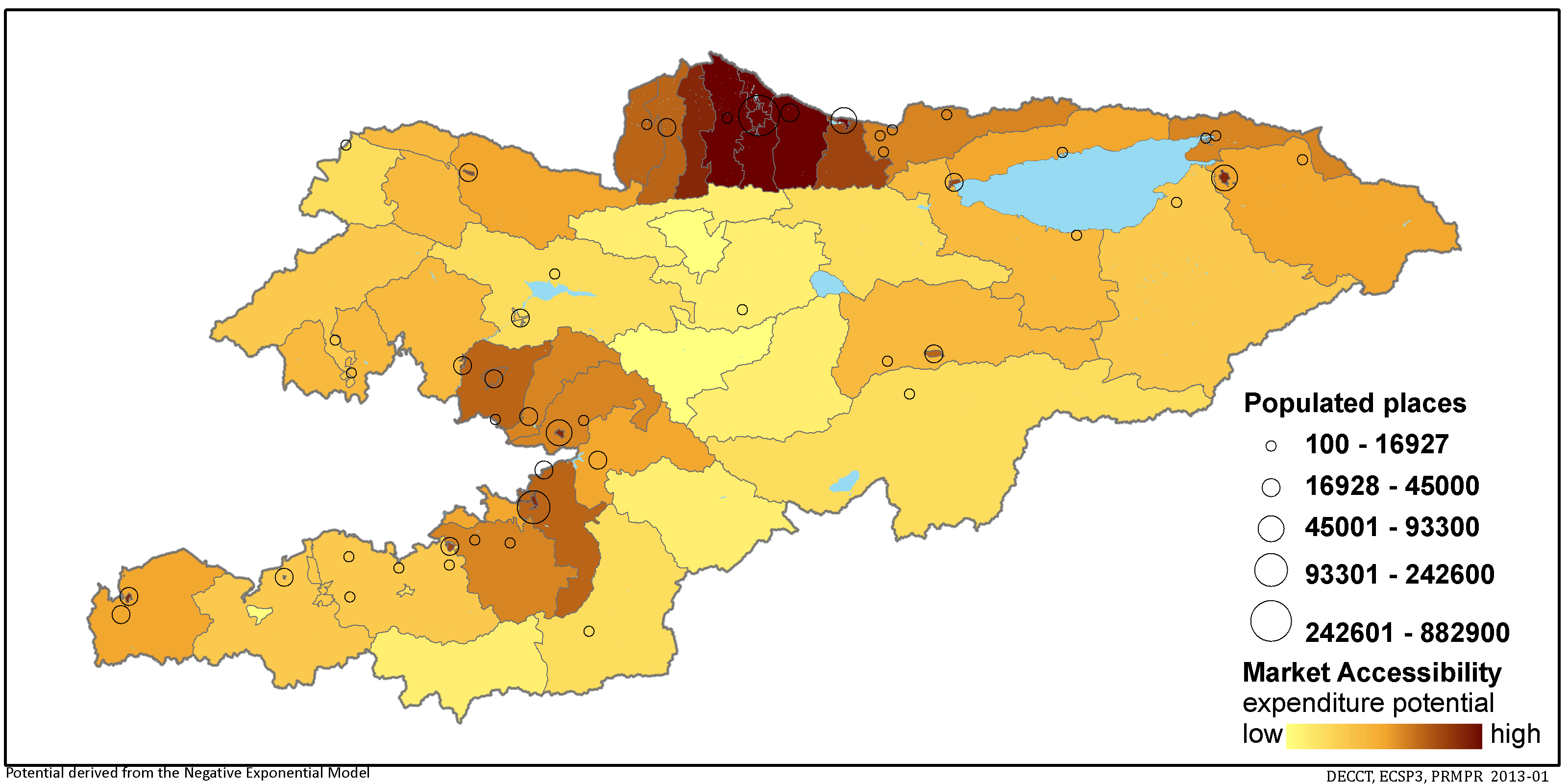
Although Bishkek and Osh are arguably strong contributors to the economy, the Market Access is an improvement from other measures such as Euclidean distance from major cities (Map 2), because it incorporates more populated places and the connectivity by the transportation network.

Map 2 : Distance to major cities: Bishkek and Osh

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Similar to the population potential map, the map of Market Accessibility with expenditure potential shows the Bishkek area dominates and in the south there are some islands of prosperity near Osh (Map 3) – only a few subtle differences of the urban areas reflecting a higher rank of expenditure versus population (Table 3 and Chart 2). The results are also consistent with the statistical understanding that the range of values of the population by rayon is greater than the range of per capita expenditure by rayon, so the rayon variance of expenditure potential is mainly driven by the population data[[18]](#footnote-18).

Map 3: Market Accessibility - expenditure potential



### Comparison of population potential and expenditure potential with other micro data in panel maps

The Market Accessibility Index with population potential and expenditure potential assist in identifying the connectivity of different regions. Additional information provides context to the populated places such as geographic context (e.g. elevation – Map 4), economic activity, and government expenditures. The locations of many of the populated places are in the lower elevation areas in the North near the capital Bishkek, the Fergana valley or near Lake Issyk Kul. These locations also coincide with bright areas in the night time lights map (Map 5). This measure can provide a possible illustration of income per capita, since it is a determinant of night time lights and it follows that night time lights can shed light on places of economic activity (Henderson et al. 2011). Information from BOOST, which is a database of expenditures from the Ministry of Finance, displays the transport and capital road repair expenditures from 2010 (Map 6 and 7). A large per capita expenditure in transport and capital road repair is specially located in urban areas and the South East rayons that are adjacent to China and Tajikistan. This is likely linked with current and recent infrastructure projects in lagging regions.

Map 4 : Elevation and populated places

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Map 5 : Night time light composite for 2010

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Map 6 : Transport expenditure (total and per capita)

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### Comparison of poverty rate with other micro data in panel maps

Micro data can be combined to illustrate linkages with poverty and access measures and indicate ways of address it (e.g. growth). In general, the high access measures are in areas with a lower poverty rate, however variation in the character of laggings areas exists. This section explores poverty rate, population potential and expenditure potential, basic services such as health and education, and employment (sectors and percent of the household).

Many of the areas of high poverty rate are located in areas with low Market Accessibility with expenditure potential (Map 7). The central rayon of Toguz-Torous and the rayons south of Lake Issyk-Kul are most notable. Likewise, areas of high consumption are located in areas with high market access.

Map 7: Poverty rate, total poverty, expenditure potential and population potential

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Demographic characteristics of household size and gender reveal variation in the areas of high poverty rate (Map 8). High household size is present in the West and South-west rayons. The percent of households that have a female household head is lower than male household head, which is present mainly in the capital region. Information about migration and remittances would be interesting to explore in light of this finding and perhaps labor migration is more widespread in the south compared with the north.

Map 8 : Demographic characteristics: mean household size and gender of household head (0 = male and 1 = female)

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Areas of high poverty are located in areas with poor health outcomes (e.g. infant and maternal mortality). The number of doctors, nurses and beds are concentrated in the capital region and the Southwest region near Osh; however number of hospitals and primary health care are located more evenly in both regions and towns with notable exceptions of Osh and Bishkek (Map 9). Information on the incidence of illness is from the census and shows the number of registered ill are concentrated in urban areas and the total number highest in the capital region and near Osh. This pattern could be due to the incentive for registration of social services available in the urban areas.

Map 9 : Health outcomes and indicators

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With regards to household characteristics of water, sanitation, and electricity, high coverage of electricity is uniform across the rayons both urban and rural, however variation of access to toilet, sewage and indoor water exist.

Map 10 : Water and sanitation household characteristics

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Areas of high poverty do overlap areas with higher than average percent of the household employed, but the dominant trend in household employment is higher in the central and Western rayons and select urban areas (Map 11).

Map 11 : Average percent of the household employed

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With regards to education, high rates of literacy exist in all rayons, however wide variation exists between areas of high poverty and levels of education (Map 12). The general pattern shows that the population of high levels of education concentration is located near relatively higher population areas. Households with a large share of tertiary education or vocational education are located in cities and the northern capital region[[19]](#footnote-19). Preschool along with primary and secondary levels of education follow the same pattern with a much higher completion rate as expected. With regards to educational expenditure, the expenditure of pre along with the primary and secondary education is disproportionately located in the lagging regions displaying pro-poor expenditures. Tertiary education expenditures are concentrated in the urban areas.

Map 12 : Education (primary, secondary, tertiary)

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| kgz_census2010_edu_sec_only_dum65 |
| kgz_census2010_edu_ter_only_dum21 |
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With regards to sector employment, sector employment has varied spatial pattern (Map 10). The households, which have a higher than average participation in manufacturing, are located in the capital region and cities. Agriculture is in the regional areas with a cluster in the West – Southwest around the Fergana valley. With regards to wages, agriculture and manufacturing are often labor intensive and associated with low wages. Agriculture has a large share of household employment and perhaps the high intensity work includes more family members than other sectors. The rayons in the Fergana valley and East of Lake Issyk Kul have relatively higher shares than other rayons. Trade, transport and commerce are located near the major populated areas. Trade has a weak presence in the central and Eastern rayons. Mining has a small yet relatively noticeable share of household employment in the central rayon of Toguz-Torous and the rayons South and East of Lake Issyk Kul. The electric / gas / water sector is in the North and urban areas.

Map 13 : Sectors of employment: manufacturing, agriculture construction, trade and transport.

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### Policy perspective

Previous reports suggest looking at development through a spatial lens in addition to a sector perspective, although admittedly sectors are more clearly and cleanly defined vis-à-vis boundaries, institutions and relationships.

A wide variation of characteristics in the lagging areas exists in Kyrgyz Republic. Access to services is not uniform. The health and education outcomes and indicators display difference between leading and lagging areas. Larger shares of low education are present in the lagging areas. With regards to health, almost all rayons have at least one or two hospitals, yet health outcomes such as infant and maternal mortality are still higher in lagging areas. Provision of basic services should be available to all regions that not only provide higher living standards, but better prepare people for the equality of opportunity in urban and rural areas.

Lagging areas need to be connected to leading areas. Policies that include the promotion of the mobility of labor and the strengthening of investments can reduce the economic distance to market and access to social services, however can also reduce economic opportunity. This connectivity provides potential opportunities and spillover effects for firms to locate in the appropriate places (e.g. land price and access to appropriate labor) that may promote economic clusters.[[20]](#footnote-20)

# Conclusion

The market accessibility index with population potential and expenditure potential illustrate the connectivity between populated places. Higher access to population potential and expenditure potential are located in the capital region and to a lesser degree near Osh city. The population potential and expenditure potential results are highly correlated since the range of the population is greater than the range of per capita expenditure, which in turn explains the similarity of the results from both inputs.

The comparison of poverty rate and market access to a number of health, education and other indicators illustrate the wide variation of rayon characteristics and spatial patterns in Kyrgyz Republic. Four particular hypotheses are examined for correspondence between information. These relationships are complex and the spatial patterns can provide insight to further investigation of the causation. First, areas of high poverty show correspondence to areas with low market accessibility. The connectivity of lagging is generally more distant than leading areas to large population centers where a relatively high concentration of economic activity takes place. Second, areas of high poverty and areas of low coverage of basic services such as education and health illustrate a wide variation of rayon and town characteristics and spatial patterns in Kyrgyz Republic. With regards to health indicators and outcomes, the incidence of registered illnesses is high in the urban areas, where as maternal and infant mortality rates are found in the sparsely populated rayons. Education attainment is high near the large cities and education expenditure for both primary and secondary education is pro-poor. Third, areas of high poverty do overlap areas with higher than average percent of the household employed, but the dominant trend in household employment is higher in the central and Western rayons and select urban areas. Fourth, areas of high poverty overlap with sectors of employment typical of low wages. The households, which have a higher than average participation in manufacturing, are located in the capital region and cities and do not show correspondence with high poverty. However, agriculture is in the regional areas with a cluster in the West – Southwest around the Fergana valley.

The information and maps in this paper can foster looking at development with a spatial perspective in Kyrgyz Republic. Leveraging previous work including the World Development Report 2009 (World Bank 2009) provides an economic geography framework for analysis and policy recommendations. Policy makers can play a key role to promote the provision of basic services across the country and the connectivity of lagging areas.

## Future work

Policy scenarios can be useful to visualize and examine the potential impact. Future work may consider scenarios to the transportation network and see the impact on Market Accessibility Index. In cases where ex-ante analysis is of interest, transportation information about the actual or anticipated changes of the road information (e.g. such as an upgrade of a road segment from unpaved to paved) is important to identify changes in travel time. In cases where a scenario is suggested to significantly alter the travel time network, information about the type of shock is needed. For example, roads may become impassable with a snow event or a landslide; identify the road segments that are altered by the shock. In cases where seasonal conditions contribute significantly to travel time, information about the passage of routes in the winter and summer are needed. Another body of work may consider the effect of accessibility indicator in economic models to statistical identify its significance with regards to per capita expenditure, poverty and employment outcomes.

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# Appendix

Table 1 : Road category and speed in model

|  |  |
| --- | --- |
| **Road category** | **Road speed** |
| Motor road | 90 kph |
| Blacktop road | 70 kph |
| Ground road | 40 kph |
| Unpaved road | 25 kph |
| Horsepath | 5 kph |

Table 2 : Market Accessibility Index – population potential

| **Oblast** | **Rayon / town / city** | **Market Access**  **Index – Population Potential** |
| --- | --- | --- |
| Chu | Bishkek city | 100.0 |
| Osh | Osh city | 52.0 |
| Chu | Alamedin | 46.9 |
| Chu | t. Tokmok | 45.6 |
| Dzhalal-Abad | t. Dzhalal-Abad | 45.1 |
| Chu | Sokuluk | 42.9 |
| Chu | Issyk-Ata | 41.4 |
| Issyk-Kul' | t. Karakol | 31.1 |
| Batken | t. Kyzyl-Kyja | 24.3 |
| Chu | Moskva | 22.8 |
| Batken | t. Suljukta | 22.6 |
| Issyk-Kul' | t. Balykchy | 21.6 |
| Dzhalal-Abad | t. Tash-Kumyr | 19.5 |
| Talas | t. Talas | 19.2 |
| Osh | Kara-Su | 18.3 |
| Naryn | t. Naryn | 16.7 |
| Chu | Chu | 16.6 |
| Dzhalal-Abad | t. Majjluu-Suu | 16.4 |
| Dzhalal-Abad | t. Kara-Kul' | 14.8 |
| Chu | Zhayiyl | 14.6 |
| Batken | t. Batken | 14.4 |
| Chu | Panfilov | 14.3 |
| Osh | Uzghen | 12.8 |
| Dzhalal-Abad | Suzak | 12.6 |
| Dzhalal-Abad | Nooken | 12.5 |
| Issyk-Kul' | Tiup | 10.7 |
| Osh | Naukat | 8.9 |
| Dzhalal-Abad | Bazar-Korghon | 7.9 |
| Osh | Aravan | 7.9 |
| Chu | Kemin | 7.6 |
| Issyk-Kul' | Issyk-Kul' | 6.3 |
| Batken | Liayiliak | 5.8 |
| Issyk-Kul' | Ak-Su | 4.9 |
| Talas | Talas | 3.9 |
| Issyk-Kul' | Ton | 3.7 |
| Talas | Bakayi-Ata | 3.4 |
| Dzhalal-Abad | Ala-Buka | 3.0 |
| Talas | Manas | 2.9 |
| Dzhalal-Abad | Aksy | 2.6 |
| Naryn | Naryn | 2.4 |
| Batken | Kadamzhayi | 1.8 |
| Batken | Batken | 1.8 |
| Issyk-Kul' | Dzhety-Oghuz | 1.6 |
| Dzhalal-Abad | Toktogul | 1.5 |
| Osh | Kara-Kul'dzha | 0.7 |
| Dzhalal-Abad | Chatkal | 0.7 |
| Naryn | Kochkor | 0.5 |
| Osh | Alayi | 0.5 |
| Talas | Kara-Buura | 0.5 |
| Naryn | At-Bashy | 0.4 |
| Naryn | Dzhumghal | 0.1 |
| Chu | Panfilov (exclave) | 0.0 |
| Naryn | Ak-Tala | 0.0 |
| Osh | Chon-Alayi | 0.0 |
| Dzhalal-Abad | Toguz-Torous | 0.0 |
| Chu | Zhayiyl (exclave) | 0.0 |

Table 3: Market Accessibility Index – expenditure potential

| **Province** | **Rayon / town / city** | **Market Access Index - expenditure potential** |
| --- | --- | --- |
| Chu | Bishkek city | 100.0 |
| Chu | Alamedin | 47.0 |
| Chu | Sokuluk | 42.9 |
| Chu | t. Tokmok | 42.8 |
| Chu | Issyk-Ata | 40.7 |
| Osh | Osh city | 40.6 |
| Dzhalal-Abad | t. Dzhalal-Abad | 38.2 |
| Issyk-Kul' | t. Karakol | 29.0 |
| Chu | Moskva | 22.7 |
| Batken | t. Suljukta | 22.3 |
| Batken | t. Kyzyl-Kyja | 21.4 |
| Talas | t. Talas | 18.9 |
| Dzhalal-Abad | t. Tash-Kumyr | 18.3 |
| Issyk-Kul' | t. Balykchy | 17.2 |
| Chu | Chu | 15.4 |
| Batken | t. Batken | 15.1 |
| Dzhalal-Abad | t. Majjluu-Suu | 14.9 |
| Naryn | t. Naryn | 14.6 |
| Chu | Zhayiyl | 14.4 |
| Chu | Panfilov | 13.7 |
| Osh | Kara-Su | 13.3 |
| Dzhalal-Abad | Nooken | 11.2 |
| Dzhalal-Abad | Suzak | 10.5 |
| Issyk-Kul' | Tiup | 8.9 |
| Osh | Naukat | 7.5 |
| Chu | Kemin | 7.2 |
| Dzhalal-Abad | Bazar-Korghon | 6.6 |
| Osh | Aravan | 6.4 |
| Osh | Uzghen | 6.0 |
| Batken | Liayiliak | 5.6 |
| Issyk-Kul' | Issyk-Kul' | 5.1 |
| Issyk-Kul' | Ak-Su | 4.5 |
| Talas | Talas | 3.8 |
| Talas | Bakayi-Ata | 3.3 |
| Issyk-Kul' | Ton | 2.9 |
| Talas | Manas | 2.9 |
| Dzhalal-Abad | Ala-Buka | 2.5 |
| Dzhalal-Abad | Aksy | 2.4 |
| Naryn | Naryn | 2.1 |
| Batken | Batken | 1.9 |
| Batken | Kadamzhayi | 1.5 |
| Issyk-Kul' | Dzhety-Oghuz | 1.3 |
| Dzhalal-Abad | t. Kara-Kul' | 0.6 |
| Dzhalal-Abad | Chatkal | 0.6 |
| Dzhalal-Abad | Toktogul | 0.5 |
| Naryn | Kochkor | 0.4 |
| Talas | Kara-Buura | 0.4 |
| Osh | Alayi | 0.4 |
| Naryn | At-Bashy | 0.3 |
| Osh | Kara-Kul'dzha | 0.3 |
| Naryn | Dzhumghal | 0.1 |
| Chu | ex. Panfilov | 0.0 |
| Naryn | Ak-Tala | 0.0 |
| Osh | Chon-Alayi | 0.0 |
| Dzhalal-Abad | Toguz-Torous | 0.0 |
| Chu | ex. Zhayiyl | 0.0 |

Chart 1: Market Accessibility Index - population potential - and total population (thousands)



Chart 2 : Market Accessibility Index – expenditure potential



Table 4 : Selection of rayon and town expenditures from BOOST (2010) (M= million, pc = per capita) (\*see data section for description and methodology)[[21]](#footnote-21)

| **Oblast** | **Rayon / town\*** | **Transport (M)** | **Capital road repair (pc)** | **Preschool education (pc)** | **Primary and secondary education (pc)** | **Tertiary education (pc)** |
| --- | --- | --- | --- | --- | --- | --- |
| Chu | Alamedin |  |  | 181 | 956 |  |
| Chu | Bishkek city | 1010 | 383 | 477 | 1476 | 1685 |
| Chu | Chu |  |  | 108 | 123 |  |
| Chu | t. Tokmok | 18 | 10 | 278 | 2550 |  |
| Chu | Issyk-Ata | 10 | 7 | 263 | 1278 |  |
| Chu | Kemin | 6 | 2 | 215 | 1761 |  |
| Chu | Moskva | 19 | 16 | 161 | 1326 |  |
| Chu | Panfilov | 9 | 6 | 66 | 1807 |  |
| Chu | Sokuluk |  |  | 90 | 1145 |  |
| Chu | Zhayiyl | 53 | 37 | 222 | 1644 |  |
| Dzhalal-Abad | Aksy | 3 | 1 | 89 | 1447 |  |
| Dzhalal-Abad | t. Tash-Kumyr | 16 | 11 | 203 | 1438 | 227 |
| Dzhalal-Abad | Ala-Buka | 3 | 1 | 162 | 1530 |  |
| Dzhalal-Abad | Bazar-Korghon | 3 | 1 | 86 | 1389 |  |
| Dzhalal-Abad | Chatkal | 3 | 0 | 477 | 2639 |  |
| Dzhalal-Abad | Nooken | 3 | 1 | 179 | 1277 |  |
| Dzhalal-Abad | t. Majjluu-Suu |  |  |  | 2346 |  |
| Dzhalal-Abad | Suzak | 18 | 13 | 77 | 1273 |  |
| Dzhalal-Abad | t. Dzhalal-Abad | 176 | 145 | 633 | 1603 | 1148 |
| Dzhalal-Abad | Toguz-Torous | 5 | 2 | 212 | 2551 |  |
| Dzhalal-Abad | Toktogul | 14 | 10 | 128 | 1597 |  |
| Dzhalal-Abad | t. Kara-Kul' | 16 | 9 | 113 | 1398 | 418 |
| Issyk-Kul' | Ak-Su | 9 | 6 | 70 | 1293 |  |
| Issyk-Kul' | t. Karakol | 95 | 84 | 447 | 1821 | 871 |
| Issyk-Kul' | Dzhety-Oghuz | 4 | 2 | 39 | 1314 |  |
| Issyk-Kul' | Issyk-Kul' | 7 | 3 | 294 | 1601 |  |
| Issyk-Kul' | t. Balykchy | 9 | 4 | 339 | 1095 |  |
| Issyk-Kul' | Tiup | 7 | 4 | 67 | 1213 |  |
| Issyk-Kul' | Ton | 3 | 1 | 83 | 1597 |  |
| Naryn | Ak-Tala | 4 | 2 | 255 | 2349 |  |
| Naryn | At-Bashy | 10 | 2 | 99 | 2012 |  |
| Naryn | Dzhumghal | 20 | 17 | 141 | 2173 |  |
| Naryn | Kochkor | 7 | 2 | 133 | 1928 |  |
| Naryn | Naryn |  |  | 153 | 1970 |  |
| Naryn | t. Naryn | 81 | 65 | 594 | 3001 | 986 |
| Osh | Alayi | 11 | 3 | 218 | 2632 |  |
| Osh | Aravan | 4 | 1 | 123 | 1432 |  |
| Osh | Chon-Alayi | 5 | 2 | 327 | 3316 |  |
| Osh | Kara-Kul'dzha | 16 | 11 | 134 | 2099 |  |
| Osh | Kara-Su | 5 | 2 | 81 | 1122 |  |
| Osh | Osh city | 120 | 90 | 348 | 1406 | 2031 |
| Osh | Naukat | 25 | 22 | 66 | 1214 |  |
| Osh | Uzghen | 37 | 31 | 59 | 1298 | 41 |
| Talas | Bakayi-Ata | 3 | 2 | 94 | 1859 |  |
| Talas | Kara-Buura | 4 | 1 | 165 | 1291 |  |
| Talas | Manas | 4 | 2 | 80 | 1598 |  |
| Talas | Talas |  |  | 66 | 1502 |  |
| Talas | t. Talas | 68 | 58 | 15 | 1189 | 516 |

Table 5 : Household rates of sector employment from NSC 2010 (see data description for more details)[[22]](#footnote-22)

| **Oblast** | **Rayon / Town** | **hh ind agri mean rayon** | **hh ind min mean rayon** | **hh ind mfg mean rayon** | **hh ind egw mean rayon** | **hh ind constr mean rayon** | **hh ind trade mean rayon** | **hh ind trans mean rayon** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Batken | Batken | 0.30 | 0.00 | 0.00 | 0.00 | 0.04 | 0.03 | 0.01 |
| Batken | Kadamzhayi | 0.27 | 0.00 | 0.01 | 0.00 | 0.04 | 0.03 | 0.01 |
| Batken | Liayiliak | 0.27 | 0.00 | 0.01 | 0.00 | 0.04 | 0.04 | 0.01 |
| Batken | t. Batken | 0.11 | 0.00 | 0.01 | 0.00 | 0.03 | 0.04 | 0.02 |
| Batken | t. Kyzyl-Kyja | 0.05 | 0.00 | 0.03 | 0.00 | 0.03 | 0.09 | 0.01 |
| Batken | t. Suljukta | 0.00 | 0.10 | 0.01 | 0.00 | 0.04 | 0.06 | 0.02 |
| Chu | Alamedin | 0.04 | 0.00 | 0.05 | 0.01 | 0.03 | 0.09 | 0.04 |
| Chu | Bishkek city | 0.00 | 0.00 | 0.04 | 0.01 | 0.02 | 0.10 | 0.03 |
| Chu | Chu | 0.21 | 0.00 | 0.03 | 0.01 | 0.02 | 0.04 | 0.02 |
| Chu | ex. Panfilov | 0.18 | 0.00 | 0.03 | 0.01 | 0.02 | 0.04 | 0.02 |
| Chu | ex. Zhayiyl | 0.08 | 0.01 | 0.04 | 0.01 | 0.02 | 0.06 | 0.02 |
| Chu | Issyk-Ata | 0.13 | 0.00 | 0.07 | 0.01 | 0.02 | 0.07 | 0.03 |
| Chu | Kemin | 0.16 | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.01 |
| Chu | Moskva | 0.21 | 0.00 | 0.05 | 0.01 | 0.02 | 0.05 | 0.02 |
| Chu | Panfilov | 0.18 | 0.00 | 0.03 | 0.01 | 0.02 | 0.04 | 0.02 |
| Chu | Sokuluk | 0.09 | 0.00 | 0.05 | 0.01 | 0.02 | 0.07 | 0.04 |
| Chu | t. Tokmok | 0.02 | 0.00 | 0.06 | 0.01 | 0.02 | 0.14 | 0.04 |
| Chu | Zhayiyl | 0.08 | 0.01 | 0.04 | 0.01 | 0.02 | 0.06 | 0.02 |
| Dzhalal-Abad | Aksy | 0.31 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.01 |
| Dzhalal-Abad | Ala-Buka | 0.37 | 0.00 | 0.01 | 0.00 | 0.03 | 0.02 | 0.01 |
| Dzhalal-Abad | Bazar-Korghon | 0.31 | 0.00 | 0.01 | 0.00 | 0.03 | 0.04 | 0.01 |
| Dzhalal-Abad | Chatkal | 0.15 | 0.03 | 0.01 | 0.00 | 0.01 | 0.04 | 0.01 |
| Dzhalal-Abad | Nooken | 0.25 | 0.01 | 0.01 | 0.00 | 0.03 | 0.05 | 0.01 |
| Dzhalal-Abad | Suzak | 0.27 | 0.00 | 0.01 | 0.00 | 0.04 | 0.04 | 0.01 |
| Dzhalal-Abad | t. Dzhalal-Abad | 0.02 | 0.00 | 0.02 | 0.00 | 0.03 | 0.10 | 0.03 |
| Dzhalal-Abad | t. Kara-Kul' | 0.01 | 0.01 | 0.02 | 0.08 | 0.09 | 0.06 | 0.02 |
| Dzhalal-Abad | t. Majjluu-Suu | 0.02 | 0.00 | 0.18 | 0.01 | 0.06 | 0.09 | 0.02 |
| Dzhalal-Abad | t. Tash-Kumyr | 0.03 | 0.01 | 0.03 | 0.02 | 0.06 | 0.07 | 0.02 |
| Dzhalal-Abad | Toguz-Torous | 0.14 | 0.04 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Dzhalal-Abad | Toktogul | 0.25 | 0.00 | 0.01 | 0.00 | 0.02 | 0.03 | 0.01 |
| Issyk-Kul' | Ak-Su | 0.35 | 0.01 | 0.00 | 0.00 | 0.01 | 0.02 | 0.01 |
| Issyk-Kul' | Dzhety-Oghuz | 0.30 | 0.01 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Issyk-Kul' | Issyk-Kul' | 0.19 | 0.00 | 0.01 | 0.00 | 0.02 | 0.06 | 0.02 |
| Issyk-Kul' | t. Balykchy | 0.01 | 0.01 | 0.03 | 0.01 | 0.05 | 0.09 | 0.04 |
| Issyk-Kul' | t. Karakol | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.10 | 0.03 |
| Issyk-Kul' | Tiup | 0.38 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Issyk-Kul' | Ton | 0.28 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Naryn | Ak-Tala | 0.26 | 0.00 | 0.01 | 0.00 | 0.03 | 0.02 | 0.01 |
| Naryn | At-Bashy | 0.27 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Naryn | Dzhumghal | 0.17 | 0.00 | 0.01 | 0.00 | 0.02 | 0.02 | 0.01 |
| Naryn | Kochkor | 0.37 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Naryn | Naryn | 0.30 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 |
| Naryn | t. Naryn | 0.01 | 0.00 | 0.01 | 0.01 | 0.02 | 0.05 | 0.03 |
| Osh | Alayi | 0.17 | 0.00 | 0.01 | 0.00 | 0.03 | 0.07 | 0.01 |
| Osh | Aravan | 0.39 | 0.00 | 0.01 | 0.00 | 0.04 | 0.03 | 0.01 |
| Osh | Chon-Alayi | 0.28 | 0.00 | 0.00 | 0.00 | 0.01 | 0.03 | 0.01 |
| Osh | Kara-Kul'dzha | 0.21 | 0.00 | 0.01 | 0.00 | 0.03 | 0.08 | 0.01 |
| Osh | Kara-Su and Osh city | 0.23 | 0.00 | 0.01 | 0.00 | 0.03 | 0.07 | 0.02 |
| Osh | Naukat | 0.40 | 0.00 | 0.01 | 0.00 | 0.03 | 0.04 | 0.00 |
| Osh | Osh city and Kara-Su | 0.23 | 0.00 | 0.01 | 0.00 | 0.03 | 0.07 | 0.02 |
| Osh | Uzghen | 0.29 | 0.00 | 0.01 | 0.00 | 0.04 | 0.06 | 0.01 |
| Talas | Bakayi-Ata | 0.35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Talas | Kara-Buura | 0.36 | 0.00 | 0.01 | 0.00 | 0.01 | 0.02 | 0.01 |
| Talas | Manas | 0.30 | 0.00 | 0.01 | 0.00 | 0.02 | 0.04 | 0.01 |
| Talas | t. Talas | 0.04 | 0.00 | 0.02 | 0.01 | 0.01 | 0.09 | 0.03 |
| Talas | Talas | 0.35 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 |

Table 6 : Household and rayon level characteristics[[23]](#footnote-23)

| **Oblast** | **Rayon / town** | **sex mean rayon** | **hhsize mean rayon** | **edu primary** | **edu sec-ondary** | **edu tertiary** | **edu lit** | **hh emp stat mean rayon** | **Elec-tricity mean rayon** | **sewage mean rayon** | **indoor water mean rayon** | **toilet mean rayon** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Batken | Batken | 0.14 | 5.98 | 0.73 | 0.52 | 0.04 | 0.97 | 0.43 | 0.97 | 0.01 | 0.00 | 0.00 |
| Batken | Kadamzhayi | 0.19 | 5.44 | 0.79 | 0.57 | 0.05 | 0.98 | 0.44 | 0.98 | 0.07 | 0.07 | 0.08 |
| Batken | Liayiliak | 0.17 | 5.81 | 0.77 | 0.55 | 0.05 | 0.97 | 0.45 | 0.97 | 0.05 | 0.00 | 0.00 |
| Batken | t. Batken | 0.22 | 5.25 | 0.76 | 0.56 | 0.12 | 0.98 | 0.36 | 0.95 | 0.05 | 0.01 | 0.04 |
| Batken | t. Kyzyl-Kyja | 0.36 | 4.24 | 0.82 | 0.53 | 0.08 | 0.98 | 0.32 | 0.98 | 0.55 | 0.29 | 0.31 |
| Batken | t. Suljukta | 0.26 | 5.60 | 0.78 | 0.61 | 0.06 | 0.98 | 0.36 | 0.98 | 0.73 | 0.13 | 0.14 |
| Chu | Alamedin | 0.42 | 3.91 | 0.85 | 0.60 | 0.13 | 0.99 | 0.39 | 0.99 | 0.50 | 0.18 | 0.39 |
| Chu | Bishkek city | 0.49 | 3.79 | 0.86 | 0.68 | 0.25 | 0.99 | 0.37 | 0.99 | 0.12 | 0.61 | 0.79 |
| Chu | Chu | 0.31 | 4.44 | 0.82 | 0.56 | 0.08 | 0.99 | 0.42 | 0.99 | 0.37 | 0.08 | 0.09 |
| Chu | Issyk-Ata | 0.37 | 4.04 | 0.82 | 0.51 | 0.10 | 0.98 | 0.42 | 0.99 | 0.51 | 0.21 | 0.25 |
| Chu | Kemin | 0.33 | 3.97 | 0.83 | 0.56 | 0.08 | 0.98 | 0.36 | 0.99 | 0.40 | 0.09 | 0.18 |
| Chu | Moskva | 0.35 | 3.97 | 0.82 | 0.48 | 0.07 | 0.99 | 0.43 | 1.00 | 0.68 | 0.14 | 0.17 |
| Chu | Panfilov | 0.33 | 4.06 | 0.82 | 0.50 | 0.06 | 0.99 | 0.40 | 0.99 | 0.28 | 0.13 | 0.15 |
| Chu | Sokuluk | 0.37 | 3.90 | 0.84 | 0.57 | 0.10 | 0.99 | 0.37 | 0.97 | 0.62 | 0.13 | 0.15 |
| Chu | t. Tokmok | 0.48 | 2.99 | 0.86 | 0.58 | 0.08 | 0.99 | 0.41 | 0.98 | 0.39 | 0.45 | 0.47 |
| Chu | Zhayiyl | 0.41 | 3.50 | 0.85 | 0.56 | 0.09 | 0.99 | 0.33 | 0.99 | 0.50 | 0.29 | 0.30 |
| Dzhalal-Abad | Aksy | 0.19 | 5.64 | 0.74 | 0.51 | 0.05 | 0.97 | 0.43 | 0.98 | 0.08 | 0.00 | 0.00 |
| Dzhalal-Abad | Ala-Buka | 0.18 | 5.50 | 0.77 | 0.54 | 0.05 | 0.97 | 0.49 | 0.98 | 0.11 | 0.00 | 0.01 |
| Dzhalal-Abad | Bazar-Korghon | 0.19 | 5.99 | 0.75 | 0.52 | 0.04 | 0.97 | 0.44 | 0.98 | 0.02 | 0.01 | 0.01 |
| Dzhalal-Abad | Chatkal | 0.20 | 5.44 | 0.76 | 0.52 | 0.06 | 0.96 | 0.35 | 0.98 | 0.41 | 0.00 | 0.00 |
| Dzhalal-Abad | Nooken | 0.22 | 5.64 | 0.77 | 0.52 | 0.05 | 0.97 | 0.41 | 0.99 | 0.21 | 0.03 | 0.04 |
| Dzhalal-Abad | Suzak | 0.20 | 6.05 | 0.76 | 0.49 | 0.04 | 0.98 | 0.42 | 0.98 | 0.33 | 0.01 | 0.01 |
| Dzhalal-Abad | t. Dzhalal-Abad | 0.38 | 4.50 | 0.84 | 0.61 | 0.13 | 0.99 | 0.31 | 0.99 | 0.48 | 0.40 | 0.43 |
| Dzhalal-Abad | t. Kara-Kul' | 0.32 | 4.17 | 0.78 | 0.55 | 0.13 | 0.98 | 0.38 | 1.00 | 0.07 | 0.76 | 0.76 |
| Dzhalal-Abad | t. Majjluu-Suu | 0.42 | 3.53 | 0.85 | 0.60 | 0.08 | 0.98 | 0.50 | 0.99 | 0.24 | 0.53 | 0.59 |
| Dzhalal-Abad | t. Tash-Kumyr | 0.30 | 4.52 | 0.78 | 0.49 | 0.07 | 0.98 | 0.33 | 1.00 | 0.56 | 0.30 | 0.31 |
| Dzhalal-Abad | Toguz-Torous | 0.22 | 5.23 | 0.77 | 0.53 | 0.07 | 0.97 | 0.33 | 0.99 | 0.05 | 0.18 | 0.18 |
| Dzhalal-Abad | Toktogul | 0.21 | 5.67 | 0.73 | 0.50 | 0.05 | 0.97 | 0.37 | 0.99 | 0.09 | 0.00 | 0.01 |
| Issyk-Kul' | Ak-Su | 0.25 | 4.77 | 0.77 | 0.50 | 0.08 | 0.98 | 0.46 | 0.99 | 0.65 | 0.01 | 0.03 |
| Issyk-Kul' | Dzhety-Oghuz | 0.25 | 4.71 | 0.78 | 0.52 | 0.08 | 0.98 | 0.42 | 0.98 | 0.72 | 0.02 | 0.03 |
| Issyk-Kul' | Issyk-Kul' | 0.32 | 4.08 | 0.81 | 0.52 | 0.11 | 0.98 | 0.40 | 0.99 | 0.52 | 0.10 | 0.11 |
| Issyk-Kul' | t. Balykchy | 0.37 | 3.99 | 0.86 | 0.63 | 0.10 | 0.98 | 0.36 | 1.00 | 0.49 | 0.31 | 0.41 |
| Issyk-Kul' | t. Karakol | 0.40 | 3.48 | 0.84 | 0.58 | 0.19 | 0.99 | 0.36 | 1.00 | 0.36 | 0.38 | 0.60 |
| Issyk-Kul' | Tiup | 0.22 | 4.79 | 0.77 | 0.49 | 0.07 | 0.97 | 0.50 | 0.99 | 0.90 | 0.00 | 0.00 |
| Issyk-Kul' | Ton | 0.23 | 4.49 | 0.81 | 0.58 | 0.07 | 0.98 | 0.39 | 0.98 | 0.46 | 0.00 | 0.02 |
| Naryn | Ak-Tala | 0.18 | 5.41 | 0.76 | 0.51 | 0.07 | 0.97 | 0.42 | 0.98 | 0.01 | 0.00 | 0.00 |
| Naryn | At-Bashy | 0.20 | 5.32 | 0.74 | 0.50 | 0.07 | 0.97 | 0.39 | 0.94 | 0.14 | 0.00 | 0.00 |
| Naryn | Dzhumghal | 0.23 | 5.06 | 0.76 | 0.51 | 0.06 | 0.97 | 0.31 | 0.97 | 0.07 | 0.00 | 0.08 |
| Naryn | Kochkor | 0.21 | 4.93 | 0.75 | 0.53 | 0.07 | 0.97 | 0.48 | 0.98 | 0.12 | 0.00 | 0.01 |
| Naryn | Naryn | 0.18 | 5.32 | 0.74 | 0.48 | 0.06 | 0.97 | 0.39 | 0.96 | 0.08 | 0.00 | 0.01 |
| Naryn | t. Naryn | 0.27 | 4.33 | 0.80 | 0.56 | 0.18 | 0.98 | 0.31 | 0.99 | 0.53 | 0.28 | 0.30 |
| Osh | Alayi | 0.20 | 5.67 | 0.74 | 0.53 | 0.06 | 0.97 | 0.38 | 0.98 | 0.05 | 0.00 | 0.00 |
| Osh | Aravan | 0.17 | 5.53 | 0.77 | 0.50 | 0.06 | 0.98 | 0.54 | 0.98 | 0.17 | 0.00 | 0.01 |
| Osh | Chon-Alayi | 0.09 | 6.16 | 0.69 | 0.46 | 0.06 | 0.97 | 0.42 | 0.98 | 0.01 | 0.00 | 0.00 |
| Osh | Kara-Kul'dzha | 0.16 | 6.35 | 0.75 | 0.54 | 0.05 | 0.98 | 0.40 | 0.96 | 0.04 | 0.00 | 0.00 |
| Osh | Kara-Su | 0.22 | 5.87 | 0.77 | 0.49 | 0.05 | 0.98 | 0.43 | 0.98 | 0.22 | 0.01 | 0.02 |
| Osh | Naukat | 0.17 | 6.14 | 0.75 | 0.52 | 0.04 | 0.97 | 0.53 | 0.98 | 0.10 | 0.00 | 0.00 |
| Osh | Osh city | 0.22 | 5.87 | 0.77 | 0.49 | 0.05 | 0.98 | 0.43 | 0.98 | 0.22 | 0.01 | 0.02 |
| Osh | Uzghen | 0.21 | 6.17 | 0.75 | 0.51 | 0.05 | 0.98 | 0.46 | 0.98 | 0.23 | 0.01 | 0.01 |
| Talas | Bakayi-Ata | 0.20 | 5.29 | 0.74 | 0.51 | 0.07 | 0.97 | 0.42 | 0.99 | 0.45 | 0.00 | 0.00 |
| Talas | Kara-Buura | 0.20 | 5.50 | 0.73 | 0.46 | 0.06 | 0.96 | 0.46 | 0.99 | 0.16 | 0.03 | 0.03 |
| Talas | Manas | 0.22 | 5.52 | 0.76 | 0.48 | 0.06 | 0.97 | 0.46 | 0.98 | 0.13 | 0.00 | 0.00 |
| Talas | t. Talas | 0.33 | 3.99 | 0.80 | 0.55 | 0.15 | 0.98 | 0.35 | 0.99 | 0.62 | 0.20 | 0.23 |
| Talas | Talas | 0.18 | 5.38 | 0.74 | 0.52 | 0.06 | 0.97 | 0.44 | 0.98 | 0.36 | 0.00 | 0.00 |

Table 7: Education characteristics from UN District 2011 Profile (\* = primary student data not provided)[[24]](#footnote-24)

| **Oblast** | **Rayon / city** | **Students (total)** | **Average Students By School** | **Average Students By Teacher** | **Schools Per 10.000** |
| --- | --- | --- | --- | --- | --- |
| Batken | Batken region | 17926 | 358.52 | 14.81 | 5.73 |
| Batken | Kadamjai region | 36172 | 441.12 | 14.74 | 4.18 |
| Batken | Leilek district | 25711 | 395.55 | 14.02 | 5.49 |
| Chu | Alamudun\* | 20342 | 581.20 | 21.12 | 2.49 |
| Chu | Bishkek city | 140212 | 1062.21 | 21.63 | 1.77 |
| Chu | Chui rayon | 8983 | 320.82 | 16.13 | 2.91 |
| Chu | Issyk-Ata region | 24861 | 469.08 | 19.27 | 4.11 |
| Chu | Kemin district | 9373 | 275.68 | 13.53 | 8.08 |
| Chu | MOSCOW DISTRICT | 16330 | 453.61 | 19.63 | 4.45 |
| Chu | Panfilov district | 7527 | 289.50 | 14.67 | 6.33 |
| Chu | Sokuluk DISTRICT | 30244 | 593.02 | 20.77 | 3.37 |
| Chu | Jayil DISTRICT | 18215 | 404.78 | 19.42 | 5.00 |
| Dzhalal-Abad | Aksy DISTRICT | 26748 | 411.51 | 12.71 | 4.46 |
| Dzhalal-Abad | Alabuka DISTRICT | 20368 | 442.78 | 15.84 | 5.32 |
| Dzhalal-Abad | Bazarkorgon region | 32430 | 484.03 | 15.49 | 4.84 |
| Dzhalal-Abad | Chatkal DISTRICT | 5577 | 293.53 | 10.66 | 9.10 |
| Dzhalal-Abad | Nooken region | 28249 | 513.62 | 20.47 | 4.07 |
| Dzhalal-Abad | Suzak district | 50771 | 445.36 | 16.78 | 3.61 |
| Dzhalal-Abad | TOGUZ-TOROUSKY DISTRICT | 5696 | 406.86 | 12.71 | 6.34 |
| Dzhalal-Abad | Toktogul rayon | 20851 | 508.56 | 16.51 | 3.82 |
| Issyk-Kul' | Ak-Suu district | 12641 | 371.79 | 11.46 | 2.82 |
| Issyk-Kul' | Jeti-Oguz district | 17508 | 427.02 | 12.47 | 5.07 |
| Issyk-Kul' | Issyk-Kul district | 16871 | 496.21 | 13.75 | 2.96 |
| Issyk-Kul' | Tyup DISTRICT | 12691 | 352.53 | 11.87 | 6.15 |
| Issyk-Kul' | Ton district\* | 10749 | 358.30 | 12.10 | 6.27 |
| Naryn | AK-Talin region\* | 7846 | 435.89 | 8.67 | 6.00 |
| Naryn | AT BASHYNSKY DISTRICT\* | 11457 | 545.57 | 11.28 | 4.28 |
| Naryn | Jumgal DISTRICT\* | 9078 | 378.25 | 11.08 | 6.00 |
| Naryn | Kochkor region | 14160 | 429.09 | 11.28 | 5.72 |
| Naryn | Naryn rayon | 10491 | 317.91 | 10.33 | 4.34 |
| Osh | Alay district | 15728 | 296.75 | 10.44 | 8.87 |
| Osh | Aravan rayon | 24109 | 430.52 | 13.38 | 5.72 |
| Osh | Chon-Alai rayon\* | 7004 | 412.00 | 10.52 | 7.64 |
| Osh | KARA-KULZHINSKY DISTRICT | 18937 | 350.69 | 14.71 | 6.26 |
| Osh | Karasuu region | 66732 | 501.74 | 16.41 | 4.05 |
| Osh | Osh city\* | 51894 | 894.72 | 20.58 | 2.40 |
| Osh | Nookat area | 49788 | 452.62 | 13.11 | 4.69 |
| Osh | Uzgen district | 50829 | 488.74 | 17.01 | 4.72 |
| Talas | Bakai-Ata rayon\* | 10049 | 436.91 | 11.99 | 5.48 |
| Talas | KARA-BUURINSKY DISTRICT\* | 12815 | 474.63 | 14.97 | 4.72 |
| Talas | Manas rayon | 6293 | 262.21 | 12.59 | 7.39 |
| Talas | Talas district | 11991 | 386.81 | 12.09 | 3.60 |

Table 8 : Health characteristics from UN District 2011 Profile[[25]](#footnote-25)

| **Province** | **English Name** | **Hospitals** | **Primary Health care** | **Hospitals (pc)** | **Health Workers (per 1000)** | **Doctors** | **Nurses** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Batken | Batken region | 3 | 4 | 3.44 | 7.71 | 115 | 558 |
| Batken | Kadamjai region | 5 | 4 | 2.55 | 6.42 | 194 | 1065 |
| Batken | Leilek district | 3 | 2 | 2.53 | 5.89 | 133 | 564 |
| Chu | Alamudun DISTRICT | 8 | 2 | 5.69 | 5.60 | 300 | 488 |
| Chu | Bishkek | 22 | 50 | 2.95 | 8.18 | 2792 | 3302 |
| Chu | Chui rayon | 1 | 1 | 1.04 | 2.59 | 57 | 192 |
| Chu | Issyk-Ata region | 3 | 1 | 2.33 | 4.88 | 185 | 444 |
| Chu | Kemin district | 3 | 2 | 7.13 | 6.09 | 82 | 174 |
| Chu | MOSCOW DISTRICT | 1 | 3 | 1.24 | 4.92 | 124 | 274 |
| Chu | Panfilov district | 2 | 1 | 4.87 | 5.36 | 47 | 173 |
| Chu | Sokuluk DISTRICT | 2 | 3 | 1.32 | 3.45 | 157 | 365 |
| Chu | Jayil DISTRICT | 2 | 8 | 2.22 | 7.73 | 186 | 509 |
| Dzhalal-Abad | Aksy DISTRICT | 1 | 1 | 0.69 | 4.19 | 124 | 487 |
| Dzhalal-Abad | Alabuka DISTRICT | 1 | 1 | 1.16 | 6.45 | 83 | 475 |
| Dzhalal-Abad | Bazarkorgon region | 3 | 1 | 2.17 | 5.30 | 146 | 588 |
| Dzhalal-Abad | Chatkal DISTRICT | 2 | 2 | 9.57 | 9.43 | 23 | 174 |
| Dzhalal-Abad | Nooken region | 5 | 2 | 3.70 | 6.29 | 154 | 697 |
| Dzhalal-Abad | Suzak district | 4 | 3 | 1.27 | 3.41 | 208 | 866 |
| Dzhalal-Abad | TOGUZ-TOROUSKY DISTRICT | 1 | 3 | 4.53 | 8.96 | 39 | 159 |
| Dzhalal-Abad | Toktogul rayon | 7 | 3 | 6.52 | 4.26 | 90 | 367 |
| Issyk-Kul' | Ak-Suu district | 1 | 2 | 0.83 | 2.35 | 52 | 231 |
| Issyk-Kul' | Jeti-Oguz district | 2 | 7 | 2.47 | 4.37 | 72 | 281 |
| Issyk-Kul' | Issyk-Kul district | 2 | 4 | 1.74 | 3.10 | 112 | 244 |
| Issyk-Kul' | Tyup DISTRICT | 1 | 2 | 1.71 | 4.76 | 50 | 229 |
| Issyk-Kul' | Ton district | 1 | 2 | 2.09 | 4.47 | 52 | 162 |
| Naryn | AK-Talin region | 1 | 1 | 3.33 | 6.94 | 29 | 179 |
| Naryn | AT BASHYNSKY DISTRICT | 1 | 1 | 2.04 | 6.55 | 54 | 267 |
| Naryn | Jumgal DISTRICT | 2 | 2 | 5.00 | 6.00 | 47 | 193 |
| Naryn | Kochkor region | 1 | 1 | 1.73 | 5.95 | 75 | 268 |
| Naryn | Naryn rayon | 0 | 1 | 0.00 | 2.66 | 37 | 165 |
| Osh | Alay district | 2 | 1 | 3.35 | 6.03 | 66 | 294 |
| Osh | Aravan rayon | 1 | 1 | 1.02 | 8.50 | 143 | 689 |
| Osh | Chon-Alai rayon | 1 | 1 | 4.50 | 8.68 | 19 | 174 |
| Osh | KARA-KULZHINSKY DISTRICT | 3 | 1 | 3.48 | 5.23 | 92 | 359 |
| Osh | Karasuu region | 4 | 1 | 1.22 | 4.82 | 370 | 1211 |
| Osh | Osh | 9 | 5 | 3.72 | 8.23 | 689 | 1301 |
| Osh | Nookat area | 2 | 2 | 0.85 | 6.44 | 214 | 1296 |
| Osh | Uzgen district | 4 | 3 | 1.82 | 5.55 | 236 | 985 |
| Talas | Bakai-Ata rayon | 1 | 2 | 2.38 | 5.26 | 40 | 181 |
| Talas | KARA-BUURINSKY DISTRICT | 2 | 1 | 3.49 | 5.31 | 66 | 238 |
| Talas | Manas rayon | 1 | 2 | 3.08 | 3.88 | 21 | 105 |
| Talas | Talas district | 1 | 1 | 1.16 | 3.28 | 61 | 222 |

Table 9 : Ministry of Health (downloaded from UN COD-FOD)[[26]](#footnote-26)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Oblast (Province)** | **Admin Name** | **#Bed** | **Marternal Mortality rate (per 100,000 live birth)** | **Infant mortality rate (per 1,000 live births)** |
| Batken oblast | Batken region | 400 | 128.3 | 30.8 |
| Batken oblast | Kadamjai region | 427 | - | 17 |
| Batken oblast | Leilek region | 362 | 37.8 | 24.6 |
| Djalal-Abad oblast | Aksy region | 393 | 96 | 9.6 |
| Djalal-Abad oblast | Ala-Buka region | 192 | 155.1 | 23.3 |
| Djalal-Abad oblast | Bazar-Korgon region | 330 | 30 | 20.2 |
| Djalal-Abad oblast | Nooken region | 401 | - | 16.4 |
| Djalal-Abad oblast | Suzak region | 537 | 61.8 | 16.9 |
| Djalal-Abad oblast | Toguz-Toro region | 70 | 175.7 | 22.7 |
| Djalal-Abad oblast | Toktogul region | 277 | 43.2 | 18.1 |
| Djalal-Abad oblast | Chatkal region | 96 | - | 12.4 |
| Issyk-Kul oblast | Ak-Suu region | 151 | 126.3 | 12.7 |
| Issyk-Kul oblast | Jeti-Oguz region | 117 | 169.1 | 22.5 |
| Issyk-Kul oblast | Issyk-Kul region | 95 | - | 24.5 |
| Issyk-Kul oblast | Ton region | 95 | - | 11.3 |
| Issyk-Kul oblast | Tup region | 140 | 70.7 | 16 |
| Osh oblast | Alai region | 190 | 53.1 | 18.5 |
| Osh oblast | Aravan region | 320 | 159.7 | 17.6 |
| Osh oblast | Kara-Suu region | 680 | 49.4 | 18.1 |
| Osh oblast | Kara-Kulja region | 287 | - | 19.2 |
| Osh oblast | Nookat region | 645 | 48.9 | 24.7 |
| Osh oblast | Uzgen region | 570 | 52.1 | 19.8 |
| Osh oblast | Chon-Alai region | 180 | - | 24.7 |
| Chui oblast | Alamudun region | 650 | 64.2 | 40.9 |
| Chui oblast | Jaiyl region | 345 | 39.8 | 16.6 |
| Chui oblast | Panfilov region | 85 | - | 18.9 |
| Chui oblast | Sokuluk region | 200 | 53.9 | 21.6 |
| Chui oblast | Kemin region | 155 | - | 16.1 |
| Chui oblast | Moscow region | 171 | 48.2 | 26.9 |
| Chui oblast | Chui region | 130 | 201.6 | 14.9 |
| Chui oblast | Issyk-Ata region | 270 | 29.7 | 18.2 |
| Nayrn Oblast | Ak-Talaa region | 70 | - | 14.1 |
| Nayrn Oblast | At-Bashy region | 115 | 225.7 | 11.8 |
| Nayrn Oblast | Jumgal region | 100 | - | 21 |
| Nayrn Oblast | Kochkor region | 116 | - | 22.4 |
| Nayrn Oblast | Naryn region | 502 | 172.6 | 12 |
| Talas oblast | Bakai-Ata region | 70 | 205.8 | 13.1 |
| Talas oblast | Kara-Buura region | 155 | - | 24.3 |
| Talas oblast | Manas region | 45 | 250.6 | 11.7 |
| Talas oblast | Talas region | 60 | 51.8 | 13.1 |

Table 10: Ill and disease rate (\* available for rayon only)[[27]](#footnote-27)

| **Oblast** | **Rayon / town** | **Ill (%)** | **Infect Parasite Registered (%)** | **Blood Circulation Registered (%)** |
| --- | --- | --- | --- | --- |
| Batken | Batken | 0.38\* | 1.59 | 1.91 |
| Batken | Kadamzhayi | 0.46 | 2.17 | 6.90 |
| Batken | Liayiliak | 0.29 | 1.23 | 3.63 |
| Batken | t. Batken | \* | 1.59 | 1.91 |
| Batken | t. Kyzyl kia | 0.45 | 1.12 | 5.52 |
| Batken | t. Suljukta | 0.46 | 1.64 | 2.92 |
| Chu | Alamedin | 0.25 | 0.76 | 4.36 |
| Chu | Bishkek city | 0.65 | 2.15 | 11.67 |
| Chu | Chu | 0.47 | 1.31 | 7.31 |
| Chu | Issyk-Ata | 0.24 | 0.49 | 4.66 |
| Chu | Kemin | 0.17 | 0.69 | 2.96 |
| Chu | Moskva | 0.33 | 0.63 | 5.07 |
| Chu | Panfilof | 0.28 | 0.66 | 4.87 |
| Chu | Sokuluk | 0.42 | 0.74 | 5.69 |
| Chu | t. Tokmok | 0.23 | 0.44 | 4.71 |
| Chu | Zhayiyl | 0.21 | 0.94 | 3.70 |
| Dzhalal-Abad | Aksy | 0.21 | 1.10 | 3.98 |
| Dzhalal-Abad | Ala-Buka | 0.18 | 1.24 | 1.20 |
| Dzhalal-Abad | Bazar-Korghon | 0.32 | 2.48 | 3.66 |
| Dzhalal-Abad | Chatkal | 0.18 | 0.94 | 3.67 |
| Dzhalal-Abad | Nooken | 0.17 | 0.76 | 1.35 |
| Dzhalal-Abad | Suzak kok jangak | 0.23 | 0.50 | 2.22 |
| Dzhalal-Abad | t. Dzhalal-Abad | 0.53 | 0.90 | 11.24 |
| Dzhalal-Abad | t. Kara-Kul' | 0.48 | 1.89 | 4.25 |
| Dzhalal-Abad | t. Majjluu-Suu | 0.64 | 3.72 | 5.24 |
| Dzhalal-Abad | t. Tash-Kumyr | 0.35 | 2.33 | 5.48 |
| Dzhalal-Abad | Toguz-Torous | 0.23 | 0.74 | 3.08 |
| Dzhalal-Abad | Toktogul | 0.21 | 1.17 | 4.18 |
| Issyk-Kul' | Ak-Su | 0.24 | 0.52 | 5.38 |
| Issyk-Kul' | Dzhety-Oghuz | 0.17 | 0.50 | 2.91 |
| Issyk-Kul' | Issyk-Kul' | 0.35 | 0.30 | 2.68 |
| Issyk-Kul' | t. balykchi | 0.35 | 0.94 | 4.72 |
| Issyk-Kul' | t. karakol | 0.55 | 0.76 | 4.91 |
| Issyk-Kul' | Tiup | 0.20 | 1.20 | 2.20 |
| Issyk-Kul' | Ton | 0.17 | 0.61 | 2.27 |
| Naryn | Ak-Tala | 0.20 | 0.47 | 4.17 |
| Naryn | At-Bashy | 0.16 | 0.45 | 2.72 |
| Naryn | Dzhumghal | 0.35 | 0.96 | 4.60 |
| Naryn | Kochkor | 0.17 | 0.52 | 2.23 |
| Naryn | Naryn | 0.26 | 3.11 | 2.61 |
| Naryn | t. Naryn | 0.69 | 2.40 | 9.57 |
| Osh | Alayi | 0.40 | 0.83 | 5.56 |
| Osh | Aravan | 0.43 | 0.98 | 2.98 |
| Osh | Chon-Alayi | 0.22 | 0.50 | 2.51 |
| Osh | Kara-Kul'dzha | 0.34 | 0.76 | 4.39 |
| Osh | Kara-Su | 0.13 | 0.33 | 1.21 |
| Osh | Naukat | 0.26 | 0.77 | 3.41 |
| Osh | Osh city | 0.26 | 0.73 | 3.16 |
| Osh | Uzgen | 0.18 | 0.86 | 1.68 |
| Talas | Bakayi-Ata | 0.16 | 0.32 | 1.63 |
| Talas | Kara-Buura | 0.13 | 0.43 | 1.41 |
| Talas | Manas | 0.15 | 0.84 | 2.40 |
| Talas | t. Talas | 0.21 | 0.62 | 2.36 |
| Talas | Talas | 0.17 | 0.29 | 2.20 |

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   Disclaimer: The boundaries, colors, denominations and any other information shown on these maps do not imply, on the part of The World Bank Group, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries. [↑](#footnote-ref-1)
2. Environmental Specialist, Development Research Group, World Bank [↑](#footnote-ref-2)
3. Notably, the economy of the populated place also is a significant factor in gains from trade. In addition, a study of China concluded that access to market explained a significant portion of the interindividual differences in returns to labor (Hering and Poncet, 2010). [↑](#footnote-ref-3)
4. As the market size increases, so does the potential for specialization and economies of scale. This may be one reason that a large share of development projects are in the transport sector. [↑](#footnote-ref-4)
5. Notably, three improvements are mentioned. First, per capita growth in the benefitted area was 3 times of the control area. Second, the decline in the extreme poverty in project villages was 2.5 more than that of control villages. Third, areas under perishable but high value products like vegetables, onion, spices and oilseeds, increased in project areas by about 10 percent while the same declined in control villages by about 18 percent. [↑](#footnote-ref-5)
6. Also, for example, see Fujita and Mori 2005 [↑](#footnote-ref-6)
7. See Skoufias and Katayama, 2011 [↑](#footnote-ref-7)
8. Market Accessibility is defined and measured with two different inputs: population potential and expenditure potential. See Empirical framework Section 4. [↑](#footnote-ref-8)
9. The number of observations is 56 and it also includes differentiating two exclaves from the rayons: Paniflov and Zhayiyl. [↑](#footnote-ref-9)
10. Kindly provided by M. Mahadevan and N. Yoshida [↑](#footnote-ref-10)
11. Pri = dum7 + dum8 + dum9. Sec = dum5 + dum6. Ter = dum1 + dum2. Voc = dum3 + dum4 [↑](#footnote-ref-11)
12. The UN district profile provides 40 districts and two cities: Osh city and Bishkek city. A selection of the districts in the report does not have the number of primary students: Alamudun, Ton, Ak-Talin, At Bashynsky, Jumgal, Chon-Alai, Osh city, Bakai-Ata, and Kara-Buurinsky. [↑](#footnote-ref-12)
13. BOOST was constructed on the basis of Ministry of Finance treasury data kindly provided by Karen Stephanie Coulibaly [↑](#footnote-ref-13)
14. The following parameters are suggested in the accessibility model from previous work (Deichmann 1997): costdistance threshold = 3 hours, cost/distance decay exponent for the negative exponential model of 1.5; and cost/distance to the point of inflection of the distance decay function at 90; and input weights transformation – inscale a square root transformation on the input weights: 2 and choose the exponent to compute square roots: 0.5. [↑](#footnote-ref-14)
15. See Mahadevan, M., and N. Yoshida. Poverty Mapping in Kyrgyz Republic. Mimeo for more details. [↑](#footnote-ref-15)
16. Project to Mollweide coordinates with 74.5 E as the central meridian and use ESRI ArcGIS calculate geometry to calculate segment distance. [↑](#footnote-ref-16)
17. Likewise all other derived information from the census 2009 for the four Bishkek rayons is merged by population weights. [↑](#footnote-ref-17)
18. This result confirms the importance of population potential even in the absence of per capita expenditure data. [↑](#footnote-ref-18)
19. A bias may exist since the level of education for Osh city is not displayed. [↑](#footnote-ref-19)
20. Although this report focuses on domestic connectivity, the World Development Report 2009 (World Bank 2009) discusses connectivity at an international level. Small area countries benefit from openness to regional trade due to the lesser capacity to compete in the global market for goods and services. [↑](#footnote-ref-20)
21. We are currently requesting the official data. [↑](#footnote-ref-21)
22. We are currently requesting the official figures from the NSC. [↑](#footnote-ref-22)
23. We are currently requesting the official figures from the NSC. [↑](#footnote-ref-23)
24. We are currently requesting the official figures from the NSC. [↑](#footnote-ref-24)
25. We are currently requesting the official figures from the NSC. [↑](#footnote-ref-25)
26. We are currently requesting the official data. [↑](#footnote-ref-26)
27. We are currently requesting official data [↑](#footnote-ref-27)