Poor Settlements in Bangladesh

an assessment of 29 UPPR towns and cities

First Print: **December 2011**

Second Print: **October 2013**

Urban Partnerships for Poverty Reduction (UPPR)

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Second Print by

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Preface by UNDP Country Director

Since its inception in 2008, *Urban Partnerships for Poverty Reduction (UPPR*) has grown to be Bangladesh's principal urban poverty reduction initiative. Currently active in 23 and soon 30 major towns and cities, it provides services to more than 3.5 million people living in some of the country's most challenged communities and aims to secure sustained improvements in the livelihoods and living conditions of the urban poor. This is an ambitious and sizeable undertaking. The Project's annual budget is in excess of USD 20 million and has some 450 staff working in communities, at the town level and in its head office in Dhaka.

Ensuring first rate delivery lies at the heart of UPPR's operations. This requires first rate systems and first rate knowledge, and therefore, first rate data. The pursuit of timely, relevant and reliable information has been a priority for UPPR's management, which has therefore designed a comprehensive framework of survey instruments. The Settlement and Vacant Land Mapping (SLM) exercise, on which this report is based, is just one of these methods. The SLM process empowered local communities by engaging them in mapping poor settlements, under the guidance of UPPR staff and its lead local partner, the Centre for Urban Studies. The dataset, covering 29 towns and cities, is a robust and flexible information resource. The results offer a comprehensive *snap-shot* of living conditions and the pattern of deprivation in each poor settlement that can also be summarized at the ward and town levels.

This report provides a major research output, offering a welfare profile for poor settlements overall and by investigating the underlying relationships at work through a series of town comparisons. Counterpart individual town reports and ward-level atlases have also been prepared. These will prove vital in facilitating better planning and use of resources, and the identification of needs by communities themselves, by project staff and by Mayors and municipal policymakers.

Indeed, the policy implications of these reports and mapping tools are considerable. They provide a solid evidential base to inform national decision-making and to challenge commonly held assumptions, and hence, build a new commitment to urban regeneration, and where necessary, the consensual resettlement of slum dwellers. Equally, local decision-makers might better understand the plight and service needs of the poor and recognize their rights as residents of cities and towns.

In the closing years of the 16th century the English philosopher, Francis Bacon wrote that "*Knowledge is power*". Some 400 years later, Former General Secretary of the United Nations, Kofi Annan, noted in an address to the General Assembly that *"Knowledge is power and information is liberating*". Through this, and a series of other informational initiatives, UPPR is seeking to permanently empower and liberate Bangladesh's challenged urban communities.

Stefan Priesner
UNDP Country Director

Foreword by UPPR National Project Director

Globally, almost one billion people, or some 32 per cent of the urban population, live in poor settlements, better known as *slums*. These settlements are growing; it is said that by 2030 the world's urban slum population will swell to about two billion people if no action is taken. Bangladesh is no exception to this trend. A mapping exercise in six cities in 2005 found that about 35 per cent of the urban population lived in slum conditions.

The Urban Partnerships for Poverty Reduction (UPPR) project seeks to improve the living conditions of three million urban poor and extreme poor people, especially women and girls. The first step in achieving this is to accurately locate the poor. UPPR sought to do this by designing and then carrying out a process of settlement and vacant land mapping (SLM) in 29 of the 30 cities and towns in which the project is operating. Using a participatory process that engages residents of poor settlements, SLM locates, characterizes and maps the poverty status of all poor settlements in the city.

This report presents comparative national-level findings of the SLM dataset for the UPPR cities and towns. It is accompanied by individual reports for each of the 29 cities and towns prepared by UPPR's national partner institution, the Centre for Urban Studies. These reports will be useful to a variety of l stakeholders at community, town and national levels. Specifically:

- **National-level policy-makers** will gain an improved understanding of the scale and nature of urban poverty, enabling better designed and informed policies.
- **Town-level decision-makers** as well as **development partners** can use the findings to accurately direct resources for infrastructure and services to the most critical wards and settlements as well as to better quantify the impact of developments that would require relocation of households.
- **Ward Councillors and community leaders** can use this report as a tool to advocate for improved infrastructure and services for their constituencies.
- **Academics** can improve their understanding of the spatial distribution of characteristics of urban poverty and use the maps and database to construct research sample frames.

In focusing on the national picture, this report will be of most relevance to central government policymakers, researchers and opinion-formers. However, the methodologies it sets out will also be interest to the other stakeholders referenced above. It is important that the wider SLM exercise and approach are seen as a package of tools to provide an effective evidential base for joined-up decision-making within the whole urban sector.

I wish to thank all those who have contributed to this report and the wider series of town studies and the overall SLM exercise. These include the staff of Centre for Urban Studies, UPPR headquarters, UNDP Bangladesh Country Office, Mayors, Ward Councillors and the communities we all serve.

Ali Ahmed
UPPR National Project Director

Table of Contents

List of Figures

List of Tables

Glossary

Base Map	A map showing certain fundamental information, used as a base upon which additional data of specialized nature are compiled or marked, and from which maps showing specialized information can be prepared.
Civic Facilities	Amenities available to public for common use that include community centres, primary schools, play grounds, parks etc.
Score card	Participatory survey tool used to assess the services and situation of poor settlements.
Geographic Information System	A system that captures, stores, analyzes, manages and presents data with reference to geographic locations. Can be used for scientific investigations, resource management, and development planning.
Hazard	A situation that poses a potential threat to life, health, property, or environment. Hazard and vulnerability interact together to create a disaster.
Land owner	An individual or group of people who has a legal claim on land or an immovable property. Depending on the nature of property rights, a land owner has the right to use, sell, rent, transfer, exchange or destroy its property.
Nature of Housing Unit	The structural conditions of houses in the settlement. For example, *permanent* means raised floor, brick wall and tile/tin roof; *semi-permanent* means raised floor, bamboo wall and tin roof; *temporary* means mud floor, bamboo wall and thatched or polythene roof
Occupation	A job or profession. The most common occupations in poor communities include rickshaw pullers, garment workers, drivers, mason, tailors, mechanic, day labourers, hawkers, transport workers, retailers/traders and domestic helpers.
Poor Settlement	A group of households living in a geographically identifiable area which is characterized by one or more of the following: (i) houses constructed of temporary materials that do not adequately protect occupants from the elements; (ii) danger from flooding; (iii) lack of access to potable water and bathing facilities; (iv) lack of sanitation facilities; (v) insecurity of tenure; (vi) high density slums in the inner city areas; (vii) inadequate solid waste management; (viii) lack of electricity; and (ix) lack of access roads and drainage.
Tenure	The term used to signify the relationship between tenant and landlord or property owner. Tenure differs from ownership and is used to describe the conditions by which land is occupied or used.
Secure Tenure	Protection from involuntary and arbitrary eviction
Social	Most common social problems or the cause for such problems in poor settlements are early marriage, dowry system, polygamy, addiction to hard

problems	drugs, domestic violence, unemployment, social unrest and insecurity.
Vulnerability	The degree to which people, property, resources, systems, and cultural, economic, environmental and social activity is susceptible to harm, degradation or destruction.
Physical vulnerability	Vulnerability in the built environment, e.g. soil erosion, floods, earthquakes, landslides, etc.
Social vulnerability	Vulnerability experienced by people related to their social, economic and political situation.

Executive Summary

1. Context and Rationale

The development and rehabilitation of the urban sector has emerged as majority policy priority in Bangladesh. Playing a central role within the Country's economic growth model, cities and towns have attracted large and sustained population flows from the rural periphery. While essential to the economy and the wider developmental process, burgeoning urban populations have given rise to severe economic and social deprivations. Conditions within slum areas are especially challenging, and UPPR was established in 2008 to specifically improve living conditions livelihoods in these communities.

Detailed data on urban Bangladesh's urban areas is limited in scope and quality. This report draws on a major survey instrument, the Settlement and Vacant Land (SLM) mapping exercise, to provide a complete urban dataset for the areas covered by UPPR. The SLM's unit of analysis is the settlement level, and the data were compiled by local communities themselves – recording demographic markers and scoring living conditions for 48,404 settlements. The rationale is to provide a robust multi-purpose dataset, capable of supporting management and the policy development process, and in permitting research into the needs of the poor and nature of the deprivations they face. Moreover, the dataset is purposefully layered – at settlement, at ward and at national level - to meet the needs of a variety of users.

This report is a major research resource, providing national level analyses via aggregate results and a series of inter-town comparisons. As such its purpose is to enable further research, prompt policy discussions and inform decision making. Its methodology includes the derivation of a single unified measure of welfare – the Settlement Living Conditions Index (SLCI) based on 16 indicators speared across a variety of domains. In turn, five sub-indices representing the main welfare dimensions are provided: Tenure and Security Conditions, Water and Sanitation Conditions, Infrastructure Conditions, Economic Conditions, and Social and Environmental Conditions. These tools are used to identify variations in welfare and to offer an estimate of relative poverty for urban areas. Additionally, the report employs statistical testing methods to examine any relationships between settlements' demographic characteristics and living conditions.

2. Key Findings

The demographic *snapshot* finds that poor urban settlements, on average, are: relatively small in size, with a median of 12 households and mean of 26; small in area with high population densities; and are long established, with 80 % of settlements being over 21 years of age. Many of these findings are contradictory to expectations and genuinely revealing. For example, it seems in spite of very significant population flows and densities, migrants tend to either, settle in and or cluster around, established urban centres.

The living conditions indices underline the extent of and breadth of deprivation suffered within urban Bangladesh. The overall mean SCLI value is fond to be 41, with values ranging between 36 and 58 (the SLCI is scaled between 0 and 100, with higher values representing greater levels of welfare). Particularly weak overall values are recorded on the Water

Sanitation Sub-Index with a mean of 31, with a range of values of between 19 and 46; Infrastructure Conditions with a mean of 39, and range of 30 to 51; and Tenure Security at 49, but with an expansive range of 25 to 78. Although there is considerable variation in the data, these three areas standout as priorities, this is both in terms of the overall data and the town level results.

There is some evidence of systemic differences between City Corporations and Pourashavas on each of conditions sub-indices. City Corporations generally score better on each living conditions, but poorly on Tenure Security. Each of these variations is statistically significant. This pattern has some intuitive sense, given the high resource allocations to these more established cities, but also the greater completion for land. Efforts to explore the distributional dimensions, and provide a relativistic measure of poverty revealed that the poorest qualities (measured by the SLCI) were over-represented in the larger settlements.

Analysis of the underlying relationships using Spearman's Rank Correlation tests reveals a complex picture with some variation between the overall results and those at the town level, underlining the need for more disaggregated analyses. While the report is careful not to attribute causation, the results reveal varying but also strong, associations between most of the demographic markers and living conditions. On settlement area and population size, the relationships with living conditions sub-indices are generally negative and significant. This confirms the earlier finding that larger settlements tend to have lower levels of welfare. However, the magnitudes and the signs vary. With regard to population density, the variability is greater, but overall, the relationship is again negative and statistically significant. On settlement age, the relationship is reversed. Living conditions are positively associated with age, and interestingly, this also includes Tenure and Security Conditions.

3. Conclusions

The report closes by offering three sets of conclusions. Firstly, on future research priorities, the report highlights the topics of migration and the clustering of new arrivals in urban areas; land use within settlements; and the connections between risk, vulnerability and resilience. It recommends each of these areas be examined though separate studies.

Second, it offers policy recommendations addressed to different levels of government. At national level, the use of SLM data may provide a useful tool for resource allocation and the prioritization of major projects. At the town and local levels, infrastructure and water sanitation investments are recommended as making the most substantial contributions to improved living conditions. Additionally, the report finds that disaggregated SLM data should be employed to support local planning processes and allocation instruments.

In relation to UPPR operations, the report finds the SLM methodology and dataset is a valuable management resource. It advocates for the use of SLM data to improve the targeting and allocation of funds, the provision of better management information, and in the design and implementation of new monitoring and evaluations tools.

Chapter One: Introduction

This introductory chapter presents the rationale and the objectives of the Settlement and Land Mapping (SLM) exercise and describes the purpose and structure of the report.

1.1. Rationale

The Urban Partnerships for Poverty Reduction (UPPR) Project, started in early 2008 and continuing to 2015, covers 23 and will soon expand to 30 towns and cities, including all city corporations (see *Table 1* below). As such, it is the largest urban poverty reduction intervention in Bangladesh, and possibly the world. It incorporated and continues to serve eleven towns and cities that had been covered under the earlier Local Partnership for Urban Poverty Alleviation Project (LPUPAP). UPPR considerably expanded the scope of activities of LPUPAP and its coverage is far greater. Where LPUPAP targeted a subset of settlements, particularly those that were more stable and established, UPPR targets all of the poor settlements in the town, with priority given to those that are the most poor and vulnerable.

Table 1: UPPR Project Towns by Division

Barisal Division	Chittagong Division	Dhaka Division	Khulna Division	Rajshahi Division	Rangpur Division	Sylhet Division
Barisal CC	Chandpur†	Dhaka CC	Jessore	Bogra	Dinajpur	Habiganj
	Chittagong CC	Faridpur†	Jhenaidah†	Chapai Nawabganj	Rangpur CC	Sylhet CC
	Comilla CC	Gazipur CC	Khulna CC	Naogaon		
	Feni†	Gopalganj	Khustia	Pabna†		
		Mymensingh	Satkhira†	Rajshahi CC		
		Naray'ganj CC		Saidpur†		
		Savar		Sirajganj		
		Tangail				
		Tongi				

† UPPR expansion towns

Without reliable and current data on the number, size, and location of these poor settlements, UPPR needed a reliable survey instrument to identify all of the poor settlements in its cities and towns. In addition, it required a method that was easily implemented and one could be *owned* and understood by the communities themselves. The Settlement and Vacant Land Mapping (SLM) approach was pioneered in Sri Lanka in 2002. It was introduced to UPPR by a consultant with expertise in SLM and then tested and adapted to the Bangladeshi context. A key feature of the method is its active inclusion of local stakeholders, including government, and organized community and women's groups from poor settlements, within the process.

The approach and subsequent dataset serves a variety of purposes. It offers both a means of understanding the challenges faced by urban policymakers and allows UPPR to complete its mission: improving the living conditions and livelihoods of three million poor and extreme poor people. The latter is not merely in terms of resource planning allocation, but also in diagnosing the relationship at work.

1.2. Objectives of the SLM

The purpose of SLM is five-fold:

- Identify and characterize the living conditions poor settlements to enable evidence-based targeting of the most vulnerable settlements and households by UPPR and others;
- Set a baseline to monitor future changes in settlements in terms of their nature, physical area, household numbers and density, thematic indicators and the aggregate poverty index, at all levels including the town, ward, community development committee and settlement levels;
- Identify and characterize vacant land to inform a pro-poor vacant land use strategy;
- Enable and inform the preparation of a town-wide tenure security improvement strategy;
- Improve the knowledge of residents of poor settlements regarding the living conditions in their town, ward and settlement and to develop their capacity to address it.

The SLM initiative was undertaken in 29 UPPR towns (all except Dhaka) between 2010 and 2011. This exercise yielded a large dataset recording the physical and socio-economic status of over 45,000 settlements. Subsequently, analysis and reporting were undertaken. UPPR's local research partner, the Centre for Urban Studies (CUS) took on the task of analyzing data and developing separate reports and atlases for individual UPPR towns, which include detailed information of settlements at the ward level. UPPR's HQ team has undertaken the national-level analysis of the data for all towns in aggregate and is responsible for this report.

1.3. Purpose and Structure of the Report

This report offers an overview and comparative perspective on the urban areas served by UPPR. It examines, through the use of rigorous statistical techniques, a series of key relationships. The analysis and commentary becomes progressively more sophisticated, beginning with a descriptive summary, followed by analysis of relationships and processes at work and closing with a policy discussion.

The report's structure follows this broad outline and is divided into six chapters. Following this introductory section, Chapter 2 outlines the steps used in the SLM survey methodology. Chapter 3 then presents the main trends and characteristics of urbanization in Bangladesh, and offers the contextual background for the analytical and policy discussions. While Chapter 4 presents a welfare profile of identified settlements, focusing on their demography, geography and living conditions attributes, Chapter 5 presents a statistical examination of the key relationships between the demographic variables and the Settlement Living Conditions Index (SLCI) and its components. Finally, Chapter 6 elaborates on the main conclusions of the SLM exercise at national level, and outlines a broad policy agenda. While the main text provides a commentary on the data and results, several analytical and other background material are provided in a series of appendices at the end of the report.

Chapter Two: Methodology

This chapter describes the steps employed within the SLM survey methodology, which was applied throughout the survey work carried out in the 29 towns. These steps are listed below in order of their implementation. The most complex stage is that of data analysis, and is supported by annexes to the report. These outline how the main Settlement Living Conditions Index (SLCI) and its subsidiary components are calculated, as well as the methodologies to conduct the comparison of means t-tests and the Spearman Rank correlation test (see *Annexes 1, 2* and *3*). This method also underpins the work carried out presented in the individual town reports and ward profiles.

The survey methodology, as discussed below, proceeds in four phases: survey preparation, survey implementation, analysis of survey results and reporting of survey results. All phases are divided into smaller steps.

Step 1: Survey Preparation

1. **Inception meeting with stakeholders.** The consultant holds an initial meeting to brief key stakeholders about the importance of mapping and about the survey process. Stakeholders include the Mayor, Councillors and key municipality staff, UPPR town staff, service providers and community leaders.

2. **Field reconnaissance.** The consultant, in collaboration with the authorities and selected community stakeholders, and based on local knowledge, makes several field visits to obtain an overview of the general conditions and distribution of poor settlements in the town.

3. **Base map preparation.** The consultant obtains a town map, preferably digitized, from the local authorities, along with a satellite image of the town. The consultant and local stakeholders update the base map by overlaying it on, and comparing it to, the satellite image and undertaking field visits to verify the actual situation. Wards are sub-divided into roughly equal size areas or *blocks* to facilitate the management of survey operations and settlement numbering in the field. To the extent possible, block boundaries should coincide with natural or manmade physical features that are easy to recognize in the field. Blocks are numbered according to the ward in which they are located. For example, block 5.1 indicates the first block in ward 5. In turn, settlements will be numbered according to the block in which they are located: 5.1.1. Afterwards, the demarcated settlement boundaries in imagery are entered into GIS format, from which the settlement and ward areas and boundaries are calculated. However, it must be noted that satellite imagery was not used in the cases of Tongi and Gopalganj, but rather, on-screen GIS digitization. Thus, data on the settlement and ward areas of these two towns is unavailable.

4. **Survey team recruitment and training.** The consultant team, with the support of UPPR's headquarters staff and town-level community organizers and settlement improvement assistants, interview and select 18-20 community leaders and members as enumerators and provide them with two days of training. The training covers concepts of poverty, poor settlement identification and score card completion, vacant land identification and recording, settlement mapping, data filing and data management.

5. **Pilot survey.** To test the effectiveness of the training, the survey team undertakes a pilot survey in a selected block. The pilot allows the surveyors to test the method and improve their surveying skills. The results of the pilot survey are checked for accuracy by the consultant and additional training is provided if needed.

Step 2: Survey Implementation

1. **Survey team formation**. For each ward, a survey team is formed comprising the consultant's survey assistant, two UPPR staff members, and a pair of community surveyors. The UPPR community organizers help support survey process while the settlement improvement assistant monitors all the activities.

2. **Poor settlement mapping**. Survey teams are assigned and must complete the survey in one block before moving to the next. The teams walk around all areas of their block, identifying poor settlements and vacant land parcels, and drawing these on the block map.

3. **Settlement assessment**. The survey team identifies the natural leader of the settlement and assembles them into a focus group. Together with the focus group, the surveyors complete the score card and vacant land data sheet.

4. **Quality control.** At the end of each day, the consultant, along with the surveyors and UPPR staff, reviews the maps, score cards and vacant parcel sheets. In case of any ambiguities or missing data, the teams revisit the field to verify or collect missing data.

5. **Data entry.** At the completion of the data collection process, all data is entered into a database of attributes and GIS of settlement shapes and locations.

6. **Quality assurance**. The consultant produces draft GIS-based poor settlement maps of the town and each ward showing the location, number, and poverty status of each settlement. The maps are verified by the consultant and cases of ambiguities or missing data are investigated and corrected in the field. In addition, UPPR HQ, town team and community surveyors conduct random field checks to verify the completeness and accuracy of maps and score card data. After making corrections, town level poor settlement maps are printed.

Step 3: Analysis of Survey Results

1. **SLM Survey dataset variables**. The dataset generated from the survey contains three different types of variables for each of the identified settlements: administrative identification variables, demographic and area variables and sixteen settlement living condition indicators.

    - **Settlement administrative identification variables** include ward number, block number, settlement number, and Community Development Committee (CDC) number if the settlement is covered by a CDC.

    - **Settlement demographic and area variables** include population size (given by the number of households), area in square kilometers, density in households per km^2 and age of the settlement.

- **Settlement living conditions indicators** include land ownership, type of occupancy and nature of housing units, presence of a functioning water supply, availability of toilet and drainage facilities, quality of access roads, electricity supply and solid waste collection services, employment, income status, access to savings and credit services, school enrolment, civic facilities, risk and vulnerability and presence of social problems. Each of the indicators has four options or scores ranging from the worst condition to the best condition.

  Indeed, the main feature of the SLM survey tool is the scorecard comprising the sixteen indicators mentioned above. These can be grouped into five main themes: tenure security conditions, water and sanitation conditions, infrastructure conditions, economic conditions and social and environmental conditions.

  By summing the scores for all sixteen indicators, we obtain for each settlement its Settlement Living Conditions Score (SLCS), which can range from 16 to 64. This score is then transformed into an index – the Settlement Living Conditions Index (SLCI) – which can range from 0 to 100. An index makes it easier to compare a result to the worst and best possible case.

  Likewise, by summing the individual indicator scores of the five main themes, we obtain for each settlement its five Multi-Condition Scores (MCS), which are transformed into five Multi-Condition Sub-Indices (MCSI).

  Both indices, the SLCI and MCSI, as well as the individual indicators, provide valuable information on the level of deprivation experienced by populations in settlements over a wide range of areas. A detailed explanation of the construction, adjustments and components of the Settlement Living Conditions Index and Sub-Indices can be found in *Annex 1: Components of the Settlement and Living Conditions Index (SLCI)*.

2. **Data tabulation.** Data collected on 44,804 identified poor settlements was analyzed at the divisional, Pourashava and wards levels. In order to obtain basic descriptive statistics, three sets of tabulations covering the following areas were conducted:

   - Settlement population size, area coverage, density and age;
   - Settlement Living Conditions Index (SLCI) Scores;
   - Settlement Multi-Condition Sub-Indices (SMCSI) Scores.

3. **Selection of statistical tests.** In line with established statistical practice, the relationships indicated by cross-compassions of the SLCI and basic demographic indicators: population, density, age, as well as area size, were validated by statistical testing. Two methods were selected:

   - Comparison of means t-tests;
   - Spearman's rank correlation tests.

   Where differences in two means are examined, comparison of means t-tests have been undertaken. When examining the differences between index or sub-index scores for two

groups of settlements in a sample, the t-test allows us to determine the difference between their mean relative to the spread or variability of their scores. This will allow us to determine whether mean differences and discrepancies are explained by random errors or by systematic errors. A detailed specification of the comparison of Means t-test in provided in *Annex 2: Methodology of the Comparison of Means t-test*.

Spearman's Rank correlation tests were carried out to determine associations within and between dataset variables. Given the ordinal nature of the SLM data, and the more demanding statistical requirements of alternative approaches, this method was found to be the most appropriate option for of establishing relationships between the variables. It is underlined however, that the tests seek to provide evidence of association and not causation.

Spearman's Rank Correlation Coefficient (SRCC) is a measure used to determine the strength of a relationship between two ordinal variables. Although correlation does not necessarily imply causation, the SRCC provides a measure of association based on the match between the rank ordering of the two variables, the validity of which can then be determined via a standard significance test. Moreover, the SRCC does not require that the variables are normally distributed. A detailed specification of SRCC is provided in *Annex 3: Methodology of Spearman's Rank Correlation Coefficient*.

Step 4: Reporting of Survey Results

1. **Poor settlement report and maps.** After completion of the analysis, UPPR HQ and the consultant prepare a final report, atlas of poor settlements, and large maps of poor settlements at the town and ward scale.

2. **Presentation to key stakeholders at town level.** UPPR HQ and town teams then make a formal presentation of the survey findings to the key stakeholders in the town, especially the Mayor, Councillor, municipal staff, and the District Commissioner. This raises awareness of the poverty situation, programme priority areas and available resources such as lands and service provisions.

3. **Formal approval to poverty profile.** After the presentation, UPPR seeks the Mayor's formal approval of the poor settlement and vacant land profile. Once signed, the document is expected to be used in formulation of the town's poverty reduction and urban development strategy.

Commentary: Key Data Issues

Although the dataset offers a rich insight into the socio-demographic characteristics of poor settlements, it also presents five limitations, which call for some caution when interpreting and comparing the results across and within towns.

Firstly, as the smallest geographic units of analysis are settlements, the dataset allows for analyses to be conducted at the settlement, ward, individual town, division, and all town-levels. Although a household count was conducted within each of the settlements, scores in an individual or a multi-condition variable for a settlement cannot be extrapolated to its entire household population, as households might be more deprived than average, while others

might present better living conditions than average. Settlement scores indeed reflect the living conditions of most households living therein.

Secondly, the data collected is based on a partially subjective ordinal scoring method, where thresholds have been defined judgmentally. Even though some ordinal variables contain interval scales, it is not possible to determine the absolute difference in the living conditions between settlements, but rather, whether a certain settlement has a lesser, equal or smaller rank than another or a group of settlements.

Thirdly, two factors which are likely to influence the results of this exercise: (i) the fact that these thresholds have been applied uniformly to all 29 towns and (ii) that town-specific -and even ward-specific- perceptions towards certain phenomena might be different. For instance, the cost of living is likely to vary across all towns, and so are wages and income. Moreover, the perception of environmental risk or social issues affecting the community may be different in settlements of a large City Corporation than in a smaller divisional town.

Fourthly, equal weights have been given to all sixteen variables that form the SLCI. Although it could be argued that some dimensions are of higher importance to the development of a settlement than others, the SLCI aims to represent a multi-dimensional summary on the living conditions of settlements within a town or a ward, and how these perform if compared to the rest. In this regard, it is likely that major challenges in some dimensions might be offset by progress in others. Nonetheless, the main comparative advantage of the SLM exercise lies in the possibility to disaggregate results at the settlement, ward and town levels by individual conditions or combinations of these, hence identifying the most pressing issues to be addressed.

Finally, dependency relationships interact between the five settlement living conditions dimensions, implying that improvements in one dimension tend to lead to improvements in another dimension. This is also the case for the 16 individual conditions variables. This is shown in *Annex 4: Spearman Rank Correlation Coefficients and P-values, Multi-Condition Sub-Indices* and *Annex 5: Spearman Rank Correlation Coefficients and P-values, Individual Variables*.

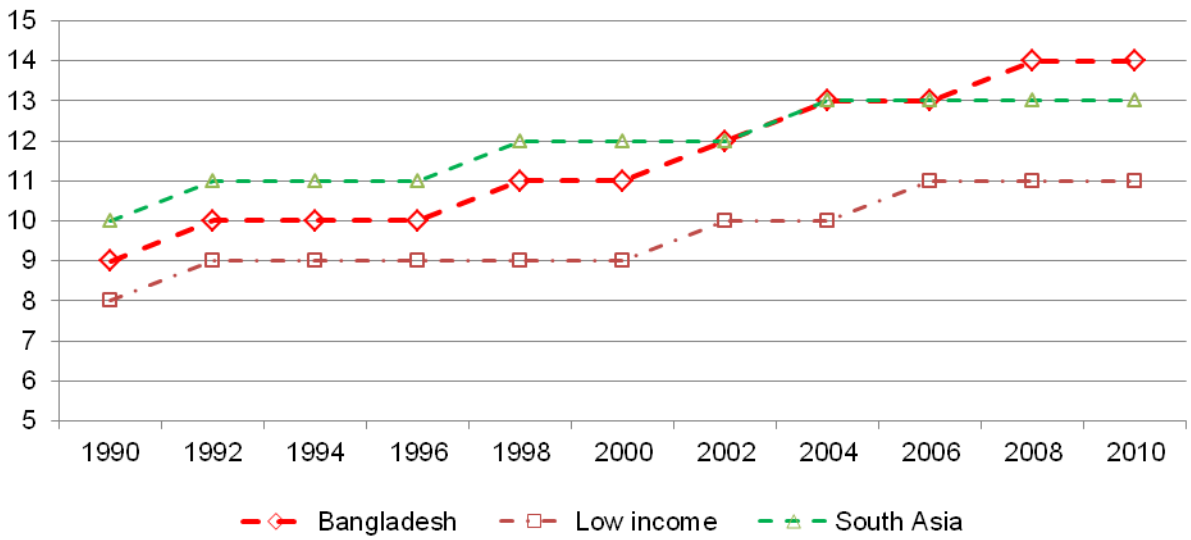
Chapter Three: Urbanization in Bangladesh: Trends and Key Characteristics

This chapter provides a brief overview of urbanization in Bangladesh and the resulting developmental challenges. Its purpose is to contextualize the analyses and commentary which follows in later chapters. The discussion draws on both Bangladeshi and external data sources. The chapter begins by charting the speed and nature of the urbanization process. Second, the connections with the rational economic model and population migration are examined. The chapter closes by considering the main policy challenges.

3.1. Urbanization Trends

Bangladesh is one of the fastest urbanizing countries in the world, its urban population growing at an estimated 6 per cent each year since Independence, at a time when national population growth was at 2.2 per cent (World Bank: 2007i). This phenomenal growth is partly driven by the reclassification of rural areas into urban areas and natural urban population growth but also by considerable rural to urban migration flows. What was once a fundamentally agricultural country has increasing become defined economically and socially by its vibrant urban sector. Moreover, although the level of urbanization in recent years has now converged to levels seen elsewhere (at around 30 per cent of the population), as *Figure 1* underlines, the level of concentration within the major agglomerations (cities of over 1 million) is considerable and well above other countries in the region and the Low Income Countries (LIC) category.

Figure 1: Percentage of Population Living in Cities of over 1 Million: Bangladesh, South Asia and Low Income Countries (1990 to 2010)

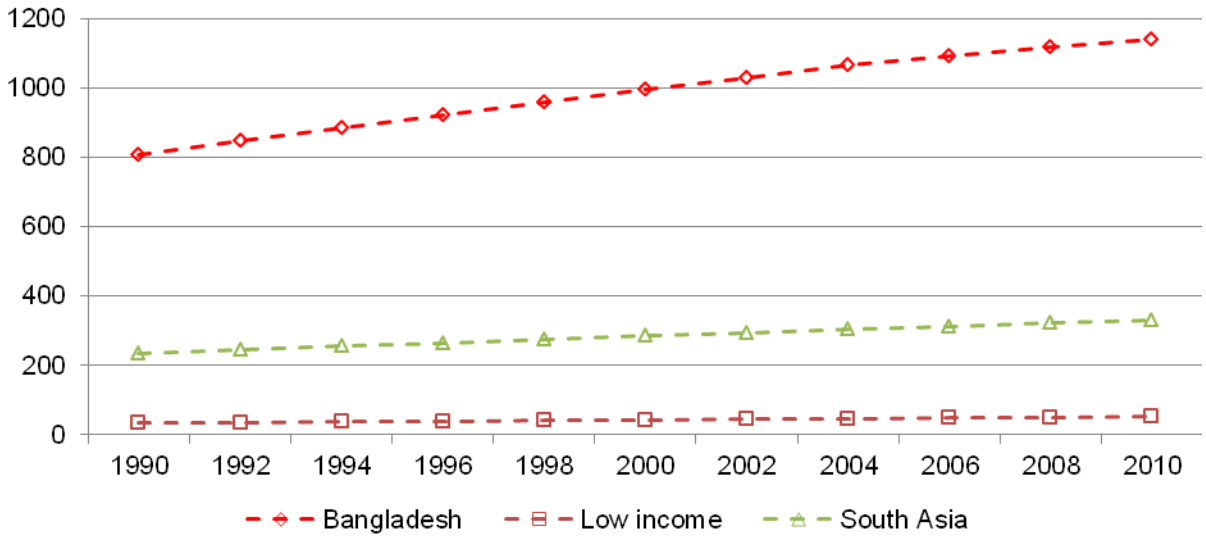


Source: World Bank (2011), World Development Indicators

This links to a further important feature of Bangladesh's urban landscape – the presence of exceptional population densities. As *Figure 2* illustrates, the level is well above the South Asian and the Low Income Country (LIC) averages, with in excess of 1100 habitants per hectare. This trend has continued unabated, and as will be argued below, this is central to the challenges faced in urban areas. Bangladesh's cities may be large, but are small in

area. Land availability is fundamentally constrained by the country's problematic hydrology and relatively small overall area.

Figure 2: Population Densities per Hectare: Bangladesh, South Asia and Low Income Countries (1990 to 2010)



Source: World Bank (2011), World Development Indicators

Therefore, while the number of urban areas increased five-fold in less than twenty years, 60 per cent of the total urban population of 35 million people resides in the four largest cities: Dhaka, Chittagong, Khulna and Rajshahi. The megacity of Dhaka is the epicenter of Bangladesh's urban expansion, the World Bank labelling it the fastest growing city in the world with an estimated 300,000 to 400,000, mainly poor, rural migrants arriving each year (World Bank: 2007ii).

These large rural-urban population flows have been the key driver of the process. A recent study by PPRC found that just 21 per cent of urban residents were born in the city they resided in and this figure dropped to 16 per cent for Dhaka residents. The study found that pull factors such as employment and education opportunities were the main reasons for the shift to urban areas, but displacement by natural disasters was a factor for more than one in ten migrants (PPRC, 2010). Other accounts (see for example UNICEF, 2010) have emphasized the importance of economic pressures and the pull of higher income opportunities.

3.2. Industrialization, Migration and Urbanization

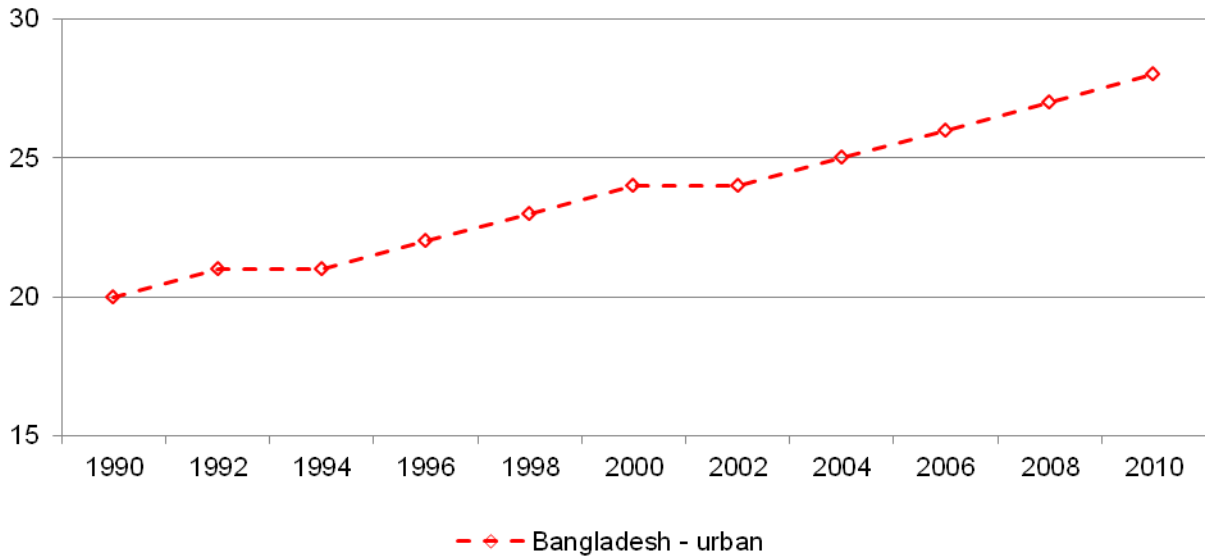
To a great extent the urbanization process has its roots in ongoing economic structural changes, which date back to the early 1990s, with the rise of industrial sector and sustained high levels of economic growth. Economic theory and empirical studies predicts that population flows are driven by income differentials between rural and urban areas. Underpinning the pattern we see in Bangladesh, is also a fundamental group of relations described by the Lewis model[1]. In short, the lower level of productivity and presence of

[1] See discussion in Thirlwall (1999), pages 140-145.

considerable under-employment within rural areas ensures a near unlimited supply of workers to the new urban-based industries at very competitive wage rates.

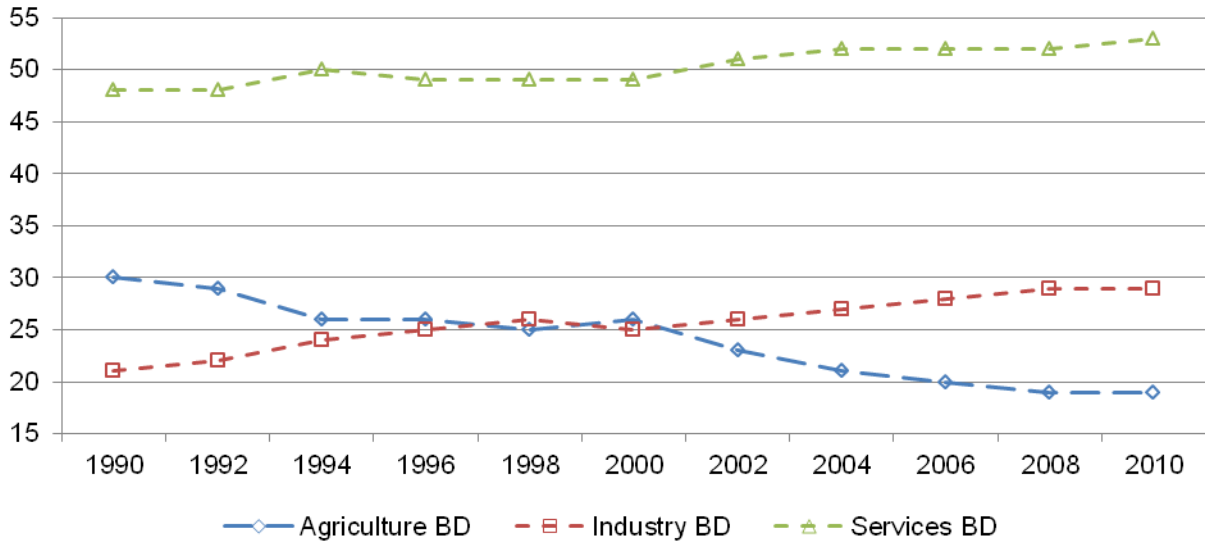
In this sense, urbanization, migration and industrialization have a symbiotic relationship, with each feeding off each other. *Figure 3* and *Figure 4*, which set out the rate of urbanization and structural economic changes since 1990 respectively, draw out these connections. The trend lines show that as the economy has grown and become more industrial, so too has the degree urbanization. Moreover, a slowdown in these trends seen in the early year of the new century is also depicted in both graphs, underlining the likely causal linkages.

Figure 3: Urbanization Rate: Bangladesh (1990 to 2010)



Source: World Bank (2011), World Development Indicators

Figure 4: Percentage of Gross Domestic Product by Sector: Bangladesh (1990 to 2010)



Source: World Bank (2011), World Development Indicators

3.3. Economic and Social Outcomes

These dynamic processes have resulted in a complex and difficult to address set of socio-economic outcomes. As *Table 2* illustrates, according to the national Household Income and Expenditure Survey (HIES) poverty rates in urban areas have declined substantially and these falls have contributed disproportionately to the overall level of poverty reduction. Yet while it is important to recognize the positive trends, the rate of poverty in urban areas still remains high and given the size of population the numbers living in poverty are daunting. Of an estimated urban population of 35 million people in 2010, 21 per cent, or 7.35 million are poor, according to the upper national poverty line (Bangladesh Bureau of Statistics, 2011).

Table 2: Urban and National Poverty Headcount Rates, Upper Poverty Line.

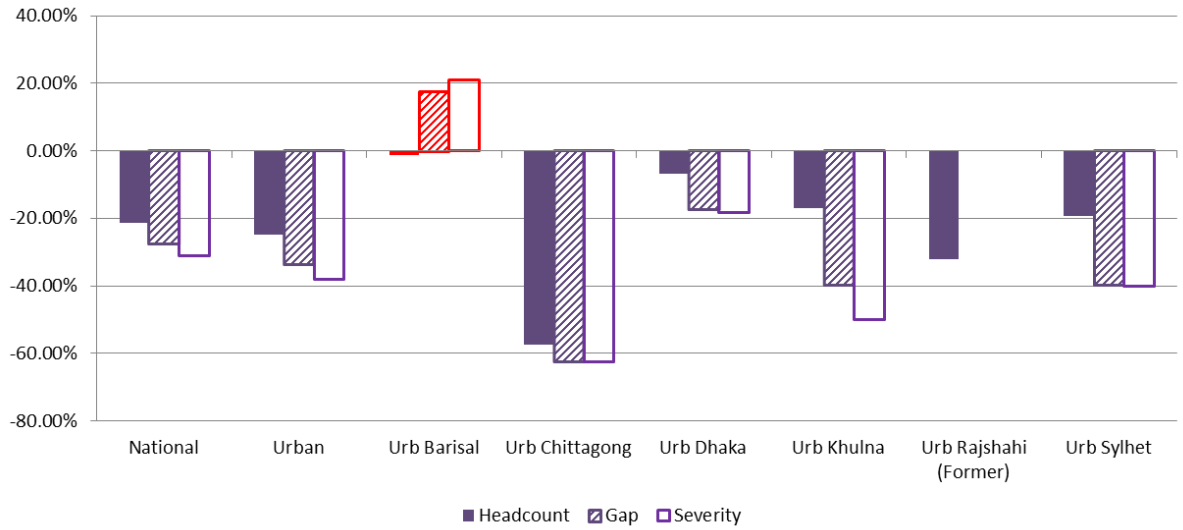
Survey Year and Change on Base	Urban Rate	National Rate
1991	43%	57%
- Change on base (%)	(n/a)	(n/a)
1995	38%	51%
- Change on base (%)	(-12%)	(-11%)
2000	35%	49%
- Change on base (%)	(-20%)	(-4%)
2005	28%	40%
- Change on base (%)	(-20%)	(-18%)
2010	21%	32%
- Change on base (%)	(-25%)	(-20%)

Source: Bangladesh Bureau of Statistics (1991, 1995, 2000, 2005 and 2011), Household Income and Expenditure Survey Results

An additional feature of the national HIES data has been the presence of large variations between urban a centers and notably, between the major cities. As

Figure 5 shows, Urban Barisal performs poorly, actually experiencing an increase in the secondary Gap and Severity measures and a very small decline in the Headcount between 2005 and 2010. Chittagong performs best, closely followed by the Northeastern and Northwestern cities. These patterns follow the trends seen within the rest of the HIES data, and also, the pattern of economic activity within Bangladesh. However, in addition they point to considerable variations between cities, an issue which is drawn out by this report. Equally, these data underscore the importance of looking beyond aggregate measures, and the SLM dataset aims to address precisely this.

Figure 5: Divisional Changes in Urban Poverty Rates, 2005 to 2010



Source: Bangladesh Bureau of Statistics (2005 and 2011), Household Income and Expenditure Survey Results

Additionally, it is important to note that although being the *engine of growth*, urban areas have also hosted some of the most severe poverty and social conditions in Bangladesh. These localized *pockets of poverty* are given by the slum areas served by UPPR and reported on within this report. It is important to recognize that aggregate analysis cannot reflect the presence of severe highly localized deprivations. Several studies have shown that the intensity of poverty (in various dimensions) is exceptional in urban slums. Moreover, wider pressures, notably migration and high population densities, have coupled with the difficult social impacts and limited the opportunities for improvement.

Land use, and its connections with population density, is a particularly problematic issue. With demand in urban areas increasing substantially, housing and land prices have increased far beyond the affordability of the general population. In Dhaka, 57 per cent of the population does not own any land, while 4 per cent own as much as 28 per cent of the land (Payne & Shafi, 2007). Strikingly, 70 per cent of Dhaka's population is forced to live on just 20 per cent of its land (Mahmud et al, 2001). In the absence of affordable housing, the constant flow of rural poor migrants have no other option than to move into established or construct new informal housing, resulting in the flourishing of slums.

In addition, physical conditions can vary significantly from slum to slum and settlement age and locality are significant. These questions are also explored in detail by this report using the SLM dataset, with the underlying hypotheses that these factors directly drive variations in living conditions.

Equally, it is important to recognize the characterization of urban poverty is considerably more complex than income and consumption-based measures given within the HIES dataset. Slum dwellers typically lack access to basic public services such as water,

sanitation, electricity, and drains, and live very cramped conditions. There are also a series of institutional questions, notably around land tenure- with dwellings built without permission from the landowners, leaving them constantly at threat of eviction. Socio-economic conditions are also important in shaping deprivation. Therefore, this report adopts a different approach to measuring poverty via a multi-dimensional index based on a series of considerations, which is also rooted in community understandings of poverty.

3.4. Key Challenges

This closing section highlights some of the key issues to emerge from this contextual chapter. The material above is vital in shaping the analyses and discussions which follow. It is interesting to note Bangladesh's position against the South Asia and LIC averages, and on many statistical indicators, the country genuinely stands out as facing exceptional challenges. The urbanization process has been very rapid and densities and contradictions of deprived populations are some of the most pressing on the globe.

However, a series of specific pointers are provided. The foremost issue to emerge is the linkages between wider economic changes and demographic patterns and nature and pace of urbanization. This implies that national policy responses need to address these issues if real sustainable and substantive solutions are to be found. Yet this also requires adequate diagnosis of the problems and the effective targeting of resources.

Second, while the urbanization process has been an engine of growth and a major contributor to poverty reduction, the self-same process has brought with it, a series of severe urban deprivations. These include the emergence of the large numbers of urban slums, in which UPPR is active and this report cover.

Third and most significantly for this report, the discussion has shown that aggregate (average) measures tend to overlook these issues. Moreover, the consequences of the existing urban development process has are poorly mapped by existing data sources. Field-based qualitative evidence has suggested severe inequities have emerged. More detailed analysis, grounded in the real life conditions experienced by urban slum dwellers, which also picks up on the differences between and within towns and cities, is vitally important if policy responses are to be addressed effectively.

Chapter Four: Welfare Profile of Settlements: Demography, Geography and Living Conditions

This Chapter presents a town-level profile of settlements, focusing on their demographic, geographic and living conditions attributes. Analyses and discussion are extensive but organized into two sections. The first, offers a demographic and area profile of the towns and cities. The second puts forward a poverty profile based on the Settlement Living Conditions Index (SLCI) and its components, as well as the adjusted poverty quartile method.

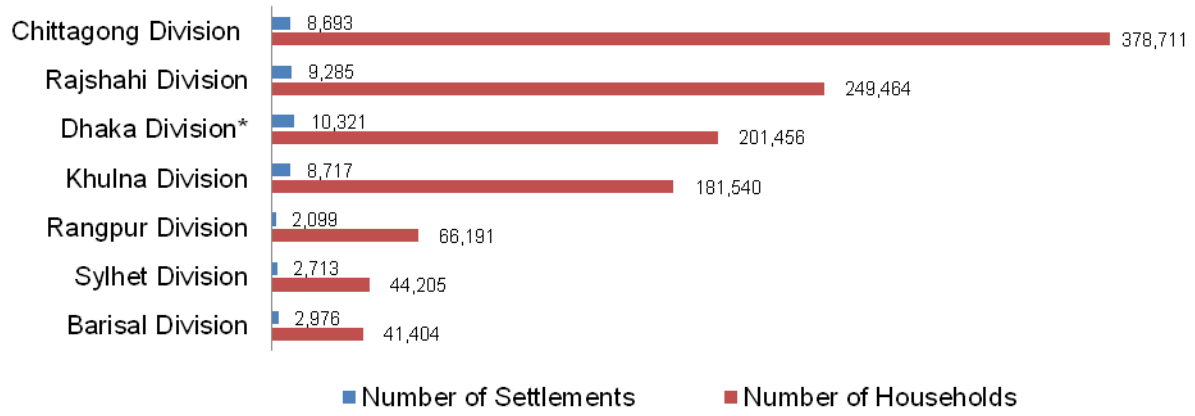
4.1. Demographic and Area Profile of Settlements

This section examines, at the division and town levels, the number, spatial location, population size, areas, densities and age of the identified poor settlements.

4.1.1. Number and Population Size of Poor Settlements

The SLM exercise identified 44,804 poor settlements in the 29 cities of Bangladesh covered[2]. These comprise 1,162,971 households with and estimated five million people (based on an average of 4.4 persons per household). *Figure 6* shows that although Chittagong Division ranks fourth in the number of settlements (8,693), it has the highest number of identified households (378,711). The highest number of settlements is recorded by Dhaka Division (10,321), which in terms of households ranks third, following Chittagong and Rajshahi Divisions. Yet it is also important to recall that the divisional data excludes Dhaka City Corporation area as this is not included in the SLM dataset The lowest number of settlements has been identified in Rangpur Division (2,099), comprising 66,191 households. Barisal Division, with only one town included in the survey, has the lowest number of households (41,404) living in 2,976 settlements.

Figure 6: Distribution of Poor Settlements and Households by Division

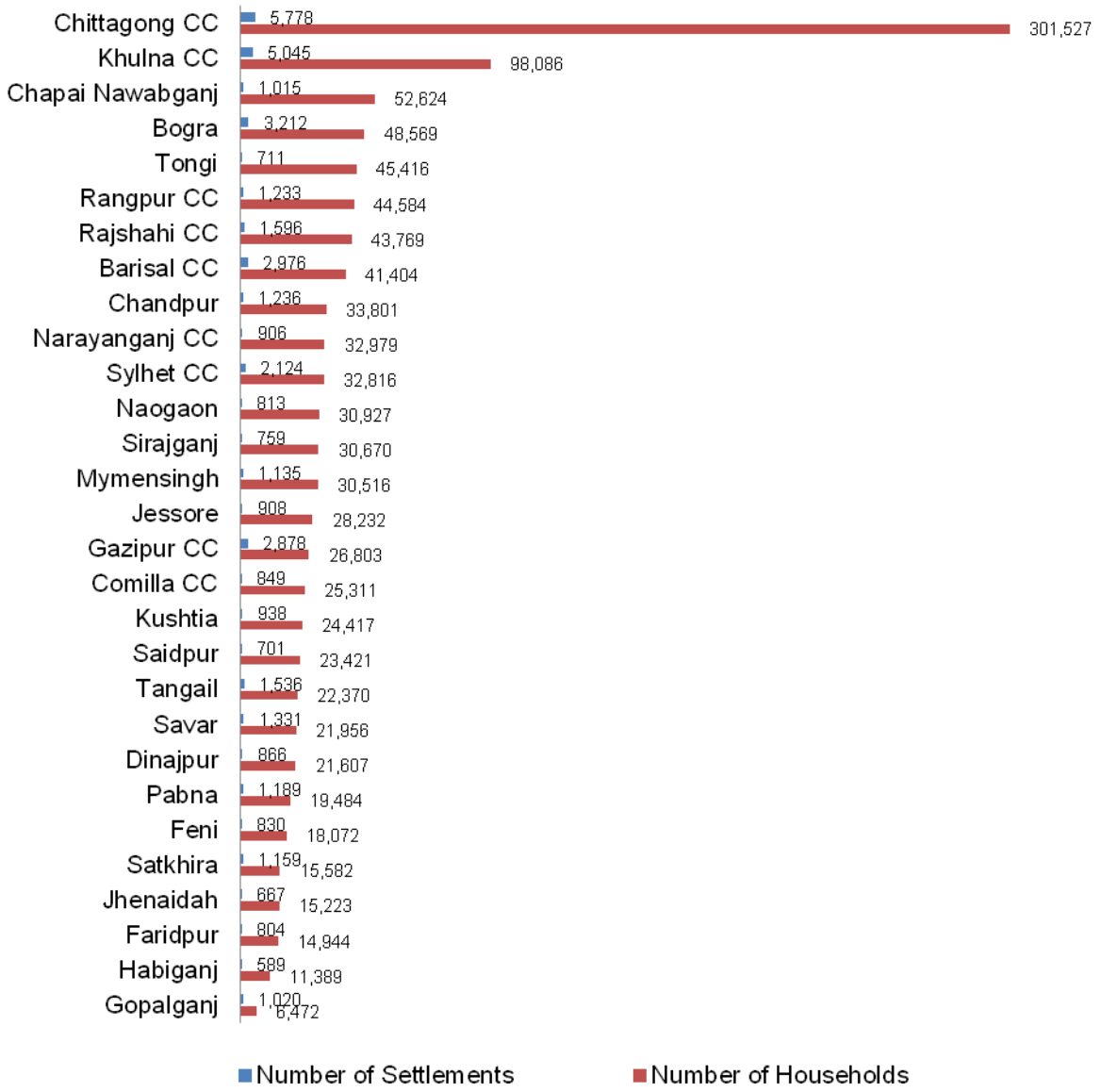


[2] The areas of settlements in Gopalganj and Tongi were unavailable at the time of writing this report. Thus density and area data is available for 27 towns.

Given the above, settlement size varies considerably. The highest number of settlements within a town were found in Chittagong City Corporation (5,778), followed by Khulna City Corporation (5,045) and Bogra (3,212). Likewise the lowest number of settlements were found in Habiganj (589), Jhenaidah (667) and Saidpur (701). Represented in terms of households, the highest number in any single town were found in Chittagong City Corporation (301,527), followed by Khulna City Corporation (98,086) and Chapai Nawabganj (52,624), while the lowest number of households were identified in Faridpur (14,944), Habiganj (11,389) and Gopalganj (6,472).

Figure 7 illustrates the heterogeneity of cities and towns in terms of number of settlements and households. For instance, the number of settlements identified in Chittagong City Corporation was 5.6 times the number of settlements identified in Gopalganj, while the number of households identified in Chittagong City Corporation is 46.6 times the number of those identified in Gopalganj.

Figure 7: Distribution of Poor Settlements and Households by Town



Therefore, *Figure 8* shows that overall, more than one in four households (25.9 per cent) resides in Chittagong. Khulna accounts for 8.4 per cent of the total number of identified households and is the only other town whose percentage of households exceeds 5 per cent. Clearly, these areas exert a disproportionate impact on any overall comparisons and analyses.

Figure 8: Percentage Distribution of Poor Settlements and Households by Town

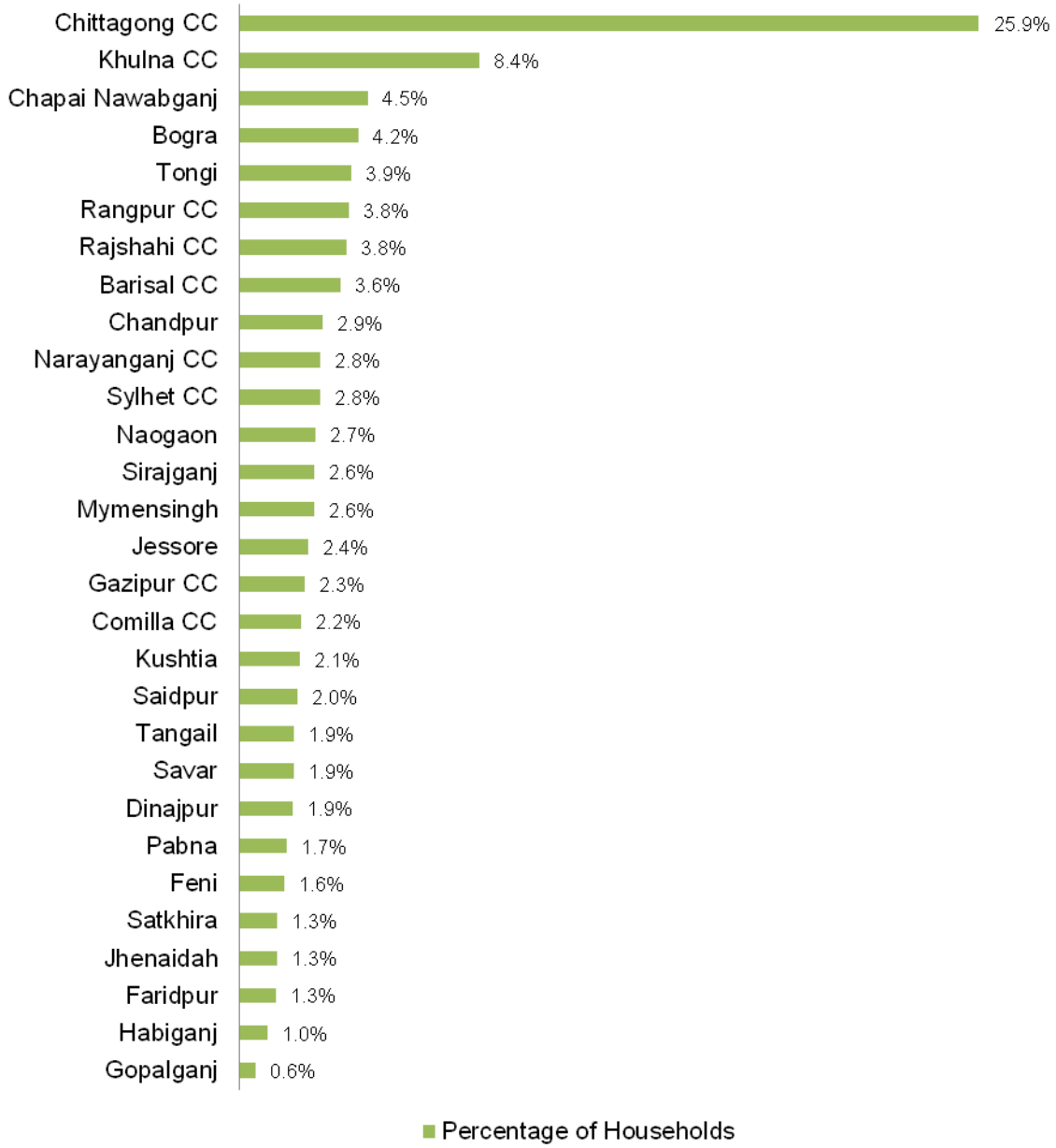
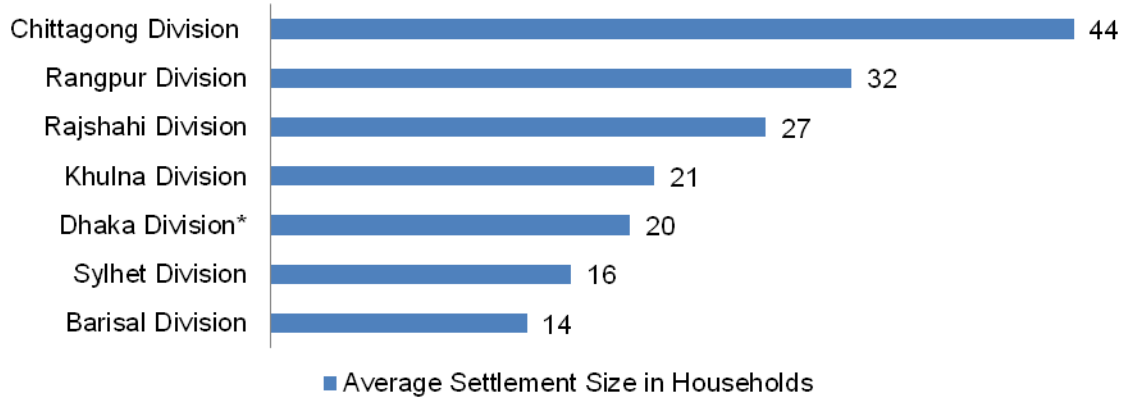


Figure 9 indicates that, overall, 50 per cent of all settlements are formed by 12 households or less. At the divisional level, Chittagong Division has the largest average settlement size (44 households), driven by Chittagong City Corporation, followed by Rangpur (32 households) and Rajshahi (27 households) Divisions. Khulna and Dhaka Divisions have average settlement sizes of 21 and 20 households respectively, while the smallest settlements on average are in Sylhet and Barisal Divisions (16 and 14 households respectively). On average, identified settlements comprise 26 households.

Figure 9: Average Settlement Size in Households by Division



At the town level, *Figure 10* illustrates that Tongi has the largest average settlement size (64 households), followed by Chapai Nawabganj and Chittagong City Corporation (52 households each). The smallest settlements on average are found in Satkhira (13 households), Gazipur (9 households), and Gopalganj (6 households).

Figure 10: Average Settlement Size in Households by Town

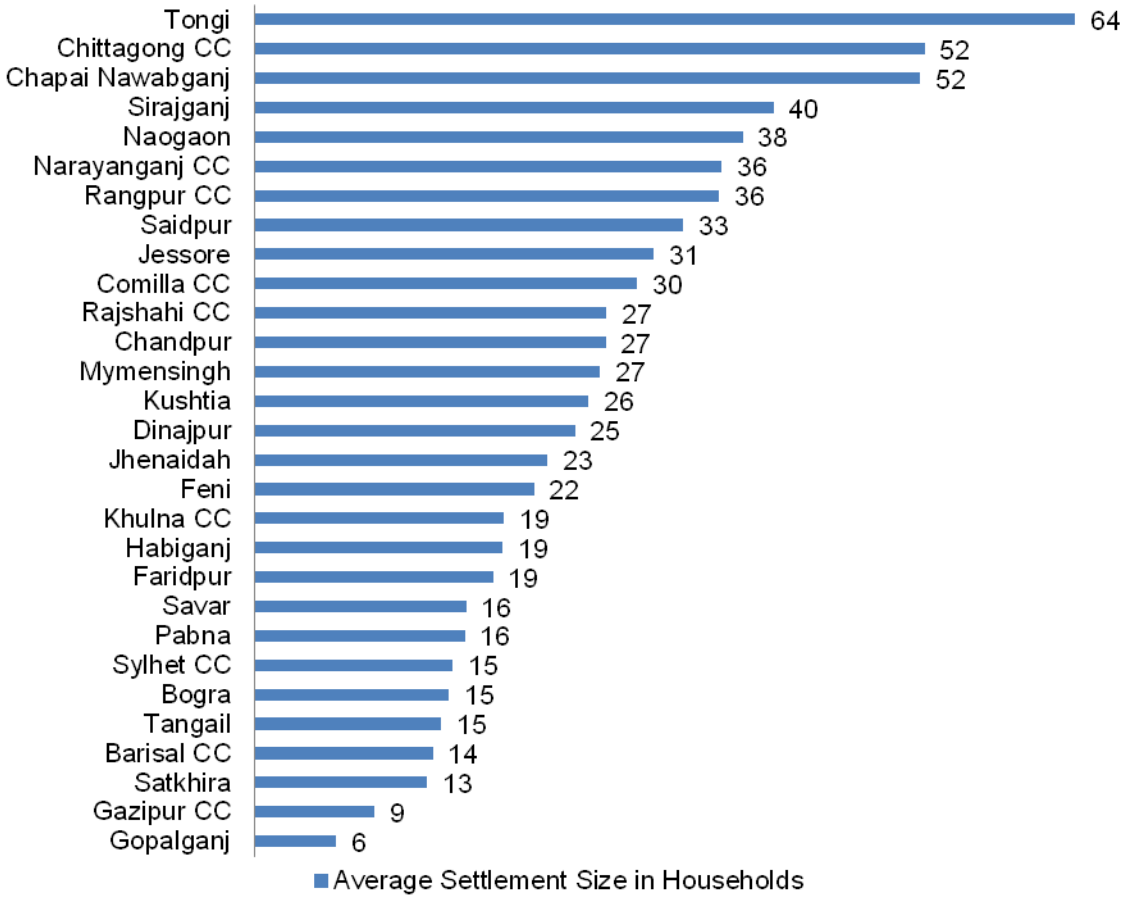
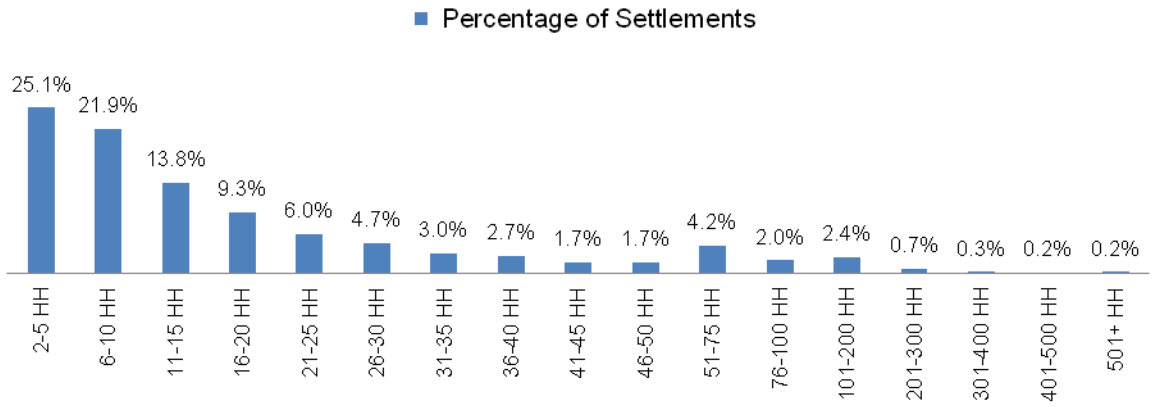


Figure 11 shows that most poor settlements are relatively small. In fact, 90 per cent of settlements consist of between 2 and 50 households. The most common settlement size range is 2 to 5 households (25.1 per cent), followed by 6 to 10 households (21.9 per cent), and 11 to 15 households (13.8 per cent). Only 3.8 per cent of all settlements have 101 or more households. It is worth saying however, this does not necessarily mean that poverty is

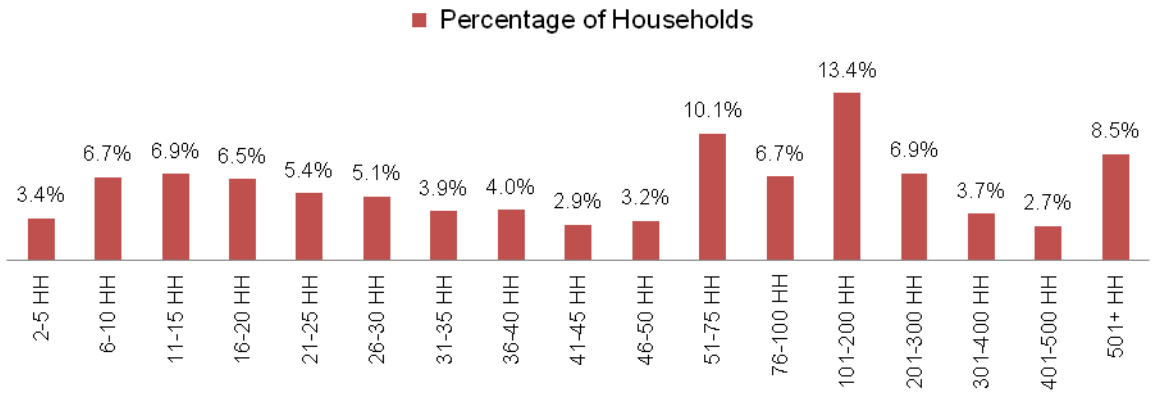
concentrated in small settlements. This issue will be returned to below, but it is worth keeping in mind that the dramatically larger population sizes in larger settlements will tend to drive up the absolute numbers of the poor.

Figure 11: Percentage Distribution of Settlements by Household Size



In contrast, *Figure 12*, which shows the distribution of households by settlement size, finds more variation in the data. Of the total number of households in poor settlements, the largest proportion are found in settlements formed by 101 to 200 households (13.4 per cent), followed by settlements of 51 to 75 households (10.1 per cent) and settlements of 501 or more households (8.5 per cent). Thus, although smaller poor settlements are more numerous, most people reside in larger poor settlements.

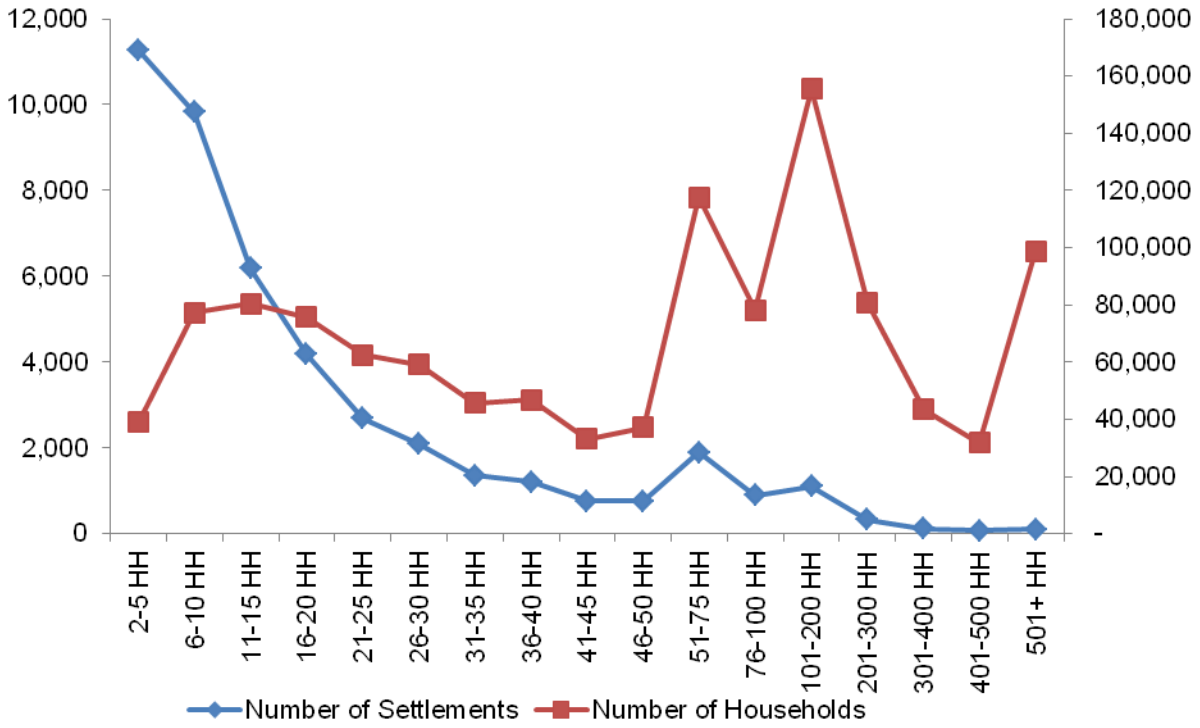
Figure 12: Percentage Distribution of Households by Settlement Size



This contrast is drawn out in

Figure ***13*** which summarizes in absolute figures the proportions presented in *Figure 11* and *Figure 12*. While 90 per cent of settlements are comprised of 50 or less households, the percentage of households living in these settlements is only 47.9 per cent. However, the 3.8 per cent settlements with 101 or more households are home to 35.3 per cent of all identified households.

Figure 13: Distribution of Settlements and Households by Household Size



A town level comparison is still more revealing. *Figure 14* indicates that the number of settlements containing between 2 and 50 households is very high in each of the towns. Yet Chittagong and Khulna (who dominate within the dataset) also present high number of settlements comprising 51 to 100 households, somewhat explaining the variations between the settlement and household distributions.

Figure 14: Distribution of Settlements by Household Size and by Town

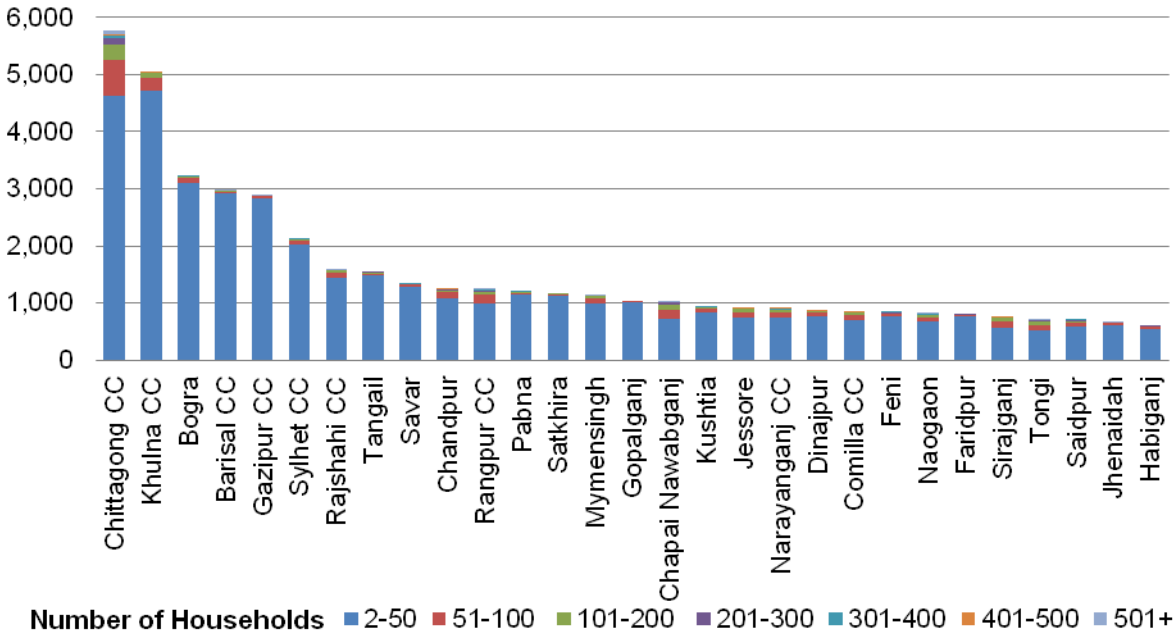
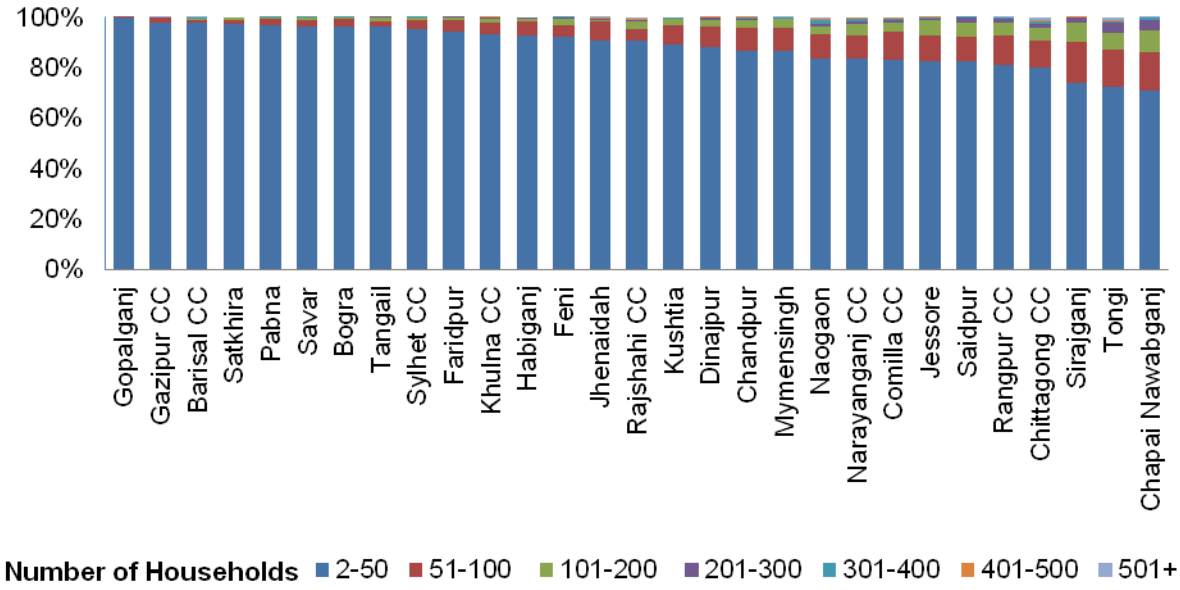


Figure 15 investigates this issue further, and shows that within each town at least 71 per cent of poor settlements consist of 2 to 50 households. This percentage reaches 100 in

Golpalganj, 98 per cent in Barisal and Gazipur. They are followed by Panama and Satkhira (97 per cent respectively). Chapai Nawabganj (71 per cent), Tongi (72 per cent) and Sirajganj (74 per cent) are the towns with the lowest proportion of settlements comprising 2 to 50 households. Chittagong (80 per cent), Comilla (83 per cent), Narayanganj (83 per cent) and Rangpur (81 per cent) have smaller percentages of small settlements (2 to 50 households).

Figure 15: Percentage Distribution of Settlements by Household Size and by Town



4.1.2. Geographical Size of Settlements

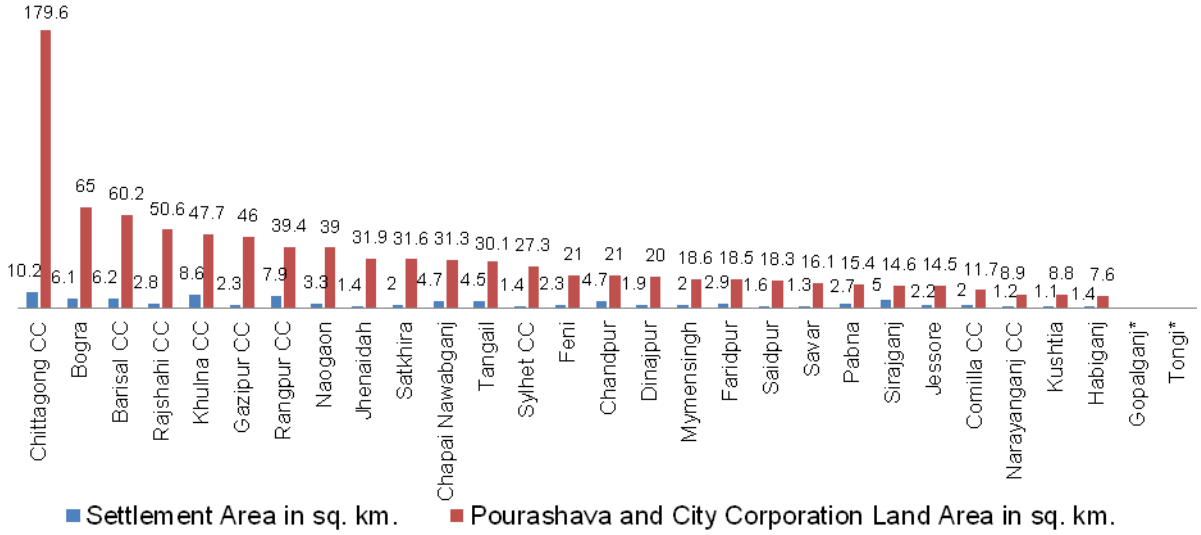
Figure 16 compares the land areas of towns and cities and the area covered by poor settlements. Chittagong has the largest area (179.6 km^2), followed by Bogra (65 km^2) and Barisal City Corporation (60.2 km^2). The physically smallest towns are Habiganj (7.6 km^2), Khustia (8.8 km^2) and Narayanganj (8.9 km^2).

Poor settlements in Chittagong have the area (10.2 km^2), followed by those of Khulna (8.6 km^2) and Rangpur (7.9 km^2). Towns where poor settlement areas were smallest included Khustia (1.1 km^2), Narayanganj (1.2 km^2) and Savar (1.3 km^2).

Overall, identified poor settlements occupy an area of 93.5 km^2 out of the 894.5 km^2 covered by the 27 towns with available data[3].

[3] The areas of settlements in Gopalganj and Tongi were unavailable at the time of writing this report

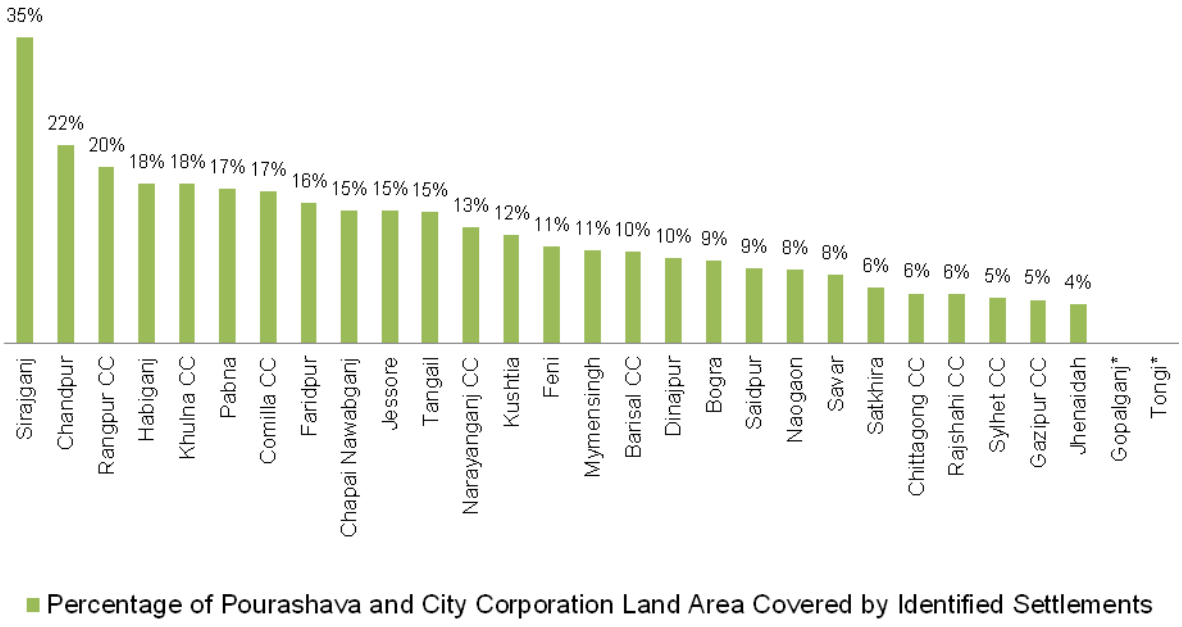
Figure 16: Total Settlement Area and Town Area by Town, in km²



** Area and density data unavailable.*

A more meaningful picture of the relative size of poor settlements is given by the percentage of the town area covered by poor settlements. This is, on average, around 10 per cent of the total land areas of the 27 towns and cities. *Figure 17* shows that towns where poor settlements cover the highest percentage of their areas are Sirajganj (35 per cent), Chandpur (22 percent) and Rangpur (20 per cent). Towns whose poor settlements cover the lowest percentage of their areas are Jhenaidah (4 per cent), Gazipur (5 per cent) and Sylhet (5 per cent). This pattern is marked contrast to the absolute distribution given above, but both remain important in national terms.

Figure 17: Percentage of Town area covered by poor Settlements



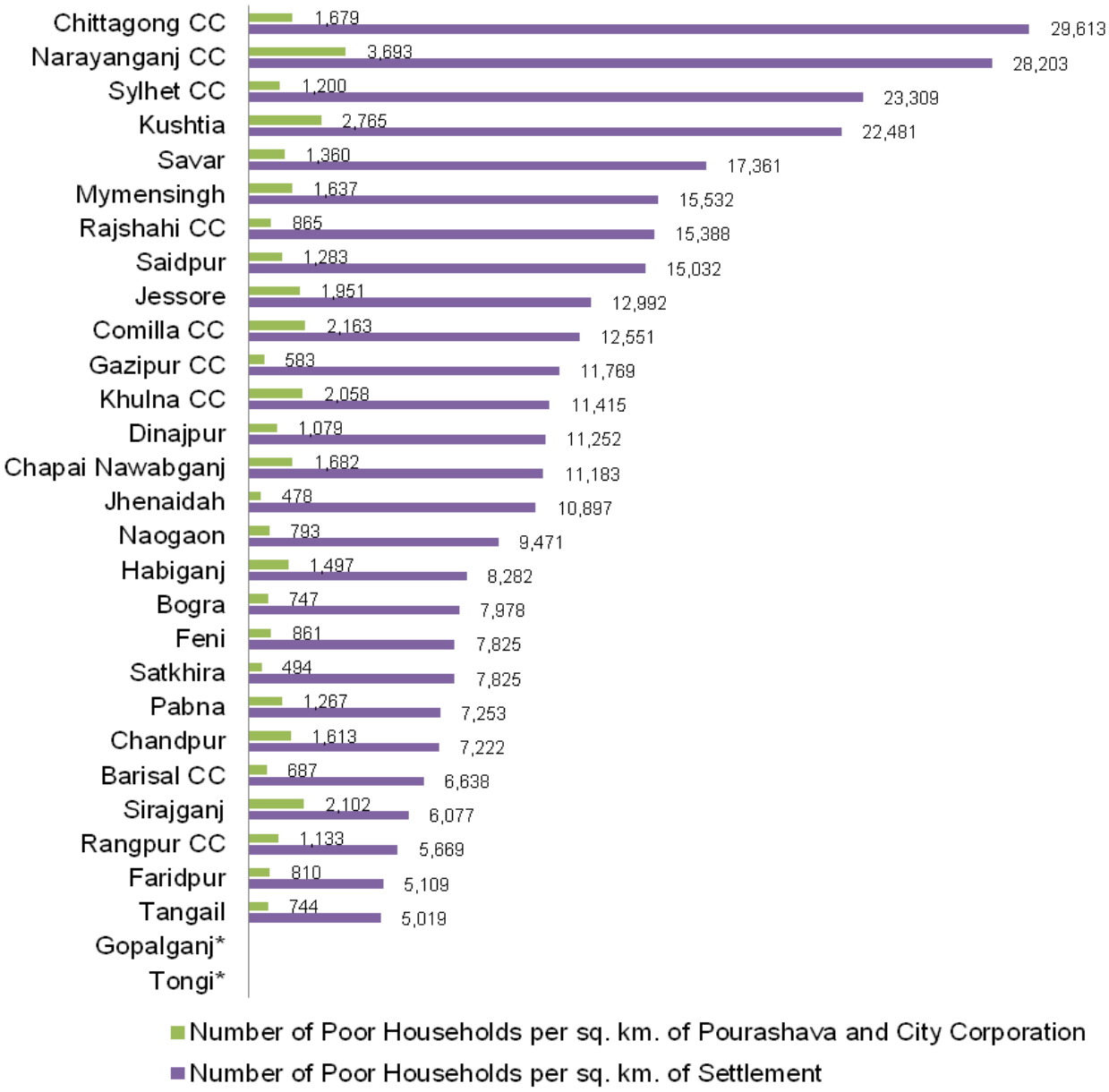
** Area and density data unavailable.*

4.1.3. Density of Poor Households within Settlements and Towns

As shown in *Figure 18*, the highest settlement densities are found in Narayanganj, followed by Khustia and Comilla. The least dense settlements are found in Jehnaidah, Satkhira and Gazipur. This is the primary measure of population densities as it applies to poor settlements themselves.

In contrast, at the town level, the highest density of poor households is recorded for Chittagong, Narayanganj and Sylhet, while the lowest town-level densities are found in Tangail, Faridpur and Rangpur.

Figure 18: Household and Poor Settlement Density by Town, per km²



** Area and density data unavailable.*

Table 3 and

*Table **4*** bring together the population, area and density indicators covered above.

Table 3 provides the exact data by town in alphabetical order; and

*Table **4*** ranks all of towns according to each of the different indicators, starting with those who record the highest values.

Table 3: Population, Area and Density Indicators by Town

Town	Number of poor sett's	Number of households	Town area (in km^2)	Area covered by poor sett's (in km^2)	Percentage of town land covered by sett's	Number of poor households per town km^2	Number of poor households per settlement km^2
Barisal CC	2,976	41,404	60.2	6.2	10%	687	6,638
Bogra	3,212	48,569	65	6.1	9%	747	7,978
Chandpur	1,236	33,801	21	4.7	22%	1,613	7,222
Chapai N.	1,015	52,624	31.3	4.7	15%	1,682	11,183
Chittag. CC	5,778	301,527	179.6	10.2	6%	1,679	29,613
Comilla CC	849	25,311	11.7	2.0	17%	2,163	12,551
Dinajpur	866	21,607	20	1.9	10%	1,079	11,252
Faridpur	804	14,944	18.5	2.9	16%	810	5,109
Feni	830	18,072	21	2.3	11%	861	7,825
Gazipur CC	2,878	26,803	46	2.3	5%	583	11,769
Gopalganj	1,020	6,472	†	†	†	†	†
Habiganj	589	11,389	7.6	1.4	18%	1,497	8,282
Jessore	908	28,232	14.5	2.2	15%	1,951	12,992
Jhenaidah	667	15,223	31.9	1.4	4%	478	10,897
Khulna CC	5,045	98,086	47.7	8.6	18%	2,058	11,415
Kushtia	938	24,417	8.8	1.1	12%	2,765	22,481
Mymensingh	1,135	30,516	18.6	2.0	11%	1,637	15,532
Naogaon	813	30,927	39	3.3	8%	793	9,471
Nar'ganj CC	906	32,979	8.9	1.2	13%	3,693	28,203
Pabna	1,189	19,484	15.4	2.7	17%	1,267	7,253
Rajshahi CC	1,596	43,769	50.6	2.8	6%	865	15,388
Rangpur CC	1,233	44,584	39.4	7.9	20%	1,133	5,669
Saidpur	701	23,421	18.3	1.6	9%	1,283	15,032
Satkhira	1,159	15,582	31.6	2.0	6%	494	7,825
Savar	1,331	21,956	16.1	1.3	8%	1,360	17,361
Sirajganj	759	30,670	14.6	5.0	35%	2,102	6,077
Sylhet CC	2,124	32,816	27.3	1.4	5%	1,200	23,309
Tangail	1,536	22,370	30.1	4.5	15%	744	5,019
Tongi	711	45,416	†	†	†	†	†
All Towns	44,804	1,162,971	894.5*	93.5*	10%*	1,300*	12,440*

† *Area and density data unavailable for Gopalganj and Tongi*

Table 4: Town Ranking by Population, Area and Density Indicators

Rank From Highest to Lowest	Number of poor sett's	Number of h'holds	Town area (in km^2)	Town area covered by poor sett's (in km^2)	Percentage of town land covered by sett's	Number of poor h'holds per town km^2	Number of poor h'holds per settlement km^2
1	Chittag. CC	Chittag. CC	Chittag. CC	Chittag.CC	Sirajganj	Nar'ganj CC	Chittag. CC
2	Khulna CC	Khulna CC	Bogra	Khulna CC	Chandpur	Kushtia	Nar'ganj CC
3	Bogra	Chapai N.	Barisal CC	Rangpur CC	Rangpur CC	Comilla CC	Sylhet CC
4	Barisal CC	Bogra	Rajshahi CC	Barisal CC	Habiganj	Sirajganj	Kushtia
5	Gazipur CC	Tongi	Khulna CC	Bogra	Khulna CC	Khulna CC	Savar
6	Sylhet CC	Rangpur CC	Gazipur CC	Sirajganj	Pabna	Jessore	Mymensingh
7	Rajshahi CC	Rajshahi CC	Rangpur CC	Chapai N.	Comilla CC	Chapai N.	Rajshahi CC
8	Tangail	Barisal CC	Naogaon	Chandpur	Faridpur	Chittag. CC	Saidpur
9	Savar	Chandpur	Jhenaidah	Tangail	Chapai N.	Mymensingh	Jessore
10	Chandpur	Nar'ganj CC	Satkhira	Naogaon	Jessore	Chandpur	Comilla CC
11	Rangpur CC	Sylhet CC	Chapai N.	Faridpur	Tangail	Habiganj	Gazipur CC
12	Pabna	Naogaon	Tangail	Rajshahi CC	Nar'ganj CC	Savar	Khulna CC
13	Satkhira	Sirajganj	Sylhet CC	Pabna	Kushtia	Saidpur	Dinajpur
14	Mymensingh	Mymensingh	Feni	Feni	Feni	Pabna	Chapai N.
15	Gopalganj	Jessore	Chandpur	Gazipur CC	Mymensingh	Sylhet CC	Jhenaidah
16	Chapai N.	Gazipur CC	Dinajpur	Jessore	Barisal CC	Rangpur CC	Naogaon
17	Kushtia	Comilla CC	Mymensingh	Comilla CC	Dinajpur	Dinajpur	Habiganj
18	Jessore	Kushtia	Faridpur	Satkhira	Bogra	Rajshahi CC	Bogra
19	Nar'ganj CC	Saidpur	Saidpur	Mymensingh	Saidpur	Feni	Feni
20	Dinajpur	Tangail	Savar	Dinajpur	Naogaon	Faridpur	Satkhira
21	Comilla CC	Savar	Pabna	Saidpur	Savar	Naogaon	Pabna
22	Feni	Dinajpur	Sirajganj	Sylhet CC	Satkhira	Bogra	Chandpur
23	Naogaon	Pabna	Jessore	Jhenaidah	Chittag. CC	Tangail	Barisal CC
24	Faridpur	Feni	Comilla CC	Habiganj	Rajshahi CC	Barisal CC	Sirajganj
25	Sirajganj	Satkhira	Nar'ganj CC	Savar	Sylhet CC	Gazipur CC	Rangpur CC
26	Tongi	Jhenaidah	Kushtia	Nar'ganj CC	Gazipur CC	Satkhira	Faridpur
27	Saidpur	Faridpur	Habiganj	Kushtia	Jhenaidah	Jhenaidah	Tangail
28	Jhenaidah	Habiganj	†	†	†	†	†
29	Habiganj	Gopalganj	†	†	†	†	†

† *Area and density data unavailable for Gopalganj and Tongi*

4.1.4. Age of Settlements

Figure 19 shows that, in all divisions, most settlements were established more than 21 years ago. Overall, some 65 per cent of settlements are more 21 years old, 10 per cent between 16 to 20 years, 9 per cent between 11 to 15 years, 10 per cent between 6 to 10 years, and only 6 per cent less than 5 years old. Chittagong and Dhaka Divisions have the highest numbers of settlements established during the past 5 years (580 and 957 respectively). This is a major finding and suggests that most settlement dwellers (including migrants) are living in long established communities, although an unknown percentage may have arrived more recently.

Figure 19: Distribution of Settlements by Age and Division

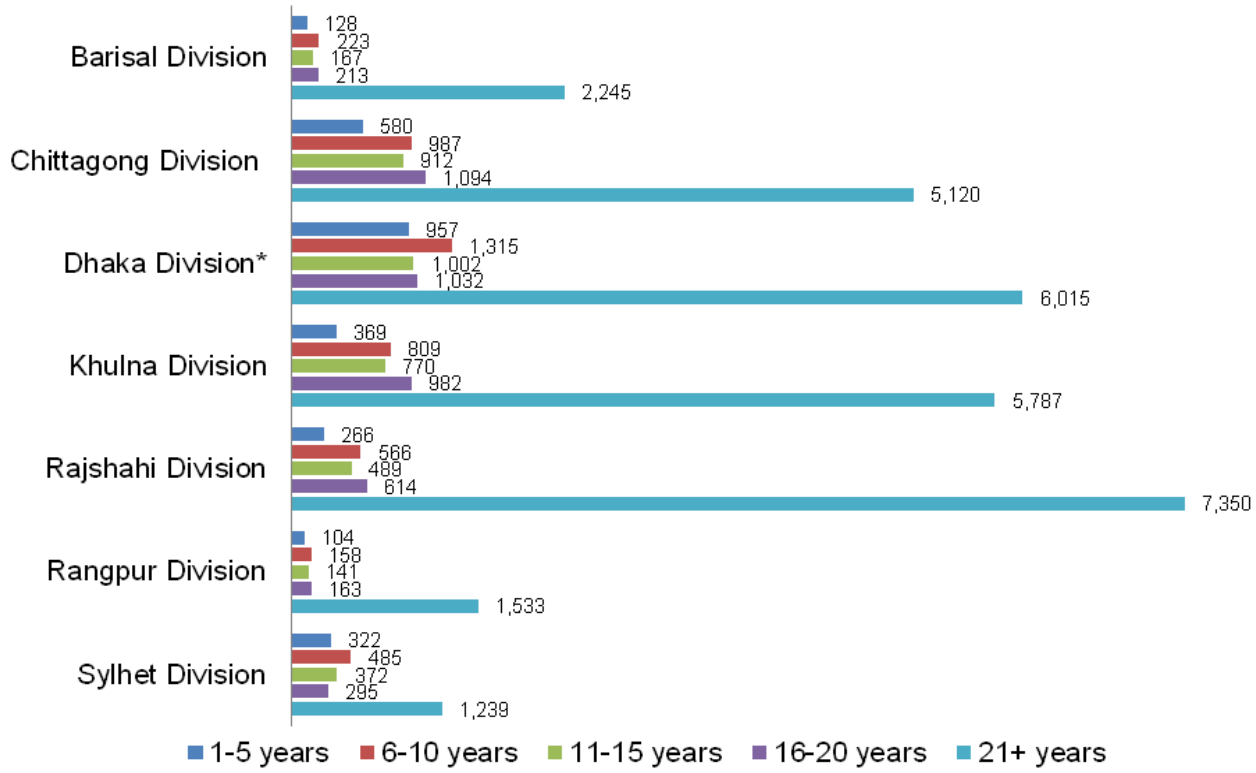
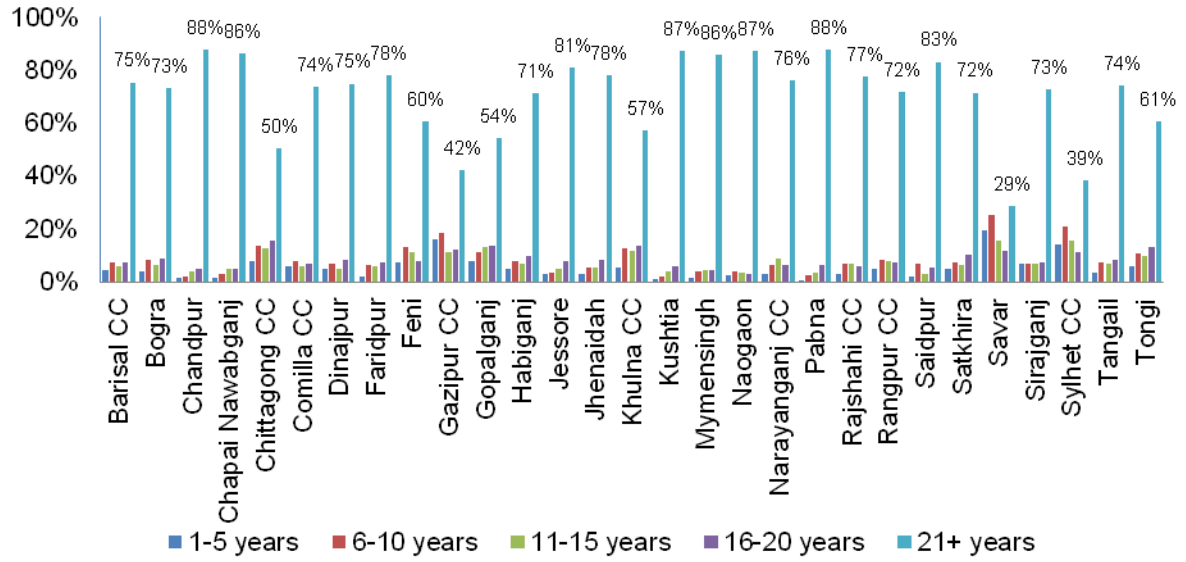


Figure 20 shows the distribution of settlement by age and town. With a few exceptions, the main pattern observed at the divisional level, whereby most settlements are older, is repeated. It is worth noting that Savar (29 per cent) and Sylhet (39 per cent) have the lowest percentage of settlements aged 21 years or older. In the case of Savar and Gazipur, which are in close proximity to Dhaka, the percentage of their settlements established during the past 5 years is 19 per cent and 16 per cent respectively. In overall terms, it is within City Corporations where the growth of new poor settlements has been greatest in the past 10 years. But even here it has been limited.

Figure 20: Distribution of Settlements by Age and Town



4.1.5. Systemic Differences in Demographic and Area Variables between Pourashavas and City Corporations

The clear variations in settlement age between City Corporations and Pourashavas prompted further investigations of possible systematic differences between the four demographic markers. Divisional and town-level tabulations of the variables appeared to support such differences and these were conformed via statistically tests. Comparison of means t-tests were used to provide a differences-in-differences analysis a (a formal specification and hypotheses is given in *Annex 2: Comparison of Means T-test Methodology).*

The hypotheses underpinning these relations vary in their clarity, since different arguments support significant differences in means in both directions. On the one hand higher poor settlement populations in City Corporations might be associated with improved economic conditions due the concentration of employment, trade and services, thus implying there area economies of scale. On the other hand, higher settlement populations in Pourashavas may be the result of poverty clustering around certain areas. Yet, some relations, such as between age and status are perhaps more clear, on the grounds that City Corporations are generally the more and longer established areas.

Table 5: Demographic and Area Variables, Comparison of Means t-test by Town Administrative Typology

Variable	Settlement Population (Households)		Settlement Area (Km^2)		Settlement Density (Households per Km^2)		Settlement Age (Years)	
Settl. Type	**Settl. in P'shavas**	**Settl. in City Corps.**	**Settl. in P'shavas**	**Settl. in City Corps.**	**Settl. in P'shavas**	**Settl. in City Corps.**	**Settl. in P'shavas**	**Settl. in City Corps.**
Sample Size	21,419	23,385	19,688	23,385	19,688	23,385	21,419	23,385
Mean	24.1	27.7	.0026	.0018	15,395	26,867	52	38
Standard Deviation	47.3	91.3	.0037	.0036	21,915	71,094	49	40
T-Stat.	-5.1764		21.4349		-21.7861		33.1066	

P-Value	0.0000**	0.0000**	0.0000**	0.0000**

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

The comparison of means t-tests show that there are significant differences in settlement household size, area, density and age between settlements in Pourashavas and those in City Corporations (see *Table 5* above). Settlements in Pourashavas tend to be on average less populous, larger in area, less dense and older than those in City Corporations. Such a pattern has some consistency with arguments based purely on the duration of establishment, with density and area size co-varying with age.

4.1.6. Summary of Findings

The SLM exercise identified 44,804 settlements comprising 1,162,971 households in 29 cities of Bangladesh. However, there is considerable concentration within the largest Cities, and more than one out of every four identified households lives in Chittagong.

Proportionately poor settlements tend to be small (where size is defined by households). Yet also, in terms of the absolute numbers, a larger number of poorer households are found in the larger settlements. Poor settlements cover 10.5 per cent of all the town land, although in Sirajganj this percentage increases to 34.5 per cent. The vast majority of poor settlements were established more than two decades ago, but in larger towns and city corporations, there is a greater incidence of newer settlements (yet even this is bounded). Importantly, there are often differences in the patterns and town rankings between relative and absolute measures of variables. Both dimensions are important in considering needs and the relationships at work.

With regards to population density, the urban area with the highest poor household density is Narayanganj, which ranks 10th in total number of households and 25th in terms of town area. Chittagong has the highest number of households, the largest area covered by poor settlements, and the highest settlement density. Settlements in City Corporations in general tend to be more populous, smaller in area, denser and younger than those in Pourashavas. This latter finding is supported by statistical testing.

In closing it is also important to note that although there are common settlement characteristics; differences in patterns of population composition, area coverage, and density are still observed across towns. This level of variation signals the importance of using correctly specified statistical tests when examining for relationships in the dataset.

4.2. Welfare Profile of Settlements

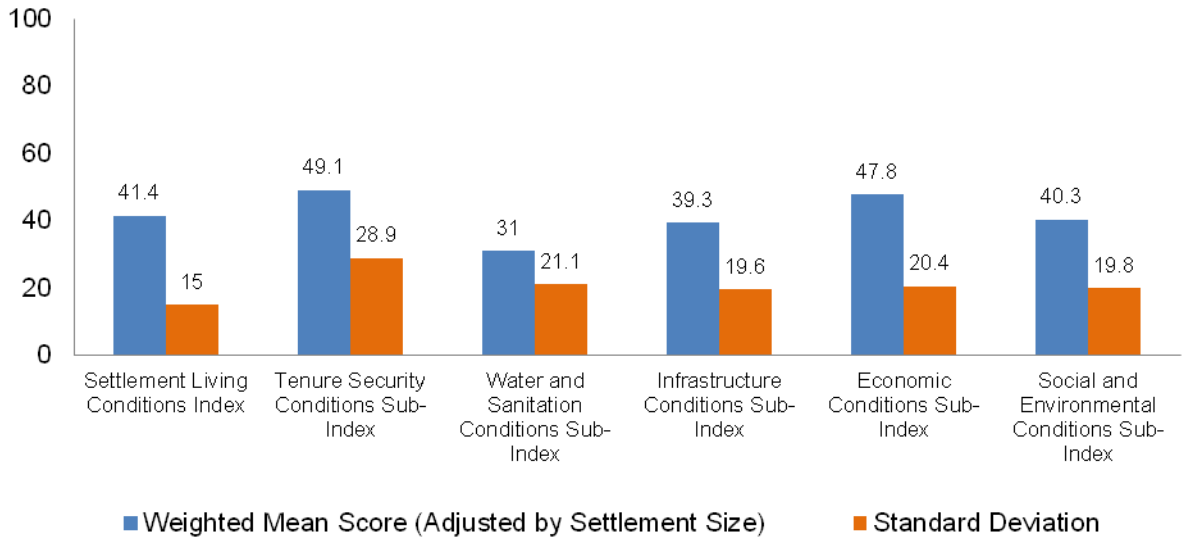
This second section within Chapter Four provides a *poverty profile-type* review of living conditions and key deprivations within settlements along with town comparisons. It begins by analyzing the settlement living conditions index data (SLCI) and the five multi-condition sub-indices at the town level. Within this, statistical tests are carried out for any systemic differences between City Corporations Pourashavas. This is based on the hypothesis that the former, being long established and of higher administrative status, enjoy better living conditions. Second, the adjusted poverty quartile approach (described in Chapter 2) is used to illustrate the differences in household size of according to poverty score, and to show the average deprivations of the 25 per cent of settlements which present the lowest scores.

4.2.1. The Settlement Living Conditions Index

The SLCI, which was introduced in Chapter 2, is the primary measure of welfare adopted by the SLM exercise. It is a combined measure of 16 ranked indicators across five sub-domains (Tenure Security, Water and Sanitation, Infrastructure, Economic Conditions, and Social and Environmental Conditions). It is scaled between 0 and 100, with higher values representing higher levels of welfare.

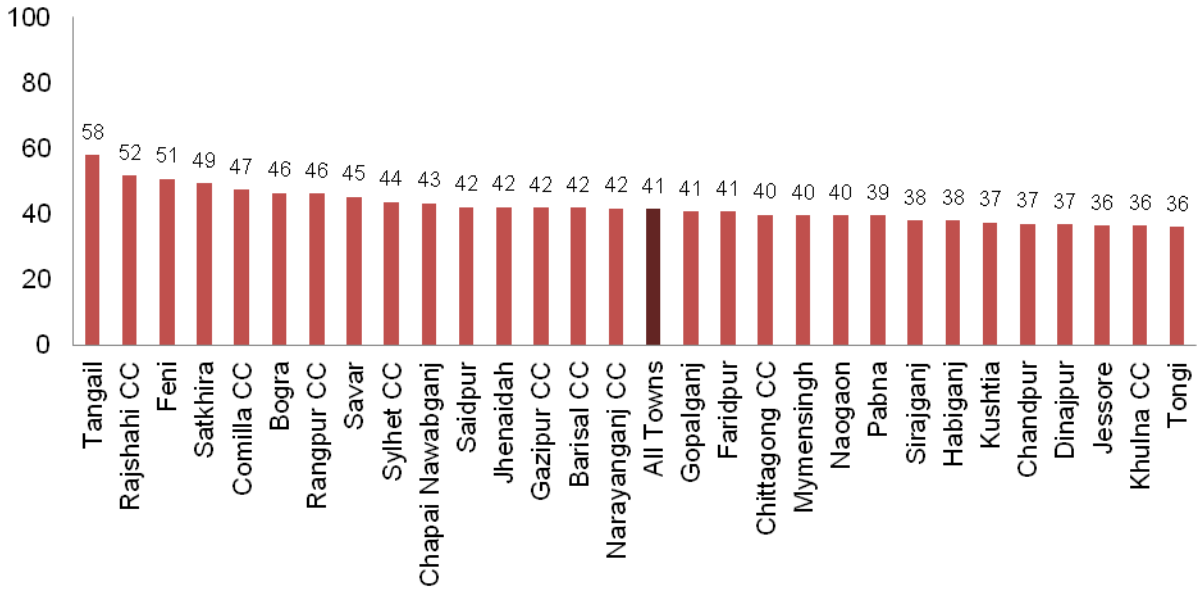
Figure 21 shows that the average index for all settlements after weighting by settlement size) stands at 41.4. The Tenure Security sub-index presents the highest mean score of all five sub-indices (49.1), but also records the greatest variability, with a standard deviation of 28.9. The Economic Conditions sub-index presents the second highest score (47.8), followed by the Social and Environmental Conditions sub-index (40.3) and the Infrastructure conditions sub-index (39.3). Finally, the identified poor settlements score most poorly on the Water and Sanitation conditions sub-index (31), marking this out as a major overall policy priority.

Figure 21: Weighted Settlement Living Conditions Index Score, Weighted Settlement Thematic Sub-Indices Scores, and Standard Deviations (Adjusted by Settlement Size)



Examining the SLCI by towns in *Figure 22*, Tangail (58) has the highest score, followed by Rajshahi City Corporation (52) and Feni (50.7). These are the only towns where the SLCI exceeds the benchmark value of 50. In contrast, Tongi, Khulna and Jessore, all scoring 36, have the lowest scores, lagging more than 20 points behind Tangail.

Figure 22: Weighted Settlement Living Conditions Index Score by Town (Adjusted by Settlement Size)



Examination for systematic differences between Pourashavas and City Corporations reveals no evidence of any correlations. *Table 6* shows, in contrast to the demographic markers reviewed above, that there are no significant differences in average SLCI scores.

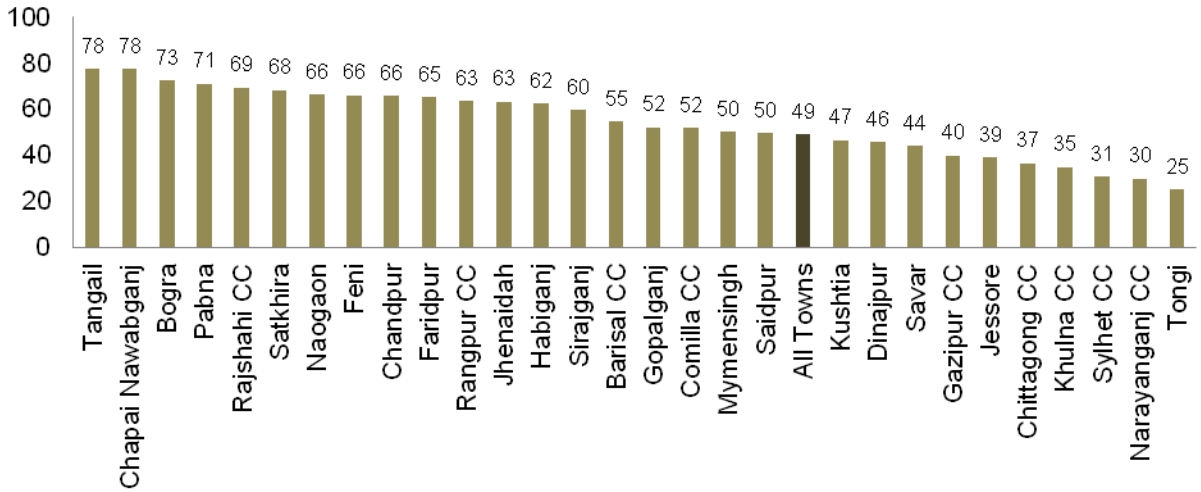
Table 6: Weighted Settlement Living Conditions Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	41.5	41.3
Standard Deviation	14.6	15.3
T-Statistic	1.4659	
P-Value	0.1427	

**Denotes significance at the 5 per cent level. **Denotes significance at the 1 per cent level*

Figure 23 shows that settlements in Tangail (78) and Chapai Nawabganj (78) have the most secure tenure conditions, followed by Bogra (73) and Pabna (71). Urban areas with the worst tenure security conditions include Tongi (25), Narayanganj (30) and Sylhet (31). Five out of the 7 towns presenting the lowest Tenure Security score are City Corporations (Narayanganj, Sylhet, Khulna, Chittagong and Gazipur).

Figure 23: Weighted Settlement Tenure Security Conditions Sub-Index Scores by Town (Adjusted by Settlement Size)



Follow–up statistical tests (see *Table 7* below) show that the differences between tenure security conditions of Pourashavas and City Corporations are significant at the 1 per cent level. Moreover, settlements in Pourashavas tend to be on average more secure than those in City Corporations.

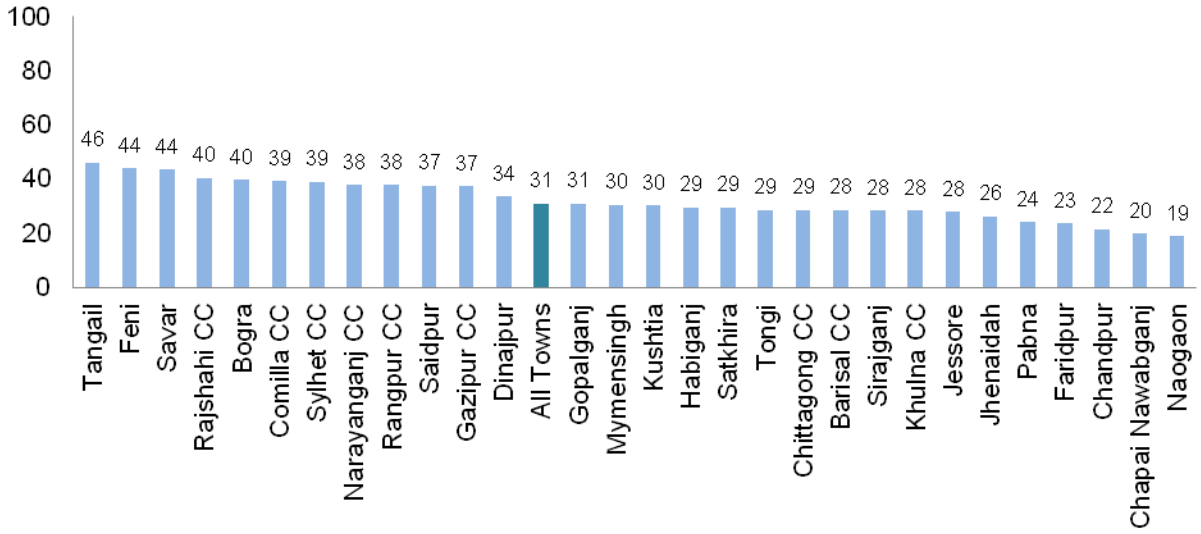
Table 7: Weighted Settlement Tenure Security Conditions Sub-Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	58.4	41.7
Standard Deviation	28.8	26.8
T-Statistic	63.5609	
P-Value	0.0000**	

**Denotes significance at the 5 per cent level. **Denotes significance at the 1 per cent level*

Scores for the Water and Sanitation Conditions sub-index are low in all towns, and none exceeds the 50 point mark (*Figure 24*). Once again, Tangail (46) has the highest score, followed by Feni (44) and Savar (44). Among the top ten best performing towns include five City Corporations (Rajshahi, Comilla, Sylhet, Narayanganj and Rangpur), suggesting higher levels investments in water and sanitation in these large urban centres. In contrast Naogaon (19), Chapai Nawabganj (20) and Chandpur (22) are the towns where outcomes were weakest.

Figure 24: Weighted Settlement Water and Sanitation Conditions Sub-Index Scores by Town (Adjusted by Settlement Size)



Statistical tests provided in *Table 8*, find a significant difference at the 1 per cent level in the water and sanitation conditions sub-index scores of settlements for Pourashavas compared with those of City Corporations. The latter score higher on average potentially reflecting the higher level of provision in long established settlements.

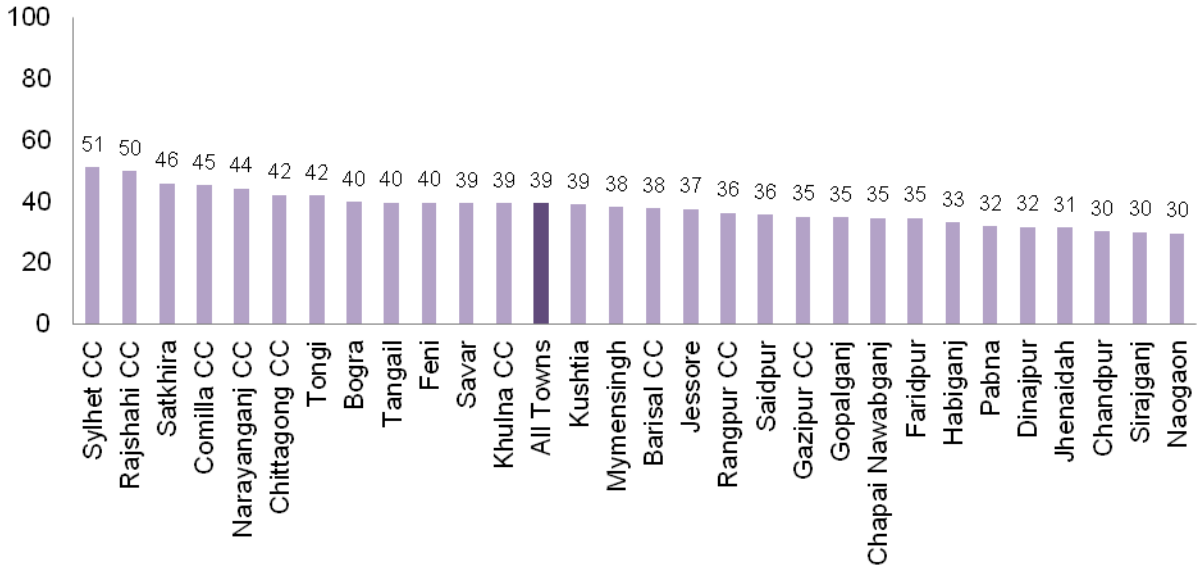
Table 8: Weighted Settlement Water and Sanitation Conditions Sub-Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	30	31.7
Standard Deviation	21.5	20.8
T-Statistic	-8.5169	
P-Value	0.0000**	

**Denotes significance at the 5 per cent level. **Denotes significance at the 1 per cent level*

Examining the Infrastructure Conditions sub-index *Figure 25* shows that Sylhet (51) has the highest score, followed by Rajshahi (50) and Satkhira (46). Again, among the top ten best performing towns are the City Corporations (Sylhet, Rajshahi, Comilla, Narayanganj and Chittagong). In contrast, Naogaon, Sirajganj and Chandpur (all with a score of 30), are the towns scoring the lowest. The relationship between Water, Sanitation and Infrastructure Sub-Indices, and potentially complementary public investment, can also be discerned – with 7 of the towns with the lowest scores appearing in the bottom ten positions in both distributions.

Figure 25: Weighted Settlement Infrastructure Conditions Sub-Index Scores by Town (Adjusted by Settlement Size)



Additionally, statistical testing (see

Table 9 below) shows that there is a significant difference at the 1 per cent level in the Infrastructure conditions sub-index scores of settlements in Pourashavas compared with those in City Corporations. As with the Water and Sanitation Sub-index, settlements in City Corporation have, on average, better infrastructure conditions than those in Pourashavas.

Table 9: Weighted Settlement Infrastructure Conditions Sub-Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

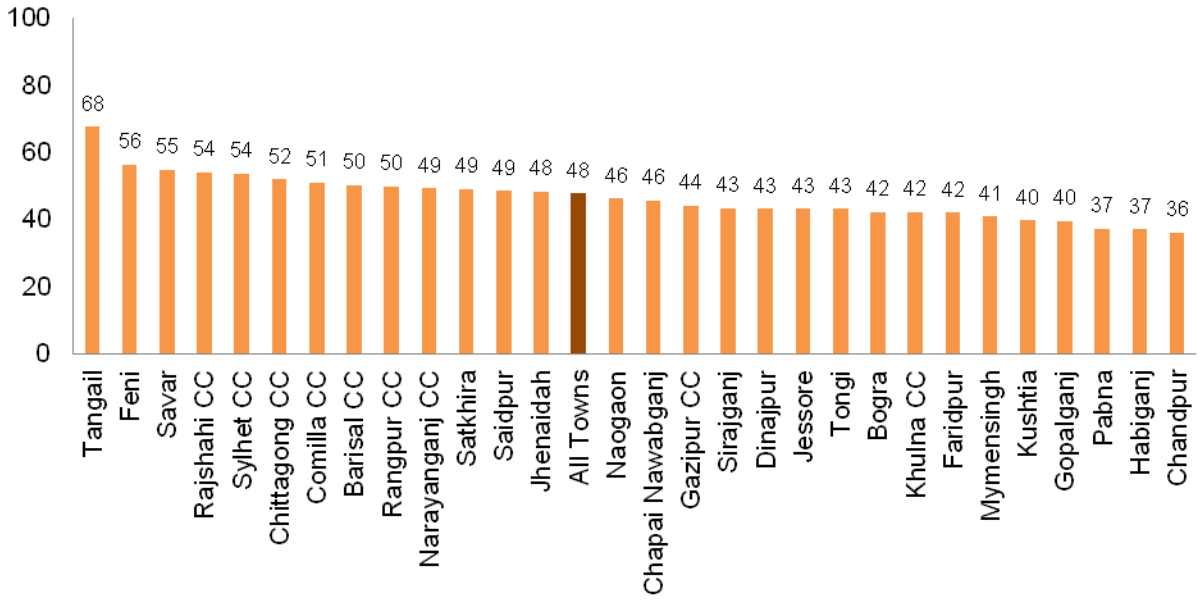
Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	36.1	41.9
Standard Deviation	18.2	20.2
T-Statistic	-31.9975	
P-Value	0.0000**	

**Denotes significance at the 5 per cent level. **Denotes significance at the 1 per cent level*

Referring now to the Economic Conditions sub-index,

Figure ***26*** illustrates that Tangail (68) records the highest score, followed by Feni (56) and Savar (55). These three towns are followed by seven City Corporations (Rajshahi, Sylhet, Chittagong, Comilla, Barisal, Rangpur and Narayanganj). This perhaps shows the potential of these large urban agglomeration centres in generating increased income, employment and savings and credit opportunities. Chandpur (36), Habiganj (37) and Pabna (37) are the towns where settlements on average exhibit the worst economic conditions.

Figure 26: Weighted Settlement Economic Conditions Sub-Index Scores by Town (Adjusted by Settlement Size)



As

Table 10 shows that there is a significant difference at the 1 per cent level in the Economic Conditions sub-index scores of settlements in Pourashavas compared with those in City Corporations. As suggested by the summary data, settlements in City Corporations, on average, enjoy better economic conditions than in Pourashavas.

Table 10: Weighted Settlement Economic Conditions Sub-Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

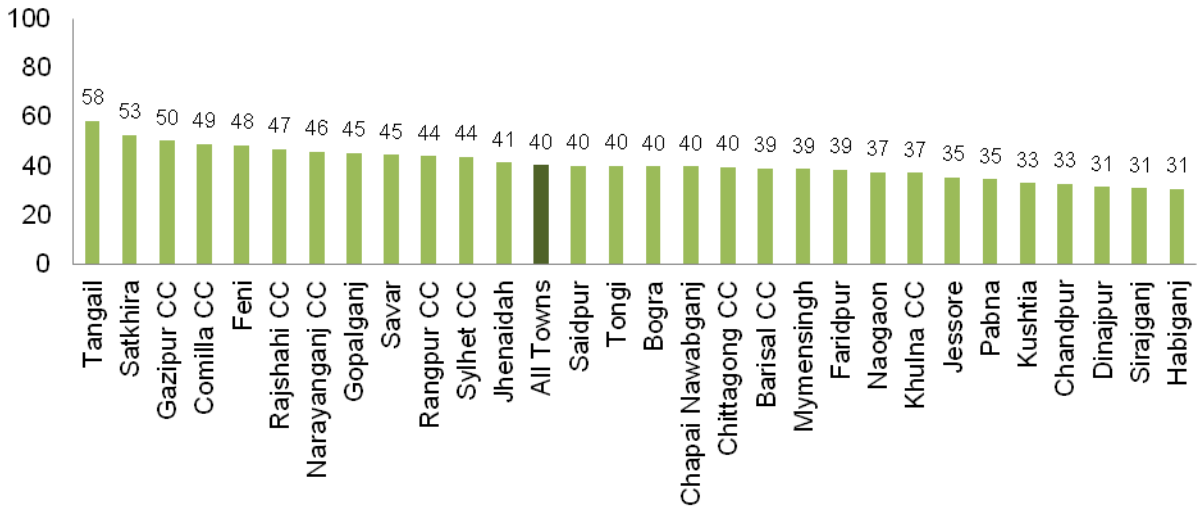
Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	44.96646	50.01381
Standard Deviation	18.64903	21.46815
T-Statistic	-73.4212	
P-Value	0.0000**	

**Denotes significance at the 5 per cent level. **Denotes significance at the 1 per cent level*

The Social and Environmental Conditions sub-index data suggest once more, that settlements in Tangail (58) obtain on average the highest score of all towns (

Figure ***27***). Settlements in Satkhira (53) and Gazipur (50) obtain the second and third best scores respectively, while Habiganj, Sirajganj and Dinajpur (all scoring 31) are the three towns with the lowest scores.

Figure 27: Weighted Settlement Social and Environmental Conditions Scores by Town (Adjusted by Settlement Size)



This pattern is confirmed by statistical testing. *Table 11* shows that there is a significant difference at the 1 per cent level in the social and environmental conditions sub-index scores of settlements in Pourashavas compared with those in City Corporations. In this regard, settlements in City Corporations have on average better economic conditions than settlements in Pourashavas.

Table 11: Weighted Settlement Social and Environmental Conditions Sub-Index Score, Comparison of Means t-test by Town Administrative Typology (Adjusted by Settlement Size)

Settlement Type	Settlements in Pourashavas	Settlements in City Corporations
Sample Size	21,419	23,385
Mean Score	39.1	41.3
Standard Deviation	18.9	20.4
T-Statistic	-12.0475	
P-Value	0.0000**	

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

To close this Sub-Section,

Table ***12*** summarizes the data shown from *Figure 21* through

Figure 27, by ranking the town scores for the SLCI and the five thematic sub-indices. This provides a multi-dimensional league of living conditions performance and reveals some very interesting patterns.

Tangail for example consistently appears close to or at the top of the rankings. Feni also performs well, appearing within the upper part of the distribution on each of the domains. Similarly, at the opposite end of the rankings, Chandpur and Habiganj perform poorly. It is

also interesting that the City Corporations (shown in underlined text) do not consistently fare better. Indeed, some, notably Khulna perform poorly across the board. This rather contrasts with the statistical test results, and again underlines the dangers of aggregate level analyses. It is also worth again referencing the concerns expressed in Chapter Two about the potential co-variations between several of the component indices, in essence that each is mapping the same character of ordinal depravations.

Table 12: Town Ranking by Population, Area and Density Indicators

Rank High to Low	Settlement and Living Conditions Index (SLCI)	Tenure Security Conditions Sub-Index	Water and Sanitation Conditions Sub-Index	Infrastruct. Conditions Sub-Index	Economic Conditions Sub-Index	Social and Environmental Conditions Sub-Index
1	Tangail	Tangail	Tangail	Sylhet CC	Tangail	Tangail
2	Rajshahi CC	Chapai N.	Feni	Rajshahi CC	Feni	Satkhira
3	Feni	Bogra	Savar	Satkhira	Savar	Gazipur CC
4	Satkhira	Pabna	Rajshahi CC	Comilla CC	Rajshahi CC	Comilla CC
5	Comilla CC	Rajshahi CC	Bogra	Nar'ganj CC	Sylhet CC	Feni
6	Bogra	Satkhira	Comilla CC	Chittagong CC	Chittagong CC	Rajshahi CC
7	Rangpur CC	Naogaon	Sylhet CC	Tongi	Comilla CC	Nar'ganj CC
8	Savar	Feni	Nar'ganj CC	Bogra	Barisal CC	Gopalganj
9	Sylhet CC	Chandpur	Rangpur CC	Tangail	Rangpur CC	Savar
10	Chapai N.	Faridpur	Saidpur	Feni	Nar'ganj CC	Rangpur CC
11	Saidpur	Rangpur CC	Gazipur CC	Savar	Satkhira	Sylhet CC
12	Jhenaidah	Jhenaidah	Dinajpur	Khulna CC	Saidpur	Jhenaidah
13	Gazipur CC	Habiganj	Gopalganj	Kushtia	Jhenaidah	Saidpur
14	Barisal CC	Sirajganj	Mymensingh	Mymensingh	Naogaon	Tongi
15	Nar'ganj CC	Barisal CC	Kushtia	Barisal CC	Chapai N.	Bogra
16	Gopalganj	Gopalganj	Habiganj	Jessore	Gazipur CC	Chapai N.
17	Faridpur	Comilla CC	Satkhira	Rangpur CC	Sirajganj	Chittagong CC
18	Chittagong CC	Mymensingh	Tongi	Saidpur	Dinajpur	Barisal CC
19	Mymensingh	Saidpur	Chittagong CC	Gazipur CC	Jessore	Mymensingh
20	Naogaon	Kushtia	Barisal CC	Gopalganj	Tongi	Faridpur
21	Pabna	Dinajpur	Sirajganj	Chapai N.	Bogra	Naogaon
22	Sirajganj	Savar	Khulna CC	Faridpur	Khulna CC	Khulna CC
23	Habiganj	Gazipur CC	Jessore	Habiganj	Faridpur	Jessore
24	Kushtia	Jessore	Jhenaidah	Pabna	Mymensingh	Pabna
25	Chandpur	Chittagong CC	Pabna	Dinajpur	Kushtia	Kushtia
26	Dinajpur	Khulna CC	Faridpur	Jhenaidah	Gopalganj	Chandpur
27	Jessore	Sylhet CC	Chandpur	Chandpur	Pabna	Dinajpur
28	Khulna CC	Nar'ganj CC	Chapai N.	Sirajganj	Habiganj	Sirajganj
29	Tongi	Tongi	Naogaon	Naogaon	Chandpur	Habiganj

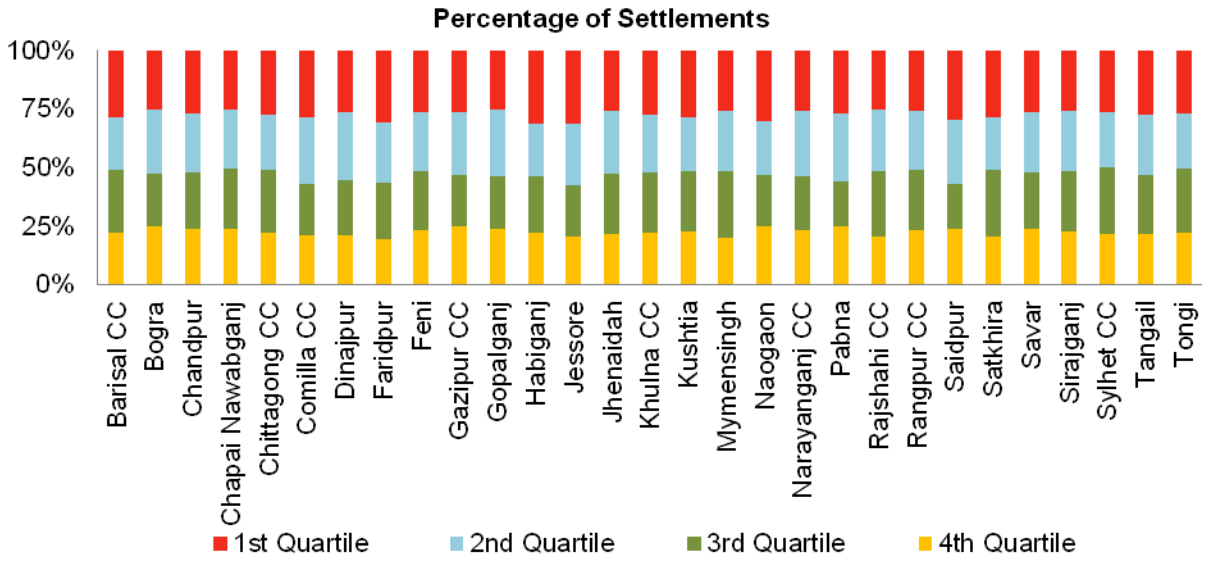
4.2.2. The Adjusted Poverty Quartile Approach

In order to examine distributional dimensions and to provide a synthetic poverty measure, all settlements were ranked according to their SLCI scores and divided into four adjusted quartiles of similar sizes. The first quartile contains the settlements with the lowest SLCI scores, and was defined as the *poorest* group. The upper quartile contains those settlements with the highest SLCI scores, and was defined as the least deprived, and therefore subjectively, the *least poor* group. It was not possible to draw four quartiles with an equal

number of settlements as several settlements shared a score that could place them into two quartiles. Quartile status serves as an inverse relative poverty measure, with lower status settlements being the poorest areas.

Figure ***28*** shows, for each town, the percentage of settlements belonging to each of the four adjusted poverty-status quartiles.

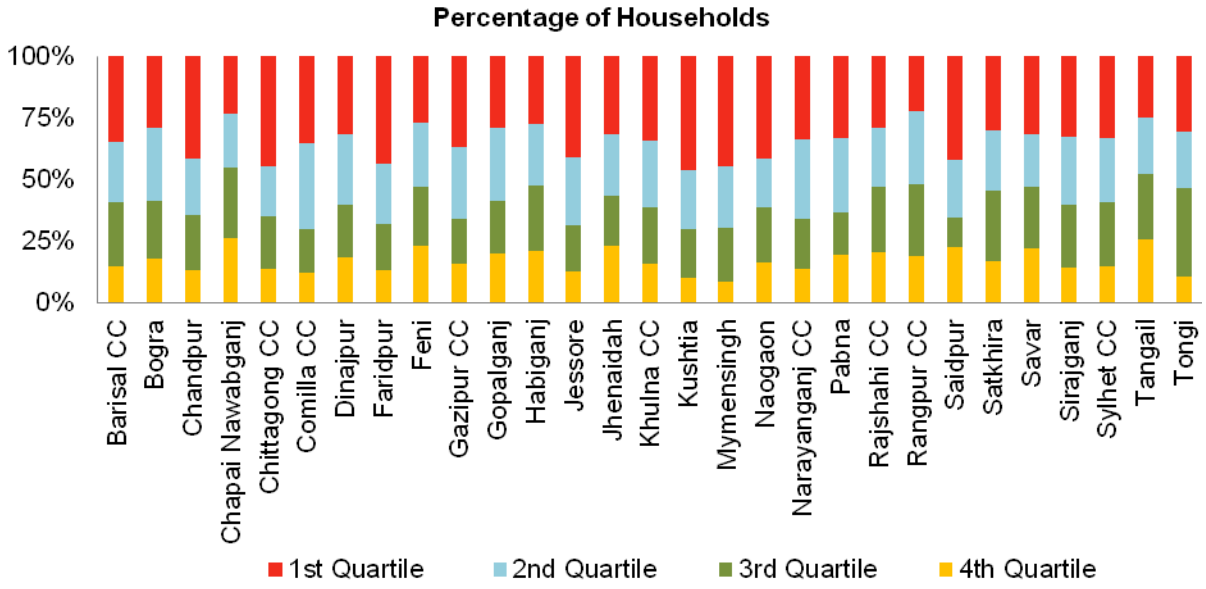
Figure 28: Percentage of Settlements by Adjusted Poverty Quartile



Similarly, *Figure 29* shows, for each town, the percentage of households in each adjusted poverty quartile. Interestingly, the number and percentage of households within each quartile increases significantly as settlements score lower. Thus settlements with higher quartile status (the richer) tend to be smaller, and settlements with lower quartile scores (the poorest) tend to be larger.

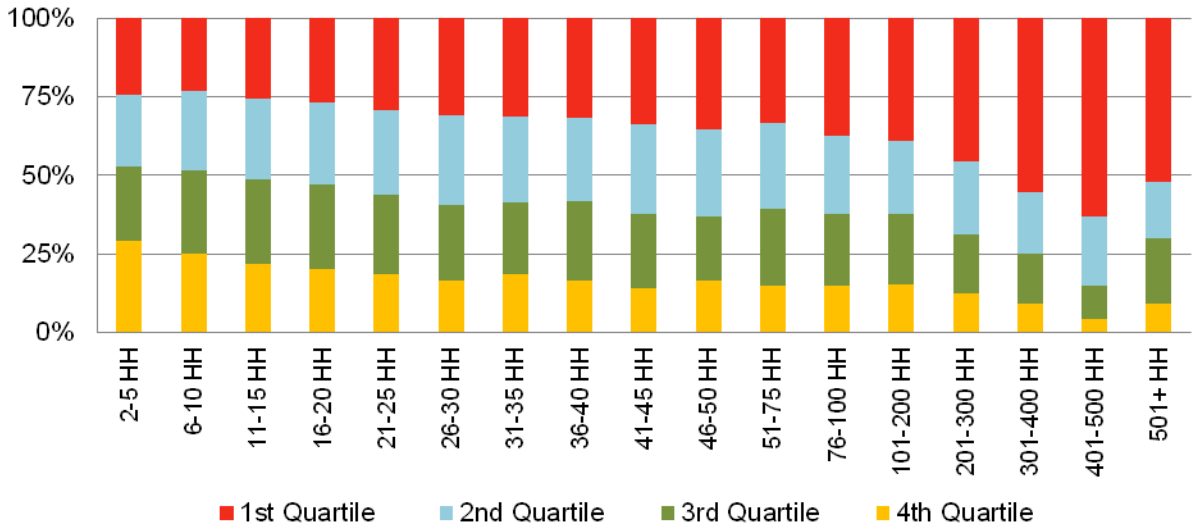
It is recognized this measure provides an inadequate substitute for a thoroughgoing analytical definition of poverty based on an objective threshold, but it does allow something to be said about the relative distribution of households based on an ordinal ranking of settlements. This finding adds to our understanding of relative poverty in poor areas. It specifically helps to resolve the apparent contradiction between the finding above regarding settlement size and household numbers in defining the locus of the most poor (see Section 4.1.1).

Figure 29: Percentage of Households by Adjusted Poverty Quartile



The pattern is further concentrated in *Figure 30*. Comparing the quartile distribution within settlement size, Figure 4.25 suggests that both variables are related. Within each settlement size group, the proportion of 1st quartile (poorest) settlements increases as settlement size increases. Likewise, the proportion of 4th quartile settlements decreases as settlement size increases.

Figure 30: Percentage Distribution of Poverty Quartile Status by Settlement Size



4.2.3. Summary of Findings

The results from this Chapter as a whole illustrate that average living conditions in settlements vary across the 29 towns surveyed. While a certain degree of variation exists in the SLCI town scores, more dramatic differences across and within towns are observed in the case of the five multi-dimensional scores.

While on average there are no statistically significant differences between settlements in Pourashavas and settlements in City Corporations on SLCI scores, settlements in

Pourashavas do tend to have better tenure security conditions than City Corporations, but worse water and sanitation, infrastructure, economic, and social and environmental conditions.

The need to analyze data within towns (across and within Wards) in order to observe intra-town variations is also evident, as data presented represents an aggregate score to conduct an inter-town comparison.

Chapter Five: Analysis of Key Statistical Relationships

This fifth chapter examines the associations and relationships at work within the data. The objective here is to understand the connections between and within the demographic and the living conditions variables (the SLCI and its components). These are potentially the most interesting cross-tabulations given that data come from two distinct and independent datasets. Although this section focuses on relationships, it is important to be cautious about attributing causation. A statistically significant result implies a relation exists between two variables, but not necessarily that one *causes* another. Alternatively, causality may be run in both directions, or it may be that the two variables co-vary on account that both are affected by a third (omitted) variable.

As explained in Chapter Three, the associations between variables are examined using Spearman Rank Correlation tests. Prior to presenting the results, a brief note on the meaning of the tables and statistics is in order. Spearman Rank Correlation Coefficient values offer an indication of the strength of the correlation while the *p* value indicates the significance level; one or two asterisks are used to signify where this occurs at the 5 per cent or 1 per cent level. Given the ordinal nature of the data (and its opinion-basis), the commentary takes significance as the more important factor. The *p* value is key variable - it indicates the percentage probability that a result could have occurred randomly, and thus there being no statistically significant relationship.

Thus, the most significant results are those where the *p* are values are below 0.01. These are given two asterisks, while results significant at the 5 per cent level are given one asterisk. A detailed overview on the methodology of Spearman's Rank Correlation Test can be found in *Annex 3: Methodology of Spearman's Rank Correlation Test*. Tables containing Spearman Rank Correlation Coefficient and *p* values for the entire sample and for individual towns can be seen at the end of each section.

5.1. Associations between the Settlement Living Conditions Index (SLCI) and Demographic and Area Variables

Referring first to the SLCI, *Table 13* below shows a significant negative association with settlement household population (-0.1451) at the 1 per cent level. This shows that smaller settlements tend to score higher and thus generally exhibit better living conditions. At the town level, this relationship is significant at the 1 per cent level for 20 towns and at the 5 per cent level for one town. In four towns (Chapai Nawabganj, Hobiganj, Satkhira and Tangail) is the relationship positive either at the 1 or 5 per cent levels, with larger settlements tending to score higher. This is also consistent with the quartile analysis of section 4.2 above.

Overall, there is a negative association at the 1 per cent level between the SLCI and settlement area (-0.0626), suggesting that geographically smaller settlements tend to score higher, and hence, have better living conditions (see

*Table **14*** below). This relationship holds for 13 out of 27 towns with available data. In seven others, the association is positively significant at the at the 1 or 5 per cent levels, while in the remaining seven there is no significant correlation between the two variables.

Household density (-0.0855) is also negatively associated with the SLCI at the 1 per cent level, thus less dense settlements tend to score higher and be better off (see *Table 15* below). At the town level, 16 towns out of 27 exhibit the same negative association at the 1 or 5 per cent levels and in seven others no significant relationship is found. Only in Barisal, Chapai Nawabganj, Rajshahi and Satkhira do higher density settlements have higher SLCI scores. Again, this is consistent with the summary level analyses presented above within the welfare profile.

Finally, *Table 16* shows that the SLCI score is positively associated with settlement age (0.1572) at the 1 per cent level. Therefore older settlements tend to exhibit better living conditions. This trend is also observed at the town level where 26 out of 29 towns present significant positive relations, mostly at the 1 per cent level. In three other towns (Saidpur, Savar and Tongi), no association is found. This is a further finding which is entirely consistent with the discussion of section 4.2 above.

Table 13: Summary of Statistical Associations between the Settlement Living Conditions Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1451 0.0000**		
Barisal CC				-0.0405 0.0272*	
Bogra			-0.1349 0.0000**		
Chandpur			-0.1862 0.0000**		
Chapai Nawabganj	0.0923 0.0033**				
Chittagong CC			-0.2058 0.0000**		
Comilla CC			-0.1185 0.0005**		
Dinajpur			-0.1020 0.0027**		
Faridpur			-0.2409 0.0000**		
Feni			-0.0230 0.5085		
Gazipur CC			-0.2124 0.0000**		
Gopalganj			-0.1051 0.0008**		
Hobiganj	0.1456 0.0004**				
Jessore			-0.2493 0.0000**		
Jhenaidah					0.0710 0.0669
Khulna CC			-0.2520 0.0000**		
Kushtia			-0.5187 0.0000**		
Mymensingh			-0.3358 0.0000**		
Naogaon			-0.1104 0.0016**		
Narayanganj CC			-0.3029 0.0000**		
Pabna			-0.1694 0.0000**		
Rajshahi CC					-0.0099 0.6934
Rangpur CC					0.0226 0.4287

Saidpur			-0.1637 0.0000**		
Satkhira		0.0623 0.0340*			
Savar					-0.0333 0.2241
Sirajganj				-0.0897 0.0135*	
Sylhet CC			-0.1641 0.0000**		
Tangail		0.0633 0.0131*			
Tongi			-0.2573 0.0000**		
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	4/29		21/29		4/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 14: Summary of Statistical Associations between the Settlement Living Conditions Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.0626 0.0000**		
Barisal CC			-0.1157 0.0000**		
Bogra			-0.1798 0.0000**		
Chandpur					0.0122 0.6679
Chapai Nawabganj					0.0252 0.4226
Chittagong CC			-0.0949 0.0000**		
Comilla CC					-0.0416 0.2262
Dinajpur				-0.0736 0.0303*	
Faridpur			-0.2644 0.0000**		
Feni	0.1481 0.0000**				
Gazipur CC					0.0277 0.1374
Gopalganj	†	†	†	†	†
Hobiganj	0.1150 0.0052**				
Jessore			-0.2404 0.0000**		
Jhenaidah	0.1776 0.0000**				
Khulna CC			-0.0588 0.0000**		
Kushtia			-0.2860 0.0000**		
Mymensingh			-0.2840 0.0000**		
Naogaon					-0.0589 0.0934
Narayanganj CC			-0.2164 0.0000**		
Pabna			-0.2215 0.0000**		
Rajshahi CC			-0.1022 0.0000**		
Rangpur CC	0.1371 0.0000**				
Saidpur	0.1697 0.0000**				
Satkhira					-0.0009

					0.9753
Savar		0.0557 0.0423*			
Sirajganj					0.0580 0.1104
Sylhet CC			-0.0852 0.0001**		
Tangail	0.2127 0.0000**				
Tongi	†	†	†	†	†

	Number of Towns with Positive Significant Correlations	Number of Towns with Negative Significant Correlations	Number of Towns with No Significant Correlation
	7/27	13/27	7/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 15: Summary of Statistical Associations between the Settlement Living Conditions Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.0855 0.0000**		
Barisal CC	0.0792 0.0000**				
Bogra			0.0558 0.0016**		
Chandpur			-0.2196 0.0000**		
Chapai Nawabganj		0.0774 0.0136*			
Chittagong CC			-0.1374 0.0000**		
Comilla CC			-0.1386 0.0001**		
Dinajpur					-0.0247 0.4678
Faridpur					0.0146 0.6801
Feni			-0.1666 0.0000**		
Gazipur CC			-0.2364 0.0000**		
Gopalganj	†	†	†	†	†
Hobiganj					0.0289 0.4838
Jessore					-0.0090 0.7855
Jhenaidah				-0.0846 0.0290*	
Khulna CC			-0.1955 0.0000**		
Kushtia			-0.2431 0.0000**		
Mymensingh			-0.1340 0.0000**		
Naogaon			-0.0903 0.0100**		
Narayanganj CC				-0.0820 0.0136*	
Pabna					0.0548 0.0590
Rajshahi CC	0.0984 0.0001**				
Rangpur CC			-0.1510 0.0000**		
Saidpur			-0.3888 0.0000**		
Satkhira		0.0602 0.0405*			
Savar			-0.0889 0.0012**		
Sirajganj			-0.2430		

			0.0000**		
Sylhet CC			-0.0960 0.0000**		
Tangail			-0.1686 0.0000**		
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	4/27		16/27		7/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 16: Summary of Statistical Associations between the Settlement Living Conditions Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.1572 0.0000**				
Barisal CC	0.0477 0.0093**				
Bogra	0.1267 0.0000**				
Chandpur	0.1041 0.0002**				
Chapai Nawabganj	0.2410 0.0000**				
Chittagong CC	0.1096 0.0000**				
Comilla CC	0.1889 0.0000**				
Dinajpur	0.2266 0.0000**				
Faridpur	0.2645 0.0000**				
Feni	0.3777 0.0000**				
Gazipur CC	0.2265 0.0000**				
Gopalganj	0.2129 0.0000**				
Hobiganj	0.3872 0.0000**				
Jessore	0.1284 0.0001**				
Jhenaidah	0.2034 0.0000**				
Khulna CC	0.1548 0.0000**				
Kushtia	0.2305 0.0000**				
Mymensingh	0.1427 0.0000**				
Naogaon	0.1472 0.0000**				
Narayanganj CC		0.0782 0.0186*			
Pabna	0.1036 0.0003**				
Rajshahi CC	0.2764 0.0000**				
Rangpur CC	0.3022 0.0000**				
Saidpur					0.0227 0.5491
Satkhira	0.1722 0.0000**				
Savar					0.0249 0.3637
Sirajganj	0.4409 0.0000**				
Sylhet CC	0.0741				

	0.0006**				
Tangail	0.0972 0.0001**				
Tongi					-0.0048 0.8977
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	26/29		0/29		3/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.2. Associations between the Tenure Security Conditions Sub-Index and Demographic and Area Variables

Table 17 repeats this analysis for the first of the subcomponents of the SLCI – the Tenure Conditions Sub-Index. The results show a statistically significant negative association between the index (made up of land ownership status, type of occupancy and housing quality) and settlement household population (-0.1013) at the 1 per cent level. This shows that smaller settlements tend to have better tenure security conditions than larger settlements. Town level results are mixed: 14 out of 29 towns have this same significant relationship at the 1 or 5 per cent levels, while in six others there is a significant positive association. Finally, in nine towns no statistical association is found.

Similarly,

*Table **18*** shows that the Tenure Security Conditions Sub-Index is positively associated with area size (0.2037), that is, larger settlements tend to have better living conditions than smaller ones. Moreover, this relationship holds at the 1 and 5 per cent levels in 15 out of 27 towns, including six out of the nine City Corporations analyzed (Barisal, Chittagong, Comilla, Gazipur, Khulna and Rangpur). In six towns, the relationship is positive and significant at the 1 or 5 per cent levels, while in six others no significant relation is found.

Following the established order, *Table 19* shows that a strong negative relationship is found between the Tenure Security Conditions Sub-Index and settlement density (-0.3503). This is significant at the 1 per cent level, implying that higher density settlements tend to have poorer security tenure conditions than those with lower densities. At the town level, a significant positive relationship at the 1 per cent level is only found in Chapai Nawabganj (0.2071), while in 21 out of 27 other towns the relationship is negative and significant at the 1 or 5 per cent levels. In five others, no significant association is found.

As *Table 20* illustrates, the Tenure Security Conditions Sub-Index is also positively associated with settlement age at the 1 per cent level (0.3405), therefore older settlements tend to present better tenure security conditions. The significance and the magnitude mark this out as one of the stronger associations between the variables, together with density. At the town level, 28 out of 29 towns present this same relationship significant at the 1 per cent level, mostly with larger rank correlation coefficients. Only in Narayanganj is there no significant association between both variables.

Table 17: Summary of Statistical Associations between the Tenure Security Conditions Sub-Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1013 0.0000**		
Barisal CC			-0.0531 0.0037**		
Bogra	0.0690 0.0001**				
Chandpur			-0.1967 0.0000**		
Chapai Nawabganj	0.1248 0.0001**				
Chittagong CC			-0.0756 0.0000**		
Comilla CC					0.0169 0.6230
Dinajpur			-0.1578 0.0000**		
Faridpur			-0.1191 0.0007**		
Feni					-0.0114 0.7436
Gazipur CC			-0.3780 0.0000**		
Gopalganj				-0.0732 0.0193*	
Hobiganj	0.1406 0.0006**				
Jessore			-0.2823 0.0000**		
Jhenaidah	0.1417 0.0002**				
Khulna CC			-0.1677 0.0000**		
Kushtia			-0.3818 0.0000**		
Mymensingh			-0.2708 0.0000**		
Naogaon		0.0765 0.0292*			
Narayanganj CC			-0.2103 0.0000**		
Pabna					-0.0121 0.6762
Rajshahi CC					0.0216 0.3889
Rangpur CC	0.1278 0.0000**				
Saidpur			-0.2627 0.0000**		
Satkhira					0.0506 0.0848
Savar			-0.2726 0.0000**		
Sirajganj					-0.0563 0.1213
Sylhet CC			-0.1080 0.0000**		
Tangail					0.0323 0.2056
Tongi					-0.0192

					0.6098
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	6/29		14/29		9/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 18: Summary of Statistical Associations between the Tenure Security Conditions Sub-Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.2037 0.0000**				
Barisal CC	0.2618 0.0000**				
Bogra	0.1074 0.0000**				
Chandpur	0.0902 0.0015**				
Chapai Nawabganj			-0.0918 0.0034**		
Chittagong CC	0.1568 0.0000**				
Comilla CC	0.1205 0.0004**				
Dinajpur				-0.0771 0.0233*	
Faridpur					0.0021 0.9535
Feni	0.3118 0.0000**				
Gazipur CC	0.0986 0.0000**				
Gopalganj	†	†	†	†	†
Hobiganj	0.1961 0.0000**				
Jessore			-0.1195 0.0003**		
Jhenaidah	0.2633 0.0000**				
Khulna CC	0.0952 0.0000**				
Kushtia			-0.2022 0.0000**		
Mymensingh			-0.1623 0.0000**		
Naogaon	0.1428 0.0000**				
Narayanganj CC			-0.1544 0.0000**		
Pabna					-0.0332 0.2528
Rajshahi CC					-0.0121 0.6286
Rangpur CC	0.1135 0.0001**				
Saidpur					0.0071 0.8516
Satkhira	0.1117 0.0001**				
Savar					-0.0265 0.3348
Sirajganj	0.1411 0.0001**				
Sylhet CC					-0.0030 0.8919
Tangail	0.2219 0.0000**				
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant**

			Correlation
	15/27	6/27	6/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 19: Summary of Statistical Associations between the Tenure Security Conditions Sub-Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.3503 0.0000**		
Barisal CC			-0.3632 0.0000**		
Bogra			-0.0480 0.0065**		
Chandpur			-0.3130 0.0000**		
Chapai Nawabganj	0.2170 0.0000**				
Chittagong CC			-0.3206 0.0000**		
Comilla CC			-0.1872 0.0000**		
Dinajpur				-0.0850 0.0124*	
Faridpur			-0.1652 0.0000**		
Feni			-0.2974 0.0000**		
Gazipur CC			-0.4707 0.0000**		
Gopalganj	†	†	†	†	†
Hobiganj					-0.0596 0.1484
Jessore			-0.2783 0.0000**		
Jhenaidah			-0.1204 0.0018**		
Khulna CC			-0.3093 0.0000**		
Kushtia			-0.1925 0.0000**		
Mymensingh			-0.2012 0.0000**		
Naogaon			-0.1262 0.0003**		
Narayanganj CC					-0.0540 0.1041
Pabna					0.0215 0.4598
Rajshahi CC					0.0306 0.2218
Rangpur CC					-0.0097 0.7333
Saidpur			-0.3346 0.0000**		
Satkhira			-0.0788 0.0073**		
Savar			-0.2057 0.0000**		
Sirajganj			-0.3458 0.0000**		
Sylhet CC			-0.1144 0.0000**		
Tangail			-0.2303 0.0000**		
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant		**Number of Towns with Negative Significant**		**Number of Towns**

	Correlations	Correlations	with No Significant Correlation
	1/27	21/27	5/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 20: Summary of Statistical Associations between the Tenure Security Conditions Sub-Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	Positive Correlation 5% Significant	Negative Correlation 1% Significant	Negative Correlation 5% Significant	No Significant Correlation
All Towns	0.3405 0.0000**				
Barisal CC	0.1762 0.0000**				
Bogra	0.1579 0.0000**				
Chandpur	0.0927 0.0011**				
Chapai Nawabganj	0.2971 0.0000**				
Chittagong CC	0.3376 0.0000**				
Comilla CC	0.2931 0.0000**				
Dinajpur	0.2232 0.0000**				
Faridpur	0.2807 0.0000**				
Feni	0.5183 0.0000**				
Gazipur CC	0.3323 0.0000**				
Gopalganj	0.2519 0.0000**				
Hobiganj	0.2404 0.0000**				
Jessore	0.1570 0.0000**				
Jhenaidah	0.1801 0.0000**				
Khulna CC	0.1292 0.0000**				
Kushtia	0.3135 0.0000**				
Mymensingh	0.2016 0.0000**				
Naogaon	0.2260 0.0000**				
Narayanganj CC					0.0387 0.2444
Pabna	0.0869 0.0027**				
Rajshahi CC	0.2808 0.0000**				
Rangpur CC	0.2298 0.0000**				
Saidpur	0.1035 0.0061**				
Satkhira	0.1484 0.0000**				
Savar	0.2021 0.0000**				
Sirajganj	0.3889 0.0000**				
Sylhet CC	0.2221 0.0000**				
Tangail	0.0964 0.0002**				
Tongi	0.1385 0.0002**				

	Number of Towns with Positive Significant Correlations	Number of Towns with Negative Significant Correlations	Number of Towns with No Significant Correlation
	28/29	0/29	1/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.3. Associations between the Water and Sanitation Conditions Sub-Index and Demographic and Area Variables

The next series of comparisons investigate the relationships with water and sanitation conditions. *Table 21* illustrates a negative significant association between the Water and Sanitation Conditions Sub-Index (made up of water supply quality, sanitation facilities and drainage facilities) and settlement household population (-0.1325) at the 1 per cent level. This shows that smaller settlements tend to have better water and sanitation conditions than larger settlements. At the town level results are mixed: 18 towns out of 29 present this same significant relationship at the 1 or 5 per cent levels, while in 11 no significant association exists.

Similarly, as *Table 22* shows, the Water and Sanitation Conditions Sub-Index is negatively associated with settlement area (-0.1472) at the 1 per cent level, therefore smaller settlements in area size tend have better water and sanitation conditions than larger settlements. While this trend is maintained in 16 towns out of 27, Tangail is the only town where a positive association between both variables is found (0.1690). In 10 other towns, no significant association is found.

Table 23 illustrates a positive significant association between water and sanitation settlement density (-0.0255) at the 1 per cent level, although it must be noted that the coefficient is very weak. This shows that higher density settlements have marginally better water and sanitation conditions than lower density settlements. The picture varies across towns, as this trend is only observed in 4 towns (Barisal City Corporation, Bogra, Dinajpur and Rajshahi), while in 14 others, the relationship is negative and significant at the 1 or 5 per cent levels, that is, lower density settlements tend to have better water and sanitation conditions. However, in nine towns no significant relationship is found. This is clearly a more complex and nuanced set of relationships at work.

Finally,

Table ***24*** shows that no significant association exists between the Water and Sanitation Sub-Index and settlement age. At the town level a considerable degree of variation is observed. Overall, 14 towns present a positive significant association at the 1 or 5 per cent levels, while the association is significant and negative at the 1 or 5 per cent levels in 4 others. In 11 towns, no significant association exists.

Table 21: Summary of Statistical Associations between the Water and Sanitation Conditions Sub-Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1325 0.0000**		
Barisal CC					0.0232 0.2057
Bogra			-0.0742 0.0000**		
Chandpur			-0.1293 0.0000**		
Chapai Nawabganj					-0.0136 0.6660
Chittagong CC			-0.2085 0.0000**		
Comilla CC			-0.1700 0.0000**		
Dinajpur					-0.0349 0.3049
Faridpur			-0.1398 0.0001**		
Feni			-0.0913 0.0085**		
Gazipur CC					-0.0039 0.8347
Gopalganj					-0.0548 0.0800
Hobiganj					0.0383 0.3530
Jessore			-0.1769 0.0000**		
Jhenaidah			-0.1137 0.0033**		
Khulna CC			-0.2384 0.0000**		
Kushtia			-0.4477 0.0000**		
Mymensingh			-0.2784 0.0000**		
Naogaon			-0.1916 0.0000**		
Narayanganj CC			-0.2276 0.0000**		
Pabna			-0.2025 0.0000**		
Rajshahi CC					0.0476 0.0573
Rangpur CC				-0.0602 0.0346*	
Saidpur					-0.0615 0.1039
Satkhira			-0.1219 0.0000**		
Savar					-0.0423 0.1230
Sirajganj					-0.0639 0.0784
Sylhet CC			-0.1915 0.0000**		
Tangail					0.0228 0.3725
Tongi			-0.2150 0.0000**		
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant**

			Correlation
	0/29	18/29	11/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 22: Summary of Statistical Associations between the Water and Sanitation Conditions Sub-Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1472 0.0000**		
Barisal CC			-0.1622 0.0000**		
Bogra			-0.1981 0.0000**		
Chandpur					-0.0165 0.5630
Chapai Nawabganj					-0.0118 0.7067
Chittagong CC			-0.1721 0.0000**		
Comilla CC			-0.1255 0.0002**		
Dinajpur			-0.0893 0.0085**		
Faridpur			-0.1868 0.0000**		
Feni					-0.0131 0.7066
Gazipur CC					-0.0061 0.7435
Gopalganj	†	†	†	†	†
Hobiganj					0.0361 0.3818
Jessore			-0.1789 0.0000**		
Jhenaidah					0.0471 0.2243
Khulna CC			-0.0819 0.0000**		
Kushtia			-0.1911 0.0000**		
Mymensingh			-0.2497 0.0000**		
Naogaon			-0.1550 0.0000**		
Narayanganj CC			-0.1495 0.0000**		
Pabna			-0.2143 0.0000**		
Rajshahi CC					-0.0124 0.6193
Rangpur CC					0.0105 0.7120
Saidpur			0.1443 0.0001**		
Satkhira			-0.1292 0.0000**		
Savar					-0.0134 0.6257
Sirajganj					0.0611 0.0923
Sylhet CC			-0.1329 0.0000**		
Tangail	0.1690 0.0000**				
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**

	1/27	16/27	10/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 23: Summary of Statistical Associations between the Water and Sanitation Conditions Sub-Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.0255 0.0000**				
Barisal CC	0.2038 0.0000**				
Bogra	0.1210 0.0000**				
Chandpur			-0.1240 0.0000**		
Chapai Nawabganj					0.0137 0.6621
Chittagong CC				-0.0319 0.0154*	
Comilla CC				-0.0727 0.0342*	
Dinajpur	0.0901 0.0080**				
Faridpur					0.0466 0.1868
Feni				-0.0817 0.0185*	
Gazipur CC					-0.0007 0.9686
Gopalganj	†	†	†	†	†
Hobiganj					-0.0085 0.8376
Jessore					0.0314 0.3446
Jhenaidah			-0.1591 0.0000**		
Khulna CC			-0.1550 0.0000**		
Kushtia			-0.2592 0.0000**		
Mymensingh			-0.1053 0.0004**		
Naogaon					-0.0197 0.5745
Narayanganj CC			-0.0858 0.0098**		
Pabna					-0.0017 0.9525
Rajshahi CC		0.0613 0.0143*			
Rangpur CC			-0.0929 0.0011**		
Saidpur			-0.2163 0.0000**		
Satkhira					0.0114 0.6989
Savar					-0.0136 0.6211
Sirajganj			-0.1915 0.0000**		
Sylhet CC			-0.0708 0.0011**		
Tangail			-0.1450 0.0000**		
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**

	4/27	14/27	9/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† Area and density data unavailable.

Table 24: Summary of Statistical Associations between the Water and Sanitation Conditions Sub-Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns					-0.0081 0.0866
Barisal CC				-0.0470 0.0104*	
Bogra	0.1110 0.0000**				
Chandpur		0.0657 0.0209*			
Chapai Nawabganj	0.1293 0.0000**				
Chittagong CC				-0.0310 0.0186*	
Comilla CC					-0.0101 0.7697
Dinajpur	0.1655 0.0000**				
Faridpur	0.1460 0.0000**				
Feni	0.1509 0.0000**				
Gazipur CC					-0.0364 0.0511
Gopalganj	0.0800 0.0000**				
Hobiganj	0.2260 0.0000**				
Jessore	0.0979 0.0032**				
Jhenaidah					0.0243 0.5312
Khulna CC	0.0626 0.0000**				
Kushtia		0.0771 0.0182*			
Mymensingh					0.0501 0.0919
Naogaon					-0.0419 0.2325
Narayanganj CC					0.0274 0.4099
Pabna	0.1805 0.0000**				
Rajshahi CC	0.2555 0.0000**				
Rangpur CC			0.1681 0.0000**		
Saidpur					-0.0698 0.0647
Satkhira					-0.0304 0.3009
Savar					-0.0380 0.1656
Sirajganj	0.3225 0.0000**				
Sylhet CC					-0.0156 0.4731
Tangail				-0.0642 0.0118*	
Tongi					-0.0633 0.0919
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	14/29		4/29		11/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.4. Associations between the Infrastructure Conditions Sub-Index and Demographic and Area Variables

From *Table 25* to *Table 28*, the analysis focuses on the quality of infrastructure. *Table 25* finds a negative significant association between the Infrastructure Conditions Sub-Index (given by individual conditions on access roads, electricity supply and solid waste collection) and settlement household population (-0.0482) at the 1 per cent level. The weak coefficient shows that smaller settlements tend to marginally have better infrastructure conditions than larger settlements. At the town level 15 towns out of 29 present a similar significant relationship at the 1 or 5 per cent levels, while in 11 no significant association exists. Only in Gazipur, Rangpur, and Satkhira do larger settlements have better infrastructure conditions than do smaller settlements.

A negative significant association exists between the Infrastructure Conditions Sub-Index and area size at the 1 per cent level (-0.2067); hence smaller settlements in area size tend to present better infrastructure conditions (see *Table 26* below). This same pattern, which is significant at the 1 or 5 per cent levels, can be observed in 22 out of 27 towns, while in 5 others, no significant correlation is found.

Table 27 shows that the relationship between the infrastructure conditions and settlement density is positive and significant at the 1 per cent level (0.1895), thus settlements with higher densities tend to exhibit better infrastructure conditions. The majority of towns (17 out of 27) have this same relationship, while only in Narayanganj is the relationship negative and significant at the 1 per cent level (-0.1097). In nine other towns, no significant correlation is found.

Finally, *Table 28* illustrates that there is a positive significant association at the 1 per cent level between the Infrastructure Conditions Sub-Index and settlement age (0.0539). The weak coefficient indicates that older settlements have marginally better infrastructure conditions than those which were established in recent years.

Table 25: Summary of Statistical Associations between the Infrastructure Conditions Sub-Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.0482 0.0000**		
Barisal CC				-0.0409 0.0258*	
Bogra			-0.1679 0.0000**		
Chandpur					-0.0499 0.0792
Chapai Nawabganj					0.0294 0.3496
Chittagong CC			-0.1817 0.0000**		
Comilla CC			-0.2315 0.0000**		
Dinajpur			-0.0964 0.0045**		
Faridpur			-0.1361 0.0001**		
Feni					-0.0144 0.6779
Gazipur CC	0.2164 0.0000**				
Gopalganj					-0.0605 0.0535
Hobiganj					0.0530 0.1989
Jessore			-0.0982 0.0031**		
Jhenaidah					-0.0040 0.9176
Khulna CC			-0.0562 0.0001**		
Kushtia			-0.2204 0.0000**		
Mymensingh			-0.2184 0.0000**		
Naogaon			-0.1243 0.0004**		
Narayanganj CC			-0.1405 0.0000**		
Pabna			-0.1881 0.0000**		
Rajshahi CC					-0.0094 0.7069
Rangpur CC		0.0621 0.0292*			
Saidpur					-0.0409 0.2792
Satkhira		0.0715 0.0149*			
Savar					0.0336 0.2203
Sirajganj				-0.0728 0.0449*	
Sylhet CC					-0.0404 0.0624
Tangail					0.0440 0.0850
Tongi			-0.2827 0.0000**		
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	3/29		15/29		11/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 26: Summary of Statistical Associations between the Infrastructure Conditions Sub-Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.2067 0.0000**		
Barisal CC			-0.2444 0.0000**		
Bogra			-0.3716 0.0000**		
Chandpur			-0.1123 0.0001**		
Chapai Nawabganj			-0.1027 0.0010**		
Chittagong CC			-0.2271 0.0000**		
Comilla CC			-0.1912 0.0000**		
Dinajpur			-0.1072 0.0016**		
Faridpur			-0.1715 0.0000**		
Feni			-0.1586 0.0000**		
Gazipur CC					-0.0292 0.1173
Gopalganj	†	†	†	†	†
Hobiganj					-0.0641 0.1201
Jessore			-0.2455 0.0000**		
Jhenaidah			-0.1084 0.0051**		
Khulna CC			-0.1908 0.0000**		
Kushtia			-0.1855 0.0000**		
Mymensingh			-0.2786 0.0000**		
Naogaon			-0.1555 0.0000**		
Narayanganj CC			-0.2101 0.0000**		
Pabna			-0.2706 0.0000**		
Rajshahi CC			-0.1589 0.0000**		
Rangpur CC					-0.0376 0.1865
Saidpur				-0.0767 0.0423*	
Satkhira			-0.0826 0.0049**		
Savar					-0.0120 0.6612
Sirajganj			-0.0939 0.0096**		
Sylhet CC			-0.0854 0.0001**		
Tangail					0.0291 0.2552
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	0/27		22/27		5/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

† *Area and density data unavailable.*

Table 27: Summary of Statistical Associations between the Infrastructure Conditions Sub-Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.1895 0.0000**				
Barisal CC	0.2402 0.0000**				
Bogra	0.2285 0.0000**				
Chandpur		0.0581 0.0410*			
Chapai Nawabganj	0.1347 0.0000**				
Chittagong CC	0.0813 0.0000**				
Comilla CC					-0.0628 0.0673
Dinajpur					0.0296 0.3839
Faridpur					0.0209 0.5541
Feni	0.1296 0.0002**				
Gazipur CC	0.2318 0.0000**				
Gopalganj	†	†	†	†	†
Hobiganj	0.1554 0.0002**				
Jessore	0.2392 0.0000**				
Jhenaidah	0.1153 0.0029**				
Khulna CC	0.1908 0.0000**				
Kushtia					-0.0376 0.2503
Mymensingh					0.0255 0.3901
Naogaon		0.0744 0.0339*			
Narayanganj CC			-0.1097 0.0009**		
Pabna	0.0842 0.0037**				
Rajshahi CC	0.1731 0.0000**				
Rangpur CC	0.1266 0.0000**				
Saidpur					0.0551 0.1451
Satkhira	0.1738 0.0000**				
Savar					0.0440 0.1087
Sirajganj					0.0452 0.2137
Sylhet CC		0.0430 0.0477*			
Tangail					0.0255 0.3178
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	17/27		1/27		9/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† Area and density data unavailable.

Table 28: Summary of Statistical Associations between the Infrastructure Conditions Sub-Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.0539 0.0000**				
Barisal CC					-0.0185 0.3125
Bogra	0.1488 0.0000**				
Chandpur					0.0553 0.0520
Chapai Nawabganj	0.2187 0.0000**				
Chittagong CC		0.0331 0.0118*			
Comilla CC	0.1448 0.0000**				
Dinajpur	0.1792 0.0000**				
Faridpur	0.2464 0.0000**				
Feni					-0.0510 0.1418
Gazipur CC				-0.0373 0.0455*	
Gopalganj	0.1666 0.0000**				
Hobiganj	0.2614 0.0000**				
Jessore					-0.0032 0.9231
Jhenaidah		0.0968 0.0124*			
Khulna CC		0.0353 0.0121*			
Kushtia	0.2368 0.0000**				
Mymensingh	0.1335 0.0000**				
Naogaon		0.0860 0.0141*			
Narayanganj CC	0.2125 0.0000**				
Pabna	0.0977 0.0007**				
Rajshahi CC	0.3518 0.0000**				
Rangpur CC	0.1430 0.0000**				
Saidpur					-0.0026 0.9445
Satkhira	0.1833 0.0000**				
Savar					-0.0118 0.6676
Sirajganj	0.3048 0.0000**				
Sylhet CC					0.0291 0.1794
Tangail		0.0305 0.0305*			
Tongi				-0.0807 0.0315*	
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	20/29		2/29		7/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.

** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.5. Associations between the Economic Conditions Sub-Index and Demographic and Area Variables

This penultimate subsection examines the relationships with economic conditions and settlement attributes. *Table 29* illustrates that there is a positive significant association between the Economic Conditions Sub-Index (made up of employment, income and savings and credit activities) and settlement household population (0.0184) at the 1 per cent level. The weak coefficient suggests that smaller settlements have only marginally better economic conditions than larger settlements. Most towns (16 out of 29) present this same relationship with 1 and 5 per cent significance levels and higher coefficients. In 9 towns however, the relationship observed is the opposite, while in 4 towns no significant relationship is found.

With regards to settlement area, the relationship appears to be negative with the Sub-Index at the 1 per cent level although the low coefficient (-0.0095) indicates a very weak effect (see *Table 30* below). In contrast, at the town level, for 14 out of 27 towns, the relationship is actually positive and significant at the 1 or 5 per cent levels, while in five towns it is negative and significant at the 1 or 5 per cent levels. In both cases, higher coefficients are observed. In eight other towns, no significant correlation is found. The relationship here therefore is a complex one.

A similar pattern is observed for settlement density, *Table 31* shows a positive association between the Economic Conditions Sub-Index and density although again, the low coefficient (0.0296) indicates that higher density settlements have only marginally better infrastructure conditions. Moreover, a mixed pattern is observed at the town level, where only 6 towns out of 27 present positive significant correlations at the 1 and 5 per cent levels, 12 towns show a significant negative correlation at the 1 and 5 per cent levels, while for 9 others no significant correlations is observed.

Finally, settlement age presents no association with settlement Economic Conditions Sub-Index as *Table 32* indicates. In 14 out of 27 towns, the relationship is actually positive and significant at the 1 or 5 per cent levels, while only in 4 it is negative and significant at the 1 or 5 per cent levels. In 11 other towns, no significant correlation is found.

Table 29: Summary of Statistical Associations between the Economic Conditions Sub-Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.0184 0.0001**				
Barisal CC	0.1034 0.0000**				
Bogra		0.0362 0.0403*			
Chandpur			-0.0941 0.0009**		
Chapai Nawabganj	0.2115 0.0000**				
Chittagong CC					-0.0137 0.2964
Comilla CC	0.1256 0.0002**				
Dinajpur					0.0251 0.4599
Faridpur			-0.1134 0.0013**		
Feni	0.1080 0.0018**				
Gazipur CC				-0.0376 0.0437*	
Gopalganj				-0.0668 0.0329*	
Hobiganj	0.1176 0.0042**				
Jessore		0.0794 0.0167*			
Jhenaidah	0.1164 0.0026**				
Khulna CC			-0.1061 0.0000**		
Kushtia			-0.2287 0.0000**		
Mymensingh			-0.2106 0.0000**		
Naogaon					-0.0060 0.8653
Narayanganj CC			-0.1027 0.0020**		
Pabna			-0.0976 0.0008**		
Rajshahi CC		0.0543 0.0301*			
Rangpur CC		0.0668 0.0190*			
Saidpur					0.0537 0.1552
Satkhira	0.1558 0.0000**				
Savar	0.2030 0.0000**				
Sirajganj		0.0807 0.0262*			
Sylhet CC		0.0445 0.0403*			
Tangail	0.1899 0.0000**				
Tongi	0.1050 0.0051**				
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	16/29		9/29		4/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 30: Summary of Statistical Associations between the Economic Conditions Sub-Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.0095 0.0000**		
Barisal CC					0.0162 0.3769
Bogra	0.0999 0.0000**				
Chandpur					-0.0115 0.6850
Chapai Nawabganj	0.3134 0.0000**				
Chittagong CC			-0.0427 0.0012**		
Comilla CC	0.1270 0.0002**				
Dinajpur	0.0940 0.0056**				
Faridpur			-0.1944 0.0000**		
Feni	0.1262 0.0003**				
Gazipur CC			-0.0840 0.0000**		
Gopalganj	†	†	†	†	†
Hobiganj	0.1624 0.0001**				
Jessore					0.0485 0.1439
Jhenaidah	0.1755 0.0000**				
Khulna CC					0.0104 0.4606
Kushtia					-0.0531 0.1041
Mymensingh			-0.1515 0.0000**		
Naogaon					0.0137 0.6958
Narayanganj CC					-0.0219 0.5110
Pabna			-0.2215 0.0000**		
Rajshahi CC					0.0201 0.4218
Rangpur CC	0.2055 0.0000**				
Saidpur	0.2251 0.0000**				
Satkhira	0.0791 0.0071**				
Savar	0.1833 0.0000**				
Sirajganj	0.1976 0.0000**				
Sylhet CC	0.0667 0.0021**				
Tangail	0.1690 0.0000**				
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	14/27		5/27		8/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† Area and density data unavailable.

Table 31: Summary of Statistical Associations between the Economic Conditions Sub-Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.0296 0.0000**				
Barisal CC	0.0584 0.0014**				
Bogra			-0.0704 0.0001**		
Chandpur			-0.0999 0.0004**		
Chapai Nawabganj					-0.0425 0.1763
Chittagong CC		0.0302 0.0216*			
Comilla CC					-0.0101 0.7680
Dinajpur			-0.1049 0.0020**		
Faridpur		0.0766 0.0300*			
Feni					-0.0193 0.5797
Gazipur CC			-0.0840 0.0024**		
Gopalganj	†	†	†	†	†
Hobiganj			-0.0826 0.0451*		
Jessore		0.0741 0.0255*			
Jhenaidah					-0.0223 0.5646
Khulna CC			-0.1182 0.0000**		
Kushtia			-0.1851 0.0000**		
Mymensingh			-0.1204 0.0000**		
Naogaon					-0.0360 0.3052
Narayanganj CC			-0.1035 0.0018**		
Pabna	0.1434 0.0000**				
Rajshahi CC					0.0192 0.4438
Rangpur CC			-0.1655 0.0000**		
Saidpur			-0.2060 0.0000**		
Satkhira	0.0919 0.0017**				
Savar					-0.0371 0.1756
Sirajganj			-0.2081 0.0000**		
Sylhet CC					-0.0235 0.2789
Tangail					0.0202 0.4289
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	6/27		12/27		9/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† Area and density data unavailable.

Table 32: Summary of Statistical Associations between the Economic Conditions Sub-Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns					0.0042 0.3770
Barisal CC					0.0013 0.9445
Bogra					0.0340 0.0538
Chandpur	0.0820 0.0039**				
Chapai Nawabganj	0.1597 0.0000**				
Chittagong CC			-0.0880 0.0000**		
Comilla CC	0.1289 0.0002**				
Dinajpur					-0.0189 0.5787
Faridpur					0.0462 0.1911
Feni	0.2314 0.0000**				
Gazipur CC					0.0159 0.3951
Gopalganj					0.0361 0.2492
Hobiganj	0.2875 0.0000**				
Jessore					0.0598 0.0719
Jhenaidah	0.1068 0.0058**				
Khulna CC		0.1650 0.0000**			
Kushtia				-0.0791 0.0154*	
Mymensingh					0.0307 0.3017
Naogaon		0.0888 0.0113*			
Narayanganj CC					-0.0355 0.2858
Pabna				-0.0733 0.0115*	
Rajshahi CC	0.0533 0.0334**				
Rangpur CC	0.1656 0.0000**				
Saidpur					0.0472 0.2122
Satkhira	0.0849 0.0038**				
Savar					-0.0399 0.1454
Sirajganj	0.2132 0.0000**				
Sylhet CC			-0.0817 0.0002**		
Tangail		0.0531 0.0375*			
Tongi	0.0989 0.0083**				
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	14/29		4/29		11/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.6. Associations between the Social and Environmental Conditions Sub-Index and Demographic and Area Variables

Finally, a set of comparative statistical tests are provided for the Social and Environmental Conditions Sub-Index. *Table 33* illustrates a negative association between the relevant Index (comprising school enrolment, civic facilities, exposure to risks and vulnerability and social issues) and settlement household population (-0.1763) significant at the 1 per cent level. Hence, less populous settlements tend to present better social and environmental conditions than more populous ones. Most towns (22 out of 29) present this same relationship with 1 and 5 per cent significant levels, while in 4 others (Chapai Nawabganj, Hobiganj, Jhenaidah and Satkhira), the relationship is also significant at the 1 or 5 per cent level but positive nature. In 3 other towns (Barisal, Feni and Savar) no significant relationship is found.

A negative significant association at the 1 per cent level between the Sub-Index and settlement area is observed in *Table 34* (-0.1208). Hence, smaller settlements in area size present better social and environmental conditions than larger settlements.

This same pattern is observed in 14 out of 27 towns, while in 7 others the relationship is positive and significant at the 1 or 5 per cent levels. Finally, in no relationship between both variables is observed in six towns.

Table 35 illustrates that social and environmental conditions and density are associated at the 1 per cent level although the low coefficient (-0.0483) indicates a weak effect, thus implying that settlements with lower densities tend to have marginally better conditions than those with higher densities. At the town level, most towns (17 out of 27) present this same negative significant relationship at the 1 and 5 per cent levels with considerably larger coefficients. Nonetheless, in four towns (Barisal, Chapai Nawabganj, Hobiganj and Jessore), the relationship is positive; while in six towns no significant correlation is found.

Finally, *Table 36* shows that settlement age and social and environmental conditions are positively related to settlement age at the 1 per cent level (0.0484). The coefficient is again weak hence older settlement marginally have better environmental conditions than those established in recent years. Most towns though (20 out of 29) present this same positive significant relationship at the 1 and 5 per cent levels with considerably larger coefficients. Only in Bogra (-0.693), is the relationship negative at the 1 per cent level, while in 8 other towns no significant association is found.

Table 33: Summary of Statistical Associations between the Social and Environmental Conditions Sub-Index and Settlement Household Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1763 0.0000**		
Barisal CC					-0.0190 0.2990
Bogra			-0.2281 0.0000**		
Chandpur			-0.2235 0.0000**		
Chapai Nawabganj		0.0708 0.0240*			
Chittagong CC			-0.2119 0.0000**		
Comilla CC			-0.1062 0.0019**		
Dinajpur				-0.0825 0.0151*	
Faridpur			-0.3016 0.0000**		
Feni					-0.0316 0.3633
Gazipur CC			-0.1872 0.0000**		
Gopalganj			-0.1071 0.0006**		
Hobiganj	0.1178 0.0042**				
Jessore			-0.2093 0.0000**		
Jhenaidah		0.0805 0.0376*			
Khulna CC			-0.2742 0.0000**		
Kushtia			-0.5080 0.0000**		
Mymensingh			-0.3493 0.0000**		
Naogaon			-0.1108 0.0016**		
Narayanganj CC			-0.3543 0.0000**		
Pabna			-0.1725 0.0000**		
Rajshahi CC			-0.0867 0.0005**		
Rangpur CC			-0.0985 0.0005**		
Saidpur			-0.1591 0.0000**		
Satkhira	0.1085 0.0002**				
Savar					-0.0447 0.1032
Sirajganj			-0.1525 0.0000**		
Sylhet CC			-0.1711 0.0000**		
Tangail				-0.0520 0.0416*	
Tongi			-0.3387 0.0000**		
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	4/29		22/29		3/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Table 34: Summary of Statistical Associations between the Social and Environmental Conditions Sub-Index and Settlement Area Size according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.1208 0.0000**		
Barisal CC			-0.2269 0.0000**		
Bogra					-0.0103 0.5593
Chandpur					0.0003 0.9907
Chapai Nawabganj					-0.0317 0.3126
Chittagong CC			-0.1210 0.0000**		
Comilla CC				-0.0716 0.0370*	
Dinajpur					-0.0628 0.0647
Faridpur			-0.3234 0.0000**		
Feni	0.0909 0.0088**				
Gazipur CC	0.0571 0.0022**				
Gopalganj	†	†	†	†	†
Hobiganj					0.0205 0.6192
Jessore			-0.2712 0.0000**		
Jhenaidah	0.1302 0.0007**				
Khulna CC			-0.1287 0.0000**		
Kushtia			-0.3155 0.0000**		
Mymensingh			-0.2750 0.0000**		
Naogaon				-0.0861 0.0141*	
Narayanganj CC			-0.2261 0.0000**		
Pabna			-0.1662 0.0000**		
Rajshahi CC			-0.1306 0.0000**		
Rangpur CC	0.1379 0.0000**				
Saidpur	0.1873 0.0000**				
Satkhira		0.0688 0.0192*			
Savar					0.0356 0.1940
Sirajganj				-0.0752 0.0383*	
Sylhet CC			-0.0970 0.0000**		
Tangail	0.1265 0.0000**				
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	7/27		14/27		6/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 35: Summary of Statistical Associations between the Social and Environmental Conditions Sub-Index and Settlement Density according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns			-0.0483 0.0000**		
Barisal CC	0.2255 0.0000**				
Bogra			-0.1884 0.0000**		
Chandpur			-0.2515 0.0000**		
Chapai Nawabganj	0.0850 0.0068**				
Chittagong CC			-0.1081 0.0000**		
Comilla CC				-0.0681 0.0472*	
Dinajpur					-0.0362 0.2867
Faridpur					0.0145 0.6814
Feni			-0.1223 0.0004**		
Gazipur CC			-0.2398 0.0000**		
Gopalganj	†	†	†	†	†
Hobiganj	0.1139 0.0056**				
Jessore		0.0818 0.0137*			
Jhenaidah					-0.0344 0.3754
Khulna CC			-0.1367 0.0000**		
Kushtia			-0.2005 0.0000**		
Mymensingh			-0.1639 0.0000**		
Naogaon				-0.0758 0.0306*	
Narayanganj CC			-0.1308 0.0001**		
Pabna					-0.0077 0.7916
Rajshahi CC					0.0393 0.1162
Rangpur CC			-0.2887 0.0000**		
Saidpur			-0.4072 0.0000**		
Satkhira					0.0341 0.2463
Savar			-0.0794 0.0038**		
Sirajganj			-0.1183 0.0011**		
Sylhet CC			-0.0960 0.0000**		
Tangail			-0.2053 0.0000**		
Tongi	†	†	†	†	†
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	4/27		17/27		6/27

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*
† *Area and density data unavailable.*

Table 36: Summary of Statistical Associations between the Social and Environmental Conditions Sub-Index and Settlement Age according to Spearman Rank Correlation Coefficients and P-Values, All Towns and Individual Towns

(1)	(2)	(3)	(4)	(5)	(6)
	Positive Correlation 1% Significant	**Positive Correlation 5% Significant**	**Negative Correlation 1% Significant**	**Negative Correlation 5% Significant**	**No Significant Correlation**
All Towns	0.0484 0.0000**				
Barisal CC					0.0086 0.6403
Bogra			-0.0693 0.0001**		
Chandpur	0.0898 0.0016**				
Chapai Nawabganj	0.1496 0.0000**				
Chittagong CC		0.0265 0.0436*			
Comilla CC					0.0241 0.4829
Dinajpur	0.1938 0.0000**				
Faridpur	0.1530 0.0000**				
Feni	0.2750 0.0000**				
Gazipur CC	0.1936 0.0000**				
Gopalganj	0.1519 0.0000**				
Hobiganj	0.3752 0.0000**				
Jessore					0.0438 0.1875
Jhenaidah	0.1899 0.0000**				
Khulna CC	0.1030 0.0000**				
Kushtia	0.2499 0.0000**				
Mymensingh	0.0941 0.0015**				
Naogaon	0.1526 0.0000**				
Narayanganj CC					0.0205 0.5375
Pabna	0.0759 0.0088**				
Rajshahi CC	0.1408 0.0000**				
Rangpur CC	0.2286 0.0000**				
Saidpur					-0.0093 0.8058
Satkhira	0.1438 0.0000**				
Savar					-0.0259 0.3450
Sirajganj	0.3770 0.0000**				
Sylhet CC					0.0189 0.3848
Tangail	0.1497 0.0000**				
Tongi					-0.0175 0.6409
	Number of Towns with Positive Significant Correlations		**Number of Towns with Negative Significant Correlations**		**Number of Towns with No Significant Correlation**
	20/29		1/29		8/29

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

5.7. Summary of Findings

A comparison between the four settlement demographic variables and the SLCI and the five multi-condition sub-indices on tenure security conditions, water and sanitation conditions, infrastructure conditions, economic conditions and social and environmental conditions water and sanitation, infrastructure and social conditions yields similar results. However, there are also important nuanced conclusions to be made.

Firstly, the findings obtained comparing the SLCI with the demographic and area variables suggest that settlements with small populations, which are geographically small, with low densities and are long established tend to have better living conditions. Yet it is also worth noting that in the case of area size and density the differences are marginal.

Secondly, the Tenure Security Conditions Sub-Index is negatively associated with settlement population size and density but positively with area size and age, all at the 1 per cent level. Indeed, these findings are intuitive and in line with expectations.

Thirdly, the data for the Water and Sanitation Conditions Sub-Index index is negatively associated with settlement household size and settlement area, but positively with settlement density, all at the 1 per cent level. These findings suggest that smaller and more densely populated settlements tend to have better water and sanitation conditions. This result is intuitively plausible, but it is also troubling that settlement age has no discernible impact, given it would be expected that more established settlements would tend to have somewhat better sanitary conditions. It is also worth noting that the relatively weak coefficient on the density variable indicates the potential effect is marginal.

Fourthly, the Infrastructure Conditions Sub-Index is negatively associated with settlement population size and settlement area, but positively with settlement density and settlement density and age – all at the 1 per cent level. Thus, these findings suggest that smaller settlements in both population and area size tend to present better infrastructure conditions, as do older and higher density settlements. It is worth emphasizing though, that the coefficients in the case of household size and age are not sizable. This is hard to explain, as one would expect that larger settlements in population and area would have been the target of large infrastructure investments such as roads and electricity. However, this relation may be reflecting the impact of poverty generally on each side of the equation.

Fifthly, the Economic Conditions Index is positively associated with settlement population size and settlement density, and negatively associated with area size – all at the 1 per cent level albeit with very low coefficients. However, this Index is not significantly associated with settlement age. Hence, these results suggest that larger settlements in household size and density tend to present marginally better economic conditions. A higher coefficient might have been expected in the case of population size, given what the literature finds in relation to say about economic opportunities and population sizes and hence the presence of effective local demand. This argument would also remain valid for area size, where a positive relationship would have been expected.

Finally, the Social and Environmental Conditions Sub-Index is negatively correlated with population size, settlement area and density, but positively correlated with age – all at the 1 per cent level. Therefore, these findings suggest that smaller settlements (in population and

area size) and with lower densities tend to have better social and environmental conditions. These also have a strong intuitive justification.

Taking the results together, the SLCI and its sub-indices correlation patterns are similar, albeit with varying significance levels and magnitudes. However, while most of the sub-indices are negatively associated with settlement size and area, the direction of the relationship with density is not uniform, while with settlement age is mostly positive but with low coefficients (with the exception of the tenure security). This implies that smaller settlements (in population and area size) and long-established settlements are significantly associated with better living conditions.

Chapter Six: Conclusions

This report provides both a digest and an analysis of the results of the Settlement and Land Mapping (SLM) exercise in 29 cities of Bangladesh. A series of descriptive statistics are presented, followed by more thorough examinations of the key connections, and the potential relationships, within the data. This final section brings these analyses together with the prior contextual discussion to offer conclusions and policy-useful recommendations. Four sets of conclusions are made: firstly, on the profile of poor settlements, focusing on the pattern of deprivation and the relationships between the living conditions and demographic variables; secondly, on further research priorities arising from findings; thirdly, on the uses of SLM findings policy development; and lastly on uses of SLM findings to improve UPPR programmatic and operational activities.

6.1. Profile of Poor Settlements and Key Relationships between Living Conditions and Demographic Variables

Foremost, the initial presentation of results underlines the extent and depth of the socio-economic problems faced in poor settlements across the country. The summary level data is striking: the mean settlement living conditions index (SLCI) for all settlements is 41.4, and multi-condition sub-indices, such as the ones on water and sanitation, infrastructure and social and environmental remain lower at 31, 39.3 and 40.3 respectively (out of a possible maximum score of 100).

Moreover, a series of basic living conditions are of high concern: 6 per cent of settlements are squatter settlements; 34 per cent have been built on private land; 22 per cent lack or have insufficient access to drinking water; 25 per cent have no toilet facilities; 57 per cent have no drains; and a striking 79 per cent have no solid waste collection service facilities.

This report also maps out the basic demographic characteristics of poor settlements. Although there is a degree of variation across towns, settlements tend to be small in population and size, population density of settlements is invariably high, and most have been in existence in excess of 20 years. Migrants tend to move into already well-established communities, settling at high densities. Moreover, settlements in City Corporations tend to be on average, more populous, smaller in area, of higher density, and more-recently established than those in Pourashavas.

Yet the data also shows considerable heterogeneity in the extent of deprivations across towns, both at the overall and thematic level dimensions. Within some towns, substantial differences in scores are also observed according to the different dimensions. Equally, some issues are simply less pressing, notably electricity supply, with only 4 per cent of settlements having no access.

While no significant differences between settlements in Pourashavas and settlements in City Corporations for SLCI scores are observed, settlements in Pourashavas tend to have, on average, better tenure security conditions than City Corporations, but worse water and sanitation, infrastructure, economic, and social and environmental conditions.

Turning to the potential relationships between the SLCI, the sub-indices and the individual indicators, it can be concluded that the SLCI and most of the sub-indices are negatively associated with settlement size and area. However, the direction of the relationship varies in the case of density. With regards to settlement age, associations are mostly positive but weak (with the exception of the tenure security). Overall, this implies that smaller settlements (in population and area) and long-established settlements are significantly associated with better living conditions, but relationships across towns are not uniform.

Although it is important to be cautious in claiming causal relationships among variables and to bear mind the limitations imposed by the subjective nature of the data, the findings do show that there is a significant degree of correlation between the SLCI and its components, and the demographic variables. The statistical significance tests largely bear out the patterns and linkages identified by the cross-tabulations. It is also clear that the problems faced in this urban area exhibit a multiplicity of drivers and interconnections, again emphasizing the need for actions on a number of fronts.

However, there also remains a great deal of variation within the data, indicating a degree of heterogeneity between localities. There is therefore a need to analyze data within towns (across and within wards) in order to observe intra-town variations also arises. The data presented here represents an aggregate score to conduct inter-town comparisons, the picture at town and Ward level will be considerably more nuanced.

6.2. Areas of Further Research

The findings highlight several important areas for further research. Firstly, understanding the growth of poor settlements and the migration patterns of settlers is a major priority. This links to the question of clustering which is not easily measured with aggregate data. It is likely that migrants prefer to cluster in long-established, high-density, centrally-located settlements rather than in newer, low-density settlements or even green field sites. However, the contributions of sedentary population growth, the inertial effects of poverty and migration to overall growth and settlement patterns remains unclear. More sophisticated GIS-based tools and greater use of mapping will be required to probe these questions.

Second, land use within poor settlements is an issue which urgently needs to be examined. Despite SLM mapping and collection of information on settlement area sizes, the alternative uses of land has not been documented. Additional efforts, building on the SLM data, would likely reveal different typologies of settlements, and may help explain not only their demographic features but also their social, economic and cultural linkages with other settlements and other areas of the town. Indeed, it may be possible that some of the high-density settlements already represent small economic and commercial centres themselves, and that some smaller settlements may be part of larger entities.

Third, vulnerability is a topic which is worthy of further investigation. This report shows that settlement density is strongly associated with risk. It is highly likely therefore that the poorest and therefore, the least resilient, would suffer the worst consequences of seasonal floods, stagnating water and landslides, among others. Having an assessment of the risk level and the margin of vulnerability would serve as the basis for contingency planning and providing relief if such events occurred.

Finally, a thorough assessment of housing conditions in poor settlements would be in order, as the report shows that that housing conditions tend to be precarious. This does not only make dwellers more vulnerable to natural disasters but also hampers their health and quality of life. Research may show, for example, that poor housing conditions – such as un-ventilated cooking stoves, earthen and damp floors, and leaky roofs – result in significant health impacts. Where possible, such evidence could be used to promote alternative house designs.

6.3. Uses of SLM for Policy Development

UPPR intends to work with national and Pourashava authorities to use the SLM results to improve national, town and ward-level policy development, resource allocation and service provision. UPPR also plans to develop an SLM database covering 29 of its programme towns in order to allow all stakeholders to access the data. This might be used for policy development, resource allocation, advocacy efforts and further research.

For individual towns, UPPR will produce town-level SLM reports and atlases, and ward-level profiles and maps. Local authorities will then be able to prioritize investments and services on the wards and settlements that lag behind in basic infrastructure conditions – such as water, sanitation and drainage – as well as in socio-economic development conditions.

Towns could develop a town-wide integrated poverty reduction strategy and/or strategies to address specific sectors. The finding that every ward has at least one poor settlement suggests that all ward Councillors should be engaged in a determining a town's poverty reduction policy. The finding that wards vary significantly in the number, density, size and nature of their poor settlements underlines that ward-level poverty reduction strategies must also be fitted to context. UPPR will also link with other urban programmes, including the Urban Governance and Infrastructure Improvement Project (UGIIP2) and Urban Primary Health Care Project (UPHCP), to target primary infrastructure investments to poorer settlements and red-card health services at the urban poor.

6.4. Uses of SLM for UPPR Programmatic and Operational Improvements

The SLM can be employed as a baseline against which UPPR will measure changes in settlement characteristics and living conditions. It is anticipated that some of the identified settlements may be completely or partially cleared, others may grow or reduce in population or physical size. The performance of the Project might also be tracked by reference to one or more of the 16 indicators and therefore it is planned to conduct a follow-up SLM on a sample or census basis.

UPPR will also use the SLM results to improve its targeting of urban poor settlements. In turn, UPPR Towns will be able to use SLM results to develop a poor settlement take-up strategy identifying questions such as: which wards and settlements to focus on; how to combine several smaller settlements into one CDC; and how to divide larger ones into multiple CDCs. This will be particularly useful in the seven towns where UPPR operations will start shortly

Finally, in identifying all of the poor settlements and their land tenure and ownership status, the SLM provides stakeholders with a valuable tool to develop and implement a tenure

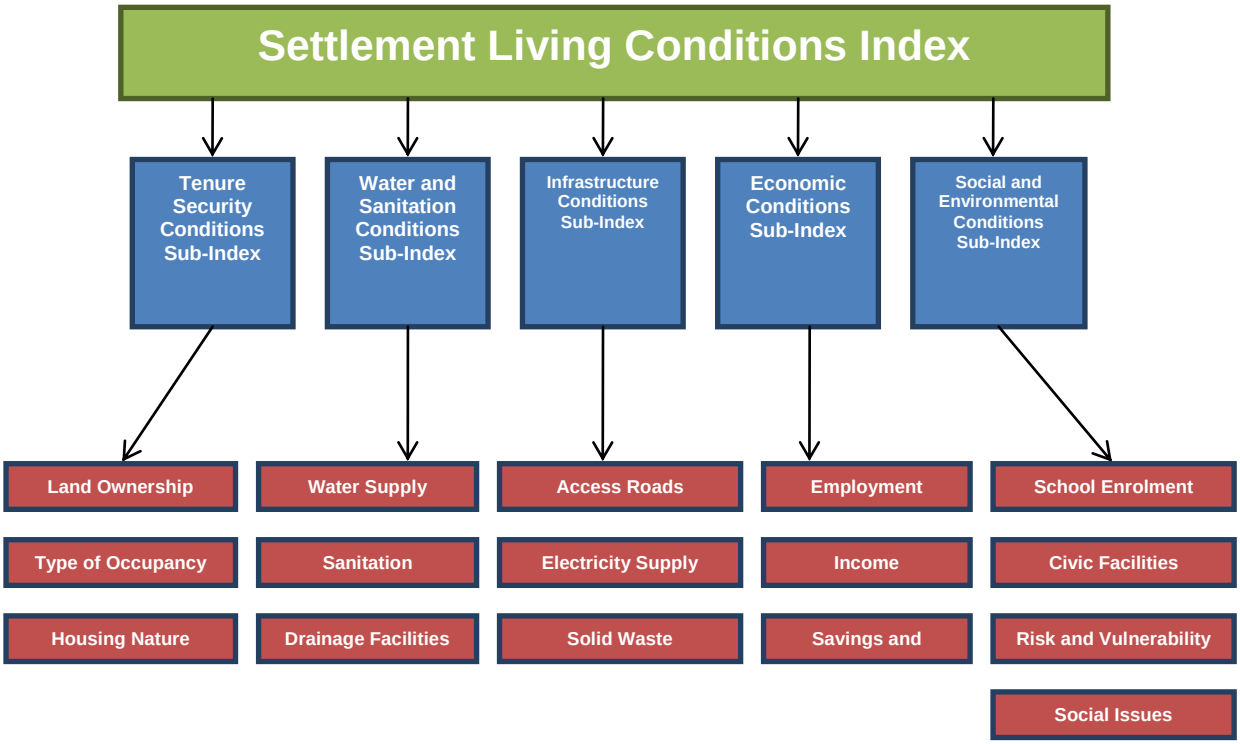
security strategy. Using this data, the strategy can quantify the scale of the problem, identify specific land owners and explore and negotiate specific improved tenure options.

Annex 1: Components of the Settlement Living Conditions Index (SLCI)

As *Figure 31* shows, the Settlement Living Conditions Index (SLCI) comprises of 16 individual indicators (see red boxes). This composite measure reflects five dimensions of living conditions: tenure security, water and sanitation, infrastructure, economic conditions, and social and environmental life. In addition, five thematic sub-indices have been developed containing three to four individual indicators (see blue boxes):

- ***Tenure Security Conditions Sub-Index*** includes: land ownership, type of occupancy and nature of housing units
- ***Water and Sanitation Conditions Sub-Index*** includes: presence of a functioning water supply, availability of toilet and drainage facilities
- ***Infrastructure Conditions Sub-Index*** includes: quality of access roads, electricity supply and solid waste collection services
- ***Economic Conditions Sub-Index*** includes: employment, income status and availability savings and credit
- ***Social and Environmental Conditions Sub-Index*** includes: school enrolment, civic facilities, risk and vulnerability and social issues index.

Figure 31: Components of the Settlement and Living Conditions Index



The Settlement and Living Conditions Scorecard

Table 37 shows the scorecard used to score individually all settlements against the 16 individual indicators, as well as the four categories within each of these.

Table 37: Settlement and Living Conditions Scorecard

Indicator	Category	Score
Land Ownership	Private Landlords	1
	Central Government	2
	Local Government	3
	Owned by Occupants	4
Type of Occupancy	Squatter	1
	Tenant without contract	2
	Tenant with contract	3
	Individual Owner	4
Housing Nature	>75% Semi-permanent	1
	<75 Semi-permanent	2
	50% Permanent 50% Semi	3
	75% Permanent	4
Water Supply	No Drinking Water	1
	1 Common Tab >15 HH	2
	1 Common Tab <15 HH	3
	Individual Pipe	4
Sanitation Facilities	No Toilet Available	1
	1 Toilet > 15 people	2
	1 Toilet < 15 people	3
	Individual Toilet	4
Drainage Facilities	No Drains, Stagnant Water	1
	No Drains	2
	Open Drains	3
	Masonry Drains	4
Access Roads	No Access Roads	1
	Earth or Gravel Roads	2
	Paved Roads, no Maintenance	3
	Paved Roads, Maintenance	4
Electricity Supply	Not Available, Line is Far	1
	Not Available, Line is Close	2
	Available, no Streetlights	3
	Available with Streetlights	4
Solid Waste Collection	Not Available	1
	Bins but no Reg. Collection	2
	Bins and Reg. Collection	3
	House to House collection	4
School Enrolment	<25% Children Enrolled	1
	25%-50% Children Enrolled	2
	50%-90% Children Enrolled	3
	>90% Children Enrolled	4
Employment	>50% Families Employed	1
	25%-50% Families Employed	2
	>50% Families Self-Employed	3
	>50% Families Reg. Employed	4
Civic Facilities	Not Available, Limited Access	1
	Available, Easy Access	2
	Available, Limited Access	3
	Available, Easy Access	4
Income	>75% HH Income <TK4000	1
	>50% HH Income <TK4000	2
	50%-75% HH Income>TK4000	3
	>75% HH Income >TK4000	4
Savings and Credit Activities	Not Available	1
	<50% Families Participate	2
	50-75% Families Participate	3
	>75% Families Participate	4
Risk and Vulnerability	High Risk	1
	Medium Risk	2
	Low Risk	3
	No Risk	4
Social Problems	>50% Families Face Problems	1
	50% Families Face Problems	2
	A few Families Face Problems	3
	Not an Issue in Community	4

Converting the settlement living conditions (SLCS) score to a settlement living conditions index (SLCI) with values ranging from 0 to 100

The settlement living conditions score (SLCS) for each settlement is the sum of the score on each of the 16 indicators contained in the scorecard. As the score on each indicator ranges from 1 to 4, the SLCS can range from 16 (minimum score) to 64 (maximum score). To ensure a clearer comparability of scores, the SLCS has been converted into the settlement living conditions index (SLCI) which ranges from 0 to 100. A score of 16 in the SLCS equals a score of 0 in the SLCI and a score of 64 in the SLCS equals a score of 100 in the SLCI.

Hence, each of the 49 possible aggregate scores (ranging from 16 to 64) has been converted as follows:

$$Index_{(0-100)} = (Score_{(16-64)} - 16) \times 2.08\overline{3}$$

Where 16 is the minimum score and 2.083 is the score difference between the 49 possible outcomes if they are converted into a scale of 0 to 100. For instance, a score of 40 on the 16 to 64 scale would equal to a score 50 on the 0 to 100 scale:

$$Index_{(0-100)} = (40 - 16) \times 2.083 = 50$$

The same procedure was repeated in the case of the settlement living conditions sub-indices obtained by each settlement. These are numeric scores that range from a minimum of 3 to a maximum of 12 in the case of the tenure security, water and sanitation, infrastructure and economic conditions sub-indices, and from a minimum of 4 to a maximum of 16 in the social and environmental conditions sub-index. To improve comparability across settlements, the settlement living conditions sub-indices have been converted into a scale of 0 to 100, where according to the sub-index 3 or 4 equals a score of 0 and 12 or 16 equals a score of 100.

Defining weights to compute weighted average scores

Weights ranging from 0 to 1 have been computed for each settlement according to the number of households in order to provide higher importance to settlements with more households with respect to settlements with less. Three different weights have been defined: settlement-level weights, town-level weights and ward-level weights.

$$\text{Settlement Weight} = \frac{\text{Number of Households in the Settlement}}{\text{Number of Households in the Entire Sample}}$$

$$\text{Town Weight} = \frac{\text{Number of Households in the Settlement}}{\text{Number of Households in the Town}}$$

$$\text{Ward Weight} = \frac{\text{Number of Households in the Settlement}}{\text{Number of Households in the Ward}}$$

For instance, ward weights for a ward formed by two settlements, where settlement 1 has 40 households and settlement 2 has 160 households would be computed as follows:

$$\text{Ward Weight}_{\text{Settlement 1}} = \frac{40}{200} = 0.2$$

$$\text{Ward Weight}_{\text{Settlement 2}} = \frac{160}{200} = 0.8$$

Assuming that the settlement living conditions index (SLCI) of settlement 1 is 50 and that of settlement 2 is 40, an unweighted ward average score between the two settlements would be 45:

$$\text{Ward Average Score}_{\text{(Unweighted)}} = \frac{\text{Settlement 1 Score} + \text{Settlement 2 Score}}{\text{Total Number of Settlements in Ward}}$$

$$\text{CDC Average Score}_{\text{(Unweighted)}} = \frac{50 + 40}{2} = 45$$

But this does not consider that settlement 2 has four times as many households as settlement 1. Thus, a weighted average between the two settlements would be 42:

$$\text{Ward Average Score}_{\text{(Weighted)}} = (\text{Settl 1 Weight} \times \text{Settl 1 Score}) + (\text{Settl Weight } 2 \times \text{Settl 2 Score})$$

$$\text{Ward Average Score}_{\text{(Weighted by Settlement Size)}} = (0.2 \times 50) \times (0.8 \times 40) = 10 + 32 = 42$$

Annex 2: Methodology of the Comparison of Two Means T-Tests

When examining the differences between index or sub-index scores for two groups of settlements in a sample, the t-test allows us to determine the difference between their mean relative to the spread or variability of their scores.

The null hypothesis of the t-test states that mean differences and discrepancies are explained by random errors. The alternative hypothesis of the t-test states that mean differences and discrepancies are explained by systematic errors.

Thus,

$$H_0: \bar{X}_1 - \bar{X}_2 = 0$$

$$H_a: \bar{X}_1 - \bar{X}_2 <> 0$$

The formula for the t-test is a ratio. The numerator is the difference between the two means or averages, while the denominator is a measure of the variability or dispersion of the scores. The denominator varies according to whether it has been assumed that the two distributions have the same variance or not. In our case, we assume that both distributions have the same variance.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{X_1 X_2}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where

$$S_{X_1 X_2} = \frac{(n_1 - 1)S_{X_1}^2 + (n_2 - 1)S_{X_2}^2}{n_1 + n_2 - 2}$$

and

$\bar{X}_1$ represents the sample mean

S represents the sample standard deviation

n represents the number of settlements in each sample

The denominator is a measurement of experimental error in the two groups combined. The wider the difference between the two means, the more confident we can be in the data. The larger the experimental error, the less confident we can be in the data. Thus, the higher the value of *t*, the greater the confidence that there is a difference.

The t-value will be positive if the first mean is larger than the second and negative if it is smaller. Once a t-value is obtained, probability tables need to be used to determine whether the ratio is large enough to say that the difference between the groups has not happened by chance.

In the probability tables, the critical value that corresponds to the number of degrees of freedom (equivalent to the number of data points in the two groups combined, minus 2) needs to be found. If the t-statistic exceeds the tabled value, the means are significantly different at the probability level that is listed. For instance, if significance is found at the 5 per cent level, this means that five times out of a hundred we would find a statistically significant difference between the means by chance, or, in other words, that we can be 95 per cent or more certain that systematic errors explain the differences in means.

Annex 3: Methodology of Spearman's Rank Correlation Test

Spearman's rank correlation test ranks each variable separately by ordering the values of the variable and numbering them: the lowest value is given rank 1, the next lowest is given rank 2 and so on. If two data values for the variable are the same they are given averaged ranks, so if they would have been ranked 14 and 15 then they both receive rank 14.5. Spearman's rank correlation coefficient, like all other correlation coefficients, will take a value between -1 and +1.

A positive correlation is one in which the ranks of both variables increase together. A negative correlation is one in which the ranks of one variable increase as the ranks of the other variable decrease. A correlation of +1 or -1 will arise if the relationship between the two variables is exactly linear. A correlation close to 0 will mean that there is no linear relationship between the ranks.

Thus, the null hypothesis of the Spearman rank correlation test is that the ranks of one variable do not covary with the ranks of the other variable. In other words, as the ranks of one variable increase, the ranks of the other variable are not more likely to increase (or decrease):

H_0: $\rho = 0$, where ρ is the population correlation coefficient

As a measure of association, Spearman's rank correlation test determines the strength and the direction of a relationship between two variables. In this regard, tests of significance need to be conducted to estimate the likelihood that a relationship between variables in a sample actually exists in the population and that hence are not the result of probability sampling or a sampling error.

Calculating Spearman's Rank Correlation Coefficient – Untied Ranks

Where no tied ranks are found in any of the two analyzed variables, Spearman's rank correlation coefficient ρ , or rho, is calculated as follows:

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

where *n* is the number of observations and d_i^2 is the difference in paired ranks squared.

An example is here provided by testing the association between the settlement living conditions index and settlement age in 9 imaginary settlements assuming that no tied ranks are found.

The settlement living conditions index and settlement age represent variables X_i and Y_i respectively, and their values can be found in the first two columns of the table below.

The values of both variables have been ordered and ranked in the third and fourth columns, representing ranks x_i and y_i respectively. The lowest value for each variable has been given rank 1 while the highest value within each variable has been attributed rank 9.

Finally the difference in paired ranks d_i has been calculated by subtracting x_i from y_i for each observation in column five, and the result has been squared in column six.

Table 38. Association Between Settlement Living Conditions Index and Settlement Age, Untied Ranks

Settlement Living Conditions Index, X_i	Settlement Age, Y_i	Rank of Settlement Living Conditions Index, x_i	Rank of Settlement Age, y_i	Difference in Paired Ranks, d_i	Difference in Paired Ranks Squared, d_i^2
3	2	1	1	0	0
67	15	7	7	0	0
32	4	4	3	1	1
55	8	6	5	1	1
12	3	2	2	0	0
76	18	8	8	0	0
54	10	5	6	-1	1
86	23	9	9	0	0
22	7	3	4	-1	1

Using the data contained in *Table 38*, we can now calculate Spearman's rank correlation coefficient:

$$\rho = \mathbf{1} - \frac{6\ X\ \mathbf{4}}{9\ (81-1)}$$

$$\rho = \mathbf{1} - \ 0.0333 = \mathbf{0.9667}$$

The results show that there is a strong positive correlation between settlement living conditions index and settlement age, meaning that as settlement age increases, the settlement living conditions index increases.

Calculating Spearman's Rank Correlation Coefficient – Tied Ranks

Where tied ranks are found in any of the two analyzed variables, Spearman's rank correlation coefficient ρ , or rho, is calculated as follows:

$$\rho = \frac{\left(\frac{\mathbf{n^3 - n}}{\mathbf{6}}\right) - \mathbf{\Sigma d_i^2} - \mathbf{\Sigma T_x} - \mathbf{\Sigma T_y}}{\sqrt{\left[\frac{\mathbf{n^3 - n}}{\mathbf{6 - 2\Sigma}T_x}\right]\left[\frac{\mathbf{n^3 - n}}{\mathbf{6 - 2}\sum T_y}\right]}}$$

where *n* is the number of observations, d_i^2 is the difference in paired ranks squared and

$\sum T_x = \frac{\mathbf{\Sigma}(t_i^3 - t_i)}{12}$, where *t* is the number of group x_i ties and

$\sum T_y = \frac{\mathbf{\Sigma}(t_i^3 - t_i)}{12}$, where *y* is the number of group y_i ties.

An example is here provided by testing the association between the settlement living conditions index and settlement age in 9 imaginary settlements assuming that tied ranks are found in both variables.

The values of both variables have been ordered and ranked in the third and fourth columns, representing ranks x_i and y_i respectively. In light blue, it can be seen that both variables present a value that is repeated in two observations.

In the case of the settlement living conditions index, two settlements score 76. Since both settlements should occupy ranks 7 and 8 but score the same, the ranks are summed and divided by the total number of tied observations. Thus both settlements are attributed a rank value of 7.5. In the case of settlement age, two settlements were established 3 years ago and this is the lowest score in the sample. As both settlements should occupy ranks 1 and 2, but were established in the same year the ranks are summed and divided by the total number of tied observations. Thus both settlements are attributed a rank value of 1.5.

The steps followed in determining d_i and d_i^2 are the same in the previous example.

Table 39. Association between the Settlement Living Conditions Index and Settlement Age. Tied Ranks

Settlement Living Conditions Index, X_i	Settlement Age, Y_i	Rank of Settlement Living Conditions Index, x_i	Rank of Settlement Age, y_i	Difference in Paired Ranks, d_i	Difference in Paired Ranks Squared, d_i^2
3	3	1	1.5	-0.5	0.25
67	15	6	7	-1	1
32	4	4	3	1	1
76	8	7.5	5	1.5	2.25
12	3	2	1.5	0.5	0.25
76	18	7.5	8	-0.5	0.25
54	10	5	6	-1	1
86	23	9	9	0	0
22	7	3	4	-1	1

Table 39 shows that within in group x_i there is only one set of tied ranks, with two tied ranks in it. This also holds in the case of y_i. Thus,

$$\sum T_x = \frac{(2^3 - 2)}{12} = 0.5$$, and

$$\sum T_y = \frac{(2^3 - 2)}{12} = 0.5$$

Thus,

$$\rho = \frac{\left(\frac{9^3 - 9}{6}\right) - 7 - 0.5 - 0.5}{\sqrt{\left[\frac{9^3 - 9}{6 - (2\ x\ 0.5)}\right]\left[\frac{9^3 - 9}{6 - (2\ x\ 0.5)}\right]}} = \frac{112}{\sqrt{[144][144]}} = \mathbf{0.9824}$$

The results show that there is a strong positive correlation between settlement living conditions index and settlement age, meaning that as settlement age increases, the settlement living conditions index increases.

Annex 4: Spearman Rank Correlation Coefficients and P-values, Multi-Condition Sub-Indices

Table 40: Settlement Living Conditions Index and Multi-Condition Sub-Indices, Spearman Rank Correlation Coefficients and P-values

	Tenure Security Conditions Sub-Index	Water and Sanitation Conditions Sub-Index	Infrastructure Conditions Sub-Index	Economic Conditions Sub-Index	Social and Environmental Conditions Sub-Index
Tenure Security Conditions Sub-Index		0.2078 0.0000**	0.0371 0.0000**	0.1894 0.0000**	0.3114 0.0000**
Water and Sanitation Conditions Sub-Index	0.2078 0.0000**		0.4380 0.0000**	0.3660 0.0000**	0.3114 0.0000**
Infrastructure Conditions Sub-Index	0.0371 0.0000**	0.4380 0.0000**		0.2492 0.0000**	0.3114 0.0000**
Economic Conditions Sub-Index	0.1894 0.0000**	0.3660 0.0000**	0.2492 0.0000**		0.3114 0.0000**
Social and Environmental Conditions Sub-Index	0.3114 0.0000**	0.4404 0.0000**	0.3198 0.0000**	0.4737 0.0000**	
Number of Significant Correlations among Multi-Condition Sub-Indices	4/4	4/4	4/4	4/4	4/4
Settlement Living Conditions Index	0.5760 0.0000**	0.7095 0.0000**	0.5528 0.0000**	0.6333 0.0000**	0.7649 0.0000**

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

Annex 5: Spearman Rank Correlation Coefficients and P-values, Individual Condition Variables

Table 41: Settlement Living Conditions Index and Multi-Condition Sub-Indices, Spearman Rank Correlation Coefficients and P-values

			Settlement Living Conditions Index																
			Tenure Security Conditions			Water and Sanitation Conditions			Infrastructure Conditions			Economic Conditions			Social and Environmental Conditions			
			Land Ownership	Type of Occupancy	Housing Nature	Water Supply	Sanitation Facilities	Drainage Facilities	Access Roads	Electricity Supply	Solid Waste Collection	Employment	Income	Savings and Credit	School Enrolment	Civic Facilities	Risk and Vulnerability	Social Issues
Settlement Living Conditions Index	Tenure Security Conditions	Land Ownership		0.8127 0.0000**	0.1443 0.0000**	0.0696 0.0000**	0.0983 0.0000**	-0.1003 0.0000**	-0.0548 0.0000**	-0.0478 0.0000**	-0.0733 0.0000**	0.0138 0.0035**	-0.0363 0.0000**	0.1522 0.0000**	0.1366 0.0000**	0.0097 0.0409*	0.2571 0.0000**	0.0251 0.0000**
		Type of Occupancy	0.8127 0.0000**		0.1977 0.0000**	0.1221 0.0000**	0.1442 0.0000**	-0.0810 0.0000**	-0.0274 0.0000**	0.0079 0.0929	-0.0668 0.0000**	0.0641 0.0000**	0.0329 0.0000**	0.1306 0.0000**	0.1746 0.0000**	0.0324 0.0000**	0.3230 0.0000**	0.0825 0.0000**
		Housing Nature	0.1443 0.0000**	0.1977 0.0000**		0.3209 0.0000**	0.3978 0.0000**	0.2017 0.0000**	0.2106 0.0000**	0.2030 0.0000**	0.1444 0.0000**	0.3516 0.0000**	0.3676 0.0000**	-0.0075 0.1131	0.2562 0.0000**	0.1722 0.0000**	0.3179 0.0000**	0.2588 0.0000**
	Water and Sanitation	Water Supply	0.0696 0.0000**	0.1221 0.0000**	0.3209 0.0000**		0.5000 0.0000**	0.1574 0.0000**	0.1511 0.0000**	0.1992 0.0000**	0.0981 0.0000**	0.3188 0.0000**	0.2399 0.0000**	0.0237 0.0000**	0.2693 0.0000**	0.1207 0.0000**	0.2646 0.0000**	0.2503 0.0000**
		Sanitation Facilities	0.0983 0.0000**	0.1442 0.0000**	0.3978 0.0000**	0.5000 0.0000**		0.2418 0.0000**	0.2273 0.0000**	0.2654 0.0000**	0.1719 0.0000**	0.3493 0.0000**	0.3362 0.0000**	-0.0087 0.0648	0.2880 0.0000**	0.2088 0.0000**	0.2864 0.0000**	0.2828 0.0000**
		Drainage Facilities	-0.1003 0.0000**	-0.0810 0.0000**	0.2017 0.0000**	0.1574 0.0000**	0.2418 0.0000**		0.4169 0.0000**	0.2840 0.0000**	0.3698 0.0000**	0.1921 0.0000**	0.2251 0.0000**	-0.0378 0.0000**	0.0994 0.0000**	0.2555 0.0000**	0.1725 0.0000**	0.1646 0.0000**
	Infrastructure Conditions	Access Roads	-0.0548 0.0000**	-0.0274 0.0000**	0.2106 0.0000**	0.1511 0.0000**	0.2273 0.0000**	0.4169 0.0000**		0.3605 0.0000**	0.3111 0.0000**	0.1893 0.0000**	0.2163 0.0000**	-0.0156 0.0009**	0.1214 0.0000**	0.2102 0.0000**	0.1757 0.0000**	0.1807 0.0000**
		Electricity Supply	-0.0478 0.0000**	0.0079 0.0929	0.2030 0.0000**	0.1992 0.0000**	0.2654 0.0000**	0.2840 0.0000**	0.3605 0.0000**		0.2410 0.0000**	0.2460 0.0000**	0.2209 0.0000**	0.0202 0.0000**	0.2124 0.0000**	0.2126 0.0000**	0.1869 0.0000**	0.2107 0.0000**
		Solid Waste Collection	-0.0733 0.0000**	-0.0668 0.0000**	0.1444 0.0000**	0.0981 0.0000**	0.1719 0.0000**	0.3698 0.0000**	0.3111 0.0000**	0.2410 0.0000**		0.1269 0.0000**	0.1514 0.0000**	-0.0527 0.0000**	0.0480 0.0000**	0.1961 0.0000**	0.0961 0.0000**	0.1217 0.0000**
	Economic Conditions	Employment	0.0138 0.0035**	0.0641 0.0000**	0.3516 0.0000**	0.3188 0.0000**	0.3493 0.0000**	0.1921 0.0000**	0.1893 0.0000**	0.2460 0.0000**	0.1269 0.0000**		0.5387 0.0000**	0.0687 0.0000**	0.4262 0.0000**	0.1851 0.0000**	0.3205 0.0000**	0.3601 0.0000**
		Income	-0.0363 0.0000**	0.0329 0.0000**	0.3676 0.0000**	0.2399 0.0000**	0.3362 0.0000**	0.2251 0.0000**	0.2163 0.0000**	0.2209 0.0000**	0.1514 0.0000**	0.5387 0.0000**		-0.0605 0.0000**	0.2657 0.0000**	0.2450 0.0000**	0.3100 0.0000**	0.3445 0.0000**
		Savings and Credit	0.1522 0.0000**	0.1306 0.0000**	-0.0075 0.1131	0.0237 0.0000**	-0.0087 0.0648	-0.0378 0.0000**	-0.0156 0.0009**	0.0202 0.0000**	-0.0527 0.0000**	0.0687 0.0000**	-0.0605 0.0000**		0.1957 0.0000**	0.0107 0.0240*	0.0337 0.0000**	-0.0905 0.0000**
	Social and Environmental Conditions	School Enrolment	0.1366 0.0000**	0.1746 0.0000**	0.2562 0.0000**	0.2693 0.0000**	0.2880 0.0000**	0.0994 0.0000**	0.1214 0.0000**	0.2124 0.0000**	0.0480 0.0000**	0.4262 0.0000**	0.2657 0.0000**	0.1957 0.0000**		0.1778 0.0000**	0.2643 0.0000**	0.2956 0.0000**
		Civic Facilities	0.0097 0.0409*	0.0324 0.0000**	0.1722 0.0000**	0.1207 0.0000**	0.2088 0.0000**	0.2555 0.0000**	0.2102 0.0000**	0.2126 0.0000**	0.1961 0.0000**	0.1851 0.0000**	0.2450 0.0000**	0.0107 0.0240*	0.1778 0.0000**		0.1890 0.0000**	0.1736 0.0000**
		Risk and Vulnerability	0.2571 0.0000**	0.3230 0.0000**	0.3179 0.0000**	0.2646 0.0000**	0.2864 0.0000**	0.1725 0.0000**	0.1757 0.0000**	0.1869 0.0000**	0.0961 0.0000**	0.3205 0.0000**	0.3100 0.0000**	0.0337 0.0000**	0.2643 0.0000**	0.1890 0.0000**		0.4272 0.0000**
		Social Issues	0.0251 0.0000**	0.0825 0.0000**	0.2588 0.0000**	0.2503 0.0000**	0.2828 0.0000**	0.1646 0.0000**	0.1807 0.0000**	0.2107 0.0000**	0.1217 0.0000**	0.3601 0.0000**	0.3445 0.0000**	-0.0905 0.0000**	0.2956 0.0000**	0.1736 0.0000**	0.4272 0.0000**	
		Number of Significant Individual Correlations	15/15	14/15	14/15	15/15	14/15	15/15	15/15	14/15	15/15	15/15	15/15	14/15	15/15	15/15	15/15	15/15
		Settlement Living Conditions Index	0.3853 0.0000**	0.4383 0.0000**	0.5570 0.0000**	0.5163 0.0000**	0.6037 0.0000**	0.4260 0.0000**	0.4568 0.0000**	0.4347 0.0000**	0.3338 0.0000**	0.5785 0.0000**	0.5382 0.0000**	0.1761 0.0000**	0.3338 0.0000**	0.3888 0.0000**	0.1761 0.0000**	0.5094 0.0000**

Spearman Rank Correlation Coefficients Appear in the first line. P-values appear in the second line.
** Denotes significance at the 5 per cent level. ** Denotes significance at the 1 per cent level.*

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